United States Department of Agriculture

Draft

Roy Creek Project

Environmental Assessment

USDA Forest Service Huron-Manistee National Forests
Huron Shores Ranger Station, 5761 North Skeel Ave, Oscoda MI 48750

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Document Structure

National Forest management is guided by congressional mandate to provide multiple benefits to American people for present and future generations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental effects that would result from the proposed action and alternatives. The document is organized into chapters:

Chapter 1: Purpose and Need for Action

This section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded. This section lists the issues and the Forest Service's responses to comments.

Chapter 2: Alternatives Including the Proposed Action

This section provides a more detailed description of the agency's proposed action and design criteria for the project, as well as alternative methods for achieving the stated purpose. These alternatives were developed based on issues raised by the public, other agencies and Forest Service employees.

Chapter 3: Environmental Consequences

This section examines the existing conditions in the project area and provides a professional analysis of the potential impacts of the alternatives proposed by the project. This section includes analysis in the following areas: Vegetation, Fire and Fuels, Wildlife and Plants, Non-Native Invasive Species (NNIS), Transportation, Recreation, Cultural Resources, Water, Air, Soils, Socio-Economics, Visual Quality, and Climate Change.

List of Preparers

This section lists the people on the interdisciplinary team and/or those who helped prepare this document.

References

This section lists the references used in this document.

Appendices

The appendices provide more detailed information including maps to support the analysis presented in the environmental assessment.

Availability of the Planning Record

A consideration in preparation of this environmental assessment has been the reduction of paperwork as specified in 40 CFR 1500.4. The objective is to furnish enough site-specific information to demonstrate a reasonable consideration of the environmental impacts of the alternatives and how these impacts might be mitigated. The Planning Record contains detailed information used in the analysis and is available upon request at the Huron Shores Ranger Station in Oscoda, Michigan

CHAPTER 1: PURPOSE AND NEED FOR ACTION

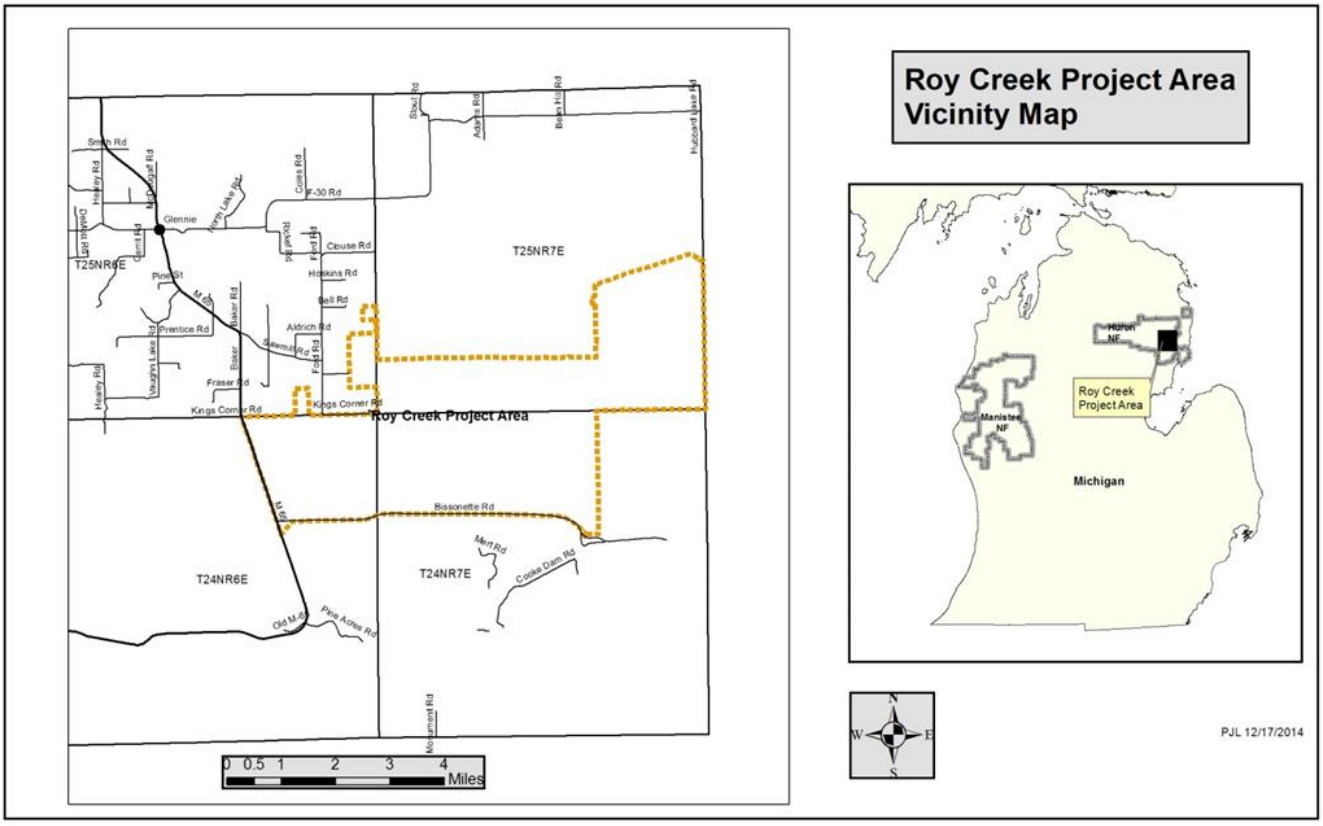
1.1 Introduction

The US Forest Service is proposing resource management activities to meet management objectives established in the Huron-Manistee National Forests Land and Resource Management Plan, as amended (USDA Forest Service, 2006). The Roy Creek Project includes timber management, hazardous fuels reduction, fuelbreak creation, wildlife habitat improvements, endangered species habitat creation, rehabilitation of user-created resource damage, and non-native invasive plant management activities. Resource management activities would occur on National Forest System public lands (public lands managed by the Forest Service) only.

1.2 Location and Area Description

The proposed actions are located on National Forest System lands in Curtis and Mikado Townships, Alcona County, Michigan and Oscoda Township, Iosco County (see Figure 1). The legal descriptions of the areas where actions are proposed are as follows: Township 25N, Range 6E, Sections 25, 26, 35, and 36; Township 25N, R7E, Sections 23, 24, 25, 26, 31, 32, 33, 34, 35, and 36 (Alcona County); Township 24N, R6E, Sections 1, 2, 3, 10, 11, and 12; and Township 24N, R7E, Sections 3, 4, 5, 6, 7, 8 ,9, 10, and 15 (Iosco County).

Figure 1: Roy Creek Project Area



1.3 Proposed Action

The U.S. Forest Service proposes the following actions on federal lands:

1. Thin approximately 1,626 acres of red pine and approximately 168 acres of white pine to improve growth of remaining trees, provide timber products, reduce hazardous fuels, and improve wildlife habitat by creating up to nine snags per acre.

2. Harvest approximately 16 acres of short-rotation oak by shelterwood cutting to release and protect the developing advanced oak regeneration, provide timber products, and provide early successional wildlife habitat. Once adequate regeneration is established the shelterwood trees would be removed.

3. Thin approximately 37 acres of long-rotation oak to promote growth of the residual stand. These treatments would also produce timber products and improve wildlife habitat.

4. Harvest approximately 10 acres of aspen by clearcutting to promote regeneration and provide early successional wildlife habitat.

5. Construct approximately 7.5 miles of temporary roads to facilitate removal of forest products. Temporary roads would follow old two-track roads or the footprint of previously-created temporary roads where possible and would be closed when management activities are completed.

6. Prescribe burn approximately 5,582 acres to reduce fuel loading to approximately 3 tons per acre of one and ten-hour fuels , restore fire into fire-adapted ecosystems, provide for firefighter safety, protect life and private property, and improve wildlife habitat. If prescribed burning activities do not initially meet the desired fuel reduction objectives they would be repeated as needed to achieve the desired fuel reduction objectives. Once the desired level is reached, subsequent prescribed burning activities would be implemented when one and ten-hour fuel levels exceed 6-8 tons per acre.

7. Create and subsequently maintain, approximately 172 acres of fuelbreaks through timber harvest, mechanical or manual cutting, and/or prescribed burning. The fuelbreaks would reduce fuel loading to protect life and private property, and provide for firefighter safety. Linear fuelbreaks would be approximately 300-350 feet wide. Maintenance would be done when ground vegetation reached a height of one foot or more or fuel loading exceeds 6 tons per acre of one and ten-hour fuels.

8. Thin approximately 80 acres of mixed jack pine, red pine, and hardwood to reduce hazardous fuels and improve wildlife habitat. Most of the jack pine would be cut and the hardwood thinned.

9. Create, and subsequently maintain, approximately 613 acres of early successional wildlife and plant habitat through timber harvesting, prescribed burning and/or mechanical or manual treatments to provide early-successional wildlife and plant habitat, provide for firefighter safety, reduce fuel loading, and protect life and private property. Maintenance would be done when ground vegetation reached a height of one foot or more or fuel loading exceeds 6 tons per acre of one and ten-hour fuels.

10. Create approximately 861 acres of Kirtland warbler habitat by clearcutting 740 acres of mixed jack pine, red pine, and oak, in two areas to create nesting and breeding habitat for the endangered Kirtland's warbler, provide early successional wildlife habitat, and provide timber products. Site preparation would be by mechanical means, hand, or by prescribed burning. Planting would be to KW stocking levels (approximately 1,452 jack pine trees per acre). Preferred method of treatment for non-merchantable portions (approximately 121 acres) within unit KW-1 (see Table 13) would be by prescribed burning to create natural regeneration. An alternative treatment would be to site prepare by mechanical means (hydroaxing, drum chopping, Bracke scarifer, etc.) and then plant. Fill-in planting may be necessary in areas where natural regeneration is below KW stocking levels (1,452 jack pine trees per acre).

11. Add approximately 200 acres to Kirtland's warbler essential habitat. Remove approximately 397 acres from Kirtland's warbler essential habitat.

12. Place approximately eight bluebird boxes and four bat boxes to provide habitat and structure within existing forest openings.

13. Create sunlit, open areas along Roy and MacDonald creek adjacent to and within riparian zones, as well as brush piles for the eastern massasauga rattlesnake. Approximately six to ten sites along each creek, totaling about 6 acres, would be created.

14. Suppress, control, or eradicate non-native invasive plant species (NNIS) on up to 200 acres annually, including 181 acres of known occurrences within the project area and within areas of proposed actions subsequent to implementation if NNIS become established. NNIS would be treated by hand spraying herbicides, introducing approved biological controls, hand pulling, cutting with a chainsaw, tilling, planting native vegetation, or using other mechanical and/or manual means as listed in Appendix C. No private property would be treated.

15. Rehabilitate user-created resource damage on approximately five acres. FR 3429 would be closed using berms and/or guardrail on the north end of the road at the top of the hill before the descent to the creek. On the south end of the road at the top of the hill near the campsite the road would be closed using berms and/or guardrail. An old culvert near the campsite would be removed. The creek crossing would be rehabilitated using erosion cloth or similar material. Native materials (rocks and logs) would be used to provide protection and rebuild the bank where it has washed into the creek. Rehabilitation efforts would also include closing damaged areas to motorized vehicles, mechanically recontouring and stabilizing the sites, and revegetating the areas by planting grasses and trees.

16. Install a new interpretive sign at the CCC pull off at the Chambers Road and King's Corner Road intersection. The existing sign would be replaced with a fiberglass weatherproof sign.

17. Replace KW interpretive signs with updated information and move to new locations within the project area.

18. Add approximately 0.03 miles of existing unclassified road to the Forest Service road system. The road would be classified as a Maintenance Level 2 roadway and open for public and administrative use. This road segment runs from Bissonette road to FR 2010.

19. Figure 6 shows its location.

20. Close approximate 4.2 miles of existing Maintenance Level 2 Forest Service System roads not currently needed for management purposes. Roadways would be closed in a variety of ways. The most common ways are with gates, guardrails, earthen berms, and barrier posts and mostly depends on the surrounding landscape and how effectively it would fit into that landscape. Level 1 status. Roads would still be open for foot travel. The list of roads to be closed is found in

21. Table 49 in the Transportation section of Chapter 3.

22. Figure 6 shows their location. (The Motor Vehicle Use Map that shows the roads within the project area is located in the Project file.)

23. Close and revegetate approximately 1.7 miles of existing Maintenance Level 2 Forest Service System roads not needed for management purposes. Roads would be closed using posts and guardrails, earthen berms, or other closure devices and planted with grasses and/or trees. The list of roads to be closed and revegetated is found in Table 50 in the Transportation section of Chapter 3.

24. Figure 6 shows their location. (The Motor Vehicle Use Map that shows the roads within the project area is located in the Project file.)

1.4 Management Direction

Activities that are planned in the National Forest System involve two different levels of decisions: a general (programmatic) decision for the entire Forest, and a site-specific decision for the project area. The Huron-Manistee National Forests Land and Resource Management Plan (Forest Plan) provides a programmatic framework regarding allocation of National Forest System lands and measures necessary to protect the Forests' resources. It describes how Forests should be managed and what resources should be provided by these lands now and in the future. The Final Environmental Impact Statement (USDA Forest Service, 2006) of the Forest Plan displays forest-wide effects of activities, such as timber harvest, wildlife habitat management, recreation and visual resource management, and transportation system management.

Implementation of site-specific projects is guided by Forest Plan direction through management prescriptions designed to attain a desired condition in each Management Area (MA). The Roy Creek Project falls within MA 4.2. The proposed activities address site-specific needs and opportunities to move the project area from the existing condition to the desired condition as set forth in the Forest Plan.

The general purpose of the project is aligned with the Forest Plan direction provided for the Management Areas located within the Project Area as follows in

Table 1.

Table 1: Forest Plan Management Area and Direction

Management Area	Forest Plan Direction
4.2 - Roaded Natural Sandy Plains and Hills	Management activities enhance and increase the variety of wildlife habitats with emphasis given to managing deer, grouse, wildlife and Kirtland's warbler essential habitat. High volumes of timber products are produced. Emphasis includes reducing life-threatening and property damaging wildfire potential and providing a variety of recreational opportunities. On the Huron National Forest, management activities maintain and develop essential nesting habitat for the Kirtland's warbler. Moderate to high volumes of softwood and low volumes of hardwood timber products are produced in Kirtland's warbler emphasis areas.

This Environmental Assessment (EA) analyzes the site-specific effects of management activities proposed in the Roy Creek Project, and is tiered to Forest Plan, FEIS, and the accompanying Record of Decision. The Forest Plan also establishes standards that preclude or limit activities to protect the environment. These standards are used to develop design criteria for the project, and are also used to assess an action's effects to ensure that the project complies with the Forest Plan.

1.5 Need and Objectives of the Roy Creek Project

The need for the Roy Creek project was arrived at by examining the differences between the existing landscape condition and the desired condition described in the Forests Plan. Field reconnaissance, review of Forest Service databases, review of compartment folders, maps, and discussions between natural resource specialists revealed substantial gaps in what appears on the landscape and what the desired condition of the landscape should be as described in the Forest Plan. For example, the Forest Plan contains information on specific age class and management requirements for forest types. Currently, the majority of the red pine stands found within the project area are over stocked and exhibit reduced growth rates. The Forest Plan desired condition and what appears on the landscape do not match. Another example is that the project area has a greater hazardous fuel risk than areas that have been treated outside of the project area. Current condition and desired condition gaps also exist in vegetation age class and diversity. Simply stated, the Roy Creek Project is needed to close the gap between the management goals of the Forest Plan (desired condition) and what is actually on the landscape (current condition). The Roy Creek Project is designed to help move the area towards the desired future condition set forth in the Forest Plan by meeting the goals and objectives for the specific Management Area (MA).

Objectives are actions intended to attain or accomplish management goals. For each objective of the Roy Creek project, an indicator of measure has been identified in order to determine how well each alternative would meet each objective. An indicator of measure is used to judge differences among actions and to determine to what degree results have or have not been achieved. They enable the decision maker to assess progress toward the desired condition.

Analysis of the Forest Plan objectives denotes a contrast between the existing condition and the desired future condition of the project area. In order to implement the Forest Plan and to

address the identified needs, based on the existing condition, site specific needs and management activities need to occur to properly manage resources within the project area.

Please refer to Table 2 on the following pages.

Table 2: Comparison of Desired Future Condition, Existing Condition and Management Activities, and Indicators of Measure

Desired Future Condition (Objective)	Existing Condition	Site Specific Need	Management Activity (Proposed)	Indicator of Measure
1. Produce a diverse mix of timber products. Move the project area towards the desired future condition set forth in the Forest Plan, particularly in regards to vegetative composition. Contribute to the economic base of local community by providing a sustained yield of wood products (ref. (USDA Forest Service, 2006), p. II-4, p. III-4.2-2, Table II-3, p. II-7, and p. III-4.2-3).	Red pine and white plantations are currently overstocked, and have an unnatural row appearance. High and low-site oak stands selected for treatment in the Roy Creek Project are either ready to be harvested to promote growth of the remaining trees or need to be treated to ensure regeneration at the prescribed rotation age and to provide for future timber. The aspen stand is mature and has reached an age suitable for regeneration.	Thin red and white pine to reduce unhealthy trees and row appearance. Treat high and low-site oak to ensure regeneration at the prescribed rotation age, and provide for future timber availability. Treat aspen to ensure wildlife habitat and future timber availability.	Commercial timber sales focusing on red pine, jack pine, high and low-site oak, and aspen.	Acres of vegetative treatments and amount of timber produced

Desired Future Condition (Objective)	**Existing Condition**	**Site Specific Need**	**Management Activity (Proposed)**	**Indicator of Measure**
2. Implement fuels reduction and fuelbreak projects where conditions warrant for the protection of life, property and safety. Restore fire into fire-adapted ecosystems through prescribed burning. High-risk areas adjacent to private lands will receive treatment priority (ref. (USDA Forest Service, 2006), p. II-3, and p. II-4).	Past fire suppression has removed the natural role of fire from the landscape. Large accumulations of hazardous fuels in wildland/urban interface.	Increase prescribed fire frequency to a 1 to 7 year interval, (intervals vary by community type) and reduce fire crown potential from 5-7 to 4 (See Revised Forest Plan, Part I); reduce the accumulated fuels to minimize wildfire potential and protect forest resources (biotic and abiotic) and private property. Create and maintain fuel breaks.	Prescribed burning, mechanical treatment of fuels, commercial timber harvest.	Acres of fuels treatments, percent reduction in fuel loading, acres moved from Fire Regime Condition Class (FRCC) 3 or 2 toward FRCC 2 or 1

3. Maintain, restore and improve community diversity and forest health and to provide for wildlife and plant viability. Identify and treat high priority NNIS infestations (ref. (USDA Forest Service, 2006) , p. II-4, p. II-5, p. III-4.2-3, and p. III-4.2-4).	Forested stands are overstocked and have limited diversity and limited understory development. Overcrowding causes lack of natural regeneration, poor tree growth, declining nutrient cycling, and increased vulnerability to infestations by insects and reduced suitability of habitat for wildlife and plants. Habitat suitability is low due to homogenous age class and species composition, infestations of NNIS.	Need to restore healthy conditions by removing unhealthy trees and reducing stocking densities to increase growth on remaining trees. Maintain various successional stages across the landscape, including early successional habitat (ESH), suppress and treat NNIS species, increase structure in aquatic systems.	Commercial timber harvest, prescribed burning or mechanical treatment, treatment of NNIS, maintain and create early successional habitat	Acres of vegetative and opening treatments and nest boxes placed. Acres of NNIS treated.
4. Provide breeding and foraging habitat for the federally endangered Kirtland's warbler (ref. (USDA Forest Service, 2006), p. II-3, p. III-4.2-3, and p. III-4.2-4).	Pine Block 16 and Pine Block 17contain over-mature jack pine and are no longer suitable KW habitat.	The two KW Blocks need to be harvested to allow for the planting and regeneration of jack pine.	Commercial harvest, mechanical treatment, prescribed burning.	Acres of KW nesting/breeding habitat created.

5. Rehabilitate user-created resource damage (ref. (USDA Forest Service, 2006) , p. II-5, and p. II-21).	User created ATV/ORV damage on closed roads causing erosion and sediment to wash into McDonald creek.	Forest Road 3429 is proposed to be closed and revegetated from both the north and south ends to block the user- created stream crossing and resulting erosion into McDonald creek.	Obliterate the road; rehabilitate soil erosion by mechanically re-contouring, seeding, mulching, planting trees, and/or using native materials.	Acres of resource damage rehabilitated.
6. Develop and operate the road system, including all bridges and culverts, maintained to the minimum standard needed to meet requirements of proposed actions, protect the environment, and provide for reasonable and safe forest access (ref. (USDA Forest Service, 2006), p. II-3, and p. II-5).	There are roads causing resource damage. Road densities surpass Forest Plan maximums for Level 1 and Level 2 roads.	Treat resource damage. Maintain the road system for 0-3 miles/square mile (Forest Plan page II 39-40) to provide access for the public, timber extraction, and administrative use.	Add roads or remove them from the system to provide for public safety, administrative use, and to comply with Forest Plan standards and guidelines.	Miles of forest system roads opened or closed to public and administrative use and acres obliterated and removed from the system.

7. Inform and educate the public regarding forest management. (USDA Forest Service, 2006), p. II-4).	The wooden interpretive sign at the historic Civilian Conservation Corp (CCC) camp is showing wear. The KW interpretive signs are in fair condition, however since KW management and numbers of birds have changed, the sign information needs updating.	The sign for the CCC camp location will need replacing within the planning cycle of the Roy Creek Project. In addition, several existing KW interpretive signs have out of date information and are no longer located in appropriate places. There is a need to provide updated interpretive information to the public.	Replace the CCC camp sign with a fiberglass (or similar material) version. Install/replace KW interpretive signs.	Signs replaced and installed in appropriate locations

Each objective from the above Table 2 is explained in more detail below. In addition, an indicator is identified to measure how well each alternative meets each objective.

1.5.1 Moderate to high volumes of softwood and low volumes of hardwood timber products are produced in Kirtland's warbler emphasis areas. (Objective 1)

Indicator: Acres of vegetation management and amount of timber produced (CCF)

Silviculture stand exams reveal that the current condition of the red and white pine stands in the project area are currently overstocked and exhibit low growth rates. These plantations have an unnatural row appearance and have crown-to-crown contact which increases the likelihood of a crown fire in the event of a wildfire. The desired timber product is to produce high quality sawlogs. Thinning is needed to promote growth on the remaining trees and maintain health. This would also reduce crown-to-crown contact; the affect would be a reduction in the potential for crown fires. Currently about 24% of the project area is in the long-lived conifer forest community.

High-site oak covers approximately 0.2% of the project area. The desired timber product is high quality saw logs. Currently these stands also are overstocked and exhibit low growth rates. Thinning is needed to promote growth on the remaining trees and maintain health.

Approximately 27% of the project area is in the low-site oak forest community. The desired timber product is pole timber and small diameter saw logs. Some of these stands exceed rotation age and exhibit decline. The proposal to regenerate one low-site oak stand would improve age-class diversity and provide for future timber availability.

There are very few opportunities to regenerate aspen (aspen occurs in 0.5% of the project area). The aspen exceeds rotation age and is exhibiting decline. The desired timber product is pole timber and small diameter sawlogs. There is a need to harvest this stand while it is still viable and able to naturally regenerate.

1.5.2 Implement fuels reduction and fuelbreak projects where conditions warrant for the protection of life, property and safety. Restore fire into fire-adapted ecosystems. (Objective 2)

Indicator: Acres of fuels treatments

The project area is currently a relatively dense forest with a continuous tree canopy and moderate to heavy fuel loading; a condition created and maintained by past and current fire suppression efforts.

Currently 97% of the project area is in Fire Regime[1] (FR) 1. Fire Regime 1 typically experiences large high-intensity wildfires with a historic return interval of about 59 years. These Fire Regimes are not confined to National Forest System lands. They also occur on private property. A breakdown of the Fire Regimes within the project area is illustrated in Table 3 on the following page.

Table 3: Fire Regimes within the Project Area

Fire Regime (FR) (numeric)	Description	Historic Return Interval (years)	Acres within Project Area	Percent of Project Area
1	Frequent, large catastrophic stand-replacing fires	59	13,682	97.28
2	Large, catastrophic stand-replacing fires at lower frequencies than FR1	107	43	0.31
3W	Relatively infrequent stand-replacing fires; within wetlands imbedded in or adjacent to fire-prone landscapes	120	322	2.29
4W	Very infrequent stand-replacing or ground fires; within wetlands embedded within or adjacent to fire-sensitive landscapes	684	1	0
Water	Water	N/A	15	0.11
Total			**14,064**	**100**

The desired condition is the reduction of hazardous fuels accumulations thus providing for the protection of life and property and the restoration of a fire-adapted and resilient ecosystem. The

[1] See Appendix F: Glossary of Terms for definition. Baring a change in covertype or land use conversion Fire Regimes remain static

desired condition is moving the project area from its current Fire Regime Condition Class[2] of Condition Class 2 (see Fire Regime Condition Class (numeric) Map in Appendix A) toward a Condition Class of 1, and changing existing fuel beds from their current expected high-intensity, high-severity fire behavior to fuel beds with lower expected rates of spread and flame lengths which would allow fire suppression resources to utilize direct attack tactics.

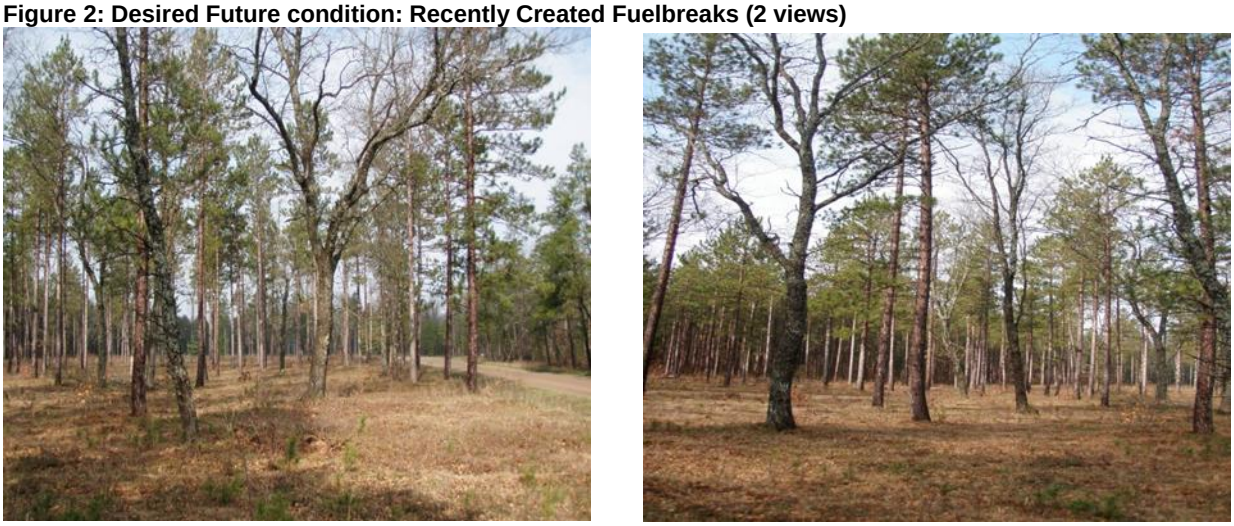
The Project's proposed vegetation management activities and use of prescribed burning are needed to help return the project areas to conditions similar to historical levels. The desired condition is to reduce the potential for stand-replacing wildfire, and reduce the fire intensity by reducing hazardous fuels.

Fuelbreaks and prescribed burning proposals were based on an analysis of hazardous fuel types (jack and red pine) and their proximity to private property. Fuelbreaks, as illustrated in Figure 2, were considered where private property was within one-half mile of hazardous fuels or where existing fuelbreaks were less than the ideal width of about 300 feet.

This project is needed to protect life and property. It is also needed to protect the safety of private and public landowners and the emergency personnel in the event of a wildfire. Historical wildfire occurrences have demonstrated the need for reducing fuel loading (i.e. creating fuel breaks around private property).

Based on a hazardous fuels analysis, each specific stand to be treated was selected due to its current high-intensity fire behavior potential in the stand and it's placement in respect to adjacent values at risk (homes, infrastructure, ingress/egress routes, etc.). In an average year, a large portion of the project area has the potential for very high-intensity fires that can occur in either the crowns of the trees or on the surface (Table 3). Treatments would allow for a higher probability of protection of these values at risk when a high-intensity fire threatens them.

Figure 2: Desired Future condition: Recently Created Fuelbreaks (2 views)



[2] See Appendix F: Glossary of Terms for definition. Unlike Fire Regimes, Fire Regime Condition Classes can be changed through various management activities.

1.5.3 Maintain, restore and improve community diversity and forest health and to provide for wildlife and plant viability. Suppress, control or eradicate known and identified Non Native Invasive Species (NNIS) populations (Objective 3)

Indicator: Acres of vegetative and opening treatments, nest boxes placed and utilized, and acres of NNIS treated

Historically, open land habitats within the project boundary ranged in size from < 1 acre to 100s of acres, primarily due to periodic, reoccurring wildfires. With the introduction of fire suppression, open land habitat in the project boundary is present as relatively small patches (openings) of less than 10 acres in size, while large early-successional habitat areas are not present at all. The lack of large openings and absence of permanent early successional habitat is one factor in the decrease in plant and animal diversity associated with open land. (Some large areas of early successional habitat are established when nesting habitat for the Kirtland's warbler is created. However, this is only temporary with effects only lasting from two to five years)

The desired condition is to manage a variety pf wildlife and fisheries habitats and plant communities in order to maintain viable populations of species. One factor in maintaining a viable population is to have a variety of successional stages present (open to young to mature) interspersed across the landscape.

There is a need to re-establish early successional habitat as illustrated by Figure 3 and provide larger and more numerous openings to provide for and increase habitat diversity. This, in turn, would help maintain and possibly increase wildlife species population viability in the project areas.

This would help promote habitat diversity within both the project boundary and across the Forest.

Figure 3: Pine/Oak Early Successional Habitat near Project Area

Nesting structure for the eastern bluebird and bats are lacking in the project area due to the relatively young age class of the forest and the abundance of relatively short-lived and quickly decomposing species such as jack pine. Eastern Bluebirds build their nests in natural cavities or

in nest boxes or other artificial refuges. If cavity holes are lacking nest boxes may be substituted.

Where cavities are lacking, roosting habitat for bats nest boxes may be placed within the project area. Utilization of nest boxes by bats has been documented in other locations on the Huron-Manistee National Forests.

A portion of the project area falls within the Pine River Massasauga Management Unit (MMU). Eastern Massasauga rattlesnakes utilize wetland areas such as cold-water tributaries as overwintering hibernacula and adjacent open habitat within approximately one kilometer of water and with less than 50% canopy closure to meet their thermal demands while hunting small rodents and insects (Johnson, et. al., 2000). The existing condition is that habitat for the eastern massasauga rattlesnake is lacking within the project area due to the relatively heavily wooded condition. The desired condition is to meet the conservation needs of the snake within MMU's. There is a need to create small sunlight areas adjacent to hibernacula to meet the massasauga' s thermal demands both after emerging in the spring and before re-entering in the fall, and to provide open early-successional habitat conditions within a kilometer of water during the active summer season.

NNIS have the capacity to alter or dominate native communities and easily become established in areas that are frequently or severely disturbed, such as roadsides, landing sites, and skid trails; therefore, control of these species has become a management priority. Propagules of non-native invasive plant species can spread from disturbed sites into the surrounding habitats and disrupt the ecology of natural communities. Non-native invasive plants can degrade wildlife habitat, change soil chemistry, alter the ecology of native plant communities, cause declines in the growth rates of canopy trees, prevent natural tree regeneration, change fire regimes, directly impact wildlife species, and displace native plants species. Management of NNIS would work towards the objective of maintained and restored community diversity and its associated benefits. As some proposed actions will increase the likelihood of spread of non-native invasive species and provide habitat for their colonization and spread, control actions are needed in action areas where NNIS are detected.

Executive Order 13112 (Executive Order 13112, 1999) directs Federal agencies "whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law…subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to:

1. prevent the introduction of invasive species;
2. detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner;
3. monitor invasive species populations accurately and reliably;
4. provide for restoration of native species and habitat conditions in ecosystems that have been invaded;

The Forest Service Manual 2900 provides direction for implementing an integrated weed management program to control and contain the spread of noxious weeds on National Forest System lands and from National Forest System lands to adjacent lands. All National Forest

System invasive species management activities will be conducted within the following strategic objectives:

1. Prevention
2. Early Detection and Rapid Response (EDRR)
3. Control and Management

The USDA NRIS TESP/IS inventory has revealed approximately 181 gross acres of National Forest System lands within the Roy Creek project area which are to some extent infested with NNIS (Figure 8). Suppression of NNIS in these areas would contribute towards the restoration and improvement of diversity, resilience, and ecosystem services provided by these plant communities. Despite mitigation measures, there is a risk that the proposed actions could physically introduce NNIS or alter habitat in ways which could make these areas susceptible to NNIS establishment. In order to maintain a diverse native plant community, treatment of NNIS which are discovered within these areas could also occur.

1.5.4 Provide Nesting Habitat for the Federally-Endangered Kirtland's Warbler (Objective 4)

Indicator: Acres of Kirtland's warbler nesting habitat created.

This project is needed to continue the ongoing management for Kirtland's warbler (KW) recovery on the Huron National Forest. In compliance with the Forest Plan (as amended), a minimum of 1,600 acres of future nesting habitat must be created annually on the Huron National Forest to ensure the sustainability and recovery of this population. This project contributes towards meeting the forests annual objective.

Treatment blocks in each of the seven management areas on the Huron National Forest are sequentially scheduled for habitat development, close to other blocks in space and time, because larger blocks of habitat are more desirable to KW. Currently there are two blocks of essential habitat that contain stands of jack pine, red pine, and mixed oak forest types that are beyond rotation age, and lie immediately adjacent to occupied habitat.

There is a need to regenerate these blocks of habitat within the Pine River KWMA to conditions that provide suitable nesting habitat for the Kirtland's warbler.

1.5.5 Rehabilitate user-created resource damage. (Objective 5)

Indicator: Resource damage rehabilitated

During the preliminary field work and surveys conducted for the Roy Creek Project, an area of user-created resource damage was discovered by Forest Service personnel. It was noted that ATV's and ORV's are continuing to use FR 3429 even though it was closed in the past. The closure devices (berms) are no longer effective and vehicles continue to cross Roy Creek causing resource damage. The site has erosion problems that will only continue to further deteriorate. The site, most of which follows a formerly closed Forest Service Road (FR 3429) and is shown in Figure 4, would be closed and/or obliterated (USDA Forest Service, 2006) (page II-39). This non-system travel route would then be left to naturally rehabilitate, or rehabilitation would be enhanced by mechanically recontouring, manual seeding and/or planting of seedlings, trees or shrubs. The creek crossing itself would be rehabilitated using erosion cloth and native materials such as rocks and logs would be used to provide protection and rebuild the bank where it has washed into the creek.

Figure 4: Resource Damage within Roy Creek Project Area (2 views)

1.5.6 Develop and operate the road system, including all bridges and culverts, maintained to the minimum standard needed to protect the environment, provide for reasonable and safe forest access and resource management. (Objective 6)

Indicator: Miles of forest system roads added or removed from the transportation system.

An analysis of the road system indicates the density of state, county and forest roads vary between 2.0 - 3.5 miles of roadway per square mile (MVUM 2014). An analysis of the existing condition revealed that 4.2 miles of roadway had little use by the public, were overgrown, and were difficult to navigate. These roadways do not play a critical role in connecting arterial roads or collector roads and do not serve the public to access National Forest lands. The desired future condition is that the maximum average miles of local roads per square mile within Management Areas 4.2 should be 0-2 miles and 0-3 miles per square for all roads. However these roads may be needed for future administrative and/or public use. There is a need to reclassify these roads from Maintenance Level 2 roadways to Maintenance Level 1 (closed to public vehicular use but still available for walk-in access).

There are approximately 1.65 miles of roads that show sign of little use by the public and are also not needed for administrative use. These roadways do not play a role in connecting arterial roads or collector roads and do not serve the public to access National Forest lands. There is a need to decommission (permanently close) these roads.

There is a currently unclassified roadway (0.03 miles) traveling from Bissonette Road to the intersection of FR 2120 and snowmobile trail H-108 (DNR-96). There is a need to open the road for public use as a Maintenance Level 2 roadway to provide additional access to the project area.

Vegetation management is proposed throughout the project area. Removal of forest products through logging typically requires construction of temporary roads to minimize impacts to natural resources. Approximately 7.5 miles of temporary roads would need to be constructed to facilitate removal of forest products. Temporary roads would follow old two-track roads where possible to minimize impacts to natural resources. These roads would be closed when management activities were completed.

Unclassified roads are user-created roads. More often than not, these roads cause resource damage to soils, damage to natural vegetation, create corridors for NNIS, and are used for firewood theft and trash dumping. There are approximately 27 miles of unclassified roadways that need to be restored and rehabilitated to protect the natural resources.

1.5.7 Inform and educate the public regarding forest management. (Objective 7)

Indicator: Signs replaced and installed in appropriate locations

The project area includes an historic Civilian Conservation Corps (CCC) camp located on Chambers Road near King's Corner road. The existing interpretive sign will need to be replaced in the near future due to weathering. There is a need to replace the sign at the CCC historic site.

The Pine River KWMA is one of only seven areas on the Huron National Forest that provides management for the federally endangered Kirtland's warbler within pine barren ecosystems. The desired condition is to use a combination of personal contacts, brochures, and information signing to inform and educate the public about forest management. Several existing Kirtland's warbler interpretive signs dispersed within the project area have out of date information and are in locations the Kirtland's warblers no longer occupy. There is a need to continue to offer interpretive opportunities regarding management for the Kirtland's warbler with up to date information and in locations the Kirtland's warbler occupy.

1.6 Decision to Be Made

This Environmental Analysis evaluates site-specific concerns and opportunities, considers alternatives, and analyzes effects of the proposed actions and alternatives for the Roy Creek Project. The Responsible Official will decide whether or not to implement the proposed activities or its alternatives, in whole or in part, based on the actions and methods, location of the actions, and project requirements and mitigations presented in this analysis.

As required by 36 CFR 219.35, the best available science is utilized in making this decision. The project record demonstrates a thorough review of relevant scientific information, consideration of responsible opposing views, and, where appropriate, the acknowledgment of incomplete or unavailable information, scientific uncertainty, and risk.

1.7 Public Involvement

On October 16, 2014 the Roy Creek project proposal was published in the Oscoda Press, Alcona County Review, and Iosco County News-Herald. In addition to advertising in the newspaper and the Schedule of Proposed Actions, scoping reports including project maps describing the proposed actions and their locations were sent to approximately 250 interested parties and adjacent landowners.

On October 22, 2014, a letter to the editor appeared in the Oscoda Press and Iosco County newspaper. The same letter was published in the Alcona County Review on October 29, 2014. The letter to the editor contained mis-information regarding the Roy Creek project. During the next two weeks, the ranger station fielded numerous calls and visits from the public who were upset based on the letter to the editor contents.

In early November a journalist from the Oscoda Press wrote an article in an attempt to clarify the Roy Creek Project proposal and that publication included a map of the ID Team project area

analysis boundary. Within the project analysis boundary there is a contingent of private land in the Northwest portion known as Bryant Subdivision. Several private landowners from the subdivision contacted the district office with the misinterpretation that the Forest Service was proposing management activities on private land.

A meeting was scheduled with Bryant subdivision landowners for December 8, 2014 in Glennie, MI. The expectation of the Forest Service, as well as the Bryant subdivision landowners, was that the meeting was going to be an informal discussion regarding the proposed actions of the project and their concerns of private land being within the project area analysis boundary.

Approximately 60 people attended the meeting held in Glennie, MI. This unforeseen larger than expected turnout came as the result of flyers, radio announcements and community-wide advertising from an outside party erroneously claiming that the meeting with Bryant subdivision landowners was a public hearing about closing down federal land.

The December 8th meeting resulted in numerous additional requests for information on the Roy Creek Project. On December 17, 2014 the Oscoda Press featured a follow-up article with a synopsis of the meeting held in Glennie.

Additional articles focused on the Roy Creek project appeared in the December and January issues of Michigan Outdoor News, The Guide, and The Curtis Community News.

Presentations on the Roy Creek Project proposals were given by Forest Service staff to the local Rotary Club, the Audubon Society, the Pine River/Van Etten Lake Watershed Coalition, and to the Sunrise Side Lifelong Learning.

A total of 65 written and oral comments were received.

1.8 Issues/Response to Comment

A summary of the comments and response to comments are located in the project file.

1.8.1 Summary of Issues

The ID Team carefully considered all the comments and concerns raised by the public, other agencies, Tribes, and Forest Service resource specialists. Response to scoping comments were separated into two groups: relevant and non-relevant issues as directed by CEQ Regulation 1500.1(b), 1500.2(b), 1500.4(c), and 1500.4(g).

1.8.2 Non-relevant Issues Considered Outside the Scope of the Proposed Action

Non-relevant issues were identified as those; 1) outside the scope of the proposed action; 2) already decided by law, regulation, the Forest Plan, or other higher level decisions; 3) not relevant to the decision being made; or 4) conjectural and not supported by scientific or factual evidence. Non-relevant issues will not be evaluated in the Environmental Consequences section of this Environmental Assessment. These non-relevant issues are summarized in a spreadsheet located in the project file.

1.8.3 Issues Considered, But Not Brought Forward In Developing Alternatives

Issue: Top jack pine as a way to sustain Kirtland's warbler habitat longer.

During a conversation with a member of the public, Forest Service staff remarked that Kirtland's warbler habitat suitability diminishes once the jack pine reaches a height of approximately 15 feet. The member of the public suggested topping Jack pine may be a way to sustain the habitat longer. While this comment was considered and carried forward as an issue, it was not developed into an alternative because it would not meet the purpose and need of the project for the following reasons;

Kirtland's warblers are a ground nesting bird. They prefer the cover provided by live lower branch structure and herbaceous grasses. These conditions occur when jack pine trees are young and sunlight can penetrate the canopy. Once the trees reach a certain height (approximately 15 feet), sunlight is restricted due to canopy closure. This causes the lower branches to die. This condition also causes herbaceous grasses to die. This overall reduction in cover renders the habitat unsuitable for nesting.

Furthermore, topping jack pine is cost prohibitive and has the potential to result in excessive damage to the residual stand by mechanized equipment. There would be an increase in branches and tops left on the ground which would create a high fire hazard. Topping trees has the potential of killing them which would then result in an even higher fire hazard.

1.8.4 Issues Studied in Detail

There were no other issues identified by the ID Team.

1.8.5 Internal Issues

The ID Team did not identify any internal issues.

CHAPTER 2: ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Introduction

This chapter contains a description of the no-action and proposed action alternatives, a description of mitigation and monitoring measures and a tabular comparison of the no-action and action alternatives.

2.2 Process Used To Formulate Action Alternative

The Interdisciplinary Team (IDT) developed the proposed action to respond to the project purpose and need, the existing Forest Plan objectives, goals, and standards, and public and agency concerns as directed by NEPA. The IDT consisted of Forest Service personnel who have expertise in different natural resource fields in order to provide a diverse, interdisciplinary approach to the project. A list of preparers is included in Chapter 4. The final, proposed action was developed through a series of resource evaluations, field visits, IDT meetings, and public interactions. If implemented, the project would be designed and administered in accordance with Forest Plan Standards and Guidelines (USDA Forest Service, 2006) and Forest Service Manuals and Handbooks (FSM and FSH).

2.3 Alternatives Not Considered in Detail

There were no issues identified that led to the development of an alternative. Refer to Section 1.9.3.

2.4 Alternatives Considered in Detail

Two alternatives are considered in detail, the No Action Alternative and the Proposed Action. Alternative 1 (No Action) analyzes the effects of deferred treatment (no management activities taking place at this time). Alternative 2 (Proposed Action) follows management direction established in the Forest Plan as described in Section 1.5 of this document.

2.4.1 Alternative 1 – No Action (Baseline Condition)

This alternative was developed in response to National Environmental Policy Act requirements [40 CFR 1502.14(d)] for a No Action Alternative. Selection of this alternative means no projects would be implemented in the project area at this time. No vegetation, fuels, wildlife, and NNIS management would take place, no timber commodities would be produced, and no resource damage would be rehabilitated. Current uses of the area would continue until such uses were prohibited by changed environmental conditions. Routine use and maintenance of roads, trails, and other facilities in the project areas would continue. Per Huron National Forest policy, all wildfires would be suppressed. Wildfire (as a natural process) is not considered in the analysis of this alternative.

Selection of the No Action Alternative does not preclude future analysis or implementation of on-going management proposals within the project area. This alternative provides a baseline used to compare to the environmental effects of the action alternative. While the no action alternative is a viable alternative, it does not help meet the desired condition as described in the Forest Plan, or achieve the Purpose and Need for Action as described in Chapter 1 of this document.

2.4.2 Alternative 2 - Proposed Action

Direction provided in the Forest Plan is the basis for this alternative. The Proposed Action is designed to move the project area from the current condition toward the desired condition as described in the Forest Plan, particularly in regards to vegetative composition. This action responds to the need to produce a diverse mix of timber products, reduce fuel loading, maintain and improve wildlife habitat, provide for species viability needs, identify and treat high priority NNIS infestations, manage the transportation system, and rehabilitate user-created resource damage.

Summary of Alternative 2 (Proposed Action)

1. **Thin approximately 1,626 acres of red pine and approximately 168 acres of white pine** to improve growth of remaining trees, provide timber products, reduce hazardous fuels, and improve wildlife habitat by creating up to nine snags per acre.

2. **Harvest approximately 16 acres of short-rotation oak** by shelterwood cutting to release and protect the developing advanced oak regeneration, provide timber products, and provide early successional wildlife habitat. Once adequate regeneration is established the shelterwood trees would be removed.

3. **Thin approximately 37 acres** of long-rotation oak to promote growth of the residual stand. These treatments would also produce timber products and improve wildlife habitat.

4. **Harvest approximately 10 acres of aspen** by clearcutting to promote regeneration and provide early successional wildlife habitat.

5. **Construct approximately 7.5 miles of temporary roads** to facilitate removal of forest products. Temporary roads would follow old two-track roads or the footprint of previously-created temporary roads where possible and would be closed when management activities are completed.

6. **Prescribe burn approximately 5,582 acres** to reduce fuel loading, restore fire into fire-adapted ecosystems, provide for firefighter safety, reduce fuel loading, protect life and private property, and improve wildlife habitat. Prescribed burn activities would be repeated as needed to achieve desired management objectives.

7. **Create and subsequently maintain, approximately 172 acres of fuelbreaks** through timber harvest, mechanical or manual cutting, and/or prescribed burning. The fuelbreaks would reduce fuel loading to protect life and private property, and provide for firefighter safety. Linear fuelbreaks would be approximately 300-350 feet wide.

8. **Thin approximately 80 acres of mixed jack pine, red pine, and hardwood** to reduce hazardous fuels and improve wildlife habitat. Most of the jack pine would be cut and the hardwood thinned.

9. **Create, and subsequently maintain, approximately 613 acres of early successional wildlife and plant habitat** through timber harvesting, prescribed burning and/or mechanical or manual treatments to provide early-successional wildlife and plant habitat, provide for firefighter safety, reduce fuel loading, and protect life and private property.

10. **Create approximately 861 acres of Kirtland warbler (KW) habitat** by clearcutting 740 acres of mixed jack pine, red pine, and oak, in two areas to create nesting and breeding habitat for the endangered Kirtland's warbler, provide early successional wildlife habitat, and provide timber products. Site preparation (if needed in KW-1 or KW-2) would be by mechanical means, hand, or by prescribed burning. Planting would be to KW stocking levels. Preferred method of treatment for non-merchantable portions (approximately 121 acres) within unit KW-1 (see

11. Table 12) would be by prescribed burning to create natural regeneration. An alternative treatment would be to site prepare by mechanical means (hydroaxing, drum chopping, etc.) and then plant. Fill-in planting may be necessary in areas where natural regeneration is below KW stocking levels.

12. **Add approximately 200 acres** to Kirtland's warbler essential habitat. **Remove approximately 397 acres** from Kirtland's warbler essential habitat.

13. **Place approximately eight bluebird boxes and four bat boxes** to provide habitat and structure within existing forest openings.

14. **Create sunlit, open areas along Roy and MacDonald creek** adjacent to and within riparian zones, as well as brush piles for the eastern massasauga rattlesnake. Approximately six to ten sites along each creek, totaling about 6 acres, would be created.

15. **Suppress, control, or eradicate non-native invasive plant species (NNIS) on up to 200 acres annually, including 181 acres of known occurrences** within the project area and within areas of proposed actions subsequent to implementation if NNIS become established. NNIS would be treated by hand spraying herbicides, introducing approved biological controls, hand pulling, cutting with a chainsaw, tilling, planting competitive native vegetation, or using other mechanical and/or manual means. No private property would be treated.

16. **Rehabilitate user-created resource damage on approximately five acres**. FR 3429 would be closed using berms and/or guardrail on the north end of the road at the top of the hill before the descent to the creek. On the south end of the road at the top of the hill near the campsite the road would be closed using berms and/or guardrail. An old culvert near the campsite would be removed. The creek crossing would be rehabilitated using erosion cloth or similar material. Native materials (rocks and logs) would be used to provide protection and rebuild the bank where it has washed into the creek. Rehabilitation efforts would also include closing damaged areas to motorized vehicles, mechanically recontouring and stabilizing the sites, and revegetating the areas by planting grasses and trees.

17. **Install a new interpretive sign** at the CCC pull off at the Chambers Road and King's Corner Road intersection. The existing sign would be replaced with a fiberglass weatherproof sign.

18. **Replace KW interpretive signs** with updated information and move to new locations within the project area.

19. **Add approximately 0.03 miles of existing unclassified road** to the Forest Service road system. The road would be classified as a Maintenance Level 2 roadway.

20. **Close approximate 4.2 miles of existing Maintenance Level 2** Forest Service System roads not currently needed for management purposes. Roads would be closed using gates, posts and guard rails, or earthen berms and placed in Maintenance Level 1 status. Roads would still be open to foot travel.

21. **Close and revegetate approximately 1.7 miles of existing Maintenance Level 2** Forest Service System roads not needed for management purposes. Roads would be closed using posts and guardrails, earthen berms, or other closure devices and planted with grasses and/or trees.

Locations of project areas are displayed in Figure 5,

Figure 6, and

Figure 7. The proposed actions would be implemented through a combination of timber sales, service contracts, and by agency personnel. Specific design criteria (Section 2.5) have been identified to address resources concerns.

Figure 5: Roy Creek Project Area Locations - Proposed Timber Management

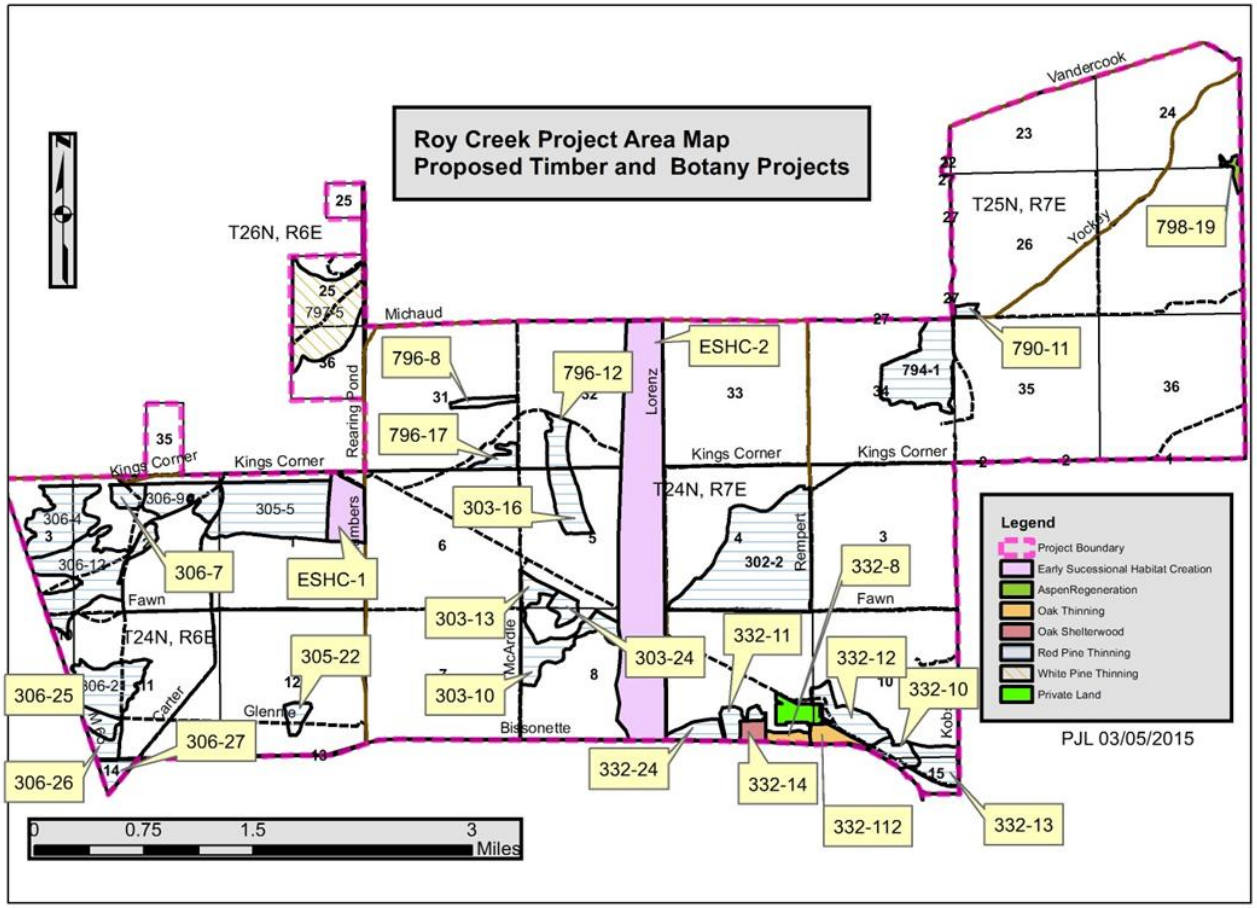


Figure 6: Roy Creek Project Area Activity Locations - Proposed Wildlife, Engineering and Watershed Projects

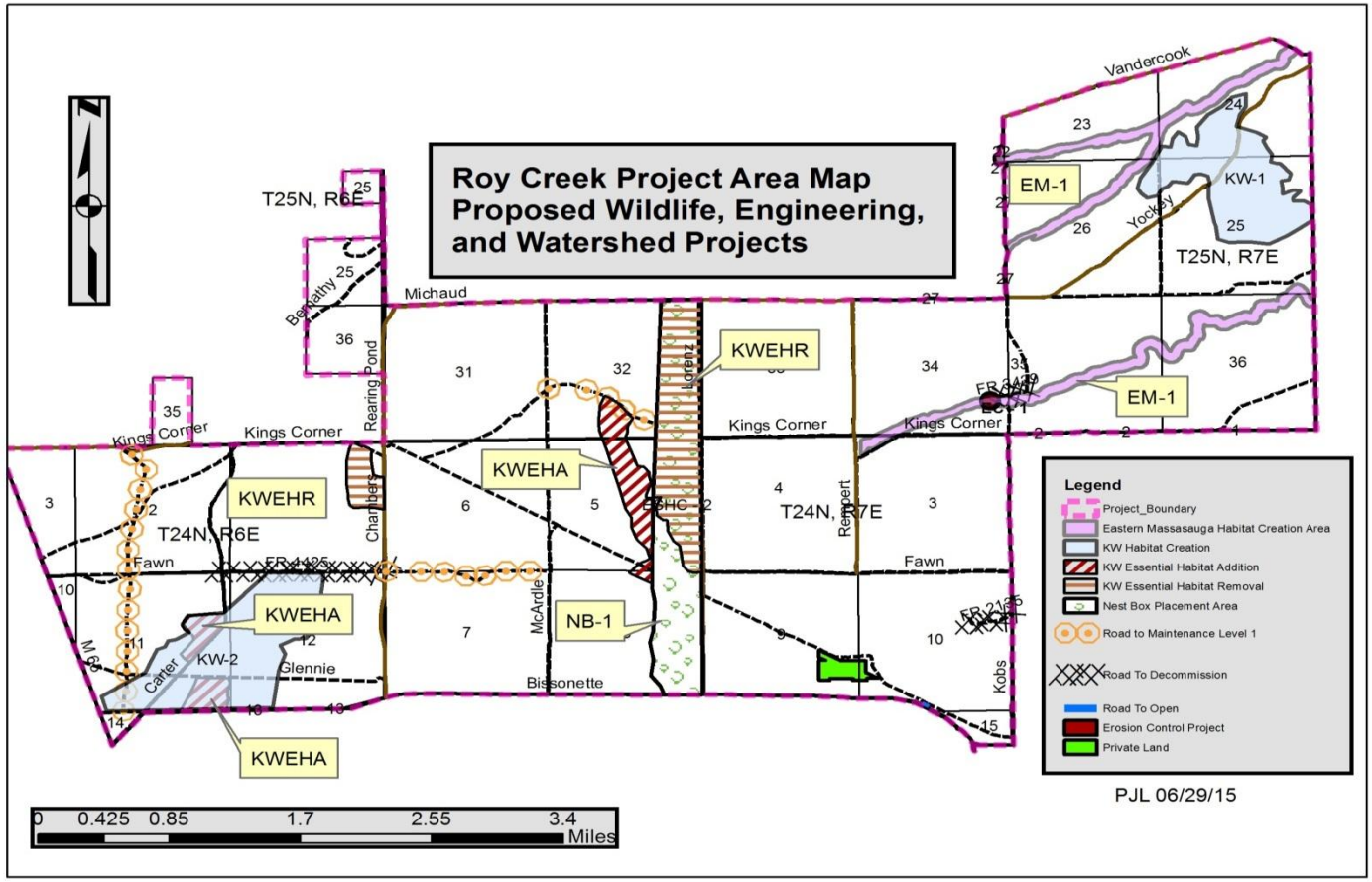


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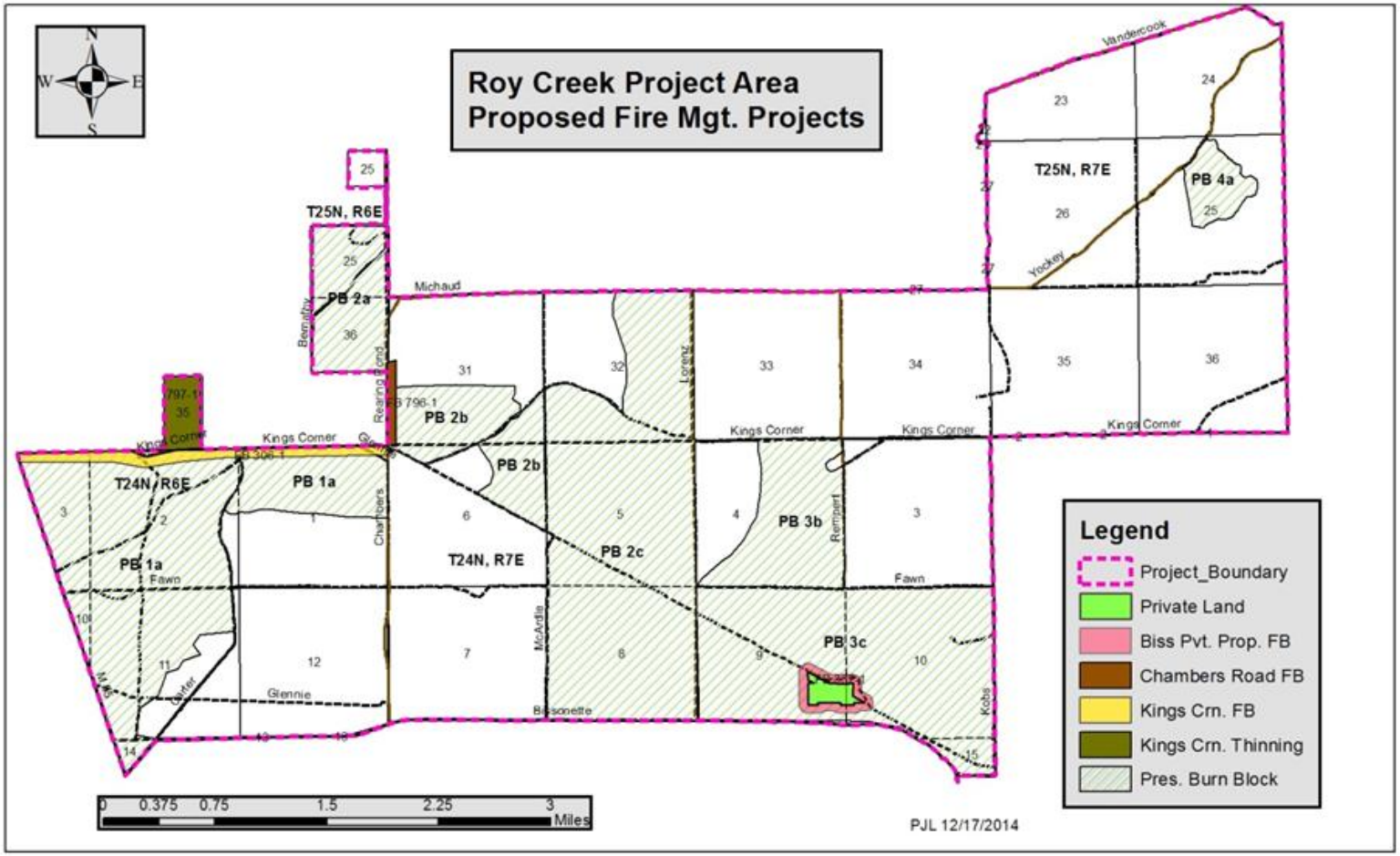
Figure 7: Roy Creek Project Area Activity Locations - Proposed Fire Management Projects



Details of Alternative 2 (Proposed Action)

Thin approximately 1,626 acres of red pine (Table 4) to improve growth of the remaining trees, provide timber products, reduce hazardous fuels, and improve wildlife habitat. The Area ID column in the Table below corresponds to the Figure 5 map.

Table 4: Red Pine Thinning Areas - Proposed Action

Area ID	Acres	Current Basal Area
302-2	335	146
303-10	74	190
303-13	21	170
303-16	53	182
303-24	20	192
305-5	190	154
305-22	17	137
306-4	104	195
306-7	22	187
306-9	69	179
306-12	161	175
306-21	91	175
306-25	24	227
306-26	23	163
306-27	21	152
332-10	27	140
332-11	25	170
332-12	61	169
332-13	47	180
332-24	28	137
790-11	8	178
794-1	138	156
796-8	14	202
796-12	32	220
796-17	21	154
Total:	**1,626**	

Gilmore and Palik (Gilmore, 2006) recommend that "red pine pole stands should be thinned when basal area reaches 140 ft^2 or more per acre, leaving about 90-110 ft^2 per acre-1." They also note that stands managed near the minimum recommended stocking will have the most rapid diameter growth. The red pine stands within the project area that were selected for thinning all have basal areas that exceed 140 ft^2/acre and therefore are overstocked. Several stands have basal areas that approach 200 ft^2/acre. Ideal growth conditions, for the stands

selected for thinning (irrespective of average stand diameter) would occur at about the 90-110 ft^2 per acre range.

The primary objectives would be to increase growth on the remaining trees, provide timber products, reduce hazardous fuels and the risk of crown fire, and improve wildlife habitat. Between 20 to 50 percent of the existing basal area would be removed; however, within 300 feet of private property, the plantations would be thinned heavier to further reduce fuel loading.
In all red pine areas:

- Mature oak and supercanopy red and white pine would be retained to improve tree species diversity, improve structural diversity for wildlife, and provide future dens and snags.
- Red pine beneath or adjacent to oaks would be removed to improve oak tree growth and mast production.
- Some jack pine would be maintained as a component of all red pine stands to improve tree species diversity and provide for future den trees and snags. The number and distribution would be determined for each stand by the silviculturist and wildlife biologist.

Thin approximately 168 acres of white pine (Table 5) to increase growth on the remaining trees, provide timber products, reduce hazardous fuels, and improve wildlife habitat. The Area ID column in the Table below corresponds to the Figure 5 map.

Table 5: White Pine Thinning Area - Proposed Actions

Area ID	Acres	Current Basal Area
797-5	168	157
Total	**168**	

Landcaster and Leak (Lancaster K. F., 1978) recommend that "white pine poletimber stands should be thinned when basal area reaches 140 ft^2 or more per acre, leaving about 100-110 ft^2 per acre." Ideal growth conditions would occur at about the 100-110 ft^2 per acre range. The white pine stand within the project area selected for thinning has a basal area of about 157 ft^2/acre and is therefore considered overstocked.

The primary objectives would be to increase growth on the remaining trees, provide timber products, reduce hazardous fuels and the risk of crown fire, and improve wildlife habitat. Between 20 to 40 percent of the existing basal area would be removed; however, within 300 feet of private property, the plantation would be thinned heavier to further reduce fuel loading.

The white pine would be pruned after thinning and prescribed burning treatments have been completed to increase the quality of future sawlogs. Wendel and Smith in Silvics of North America, (Burns, Russell M., and Barbara Honkala, tech. coords., 1990) note that second-growth stands of white pine are noted for their limbiness and recommend pruning to increase

quality production. Lancaster (Lancaster K. F., 1984) notes that: "because of the persistence of branches and degrade associated with weevil damage, pruning is a necessary cultural practice in white pine management". Trees selected for pruning would be ones that exhibit high vigor and straight stems. Approximately 50 to 100 trees per acre would be pruned.

In the white pine area:

- Mature oak and supercanopy red and white pine would be retained to improve tree species diversity, improve structural diversity for wildlife, and provide future dens and snags. White pine beneath or adjacent to oaks would be removed to improve oak tree growth and mast production.

Regenerate approximately 16 acres of mature short-rotation oak (Table 6) by the shelterwood method to create a new age class of oak and release and provide shade to the developing advanced oak regeneration. The Area ID column in the Table below corresponds to the Figure 5 map.

Table 6: Low-Site Oak Shelterwood Area - Proposed Actions

Area ID	Acres
332-14	16
Total	**16**

In the oak shelterwood, approximately 30-40 percent of the existing basal area would be retained to provide a seed source and shade a developing understory. The trees selected for retention (seed trees) would be the largest, most vigorous, and best-formed individuals of desirable species. Dead trees would be left unless they pose a hazard to loggers. It that case they would be felled and left on site. Red and white pine 12" dbh or larger would be retained for species diversity. Site preparation would consist of felling submerchantable trees one inch dbh or larger once timber harvest activities are completed. Once adequate regeneration is established the shelterwood trees would be removed.

Sander and Graney (Sander I. L., 1992) state: "when oak advance reproduction is small, scarce, or absent, the regeneration method most likely to produce the best results is the shelterwood method." Daniel and others (Daniel, 1979) state: "The essential purpose of the shelterwood method is to accomplish the regeneration of the site under the shade and protection of the final crop trees. In contrast to the relatively rigid conditions created by the clearcutting and seed-tree methods for the establishment of even-aged stands, the shelterwood method is capable of producing any degree of site protection in a stand. This capability of manipulating stand density to provide the environment required for the regeneration of one or several species on a variety of sites makes the shelterwood method the most flexible way of reproducing even-aged stands. Another distinction is the shelterwood method's capacity for producing an abundance of uniformly distributed seed."

They further add: "The advantage of the uniform shelterwood method (which is what would be done) can be listed as follows: 1) it allows ultimate control of site conditions for the regeneration of even-aged stands; 2) it is the best method for heavy-seeded species; 3) it provides the best control over regeneration composition, amount, and distribution; 4) it is the most flexible method since it is applicable to tolerant and intolerant species; 5) good soil protection is provided; 6) high aesthetic qualities are produced; and (7) there are no biological constraints on its application to large areas."

Thin approximately 37 acres long-rotation oak (Table 7) to promote growth of the residual stand, produce timber products, and improve wildlife habitat. The Area ID column in the Table below corresponds to the Figure 5 map.

Table 7: High-Site Oak Thinning Areas - Proposed Action

Area ID	Acres	Current Basal Area
332-8	17	98
332-112	20	130
Total	**37**	

The oak stands within the project area that were selected for thinning have basal areas of about 110-120 ft2/acre and are therefore considered overstocked. Sander (Sander I. L., 1977) recommends that: "stocking be reduced to not less than "B" level." Ideal growth conditions, for the stands selected for thinning (irrespective of average stand diameter) would occur at about a residual basal area of about 70ft² per acre.

Supercanopy, pole-sized, or sawtimber-sized red and white pine would be retained to improve tree species diversity and provide future dens and snags within oak stands. However, poorly-formed red and white pine adjacent to well-formed dominant or codominant oaks would be removed. Aspen clones would be regenerated to further increase tree species diversity by removing all trees within the clonal area. The stands would be thinned to a leave basal area of approximately 70ft² per acre.

Regenerate approximately 10 acres of mature aspen by clearcutting to promote regeneration, improve wildlife habitat, and provide timber products (
Table 8). The Area ID column in the Table below corresponds to the Figure 5 map.

Table 8: Aspen Regeneration Area - Proposed Actions

Area ID	Acres
798-19	10
Total	**10**

Site preparation would consist of felling submerchantable trees one inch dbh or larger once timber harvest activities are completed. Four (4) trees per acre of the largest diameter practical

would be retained in 1/10 to 1/4-acre clumps to provide mast and/or den trees. Dead trees that pose a hazard to loggers would be felled and left on site.

Prescribe burn approximately 5,582 acres (Table 9) to reduce fuel loading, restore fire into fire-adapted ecosystems, protect life and private property, provide for firefighter safety and improve wildlife habitat. Other benefits include the creation of early-successional wildlife and plant habitat. The Area ID column in the Table below corresponds to the

Figure 7 map.

Table 9: Prescribed Burning Areas - Proposed Actions

Area ID	Acres
PB 1a	1,486
PB 2a	325
PB 2b	393
PB 2c	1,625
PB 3b	420
PB 3c	1,212
PB 4a	121
Total	**5,582**

Prescribed burns within forested areas would be of low-to-moderate-intensity. Low-to-moderate intensity prescribed burns generally have one-to-two-foot flame lengths with a maximum flame length of less than four feet. Occasionally, moderate-to-high-intensity prescribed burning may be needed to meet management objectives. Moderate-to-high-intensity prescribed burns generally have five-to-six-foot flame lengths with a maximum flame length of eight feet.

Restoration may take multiple entries of prescribed burning or mechanical treatments one to two years apart at a time to reduce fuel accumulations. Fire intensity would be maintained within prescription using ignition patterns and methods based on weather conditions. Much of the prescribed burning would be conducted during the summer months or during conditions of moist soil and duff. Fire severity would vary from 100 percent reduction of surface fuels to a mosaic burn pattern. Once restoration efforts are successful blocks would be placed on maintenance cycles. A maintenance cycle of every 3-10 years of low-to-moderate fire behavior is recommended after restoration entries with fire or mechanical treatments.

Create and subsequently maintain, approximately 172 acres of fuelbreaks (

Table 10) through timber harvest, mechanical or manual cutting, and/or prescribed burning. This would be to reduce fuel loading so as to protect life and private property, provide for safety (in the event of a wildfire), and to provide early successional wildlife and plant habitat. The Area ID column in the Table below corresponds to the

Figure 7 map.

Table 10: Fuelbreak Creation and Maintenance areas - Proposed Actions

Area ID	Name	Acres
FB 306-1	King's Corner Fuelbreak	100
FB 332-1	Biss Pvt. Property Fuelbreak	50
FB 796-1	Chambers Road Fuelbreak	22
Total		**172**

Fuelbreaks FB 306-1, FB 332-1, and FB 796-1 were established in the early 2000's and are currently about 200 feet wide. They would be expanded to the desired width of 300-350 feet.

Harvest in the proposed fuel breaks would primarily remove tree species that are considered a fire hazard such as jack pine and red pine, but would retain healthy oak and other desired species to maintain visual quality. Basal area within the first 200 feet of the fuelbreak would be in the 30-50 ft^2/ac range gradually increasing to 40-60 ft^2/ac in the remaining 100-150 feet. The fuel breaks would be maintained every 3 to 5 years through hand or mechanical means and/or by prescribed burning.

Thin and subsequently prescribe burn approximately 80 acres of mixed jack pine, red pine and mixed hardwood (Table 11) to reduce fuel loading, improve wildlife habitat and restore fire into fire-adapted ecosystems. The Area ID column in the Table below corresponds to the

Figure 7 map.

Table 11: Fuel Reduction Area - Proposed Actions

Area ID	Acres
797-1	80
Total	**80**

This area is a mixture of jack pine, hardwood, and red pine. The area would have all the jack pine removed to reduce fuel loading and the hardwood thinned to increase growth on the remaining trees. It would then be maintained in a semi-open condition by hand or mechanical means, or by prescribed burning.

Create approximately 861 acres of Kirtland warbler habitat by clearcutting approximately 740 acres of mixed jack pine, red pine, and oak, in two areas to create nesting habitat, to provide early successional wildlife habitat, and to provide timber products. Site preparation (if needed in KW-1 or KW-2) would be by mechanical means, hand, or by prescribed burning. Planting would be to KW stocking levels. The preferred method of treatment for the non-merchantable portions (approximately 121 acres) within unit KW-1 (see

Table 12) would be by prescribed burning to create natural regeneration. An alternative treatment would be to site prepare by mechanical means (hydroaxing, drum chopping, etc.) and then plant. This would be done if conditions were too dry to burn safely or too wet to achieve the desired results. Fill-in planting may be necessary in areas where natural regeneration is below KW stocking levels. The Area ID column in the Table below corresponds to the

Figure 6 map.

Table 12: Kirtland's Warbler Nesting and Breeding Habitat Creation - Proposed Actions

Area ID	Comp-Stand	Merchantable Acres	Submerchantable Acres	Total Acres
KW-1	789-7	250	0	371
	789-14			
	789-20			
	789-21			
	789-30			
	790-21			
	789-16	0	121	
KW-2	305-14	490	0	490
	305-16			
	305-21			
	305-23			
	305-24			
	306-22			
	306-23			
	306-24			
Total		**740**	**121**	**861**

Approximately six acres of the submerchantable portion of KW-1 would be cut as part of a timber sale to facilitate prescribed burning activities in the remaining non-merchantable portion.

Add/Remove acreage to Kirtland's warbler essential habitat (Table 13). The Area ID column in the Table below corresponds to the
Figure 6 map.

Table 13: Acreage Additions or Removals to Kirtland's Warbler Nesting and Breeding Habitat - Proposed Actions

Area ID	Proposed Action	Acres
KWEHA	Add to essential habitat	200
KWEHR	Remove from essential habitat	397
Net adjustment to essential habitat		**-197**

Three areas, totaling approximately 200 acres would be added to Kirtland's warbler essential habitat to facilitate management of essential habitat blocks within the Pine River KWMA. Two other areas, totaling approximately 397 acres would be removed from essential habitat and managed in the long term for early successional habitat. The net reduction in essential habitat would be about 197 acres. (Acreage adjustments are allowed under the Kirtland's warbler management plan if needed to meet other resource objectives or management needs.)

Create, and subsequently maintain, approximately 613 acres of early successional habitat (Table 14) through timber harvesting, prescribed burning, and/or mechanical or manual treatments to create and provide early successional wildlife and plant habitat, reduce fuel

loading to protect life and private property, and provide for firefighter safety. The Area ID column in the Table below corresponds to the
Figure 6 map.

Table 14: Early Successional Habitat Creation Areas - Proposed Actions

Area ID	Name	Acres
ESHC - 1	King's Corner Road	68
ESHC - 2	Lorenz Road	545
Total		**613**

Within the King's Corner Road and Lorenz Road Early Successional Habitat Creation Area (ESHC - 1 and ESCH - 2) the average basal area would be reduced to about 30-40 ft^2/ac. In some areas, the entire overstory component would be removed while in others, overstory vegetation would remain to create a patch mosaic of openings and occasional red pine, jack pine, and oak. Areas already open with abundant grass species in the ground cover would be targeted for greater overstory removal. In these areas, ground disturbance with a roller chopper or harrow disc or similar equipment would be used to create conditions suitable for increased grass seed germination. Seeding may also be done in these areas. Herbicides may be used to suppress and eradicate NNIS. Prescribed burning would be used to maintain open canopy conditions and stimulate warm season grass establishment. All dead standing trees within the area would be retained for snags and future down wood. However, dead trees that pose a hazard to loggers would be felled and left on site. Both areas would meet the objective of creating both early successional habitat areas and fuelbreaks.

Create sunlit, open areas along Roy and MacDonald creeks adjacent to and within riparian zones, as well as brush piles for eastern massasauga rattlesnake (EMASS) benefit in Land Type Association (LTA) 1, (Table 15). The Area ID column in the Table below corresponds to the Figure 6 map.

Table 15: EMASS Opening Creation Areas - Proposed Actions

Area ID	Acres
EM-1	6
Total	**6**

Habitat for the EMASS would be created in stands adjacent to wetlands and creeks in the riparian zone and adjacent habitat. These areas would be created by opening up small pockets of timber (0.1 to 0.25 acre each, using hand tools and chainsaws). Small brush piles would also be constructed to provide cover and foraging sites. Approximately six to ten sites along each creek would be created, totaling approximately 6 acres.

Place approximately eight bluebird boxes and four bat boxes to provide habitat and structure within an existing forest opening, (

Table 16). The Area ID column in the Table below corresponds to the Figure 6 map.

Table 16: Nest Box Placement - Proposed Actions

Area ID	Bluebird boxes	Bat boxes
NB-1	8	4
Total	**8**	**4**

Nest boxes for both the eastern bluebird and bats would be placed within an existing large opening and within the proposed ESHC-2 along Lorenz road. Boxes would be placed far enough apart to minimize territory overlap.

Suppress, control, or eradicate non-native invasive plant species (NNIS) on up to 200 acres annually, including 181 acres of known occurrences within the project area and within areas of proposed actions subsequent to implementation if NNIS become established. NNIS would be treated by hand spraying herbicides, introducing approved biological controls, hand pulling, cutting with a chainsaw, tilling, planting native vegetation, or using other mechanical and/or manual means. No private property would be treated. See Appendix B for a detailed description of manual and mechanical treatment methods, herbicide use, and herbicides used.

The NNIS inventory has revealed that approximately 181 acres within the Roy Creek project area contain NNIS (Figure 8). Acreage of individual species within the gross area is described in Table 17 and

Table 18. NNIS along Roadways and Trails account for 170 gross acres, with approximately 60% of herbaceous plant cover being NNIS. NNIS within stand interiors account for about 11 gross acres, with approximately 18% of herbaceous plant cover being NNIS. Total known NNIS treatments could occur on approximately 57% of 181 gross acres.

Additional treatments could occur within the proposed action areas as infestations are identified. In section 1.3, proposed actions 1-10, and 13, would modify the existing environment and could potentially facilitate the establishment of NNIS. In these areas, if new infestations of any species listed on the Forest NNIS list Appendix B are discovered, they could be treated to prevent their expansion within the action area. The total area of these proposed activities is approximately 9,125 acres, although treatment of new infestations and known infestations would not exceed 200 gross acres annually within the Roy Creek project area.

The proposed NNIS actions would be implemented by priority, as determined at the discretion of the Huron-Manistee National Forest and to the extent that capability and funding permits, not to exceed 200 acres of treatment annually within the Roy Creek project area. Considerations made to establish the priority for treatments in the Roy Creek project area include:

- Treatment of NNIS by Forest Rank. Currently only Forest Rank 3 and 4 species are known to be present within the project area. Treatment priority would be given to Rank 3 species before Rank 4 species. If an introduction of a Rank 1 or Rank 2 species is discovered in an existing area described for treatment or within an area of proposed activities, priority would be given to those species respectively.

- Treatment of new NNIS discoveries within proposed action areas which were previously free of NNIS. Priority among these treatments would be considered within the context of the Forest Rank system.
- Treatment of NNIS which are found within stand interiors. These treatments would take priority over roadway and trail occurrences as greater success in control is facilitated by their small size and increased isolation from the corridors which facilitate reestablishment of NNIS. Priority among these treatments would be considered within the context of the Forest Rank system.

- Treatment of Rank 4 NNIS which are found along roadways and trails would have the least priority after all other considerations. While treatment of this NNIS category poses the greatest challenge to control efforts, management of these NNIS would contribute to the established need and objective to restore and improve the diversity and viability of native plant communities.

Treatment of non-native undesirable species which have been inventoried and represented in Table 18 and
Table 19 as Forest Rank "0" would only be treated if the species coincided with an area being treated for a Forest Rank 1 – 4 species.

Table 17: NNIS Stand Interior Treatment Areas

NNIS Stand Interior Occurrences (greater than 66' from road) - Proposed Action					
Unit	Common Name	Species	Forest Rank	Gross Area*	Infested Area*
1	Canada thistle	*Cirsium arvense*	4	0.02	0.00
	Bull thistle	*Cirsium vulgare*	4		
2	Canada thistle	*Cirsium arvense*	4	0.01	0.01
3	Autumn olive	*Elaeagnus umbellata*	4	0.00	0.00
4	Canada thistle	*Cirsium arvense*	4	0.05	0.05
5	Common St. John's-wort	*Hypericum perforatum*	3	0.41	0.08
	Spotted knapweed	*Centaurea stoebe*	4		0.08
6	Autumn olive	*Elaeagnus umbellata*	4	0.00	0.00
7	Spotted knapweed	*Centaurea stoebe*	4	8.33	1.25
8	Bird's foot trefoil	*Lotus corniculatus*	0	1.96	0.27
	Smooth brome	*Bromus inermis*	4		0.02
	Common St. John's-wort	*Hypericum perforatum*	3		0.10
	Spotted knapweed	*Centaurea stoebe*	4		0.10
9	Spotted knapweed	*Centaurea stoebe*	4	0.25	0.05
10	Leafy spurge	*Euphorbia esula*	3	0.01	0.00
11	Leafy spurge	*Euphorbia esula*	3	0.01	0.00
12	Leafy spurge	*Euphorbia esula*	3	0.01	0.00

				Total:	2.02
* Area presented as zero acreage is an area of scattered individuals occupying less than five thousandths of an acre or about 220 square feet.					

Table 18: NNIS Roadway and Trail Treatment Species

NNIS Roadway Occurrences (within 66') - Proposed Action				
Common name	Species	Gross Acres	Infestation Acres*	Forest Rank
Hoary alyssum	*Berteroa incana*	3.84	0.19	4
Smooth brome	*Bromus inermis*	17.12	0.87	4
Spotted knapweed	*Centaurea stoebe*	186.93	59.29	4
Bull thistle	*Cirsium vulgare*	1.54	0.07	4
Orchard grass	*Dactylus glomerata*	1.40	0.01	4
Queen Anne's Lace	*Daucus carota*	21.86	4.69	4
Autumn olive	*Elaeagnus umbellata*	0.02	0.01	4
Leafy spurge	*Euphorbia esula*	0.01	0.00	3
Common St. John's-wort	*Hypericum perforatum*	136.11	18.29	4
Ox-Eye Daisy	*Leucanthemum vulgare*	4.44	0.04	0
Bird's Foot Trefoil	*Lotus corniculatus*	32.82	6.68	0
White sweetclover	*Melilotus alba*	12.31	4.74	3
Yellow sweet clover	*Melilotus officinalis*	38.37	1.48	3
Timothy	*Phleum pratense*	9.47	0.09	0
Canada Bluegrass	*Poa compressa*	0.01	0.00	0
Mullein	*Verbascum thapsus*	40.59	5.51	0
Periwinkle	*Vinca minor*	0.01	0.00	4
		Total:	101.99	
* Area presented as zero acreage is scattered individuals occupying about 220 square feet.				

Table 19: Infestation Acreages

Infestation by Forest Rank					
Forest Rank	1	2	3	4	5
Interior	0	0	0.19	1.57	0
Roadway	0	0	6.22	83.44	0
Totals	0	0	6.40	85.01	0

Table 20: Forest NNIS Categories

Forest Rank Guidelines	
1=Not on Forests yet; eradicate new occurrences immediately upon discovery	4=Prevent invasion of last areas not invaded, eradicate in high priority areas
2=Eradicate wherever found	5=Status on Forest uncertain, control/eradication site specific
3=Control source populations, eradicate outliers	S = State of Michigan Noxious Weed

Manual or mechanical methods would be the principle method of control for small spot infestations. Examples of hand tools that might be used include shovels, saws, axes, loppers, hoes, or weed-wrenches. Mechanical methods may include cutting with a string trimmer, chainsaw, brush saw, aquatic harvester, or mower. Plowing or disking may be used in gravel pits or other heavily disturbed sites.

Small infestations of herbaceous plants with shallow roots would typically be hand-pulled. Deeper-rooted herbaceous plants such as autumn-olive would be dug up with a shovel. Larger infestations would be mowed or otherwise cut. Individual bushes or small groups of bushes would typically be dug up or girdled. Large infestations of exotic bushes would generally be treated with herbicides.

The objectives of herbicide use would be to control invasive plant species at sites where manual or mechanical means would be cost-prohibitive or result in excessive soil disturbance or other resource damage. Herbicide application may also be the preferred treatment for certain NNIS species that do not adequately respond to mechanical treatment. Herbicide drift is much reduced with spot treatment. In most cases, herbicides would be directly applied to non-native invasive plants using spot treatments or linear treatment along travel corridors. Treatments consist of various techniques for applying herbicides to target NNIS without impacting desirable vegetation and other non-target organisms, including humans. Techniques that may be used include:

- Spraying foliage using hand-held wands, backpack sprayers, or a sprayer mounted on an ATV or tractor;
- Basal bark and stem treatments using spraying or painting (wiping) methods;
- Cut surface treatments (spraying or wiping); and
- Woody stem injections.

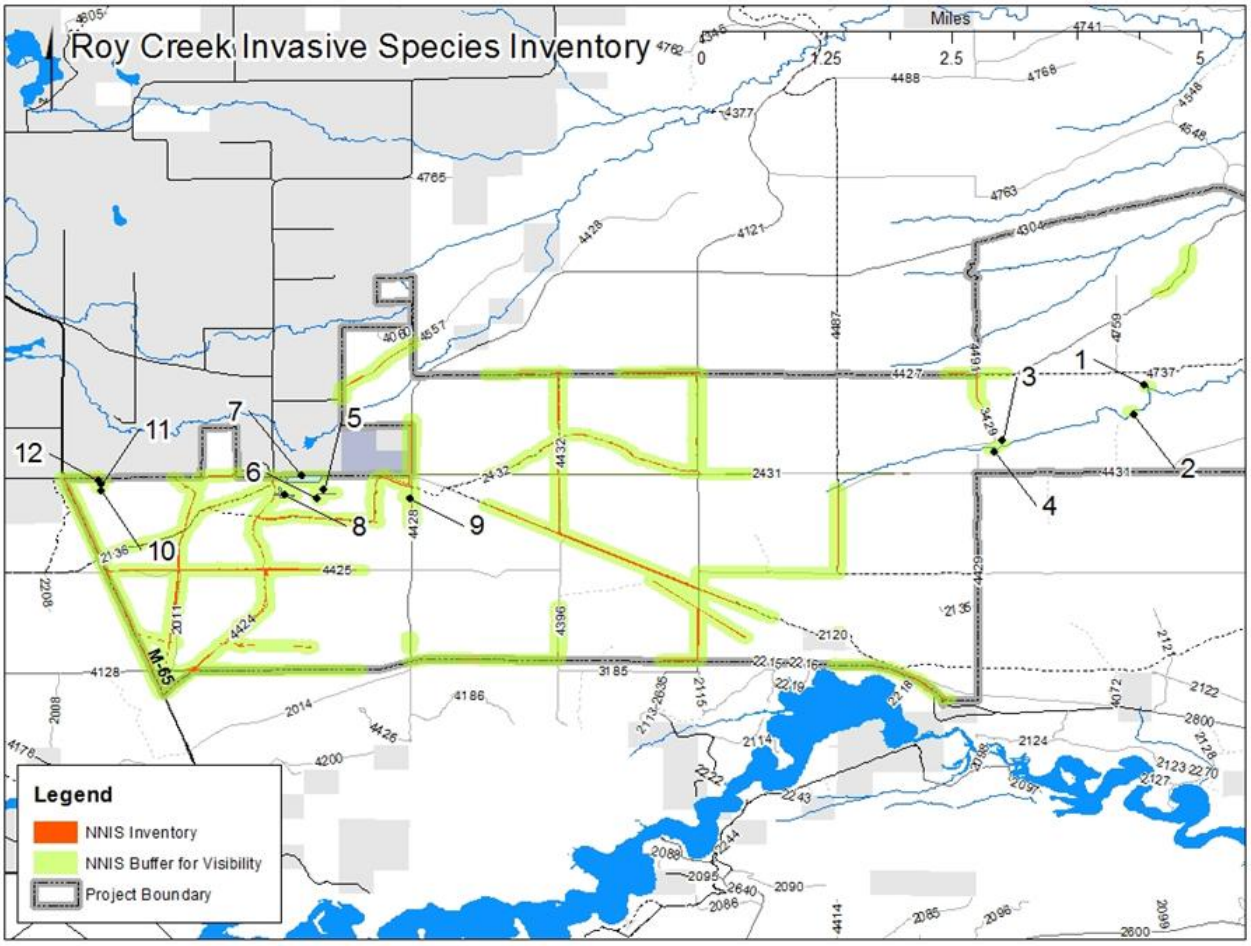
Table 21 lists herbicides which would potentially be used for proposed NNIS treatments and the most likely method in which they would be used. As more effective and selective herbicides and methods become available, they may be used following consultation with district resource managers.

Table 21: Potential Herbicides Used

Herbicide	Target Plants	Treatment Method
2,4-D	Broadleaf herbs and woody seedlings	Roadside backpack or mechanical broadcast spray

Aminopyralid	Broadleaf weeds and spotted knapweed	Spot treatment, backpack or broadcast spray
Clopyralid	Exotic thistles and crown vetch	Backpack spray
Glyphosate	Upland broadleaf herbs and woody invasive plants	Spot treatment, generally used for woody hack and squirt method
Imazapic	Some annual and perennial grasses and some broadleaf weeds	Spot treatment
Triclopyr	Broadleaf herbs and woody invasive plants	Spot treatment, generally used for woody hack and squirt method or basal bark treatment

Figure 8: NNIS Species Treatment Areas



Rehabilitate user-created resource damage on approximately 5 acres, (Table 22). Rehabilitation efforts would include closure of damaged areas to motorized vehicles, mechanically recontouring and stabilizing the sites, revegetating the area by planting grasses

and trees, and stabilizing streambanks. The Area ID column in the Table below corresponds to the
Figure 6 map.

Table 22: Areas to Rehabilitate User-Created Resource Damage - Proposed Actions

Area ID	Acres
EC-1	5
Total	**5**

Approximately 0.22 miles of FR 3429 would be closed to reduce or eliminate sediment from entering Roy Creek. This portion of road is located in T25N, R7E, Section 35 (see also road closure section). Closure would be accomplished by using berms, posts and guardrail, or other closure devices on the north end of the road at the top of the hill before the road descends to the creek. The old roadbed would be revegetated using native grasses and trees.

Approximately 0.16 miles of an old two-track road located in T25N, R7E, Section 34 that goes northward from an undeveloped campsite toward Roy Creek would be closed to reduce or eliminate sediment from entering the creek. Closure would be accomplished using berms, posts and guardrails, or other closure devices. The old roadbed would be revegetated using native grasses and trees. An old culvert at the campsite would also be removed.

The creek crossing would be rehabilitated using erosion cloth or similar material. Native materials (such as rocks and logs) would be used to provide protection and rebuild the bank where it has washed into the creek. Rehabilitation efforts would also include closing damaged areas to motorized vehicles, manually or mechanically recontouring and stabilizing the sites, and revegetating the areas by planting native grasses and trees or shrubs.

Install and/or replace new interpretive signs
The existing sign at the CCC pull off at the Chambers Road and King's Corner Road intersection would be replaced with a fiberglass weatherproof sign. The KW interpretive signs would be upgraded/updated with current information and moved to new locations within the project area. These locations could change as needed to keep current with the management activities that are described in the sign.

Table 23: Interpretive Sign Placement - Proposed Actions

Sign Name	Location	Proposed Action	Number(s)
CCC Interpretative	King's Corner/Chambers Roads	Upgrade/Replace	1
KW Interpretative	Within project area near recent KW management activities	Upgrade/Update	4

Adjust road density to meet resource management needs
Approximately 0.03 miles of existing unclassified road would be added to the Forest Service road system. The road would be classified as a Maintenance Level 2 roadway. (See Figure 6 for location.)

Approximate 4.2 miles of existing Maintenance Level 2 Forest Service System roads not currently needed for management purposes would be closed using gates, posts and guard rails, earthen berms, or other closure devices and placed in Maintenance Level 1 status. Roads would remain open to foot travel. (See Figure 6 for location.)

Approximately 1.7 miles of existing Maintenance Level 2 Forest Service System roads not needed for management purposes would be closed and revegetated (decommissioned). Roads would be closed using posts and guardrails, earthen berms, or other closure devices and planted with grasses and/or trees. (See Figure 6 for location.)

Table 24: Road System Management Activities - Proposed Actions

Road Number	Length (miles)	From	To	Proposed Action	Maintenance Level (New)
None	0.03	Bissonette Road	FR 2120	Add to system	2
FR 2011	2.0	Bissonette Road	Kings Crn. Road`	Close to motor vehicle use	1
FR 4425	1.12	FR 4428	FR 4386	Close to motor vehicle use	1
FR 2432	1.1	FR 4396	FR 4121	Close to motor vehicle use	1
FR 4425	1.08	FR 4424	FR 4428	Decommission	0
FR 3429*	0.22	MP 0.68	MP 0.90	Decommission	0
FR 2135	0.35	Kobs	End	Decommission	0

*Decommissioning would be accomplished in conjunction with rehabilitation of user-created damage

2.5 Design Criteria

Specific actions may be incorporated into the project design during the development of alternatives based on resource concerns and issues raised during scoping and analysis. Design criteria are intended to lessen or eliminate potential impacts from proposed activities. These criteria are measures that may or may not be included in Forest Plan's Standards and Guidelines, or may impose a stricter application of a Standard or Guideline.

2.5.1 Wildlife Protection Measures

General

Regional Forester's Sensitive Species would be protected within all project areas to the greatest extent possible.

- New sensitive species locations discovered within a project area may result in all actions being delayed or interrupted within the area. The appropriate district wildlife/fisheries biologist or botanist would be consulted to determine effects of the action on the species.

Kirtland's Warbler

- Where Kirtland's warblers are found to be actively nesting within ¼ mile of any stand proposed for timber harvest and/or prescribed burning, harvest and/or burning activities in that stand would only be permitted between August 16th and April 30th.
- Herbicide application in occupied habitat would only be permitted between August 16 and April 30.
- The utilization of heavy machinery for road closures within occupied Kirtland's warbler habitat would only be permitted between July 1st and May 19th.

Northern Long-eared Bat

- Where northern long-eared bat are determined to be utilizing any stand proposed for timber harvest (denning and/or roosting purposes), harvest activities in that stand would only be permitted from October 1st - March 30th.
- In suitable NLEB habitat, no burning would occur during the summer maternity season (June 15-August 1) to protect females and non-volant pups.

Northern Goshawk/Red-Shouldered Hawk

The following design criteria for northern goshawks apply to all actions (USDA Forest Service, 1993):

- Nest protection area (approximately 30 acres)—management actions, such as timber harvest or prescribed burning, would be prohibited within 660 feet of an active northern goshawk or red-shouldered hawk nest at all times.
- Crown closure would not be reduced below 60% (90 BA in either hardwood or conifer stands) within 300 feet of the nest-protection area.
- No management activities would occur from March 1st to July 31st in the nest protection area.
- Prescribed burning within the nest protection area would be of low intensity only.
- Timber harvest activities and large mechanical equipment would be prohibited within approximately 0.5 mile of the nest (a.k.a. post-fledging area) from March 1st through July 31st.
- Activities that involve minimal human presence, such as timber marking, would be permitted within the post-fledging area during this period.

Eastern Massasauga Rattlesnake

- Prescribed burning should be limited to periods when the snake is not present:
- In upland habitats, late autumn through early spring (October 15 - May 15). Site specific prescriptions may allow for flexibility to respond to each year's conditions.
- In lowland habitats, snakes are absent in mid-summer and are below ground in winter; summer fires may be difficult to manage and potentially should be avoided; winter burns may be accomplished through cutting, stacking, curing and final burning after the ground is frozen.
- If summer mowing is required, it would occur during midday (1100 h to 1500 h), when most snakes are under cover.
- In warmer weather, a visual search should be conducted before burning or mowing in areas known to be used by massasauga.
- Timber harvesting activities and soil manipulation in lowland areas should only be carried out when the substrate is frozen.

2.5.2 Plant Protection Measures

Regional Forester Sensitive Species (RFSS) Plant Protection Measures

- Known locations of Hill's thistle will be marked and protected from heavy equipment and ground-disturbing activities (temporary roads, landings, skid trails, furrowing, etc.).
- Heavy equipment and ground disturbing activities would be excluded from an area within ten feet of marked Hill's thistle (Cirsium hillii), and other RFSS plant locations, unless specified otherwise by district botanist.
- When working within or adjacent to streamside management zones the State of Michigan's Best Management Practices will be followed.
- Only trained personnel would utilize herbicide near known locations of RFSS.

2.5.3 Measures to Prevent the Spread of Non-Native Invasive Species (NNIS)

- Equipment taken off-road would first be cleaned of seeds, soil, vegetative matter and other debris that could hold NNIS seeds and/or propagules and inspected by a Forest Service representative to prevent NNIS introduction or spread.
- Skid trails and plow lines would be placed and rehabilitated in a way that limits the spread of existing NNIS from roads, trails, or powerline corridors, into stand interiors. Skid trails and plow lines would be rehabilitated (re-contoured, seeded, etc.) after they are no longer needed.

2.5.4 Cultural Resources Protection Measures

- All cultural resource sites and cultural reserve areas would be protected by avoiding ground disturbance treatments at the site(s) or protected area(s), either through sale design alteration, or through designation of a buffered protected area. For cultural resource sites, a buffered protected area would include at least a 30-meter (100 feet) buffer or other area determined by a Forest Service archaeologist which would be adequate in size to protect the site. For the list of site/area specific mitigation measures, refer to the Cultural Resource Finding Record (2015
- Specific protection measures are as follows:
- Utilize a Forest Service Archeologist or Para-archeologist to identify cultural resource(s) for avoidance by establishing (flagging) a 30-meter Protected Area around features.
- Removal of NNIS from reserve area needs consultation with Forest Service archeologist prior to project implementation.
- In consultation with the Forest Archeologist, develop and implement a prescribed burn plan that minimizes effects to known cultural resources.
- Any cultural resource sites found during implementation of the project would be reported immediately to a Forest Service Archaeologist and work would stop in the area. Project work would not be allowed to resume until the cultural resources have been documented and the sites are preserved from any potential impacts.

2.5.5 Vegetation Management

Aspen

- To maximize aspen sprouting, timber harvest activities would be conducted during dormant season from September 30th to May 1st.

Oak

- Timber harvest of oak would be prohibited from April 15 to July 15 to prevent oak wilt.

Logging Slash Measures

- Trees within harvested red pine and white pine stands proposed for prescribed burning would be whole-tree skidded to designated landings to facilitate prescribed burning and minimize damage to the residual stand. Unmerchantable portions of the trees on the log landing would be chipped and removed from the sale area or piled and burned.

Temporary Roads and Landings

- To the extent possible, old temporary roads and landings would be used to minimize the construction of new temporary roads and landings. Temporary roads and landings would be revegetated and waterbared as needed and closed when management activities are completed.

Healthy Forest Protection Measures

- Prescribed burning in red pine stands would be prohibited from May 1 to July 15 to reduce the stress on the red pine during the period of active bud growth and leader development. These dates may be slightly adjusted per direction from the zone silviculturist.

- Mortality, including post mortality resulting from prescribed burning in red and white pine plantations should not exceed 5%.

2.5.6 Motorized Routes/Resource Protection Measures

- Timber, fuels treatment, or prescribed burning operations using designated roads or recreational trails would post activity signs at either end of the effected section and at any intersection prior to that location.

- Timber, fuel and fire operations that are not using a designated route for access, but are crossing the road or trail would post signs warning of localized area operation activity 350 feet on either side of the affected travel route.

- Roads and trails would be returned to standard, after timber, fuels, or prescribed burning operations are completed and prior to re-opening the designated travel route.

- Logging equipment crossing forest roads or trails must have the crossings spaced 660 feet apart and adequately signed to warn road or trail users.

- Trash dumped within the project area would be cleaned up when feasible.

2.6 Summary Comparison of Alternatives

The following table (Table 25) provides a summary of how the alternatives compare in terms of objectives and activities.

Table 25: Comparison of Alternative--Objectives and Activities

	Description	Alt 1 No Action	Alt 2 Proposed Action
Objectives	1. Moderate to high volumes of softwood and low volumes of hardwood timber products are produced in Kirtland's warbler emphasis areas . Contribute to the economic base of local community by providing a sustained yield of wood products.	No	Yes
	2. Implement fuels reduction and fuelbreak projects where conditions warrant for the protection of life, property and safety. Restore fire into fire-adapted ecosystems.	No	Yes
	3. Maintain restore and improve community diversity and forest health and to provide for wildlife and plant viability. Identify and treat high priority NNIS infestations.	No	Yes
	4. Provide nesting habitat for the federally endangered Kirtland's warbler.	No	Yes
	5. Rehabilitate user-created resource damage.	No	Yes
	6. Develop and operate the road system, including all bridges and culverts, maintained to the minimum standard needed to meet requirements of proposed actions, protect the environment, and provide for reasonable and safe forest access.	No	Yes
	7. Inform and educate the public regarding forest management.	No	Yes
Activities	1a. Thin red pine to improve growth of remaining trees, provide timber products, reduce hazardous fuels, and improve wildlife habitat. (acres)	0	1,626
	1b. Thin white pine to increase growth of remaining trees, provide timber products, reduce hazardous fuels, and improve wildlife habitat. (acres)	0	168
	2. Regenerate mature short-rotation oak by the shelterwood method to create a new age class of oak and release and provide shade to the developing advanced oak regeneration. (acres)	0	16

Description	Alt 1	Alt 2
	No Action	Proposed Action
3. Thin long-rotation oak to promote growth of the residual stand, produce timber products and improve wildlife habitat. (acres)	0	37
4. Regenerate mature aspen by clearcutting to promote regeneration, improve wildlife habitat and provide timber products. (acres)	0	10
5. Construct temporary roads to facilitate removal of timber.	0	7.5
6. Prescribe burn to reduce fuel loading, restore fire into fire-adapted ecosystems, protect life and private property, provide for firefighter safety, improve wildlife habitat. (acres)	0	5,582
7. Create and subsequently maintain fuelbreaks through timber harvest, mechanical or manual cutting, and/or prescribed burning. (acres)	0	172
8. Thin and subsequently prescribe burn mixed jack pine, red pine and mixed hardwood to reduce fuel loading, improve wildlife habitat and restore fire into fire-adapted ecosystems. (acres)	0	80
9. Create, and subsequently maintain early successional habitat through timber harvesting, prescribed burning, and/or mechanical or manual treatments to create and provide early successional wildlife and plant habitat, reduce fuel loading to protect life and private property, and provide for firefighter safety. (acres)	0	613
10. Create Kirtland's warbler habitat by clearcutting mixed jack pine, red pine and oak in two areas and to provide early successional wildlife habitat, to provide timber products. (acres)		861
11. Add/Remove acreage to Kirtland's warbler essential habitat. (acres)	0	-197
12. Place bluebird and bat boxes		8/4
13. Create sunlit, open areas along Roy and MacDonald Creeks adjacent to and within riparian zones, as well as brush piles for eastern massasauga rattlesnake benefit in Land Type Association 1. (acres)	0	6
14. Suppress, control or eradicate NNIS	0	200
15. Rehabilitate user-created resource damage. (acres)	0	5
16. Install a new interpretive sign at CCC historic site. (number of signs)	0	1

	Description	Alt 1	Alt 2
		No Action	Proposed Action
	17. Replace KW interpretive signs		5
	18. Add an existing unclassified road to the Forest Service road system. (miles)	0	0.03
	19. Close existing Maintenance Level 2 Forest Service System roads to motor vehicle use. (miles)	0	4.2
	20. Close and revegetate Maintenance Level 2 Forest Service System roads. (miles)	0	1.7

2.7 Monitoring

Information gathered before, during and after implementation of activities is used to determine the effectiveness of the project's design and associated mitigation measures. This establishes a feedback mechanism so management can develop and employ an adaptive learning curve. Monitoring is done at recurring intervals as a basis for Forest Plan implementation. Project effectiveness monitoring is done by sampling specific projects at specified time intervals. The following activities associated with the proposed action would be monitored:

- Timber harvest activities-age class composition, vegetation composition, basal area, soil compaction
- Reforestation-first and third year survival surveys, stocking surveys
- Road closures/obliteration-soil restoration, fewer trash dump sites, effectiveness monitoring
- Creation of early successional habitat-reduction of canopy closure, fuels reduction, NNIS suppression, effectiveness monitoring, increasing number of open land native plant and wildlife species
- Snags and Down Wood-average snags and downed wood/acre, meets Forest Plan minimums
- Endangered, threatened and Regional Forester's Sensitive Species (RFSS)-numbers of individuals change with associated changes in habitat suitability, effectiveness monitoring
- NNIS-decrease in areas of infestation and numbers of individuals, effectiveness monitoring
- Fuel reduction: Tons of hazardous fuels/acre, change in condition class, third year surveys, number of live and dead trees per acre by diameter at breast height (DBH) class.

CHAPTER 3: ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

This section summarizes the current condition(s) of the affected project area by resource, and provides an analysis of the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of the alternatives.

Chapter IV of the Forest Plan FEIS (pages 5-9) discusses the practices of even-aged silviculture and its impacts to vegetation when utilized in forest management. The remaining pages of the chapter discuss cumulative effects of eighteen individual environmental elements such as soils, vegetation, wildlife, etc. Since the proposed project conditions are typical of those discussed in the Forest Plan FEIS, this analysis tiers to the FEIS discussions. The actions proposed in the action alternatives presented are consistent with the direction of the Forest Plan's Final Environmental Impact Statement and the Forest Plan.

Chapter 3 is organized by resource, e.g. vegetation (timber) management, fuels management, wildlife management, etc. This section covers the Affected Environment (Current Condition) and Environmental Consequences of the alternatives (the Effects Analysis) on the objectives and issues relevant to each resource. The following is an outline of how the resource sections are organized:

Affected Environment: This is a brief description of the resources' current condition in the project area(s), and any relative factor(s) that have affected that condition.

Direct and Indirect Effects: This describes the direct and indirect effects of each alternative on the current condition of the resource. Generally, direct effects are caused by the action and occur at the same time and place as the action. Indirect effects are caused by the action but occur later in time or are spatially removed from the action. Effects can be neutral, beneficial or detrimental.

Cumulative Effects: Cumulative effects include not only the effects of the proposed (present) actions, but may also include the incremental effects of past actions and reasonably foreseeable future actions on the resource. The analysis includes effects within the previously-defined cumulative effects analysis area.

Table 26 on the following page summarizes the past, present and reasonably foreseeable future actions in the Roy Creek Project area. These actions are considered in each cumulative effects analysis in this chapter.

Table 26: Past, Present and Reasonable Foreseeable Future Actions in the Roy Creek Project Area

Federal Actions Within the Project Area	Past	Present	Future
Fuelbreak maintenance and creation	●	●	●
Road maintenance	●	●	●
Timber harvest and reforestation activities	●	●	●
Kirtland's warbler habitat creation and occupied habitat closures	●	●	●
Wildlife and plant habitat closures	●	●	●
Wildfire suppression activities	●	●	●
Prescribed burn activities	●	●	●
NNIS treatments	●	●	●
Non-federal Actions Within the Project Area	**Past**	**Present**	**Future**
Alcona and Iosco County road maintenance	●	●	●
Recreational activities (i.e. hunting, snowmobiling, driving for pleasure)	●	●	●

3.2 Vegetation Management

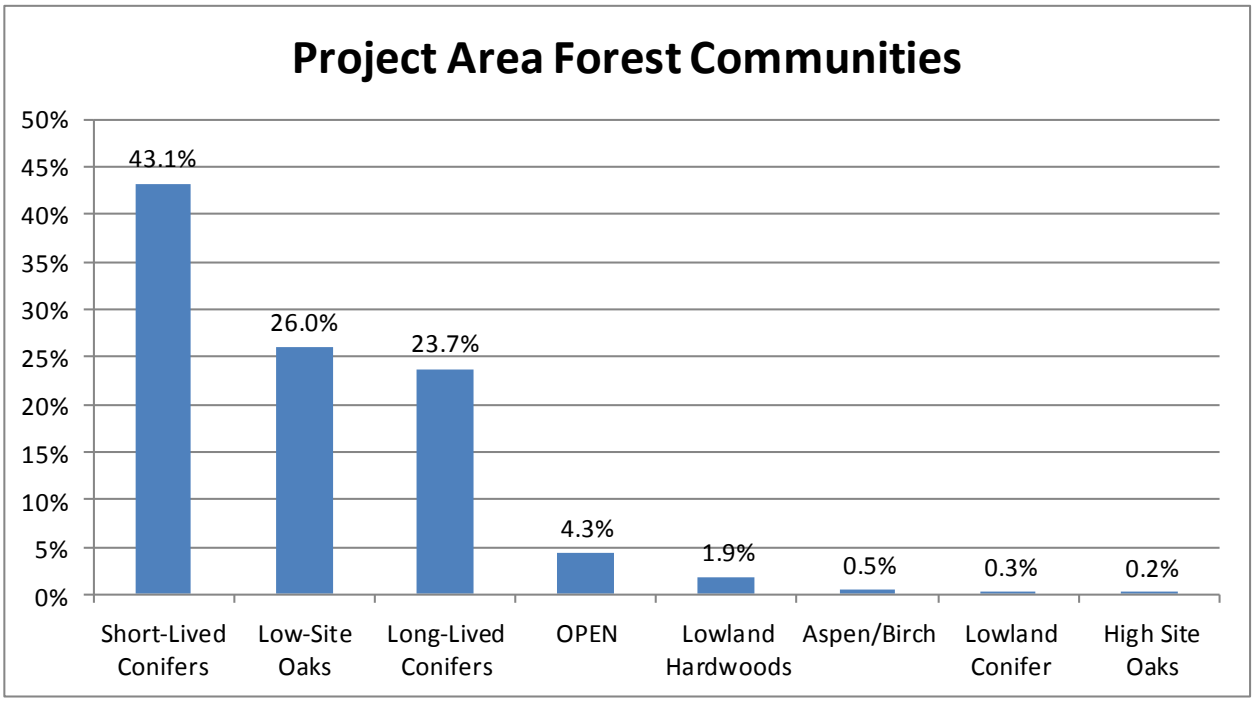
Affected Environment

The Roy Creek Projects proposed activities address site-specific needs and opportunities to move the project area from the existing condition to the desired condition as set forth in the Forest Plan. As a result of these management practices, desired species compositions are obtained and timber products are produced.

The forest communities within the Roy Creek Project are shown in

Figure 9. These forest communities include 43 percent of short-lived jack pine conifer, 26 percent low-site northern pin oak and white oak, 24 percent long-lived red and white pine. Less than two percent is lowland hardwoods and forest types less than one percent include aspen/birch, lowland conifer and high site northern red oak. The remaining four percent is classified as open or nonforested.

Figure 9: Forest Composition for the Roy Creek Project



This analysis will address five forest communities that are proposed for treatment; short-lived conifer (jack pine), long-lived conifer (red pine), low and high-site oak, and aspen.

Short-Lived conifer (jack pine)
The jack pine forest type occurs throughout the project area and is commonly found on dry coarse sandy soils within glacial outwashes. These sites are considered poor because water and nutrients quickly leach through the soils. Jack pine is well adapted to these conditions and does not have much competition from other species. The Forest Plan (page II-17) recommends that jack pine be harvested between 40-60 years to maintain even-aged stands of jack pine.

Historically, wildfires have regenerated thousands of acres of jack pine. Jack pine has serotinous cones which require heat from fires to open the cones and release the seed. Fire also removes the thick layer of thatch and exposes mineral soils for ideal seed germination. Due to the unpredictability of wildfires, many of the jack pine stands on the Huron Shores District have been clearcut and planted.

Most of the jack pine forest type on the Forest has been designated as essential habitat for the federally endangered Kirtland's warbler (KW). The KW requires large areas of young jack pine that is between 5 to 20 year old. The Roy Creek Project contains jack pine that is designated as essential habitat for the KW and is strategically managed. A schedule to create short-lived conifer habitat has been designed to maintain a balanced age class of jack pine ≤ 50 years old. Figure 11 displays the jack pine age class distribution within the Roy Creek Project. Shaded fuelbreaks are proposed to be created outside of Kirtland's warbler habitat.

Long-Lived Conifer
The red pine proposed for treatment was planted by the Civilian Conservation Corps (CCC) in the 1930s and 1940s. The younger red pine was planted in the early 1960s. These plantations were planted to reforest landscapes that had been cleared for farming and grazing. Other areas were reforested because of presettlement timber harvesting and wildfires. The stands proposed for treatment are overstocked and need to be thinned to maintain growth.

The Forest Plan (page B-23) recommends that stands with commercial value be thinned at intervals of ten years or more, and that these treatments occur several times throughout the rotation of a red pine stand. Most of the stands proposed for treatment were last thinned approximately 15-20 years ago while some have never been thinned. (For the purpose of analysis white pine is included with the red pine since it makes up only nine percent of the total *Long-Lived Conifer* proposed for thinning.)

Low Site and High Site Oak
Low site oaks (LSO) are relatively short-lived and are found on poor sandy soils. LSO includes northern pin oak, and white oak. These stands are rarely homogenous and often have a pine component. Generally short-lived oaks are found on low sites and have a site index less than 55, and long-lived oaks are found on high sites with a site index greater than 55.

High site oak (HSO) are long-lived and consist of primarily northern red oak and occur on sandy to loamy soils. These soils have a higher moisture and nutrient holding capacity and can provide better growing conditions. High site oak (HSO) may have pine, aspen, or red maple interspersed throughout the stand. Most of the HSO stands within the project area have a red maple understory and are deficient in oak regeneration. Without the oak component in the understory, these stands may eventually be replaced with a red maple or pine forest type.

The Forest plan (page II-17) recommends that the LSO be harvested at a 50-80 year rotation and that HSO be harvested at a 70-120 year rotation. The shelterwood method would most likely be used to regenerate the LSO. However, harvesting methods for HSO may vary depending on the amount of oak regeneration in the understory. The proposed oak treatments would help establish a younger age class of oak.

Aspen/Birch
Aspen occurs naturally across the entire range of soils on the Huron National Forest, except the poorest outwash sands and deep organic wetlands. Aspen trees are relatively short-lived and may exhibit signs of decline at advanced ages. The Forest plan (page II-17) recommends that aspen is harvested on a 40-60 year rotation, but can mature well past 60 years on a good productive site. Clearcutting is the optimum method for regeneration (Forest Plan, B-10). A clearcut harvest stimulates thousands of root suckers that often become six feet tall in the first year. All though aspen was not a significant part of the ecosystem in the past; maintaining the aspen forest type provides timber products and wildlife habitat for deer and grouse.

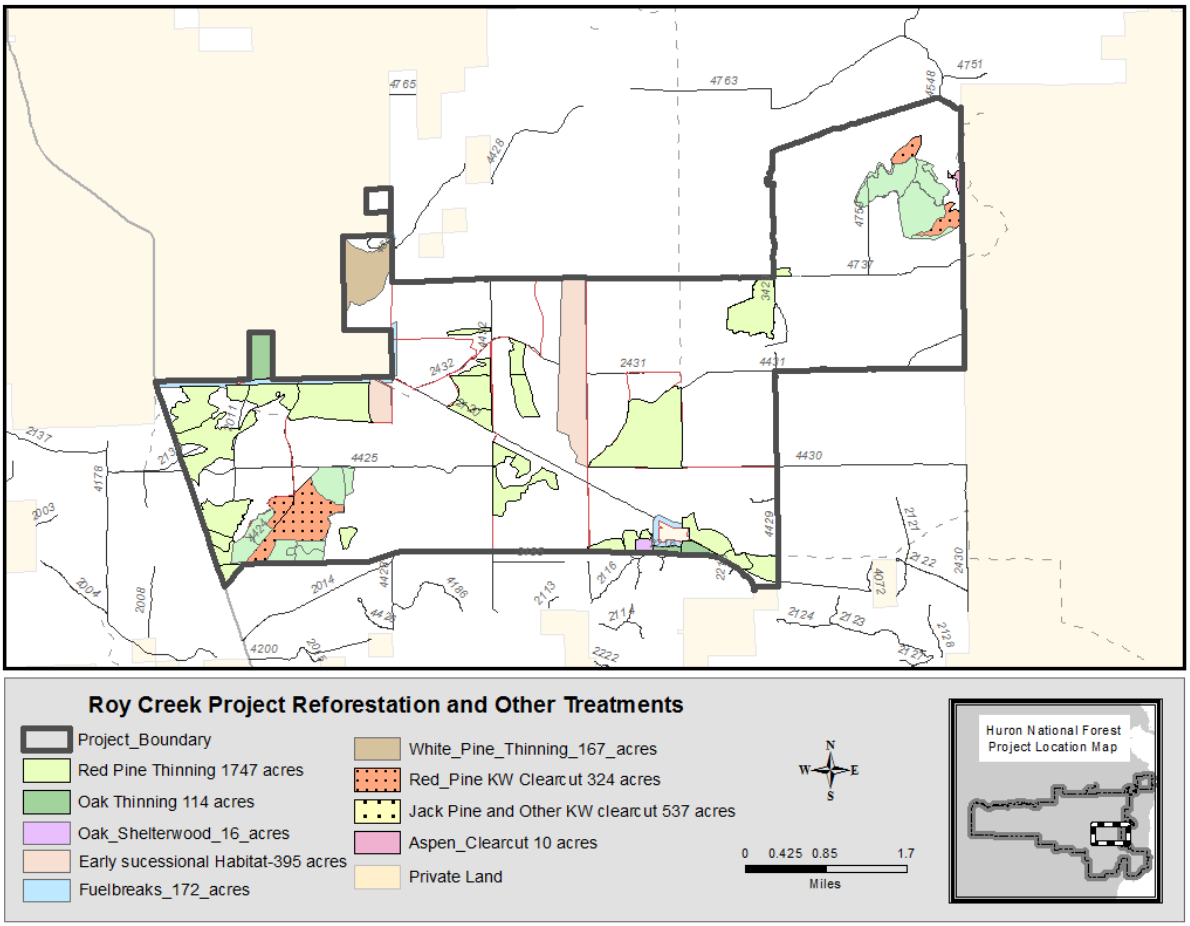
Cumulative Effects Analysis Area
The geographical area for analyzing cumulative effects of vegetative treatments will be the Roy Creek Project boundary (see Figure 10). This boundary was created by utilizing existing

compartment boundaries to best encompass all the proposed actions. The analysis area is approximately 14,064 acres.

Compartment boundaries were selected for analysis because these boundaries utilize existing roads, similar community types, and landforms. They are also used for Forest planning and vegetation management prescriptions. The cumulative effects boundary includes the proposed vegetation treatments as well as the past, present and future actions.

For the purpose of this analysis, cumulative effects will be bound in time by a twenty-year period. This period includes the past ten years of management activities and the reasonably foreseeable future of planned vegetation management for the next ten years. The base year will be 2014. Vegetation management activities beyond ten years were not included in the analysis because aspen stands that were clearcut beyond ten years have regenerated and moved out of the 0-9 year age class. The red pine plantations that were thinned have filled in most of the canopy gaps, and are now considered to be over stocked. The jack pine and red pine clearcuts have been reforested with jack pine and some areas may still be occupied by the Kirtland's warbler. Very little oak has been managed in the last ten years and the treatments beyond ten years are not recognizable.

Figure 10: Roy Creek Project Analysis Boundary



Past, Present and Foreseeable Future Actions

The Forest Service has managed lands for wildlife, dispersed recreation, wildfire suppression and prevention, constructed, maintained and closed unclassified roads and trails, maintained forest openings, treated non-native invasive species, and surveyed landlines. The removal of firewood from National Forest System lands has been permitted.

Oak and jack pine have been treated in the past ten years within the cumulative effects analysis area (CEAA).

Table 27 lists timber sale is the past ten years within the CEAA.

Table 27: Timber Sales Completed in the Past Ten Years or Less Within the CEAA

Timber Sale Name	Vegetative Management Treatment	Year Completed	Acres Treated (approx.)	Volume produced - Ccf (approx.)
Little Blue Stem	Stand Clearcut	2003	43	516
Fuel Reduction TS	Commercial Thin	2003	41	369
Pine River HFI	Fuelbreak	2005	275	670
Bissonette	Fuelbreak	2007	47	298
King WUI	Fuelbreak	2007	81	1382
Red Trout KW	Stand Clearcut	2008	159	1584
Pine 12 KW*	Stand Clearcut	2011	368	3978
Queens Corner KW	Stand Clearcut	2011	253	1302
Pine 8a KW*	Stand Clearcut	2012	93	693
* KW blocks with mostly red pine				
Totals			**1,360**	**10,792**

Timber sales proposed in the next 10 years are displayed in Table 28.

Table 28: Timber Sales Planning the Next Ten Years or Less within the CEAA

Timber Sale Name	Vegetative Management Treatment	Estimated Sale year	Acres Treated (approx.)	Red pine acres clearcut
Stout-Snowbird	Stand Clearcut	2015	284	39
Totals			**284**	**39**

Objective 1: Predicted Attainment of Producing a Diverse Mix of Timber Products, and Moving the Project Area Towards the Desired Future Condition Set Forth in the Forest Plan, Particularly in Regards to Vegetative Composition.

Alternative 1(No Action)

Direct and Indirect Effects

Short-lived Conifer (jack pine)

The proposed fuelbreaks, early successional habitat and Kirtland's warbler habitat would not be created through timber harvests and prescribed burning. Without treatment or disturbance, the jack pine would continue to mature and succeed to a more diverse species mix that includes white pine, red pine and oak. In some areas, the jack pine is already mature and would continue deteriorating releasing the oak in the understory.

Long-lived Conifer (red pine)

The red pine would continue to grow but at much slower rates due to limited growing space in a closed forest canopy. Red pine in an untreated environment tends to have small crowns with narrow taper and is susceptible to wind throw.

The low quality, suppressed and unhealthy trees would remain in the stands. Tree densities would not be lowered and growing space for residual trees would not be created. Overstocked stands would have competition stress, lowering the plantations vigor and increasing vulnerability to bark beetles and disease.

Unmanaged red pine has greater crown-to-crown contact which increases the potential of a crown fire. Prescribed burning would not be implemented to reduce hazardous fuels in red pine plantations.

Pruning of limbs within white pine stands would not be done to improve quality of future wood products.

Low Site and High Site Oak
Alternative 1 would defer the oak management treatments and the effects would be as follows: Low Site Oak Thinning - The short lived oak species would continue to grow but at a slower rate due to the stands age and in some cases tree stocking densities. Many of these oak are mature and exhibiting signs of decline. Without removing some of the older trees, existing oak regeneration would continue to be suppressed. However, as the mature oak succumbs to mortality, understory regeneration would slowly be released. Prescribed burning would not be used to stimulate suppressed oak seedlings and prepare seedbed for additional oaks to germinate.

Deferring treatment would allow the oak to succeed to a more pine dominated forest type, create uneven aged stands, shift species composition and would not meet the Forest Plan (page B-11) oak management guidelines of even-aged oak.

High Site Oak Thinning/shelterwood
The long lived oak species would also continue to grow but at a slower rate due to competition for crown growing space. These stands are considered overstocked according to oak management stocking charts. Existing oak regeneration would continue to be suppressed if the mid-story and co-dominate crowns of red maple and oak are not mechanically removed. Alternative 1 would not open the crown canopy and provide the necessary sunlight for new oak recruitment.

Prescribed burning would not be implemented to reduce red maple competition and enhance conditions for oak germination by exposing mineral soil and providing a flush of nutrients. Red maple would continue to grow and eventually become the dominate species in the stand.

Aspen/Birch
Deferring the mature aspen (80-90 years old) harvest would result in lost opportunities to regenerate this aspen. Without a disturbance, the shade intolerant aspen would begin to decline. Shade tolerant and mid tolerant species such as oak and pine in the understory would eventually replace the aspen.

Cumulative Effects
The red pine would put on minimal radial growth and without a crown replacing fire or the proposed jack pine regeneration treatments, the late-successional jack pine would gradually be replaced with longer lived species. Of the present timber sales, 281 acres of timber harvesting in the Snowbird Timber Sale would continue as planned.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

Alternative 2 would harvest timber and meet the objective of producing a diverse mix of timber products. It moves the projects vegetation composition towards the desired future condition as set forth in the Forest Plan (page II-7) (USDA Forest Service, 2006). These alternatives include different management techniques to achieve the desired future condition for each forest type proposed in the Roy Creek Project. Approximate acres treated, and estimated volume produced is listed in Table 29.

Table 29: Vegetative Management Strategies, Acres Treated, and Volume Produced

Vegetative Timber Management Treatments Roy Creek Project	Acres Treated (approx.)	Estimated Volume (Ccf)
Red Pine Clearcut (KW	324	6,500
Jack Pine and other Clearcut (KW)	422	5,001
Temporary KW Fuelbreak	6	37
Red Pine Thinning	1,626	14,560
White Pine Thinning	168	1,517
Oak Thinning-LSO	80	648
Oak Thinning-HSO	37	299
Oak Shelterwood-LSO	16	160
Aspen clearcut	10	200
Early Successional Habitat Creation	395	2,873
Fuelbreaks/Shelterwood	172	1,702
Total	**3,256**	**33,497**

Long Lived Conifer Thinning (Red Pine)

Trees that are low quality, unhealthy, or interfere with the growth of high quality trees would be removed. In the short term, the red pine thinning treatments would provide about 16,077 Ccf of timber products. Long term effects of the red pine thinning would increase the volume for individual trees remaining in the stands. Thinned red pine plantations would allow the remaining trees to achieve optimal growth, produce high quality sawtimber and may be less susceptible to insects, disease and fire damage.

A research study in northern Minnesota (WIDNR, 2003) analyzed the effects of prescribe burning in a red pine stand. Their conclusion was that prescribe burning has a negative short term effect on red pine tree growth and drought vulnerability. When prescribe burning was no longer used, the red pine stand soon recovered to pre burn productivity.

Prescribed burning would have a negative effect if the charred bark is still present at next future timber sale (10-15 years). Most of the red pine harvested on the Tawas and Harrisville Ranger Districts are done before prescribed burning without charred bark. However if the proposed prescribed burning is continued on a regular maintenance schedule, then charred bark would be present at next red pine thinning entry and could devalue the timber.

Long Lived Conifer Clearcut (Red Pine)
324 acres of red pine would be clearcut and converted to jack pine. These acres would be planted with 1,452 jack pine trees per acre, to create Kirtland's warbler (KW) habitat.

Short-Lived Conifer-Clearcut (Jack Pine)
Two jack pine unit clearcuts (KW-1 and KW-2) totaling 422 acres would provide 5,001 Ccf of timber products. These acres would be planted with 1,452 jack pine trees per acre to create KW habitat.

The KW-1 unit also contains six acres of sub merchantable jack pine that would be clearcut and provide 37 Ccf of chip material. This area would serve as a temporary fuel break for the adjacent proposed prescribed burn. The temporary fuelbreak would be prescribed burned to reduce remaining hazardous fuels that include slash and grasses. Any natural regeneration established within the clearcut would be killed by prescribed burning. After the fire is implemented the temporary fuelbreak acres would be planted with 1,452 jack pine trees per acre.

An indirect effect of planting jack pine to KW habitat densities is low productivity. Jack pine crown closure would occur during the sapling size class, eliminating growing space and stagnating annual growth. Competition for resources would eventually shade out some trees and decrease the amount of trees per acre. Kirtland's warbler jack pine is managed on a 50 year rotation to a keep a distributed balance of habitat throughout the designated KW management areas. KW jack pine plantations that have been harvested at 50 years or less produced low quality material with low value. Fifty years does not provide enough time for the jack pine to develop into quality timber.

Short-Lived Conifer-Natural Regeneration (Jack Pine)
High-intensity prescribed burning is proposed to naturally regenerate 115 acres of jack pine within the KW-1 site. This jack pine was planted in 1993 and is currently sub merchantable. The remaining KW-1 site contains 248 acres of merchantable timber along with six acres of sub merchantable material. These acres would be harvested and serve as a temporary fuelbreaks for implementing the high-intensity prescribe burn.

Heat created by the fire would kill the jack pine overstory, open its serotinous cones, and release seed. Fire would also remove the thick layer of thatch; expose mineral soil that would improve seed germination. In areas where jack pine regeneration did not occur or meet KW stocking densities, fill in planting maybe required. If burning is not implemented, the sub merchantable material would be most likely chipped and removed and then planted.

It may be more cost effective to naturally regenerate this jack pine as shown in Table 30. This jack pine is sub merchantable and would not generate enough timber receipts to cover reforestation costs. The Forest Service has paid $710.00 per acre to remove this type of material in past fuelbreak projects. According to 2012 KV plans, standard reforestation costs per acre include $125.00 for site preparation, $378.00 for jack pine seedlings and planting, $15.00 for survival surveys. A $15.00 per acre cost for stocking surveys would be incurred

whether planting or prescribe burning. Estimated prescribe burning costs for the Roy Creek Project is $132.00 per acre.

Table 30: Estimated Costs for Standard Reforestation and Prescribe Burning

Treatment	Standard Reforestation (cost per acre $)	Prescribed Burning (cost per acre $)
Removal of sub merchantable jack pine	710.00	0
Site preparation	125.00	0
Trees and planting	378.00	0
Survival surveys	15.00	0
Stocking surveys	15.00	15.00
Prescribe burning	0	132.00
Total	**1,243.00**	**147.00**

A direct effect of this site preparation action (prescribed burning) includes 115 acres of jack pine killed and regenerated to KW stocking densities. These sites would have the appearance of a wildfire with standing dead timber for a number of years. An indirect effect of standing dead timber would be that it would attract more native bark beetles and other insects as is typical after a fire. Natural regeneration and adjacent timber in past wildfires has not been affected by increased population spikes of insects. A loss of future timber revenues would be an indirect effect of burning the jack pine. The immature jack pine would eventually become merchantable timber that could be harvested and sold.

Short-Lived Conifer- Early Successional Habitat
The vegetation treatment would produce approximately 2,873 Ccf of timber products. Most of the overstory would be removed leaving only scattered clumps of trees. Prescribed burning would remove slash from the timber harvest, reduce the amount of pine regeneration, and promote species associated with early successional habitat.

Long term effects would be creating about 613 acres of a non-forested stand that would not produce future timber products. The habitat would be maintained overtime with prescribed burning or mechanical treatments to prevent additional species establishment. Prescribed burning would favor oak species since fire tends to kill young pine and oak has the ability to resprout.

Low-Site and High-Site Oak
Both alternatives would help meet the goal of sustaining the oak forest type. These treatments include prescribe burning and thinning oak. The oak treatments would allow for oak regeneration and create favorable growing conditions for the residual trees.

Low-Site Oak harvesting would provide approximately 808 Ccf. The thinning and the shelterwood treatments would regenerate oak by stump sprouting and releasing existing

regeneration from the understory. Harvest activities may scarify soils and enhance opportunities for new recruitment of oak.
Typically, low-site oak has poor soils and does not have competition from other species such as red maple. However jack pine thrives in poor soils and some of the jack pine within these units would also be thinned or removed. Typically the shelterwood cut would remove more trees per acre than a thinning treatment. In the long term, these treatments would help balance the age class distribution within the low site oak communities by harvesting the mature oak and allowing a younger age class to develop.

High-Site Oak thinning would produce about 299 Ccf. This treatment would remove mostly midstory and intermediate red maple. It may also remove some overstory trees to release the oak in the understory. In the long term, successful advanced oak regeneration would meet the requirements to implement a future shelterwood cut and create a younger age class of HSO within the analysis boundary.

Low to moderate intensity fire would be prescribed to reduce red maple seedlings and saplings. Implementation would occur in the spring, during which time red maple translocates its carbohydrate reserves from the root system to the stem. This process happens earlier for red maple than oak. Fire would kill a certain percentage of red maple stems but may not prevent the red maple from sprouting. Additional prescribed burns may be required if the desired mortality is not achieved. Fire may also encourage suppressed oak regeneration. Oak responds very well to fire due to the large amount of root reserves stored in its substantial root system. Without fire, suppressed oak regeneration may require several years of lag time before it responds to improved light conditions.

Prescribed burning may have some negative effect on overstory trees. Fire could damage the boles and the unpredicted mortality could potentially affect the areas stocking densities. Fire can also cause stress to the stand and increase the risk of insects and disease, particularly the Ips bark beetle and armillaria root disease.

Fuelbreaks
Alternative 2 creates 172 acres of Fuel breaks producing about 1,702 Ccf. These fuelbreaks would entail removing all jack pine and leaving the oak species. Prescribe burning would be used to remove logging slash as well as small diameter sub merchantable jack pine. Fuelbreak creation would have the same effects as creating early successional habitat.

Aspen/Birch
Ten acres of aspen clearcut would produce approximately200 Ccf of timber products. This harvest would encourage new stands of aspen to regenerate through sprouting, thus increasing the project area's young age class and early-successional aspen component.

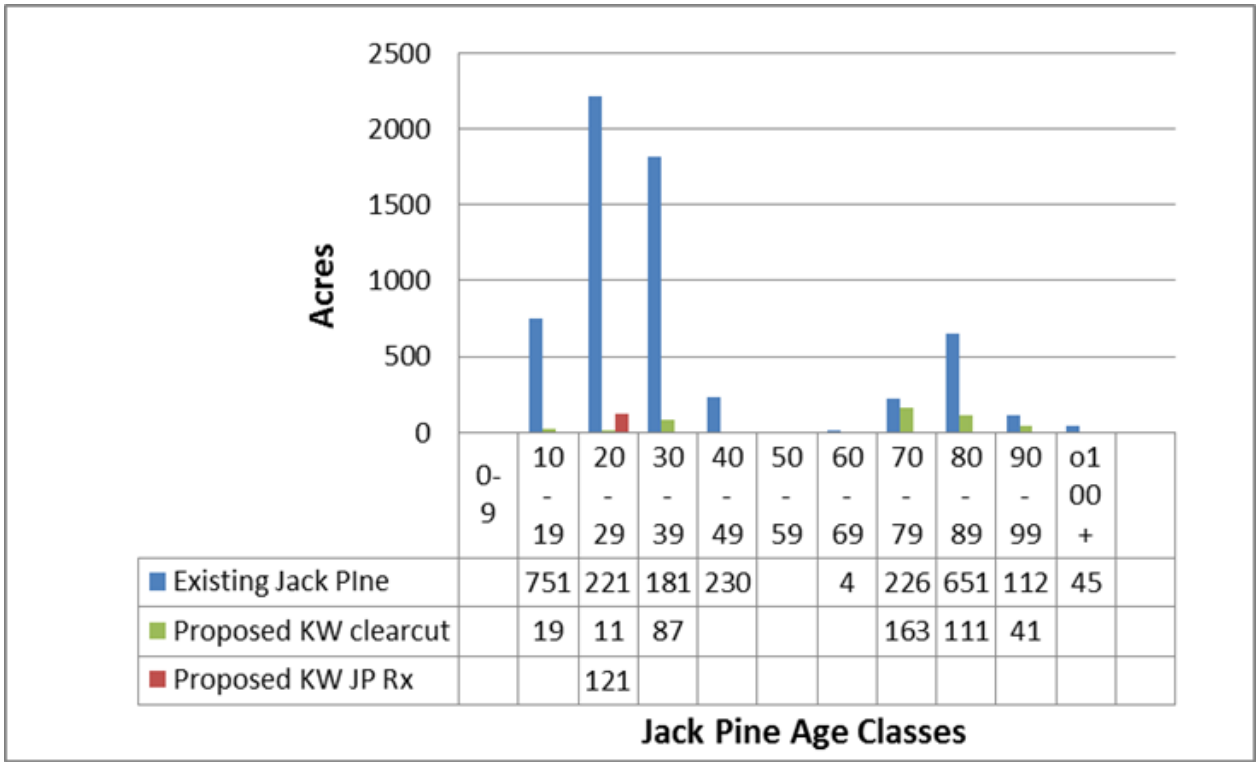
To increase diversity within the aspen community, some hardwood and pine species would be retained in the overstory and midstory. Dead trees and reserve areas would also be left to provide dens and snags for wildlife species diversity. Harvesting in aspen regeneration units would occur between September 30 and May 1, in order to increase the density of aspen sprouting.

Cumulative Effects

Alternatives 2 would continue the trend of vegetation management and produce timber products for the local economy by thinning red pine, clearcutting red pine, jack pine and maintaining the oak and aspen forest type.

Kirtland's warbler habitat management has occurred in the past and together with the proposed actions and planned future actions would have a positive cumulative effect on jack pine age classes. Creating Kirtland's warbler habitat would shift 861 acres into the 0-9 age class as illustrated in Figure 11. Age class distribution is needed in order to maintain a balance of different aged jack pine stands less than 50 years.

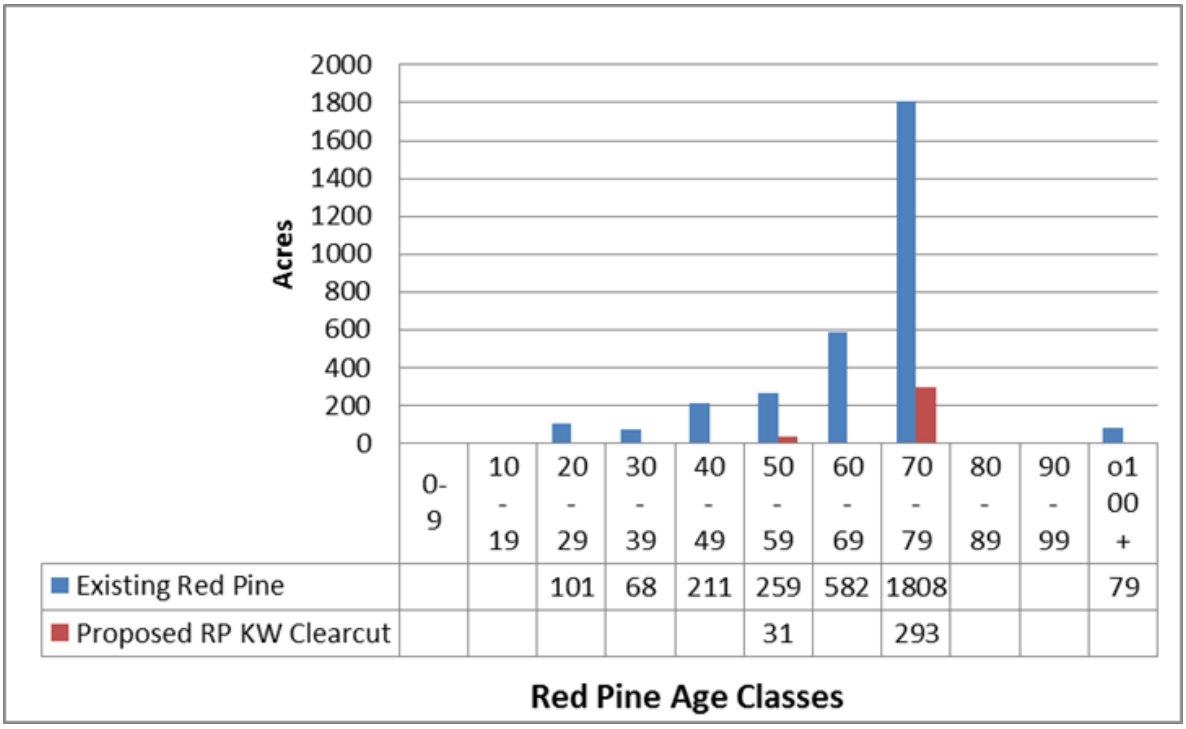
Figure 11: Jack Pine Age Classes for Roy Creek Project



	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	o100+
Existing Jack PIne		751	221	181	230		4	226	651	112	45
Proposed KW clearcut		19	11	87				163	111	41	
Proposed KW JP Rx			121								

These actions would have a negative effect on sustaining the red pine forest type in the Roy Creek Project Area. The Roy Creek Project Area has 3,108 acres of red pine remaining. Approximately 2,578 acres of this red pine is designated as essential KW habitat and may eventually be converted to jack pine over time (see Figure 12). The Roy Creek Project proposes to clearcut approximately 324 acres of red pine.

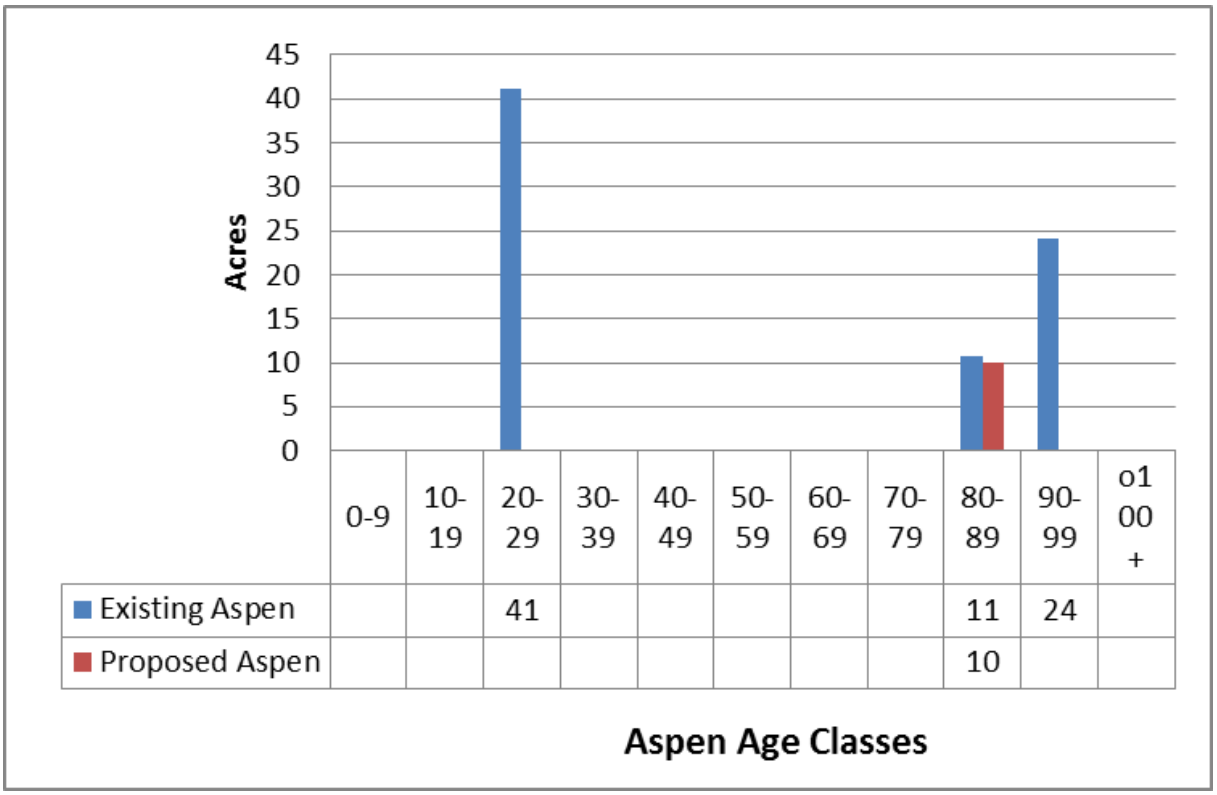
Figure 12: Red Pine Age Classes in the Roy Creek Project Area



A balanced age class of aspen is difficult to achieve since the project area only contains 76 acres. Harvesting the proposed 10 acres would have a positive effect in regards to regenerating a 0-9 age class as aspen as illustrated in

Figure 13. The mature 29 acre stand of aspen would not be harvested because it is inaccessible due to adjacent private land and wetlands. The remaining 41 acres is still too young for harvest.

Figure 13: Aspen Age Classes for Roy Creek



3.3 Fire and Fuels Management

Affected Environment

The Huron National Forest is interspersed with many private in-holdings. Many of the private parcels located within the boundary have developed into residential areas or smaller subdivisions consisting of summer or year-round homes. Springtime routinely finds local residents cleaning yards of miscellaneous vegetative debris. Spring fire season parallels this clean-up operation and burning debris pose fire risks to the surrounding national forest and adjacent properties. Several of the proposed treatment areas are adjacent to or near these subdivisions and because of their fire-prone nature, are considered to be in the Wildland Urban Interface, (WUI) an influence zone where residential lands transition to rural forested areas. Private properties adjacent to these untreated stands are at a higher risk of being lost during a wildfire than where trees and shrubs are removed around the property. The treatment areas being considered are adjacent to or within identified Communities at Risk listed in the National Fire Plan (Federal Register, 2001). These communities include Curtis, Mikado, and Oscoda Townships.

Project Area

The Roy Creek Project area is primarily Landtype Association 1 (LTA 1): Outwash Sandy Plains (Appendix A). LTA 1 is characterized by dry sandy plains deposited by water from melting glaciers. Some areas have gravelly layers or layers with finer soil textures at various depths in

the soil. Topography is comparatively level but may also be pitted or dissected. Vegetation is predominantly jack or red pine, black, white, or northern pin oak, bracken fern, and blueberries. Remnants of dry sand prairie, oak-pine barrens and jack pine barrens occur in some areas. Fire is a common natural disturbance event on this landtype association. Research varies but most agree surface fire occurred periodically upon the landscape (10-50 year intervals). The Fire Regime for this area is classified as Fire Regime 1 (FR1) (Table 3). FR1 landscape ecosystems historically experienced frequent, large, catastrophic stand-replacing fires (Cleland D. T., 2004). An analysis of the Huron National Forest clearly identifies most of the project area, including private property, as having potential for very high-intensity crown or surface wildland fire in either years of normal precipitation or drought (see Figure 31and Figure 32).

Following European settlement of Michigan, logging practices, agriculture and fire suppression have altered the historic vegetation. The settlement of people, accumulation of fuels, altered forest structure and lack of fire as a natural disturbance process has elevated the condition class of the landscape. The Roy Creek Project area is now primarily classified as a Fire Regime Condition Class 2 (see Figure 35) or moderate departure from historical vegetation reference conditions. The overstory vegetation has been planted in tight, close canopy conditions, the lack of fire has allowed surface fuels to accumulate and lower branches of overstory are close to the ground (base canopy). A base canopy close to the ground allows for fires to transition from the surface to the crowns.

Frequent fire and in some places frost and drought conditions were primary disturbance regimes that maintained an open canopy by limiting the development of woody vegetation and allowing a mixture of grasses and sedges. The average return time for canopy replacement fires is estimated to be about 80 years. Light-to-moderate surface fires are estimated to have occurred every 20-40 years while historical records indicate near annual fires in the early successional habitat ecosystem (Mikel, 2008). Fires would have been started by lightning strikes, Native Americans, and early settlers. Insect infestations in the jack pine also influenced fire frequency (Mikel, 2008).

Wildfires have occurred in and around the Roy Creek project area in the past and almost all were caused by humans. Most wildfires were small. The King's Corner fire (2014) occurred within the project boundary. Although the fire did not immediately threaten any structures there was a high potential for a large wildfire to develop. The Bissonette Fire (2008) also occurred within the project area boundary and threatened structures and occupied dwellings. Immediately adjacent to the project area were the Ford Road fire (2015), Quick Road fire (2013), and the Exhaust fire (2010). These fires burned approximately 22, 55, and 270 acres respectively. Figure 30 in Appendix A illustrates the number of fire occurrences within or around the Roy Creek Project Area from 1979-2013.

Figure 33 in Appendix A illustrates the proximity of private property and associated structures to Forest lands. Not only do the private lands provide a source of human caused ignitions but they are also at high risk to wildfires established on other property and moving across the landscape.

In addition to life and property, values at risk include but are not limited to Kirtland's warbler habitat and commercial timber stands. Figure 34 in Appendix A shows the presence of essential habitat for the endangered Kirtland's warbler within and around the Roy Creek Project boundary. State and federal monies are spent in the establishment and maintenance of this habitat in the efforts to support and increase the population of Kirtland's warblers.

Table 31 below describes the Hauling Chart, an interpretation of fire line suppression tactics in relation to flame lengths. Reference to this table will be in the effects section later in this chapter.

Table 31: Fireline Interpretations of the Hauling Chart (USDA, 1982)

Flame Length (feet)	Interpretations
0-4	Persons using hand tools can generally attack fires at the head or flanks. Hand line should hold the fire
4-8	Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold fire. Equipment such as dozers, engines and retardant aircraft can be effective
8-11	Fires may present serious control problems such as torching, crowning and spotting. Control efforts at the head of the fire will probably be ineffective.
11+	Crowning, spotting and major runs are common; control efforts are the head of the fire are ineffective.

3.3.2 Objective 2: Predicted Attainment of Implementing fuels reduction and fuelbreak projects where conditions warrant for the protection of life, property and safety. Restore fire into fire-adapted ecosystems.

Past, Present, and Future Actions

Past Actions
Federal: The Federal Government managed lands for wildlife, recreation, fuel reduction, timber and ecological purposes, suppressed wildfires, constructed, maintained and closed roads and trails, and leased and authorized the development of mineral resources. Table 32 lists the fire and fuel reduction activities that have occurred in the Cumulative Effects Area.

Table 32: Fire and Fuels Reduction Activities in the Cumulative Effects Area

Year	Activity	Acres
2005	Clearcut	434
	Prescribe Burn	43
2007	Clearcut	368
	Fuelbreak Maintenance - Mechanical	67
2008	Prescribe Burn	372
	Fuelbreak Maintenance - Mechanical	41
	Yarding	40
2009	Prescribe Burn	36
	Clearcut	87
2010	Chipping	4
	Fuelbreak Maintenance - Mechanical	180
	Fuelbreak Maintenance – Pres. Burn	300
	Piling	201
	Clearcut	255
	Create Openings	122
2011	Burn Piles	140
	Prescribe Burn	342
2012	Burn Piles	140
	Compact Crush	65
	Prescribe Burn	342
2013	Burn Piles	20
	Fuel Break Maintenance	44
	Prescribe Burn	414
Total		**4,057**

Past Actions – Non-Federal: Alcona and Iosco County governments constructed, maintained, and improved roads in the areas. Private individuals have used the cumulative effects analysis areas for recreational purposes – hunting, snowmobiling, ATV riding, etc. Non-federal entities likely started wildfires in the cumulative effects analysis area.

Present Actions

Federal: The Federal Government continues to manage lands for wildlife, recreation, fuel reduction, timber and ecological purposes, suppress wildfires, construct, maintain and close roads and trails, and to lease and authorize the development of mineral resources.

There is one timber sales presently within the cumulative effects analysis boundaries: the Stout-Snowbird Timber Sale. It is proposed to be sold in FY 2015 and would encompass approximately 263 acres. Other planned activities are listed in Table 33.

Table 33: Planned Activities in the Cumulative Effects Analysis Area

Year	Activity	Acres
2015	Pres Burn	321
	Fuelbreak Maintenance - Mechanical	193
2016	Burn piles	45
	Clearcut	263
	Prescribe Burn	70
2017	Prescribe Burn	73
2020	Prescribe Burn	114
Total		**1,079**

Non-Federal: Alcona and Iosco Counties continue to maintain and improve roads in the areas. Private individuals continue to use the cumulative effects analysis areas for recreational purposes – hunting, snowmobiling, ATV riding, etc. There is no oil and gas well development currently within the analysis area.

Future Actions
Federal: The Federal Government will likely continue to manage for wildlife, recreation, fuel reduction, timber and ecological purposes, suppress wildfires, construct, maintain and close roads and trails, and lease and authorize the development of mineral resources. Other than the Stout-Snowbird Timber Sale no timber sales are proposed to be implemented within the analysis boundaries in the near future.

Non-Federal: Alcona and Iosco County governments are likely to continue to maintain and improve roads in the analysis area. Private individuals are likely to continue to use the analysis areas for recreational purposes – hunting, snowmobiling, ATV riding, etc. Non-federal entities are likely to start wildfires in the analysis areas. Private companies are likely to develop and maintain gas wells and associated facilities on non-federal lands within the analysis areas.

Cumulative Effects Analysis Boundary
For the purposes of analyzing effects of fuels reduction, the temporal analysis area will be the immediate area surrounding the project activities. This analysis area was chosen because: 1) it encompasses the project activities affecting fire and fuels, 2) fuels treatment elsewhere will have little to no effect on fire behavior within the treatment areas and 3) the proposed actions would have similar effects on the hazardous fuels and fire regimes as those of past, present, and reasonably foreseeable future actions within the analysis boundaries.

The short-term effects time frame is defined as 0-5 years. The long-term effects time frame is defined as 5-10 years. This long term time frame was chosen based on the effectiveness of hazard fuels reduction treatments. The long-term duration of effectiveness for the project activities would be similar to historic timeframes, with one “maintenance” prescribed burn treatment lasting approximately three to seven years and mechanical treatment remaining effective for about ten years due to reduced overstory vegetation.

Fire and fuel treatments have been separated into four dominant fuel type categories to aid in delineating direct, indirect and cumulative effects. The four major categories are: Fuelbreaks, Jack Pine Overstory, Red Pine Overstory and Mixed Hardwoods Overstory.

The proposed fire and fuels treatments include the creation and maintenance of fuelbreaks adjacent to private property, creation and maintenance of early successional habitat (which would also function as a fuelbreak in Kirtland's warbler Essential Habitat). Biomass removal through the thinning of red and white pine stands allows fuel loading and fire hazards to decrease. These activities are summarized in **Error! Reference source not found.**.

Table 34: Summary of Alternative 2 Fuel Reduction Activities

Hazardous Fuels Reduction Activities	Acres
Fuelbreak Creation and Maintenance*	172
Early Successional Habitat Creation*	861
Thinning and Prescribed Burning	7402
Total	**8,435**

*for fire effects and behavior purposes fuelbreaks and early successional habitat creation are considered together

The analysis will consider management actions and other factors, such as wildfire, on public and private lands within the analysis boundary that have reduced or are planned to reduce hazardous fuels for the past and future ten years. The long-term duration of effectiveness for the project activities would be similar to historic timeframes, with prescribed burning treatment lasting approximately seven years and mechanical treatment remaining effective for about ten years due to reduced over-story vegetation. A wildfire event in untreated fuels would result in a long-term effect for the project area for the same ten-year duration as the thinning projects. This assumption is based on past wildfire experience and stand-replacement fire intensities.

Restoration treatments may take several entries (once a year, every two years) to meet objectives. A wildfire event in untreated fuels would result in a long-term effect for the project area for the same ten-year duration as the thinning projects and may or may not achieve Management Area objectives. This assumption is based on past wildfire experience and stand-replacement fire intensities. For example, a wildfire event may result in jack pine regeneration in close proximity in a management area where the desired vegetation is oak.

Alternative 1 (No Action)

Direct and Indirect Effects

With management action deferred, there would be no direct effects of selecting the No Action Alternative.

The long-term indirect effect would include continued steady increase in fuel loading within the project area. As pine stands mature and their canopies become denser the potential for crown fires would increase. This would result in increased risk for public and firefighter safety from catastrophic wildfire on the landscape.

Defending structures would become extremely hazardous and virtually impossible especially if heavy fuel loadings were ignited immediately adjacent to the structure(s). It is likely that indirect suppression tactics (used when flame lengths exceed 4 feet) would be implemented since fire intensities and flame lengths increase with the fuel loadings. Predicted fire behavior under spring-time and summer-time conditions is illustrated in Table 35.

Not implementing fire and fuels treatments would result in rates of spread of about 4.5 - 19.3 ft. /min and flame lengths of about 4.4 - 9.9 feet during the springtime when most wildfires occur. Lower rates of spread (2.4 - 5.0 ft. /min) and shorter flame lengths (1.6 - 4.1 ft.) would occur once "Green Up" conditions are present.

Table 35: Predicted Fire Behavior if the No-Action Alternative were implemented

Spring			**Green Up**			**Crown Fire Potential (scale of 0-9)**	**Overstory Community and Representative Fuel Model (Spring/Summer)**
Rate of Spread (ft/min)	**Flame Length (ft)**	**Fireline Intensity (btu/ft^2/ min)**	**Rate of Spread (ft/min)**	**Flame Length (ft)**	**Fireline Intensiy (btu/ft^2/ min)**		
19.3	9.9	11,820	4.9	4.1	4215	7	Red Pine (SB3/TU1*)
4.5	4.5	3795	3.7	3.7	2773	6	Jack Pine (TL9/TL9)*
6.1	4.4	3824	5.0	3.7	2677	5	Mixed Hardwoods and Pine (TU2/TL9)*
14.3	6.4	7876	2.4	1.6	1682	4	Openings (SB2/TL6)*

* These abbreviations depict fuel models and are explained in the Fire and Fuels Specialist report

A direct effect of longer flame lengths would result in an increased resistant to fire control efforts (see Table 35.). Hardwood stands would also continue to have the potential for a high-intensity surface fire.

This alternative does not provide for the creation of defensible space needed for safer firefighting, public protection, and protection of adjacent improvements.

Another indirect effect of not reducing fuel loading and crown-to-crown contact is illustrated in

Figure 14. The stand illustrated was impacted by the No Pablo fire in April, 2000 and was almost completely destroyed by the fire. A fire that results in this kind of destruction produces an extreme amount of heat and poses an extremely hazardous situation for both the public and firefighters.

Figure 14: Unthinned Red Pine Stands Impacted by the No Pablo Fires (April 2000)

The proposed expanded fuelbreak areas and creation of early successional habitat would continue to be classified as listed in Table 35. During the spring, areas next to private property and homes could have flame lengths from 0-10 feet and rates of spread in the range of 0-19 feet per minute (refer to Table 31 in affected environment section). Under typical weather and dry fuel conditions the higher rates of spread, longer flame lengths and resulting higher fireline intensities are present when large destructive fires occur (refer to fireline intensity columns in the tables throughout this section. (For a complete definition of fireline intensity, refer to the Fire and Fuels Specialist report). Tractor-plow and dozer fireline production rates would be very low, leading to increased time to control the fire and longer exposure times to hazardous conditions for firefighters. Left unmanaged, existing fuelbreaks would slowly return to a more heavily-wooded condition with a denser canopy and heavier fuel loadings.

Private property within and adjacent to the project area would continue to have dense jack pine or red pine stands immediately adjacent to structures and the arterial roads serving the project area. Escape from a major wildfire would be difficult. Emergency responders attempting to enter the area to conduct evacuations or protect homes and citizens attempting to evacuate could easily be overrun by a crown fire or intense surface fire along the arterial roads.

The intensity of a crown fire overrunning a road could trap people attempting to leave or enter the area and would likely prove fatal or cause serious injury to anyone in the fire's path. The Stephan Bridge Road Fire Case Study (National Fire Protection Association, n.d.) notes: "several law enforcement personnel found themselves nearly trapped by this fast-moving fire as they checked homes on divergent and dead-end trails". Potential flame impingement on major roads like Kings Corner Road and Chambers Road could be worse than what is illustrated in photo (Figure 15) because these roads are narrow dirt roads. Escape under these conditions would be dangerous and anyone caught in this situation would likely be killed or seriously burned.

Finally, the proposed actions would be deferred and fire would not be reintroduced into fire-adapted ecosystems. Fire regimes would remain outside of historical ranges and the majority of the project area would remain in a Fire Regime Condition Class 2. Hazardous fuels would not be reduced. In the long term, the No Action alternative would continue to exclude fire and increase the possibility of stand-replacement wildfires due to current stand characteristics.

According to the Environmental Protection Agency (Environmental Protection Agency, 1998): "the lack of fire also has unintended ecological effects, leading to the loss of habitat for rare species and the decline of ecosystems. Fire exclusion can lead to an alteration in natural community types and an important loss of biodiversity". Pyne and others note: "valued forest like pine, oak, and sequoia; rich grasslands like the tall grass prairie and marshes; a host of mixed biome habitats valuable to wildlife; can degrade without a proper regime of fire and all become susceptible to catastrophic wildfire" (Pyne S. A., 1996).

Figure 15: Crown Fire Impingement on a Road-Meridian Boundary Fire (2010)

Cumulative Effects

When combined with past, present, and reasonably foreseeable future actions, Alternative 1 would reverse the trend of reducing fuel loadings and therefore fire intensities, and hazardous fuels to protect the public and increase firefighter safety. It would reverse the trend of creating and maintaining fuelbreaks in areas of hazardous fuels that are adjacent to private property and would also reverse the trend of reintroducing fire into fire-adapted ecosystems.

Alternative 2 (Proposed Action)

Direct and Indirect Efects

Fuelbreaks and Early Successional Habitat

Direct effects include the reduction of crown-to-crown contact, removal of ladder fuels, and retention of less-flammable vegetation, such as hardwoods, combined with periodic maintenance by either mechanical treatments or prescribed burning, would provide an area where a large and potentially destructive wildfire would transition from a crown fire to a surface fire. The fire could then be more easily controlled by fire suppression personnel and allow them to work more safely due to an area of reduced fire intensity (definition in fire and fuels Specialist Report located in project file). "Fuel breaks are not expected to control a fire in themselves, but provide points of access to facilitate control of the flanks and provide possible backfire action in the face of an advancing fire head" (California Department of Forestry and Fire Protection, 2000).

Indirect effects of the benefits of fuelbreaks are illustrated in the following examples: The *Fuel Break Fire* (1998) was a running crown fire in young jack pine that occurred near Oscoda, Michigan. It threatened homes along Grass Lake Road. The fire was limited to 69 acres and was contained in approximately three hours. One of the factors that aided containment was the strategic placement of a fuelbreak several years earlier just east of the Oscoda Elementary and High School complex. The U.S. Forest Service Success Story Reporting System reports: "on this same fire (*Fuel Break Fire*) Oscoda Township Fire Chief Allan McGregor praised the fuel-break work that had been completed. He credited it for stopping what would have been the certain loss of structures had it not been completed, and for the added safety it provided to firefighters battling the blaze". The article further notes the fuelbreak created along this road (Grass Lake Road) the previous fall allowed Oscoda Township Firefighters to deploy structure protection along the road. While the fire spotted across the road into fuels around the homes, the firefighters were able to safely stop the spread and no structures were lost (USDA Forest Service - Success Story Reporting System, 2002).

Another successful use of a fuelbreak occurred on May 18, 2010. Several homes were spared along the south side of Hunter Lake Road in Michigan's Crawford County, thanks to a fuelbreak created around 1995. The fuel break allowed the crown fire to transition to a surface fire with a significantly lower intensity and speed. In the area where the fuelbreak ended (near Highway M-18) the fire crossed the road and continued spreading southward" (USDA Forest Service - Success Story Reporting System, 2010).

In 2012 firefighters set fire to the grasses growing in the Mack Lake subdivision fuelbreak to remove available fuels and to prevent the spread and impact of the Little Mack wildfire to the homes (

Figure 16).

Figure 16: A Backfire Set in This Fuelbreak Prevented the Spread of the Little Make Fire (2012) into a Subdivision (Note the structures on the right side of the photograph – fuelbreak area is outline in red.)

The direct effects of implementing Alternative 2 would be a reduction of about 20 to 43 percent in *Crown Fire Potential* across all fuel beds regardless of time of year. *Rate of Spread, Flame Length* and *Fireline Intensity* would decrease about 35, 57, and 39 percent respectively for the Jack Pine fuel bed under summer time conditions. Mixed Hardwoods and Pine under summer time conditions would see a reduction of approximately 52, 57, and 37 percent respectively in *Rate of Spread, Flame Length*, and *Fireline Intensity*. The red pine fuel bed would see decreases in *Rate of Spread, Flame Length* and *Fireline Intensity* of 36, 35, and 33 percent respectively during springtime conditions and a reduction of 51, 61, and 60 percent respectively under summertime conditions for *Rate of Spread, Flame Length* and *Fireline Intensity* (see Table 43). These decreases are due to changing the fuel beds to fuel types that are less volatile.

However there would be an increase in *Rate of Spread, Flame Length* and *Fireline Intensity* for Jack Pine and Mixed Hardwoods and Pine fuel beds under springtime conditions. For the jack pine fuel bed this increase would be 69, 30, and 52 percent respectively for *Rate of Spread, Flame Length,* and *Fireline Intensity*. The Mixed Hardwoods and Pine would see increases of 57, 31, and 51 percent respectively for *Rate of Spread, Flame Length,* and *Fireline Intensity*. This is due to the increased presence of grasses in the understory vegetation and more sunlight reaching the forest floor. However, the increases in *Rate of Spread, Flame Length,* and *Fireline Intensity* would not impact firefighter and public safety because the reduction in heavy fuels and opening of the tree canopy would allow for better maneuverability within the stands

The indirect effects would be an increase in firefighter and public safety, lowered risk of homes and private property being damaged or destroyed, and an increased effectiveness of fire suppression forces and/or evacuations in the event of a wildfire. The treatments would decline in effectiveness over time, with mechanical treatments declining over a ten-year period and

prescribed burning declining over seven years. The three-to-ten year maintenance schedule of the fuel breaks provide a constant benefit to the analysis area by lower fire intensity.

Other indirect effects would be that it would introduce both spatial and temporal landscape heterogeneity (diversity). (Pyne S. A., 1996) notes: "fire creates a variety of regeneration environments suitable for early successional species colonization. Increased landscape heterogeneity consequently leads to increased species diversity. When disturbances are intermediate in frequency and intensity, the resulting environmental heterogeneity provides opportunities for both resident and colonizing species to persist thereby maximizing biological diversity".

Several areas are proposed for fuelbreak expansion and/or creation. Table 36 shows the predicted fire behavior pre- and post-treatment for various vegetative types in the proposed fuelbreak areas. The post treatment Crown Fire Potential would be reduced to a 4 for all types. Although spring time rates of spread and flame lengths would increase due to a change in vegetation to more grasses, it should be noted that fire suppression efforts are still aided by the conversion of the fuels from timber litter type to grass type.

Table 36: FCSS Modeling Results for Effects of Fuelbreak Treatments of Fuels

Fuel Beds	Before Treatment					Post Treatment				
	Fuel Model	Rate of Spread (ft/min)	Flame Length (ft)	Crown Fire Potential	Fireline Intensity (btu/ft^2/min)	Fuel Model	Rate of Spread (ft/min)	Flame Length (ft)	Crown Fire Potential	Fireline Intensity (btu/ft^2/min)
Jack Pine	TL9	4.5	4.5	6	3795	SB2	14.3	6.4	4	7876
	TL9	3.7	3.7	6	2773	TL6	2.4	1.6	4	1682
Mixed Hardwoods and Pine	TU2	6.1	4.4	5	3824	SB2	14.3	6.4	4	7876
	TL9	5	3.7	5	2677	TL6	2.4	1.6	4	1682
Red Pine	SB3	19.3	9.9	7	11820	SB2	14.3	6.4	4	7876
	TU1	4.9	4.1	7	4215	TL6	2.4	1.6	4	1682
Spring	Crown Fire Potential Scale 0 (lowest) to 9 (highest)									
Summer										

Red Pine Overstory

The direct effects of the proposed fire and fuels treatments reduce fireline intensities by 12-22 percent in the springtime (when most wildfiress occur). In the summertime Fireline intensities increase by about 7 percent for areas that are thinned and not prescribed burned. Areas that are thinned and prescribed burned see a 13 percent reduction in fireline intensities (see Table 37).

Approximately 1,626 acres of red pine and 168 acres of white pine are treated to reduce crown-to-crown contact.

The direct effects of thinning are well illustrated by the reduction in fire behavior that occurred in April 2000 on the No Pablo Fire. As the 5,200 acre wildfire moved across the landscape the fire behavior was different when it impacted a thinned red pine stand versus an unthinned stand (see Figure 14). As shown in Figure 17 there was very little mortality in the thinned stand because the fire dropped out of the crowns of adjacent trees as soon as it reached the thinned stand. The fire then became a surface fire which consumed only low-lying surface vegetation and left the red pine relatively undamaged. If a fire were to occur again in this same stand in another three to four years it would be relatively easy to control with minimal risk to public and firefighter safety.

Figure 17: Thinned Red Pine Stand Impacted by the No Pablo Fire (2000)

The direct effects of thinning and prescribed burning of red pine stands would be decreased fire intensity due to reduced fuel loading in the stands being treated. Thinning red pine stands would reduce the probability of crown fires by eliminating crown-to-crown contact. Overall, the probability of intense surface fires and crown fires in red pine stands would be reduced, thus providing a safer environment for firefighters and the public.

The direct effects of prescribed burning would be to reduce hazardous fuels buildup and change areas currently classified as Fire Regime Condition Class 2 or 3 to Fire Regime Condition Class 1. Low-to-moderate fire intensity and mosaic prescribed burning as illustrated in Figure 18 would be used to achieve these results.

Figure 18: Example of Low Fire Intensity Utilized During a Prescribed Burn

This may take multiple entries of prescribed burning or mechanical treatments 1 to 2 years apart to continue to reduce fuel accumulations and maintain a Fire Regime Condition Class 1.

The direct effect of the proposed three-to-ten year prescribed burning maintenance schedule would be lighter fuel loadings and thus lower fire intensities.

Table 37 illustrates changes in fire behavior that may be expected for *Rates of Spread*, *Flame Length*, *Crown Fire Potential*, and *Fireline Intensity* under both spring and summertime conditions and for various treatment options. The Before Treatment also illustrates what could be expected if the No-Action Alternative (Alternative 1) were implemented.

In the springtime (when most wildfires occur on the Huron-Manistee National Forests) the direct effect of Thinning Only is a reduction in *Rate of Spread*, *Flame Length*, and *Fireline Intensity* when compared to Before Treatment (or No-Action). The reduction is approximately 13, 5, and 12 percent respectively. However if areas are both thinned and subsequently prescribed burned there is an even greater reduction in *Rate of Spread*, *Flame Length* and *Fireline Intensity*. The reduction is about 26, 19, and 22 percent respectively when compared to Before Treatment (or No-Action).

In the summertime the direct effect of Thinning Only is an increase in *Rate of Spread*, *Flame Length*, and *Fireline Intensity*. The increase is about 8, 11, and 7 percent respectively when compared to Before Treatment (or No-Action). This is due to the increased presence of grasses in the understory vegetation and more sunlight reaching the forest floor. However, the increase in *Rate of Spread*, *Flame Length*, and *Fireline Intensity* would not impact firefighter and public safety because the reduction in heavy fuels and opening of the tree canopy would allow for better maneuverability within the stands. However if areas are both Thinned and Prescribed Burned there is a reduction in *Rate of Spread*, *Flame Length*, and *Fireline Intensity*. The reduction is 16, 12, and 13 percent respectively when compared to Before Treatment (or No-Action).

Regardless of the treatment method, including Alternative 1 (No Action) Crown Fire Potential remains unchanged.

With scheduled maintenance the direct and indirect effects would be the overall reduction in *Flame Length, Rate of Spread* and *Fireline Intensity* should a fire occur.

Table 37: Estimated Change in Fire Behavior-Thinning Only versus Thinning and Prescribed Burning

Before Treatment					Post Thinning Treatment					Post Thinning and Prescribed Burning Treatment				
Fuel Model	**Rate of Spread (ft/min)**	**Flame Length (ft)**	**Crown Fire Potential**	**Fireline Intensity***	**Fuel Model**	**Rate of Spread (ft/min)**	**Flame Length (ft)**	**Crown Fire Potential**	**Fireline Intensity***	**Fuel Model**	**Rate of Spread (ft/min)**	**Flame Length (ft)**	**Crown Fire Potential**	**Fireline Intensity***
SB3	19.3	9.9	7	11,820	SB3	16.7	9.4	7	10,439	SB3	14.3	8.0	7	9347
TU1	4.9	4.1	7	4215	TU2	5.3	4.6	7	4554	TL9	4.1	3.6	7	3674
Crown Fire Potential Scale 0 (lowest) to 9 (highest) *Fireline Intensity is in btu/ft^2/min										**Spring**			Summer	

The indirect effect of the proposed red pine thinning treatments serve as a buffer between private property located north of King's Corner Road and forested areas located to the south.

The buffers would provide firefighters areas where fire behavior would be expected to be less severe, opportunities for a crown fire to be reduced to a surface fire and the implementation of direct attack tactics. These effects are most evident in the spring time, as show in Table 37 which is the period of highest fire occurrence on the Huron-Manistee National Forests.

Jack Pine Overstory

Not all fires in jack pine stands are wildfires. In the summer of 2011 on the Camp Ten Prescribed Burn, three attempts were made on three different days to conduct a prescribed burn under a jack pine dominated overstory and the fire would not burn through the understory. Historically 94 percent of the fires occurring in this fuel type were surface fires with an average fire interval of three years. In the nearby Great Pine Barrens (see Figure 29 in Appendix A), 76 percent of the fires were surface fires with an average fire interval of seven years (Mikel, 2008).

After KW habitat has been clear cut, in the short-term it would serve as a fuelbreak until it is replanted. In the longer term, as the newly planted trees grow the area would exhibit an increased fire hazard due to the densities at which jack pine is planted for KW habitat. Fuelbreaks are designed and locations chosen with this in mind.

With the implementation of the proposed treatments the Fire Regime Condition Class would be reduced from a 2 to a 1 and fire resistant vegetation would be favored in order to create a buffer to assist firefighters in fire suppression efforts between high value resources (private lands, recreation areas) and Kirtland's warbler habitat areas.

Table 38 illustrates changes in fire behavior that may be expected for *Rate of Spread, Flame Length, Crown Fire Potential,* and *Fireline Intensity* under both spring and summertime conditions. The Before Treatment illustrates expected fire behavior before prescribed burning is

done and also what would be expected if the No-Action Alternative (Alternative 1) were implemented.
In the springtime (when most wildfires occur on the Huron-Manistee National Forests) the direct effect of prescribed burning is a reduction in *Rate of Spread*, *Flame Length*, and *Fireline Intensity* when compared to Before Treatment (or No-Action). The reduction is about 58, 38, and 17 percent respectively.

In the summertime the direct effect of prescribed burning is a decrease in *Rate of Spread*, *Flame Length*, and *Fireline Intensity*. The decrease is approximately 57, 35, and 26 percent respectively when compared to Before Treatment (or No-Action).

Crown Fire Potential in both spring time and summertime drops from a 6 to a 3 for treated areas.

Table 38: Estimated Change in Jack Pine Overstory with Implementation of Proposed Treatments

Before Treatment					Post Prescribed Burning Treatment				
Fuel Model	**Rate of Spread (ft/min)**	**Flame Length (ft)**	**Crown Fire Potential**	**Intensity (btu/ft^2/ min)**	**Fuel Model**	**Rate of Spread (ft/min)**	**Flame Length (ft)**	**Crown Fire Potential**	**Intensity (btu/ft^2/ min)**
TL9	4.5	4.5	6	3795	TL5	1.9	2.8	3	3134
TL9	3.7	3.7	6	2773	TL8	1.6	2.4	3	2060
Crown Fire Potential Scale 0 (lowest) to 9 (highest)							**Spring**	**Summer**	

Mixed Hardwoods and Pine Overstory
Within the Roy Creek project area are prescribed burning blocks with portions that are classified as mixed hardwoods and pine overstory. Tree species often found in these blocks are primarily red, white and jack pine, black, white, and red oak, and aspen.

Blocks 1a, 2a, 2c, 3b, and 3c (see Figure 28 in Appendix A) all have stands of mixed hardwoods and pines overstory within them. Treatment of this overstory has a primary objective of encouraging the hardwood species of the overstory in order to decrease fire intensities by selectively removing more flammable species (red pine and jack pine). An indirect effect would be that crown-to-crown contact would be eliminated where thinning activities occur. A direct effect would be that fire intensity in the mixed hardwood and pine stands would be reduced from 21 to 26 percent depending on the time of year and the treatments employed. This would provide a safer environment for firefighters and the public. A low-to-moderate intensity prescribed burn is illustrated in

Figure 19.

Figure 19: Low to Moderate Fire Intensity on a Prescribed Burn in Mixed Hardwoods and Pine

An indirect effect would be that fire would be reintroduced back into fire-adapted ecosystems. Prescribed burning can be an important tool for regenerating oak stands and an indirect effect would be that oaks would sprout vigorously after fire, and competing vegetation (such as red maple) may be reduced.

Over time, with the implementation of the proposed treatments, the Fire Regime Condition Class would be reduced from a 2 to a 1.

With the proposed treatments in mixed hardwoods and pine overstory the direct effects would be reduced fire behavior

Table 39 illustrates changes in fire behavior that may be expected for *Rates of Spread*, *Flame Length*, *Crown Fire Potential*, and *Fireline Intensitiy* under both spring and summertime conditions and for various treatment options. The Before Treatment also illustrates what would be expected if the No-Action Alternative (Alternative 1) were implemented.

In the springtime (when most wildfires occur on the Huron-Manistee National Forests) the direct effect of Thinning Only is a reduction in *Rate of Spread*, and *Fireline Intensity* when compared to Before Treatment (or No-Action). The reduction is approximately 2 and 7 percent respectively. *Flame Length* increases by approximately 2 percent due to increased grasses in the understory and more sunlight reaching the forest floor. However if areas are both Thinned and Prescribed Burned the reduction in *Rate of Spread*, *Flame Length*, and *Fireline Intensity* is approximately 10, 18, and 21 percent respectively when compared to Before Treatment (or No-Action).

In the summertime, when compared to Before Treatment (or No-Action) the direct effect of Thinning Only is a reduction in *Rate of Spread* of approximately two percent but an increase in *Flame Length* of about three percent and an increase of *Fireline Intensity of about five percent*. The increase in *Flame Length and Fireline Intensity* is due to the increased presence of grasses in the understory vegetation and more sunlight reaching the forest floor. However, the increase in rates of spread and flame lengths, and fireline intensities would not impact firefighter and

public safety because the reduction in heavy fuels and opening of the tree canopy would allow for better maneuverability within the stands.

However in areas are both thinned and subsequently prescribed burned there is a reduction in *Rate of Spread*, *Flame Length* and *Fireline Intensity*. The reduction is about 22, 24, and 26 percent respectively when compared to Before Treatment (or No-Action).

Regardless of the treatment method, including Alternative 1 (No Action) Crown Fire Potential remains unchanged.

With scheduled maintenance the indirect and cumulative effects would result in reduced flame lengths, rates of spread and fireline intensities

Table 39: Estimated Change in Expected Fire Behavior in the Mixed Hardwood and Pine Overstory with Proposed Treatments

Before Treatment					Post Thinning Treatment					Post Thinning and Prescribed Burning Treatment				
Fuel Model	**Rate of Spread (ft/min)**	**Flame Length (ft)**	**Crown Fire Potential**	**Fireline Intensity (btu/ft^2/min)**	**Fuel Model**	**Rate of Spread (ft/min)**	**Flame Length (ft)**	**Crown Fire Potential**	**Fireline Intensity (btu/ft2/min**	**Fuel Model**	**Rate of Spread (ft/min)**	**Flame Length (ft)**	**Crown Fire Potential**	**Fireline Intensity (btu/ft^2/min)**
TU2	6.1	4.4	5	3824	TU2	6	4.5	5	3565	TL9	5.5	3.6	5	3028
TL9	5	3.7	5	2677	TL9	4.9	3.8	5	2818	TL8	3.9	2.8	5	1989
Crown Fire Potential Scale 0 (lowest) to 9 (highest)									**Spring**		**Summer**			

Cumulative Effects

Actions in the past 10 years, as listed in Table 26, have all contributed toward reducing hazardous fuels in the project area. Future planned activities as listed in table Y would also contribute toward reducing hazardous fuels in the area. When combined with these past, present, and reasonably foreseeable future actions, Alternative 2 would continue the trend of reducing fuel loadings and therefore fire intensities. This Alternative would also reduce hazardous fuels thus helping protect the public, increasing firefighter safety, helping protect homes in the event of a wildfire, and restoring fire into fire-adapted ecosystems.

Timber harvesting, fuelbreak construction and maintenance, opening creation and maintenance of existing openings within the area, and prescribed burning would continue to provide an overall positive contribution toward reducing hazardous fuels within the analysis boundary. Treatments that reduce fuel loading on private property or in utility corridors by either prescribed burning or mechanical means would have additional positive effects on reducing hazardous fuels within the project area.

In the long term, the effectiveness of the activities would decrease as biomass increases. The treatments would decline in effectiveness over time, with mechanical treatments declining over a ten-year period and prescribed burning declining over seven years. The three-to-ten year maintenance schedule of the fuel breaks, and pine stands provide a constant benefit to the analysis area by maintaining light fuel loading and thus low fire intensity.

The cumulative effects of the planned periodic maintenance treatments would assure that fuel loadings would not increase to pre-treatment levels.

3.4 Wildlife and Plant Management

This section addresses how implementation of the action alternatives would affect wildlife species associated with the current vegetative community types of the project area. Wildlife species are directly affected by the act of removing trees through timber harvest and reforestation activities and by prescribed burning. Wildlife species are indirectly affected by the resulting forested conditions after tree removal. Wildlife species are also cumulatively affected by the combination of these conditions, past actions, and those created by other adjacent expected actions over time.

The Huron-Manistee National Forests are required to maintain the viability of all native and desirable non-native species; this requirement is met through the Species Viability Evaluation (SVE) process. Detailed evaluation occurs only for those species identified on the "Species Viability Evaluation List" which may have viability concerns (USDA Forest Service, 2006). Following development of this list, species were grouped by associated habitat and a focal species was selected for each of these habitat groups. The effects of action alternative proposals on the viability of wildlife species will be addressed utilizing these habitat groups and focal species. A detailed discussion of the Species Viability Process can be found in the Final Environmental Impact Statement (FEIS) Appendix B, to the 2006 Forest Plan revision (USDA Forest Service, 2006).

Although wildlife species each have their own individual habitat requirements, similar needs allow a general grouping of species associated with common community types. The Huron-Manistee National Forests have six Management Indicator Species, four of which are wildlife species. Principal habitat characteristics and species or habitat abundance for Management Indicator Species (MIS) can be found in the Huron-Manistee's Forest Plan (USDA Forest Service, 2006). An analysis of potential effects for the proposed management activities on MIS Species would result in an analysis for wildlife species with similar essential habitat requirements. A portion of wildlife species on the Huron-Manistee National Forests receive representative consideration by analyzing the effects to MIS.

Effects to Federally endangered, threatened, (ETS) and Regional Forester's Sensitive species (RFSS) are addressed in the Biological Evaluation (BE) located in the Roy Creek Project file; a brief synopsis of the determinations from the BE will follow the MIS discussion.

<u>Affected Environment</u>

Thirty habitat communities were used to conduct Species Viability Evaluations (SVE) for wildlife and fish across the Huron-Manistee National Forests in the Final Environmental Impact Statement (FEIS) to the 2006 Forest Plan revision (USDA Forest Service, 2006). Proposed actions in the Roy Creek Project may affect wildlife in thirteen of these communities (Table 40) because activities would affect or create habitat in these communities. The following effects analyses disclose, by habitat community, the expected direct, indirect and cumulative effects of each alternative. To facilitate the analyses, surrogate, or focal, species are identified as representatives of each habitat community, and determinations are made for the communities via surrogate species. From the focal species listed in the FEIS, the most appropriate surrogate species was selected for the specific Roy Creek Project area. The surrogate species for each habitat community are described at the beginning of each section. It is important to note that

some species may be able to survive in multiple habitat communities. For all species, if a viable population exists in at least one habitat community, then the species is considered viable.

Table 40: Species Viability Evaluations (SVE) Communities Analyzed

Habitat Group	Vegetation Age	Associated Species
Rivers and Streams	all	Wood Turtle
Riparian/Lowland Hardwood/Floodplain (mid to late)	19 - 59	Red-Shouldered Hawk
Riparian/Lowland Hardwood/ Floodplain (early-to mid)	0 - 19	Eastern Massasauga Rattlesnake
Lowland Conifer/Boreal	all	Black-Backed Woodpecker
Oak/Pine (late)	60+	Red-Headed Woodpecker
Oak/Pine (early-mid)	0 - 59	Whip-poor-will
Aspen/Birch (early)	0 - 19	Golden-winged Warbler
Red and White Pine/Spruce (late successional)	60+	Northern Goshawk*
Jack Pine (open-early)	0 - 7	Michigan Bog Grasshopper
Jack Pine (mid)	8 - 19	Kirtland's Warbler
Jack Pine (mid-late)	20+	Spruce Grouse
Pine Barrens	all	Dusted Skipper
Grassland (small openlands)	all	Eastern Massasauga*

*Because the surrogate species listed in the FEIS (American marten for red pine and eastern box turtle for grasslands) do not occur on the Tawas or Harrisville Ranger Districts, an alternative species was selected.

Cumulative Effects Analysis Boundary

The cumulative effects analysis boundary (CEA) includes all private and public land in the Pine River Kirtland's Warbler Management Area, an approximately 20,000 acre area designated as essential habitat and managed to provide nesting habitat on a 50-year rotation. The analysis area was chosen because of similarities between objectives and management activities over time.

For the purpose of this analysis, cumulative effects will be bounded in time by a 20-year period. This period includes the past ten years and the reasonably foreseeable future ten years. This temporal boundary was chosen to reflect the approximate period of time it would take for vegetation to respond to commercial timber sales and vegetative fuel loading to increase to a point where past treatments would stop meeting intended wildlife habitat objectives. Vegetation management history is available for the past ten years and is reasonably planned for the next ten year period. Maintenance intervals are projected past the ten year foreseeable future projects recognizing that reducing fuels and restoring fire to the ecosystem is an ongoing process. Also, the process of clearcutting, reforestation, occupation and abandonment in Kirtland's warbler habitat management typically occurs over a 20-year period.

The cumulative effects analysis area is approximately 14,064 acres of combined National Forest system lands and private lands. The Forest Service manages 99.8%; the remaining 0.2% of the analysis area is interspersed private land, sharing similar soil properties and vegetative composition.

A variety of past and future federal and non-federal actions occur within the Roy Creek Project boundary (Table 26). Activities with known acreages have been implemented under many different NEPA documents.

Although the age class distribution by vegetation community type for the Roy Creek Project Area (Table 41) is not a direct match with all 30 communities analyzed in the FEIS, it is a tool used in this analysis of effects on wildlife habitat. The current vegetative condition is reflective of the existing habitat available to terrestrial wildlife species.

Table 41: Age Class Distribution in the Roy Creek Project Area

Community Type	Total (Acres)*	N/A	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 +
Aspen/Birch	76				41						11	24	
High-Site Oaks	28										4	24	
Lowland Conifers	38									11		10	16
Lowland Hardwoods	260									103	16	141	
Long-Lived Conifers	3332				101	68	211	260	750	1833			109
Low-Site Oaks	3645			446	345	294		17	277	1457	579	210	20
Open	608	608											
Short-Lived Conifer	6047		751	2213	1814	230		4	227	651	112	45	
Total	**14032**	**608**	**751**	**2659**	**2302**	**592**	**211**	**281**	**1254**	**4056**	**722**	**454**	**145**

*Acres are approximate

3.4.1 Objective 3; Predicted Attainment of Maintaining, Restoring and Improving Community Diversity and Forest Health and to Provide for Wildlife and Plant Viability. Identify and Treat High Priority NNIS Infestations *

*Note: Predicted attainment of identifying and treating high-priority NNIS infestations will be discussed in the NNIS section

Alternative 1 (No Action)

Direct and Indirect Effects—All Communities
In the short term, Alternative 1 would have beneficial effects on wildlife that prefer mid-successional and mature forest because it would maintain mature forest habitat groups in the oak/pine (late), mixed hardwood (late), red and white pine/spruce (late), jack pine (mid-late) communities which support wildlife that prefer the current vegetative condition. Deferring

proposed actions would have adverse effects on wildlife inhabiting open land and early successional forest because the habitat would not be created. In the long term, deferring the proposed action would have adverse effects on wildlife inhabiting mid-successional forests because no early successional age classes would be present to grow into mid-successional age classes.

Cumulative Effects—All communities
The age class distribution would not be balanced and would trend towards late successional forests.

Alternative 2 (Proposed Action)
Alternative 2 would help meet the desired future condition as described in the Forest Plan (USDA Forest Service, 2006) and achieve the objective of maintaining and improving wildlife habitat. This alternative would have both beneficial and adverse effects on maintaining and improving wildlife habitat. The thirteen affected communities are analyzed individually because effects differ for each one.

Rivers and Streams
Alternative 2 would have very minor beneficial effects on improving habitat for species viability needs in the Rivers and Streams SVE community. The wildlife surrogate species for this community is the wood turtle which require partially shaded, wet-mesic herbaceous vegetation such as raspberries, strawberries, grasses, willows, and alders along or near the river for foraging. Forested floodplains with numerous sunlit openings and a dense mixture of low herbs and shrubs provide ideal habitat for this species. No wood turtles were found during field surveying.

Proposed rehabilitation of a creek crossing is the only proposed activity within the Roy Creek Project Area that would affect the rivers and streams SVE community.

Direct and Indirect Effects
Effects to the wood turtle are analyzed in the Roy Creek Wildlife Biological Evaluation (USDA Forest Service, 2014). A direct effect would be that individual wood turtles could be crushed by heavy equipment used while rehabilitating the creek crossing.

Rehabilitation of damage would have a beneficial effect on this species in the long-term since it would improve stream flow and increase suitable habitat for the wood turtle.

Cumulative Effects
No other past or future activities have occurred or are planned to occur to impact this SVE community within the CEA boundary. Therefore, there would be no cumulative effects to this community.

Riparian/Lowland Hardwood/Floodplain (mid to late)
Alternative 2 would have minor beneficial effects on Riparian/Lowland Hardwood/Floodplain (mid to late) by providing a slight increase in foraging habitat for its focal species, the red-shouldered hawk. Woodland raptor surveys and nest searches resulted in the discovery of one

active red-shouldered hawk nest within the project area. Two red-shouldered hawks were observed within the proposed project area; both occupying the active nest found. A secondary nest was also found near the active nest. No additional records of the species exist in the proposed project areas.

The Riparian/Lowland Hardwood/Floodplain (mid to late) SVE community is equivalent to the lowland hardwoods community at least 60 years old. Two hundred and sixty acres of this community currently exist within the project area. Eastern massasauga rattlesnake habitat creation is the only proposed action that has potential to affect this community.

Direct and Indirect Effects

The red-shouldered hawk is analyzed in depth in the Roy Creek Wildlife Biological Evaluation (USDA Forest Service, 2014).

Direct impacts proposed by this alternative include approximately six acres of mid-late age class Riparian/Lowland Hardwood/Floodplain habitat being reverted to open conditions. Under the design criteria, there would be no direct impacts to red-shoulder hawk as all activities would take place away from active and secondary nesting trees. Indirectly, this proposed action would create five additional acres of foraging habitat for red-shouldered hawk adjacent to suitable nesting habitat. Because the proportion of proposed habitat change is so small (six acres out of 260, < 2%), the beneficial impacts to this community and its surrogate species are inconsequential.

Cumulative Effects

When considered with past, present, and reasonably foreseeable federal and non-federal activities, Alternative 2 would have minor beneficial cumulative effects on the objective of maintaining and improving wildlife habitat and providing for species viability needs in the Riparian/Lowland Hardwood/Floodplain (mid- to late-successional) community.

Red-shouldered hawk habitat improvement would be cumulative with other red-shouldered hawk foraging habitat created or maintained on federal or non-federal lands. Proposed eastern massasauga rattlesnake habitat creation (five acres) would be beneficially cumulative with the creation or maintenance of open forests in the cumulative effects analysis area. Past beneficial federal actions include 122 acres of wildlife habitat creation/improvement.

Riparian/Lowland Hardwood/Floodplain (early- to mid-successional)

Currently, this SVE community does not exist within the Roy Creek project area. The proposed five acres of eastern massasauga rattlesnake habitat creation would create this community within the project area. This would benefit the surrogate species, the eastern massasauga rattlesnake which prefers sunlit openings to bask adjacent to streams.

Habitat creation for the Eastern massasauga rattlesnake is the only proposed action that would affect this community.

Direct and Indirect Effects
The eastern massasauga is analyzed in depth in the Roy Creek Wildlife Biological Evaluation (USDA Forest Service, 2014).

There would be no direct impacts on the eastern massasauga during project implementation. Indirectly, creating earlier successional habitat for this species in this forest community would beneficially impact the eastern massasauga. However, due to the relative small size of the proposed project (six acres), the impact would be minimal if not inconsequential.

Cumulative Effects
There has been no past, present or future action to cumulatively add to the proposed habitat creation; therefore, there would be no cumulative effect on the riparian/lowland hardwood/floodplain (early- to mid- successional) SVE community.

Oak/Pine (late)
Alternative 2 would have beneficial effects on improving wildlife habitat and providing for species viability needs in the Oak/Pine (late) SVE community. The wildlife surrogate species for this community is the red-headed woodpecker, which select habitat that is more open than the current condition of the oak and oak/pine stands proposed for treatment. Red-headed woodpeckers are known to occur commonly in mature oak stands and occupy several KW blocks within the Roy Creek Project Area. The main area inhabited occurs within a large oak savannah/fuel break created by the Forest Service years ago. This area would become early successional habitat if Alternative 2 is implemented and continue to be maintained in its current state. It has been maintained by mechanical means and also through the use of prescribed burning more recently (past 6 years), to the benefit of the species.

The Oak/Pine (late) community is equivalent to short rotation oak or low site oak forests that are at least 60 years old. Currently, 2,493 acres of this community type exist within the project area. Proposed oak thinning, shelterwood cut, fuel break creation, and prescribed burning within mature low-site oak forests would affect the Oak/Pine (late) community.

Direct and Indirect Effects
The red-headed woodpecker is analyzed in depth in the Roy Creek Wildlife Biological Evaluation (USDA Forest Service, 2014).

Alternative II would have beneficial impacts on suitable red-headed woodpecker nesting and foraging habitat. Proposed treatments could have adverse, short-term impacts on individual red-headed woodpecker as well. Oak thinning, oak shelterwood cuts, and prescribed burning would improve nesting habitat in both the short term and the long term. Creating a more open forest through timber harvest and/or prescribed burning would provide red-headed woodpecker habitat if snags and mature oaks are retained. Thinning/removing overstory oak would create a more open forest which would improve habitat for this species.

NNIS treatments and opening improvement would increase habitat diversity for prey species; thus benefitting red-headed woodpecker indirectly, but also increasing predator habitat and adversely affecting red-headed woodpeckers indirectly.

Fuelbreak creation would improve red-headed woodpecker habitat in the long term due to the maintenance of snags. Creating a more open forest with associated proposed fuelbreaks and early successional habitat would provide red-headed woodpecker habitat if snags and mature oaks are retained. Shelterwood harvest in short-rotation oak would create more open habitat with retention of some mature seed trees. This habitat condition would be highly suitable for approximately five years until regeneration of seedling/saplings made the understory too dense, leading to a slight reduction in habitat in the long term. Treatment of the low-site oak forests would have beneficial indirect impacts in the long term also as it would result in retention of this forest type.

No loss of viability would occur for red-headed woodpeckers because the Roy Creek treatment areas make up only a small portion of available nesting and foraging habitat in the larger planning area and adjacent habitat outside of the Project Area.

Cumulative Effects

When considered with past, present, and reasonably foreseeable federal and non-federal activities, Alternative 2 would have beneficial cumulative effects on the objective of maintaining and improving wildlife habitat and providing for species viability needs in the Oak/Pine (late) community.

Red-headed woodpecker habitat improvement would be cumulative with other red-headed woodpecker habitat created or maintained on federal or non-federal lands. Proposed thinning and low- to moderate-intensity prescribed burning in short-rotation oak and oak/pine (53 acres) would be beneficially cumulative with the creation or maintenance of open forests in the cumulative effects analysis area. Past beneficial federal actions includes 38 acres of oak/pine thinning in the project area.

Oak/Pine (early-mid)

The proposed actions in Alternative 2 would have beneficial effects on improving wildlife habitat including early successional habitat, and providing for species viability needs in the Oak/Pine (early-mid) SVE community. The wildlife surrogate species for this community is the whip-poor-will which nests in dry deciduous or mixed forests with an open understory, and forage in open areas such as the Oak/Pine (early-mid) community.

The oak/pine (early-mid) community is equivalent to short-rotation oak or low-site oak forests that are 0 to 59 years old. Whip-poor-will surveys were not conducted for the Roy Creek Project, however, occurrences are known within proposed action areas. One thousand, one hundred and fifty-two acres of suitable whip-poor-will habitat is present within the cumulative effects analysis area.

Direct and Indirect Effects

In the short term, low-site oak shelterwood cuts would reduce nesting (mature forest) habitat while increasing foraging habitat. In the long term, wildlife habitat would be improved because oak treatments would improve suitable whip-poor-will foraging habitat for approximately 20 years after treatment. Timing restrictions to timber harvesting, such as protection of northern

long-eared bat and oak wilt (April through July 30) would prevent direct adverse impacts during the whip-poor-will nesting and brood-rearing period. Similarly, prescribed burns would occur outside the nesting and brood-rearing period, preventing direct adverse impacts. Prescribed burns would enhance habitat by stimulating the growth of young sapling oak and would enhance regeneration. Warm-season grasses and nectaring sources would also benefit from these treatments. Habitat conditions for a variety of species such as wild turkey, eastern bluebird and the RFSS dusted skipper would also improve.

Cumulative Effects

When considered with past, present, and reasonably foreseeable federal and non-federal activities, Alternative 2 would have a beneficial cumulative effect on the objective of maintaining and improving wildlife habitat and providing for species viability needs in the oak/pine (early-mid) community.

Harvesting oak would create whip-poor-will foraging habitat and have beneficial cumulative effects considering the current vegetative condition. Low-site oak under 60 years old is present on the project area, but only a portion is currently under 10 years old. Regeneration of habitat by shelterwood harvest would increase oak stands in the 0-9 year age class. Low-site oak under 60 years old (nesting habitat) is also present within the project area. The proposed action alternatives would improve habitat within the project area. In the past, 38 acres of oak have been commercially thinned, which would cumulatively benefit this community and the focal species when added to the activities proposed under Alternative 2.

Aspen/Birch (early)

The proposed actions in Alternative 2 would have beneficial effects on improving wildlife habitat including early successional habitat, and providing for species viability needs in the Aspen/Birch (early) SVE community. The wildlife surrogate species for this community is the golden-winged warbler (USDA Forest Service, 2006).

The Aspen/Birch (early) community is equivalent to aspen and birch forests 0 - 19 years old. Golden-winged warblers inhabit early successional habitats including aspen harvest and regeneration areas, typically 6-10 years after harvest. This community does not currently exist within the Roy Creek Project Area. Therefore, proposed actions to create this habitat would benefit this species. Alternative 2 would improve habitat in the Aspen/Birch (early) community with the proposed ten acres of aspen regeneration.

Direct and Indirect Effects

In the short term, individuals would not be affected by proposed treatments because habitat does not currently exist in proposed action areas and no golden-winged warblers were found during surveys. Alternative 2 would create golden-winged warbler habitat by regenerating patches of aspen forest within the proposed ten acre aspen stand. Therefore, alternative 2 would have a beneficial effect on golden-winged warblers.

Cumulative Effects

No past activities have occurred within the CEA to promote Aspen/Birch (early) communities, nor are activities presently occurring, or planned. Therefore, there is no cumulative effect to

this community or the surrogate species under Alternative 2 unless private landowners within the CEA are maintaining this community. If private landowners are maintaining early successional stages of aspen within the CEA, there is a cumulative beneficial effect to the Aspen/Birch (early) community.

Red and White Pine/Spruce (late)
The proposed actions in Alternative 2 would have beneficial effects on improving wildlife habitat and providing for species viability needs in the Red and White Pine/Spruce (late) SVE community. The wildlife surrogate species for this community is the northern goshawk. The Red and White Pine/Spruce (late) community is equivalent to the long-lived conifer vegetation class over 60 years old (USDA Forest Service, 2006). This includes 2,692 acres within the project area.

Red pine thinning and prescribed burning in Alternative 2 would improve wildlife habitat within the Red and White Pine/Spruce (late) community.

Direct and Indirect Effects
The northern goshawk is analyzed in depth in the Roy Creek Wildlife Biological Evaluation (USDA Forest Service, 2014).

Red pine thinning and prescribed burning would have minor short-term adverse effects on foraging goshawks. However, thinning and burning red pine forests would have a long-term beneficial indirect effect. Habitat would improve for prey species, and thinning allows the remaining trees to grow large faster, improving nesting habitat in the long term. Therefore, Alternative 2 would have a beneficial impact on northern goshawk and the Red and White Pine/Spruce (late) community.

Cumulative Effects
When considered with past, present, and reasonably foreseeable federal and non-federal activities, Alternative 2 would have an overall beneficial cumulative effect on the objective of maintaining and improving wildlife habitat and providing for species viability needs in the Red and White Pine/Spruce (late) SVE community. Considering similar past, present, and future red pine thinning and prescribed burning, proposed actions would have short-term adverse and long-term beneficial cumulative effects on northern goshawk.

Jack Pine (open-early)
The proposed actions in Alternative 2 would have beneficial effects on improving wildlife habitat including early successional habitat, and providing for species viability needs in the Jack Pine (open-early) SVE community. The wildlife surrogate species for this community is the Michigan bog grasshopper. Michigan bog grasshopper occurrences are not recorded within the project or CEA, nor were they found during field surveys.

The Jack Pine (open-early) community is equivalent to openings and jack pine forests 0-7 years old; 1,359 acres of this community currently exist within the project area (Table 41). Treatments proposed by Alternative 2 would create or improve habitat in the jack pine (open-early) community.

Direct and Indirect Effects

Proposed implementation of fuel breaks, early successional habitat creation, clearcutting for Kirtland's warbler habitat would have no direct effects on wildlife species associated with this habitat type, as the former habitat would not be occupied as it is unsuitable. Prescribed burning could incinerate some individual grasshoppers negatively directly impacting these associated species.

However, suitable habitat would be created and improved through proposed opening creation and improvement, temporary and permanent fuelbreak creation and maintenance, low- to moderate-intensity prescribed burning in open habitat, Kirtland's warbler habitat development through both harvesting, planting and prescribed burning, and non-native species control. Warm-season grasses and native nectaring sources would flourish after treatment with fire and would improve over time through maintenance activities. Treatment of NNIS would reduce competition from these undesirable species and enhance overall habitat suitability. Therefore, Alternative 2 would have a beneficial effect on Michigan bog grasshopper and other associated wildlife species of this habitat, such as wild turkey and eastern bluebird.

Cumulative Effects

When considered with past, present, and reasonably foreseeable federal and non-federal activities, Alternative 2 would have a beneficial cumulative effect on the objective of maintaining and improving wildlife habitat including early-successional conifer habitat, and providing for species viability needs in the Jack Pine (open-early) SVE community. Alternative 2 would have beneficial cumulative effects on the Michigan bog grasshopper when combined with past, present, and future actions, particularly the creation of temporary habitat through Kirtland's warbler management in essential habitat where similar treatments temporarily create or improve early-successional jack pine habitat. In the past, 1,064 acres have been clearcut within the CEA, 409 acres of fuelbreaks have been created, 122 acres of wildlife openings have been created or enhanced, and 403 acres have been prescribe burned within the CEA. Presently, 44 acres of fuelbreaks are being created and 414 acres of prescribed burning have occurred. Finally, 619 acres would be prescribed burned, and 281 acres would be clearcut within the cumulative effects analysis area. All these actions cumulatively benefit the Jack Pine (early-open) community.

Jack Pine (mid)

The Jack Pine (mid) community is equivalent to jack pine forests 8-19 years old. The proposed actions in Alternative 2 would have beneficial effects on improving wildlife habitat, including Kirtland's warbler habitat, and providing for species viability needs in the Jack Pine (mid) SVE community. The wildlife surrogate species for this community is the Kirtland's warbler. Currently, Kirtland's warbler breeding habitat is not currently present within proposed treatment areas; therefore there would be no direct effects on this species. Breeding habitat does occur within the cumulative effects analysis area and immediately adjacent to occupied habitat.

Alternative 2 proposes Kirtland's warbler habitat development through both harvest/planting and prescribed burning.

Direct and Indirect Effects
This species is analyzed in depth in the Roy Creek Biological Evaluation (USDA Forest Service, 2014).

Breeding habitat for the Kirtland's warbler would be created through a combination of prescribed burning as well as harvest and planting; therefore, Alternative 2 would have a beneficial effect on Kirtland's warbler.

Cumulative Effects
When considered with past, present, and reasonably foreseeable federal and non-federal activities, Alternative 2 would have a beneficial cumulative effect on the objective of maintaining and improving wildlife habitat including early successional habitat, and providing for species viability needs in the Jack Pine (mid) SVE community. Within the CEA, 1,037 acres of Kirtland's warbler habitat have been planted in the past 10 years, 624 acres have occurred presently, and 287 acres will occur in the future. Developing 900 additional acres as proposed in the Roy Creek Project would cumulatively benefit this species and its community within the project area.

Jack Pine (mid-late)
The proposed actions in Alternative 2 would have adverse effects on improving wildlife habitat and providing for species viability needs in the Jack Pine (late) SVE community. The wildlife surrogate species for this community is the spruce grouse. Spruce grouse are closely associated with coniferous forests, and this species is typically found in jack pine 20-30 years old on the Tawas Ranger District. No spruce grouse were found during project surveys, and no occurrences are known within the proposed action areas.

The Jack Pine (mid-late) community is equivalent to jack pine forests at least 20 years old. Currently, 3,083 acres of this habitat type exist within the Roy Creek Project Area. Proposed early successional habitat creation, fuelbreak creation, and jack pine clear cutting would remove mature jack pine habitat.

Direct and Indirect Effects
Openings and fuelbreak creation would have no short-term impacts on individual spruce grouse because this species is currently not present (USDA Forest Service, 2014). Kirtland's warbler habitat creation through harvest/planting and high intensity prescribed burning would have a beneficial impact on spruce grouse because mid-successional jack pine would develop over the long term. Openings and permanent fuelbreak creation/maintenance and jack pine thinning would have adverse effects on spruce grouse habitat because the proposed open landscape would not likely provide spruce grouse habitat. However, this habitat type is abundant throughout the project area and is not considered a limiting factor to associated species; proposed actions would have minimal indirect adverse effects due to loss of small acreages of habitat. Proposed prescribed burning of this community would create some small gaps in the canopy and stimulate understory vegetation, such as blueberry, huckleberry, and native warm season grasses. Proposed prescribe burning would have beneficial indirect effects by increasing species diversity and enhancing the suitability of the habitat for spruce grouse and associated wildlife species.

Cumulative Effects

When considered with past, present, and reasonably foreseeable federal and non-federal activities, Alternative 2 would have an adverse long-term cumulative effect on the objective of maintaining and improving wildlife habitat and providing for species viability needs in the Jack Pine (mid-late) community. Proposed clearcutting jack pine stands (900 acres), permanent fuelbreak creation (172 acres), and early successional habitat creation (613 acres) would reduce the amount of habitat in the Jack Pine (mid-late) SVE community by 1,685 acres, or an overall reduction of 55% in the CEA.

Following Roy Creek project implementation, the Jack Pine (mid-late) community would still make up 11% of the project area. Past Kirtland's warbler habitat creation projects (1,037 acres) have created spruce grouse habitat in the long term (20 years following planting). In 20 years (2033), after implementation of the Roy Creek project and other present and future planned activities, jack pine over 20 years old would still make up a large proportion of all short-lived conifer stands. In 2033, 2,213 acres of younger jack pine would be recruited into this SVE community type. Therefore, adverse cumulative impacts would be minimal with consideration to natural processes.

Grasslands (small open lands)

The proposed actions would have beneficial effects on improving wildlife habitat including early successional habitat and providing for species viability needs in the Grasslands (small open lands) SVE community. The wildlife surrogate species for this community is the eastern massasauga rattlesnake.

Eastern massasauga rattlesnakes inhabit open uplands associated with wetlands during the summer months in northern Michigan. No eastern massasauga rattlesnakes were observed during wildlife surveys of proposed action areas; however, they are known to occur throughout the project area. Proposed eastern massasauga rattlesnake habitat creation and early-successional habitat creation would create and improve habitat suitable for this species.

Direct and Indirect Effects

The Grasslands (small open lands) community is equivalent to forest openings; only a small portion of the project area is in this community. Habitat exists within the Roy Creek Project area and vegetative treatments such as proposed opening maintenance and improvements and fuelbreak creation and maintenance would create and improve habitat suitable for the eastern massasauga rattlesnake. Enhancements to this habitat, such as supplemental planting of warm season grasses, prescribed burning which stimulates the vegetation, planting of nectaring sources, and eradication or suppression of NNIS would provide beneficial indirect effects to butterflies, skippers and associated species.

Cumulative Effects

When considered with past, present, and reasonably foreseeable federal and non-federal activities, Alternative 2 would have a beneficial cumulative effect on the objective of maintaining and improving wildlife habitat, including early-successional habitat, and providing for species viability needs in the Grasslands (small open lands) SVE community. Opening

improvement activities occurring in the past 10 years (122 acres) and planned for the future warm season grass seeding (3 acres) would be cumulative with proposed activities. Alternative 2 would increase habitat created in the Grasslands (small open lands) community by 4% with 618 acres of early successional habitat creation. Kirtland's warbler habitat creation would also continue to create habitat, albeit temporarily, for species associated with this community.

Early Successional Habitat
The proposed action would have beneficial effects on improving wildlife habitat including early successional habitat and providing for species viability needs in the Pine Barrens SVE community. The wildlife surrogate species for this community is the dusted skipper. Dusted skipper habitat includes open land with host plants, such as little bluestem, for larvae and nectar sources for adults.

The early-successional habitat community is equivalent to large openings that provide dusted skipper habitat. Currently, 608 acres of this habitat exist within the project area. Proposed early- successional habitat creation and fuelbreak creation improvement may create or improve dusted skipper habitat.

Direct and Indirect Effects
The dusted skipper is analyzed in depth in the Roy Creek Wildlife Biological Evaluation (USDA Forest Service, 2014).

Six hundred and thirteen acres of large early-successional habitat creation would be created and managed as open lands in Alternative 2, having a beneficial effect on the objective of improving wildlife habitat including early-successional habitat, and providing for species viability needs for the pine barren community. As these lands are currently forested, they do not provide habitat for dusted skipper, so over the short term there would be no impacts since habitat has not yet become established. Over the long term, fuel breaks created/maintained, prescribed burning, and NNIS treatment under Alternative 2, would establish large openings as dusted skipper habitat by developing warm season grasses and forbs for nectaring sources. Therefore after approximately five years, Alternative 2 would have beneficial impacts on dusted skipper.

Cumulative Effects
In the past, 1,064 acres have been clearcut within the CEA, 409 acres of fuel breaks have been created, 122 acres of wildlife openings have been created or enhanced, and 403 acres have been prescribe burned within the CEA. Presently, 44 acres of fuel breaks are being created and 414 acres of prescribed burning have occurred. Finally, 619 acres would be burned, and 281 acres would be clearcut within the CEA. All these actions cumulatively benefit the Pine Barren community.

When considered with past, present, and reasonably foreseeable federal and non-federal activities, alternative 2 would have a beneficial cumulative effect on the objective of maintaining and improving wildlife habitat including early successional habitat, and providing for species viability needs in the Pine Barrens SVE community. Cumulative effects on dusted skipper are discussed in detail in the Roy Creek Project Biological Evaluation (USDA Forest Service, 2014).

Management Indicator Species

Since the Forest Service's evolution from single-species management to ecosystem management, wildlife biologists have utilized a more holistic approach when addressing the needs of wildlife species. Although each wildlife species has individual habitat requirements, the sheer number (409 vertebrate species alone) renders single-species management unfeasible. Similar needs among wildlife species allows a general grouping of animals associated with common habitat types. Management Indicator Species (MIS) represent animals with more specific habitat requirements, animals that require rare or unique habitats and animals that are popular game/viewing species. The Huron-Manistee National Forests has six wildlife Management Indicator Species (Table 42). Principal habitat characteristics and species or habitat abundance for the MIS can be found in the Forest Plan (USDA Forest Service, 2006). The analysis of potential effects of the proposed management activities on MIS Species would result in an analysis for wildlife species with similar essential habitat requirements. Further discussion on the status of MIS is documented in the Huron-Manistee National Forests Monitoring and Evaluation Reports, which are incorporated here by reference.

Table 42: Management Indicator Species (MIS) and Associated Habitat

INDICATOR SPECIES	PRINCIPAL HABITAT CHARACTERISTICS	EXISTING CONDITION WITHIN THE PROJECT AREA
Bald Eagle *Haliaeetus leucocephalus*	Nest in super canopy trees, generally white pine and aspen, near lakes and large rivers.	Nesting habitat not present
Karner Blue Butterfly *Lycaeides melissa samuelis*	Openings and edges in oak barrens and oak savannahs with lupine.	Species not found on Huron Nat'l Forest—will not be discussed
Kirtland's Warbler *Setophaga kirtlandii*	Dense stands of jack pine 5 to 15 years old and 1.7 to 5.0 meters tall on poor sandy soils.	Habitat present and occupied
Ruffed Grouse *Bonasa umbellus*	Aspen and aspen-alder mixes, 5-25 years old, with large-crowned male aspen clones.	Some poor habitat available in project area
Brook Trout *Salvelinus fontinalis*	Cold water streams	Habitat present
Mottled Sculpin *Cottus bairdi*	Cool, clear, moderate and high-gradient creeks, streams, and small rivers	Habitat present

Population trends for MIS are found in the annual HMNF Monitoring and Evaluation Reports. This information is utilized to implement and adjust the Forest program.

Bald Eagle

Affected Environment

Forest types and habitat conditions on the project area do not meet all the habitat requirements of bald eagle throughout the year. Due to a lack of large bodies of water and river courses and adjacent super-canopy trees, nesting and foraging habitat do not occur at the project level. Therefore, existing vegetative conditions and habitat suitability are low. Existing habitat would likely only receive occasional use as perching trees. Forest types and habitat conditions are therefore, not suitable for the bald eagle.

Alternative 1 (No Action)

Direct and Indirect Effects

Under Alternative 1, no action would occur and there would be no direct effects to bald eagle across the project area. Under Alternative 1, no habitat would be altered or created; therefore there would be no indirect effects to bald eagle across the project area.

Cumulative Effects

There would be no cumulative effects since no habitat would be altered or created.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

There is potential for some slight indirect beneficial effects from harvesting as the remaining mature trees may grow and become suitable perching trees in the future.

Cumulative Effects

Alternative 2 proposes harvesting trees and would also improve growth and older aged characteristics among the remaining trees. The remaining trees could potentially be future perch trees. Although effects for both alternatives are nearly negligible since there are no large bodies of water in the project area, Alternative 2 would be slightly more beneficial to bald eagle than Alterative 1 because it would allow trees to grow faster and reach older-aged conditions sooner.

Activities occurring on National Forest System and privately owned lands within the analysis area are expected to remain the same into the foreseeable future. Management on privately owned lands within the analysis area is generally tiered toward early successional habitat. These types of habitats do not benefit bald eagle. There are privately owned lands within the analysis that are low lying and wet, that present access problems for humans. These lands are not likely to be actively managed and possess old growth characteristics, characteristics beneficial to bald eagle.

Continuing to manage National Forest System Lands in old growth would benefit bald eagle. As supercanopy trees are not limiting across the analysis area, the Roy Creek Project area does not include large bodies of water; therefore, the actions of Alternative 2 would have no overall cumulative effect on bald eagles throughout the project or analysis area now or into the foreseeable future.

Kirtland's warbler

The effects to Kirtland's warbler are discussed under the ETS section of the EA. Effects are further discussed in the Roy Creek Wildlife Biological Evaluation located in the project file (USDA Forest Service, 2014).

Natural History

The only federally-listed species known to occur on the Tawas and Harrisville Ranger Districts is the endangered songbird, the Kirtland's warbler (*Setophaga kirtlandii*). Kirtland's warbler (KW) breed primarily in jack pine forests in the northeastern portion of the Lower Peninsula of Michigan, and migrate to The Bahamas over winter. Lack of breeding habitat and nest parasitism from brown-headed cowbirds are the primary threats to the species.

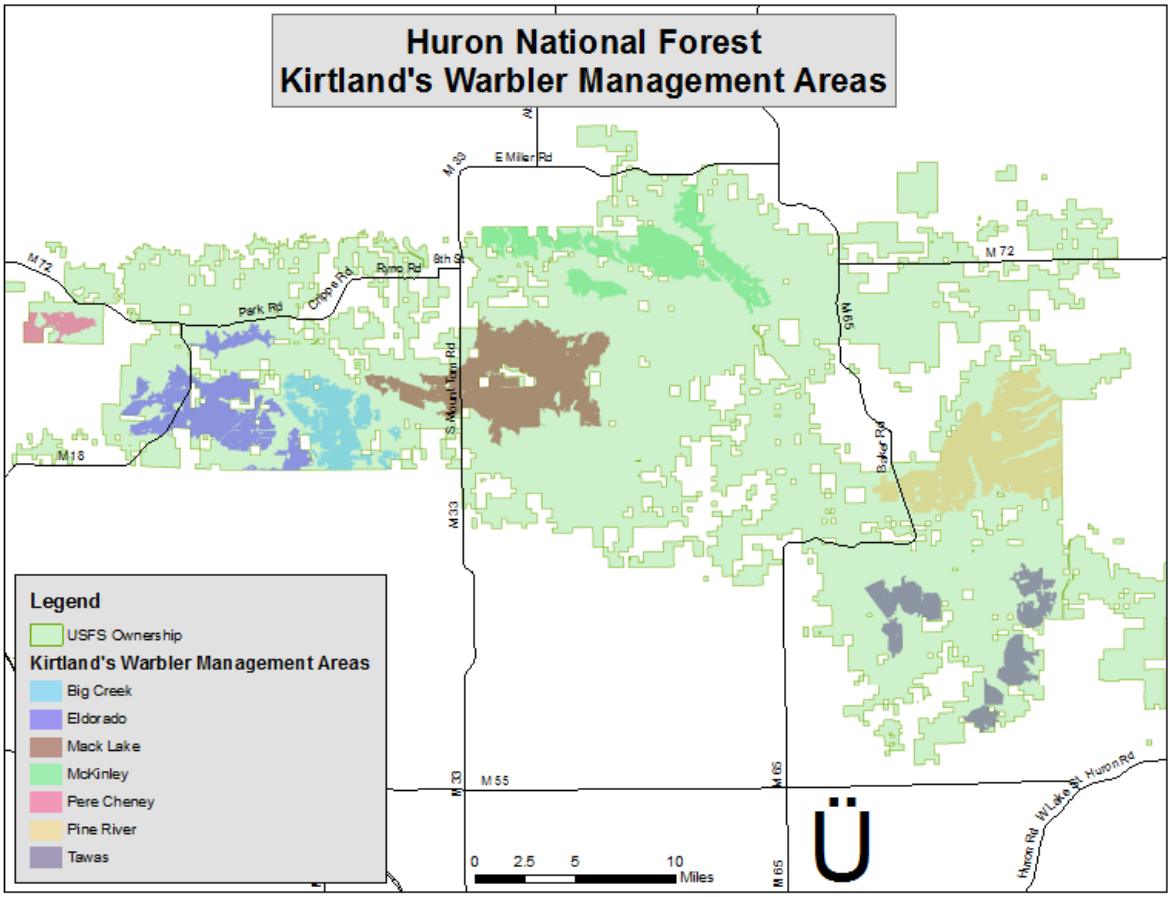
Kirtland's warbler breeding habitat in Michigan is restricted to poor, sandy soils of glacial origin, which occur primarily in the northeastern Lower Peninsula. KW breeding habitat is dynamic and ephemeral, and their survival depends on continuous, uninterrupted regeneration of new breeding habitat throughout northern Michigan jack pine forests. The species prefers large stands of dense, young jack pine with interspersed openings. The preferred jack pine is typically between 5 and 15 feet tall (approximately 5 to 15 years old). With both wildfires and human management, KW breeding habitat shifts across the landscape through time as new areas of jack pine become suitable and older areas unsuitable. These birds are adept at finding and using these new areas of breeding habitat.

Habitat Management

The Forest Service has designated approximately 88,300 acres in seven management areas (see

Figure 20) on the Huron National Forest as “essential habitat” (USDA Forest Service, 2006). Defined as “that land identified as biologically appropriate and necessary for the development of nesting habitat for the Kirtland’s warbler” (Huber, Weinrich, & Carlson, 2001), essential habitat is regulated for sustained yield of warbler breeding habitat, and each management area is developed into nesting habitat on a 40- to 70-year rotation (Huber, Weinrich, & Carlson, 2001).

Figure 20: Kirtland's Warbler Management Areas on the Huron National Forest



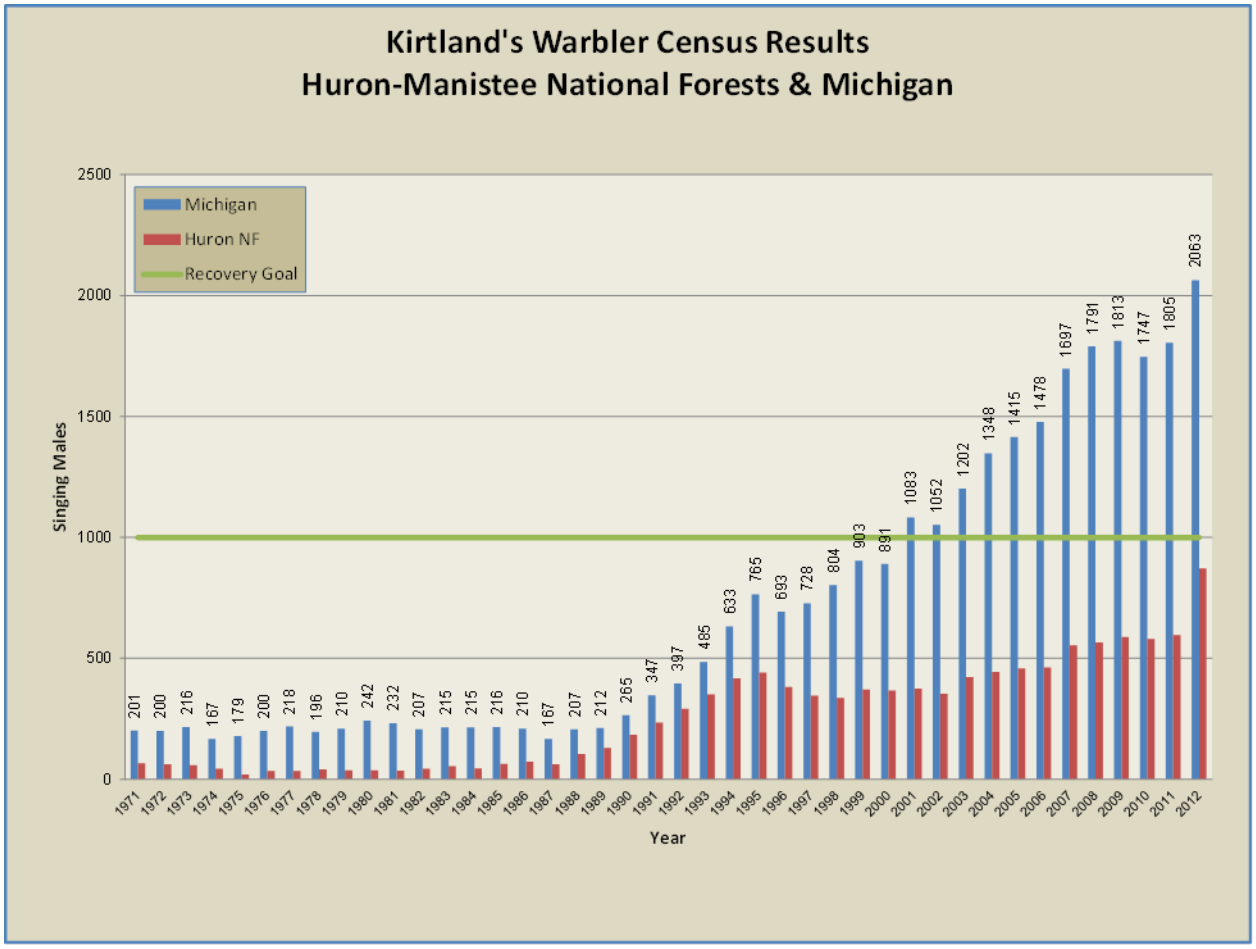
Population

Biologists have conducted a census of the Kirtland's warbler (KW) breeding population annually since 1971 (see

Figure 20). Singing males are counted, with the assumption that each singing male represents one mated pair. Between 1971 and 1990, the entire KW population averaged around 200 pair per year. KWs have responded well to the active management program since then. Since 1990, the population has increased substantially due to an increase in available breeding habitat and cowbird control. In 2001, the population exceeded the recovery goal of 1,000 pairs for the first time, and has remained above 1,000 pairs through 2013. However, habitat management, cowbird control, monitoring, education and research will be needed perpetually to maintain the KW population into the future (USDI Fish and Wildlife Service, 2011).

The latest census was conducted in June of 2013. Final numbers for the Huron N.F. have been tallied; however, the 2013 census results graph is not yet out. Figure 21 will be used instead; which estimated the population at 2,090 pairs in Michigan, Wisconsin, and Canada in 2012 (Michigan Department of Natural Resources, 2012). The 2013 census found a total of 738 singing males on the Huron National Forest, 318 singing males above the Forests' objective of providing for a minimum of 420 pairs of Kirtland's warblers (USDA Forest Service, 2013).

Figure 21: Kirtland's Warbler Singing Males on the Huron-Manistee Forests



<u>Affected Environment</u>

The Roy Creek Project Area encompasses 10,856 acres of essential habitat from the Pine River Kirtland's Warbler Management Area. Of these acres approximately 2,042 were occupied by Kirtland's warblers during the 2013 census. There are no activities proposed to occur in areas occupied by Kirtland's warbler. However, wildlife, timber, engineering, and prescribed burning treatments are proposed to occur in essential Kirtland's Warbler habitat. The proposed treatments would occur in mature oak and red pine stands, mid-successional jack pine forests, on and along selected roads within KW essential habitat, not in, but adjacent to occupied habitat (obliteration or closing of roads and treatments of areas along roads). These jack pine areas are no longer suitable habitat for KW because the trees are not the appropriate size, type, density, and/or too old for breeding habitat. Much of it would be replanted to new habitat for KW, which would eventually become occupied habitat.

Past, Present, and Future Actions

Past Actions
Federal: The Federal Government managed lands for wildlife, recreation, fuel reduction, timber and ecological purposes, suppressed wildfires, constructed, maintained and closed roads and trails, and leased and authorized the development of mineral resources.

The Federal Government designated and managed approximately 53,500 acres of jack pine as Kirtland's warbler essential habitat on the Huron National Forest. In 1997, the Huron-Manistee National Forests amended its Land and Resources Management Plan to adjust the amount of essential habitat to approximately 68,000 acres. This adjustment was necessary to provide the flexibility to modify projects for visual or other objectives.

In April 2006, Forest Plan designated approximately 88,000 acres of essential habitat, an increase of approximately 18,000 acres over the 1986 Forest Plan. The following vegetation management actions have occurred over the 20-year past cumulative effects analysis period (see Table 43).

Table 43: Vegetation Management Actions in the Cumulative Effects Area

Year	Action	Acres	Comments
1995	Thin Red Pine	398	North Fawn Timber Sale
1995	Clearcut Jack Pine	271	Daylight Timber Sale
	Thin Jack Pine	62	
1996	Thin Red Pine	235	Byron's Pick Timber Sale
1997	Thin Red Pine	452	Buck Timber Sale
	Clearcut Jack Pine	51	
1997	Thin Red Pine	212	Bambi Timber Sale
1997	Thin Red Pine	352	Rusty Raptor Timber Sale
	Clearcut Jack Pine	271	
1999	Clearcut Jack Pine	342	Queens Corner Timber Sale
	Clearcut Oak	20	
	Thin Jack Pine	6	
	Thin Jack Pine/oak	5	
	Thin Red Pine	467	
2000	Clearcut Jack Pine	271	Rusty Bird Timber Sale
2002	Thin Jack Pine and Oak	38	Little Bluestem Timber Sale
2004	Create Fuelbreak	275	Pine River HFI Timber Sale
2006	Create Fuelbreak	47	Bissonette Fuels Timber Sale
2007	Create Fuelbreak	122	King WUI Timber Sale

Table 44 provides an overall summary of the past vegetation management actions listed above by treatment.

Table 44: Summary of Vegetation Management

Action	Acres
KW habitat development	1,155
Red pine thinning	934
Jack Pine thinning	68
Jack Pine/Oak thinning	43
Jack Pine clearcutting (non-warbler)	51
Oak clearcutting	20
Fuelbreak creation	444
Prescribed Burning	987
Wildfire in essential habitat	0
Total	**3,702**

Past Actions – Non-Federal: Alcona and Iosco County governments constructed, maintained, and improved roads in the areas. Private individuals have used the cumulative effects analysis areas for recreational purposes – hunting, snowmobiling, ATV riding, etc. Non-federal entities likely started wildfires in the cumulative effects analysis area.

Present Actions
Federal: The Federal Government continues to manage lands for wildlife, recreation, fuel reduction, timber and ecological purposes, suppress wildfires, construct, maintain and close roads and trails, and to lease and authorize the development of mineral resources.
There is one timber sales presently within the cumulative effects analysis boundaries: the Stout-Snowbird Timber Sale. It is proposed to be sold in FY 2015 and would encompass approximately 263 acres. Other planned activities are listed in
Table 45.

Table 45: Planned Activities in the Cumulative Effects Analysis Area

Year	Action	Acres
2014-2021	Prescribed Burning	1,480
	Compacting/Crushing of fuels	65
	Fuelbreak maintenance	77
	Wildlife habitat and seeding	3
Total		**1,625**

Non-Federal: Alcona and Iosco Counties continue to maintain and improve roads in the areas. Private individuals continue to use the cumulative effects analysis areas for recreational purposes – hunting, snowmobiling, ATV riding, etc. There is no oil and gas well development currently within the analysis area.

Future Actions
Federal: The Federal Government will likely continue to manage for wildlife, recreation, fuel reduction, timber and ecological purposes, suppress wildfires, construct, maintain and close roads and trails, and lease and authorize the development of mineral resources.

Other than the Stout-Snowbird Timber Sale no timber sales are proposed to be implemented within the analysis boundaries in the near future.

Non-Federal: Alcona and Iosco County governments are likely to continue to maintain and improve roads in the analysis area. Private individuals are likely to continue to use the analysis areas for recreational purposes – hunting, snowmobiling, ATV riding, etc. Non-federal entities are likely to start wildfires in the analysis areas. Private companies are likely to develop and maintain gas wells and associated facilities on non-federal lands within the analysis areas.

3.4.2 Predicted Attainment of Providing Breeding and Foraging Habitat for the Federally Endangered Kirtland's Warbler (Objective 4)

Alternative 1 (No Action)

The Kirtland's warbler is a habitat specialist, preferring to nest in large areas of dense young jack pine approximately 5 to 15 years old, or between five and 15 feet tall. Once these areas have grown too old, the species abandons the habitat and moves to younger jack pine habitat. Consequently, new habitat needs to be created continually to replace habitat that has grown too old.

Approximately 88,300 acres have been designated as essential habitat for the Kirtland's warbler on the Huron National Forest. Contiguous areas of essential habitat are called Kirtland's Warbler Management Areas (KWMAs). Seven KWMAs have been designated on the Huron National Forest. The remaining 17 KWMAs in the Lower Peninsula have been designated on Michigan Department of Natural Resources (MDNR) lands, and areas of federal lands managed by the U.S. Fish and Wildlife Service.

Direct and Indirect Effects
Alternative 1 would not meet the objective of providing potential breeding and foraging habitat for the Kirtland's warbler since habitat development (clearcutting and reforestation of jack pine) in the proposed KW areas would be deferred, and 861 acres of Kirtland's warbler breeding and foraging habitat would not be created. This alternative would not help meet the desired future condition as described in the Forest Plan (III-4.2-7-8), or to achieve the Purpose and Need for Action as described in Chapter 1 of this document.

Treatment blocks in each of the seven management areas on the Huron National Forest are sequentially scheduled for habitat development, close to other blocks in space and time, because larger blocks of habitat are more desirable to KW.

Alternative 1 would have no effect on individual Kirtland's warbler or their habitat in the short term because no actions would occur, causing no creation or destruction of habitat. In the long term, however, lack of action would cause essential habitat to eventually become too old and tall, causing KWs to 'abandon' these areas. This would create a decrease in suitable habitat available with no new habitat being created to balance this loss and provide new areas for the warbler to nest.

Cumulative Effects

Choosing to not manage these two blocks of essential habitat at this time would result in a loss of habitat suitability to adjacent occupiable habitat, and the potential loss of as many as 1,148 nestlings that may have been produced if management were implemented (861 acres/15 acres territory per pair x 4 nestlings per pair per year over 5 years = 1,148 nestlings potentially produced) (Huber, Weinrich, & Carlson, 2001).

Alternative 2 (Proposed Action)

Direct and Indirect Effects

Alternative 2 would help to meet the desired future condition as described in the Forest Plan, or to achieve the Purpose and Need for Action as described in Chapter 1 of this document. Alternative 2 would help attain the objective by creating approximately 861 acres of potential future Kirtland's warbler breeding and foraging habitat in the KW-1 and KW-2 treatment blocks (Pine River KWMA). The habitat would be created by clearcutting mature trees and reforesting the treatment blocks to jack pine, through natural or artificial means, to the stocking density recommended in the Strategy for Kirtland's Warbler Habitat Management (Huber, Weinrich, & Carlson, 2001). An indirect effect would be the potential for producing approximately 1,148 nestlings while the habitat is occupiable.

Removal of 197 acres of essential habitat would have no effect on Objective 4 over the short and long terms since additional essential habitat has been designated specifically to compensate for other resource needs, e.g. for fuels reduction via fuel breaks (USDA Forest Service, 2006); (USDI Fish and Wildlife Service, 2006). In the Biological Opinion for the Forest Plan, the U.S. Fish and Wildlife Service states that "[w]ith this additional acreage, any nesting pairs displaced by small losses of essential habitat should be able to nest elsewhere without any measurable adverse impacts to their reproductive potential" (USDI Fish and Wildlife Service, 2006).

The red and white pine thinning, oak thinning and regeneration, aspen regeneration, prescribed burning, erosion site rehabilitation, fuel break construction/maintenance (other than previously noted), opening creation and improvements (other than previously noted), non-native invasive species control, as proposed, would have no short- or long-term effects on the objective of providing breeding and foraging habitat for KW. Although some of these actions would occur in essential habitat the actions would not create occupiable habitat for the species. These proposed actions are listed in Table 46.

Table 46: Proposed Actions within Kirtland's Warbler Essential Habitat

PROPOSED ACTION	Acres/Miles in Essential Habitat	IN HABITAT OCCUPIED IN 2013?
Prescribed Burning	3,562 acres	N
Timber Treatment	2,268 acres	N
Fuelbreak Creation	24 acres	N
Close System Roads	4.2 miles	N
Obliterate System Roads	1.7 miles	N

Prescribed burning, non-merchantable timber treatment with prescribed burning, fuel break creation, and NNIS treatment within non-occupied KW essential habitat would have no direct effect on individual Kirtland's warbler because treatments would not occur during the breeding season in or near occupied habitat. Individual KW would not be present in the proposed treatment areas, which are currently considered unsuitable for KW because they are not jack pine habitat, or the jack pine forests are not the appropriate size, type, density, and/or age for breeding habitat. The proposed prescribed burning, non-merchantable treatment, and fuel break creation within essential habitat would have no indirect effect on KW over the long term because breeding habitat does not currently exist and would not be created by the proposed actions. This essential habitat may still be managed for KW in the future. Treatments proposed in the Roy Creek Project areas that are set to create new 'occupiable' habitat (KW clear cut and plant) are interim habitat treatments to occur in the future and would be directly and indirectly beneficial. The two proposed areas from this project would not become suitable breeding habitat until a few years after planting.

Proposed road obliteration and seasonal snowmobile trail use adjacent to occupied Kirtland's warbler habitat would have no adverse effects on KW. Roads would be closed with the use of a bulldozer (pushing soil on either end of all proposed roads) or by guardrails. The use of heavy machinery to close roads would not occur during the nesting period of the birds (May 1 to July 30th) and would be operating on an already existing road for a very short period of time (30-45 minutes). Any impact outside of this time frame would be minimal due to the small temporal scale of disturbance. Closing these roads and seasonally gating snowmobile trails in occupied habitat would limit traffic, noise, and disturbance within their habitat during nesting however indirect effects would likely be insignificant and discountable.

The proposed action of creating 328 acres of early successional wildlife habitat along Lorenz Road would take it out of essential KW habitat, which is an administrative action and would not result in any additional habitat management. Two hundred acres of early successional wildlife habitat (currently oak savannah/fuel break) would conversely be added into essential habitat and allowed to regenerate naturally. It would then be incorporated into KW habitat creation in future proposals. Neither of these areas is currently occupied with KW. Therefore, these actions would have no direct effects on KW or their essential habitat.

Cumulative Effects

When considered with past (Warbler 67, Warbler Haven, Exhaust Fire KW), present (Snowbird KW) and reasonably foreseeable future Kirtland's warbler habitat-creation projects (Roy Creek), Alternative 2 would have a beneficial cumulative effect on meeting Objective 4 since it would continue to implement the KW strategy plan by contributing to the annual regeneration of jack pine (temporal factor).

No cumulative effects would occur for non-merchantable timber treatments because these proposed actions have no effect on Kirtland's warbler. However, prescribed burning and fuel break creation/maintenance would have beneficial cumulative effects due to the open habitat created and maintained near KW occupied habitat. These areas attract KW and allow for better foraging habitat adjacent to occupied stands. These areas would also be available for KW habitat creation into the future.

There would be beneficial cumulative effects to the Kirtland's warbler associated with the road closures through KW essential habitat. Road and trail closures would lead to fewer disturbances to nesting KWs and eventually more habitat. A decrease in vehicular travel through occupied habitat would also cumulatively benefit individual KW across the Pine River KWMA.

Ruffed Grouse

Affected Environment

Ruffed grouse require multi-age/size classes of aspen in close proximity to each other in order to meet their nutrient and cover requirements throughout the year. Aspen occurs naturally across the entire range of soils on the Huron-Manistee National Forests, except the poorest outwash sands and deep organic wetlands. However only a small amount of National Forest System lands within the project area are represented by the aspen/birch forest type. Generally, the aspen within the project area can be characterized as mature to over mature. Although Aspen/Birch habitat is abundant and available throughout the District and the Forest, across the project area habitat suitability is low because so little aspen habitat occurs in the project area and the early age classes (seedling/sapling) so critical to courtship, nesting, and brood-rearing, are absent.

Forest types and habitat conditions on the project areas do not meet all the nutrient and cover requirements of ruffed grouse and associated species throughout the year, because the most critical age classes (seedling/sapling) simply do not occur. Therefore, existing conditions are considered to have low habitat suitability. Existing habitat would likely only receive seasonal use by a few grouse through the year as grouse forage on the catkins, leaves and buds available on older-aged aspen trees.

Alternative 1 (No Action)

Direct and Indirect Effects

If the action alternative is not implemented, there would be no direct effects to ruffed grouse across the project area. No new habitat would be created; therefore there would be no indirect effects to ruffed grouse across the project area due to the lack of suitable habitat available in the existing condition.

Wildlife species such as ruffed grouse and white-tailed deer have a high recreational appeal both for wildlife viewing and as game species. In the absence of active management within the project area and the analysis bounds area opportunities to view and hunt these species would decrease slowly over time as early successional vegetation types decrease through the process of natural succession. This reduction in habitat would directly reduce the available numbers of white-tailed deer and ruffed grouse over the long term, therefore, making it harder to encounter them. Reduced densities and availability of game species may make the project area less desirable to the public who could enjoy better encounter rates in areas with more suitable habitat and higher numbers of game. Areas such as the Designated Grouse Management Areas

are managed more intensively for early successional forest and provide increased diversity and heterogeneity of plant and wildlife species, and provide increased encounters of game species and wildlife species which are desirable to the public.

Cumulative Effects
There would be no cumulative effects to ruffed grouse under Alternative 1.

Alternative 2 (Proposed Action)

Direct and Indirect Effects
While not optimal, some habitat would be improved under the action alternatives, as some oak harvests would provide some habitat for grouse and would meet some of the needs of species which require early successional habitat. This harvest would encourage new stands of oak to regenerate through sprouting, thus increasing the project area's young, early-successional habitat component, the age class critical to nesting and brood-rearing. Ten acres of aspen regeneration would increase suitable habitat for grouse, though not by a great deal. The action alternatives would provide some future habitat for ruffed grouse and would improve age class distribution and therefore suitability across the project area.

Early successional habitat creation is also proposed under the action alternatives. Fruiting trees and shrubs such as cherry and serviceberry would be retained across the project area, through project design criteria and would provide a beneficial food source for ruffed grouse.

Cumulative Effects
The action alternatives provide more habitat capability to support ruffed grouse as compared to the current vegetative condition. Due to the popularity of game species (such as grouse and deer) for hunting and wildlife viewing, it is likely that state and federal land managers, as well as private property owners would continue to manage for early successional species into the foreseeable future.

Private lands within the analysis area are mainly occupied dwellings, and/or managed for recreational purposes such as wildlife viewing and hunting. Some stands are harvested and grasses, trees, shrubs, and forbs are planted to attract early successional game species such as ruffed grouse and white-tailed deer. These practices were the norm five years ago and are expected to be similar over the next five years.

No management specifically tiered towards ruffed grouse has taken place on National Forest System Lands the previous ten years within the analysis area due to the lack of aspen, and no management for ruffed grouse is expected to occur for the next five years. The action alternatives would provide a cumulatively beneficial effect by increasing suitability of habitat throughout the analysis area by creating early successional habitat and downed woody debris (drumming logs), and would retain fruiting trees and shrubs for ruffed grouse.

Brook trout and Mottled Sculpin

Affected Environment
Brook trout require cool water temperature (maximum summer water temperature less than 23° C), suitable spawning sites, relatively stable water flow, moderate precipitation, and structural features such as overhead cover, woody debris, and deeper holes. Optimal riverine habitat is characterized by clear, cold, spring-fed water; a silt-free rocky substrate in riffle-run areas; an

approximate 1:1 pool-riffle ratio, with areas of slow, deep water; well-vegetated stream banks; abundant instream cover and relatively stable water flow.

Mottled sculpins inhabit small, clear streams, where they occupy both riffle and pools over sand, gravel, boulders or limestone. Mottled sculpins favor clear water with some form of shelter to use as hiding cover. They are generally 3-4 inches in length. This bottom dwelling species has often been called a trout indicator, and it is a fact that, where sculpin populations exist, the water generally holds trout populations as well. Threats to habitat suitability include loss or degradation of habitat features, elevated stream temperatures and sedimentation.

Beaver can adversely affect stream cover by cutting down adjacent alder and aspen thus reducing shade, increasing water temperature, blocking seasonal movements with dams, causing sedimentation of spawning areas, and altering habitat which causes increased competition from other fish species. They can also cause water temperatures to rise above 23°C by blocking stream flow with dams, in addition to reduction in tree or brush cover. Timber harvest can adversely affect brook trout habitat also due to reduction in cover by tree cutting or by encouraging aspen which then attracts beaver, where the harvest occurs immediately adjacent to streams.

Both the brook trout and mottled sculpin are found throughout the streams on the Huron-Manistee (Zorn & Sendek, 2001).

Alternative 1(No Action)

Direct and Indirect Effects
Alternative 1 would have less benefit to brook trout by not actively converting aspen to long-lived species. There would be no adverse impacts on any trout streams as there would be no timber harvesting or road building.

Cumulative Effects
There would be a minor effect at the stream crossing since sediment would continue to enter the creek from illegal stream crossings from OHV's.

Alternative 2 (Proposed Action)

Direct and Indirect Effects
Rehabilitation of user-created resource damage at an illegal stream crossing would have positive effects on brook trout and mottled sculpin and the habitats they occupy. Restoring aquatic habitat and increasing the within stream large wood component would help stabilization of eroding streambanks and reduce sediment delivery, resulting in lowered sand bedload. Ultimately, stream channels would become narrower, the substrate coarser and overall channel shape more complex.

This alternative would result in a reduction in sediment and other non-point sources of pollution improving the habitat quality. Runoff that had been directly delivered to stream systems would be filtered through soils and riparian areas. This would also improve stream water temperatures for brook trout and sculpin by allowing water to cool before entering the streams.

Streamside Management Zones (SMZ) in the state's Best Management Practices are defined as areas directly between streams and water and timber sale activities and prescribed burns

(MDNR and MDEQ, 2009). Provisions within the SMZ typically include sediment filter strips, a base shade level, restrictions on ground disturbance, and protection of stream bank and streambeds. In stands adjacent to cold-water systems, proposed harvesting would not reduce canopy closures below 75% in order to maintain shading, and prevent sunlight from raising stream temperatures. These practices are to prevent timber harvest activities and prescribed burns adjacent to riparian areas from adversely affecting aquatic habitat.

Through design criteria, the Roy Creek project mitigates the threat of sedimentation into streams by following BMP's.

Proposals for creating up to 1/10 acre of eastern massasauga habitat within SMZ would be constructed on the north side of the creek, and therefore would not create a canopy break that would allow sunlight to reach the creek. Therefore this would not have an effect on brook trout and molted sculpin.

Cumulative Effects
No other past or future activities have occurred or are planned to occur to impact these species within the CEA. Therefore, there would be no cumulative effects to these two species following project implementation.

Regional Forester's Sensitive Species—Wildlife

Direct, indirect, and cumulative effects were analyzed for each of the following species in the Biological Assessment (BA) and Biological Evaluation (BE) for the Roy Creek Project (USDA Forest Service, 2014); (USDA Forest Service, 2013). The Roy Creek Project analysis is consistent with the analysis in the Forest Plan BA/BE (USDA Forest Service, 2006) and (USDA Forest Service, 2005). In addition, the Roy Creek Project design criteria would reduce adverse impacts to RFSS.

Based on field surveys, occurrence records, and the analysis of the effects on federally listed endangered and threatened species and Regional Forester's Sensitive Species (RFSS), the following determinations were made in the BA/BE:

Kirtland's Warbler

The Roy Creek Project Kirtland's warbler analysis is consistent with the analysis in the Forest Plan BA (USDA Forest Service, 2006). In addition, Roy Creek Project design criteria would further reduce potential impacts to individuals.

Based on census records and the analysis of effects on Kirtland's warbler, Alternatives 1 and 2 would have no effect on Kirtland's warbler. No Kirtland's warbler habitat would be created or removed with implementation of the Roy Creek Project, and the proposed actions would have no short- or long-term effects on individuals or their habitat. No loss in viability of the species would occur because adequate habitat is being created through other projects on the Huron National Forest.

Northern Flying Squirrel

The Roy Creek Project northern flying squirrel analysis is consistent with the analysis in the Forest Plan BE (USDA Forest Service, 2005). In addition, Roy Creek Project design criteria would further reduce potential impacts to individuals.

Based on the analysis of effects on northern flying squirrel, I make the professional determination that Alternative 1 would have no impact on northern flying squirrel because actions would be deferred.

No loss of viability would occur for northern flying squirrel for Alternative 2 on the Huron National Forest because treatments would occur in localized areas and may adversely impact only a small portion of the population. Red and white pine thinning, oak thinning, prescribed burning and NNIS treatments would improve northern flying squirrel habitat in the long term. Oak restoration, fuel break creation, and early successional habitat creation, however, would reduce suitable habitat. Although this would create a reduction of habitat suitability through harvest of mature trees, impacts would be minimal on the population because the vegetation is distributed well among the other age classes and plenty of mature forest exists throughout the project area as a whole.

Based on the analysis of effects on northern flying squirrel, I make the professional determination that Alternative 2 may impact individual northern flying squirrel, but is not likely to cause a trend towards federal listing or a loss of viability.

Little Brown Myotis

The Roy Creek Project little brown myotis analysis is consistent with the analysis in the Forest Plan BE (USDA Forest Service, 2005). In addition, Roy Creek Project design criteria would further reduce potential impacts to individuals.

Based on the analysis of effects on little brown myotis, it is my professional determination that Alternative 1 would have no impact on little brown myotis because actions would be deferred.

No loss of viability would occur for little brown myotis for Alternative 2 on the Huron-Manistee National Forests because treatments would occur in localized areas and may adversely impact only a small portion of the population. Oak restoration and shelterwood removal, opening creation/improvements and fuel break creation would reduce roosting habitat while increasing little brown myotis foraging habitat. Red pine, white pine and oak thinning would improve little brown myotis roosting habitat in the long term. Summertime prescribed burning would reduce the understory component within stands, temporarily removing habitat for moths and other flying insects and thereby temporarily displacing prey species for little brown myotis. Over the short-term, as vegetation responds to the prescribed burn, insect populations would similarly increase in abundance and diversity providing increasing foraging opportunities. Prescribed burning may have long-term beneficial impacts on roosting and foraging habitat. Controlling NNIS and rehabilitating user-created damage would have no impacts on little brown myotis.

Based on the analysis of effects on little brown myotis, it is my professional determination that Alternative 2 would have a beneficial impact on little brown myotis.

Northern Goshawk

The Roy Creek Project northern goshawk analysis is consistent with the analysis in the Forest Plan BE (USDA Forest Service, 2005). In addition, Roy Creek Project design criteria would further reduce potential impacts to individuals.

Deferring treatments in Alternative 1 would have both beneficial and adverse impacts to northern goshawk nesting and foraging habitat. Forests would be allowed to mature, providing

greater suitable habitat with time. However, deferral of action would adversely impact nesting, foraging, and prey habitat enhancements. No loss of viability would occur for northern goshawk on the Huron-Manistee National Forests because nesting and foraging habitat is commonly found throughout and would remain available even if no actions are implemented.

Alternative 2 would have both beneficial and adverse impacts on suitable northern goshawk nesting and foraging habitat. Proposed treatments may have adverse short-term impacts on individual northern goshawk as well. Red pine, white pine and oak thinning would improve nesting habitat in the long term. Fuel break creation, KW habitat creation and oak restoration would reduce the amount of suitable nesting and foraging habitat. These treatments, in addition to prescribed burning, NNIS treatments, and opening improvement, would increase habitat diversity for prey species; thus benefitting northern goshawk indirectly. No loss of viability would occur for northern goshawk because the Roy Creek treatment areas make up a small proportion of available nesting and foraging habitat in the larger planning area and adjacent habitat.

Based on the analysis of effects on northern goshawk, I make the professional determination that Alternatives 1 and 2 may impact individual northern goshawk, but are not likely to cause a trend towards federal listing or a loss of viability.

Red-shouldered hawk

The Roy Creek red-shouldered hawk analysis is consistent with the analysis in the Forest Plan BA (USDA Forest Service, 2006). In addition, Roy Creek design criteria would further reduce potential impacts to individuals.

Deferring treatments (Alternative 1) would have both beneficial and adverse impacts to red-shouldered hawk and their foraging habitat. Forests would be allowed to mature, providing greater suitable habitat over time. However, deferral of action would adversely impact prey habitat enhancements. No loss of viability would occur for red-shouldered hawk on the Huron-Manistee National Forests because nesting and foraging habitat would remain even if no actions are implemented.

Alternative 2 would have both beneficial and adverse impacts on suitable red-shouldered hawk nesting and foraging habitat. Proposed treatments may have adverse short-term impacts on individual red-shouldered hawk. Red and white pine thinning and oak thinning would improve nesting habitat in the long term. Fuel break creation and oak restoration would reduce the amount of suitable nesting and foraging habitat as well. These treatments, in addition to prescribed burning, NNIS treatments, and opening improvement would increase habitat diversity for prey species; thus benefitting red-shouldered hawk indirectly, but also increasing predator habitat and adversely affecting red-shouldered hawk indirectly. No loss of viability would occur for red-shouldered hawk because the Roy Creek treatment areas make up only a small portion of available nesting and foraging habitat in the larger planning area.

Based on the analysis of effects on red-shouldered hawk, I make the professional determination that Alternatives 1 and 2 may impact individual red-shouldered hawk, but are not likely to cause a trend towards federal listing or a loss of viability.

Red-headed Woodpecker

The Roy Creek red-headed woodpecker analysis is consistent with the analysis in the Forest Plan BA (USDA Forest Service, 2006). In addition, Roy Creek design criteria would further reduce potential impacts to individuals.

Deferring treatments (Alternative 1) would have both beneficial and adverse impacts to red-headed woodpecker and their foraging habitat. Forests would be allowed to mature, providing greater suitable habitat over time. However, deferral of action would adversely impact prey habitat enhancements. No loss of viability would occur for red-headed woodpecker on the Huron National Forest because nesting and foraging habitat would remain even if no actions are implemented.

Alternative 2 would have both beneficial and adverse impacts on suitable red-headed woodpecker nesting and foraging habitat. Proposed treatments could have adverse, short-term impacts on individual red-headed woodpecker as well. Oak thinning, oak shelterwood cuts and prescribed burning would improve nesting habitat in the long term. Fuel break creation and oak restoration would reduce the amount of suitable nesting and foraging habitat. These treatments, in addition to NNIS treatments and opening improvement, would increase habitat diversity for prey species; thus benefitting red-headed woodpecker indirectly, but also increasing predator habitat and adversely affecting red-headed woodpeckers indirectly. No loss of viability would occur for red-headed woodpeckers because the Roy Creek treatment areas make up only a small portion of available nesting and foraging habitat in the larger planning area and adjacent habitat outside of the project area.

Based on the analysis of effects on red-headed woodpecker, I make the professional determination that Alternatives 1 and 2 may impact individual red-headed woodpecker, but are not likely to cause a trend towards federal listing or a loss of viability.

Eastern Massasauga Rattlesnake

The Roy Creek eastern massasauga rattlesnake analysis is consistent with the analysis in the Forest Plan BA (USDA Forest Service, 2006). In addition, Roy Creek design criteria would further reduce potential impacts to individuals.

Deferring treatments (Alternative 1) would have both beneficial and adverse impacts to eastern massasauga. Short-term, adverse impacts would not occur. By deferring enhancement of early successional habitat, individual eastern massasauga would experience long-term adverse impacts as suitable habitat would decline from canopy closure and reduced understory development within the project area.

Alternative 2 would have both beneficial and adverse impacts on individual eastern massasauga and their habitat. Proposed treatments may have adverse, short-term impacts on individual eastern massasauga; though the timing restrictions placed on activities outlined in the design criteria would mitigate the degree of impact. Both timber and fuels treatments, such as oak restoration, openings creation, NNIS treatments and prescribed burning would improve habitat for both eastern massasauga and its prey in the long-term.

Based on the analysis of effects on eastern massasauga I make the professional determination that Alternatives I and II may impact individual eastern massasauga, but are not likely to cause a trend towards federal listing or a loss of viability.

Wood Turtle

The Roy Creek Project wood turtle analysis is consistent with the analysis in the Forest Plan BA (USDA Forest Service, 2006). In addition, Roy Creek Project design criteria would further reduce potential impacts to individuals.

Based on the analysis of effects on wood turtles, I make the professional determination that Alternative 1 would have no impact on wood turtle because actions would be deferred.

Alternative 2 would have some short-term adverse impacts to wood turtles. Habitat enhancement in the long term, however, has the potential to benefit a greater number of individuals than the short-term adverse impacts.

Based on the analysis of effects on wood turtles, I make the professional determination that Alternative 2 may impact individual wood turtle, but is not likely to cause a trend towards federal listing or a loss of viability.

Channel Darter

The Roy Creek Project channel darter analysis is consistent with the analysis in the Forest Plan BA (USDA Forest Service, 2006). In addition, Roy Creek Project design criteria would further reduce potential impacts to individuals.

Based on the analysis of effects on channel darter, I make the professional determination that Alternative 1 would have no impact on channel darter because actions would be deferred.

Alternative 2 would have some short-term, adverse impacts to channel darter. Habitat enhancement in the long term, however, has the potential to benefit a greater number of individuals than the short-term adverse impacts.

Based on the analysis of effects on channel darter, I make the professional determination that Alternative 2 may impact individual channel darter, but is not likely to cause a trend towards federal listing or a loss of viability.

Determination of Effects for Dusted Skipper, Frosted Elfin, and Southern Grizzled Skipper

The Roy Creek Project dusted skipper, frosted elfin, and southern grizzled skipper analysis is consistent with the analysis in the Forest Plan BA (USDA Forest Service, 2006). In addition, Roy Creek Project design criteria would further reduce potential impacts to individuals.

Deferring habitat improvements (Alternative 1) would result in a loss of habitat for dusted skipper, frosted elfin, and southern grizzled skipper in the long term. However, no measurable loss in viability would occur for these species because these species are found in several locations on the Huron National Forest, and open habitat is perpetually managed across the forest through other projects.

Alternative 2 may elicit some short-term adverse impacts to the dusted skipper, frosted elfin and southern grizzled skipper. However, long-term habitat creation has the potential to benefit a greater number of individuals within the area when compared to the short-term adverse impacts because habitat enhancement is sustained for a longer amount of time (years compared to days), spanning multiple generations.

Prescribed burning within these ecosystems could elicit negative direct and indirect impacts to the plant community containing the species detailed above, and if this action accumulates within the same area it could cause negative cumulative effects; e.g. the removal of roadside soil and nutrients essential for germination and establishment of seeds. However, design criteria and burn plan guidelines limit ground disturbing activities in these areas during certain time periods and hence, the potential for cumulative effects. Similar activities from the past, present and future that have the potential to impact plants required by these three butterfly species for nectaring and egg-laying within the CEA are KW habitat creation and prescribed burning.

Based on the analysis of effects on dusted skipper, frosted elfin and southern grizzled skipper, I make the professional determination that Alternatives 1and 2 may impact individual dusted skipper, frosted elfin and southern grizzled skipper, but are not likely to cause a trend towards federal listing or a loss of viability to any of the species.

Northern Long-eared Bat

Based on the analysis of effects on northern long-eared bat, Alternative 1 would have no effect on northern long-eared bat because actions would be deferred.

A detailed description of the effects of Alternative 2 on NLEB is located in the Biological Evaluation for Roy Creek. In the BE, a determination of may affect, but is not likely to adversely affect northern long-eared bats was made for Alternative 2. This determination was supported in a letter of concurrence from a letter from the U.S. Fish and Wildlife Service (September 22, 2014).

The Regional Forester Sensitive Species (plants) that will be addressed are listed in

Table 47.

Table 47: Regional Forester Sensitive Species

Considered Scientific Name	Common Name	Habitat	Occurrences Within Proposed Treatment Areas	HNF Occurrence Records
Cirsium hillii	Hill's Thistle	Pine Woods, Oak-Pine Barrens, Dry Prairie, Open Dry Sand, Prairie Woodland, Barrens	28	1,256
Dalibarda repens	False Violet	Wooded Dune Swale, Swamp, Hardwood Conifer Swamp, Sub-irrigated Forest	39	57
Cynoglossum virginianum var. *boreale*	Northern Wild Comfrey	Semi-open Mesic Depression, Rich Mesic Northern Forest, Late Successional Pine	1	68
Taxus canadensis	Canada Yew	Mesic Forest, Swamp	0	9

Hill's Thistle (Cirsium hillii)

Hill's thistle is an early succession plant which occurs in a variety of open, disturbance-prone habitats (NatureServe, 2013a). The habitat in which Hill's thistle most commonly occurs—savanna, prairie, jack pine plains—is globally rare and dependent upon fire to create and maintain open conditions (Reznicek & Voss, 2011). While locally common on the Huron National Forest, this species has experienced a long-term population decline of approximately 30-70% through its range and has a global conservation rank of G3—vulnerable. This is largely due to a substantial loss of suitable habitat throughout its relatively limited ranges (NatureServe, 2013b). Over 1,200 occurrences of Hill's thistle have been documented on the Huron National Forest, with each occurrence averaging eight or more individuals (USDA Forest Service, 2013). High light levels and exposed mineral soil are requirements for germination of Hill's thistle seed. Some degree of detritus removal and/or soil disturbance is necessary for the establishment of new colonies, which could be accomplished through the use of prescribed fire and canopy removal (Higman, 1996). The plants form small colonies that increase the size of genets, but not to the extent that it could be deemed vegetative reproduction (i.e. establishment on new sites). Each rosette, once established, lives 2-3 years before flowering and dying (Higman, 1996).

There are 68 Hill's thistle occurrences documented within the entire Roy Creek Project Area; in total, 425 individual plants have been found, with an average of 11 individuals per location. Of

the 68 documented occurrences, 28 exist within proposed treatment areas within the project area.
The occurrences of Hill's thistle by proposed treatment are listed below in Table 48.

Table 48: Frequency of Hill's Thistle by Proposed Treatment

Action	Number of Occurrences
Red Pine Thinning	17
Prescribed Burning	28
Early Successional Habitat Creation	2
Fuelbreak Creation	1

Alternative 1 (No Action)

Direct and Indirect Effects
The No Action Alternative would have no direct impacts to Hill's thistle. No new action would take place to impact individuals of this species.

Indirectly in the short-term (0-3 years), suitable habitat for Hill's thistle would remain unchanged under the No Action Alternative. However, in the short-term, invasive species would continue to compete with Hill's thistle as no treatment of weeds would occur. This is a negative short-term indirect impact to Hill's thistle.

In the long-term, suitable habitat for Hill's thistle would decline within the project area. Hill's thistle is an early successional species, requiring high levels of light. Currently, less than 0.04% of the project area is open habitat; as succession continues within the project area, trees and other woody vegetation would continue to increase in secondary growth, canopies would continue to close within the project area. This would lead to an overall decline in suitable habitat. Under this alternative, activities promoting open habitats would not occur and additional habitat for Hill's thistle would be subject to natural processes.

Early successional habitat is created following disturbance, e.g. strong wind events to create openings in the canopy, wildfires, etc. The Forest Service, as an agency, is committed to fire suppression to ensure public safety; therefore, limited early successional habitat within the project area would be naturally created by fire. Additionally, as time goes on, seed viability is reduced thereby further decreasing the recruitment potential of Hill's thistle following a disturbance event as the seedbank continues to age. Hill's thistle would be negatively impacted under the No Action Alternative, due to forest succession.

Invasive species infestations along roadsides and trails within the project area have been identified. Under the No Action alternative, invasive plant species would continue to colonize the project area from roadsides and spread into stand interiors in the absence of treatment. This would elicit a negative indirect impact on all sensitive plants in or near the project areas, but particularly to early successional, open canopy species like Hill's thistle which share the same habitat requirements as many common roadside weeds. Indirectly in the long-term in the absences of treatment, invasive plant species would continue to compete for resources, further eliciting a negative impact on Hill's thistle.

Cumulative Effects
As the forest age classes move towards older age classes, there would be less habitat available for Hill's thistle. The canopy closure would inhibit Hill's thistle from becoming established.

Alternative 2 (Proposed Action)

Direct and Indirect Effects
Treatment areas where heavy equipment would be used and Hill's thistle was found are subject to design criterion which would protect individual Hill's thistle from being crushed, uprooted, or damaged during logging operations or plow line construction. Treatment areas that where these criteria pertain include early successional habitat creation, red pine thinning, fuel break creation, and all prescribe burning activity where Hill's thistle occurs (Table 48). Within these treatment areas, negative direct impact to Hill's thistle would be minimized due to the design criterion.

Logging activities associated with creating early successional habitat and fuel breaks have the potential to elicit similar direct impacts to individual Hill's thistle because the intended stand basal area is very similar (i.e. logging activities would be fairly intensive). During project implementation, there is potential for individual Hill's thistle to be killed if timber activities take place within the growing season and individuals become uprooted. However, potential exist for only three individuals of Hill's thistle to be impacted out of the 1,256 known occurrences on Forest; therefore, would be no loss of viability of Hill's thistle within the planning area. If timber activities occur during the dormant season following the flowering and fruiting period, which typically occurs (October-April), plants would not be impacted.

Logging activities associated with red pine thinning have the potential to adversely impact the 17 individuals found within red pine stands, regardless of design criteria (plants could be overlooked, a skid trail could run over individuals). However, with such a small number of plants found, and mitigation measures already in place, there would be no loss of viability of Hill's thistle on the forest. If timber activities occur during the dormant season following flowering and fruiting (October-April), plants would not be impacted.

Hill's thistle is a species of fire-prone ecosystems; therefore, there would be no mitigation for individual Hill's thistle within areas prescribed to be burned. Individuals within the prescribe burn would most likely be incinerated if the burn occurs within the growing season of Hill's thistle. This would be a direct negative impact to all 28 individuals found within these sites. Burning outside of the growing season, when plants are dormant (October-April), would have no direct impact on individuals.

Herbicide treatments would occur during the growing season of Hill's thistle; there is therefore a potential for herbicide treatments to chemically kill an individual or individuals of Hill's thistle. However, under the design criteria and best management practices, only trained personnel in both plant identification and herbicide use would be applying herbicide and would avoid all known locations of the plant. Any negative direct impact is, therefore, minimized. Some individual Hill's thistle may be adversely impacted, but no loss of viability within the planning area would occur.

Indirectly in the short-term, habitat for Hill's thistle would become increasingly suitable under Alternative 2. The creation of fuel breaks, all burning activities, all timber activities, early successional habitat creation and enhancement, and eastern massasauga rattlesnake habitat

creation, would increase suitable habitat for Hill's thistle through the combination of ground disturbance and open canopy creation. Prescribed burning activities would also introduce an influx of nutrients essential for plant growth in the short-term. These activities would stimulate germination of seeds already in the seedbank and exposed mineral soil from timber or prescribed burning activities would create potential dispersal sites for new seed.

Invasive species treatments would also beneficially impact Hill's thistle in the short-term as competitive pressure from weeds is removed from the sensitive plants population. Similarly, the proposed road closures would decrease the spread of invasive plants and erosion damage associated with vehicular travel, thereby beneficially impacting Hill's thistle.

In the long-term, as canopies increasingly close, suitable habitat for Hill's thistle would decline within thinned stands (oak and red pine stands). Hill's thistle that had seeded into these areas would most likely remain in stand openings. The impact would be similar for all activities related to the creation of Kirtland's warbler breeding habitat; in the long-term, Hill's thistle would occur in open pockets within these stands as the canopy further becomes closed.

In the long-term following prescribed burn activities, without alteration of canopy conditions, Hill's thistle would not be impacted. Very early on, these plants may have the potential (if within adequate dispersal distance) to seed in and competitively establish on bare mineral soil within the project area. However, shortly afterwards, they would be outcompeted by later successional species that are more shade tolerant. Long-term beneficial impacts (>20 years) would be minor as most sites would revert to pre-activity canopy closure and gradually decline in habitat suitability.

Early successional and eastern massasauga rattlesnake habitat creation would increase and maintain suitable habitat for Hill's thistle in the long-term, an indirect benefit. Openings also enhance pollinator habitat for Hill's thistle, thereby increasing progeny of individuals.

Long-term beneficial impacts from invasive species treatment would be beneficial to Hill's thistle, as this treatment would decrease the overall presence of competitive weed species within the project area.

The proposed road closure and erosion rehabilitation would enhance habitat for Hill's thistle, similarly to openings creation. Old roads would also become suitable habitat for Hill's thistle in the long-term; it would most likely take 20+ years for the canopy over a road to close.

All other activities not discussed in detail would have no indirect effects on Hill's thistle.

Cumulative Effects

With consideration to the actions of the past 10 years, present actions and reasonably foreseeable actions ten years in the future within the Cumulative Effects Analysis boundary (CEA), the Proposed Action would elicit beneficial cumulative impacts on this plant.
The Roy Creek project area has been managed for Kirtland's warbler breeding habitat under the Pine River Kirtland's Warbler Management Area for the past ten years, and will continue to be managed for this species in the reasonably foreseeable future. The past management activities associated with creating and maintain warbler habitat had the potential to disturb and even cause mortality to individual Hill's thistle in the project area, historically. In the past 10 years, approximately 1,000 acres in the Roy Creek Project area have been clear cut, mechanically prepared for planting, and planted to jack pine. This constitutes 6% of the CEA. In the foreseeable future, approximately 280 additional acres within the CEA are planned to be clear

cut, site prepared, and planted to Kirtland's warbler habitat. This project proposed an additional 800 acres subjected to this type of management; within the entire CEA, approximately 2,000 acres, or approximately 13%, of the CEA would have been clearcut, site prepped and planted to jack pine. This activity has both negative direct effects and beneficial indirect effects in the short- and long-term on Hill's thistle. Cumulatively, converting stands of later successional forest to jack pine creates more suitable habitat for Hill's thistle overall within the CEA. While in time, these jack pine plantations succeed, the resultant conditions favor wildfire—a disturbance that Hill's thistle is adapted. Private and state land with the CEA totals 1,319 acres. This land is not managed for Kirtland's warbler; therefore, private and state land within the CEA would not have a cumulative impact on Hill's thistle in regard to this particular proposed action.

In terms of timber thinning, 38 acres of red pine have been commercially thinned in the past 10 years—no commercial timber thinning is planned in the future 10 years. Alternative 2 proposes 2,040 acres of thinning within red pine, oak, and white pine. Cumulatively, private and state land managers may have in the past and may, in the future, commercially thin a portion of the 1,319 acres of land within the CEA. This land makes up < 7% of the CEA—commercial thinning on private land would have negligible cumulative impacts to Hill's thistle overall. As only 38 acres of commercial thinning is considered cumulative on Forest Service land, overall cumulative impacts to Hill's thistle due to this proposed activity is also negligible. Temporarily, the action creates improved habitat for Hill's thistle; however, cumulatively this action does not impact the plant's population within the CEA or within the planning area.

The proposed actions in Alternatives 2 would increase early successional open habitat suitable for Hill's thistle within the CEA through the creation of fuelbreaks, early successional habitat creation, closures of roads, and the use of fire. In the past, management for wildlife openings and fuelbreaks has created 530 acres of open habitat suitable for Hill's thistle, and in the future, 44 acres of fuel break creation is planned. Currently a large portion (35%) of the forested area in the CEA is late successional (over 70-79 age class; Table 5); 608 acres are open habitat (< 3%). The proposed 613 acres of early successional habitat and 172 acres of fuel break creation would cumulative increase suitable habitat for Hill's thistle, when added to the past and future fuelbreak creation and wildlife openings. This is a cumulative beneficial impact to Hill's thistle.

Fire, as a disturbance tool, can increase suitable habitat for Hill's thistle within the CEA. In the past 10 years, about 403 acres of land have been prescribed burned within the CEA, presently, 414 acres have been burned, and 10 years in the future, 537 acres are planned to be burned. The 5,574 acres of prescribe burning proposed by Alternative 2 would cumulatively increase suitable habitat for Hill's thistle within the CEA, thereby benefiting this species.

No invasive species treatments have occurred in the past, present or future on Forest Service land within the CEA. However, invasive species treatment could have or will occur on private and state land within the CEA. Any invasive species treatment would have a beneficial cumulative impact on Hill's thistle within the CEA.

Therefore, the proposed action, when considered with past, present, and reasonably foreseeable future actions, would have a beneficial cumulative impact on Hill's thistle. Impacts of the proposed action would not affect species viability because the magnitude of impacts would be low and affect few individuals relative to the total abundance of the species on the Huron-Manistee National Forests.

False Violet (Dalibarda repens)

False violet was found within one of the proposed action areas of the Roy Creek project. False violet is a low herbaceous perennial plant in the rose family, the only herbaceous species of this family in Michigan. Its flowers, which appear in mid-July to late August, and leaves arise from slender creeping stolons (Penskar, 2002). False violet is a species of swamps and moist woodlands, often coniferous dominated. It can grow in pine need litter and humus over sand, indicating that it has the ability to occur in moderately acidic conditions. Overstory dominants associated with this species include: red and white pine, balsam fir, red maple, black spruce, and paper birch (Reznicek & Voss, 2011).

False violet occurs from Ontario and Minnesota east to Nova Scotia and south to Michigan, Ohio and North Carolina, though the North Carolina population may be disjunt. While it is ranked as a G5 species, secure globally, it is rare along the southern portion of its range. In Michigan, it is considered S1S2—critically imperiled or threatened. This species has a coefficient of conservatism of 10 (Herman, 2001), indicative of its rare and unique status in Michigan. In the state, false violet has been found in Alcona, Antrim, Newaygo and Crawford counties. There are 57 occurrence records on the Huron National Forest. Forty-two of them exist within the Roy Creek Project Area.

Threats to this species include development, wetland drainage, and succession (Penskar, 2002).

There are 42 occurrences documented occurrences of false violet within the Roy Creek Project Area; in total, 1,686 individual plants have been found, with an average of 41 individuals per record. Of these 42 occurrences, 39 exist within proposed treatment areas.

Alternative 1 (No Action)

Direct and Indirect Effects
The No Action Alternative would have no direct impacts to false violet. No new action would take place to impact individuals of this species.

Indirectly in the short-term and long-term, suitable habitat for false violet would remain fairly unchanged under the No Action Alternative. Individuals within the project area would be subject to natural disturbances (i.e. windthrow, fire) to create suitable habitat for recruitment as succession and canopy closure would continue.

Invasive species infestations along roadsides and trails within the project area have been identified. In the short-term, invasive species would continue to compete with false violet as no treatment of weeds would occur. This is a negative short-term indirect impact to false violet. Invasive plant species would continue to colonize the project area from roadsides and spread into stand interiors in the absence of treatment. Indirectly in the long-term in the absences of treatment, invasive plant species would continue to compete for resources, further eliciting a negative impact on false violet.

Cumulative effects
There would be no cumulative effects to false violet.

Alternative 2 (Proposed Action)

Direct and Indirect Effects
False violet occurs only within the Project Area along the creek beds of Roy, McDonald and Vandercook Creeks where Eastern Massasauga habitat creation is proposed to occur. Therefore, this is the only proposed activity that could elicit direct effects on false violet.

Direct effects to false violet due to this activity are minimal. The proposed activity involves using chainsaws to fall trees and brush in order to create sunlit openings along streambanks and adjacent slopes. During project implementation, individuals of false violet could be crushed or shaded out by fallen trees or brush. This would lead to some mortality. However, under the design criteria, areas where known occurrences of false violet exist would be avoided. Any negative direct impact is therefore minimized. Some individual false violets may be adversely impacted, but no loss of viability within the planning area would occur.

Indirectly, in the short-term and long-term, habitat for false violet would become increasingly suitable under Alternative 2. Sunlit openings within suitable habitat increase the suitability and create opportunity for establishment of new false violet seed. An increase in openings within suitable habitat would stimulate this species seedbank. Creating eastern massasauga habitat would indirectly benefit false violet by creating suitable habitat for this species progeny.

Indirectly, invasive species treatments would beneficially impact false violet in the short- and long-term as competitive pressure from weeds would decline within the project area. Canada and bull thistle were identified in stands adjacent to false violet. Removing these species in the short- and long-term would benefit false violet.

Bees provide pollination to 80% of flowering plants—their abundance and diversity is negatively correlated with forest cover (Winfree, 2007). Creating and enhancing early-successional habitat would lead to an overall increase in pollinator species within the project area. Falseviolet, as an insect-pollinated plant, is thereby indirectly benefitted by any activity that decreases overall canopy or shrub cover in adjacent areas. Activities which meet this criterion are: creations of fuelbreaks, creation of early successional habitat, prescribe burning, creation of eastern massasauga habitat, and road closures. However, eastern massasauga habitat creation is the only activity that is adjacent to suitable false violet habitat. Therefore, the overall increase in pollinator abundance throughout the project area only slightly benefits false violet, not likely to influence species viability on the forest due to the scale of this proposed project.

As no other activities are occurring within or near suitable habitat for false violet, they would have no indirect effect on this species.

Cumulative Effects
Cumulative actions that could impact false violet within the CEA exclusively include enhancing pollinator abundance within the project area, and decreasing competitive pressure by invasive species. No other activities have occurred, are occurring or are planned to occur in suitable habitat for false violet within the bounds of the CEA or have the potential to impact the species indirectly. Therefore, there would be no cumulative impact due to these other activities. Cumulatively, the proposed actions in Alternatives 2 would increase early successional open habitat suitable for pollinators of false violet within the CEA through the creation of fuelbreaks, early successional habitat creation, closures of roads, and the use of prescribed burning. In the past, management for wildlife openings and fuelbreaks has created 530 acres of open habitat suitable for insect pollinator species. However, currently a large portion (35%) of the forested

area in the CEA is late successional (over 70-79 age class; Table 5); 608 acres are open habitat (< 3%). The proposed 613 acres of early successional habitat, 6 acres of eastern massasauga habitat creation and 172 acres of fuel break creation would cumulative increase suitable habitat for pollinators, when added to the past fuelbreak creation and wildlife openings, and 44 acres of planned fuelbreak creation. Although much of this activity does not or would not occur immediately adjacent to suitable habitat for false violet, increasing pollinator abundance within the CEA would ultimately cumulatively benefit the progeny of individual false violets.

No invasive species treatments have occurred in the past, present or future on Forest Service land within the CEA. However, invasive species treatment could have or may occur on private and state land within the CEA. Any invasive species treatment would have a beneficial cumulative impact on false violet within the CEA as this action reduces competitive pressure on this species.

Therefore, the proposed action, when considered with past, present, and reasonably foreseeable future actions, would have a beneficial cumulative impact on false violet. Impacts of the proposed action would not affect species viability because the magnitude of impacts would be low and affect few individuals relative to the total abundance of the species on the Huron-Manistee National Forest.

Northern Wild Comfrey

Northern wild comfrey is a mid-successional plant which inhabits a variety of habitats. It has been documented to occur in forest gaps, openings, edges but also under a shaded canopy of mature coniferous, mixed or hardwood forest (Reznicek & Voss, 2011) and (Abrams, 2001). Part of this species lifecycle may be dependent upon conditions associated with a closed canopy forest (higher humidity, less competition, lower temperatures) and other stages, such as flowering and establishment, may depend upon the increase in light level associated with forest openings (NatureServe, 2013a). These traits suggest that this species may be adapted to conditions created by occasional fire disturbance. The plant is a non-clonal perennial which resprouts from a taproot each spring, reaching a height of 1 to 2 feet. It flowers from May to June—its animal dispersed fruit develop July through August. Because these seeds are large, they may not last long in the seedbank (Abrams, 2001). Individuals reproduce infrequently, are long-lived and take years to reach reproductive maturity (Hiawatha National Forest, 2005).

This species appears to be retreated northward through its range. Populations that have been monitored for years appear to be declining in the southern extent of its range. This is a G5 ranked plant, indicating it is apparently secure throughout its global range, though, in the state of Michigan, it is an S3 plant—vulnerable—because it is rare and uncommon. Threats to this plants population include succession (canopy closure), invasion by exotic weeds, herbivory, fire suppression and logging (Hiawatha National Forest, 2005).

On the Huron National Forest, northern wild comfrey has been documented in red pine plantations planted on outwash plains, in microsites of partial shade where moisture is maintained and there is reduced ground competition. There are 68 documented occurrences of northern wild comfrey on the Huron Nation Forest—each occurrence averaging 12 individuals.

There are two documented occurrences of northern wild comfrey within the Roy Creek Project Area. In total, nine individual plants were found, with an average of four individuals per site. Only one of these occurrences exists within the proposed treatment areas.

Alternative 1 (No Action)

Direct and Indirect Effects
The No Action Alternative would have no direct impacts to northern wild comfrey. No new action would take place to impact individuals of this species.

Indirectly in the short-term (0-3 years), suitable habitat for northern wild comfrey would remain unchanged under the No Action Alternative.

In the long-term, suitable habitat for northern wild comfrey would decline within the project area. Succession would continue, canopies would close, and openings necessary for seed establishment would arise through natural events only. Openings are created following disturbance, e.g. strong wind events to create openings in the canopy, wildfires, etc. The Forest Service, as an agency, is committed to fire suppression to ensure public safety; therefore, limited forest gaps within the project area would be naturally created by fire. Additionally, as time goes on, seed viability is reduced, thereby further decreasing the recruitment potential of northern wild comfrey following a disturbance event as the seedbank continues to age. Northern wild comfrey would be negatively impacted under the No Action Alternative, due to forest succession.

Invasive species infestations along roadsides and trails within the project area have been identified. In the short-term, invasive species would continue to compete with northern wild comfrey as no treatment of weeds would occur. This is a negative short-term indirect impact to northern wild comfrey. Invasive plant species would continue to colonize the project area from roadsides and spread into stand interiors in the absence of treatment. Indirectly, in the long-term in the absences of treatment, invasive plant species would continue to compete for resources, further eliciting a negative impact on northern wild comfrey.

Only two occurrences of northern wild comfrey were found within the entire project area, suggesting that this plant has been extirpated from this site, or that habitat is limiting or non-existent. Because so few plants would be impacted overall impacts to the population would be discountable.

Cumulative Effects
There would be no cumulative effects to Northern wild comfrey.

Alternative 2 (Proposed Action)

Direct and Indirect Effects
During prescribe burning individuals of northern wild comfrey may be incinerated. During timber harvest activities, individuals may also be crushed. This would be a negative direct effect on northern wild comfrey. However, direct impacts would be minimized due to the design criteria. Heavy equipment and fire control lines would avoid the one known plant location. Direct effects would be negative, but only to a minute degree—only one plant occurrence out 68 on the Forest would be impacted.

Indirectly in the short-term, habitat for northern wild comfrey would become increasingly suitable under Alternative 2. The creation of fuel breaks, all burning activities, all timber activities, early successional habitat creation and enhancement, and eastern massasauga habitat creation, increase suitable habitat for northern wild comfrey through the combination of ground

disturbance and open canopy creation. Fire activities also create openings and introduce an influx of nutrients essential for plant growth in the short-term. These activities would stimulate germination of seeds already in the seedbank and exposed mineral soil from timber or fire treatment activities would create potential dispersal sites for new populations.

In the long-term, as canopies increasingly close within thinned stands, suitable habitat for northern wild comfrey would remain. Following initial project implementation, suitable habitat for regeneration would have been created, stimulating the population of northern wild comfrey within the project area; as canopies close, habitat within these stands would revert to current conditions. However, maintained openings in the long-term, such as early successional habitat creation and permanent fuel break creation, would introduce habitat diversity to the project area. As part of this plants lifecycle is dependent upon both open and closed canopy conditions, increasing age diversity within the project area indirectly benefits northern wild comfrey in the long-term.

Similarly to false violet, increasing suitable pollinator habitat through the creation of early successional habitat would also indirectly benefit northern wild comfrey in the short- and long-term.

Invasive species treatments would also beneficially impact northern wild comfrey in the short- and long-term as competitive pressure from weeds is removed from the sensitive plants population. Similarly, the proposed road closures would decrease the spread of invasive plants and erosion damage associated with vehicular travel, thereby indirectly beneficially impacting northern wild comfrey.

All other activities not discussed in detail would have no indirect effects on northern wild comfrey. Jack pine stands are not suitable habitat for northern wild comfrey— management activities associated with the Kirtland's warbler would have no effect on this species, and no individuals were found in or around areas proposed for aspen management.

Cumulative Effects

With consideration to the actions of the past 10 years, present actions and reasonably foreseeable actions 10 years in the future within the Cumulative Effects Analysis boundary (CEA), the Proposed Action would elicit beneficial cumulative impacts on northern wild comfrey.

In terms of timber thinning, 38 acres of red pine have been commercially thinned in the past 10 years—no commercial timber thinning is planned in the future 10 years. Alternative 2 proposes 2,040 acres of thinning within red pine, oak, and white pine. Cumulatively, private and state land managers may have in the past and may, in the future, commercially thin a portion of the 1,319 acres of land within the CEA. This land makes up < 7% of the CEA—commercial thinning on private land would have negligible cumulative impacts to northern wild comfrey overall. As only 38 acres of commercial thinning is considered cumulative on Forest Service land, overall cumulative impacts to northern wild comfrey due to this proposed activity is also negligible. Temporarily, the action creates improved habitat for northern wild comfrey; however, cumulatively this action does not impact the plant's population within the CEA or within the planning area.

The proposed actions in Alternatives 2 would increase early successional open habitat suitable for recruitment of northern wild comfrey within the CEA through the creation of fuelbreaks, early successional habitat creation, closures of roads, and the use of prescribed burning. In the

past, management for wildlife openings and fuelbreaks has created 530 acres of open habitat suitable for northern wild comfrey, and in the future, 44 acres of fuel break creation is planned. Currently a large portion (35%) of the forested area in the CEA is late successional (over 70-79 age class); 608 acres are open habitat (< 3%). The proposed 613 acres of early successional habitat and 172 acres of fuel break creation would cumulative increase habitat for northern wild comfrey, when added to the past and future fuelbreak creation and wildlife openings. This is a cumulative beneficial impact to northern wild comfrey.

Fire, as a disturbance tool, can increase suitable habitat for northern wild comfrey within the CEA. In the past 10 years, 403 acres have been prescribed burned within the CEA, presently, 414 acres have been prescribed burned, and 10 years in the future, 537 acres are planned to be prescribed burned. The 5,574 acres of prescribe burning proposed by Alternative 2 would cumulatively increase suitable habitat for northern wild comfrey within the CEA, thereby benefiting this species.

No invasive species treatments have occurred in the past, present or future on Forest Service land within the CEA. However, invasive species treatment could have or may occur on private and state land within the CEA. Any invasive species treatment would have a beneficial cumulative impact on northern wild comfrey within the CEA.

Therefore, the proposed action, when considered with past, present, and reasonably foreseeable future actions, would have a beneficial cumulative impact on northern wild comfrey. Impacts of the proposed action would not affect species viability because the magnitude of impacts would be low and affect few individuals relative to the total abundance of the species on the Huron-Manistee National Forest.

Canada Yew (Taxus canadensis)

Canada yew is an extremely shade-tolerant low coniferous shrub which is found in rich, sometimes swampy, late successional deciduous, mixed or coniferous forests dominated by hemlock, white pine, fir and cedar (Reznicek & Voss, 2011). Often it occurs on river banks and ravines along moisture gradients; occurrences of this plant indicate cool, moist, old growth conditions (Sullivan, 1993). Canada yew's range is north of the Ohio River into Canada and west to Minnesota. It is globally ranked as G5—secure throughout its range; in Michigan it is not ranked yet, still being under review (NatureServe, 2013a). There are nine occurrences of Canada yew on the Huron National Forest; all known occurrences are along creeks or the Au Sable River under a shaded overstory.

The species generally reproduces asexually by layering, is shade tolerant and fire intolerant (Earle, 2013). It is highly preferred by moose and white-tailed deer and has become scarce in Michigan due to herbivore pressure by white-tailed deer (Reznicek & Voss, 2011), (Sullivan, 1993), (Leopold, 1947), and (Snyder J. D., 1976).

There are no documented occurrences of Canada yew within the Roy Creek Project Area; however, there is one historic occurrence of Canada yew within 27 meters of the Project Boundary. No occurrences exist within proposed treatment areas.

Alternative 1 (No Action)

Direct and Indirect Effects
The No Action Alternative would have no direct impacts to Canada yew. No new action would take place to impact individuals of this species.

In the short- and long-term, the vegetation within the project area would continue to succeed, canopies would continue to close and basal area would continue to increase. Because Canada yew is a late-successional plant species, the indirect impacts of the No Action alternative would be beneficial to this species. However, invasive plant species would continue to elicit competitive pressure on Canada yew, a negative indirect effect.

Overall, habitat where Canada yew occurs near the project area is relatively uninvaded by exotic plant species. The beneficial indirect impacts of successional changes under the no action alternative outweigh the adverse impacts of invasive plant competitive pressure.

Cumulative Effects
There would be no cumulative effects on Canada yew. It was not found within the project area.

Alternative 2 (Proposed Action)

Direct and Indirect Effects
No Canada yew was found within the proposed action areas within the project boundary. Therefore, there would be no direct impact to this species under the Proposed Action alternative. No proposed commercial thinning or prescribed burning activities are taking place in suitable habitat for Canada yew. These proposed projects would have no indirect impacts to Canada yew due to this fact.

Indirectly, in the short- and long-term, open habitat within the project area would increase by about 785 acres with the proposed fuel break and early successional habitat creation. Open habitat creates foraging habitat for white-tailed deer within the project area and would indirectly increase herbivore pressure on Canada yew both in and adjacent to the project area. This would elicit a negative indirect impact in the short- and long-term on this species.

Proposed aspen regeneration would also have the similar effects on Canada yew in the short-term; cutting aspen would enhance foraging habitat for white-tailed deer, which could lead to an increase in deer abundance within the project area, indirectly negatively impacting Canada yew. In the long-term, as aspen ages, the habitat would not be as ideal for white-tailed deer; therefore, in the long-term, proposed aspen regeneration would have no effect on Canada yew. The size of the proposed action is very small (10 acres) so the relative impact on Canada yew of both short- and long-term effects would be discountable.

Invasive species treatments would beneficially impact Canada yew in the short- and long-term as competitive pressure from weeds is removed from the sensitive plants population. Similarly, the proposed road closures would decrease the spread of invasive plants and erosion damage associated with vehicular travel, thereby indirectly beneficially impacting Canada yew. Proposed erosion restoration would increase suitable habitat for Canada yew in the long-term as this site exists in potential suitable habitat for this species.

All other activities not discussed in detail would have no indirect effects on Canada yew.

Cumulative Effects

Cumulative actions that could impact Canada yew within the CEA exclusively include indirectly enhancing white-tailed deer abundance within the project area, and decreasing competitive pressure by invasive species. No activities have occurred, are occurring or are planned to occur in suitable habitat for Canada yew within the bounds of the CEA or have the potential to impact the species or its habitat directly. Therefore, there would be no cumulative impact due to these other activities.

Cumulatively, the proposed actions in Alternatives 2 would increase early successional open habitat suitable for herbivorous ungulates within the CEA through the creation of fuelbreaks, early successional habitat creation, closures of roads, and aspen regeneration. In the past, management for wildlife openings and fuelbreaks has created 530 acres of open habitat suitable for white-tailed deer. However, currently a large portion (35%) of the forested area in the CEA is late successional (over 70-79 age class; Table 5); 608 acres are open habitat (< 3%). The proposed 613 acres of early successional habitat, six acres of eastern massasauga habitat creation, ten acres of aspen regeneration, and 172 acres of fuel break creation would cumulative increase suitable habitat for white-tailed deer, when added to the past 530 acres of fuelbreak creation and wildlife openings, and 44 acres of planned fuelbreak creation. Although much of this activity does not or would not occur immediately adjacent to suitable habitat for Canada yew, increasing white-tailed deer abundance within the CEA would ultimately cumulatively adversely impact individual Canada yews.

No invasive species treatments have occurred in the past, present or future on Forest Service land within the CEA. However, invasive species treatment could occur on private and state land within the CEA. Any invasive species treatment would have a beneficial cumulative impact on Canada yew within the CEA as this action reduces competitive pressure on this species.

3.5 Non-Native Invasive Species Management

Affected Environment

The management of non-native invasive species (NNIS) is important because they have the capacity to alter or dominate native communities and easily become established in areas that are frequently or severely disturbed, such as roadsides, landing sites, and skid trails. They can then spread from these disturbed sites into the surrounding habitats and disrupt the ecology of natural communities. Non-native invasive plants can reduce biodiversity, alter the environment they invade, and impact wildlife, plants, and people.

NNIS can alter their environment by changing hydrology, soil chemistry, and fire regimes. They impact wildlife species by causing direct mortality, decreasing available food supplies, providing nutritionally inferior food, and poisoning or repelling insects. They impact other plant species by competing for water, sunlight, nutrients, space, and pollinators; producing allelopathic compounds and disrupting mycorrhizal relationships; diluting gene pools through hybridization; causing declines in the growth rates of canopy trees; preventing natural tree regeneration; and displacing native plants. They also impact people by impeding industry, disrupting agriculture, and endangering human health, degrading recreational experiences, and costing billions of dollars for treatment every year (Tallamy, 2007).

The analysis area for direct and indirect effects includes NFS lands within the project area. Invasive species are defined as: “alien species whose introduction does or is likely to cause

economic or environmental harm or harm to human health" (Executive Order 13112, 1999). The Huron-Manistee National Forests have developed a list of certain 87 plants labeled NNIS; each species has a priority rank for treatment (see Appendix B). This list is refined annually to add and reprioritize certain species as they become more or less prevalent on the Forest.

Occurrences of non-native invasive plant species inventoried show that among 87 species ranked by the Huron-Manistee National Forests as non-native invasive species requiring management action, 13 NNIS were found within the project area (Table 17 and Table 18). Of these species, three were of Forest Rank 3 and 10 were of Forest Rank 4. An additional five non-native invasive species not currently ranked but present within the infested areas could be treated coinciding with the treatment of prioritized species. Additional NNIS may have invaded the Project Area since botanical surveys were conducted. If new NNIS species or new infestations of NNIS are found during project activities, they would be evaluated at that time and treated as necessary. A complete list of NNIS documented during botanical surveys of the Project Area can be found in the Project Record.

Cumulative Effects Analysis Boundary
The cumulative effects analysis (CEA) will consider similar vegetation management projects of twenty years past and ten years future. The timeframe was chosen because twenty years is roughly the timeframe that past ground disturbance activities would remain evident. Ten years in the future constitutes "reasonably foreseeable" in regards to timber sale planning within the project area. Attempting to predict further than ten years of activities becomes impractical. Therefore, the time span is twenty years in the past and ten years in the future.

The Roy Creek project area is part of a larger land management unit known as MA 4.2 which has been managed in the past and will foreseeable continue to be managed for similar vegetation projects (Figure 1). The spatial extent of this area covers 20,000 acres of land, of which the Roy Creek project area occupies about 14,064 acres, see below. This area will define the spatial extent of the CEA.

A variety of past, present, and future federal and non-federal actions occur within the Roy Creek Project boundary (Table 26).

For NNIS, the types of activities that are relevant to the proposed action include anything that increases or decreases the potential for NNIS abundance within the CEA. These activities include NNIS treatment, ground disturbing activities (e.g. timber activities) or activities that have the potential to exposes mineral soil (e.g. fire) making the land temporarily suitable for NNIS colonization. Human related vectors of seed dispersal (e.g. mowing, general traffic through vegetation) will also be considered as a part of cumulative effects. Past, present and future actions relevant to proposed NNIS treatment are discussed below.

Alternative 1 (No Action)

Direct and Indirect Effects
In the short term, deferring mechanical activity associated with timber harvesting and prescribed fire could result in slower or fewer invasions by NNIS than if mechanical treatments occurred,

since soil disruption is a major avenue for the introduction and spread of NNIS. Deferment of prescribe fire could also limit the short-term invasion potential of NNIS, as fire exposes mineral soil, suitable habitat for NNIS propagules. In the long-term, if current NNIS populations remain untreated, potential exists for their expansion throughout all areas within the CEA along maintained travel corridors.

In the absence of NNIS treatment, the Project Area would continue to be a source of NNIS spread as recreationists, wildlife, humans and their equipment travel from infested areas within the CEA to uninfested areas in the short- and long-term. These infestations will continue to spread causing a net increase in NNIS abundance within the CEA in the long-term, to which point the goal of NNIS reduction or elimination within the project area will no longer be as feasible.

This alternative would not help meet the desired future condition as described in the Forest Plan, or to achieve the Purpose and Need for Action as described in Chapter 1 of this document.

Cumulative Effects

Activities occurring over the past 20 years within stands of the CEA boundary, which manipulated the environment and have provided opportunities for NNIS spread, occur over approximately 7,500 acres. As no NNIS treatments have occurred within the CEA the irruption of NNIS within portions of these activity areas has contributed to the establishment of local seed banks within those activity areas and has resulted in greater seed production and dispersal throughout the CEA. There is an additional 800 acres within the CEA which has not been manipulated within the past 20 years and is planned for ground disturbing activities at some point in the next ten years. These activities will also contribute to NNIS establishment and dispersal. The result of which is reduced early successional community diversity. Right-of-way maintenance and gravel road grading has and will continue to occur throughout the timeframe considered in the CEA. The disturbance from travel corridor activities provides a continuous opportunity for NNIS to spread throughout the CEA.

No action is proposed in Alternative 1, and there would be no additional ground disturbing activities which could directly contribute to greater NNIS abundance within the CEA. While no NNIS control measures are proposed under this alternative, the Non-native Invasive Plant Control Project programmatic EA provides for the management of limited species which are highly invasive and/or management of invasive species within high priority areas. However, the NNIP EA will not provide for management of lower priority species (e.g. Category 4) in low priority areas (e.g. roadsides) (USDA Forest Service, 2008). Neglecting to control these lower priority species will indirectly contribute to their increasing abundance, especially along travel corridors, within the CEA. NNIS irruptions occurring within areas of past and planned activities will contribute to the seed bank and disperse locally. As stands mature those populations will be replaced by more competitive shade tolerant vegetation, although the seed bank will remain and could flourish again if a natural disturbance were to occur.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

The proposed treatment of NNIS with herbicides and mechanical methods is designed to achieve a reduction of NNIS. By killing individual NNIS plants, the abundance of NNIS within the CEA would be directly and indirectly impacted as there would be no production of NNIS new seed. Re-treating the areas for up to five years would temporarily prevent successful NNIS recruitment from the seed bank. After five years the seed bank would likely be reduced, although not fully exhausted.

Activities such as timber harvesting and prescribed fire increase the likelihood that NNIS propagules would be introduced or spread from existing centers of infestation. These activities expose mineral soil to a varying degree, and, therefore, provide temporary new habitat for NNIS to more easily colonize. However, the proposed NNIS treatments within and adjacent to these sites combined with design criteria that require equipment cleaning, prior to entering the project area, combine to minimize the likelihood of NNIS introductions caused by this project. Re-vegetating disturbed areas with either native or non-persistent non-native species would also decrease the possibility of NNIS invading a disturbed area. Mid-spring prescribed fires could also be useful in reducing the populations of spotted knapweed and increasing the presence of native warm season grasses ((MacDonald, 2007).

Alternative 2 would help to meet a desired future condition as described in the Forests' Plan, and respond to the Need and Objectives as described in Chapter 1 of this document.

Cumulative Effects

Past road maintenance, and to a lesser degree, past land use on all ownerships, have all contributed to the increase and spread of NNIS over the past twenty years. This includes the approximate area of 7,500 acres which has been managed by the US Forest Service. In addition to the area of past activities there are the 1,400 acres of currently planned activities and, under this alternative, nearly an additional 9,000 acres of proposed activities. Wherever mechanized equipment has been or will be involved in land management practices, inevitably, NNIS generally appear. Cleaning of this equipment and using the best management practices coupled with persistent and active monitoring, reduces the potential for NNIS introduction. NNIS management under Alternative 2 which facilitates treatments of all NNIS species listed in Appendix B, within the Roy Creek Project area, allows for greater control measures than is possible with the HMNF programmatic EA alone, which allows for early detection, rapid response management of only high priority invasive species wherever they may occur, and/or management of high priority areas. The extent of treatment possible under Alternative 2 would provide the greatest possibility for reduction of NNIS within the project area.

Past, present and future prescribed burns would stimulate the restoration of native plant communities and thereby increase the resistance of the areas to infestations of NNIS. Restoration of healthy, natural ecosystems would, in the long-term, reduce the spread of NNIS.

The proposed action of NNIS treatment within treatment areas would prevent or negate any increases in NNIS cause by proposed activities utilizing mechanized equipment and other

similar future projects within the CEA. When combined with past, present, and reasonably foreseeable future activities, Alternative 2 would likely achieve an objective of reduced NNIS coverage.

3.6 Transportation

Affected Environment

The benefits and risks associated with the forest transportation system are part of the character of the affected environment. The Forest Service is mandated to provide sustainable access in an environmentally responsible manner, to restore areas when roads are no longer needed, maintain the minimum road system needed for sustainable public and agency access, and to conduct the work in a fiscally responsible manner.

The primary goals and objectives of the Forest Plan are to: "maintain roads that meet health and safety, resource and administrative needs (Forest Plan II-3)". Roads also provide access to a variety of wildlife habitats, recreational opportunities, and access to private property.

The Forest transportation system provides many benefits associated with resource management and public use of the National Forests identified as:

- Access for recreationists – hunters, driving for pleasure, berry picking, and mushroom picking
- Access for private land inholdings
- Access special uses such as power lines, pipe lines, telephone, and mineral developments. Road use is limited to permit holders and inspectors only.
- Access for management – wildlife, watersheds and vegetation, fire suppression, other resources

The Forest transportation system provides many risks and problems identified as:

- Roads serve as introduction areas for non-native species
- Cowbird parasitism – roads in mature forests increase risk to songbirds
- Road noise may prevent wildlife from using habitats adjacent to roads and trails
- Direct effect on terrestrial wildlife – reduction in habitat
- Habitat fragmentation
- Roads may be a barrier to species movement
- Roads cause wildlife mortality due to vehicle/wildlife collisions
- Illegal human activities – poaching, trash dumping, off-road motor vehicle use
- User-created (unauthorized) roads that access lands closed to motor vehicles
- Increased potential for destructive wildfire in remote locations
- Increased access for timber theft

- High costs of maintaining a large road system
- Noise and disruption for those visitors seeking a more isolated experience

ID Team members visited and assessed all roads within the project area to gain a better understanding of the transportation system. Roads were determined to be closed based on the following criteria: 1) roads not needed for resource management access; 2) roads causing resource damage; 3) roads are in poor drivable condition and overgrown; 4) roads not needed to access private property or permitted special use activities; 5) roads not being used to access dispersed camping sites or other recreational activities such as hunting, bird viewing, berry picking and mushroom gathering 6) duplicate roads.

There are several designated types of roads within the project area. Definitions of common road terminology are located in Appendix F.

Arterial roads are roads that provide service to large land areas to form an integrated network of primary travel routes. They have been designed based on the demand for travel efficiency rather than resource management. Collector roads serve smaller land areas than arterial roads and they usually collect traffic from local roads onto arterial roads. Local roads serve the smallest land areas and are roads that connect terminal facilities with collector and arterial roads.

Forest Plan direction is to reduce the number of miles of roads, regardless of type, by emphasizing closures of roads determined to be non-essential. The Forest Plan also directs resource managers to maintain the minimum road system necessary to provide administrative and public access (Forest Plan II-3 and II-5).

Within the Roy Creek project area there are approximately 42.99 miles of Forest Service roads open to the public and approximately 7.79 miles of State and County roads for a total of 50.78 miles. State and County roads are maintained for motor vehicle access between communities and residences and serve as collector roads for Forest resource activities. The Forest roads are maintained to conduct resource management activities and serve as public access to Forest resources.

The overall average for all open roads with the project area is about 2.31 miles per square mile. The desired maximum road mileage for MA 4.2 is 2.0 miles per square mile for local roads, 1.0-2.0 miles per square mile for collector roads, and 3.0 miles per square mile for all roadway types (USDA Forest Service, 2006) (Table 11-13 page 11-40). Although the open road density of 2.31 for the project area falls within the Forest Plan guidelines of 2.0-3.0 miles/square mile, the roads proposed for closure and decommissioning have specific issues relating to resource damage, duplication, are not drivable, or have high maintenance costs.

Except for approximately 63 acres, Forest Service lands within project area are all located within ½ mile of an open system road. Unauthorized roadways are not part of the roadway system and consequently do not get incorporated into roadway density's.

All roadways show various signs of use; some are used more than others. Lightly-used roads are overgrown and hard to navigate, do not play a critical role in connecting arterial roads or collector roads, and do not serve the public to reach National Forest lands that are otherwise unreachable. A lightly-used road is illustrated in

Figure 22. Note the narrow clearance and the ground vegetation that that covers almost the entire road surface.

Figure 22: A lightly-used System Road (Forest Road 2432 east of intersection with Forest Road 4432)

Local roads within the project area are primarily native-surfaced roads with some roads improved to include crowning, drainage structures or ditches, and graveled surfaces. Many of the local roads are referred to as "two-tracks" with very little improvement other than an identifier sign. Unfortunately, trash is often dumped along open roads, particularly on roads adjacent to communities and subdivisions. An example of trash dumping on roads is illustrated in
Figure 23.

Figure 23: Examples of Trash Dumped along Forest Service Roads Slated to be closed in the Project Area

National Travel Management Rule
In 2005, the Forest Service published a final travel management regulation governing the use of OHV's and other motor vehicles on National Forest System lands. The final rule requires

national forests to designate roads, trails, and areas that are open to motor vehicle use. The rule prohibits motor vehicles off the designated system. Beginning in March 1, 2008, the Huron National Forest implemented the National Travel Management final rule by publishing a Motor Vehicle Use Map (MVUM). The MVUM is published annually and identifies forest roads open to public motor vehicle use. All roads not on the map (or not on the designated transportation system) are illegal to drive. Refer to the 2014 Huron National Forest Motor Vehicle Use Map in the project file. The roads analysis is based on this map.

Unclassified Roads

Unclassified roads are user-created roads, unplanned roads, abandoned travel ways, and off-road vehicle tracks that have not been designated and/or managed as part of the forests transportation system and are illegal to drive on with a motor vehicle. Unclassified roads inventoried for this project ranged from old timber sale haul roads that had been closed and re-opened by users or user-created roads for access to firewood, camping and hunting spots, or for off-road driving. There are approximately 21 miles of unclassified roads inventoried in the Roy Creek project area.

Unclassified roads cause resource damage. Motor vehicle use on unclassified roads causes an array of resource issues. Illegal ATV use is occurring on these roads as well. It has been well documented that unclassified roads, especially near communities, have higher amounts of household trash and building material dumping (
Figure 23), illegal tree cutting, soil compaction, vegetation loss, higher infestations of NNIS, and have a higher number of unattended burning campfires that contribute to an increase of wildfire ignitions. In many cases, unclassified roads become severely eroded and as a result, large amounts of soil wash into streams and drainages.

Unclassified roads cost the Forest Service thousands of dollars annually in garbage pickup, wildfire suppression, and soil restoration projects. To reduce this resource damage and the associated financial burden on the agency, unauthorized roads may be closed at any time. They are typically closed to public motor vehicle use through placement of berms or other type of barriers. Obliterating and rehabilitating unclassified roads would continue into the future.

This project area assessment has reviewed the Forest's inventory of unclassified roads in the Roy Creek project area and has proposed to physically close unclassified roads. There is also one unclassified road segment proposed to be reclassified and added to the Forest transportation system. These road reclassifications are described in Alternative 2.

Cumulative Effects Analysis Boundary

The cumulative effects analysis area for transportation resources will be defined as the project area. This geographic bound for cumulative effects analysis was chosen for similar road and transportation types where the mix of National Forest and private roads has an influence on transportation management across the landscape.

For the purpose of this analysis, cumulative effects will be bounded in time by a fifteen-year period. This period includes the past five years of transportation management activities and the reasonably foreseeable future ten years. This temporal boundary was chosen because

transportation management during this timeframe is closely associated with the timber management during this same timeframe.

Past, Present and Future Actions
The only transportation project that has been recently completed within this project area was the upgrade of Bissonette Road to resurface the road, widen the road shoulders and reshape the drainage ditches. See Table 26 for a list of past, present and future actions.

Other than routine maintenance, no other road maintenance projects are planned for the near future within this project area. Future temporary roads may be created for administrative use as a part of project implementation over the next decade; however temporary roads are closed within a year of project completion. Temporary roads related to proposed timber harvest activities are not included as part of this transportation system analysis. This is because temporary roads are closed after harvest is completed.

3.7.1 Predicted Attainment of Developing and Operating the Road System, Including all Bridges and Culverts, Maintaining the Minimum Standard Needed to Meet Requirements of the Proposed Actions, Protecting the Environment, and Providing for Reasonable and Safe Forest Access. (Objective 6)

Alternative 1 (No Action)

Direct and Indirect Effects
The direct effect of implementing Alternative 1 would result in no change in the existing forest road density. No roads would be added to the system nor would any roads be closed to vehicular use. No roads would be permanently decommissioned. The miles of system roads available for public motor vehicle use would not be affected. Forest Plan direction (USDA Forest Service, 2006)(page 11-5) to: "reduce the net miles of roads on the Forests by emphasizing the closures of roads determined to be non-essential for resource management" would not be met.

The indirect effects of implementing this alternative would be the continuance of illegal activities such trash dumping, illegally driving on non-system roadways, and firewood theft. In the short and long term open roads would continue to provide avenues for the introduction of non-native invasive species, a fact also noted in the Tawas-New Dawn Environmental Assessment (USDA Forest Service, 2012), wildlife habitat reduction, and mortality cause by animal and vehicle collision. Closures to reduce/prevent sediment from entering McDonald Creek would not happen. Hunters that prefer less interaction with motorized vehicles would continue to encounter motorized vehicles. Seldom-used roadways would continue grow in until use was not possible.

System roads would continue to be maintained as funding allows. This would consist of localized brushing and spot gravelling. The more heavily used roads (Maintenance Level 3 and 4) would receive most of the maintenance funding while Maintenance Level 2 roads would see little, if any maintenance.

Decommissioning of unclassified roads would continue.

Cumulative Effects
Implementation of Alternative 1 would reverse the trend of closing roads not needed for management activities and resource protection.

Alternative 2 (Proposed Action)

Direct and Indirect Effects
The direct effect of implementing the Proposed Action would be adding approximately 0.03 miles of road to the road system while closing approximately 6.0 miles of roads to motor vehicles. Of these 6.0 miles, approximately 4.2 miles would change maintenance levels (level 2 to level 1). Maintenance level 1 roads would still be available for foot travel and may be used for management activities at a later date. Proposed maintenance level changes are listed in Table 49. Approximately 1.7 miles of road would be decommissioned (obliterated). These roads are shown in **Table 50**.

Table 49: Roads Moved from Maintenance Level 2 to Maintenance Level 1

Road No.	From	To	Length/miles (approx.)	Reason
FR 2011	Bissonette	Kings Crn. Road	2.0	Overgrown, duplicate road within less than ½ mile, NNIS infestations along road
FR 4425	FR 4428	FR 4396	1.12	Overgrown road, NNIS infestations
FR 2432	FR 4396	FR 4121	1.1	Overgrown, NNIS infestations
Total			**~4.2**	

Table 50: Roads to be Decommissioned and Revegetated

Road No.	From	To	Length/miles (approx.)	Reason
FR 4425	FR 4424	FR 4428	1.08	Overgrown, NNIS infestations along roadway
FR 3429	MP 0.68	MP 0.90	0.22	Resource damage, sedimentation into creek, illegal ORV use, NNIS infestations
FR 2135	Kobs	End	0.35	Dead ends into critical endangered species habitat
Total			**~1.7**	

The new road density for all roads open to motor vehicle use would now be 2.04 miles per square mile, a reduction of about twelve percent. Motorized vehicular use of 0.03 miles of an unclassified road would change to maintenance level 2 and would be legal to drive. The entire project area (Forest Service lands only) would continue to be within 1/2 mile of an open road.

The indirect effects of decommissioning roads would be a reduction in NNIS infestation areas (most of the NNIS infestation occur along roadways see NNIS map Figure 8) or these roads serving as vectors of NNIS species such as spotted knapweed (see Objective 3). Closing a portion of FR3429 would also help reduce or prevent sediment from entering McDonald Creek (see Objective 5). Closure of these roads would displace a small number of hunters and dispersed campers. Other recreationists may have to walk further to reach their favorite berry picking or mushroom picking area. The decrease in open road densities would slightly increase the value of the area for those who prefer less interaction with motorized vehicles.

Cumulative Effects

Implementation of Alternative 2 would continue the trend of decommissioning roads determined to be non-essential for resource management and maintaining a transportation system that meets health and safety, resource and administrative needs (USDA Forest Service, 2006).

3.7 Recreation

Affected Environment

Interpretative signs have been placed at various locations within the project area. Several signs display information about management activities designed to create habitat for the endangered Kirtland's warbler. Another sign provides information about a historically significant site.

The Kirtland's warbler signs are located in areas the bird has ceased to use due to the habitat no longer being suitable for nesting purposes and display information about activities that are no longer taking place in that location. Some signs have deteriorated to the point where they are difficult to read. They do not portray up-to-date information to the visiting public.

Figure 24 displays an information sign in a location where the management activities no longer take place and portrays the wrong information to the visiting public.

Figure 24: Kirtland's Warbler Sign in a Location Where Habitat is Outdated

(The jack pine behind the sign has outgrown the size used by the Kirtland's warbler for nesting habitat.)

Figure 25 portrays a picture of the sign at the old CCC camp that is located near the intersection of King's Corner Road and Chambers Road. The sign is showing signs of weathering and is becoming difficult to read.

Figure 25: Sign at the Old CCC Camp Location

ROS

The Forest Service uses a classification system called the Recreation Opportunity Spectrum (ROS) to help describe differences in recreation settings, opportunities and experiences and to help guide management activities [ROS (Forests' Plan EIS, Chapter III, pages 271-275)]. Recreation settings vary from primitive - where there is little evidence of other people, and more opportunities for self-reliance - to more developed rural areas which offer more facilities, and better access and opportunities to interact with other recreationists. The ROS is used as a tool to describe the existing array of recreation settings and activities expected by recreation users.

The Roy Creek Project falls within the *Roaded Natural* ROS. The following table (Table 51) was adapted from the Forests' Plan discussion on ROS and displays relevant settings and activities for the *Roaded Natural* ROS class found within the Roy Creek Project Area.

Table 51: ROS Class, Setting and Activities and facilities of the Roy Creek Project Area

ROS Class	Setting	Activities and Facilities
Roaded Natural	• Opportunity to affiliate with other users in developed sites but with some chance for privacy. Self-reliance on outdoor skill of only moderate importance. Little challenge and risk. • Mostly naturally-appearing environment as viewed from trails and roads	• Access for people with disabilities is of only "moderate" challenge. • Rustic recreation facilities that use native materials (synthetic materials should not be evident)

	• Some obvious on-site controls of users. • Access and travel is conventional • Vegetative alterations done to maintain desired visual and recreational character	• Interpretation through simple wayside exhibits.

Quality recreation experiences are broadly defined by forest visitor's themselves and the activities they prefer to participate in. The National Visitor Use Monitoring (NVUM) is a nationwide Forest Service program that provides information on what activities recreationists prefer to participate in and their perception of their experience. The results of the Huron-Manistee National Forests last NVUM survey effort in 2012 revealed the Huron-Manistee receives approximately four million recreation visits a year.

The most popular recreation activities on the forests are; viewing natural features, viewing wildlife, hunting, fishing, hiking, and driving for pleasure. The Roaded Natural ROS setting encompasses most of the project area and provides abundant opportunities for the Forests' most popular activities.

The number of visitors who prefer dispersed recreation within the Roy Creek project area is considered average compared to other areas on the Huron National Forest.

Dispersed Recreation

Dispersed recreation is defined as those activities occurring outside of developed camping or concessionaire-operated facilities. Dispersed recreation activities are diverse and include activities such as driving for pleasure, hiking, hunting, fishing, boating, horseback riding and camping.

Dispersed recreation occurs at specific sites as well as across the project area. Dispersed recreation sites are small user-created areas in the general forest where evidence of activity occurs. Dispersed sites are not formally maintained by the Forest Service. They receive use on an intermittent or seasonal basis. Examples of dispersed sites include a camp spot or a fishing trail accessing a stream. There are an average number of dispersed sites within the project area. The Roy Creek project area is adjacent to the community of Glennie. There a large number of vacation and second homes surrounding them. This demographic tends to bring both local and non-local user groups to the project area for dispersed recreation.

Motorized recreation is a very popular dispersed activity across the forests as well. Driving for pleasure is a popular activity across the project area. There are about 17.8 miles of snowmobile trail. There are about 50.78 miles of road available for the public to drive within the project area. Approximately 42.99 miles are Forest roads and 7.79 miles are county roads. These are available for the public to drive and explore the forest.

Hunting is reported as one of the top recreational activities on the Huron-Manistee National Forest (Social and Economic Assessment for the Michigan National Forests, 2006, NVUM 2007). Hunting seasons start with squirrel, grouse and woodcock in mid-September. In

October, November and December, local and non-local white-tailed deer hunters dominate. Wild turkey hunting is mainly a spring activity. White-tailed deer hunting is the most popular type of hunting.

There are 1.8 miles of designated ATV trail within the project area. Illegal use does occur due to the proximity of the Bryant subdivision to the project area. ATV use is allowed on county roads; however there are less than five miles of county road within the project area. ATV's are not allowed on Forest Service roads which comprise approximately 90% of the area.

There are approximately 16 miles of snowmobile trail within the project area. There is a state trailhead locally referred to as the "Turkey Foot" just outside and adjacent to the project area boundary.

Developed Recreation and Recreation Facilities
There are no developed recreation sites or recreation facilities within the project area.

Recreation Special Uses:
There is a snowmobile shelter under special use permit within the project area located at the junction of State Trail 96 and Kobs road. This shelter is used primarily on the weekends and use is dependent on snow conditions.

Cumulative Effects Analysis Boundary
The spatial bounds for analysis include the Management Area (MA) that comprise the project area boundaries (refer to the project record for Recreation Cumulative Effects Analysis Area). This geographic bound was chosen because it reflects a contiguous area of like management, and similar Forests' Plan standards and guidelines.

The temporal bounds of analysis will be defined as currently (2015) to ten years into the future (2025). Ten years was chosen as the future bounds because recreation trends and types change approximately every decade. Ten years is also the planning lifespan of this document.

Past, Present, and Future Actions
A portion of Bissonette Road, which forms most of the southern boundary of the project area, has been resurfaced in the past five years.

In the past interpretative signs have been placed at various location within the project area to provide forest visitors with information about ongoing management activities and at sites of historic interest. Presently, there are several informational signs within the project area. No sign placement or relocation is planned in the future (other than what is proposed in this document).

A portion of FR 3429 is allowing sediment to enter Roy Creek. The road is also being used as an illegal ATV/ORV trail. ATV and ORV's are crossing the creek causing degradation to water quality and eroding stream banks (see Figure 4).

Alternative 1 (No Action)

Direct and Indirect Effects
ROS:
Recreationists choose settings and activities to create desired experiences. The Forests' Plan has designated this ROS setting based upon current condition at the time the plan was written. Since there would be no change or management of the landscape under the No Action Alternative, there would be no change in ROS in the short or long term.

Dispersed Recreation:
There would be no direct effects in dispersed recreation opportunities as a result of implementing the No Action alternative. Over the longer term (5-10 years), indirect effects would be that hunting opportunities would shift across the landscape and tend towards later successional species. Those hunters preferring early-successional species would need to look outside of the project area where harvest activities were manipulating vegetation to earlier stages of succession.

The No Action Alternative would have no direct or indirect effects to driving for pleasure. The public would have the same number of miles of open legal road to drive as they do now. The Forest Service practice of closing/obliterating unclassified roads would still occur to protect and abate resource damage.

Developed Recreation and Recreation Facilities
The No Action Alternative would have no direct or indirect effects on Developed Recreation or Recreation Facilities since none are present within the project area.

Recreation Special Uses
The No Action Alternative is not expected to create any direct or indirect effects to special use recreation events in the area.

Cumulative Effects
Since there are no direct or indirect effects, there would be no cumulative effects on the ROS, Developed Recreation or Recreation Special Uses. Cumulative effects on dispersed recreation would be that since forest age classes would shift into older, mature age classes, there would be a decline in hunting species associated with early successional habitat.

Alternative 2 (Proposed Action)

Direct and Indirect Effects
ROS:
In the short term (3-5 years), Alternative 2 would maintain the present Recreation Opportunity Spectrum classes.

Proposed activities may have an effect on what recreationists choose to participate in and when. Timber harvest and prescribed burning would have the potential to temporarily reduce the

feeling of seclusion in the short term. In addition, sense of place may be upset for recreationists preferring a quieter setting in the short term. Harvested areas would appear manipulated rather than naturally-appearing, especially along roads and trails. Vegetative alterations would be done to maintain desired recreational characteristics. For example, fuel breaks would have scalloped edges alongside roads and trails.

Dispersed Recreation:
In the immediate short term while timber harvesting and prescribed burning took place, hunters and forest users may be displaced from traditionally used areas. Treated stands would almost immediately present new ground vegetation and as a result, increasing the likelihood for use by early-successional wildlife species. For five to ten years in the future, this new vegetation age class would produce better hunting opportunities for those commonly hunted early species such as white-tailed deer, rabbit and ruffed grouse. The increase in nutrients in the soil after a prescribed burn would increase blueberry production and picking opportunities in the short term.

Pleasure drivers may encounter harvest equipment and trucks in active logging areas. This may deter some drivers from those areas until harvest is complete, while others may be curious about the activity. During times when harvest is not taking place, drivers would encounter wider roads due to brushing and maintenance. When harvest is complete, vegetation would grow back along the sides of the roads and regular road maintenance would resume.

Direct effects of prescribed fire treatments would be that it would produce heat, smoke and ash. This may be unappealing to forest visitors in the immediate term. Signage would be placed along trails and roads to warn visitors of the prescribed burn. Indirect effects of prescribed burning would result in less understory vegetation. This may displace hunters who prefer to hunt species that prefer thicker understory such as rabbit or ruffed grouse.

There are a total of approximately 21 miles of unclassified roads within the project area. Closing unclassified roads would have no effect on pleasure drivers since these roads are already closed to public vehicle traffic. Closing these roads may affect those hikers and hunters who prefer to walk linear features rather than cross country when accessing the forest on foot.

The Roy Creek project area has a high number of miles of open roads within its boundaries (50.78 miles). Alternative 2 proposes to close about 6.0 miles of open roads. Closing these roads to motor vehicle use (see
Table 49 and **Table 50**) would result in the direct effect of 12 percent fewer roads being available for driving pleasure. Those who use the specific roads slated for closure may feel there are fewer opportunities for vehicle access to the forest. It should be noted that many of the roads proposed for closure are overgrown and damage to vehicles traveling on them is likely. An indirect effect of closing roads would be larger tracts of undisturbed land for other recreational pursuits.

Developed Recreation
Investing in recreation resources places an importance on recreation as a legitimate use of Forest Service lands. It also communicates to the public that the Forest Service cares for its

recreation resources and visitors who use them. Maintained facilities encourage positive attitudes from recreationists towards managers as well and an often time manifests itself in a stronger sense of place.

Users of the snowmobile trail in the short term would be aware of harvesting and chipping equipment adjacent to the trail system. Portions of the trail would be crossed by this equipment and since harvest activities may occur throughout the year, there is the strong possibility that trail users would encounter equipment crossing the trail. (The trail is a dual use trail with both motor vehicle and snowmobile use allowed. Use by motor vehicles is not allowed during the snowmobile season – December 1 to March 31.) Harvesting adjacent to the snowmobile trail would make the trail appear larger and increase sight distances. With increased sight distance, riders may increase their speed or drive off trail. This would occur until new vegetation established itself in 5-10 years.

Recreation Facilities:
Alternative 2 would have no effect on recreation facilities since there are none in the project area.

Recreation Special Uses:
Harvesting may disrupt snowmobile shelter users experience and produce noise in the short term.

Cumulative Effects
Recreation and tourism pressures are expected to continue to increase with greater numbers of people looking to use public lands for a variety of leisure activities. Cumulatively, the proposed management activities within the analysis area would shift recreation uses across the landscape. No adverse cumulative effects are expected from past, proposed, or reasonably foreseeable future management activities, as the existing array of recreation opportunities would not change within the analysis area. Recreation users would continue to find similar opportunities in the future that have existed in the area in the past.

3.7.1 Predicted Attainment of Installing or Replacing Current Interpretive Signs and Placing in Appropriate Locations. (Objective 7)

Alternative 1 (No Action)

Direct and Indirect Effects
The direct effect of implementing the No Action alternative would result in signs that display information about management activities designed to aid in the recovery of the Kirtland's warbler continuing to be located in areas where those management activities no longer take place. Visitors to the area would continue to read information about the warbler in incorrect locations. The sign at the old CCC camp would not be replaced and would continue to deteriorate, eventually becoming unreadable.

Cumulative Effects
A cumulative effect would be that visitors to the area would not receive information about the CCC site and its significance in early management of the forest. Forest visitors would not

receive accurate interpretive information regarding Kirtland's warbler habitat management at the locations where signs exist and the habitat is no longer utilized.

Alternative 2 (Proposed Action)

Direct and Indirect Effects
The direct effect of implementing this alternative would result signs that display information about management activities designed to aid in the recovery of the Kirtland's warbler being be moved to locations where those activities are taking place. Visitors to the area would receive correct information about recovery activities. The sign at the old CCC camp would be replaced. Visitors to the area would receive information about the site and its significance in early management of the forest. Over the long term an indirect impact may be that this would lead to an increased respect for resources.

Cumulative Effects
Visitors to the forest would continue to receive up-to-date information about forest management activities. Forest Plan direction (USDA Forest Service, 2006) to: "use a combination of personal contacts, brochures, maps and informational signing to inform and educate users about forest management" would be met.

3.8 Cultural Resources

Affected Environment
Cultural resource surveys were conducted in the Roy Creek Project area by an archaeologist and heritage resource technicians. A report was completed for this project and submitted to the State Historic Preservation Officer (SHPO), for concurrence which was received on April 9, 2015. This project complies with the National Historic Preservation Act of 1966, as amended, Executive Order 1153, 36 CFR 800.4 regulations and Forest Service Manual direction.

Cumulative Effects Analysis Boundary
The Cultural Resource cumulative effects analysis area includes all public and private lands, and waterways contained within the boundary of the Roy Creek Project. Cumulative effects of project actions may affect one or more aspects of a particular historic property's integrity.

Alternative 1 (No Action)

Direct and Indirect Effects
Indirect effects of the No Action alternative may include benign neglect to cultural resources.

Cumulative Effects
There would be no cumulative effects associated with the no action alternative.

Alternative 2 (Proposed Action)

Direct, Indirect and Cumulative Effects

With design criteria, there would be no direct, indirect or cumulative effects on cultural resources. Any activities would be suspended if any heritage resources are discovered during implementation and would resume pending further investigation by an archaeologist.

3.9 Water, Air, and Soil Resources

Affected Environment

Chapter 3 pages III-1 through III-30 of the Final Environmental Impact Statement for the Forest Plan (USDA Forest Service, 2006) details the affected environment of soil, water, and air resources across the Huron-Manistee National Forests including the area proposed for treatment in the action alternative. A more detailed discussion of the affected environment for each resource occurs in their respective sections.

Cumulative Effects Analysis Boundary

An explanation of the cumulative effects analysis boundary for each resource is found in their respective sections.

Past, Present, and Future Actions

Table 26 displays the past, present, and future actions in the project area. Road maintenance, trail maintenance (ORV and snowmobile), opening and fuelbreak maintenance, Stout/Snowbird Timber Sale (2015), firewood cutting, and prescribed burning are the primary federal projects occurring within the project are during the cumulative effects timeframes listed above.

Non-federal activities include maintenance and reconstruction of utility lines, road maintenance, possible timber harvest, and potential residential or agricultural development on private lands.

Soil Resources

Affected Environment

The affected environment for soil resources for Alternative 2 is the specific project area for each alternative. The soils in the treatment area are typical of the dominant soil types across the Huron National Forest, which largely owe their sandy character to the preponderance of meltwater during late-glacial time. The three most common soil types in areas proposed for action are classified as Grayling (92%), Graycalm (1%) and Typic Udispamments (2.5%). These soils occur on moraines, outwash plains, terraces, and former lake plains (NRCS, 1998) and occur on flat or gently rolling terrain. The remainder of the soils in the project area (< 5%) occur in low depressions, former glacial drainage channels, and to a very minor extent, floodplains.

The vast majority of soils in the treatment areas are excessively drained and somewhat excessively drained, with very deep water tables. They have little to no flooding potential, and surface runoff is negligible to low even on steeper slopes (NRCS, 1998) and (NRCS, 2002).

Given the sandy and nutrient poor character of soils in the project area, the main soil management concerns associated with the proposed actions is related to erosion and biomass removal. Additional minor concerns could include nutrient loss from tree harvesting, disruption of local hydrologic budgets by mechanical compaction and/or vegetation removal, and sedimentation in riparian zones.

Grayling, Graycalm, and Typic Udipsamments soils are easily permeable and well drained and do not retain nutrients long enough to be amassed in any appreciable amounts. These soils are rated by NRCS as possessing an erosion hazard of slight to moderately susceptible to water erosion. Slopes greater than 30 percent have an NRCS erosion hazard rating as severely susceptible to water erosion. In all cases these soils are severely susceptible to wind erosion.

Cumulative Effects Analysis Boundary
The cumulative effects analysis area for soil resources is the specific projects sites for each alternative, (Figure 5,
Figure 6, and

Figure 7). Management impacts to soils do not typically have an impact to any other surrounding areas that are not being treated (USDA Forest Service, 2006). The temporal boundary is three years for the cumulative effects analysis, as this is the time it has taken for re-vegetation and leaf litter deposition to accumulate on the Forest.

Alternative 1 (No Action)

Direct and Indirect Effects
Without implementation of the proposed action, the affected environment described in this section would persist. Since no earth disturbing activities are proposed in this alternative, it presents the least risk to potential sedimentation, compaction, erosion or nutrient loss. However if forest roads are not properly maintained within these watersheds, the chance of erosion and sedimentation from these roads could increase.

Cumulative Effects
Erosion of the stream bank as depicted in Figure 4 would continue, allowing sediment to enter Roy Creek.

Alternative 2 (Proposed Action)

Direct and Indirect Effects
Implementation of any proposed action would follow The State of Michigan's Best Management Practices to help minimize compaction and erosion due to harvest activities (MDEQ, 2009), (USDA Forest Service, 2012a).

Erosion
Implementation of any proposed action would follow the State of Michigan's Best Management Practices to help minimize compaction and erosion due to harvest activities (MDEQ, 2009).

Moderate soil erosion can be expected on steeper slopes if ground is not frozen or snow covered and would be mitigated by limiting use of skid trails on slopes greater than 30 percent. Where needed, approximately 7.5 miles of temporary roads would be utilized to access harvest units not accessible by forest service roads or pre-existing travel routes that were closed after past timber harvesting activities.

Temporary roads, skid trails, and landings and clearcuts as well as control lines for prescribed burning are the primary sites where vegetation removal and soil disturbance could be significant to produce erosion of bare soil. All temporary roads and landings would be physically closed (gates, slash, stumps, berms, etc.), signed as such, seeded were appropriate, and erosion control feature constructed to ensure recovery of those impacted sites. Standard road and landing design with erosion control features such as waterbars, placement of slash and organic material, and/or seeding would be implemented to stabilize and revegetate these sites. Control lines for prescribed burns would utilize the existing road system whenever possible to minimize potential erosion. Control lines that cause soil disturbance would be closed in the same manner as temporary roads.

Sedimentation
On the Huron-Manistee National Forest, vegetation management activities typically do not occur within riparian management zones. Ephemeral draws would not be used as skid trails, nor would heavy equipment be used within riparian management zones. As such, it is not expected that any sedimentation would occur in nearby surface water systems.

Compaction
Soil compaction would occur to some degree, particularly along skid trails, landings and prescribed burning control lines. However, on such sandy soils, it is believed that compaction presents only a short term (1-5 years) effect on soil productivity (Page-Dumroese, 2006). After 10 years, compaction on sandy soils is generally not measureable (Voldseth, 2011).

Fire and Nutrients
Effects from fire on soil nutrients are dependent on the fire intensity and homogeneity, as well as inherent soil nutrient availability at the site. Low-to-moderate intensity prescribed burns would be used. Flame lengths would be generally less than four feet and in most areas would be less than two feet. Brown and Davis (Brown, 1973) state: "the heat generated by the prescribed burns would be insufficient to destroy organic matter."

Prescribed burning would not affect storm runoff, sediment concentrations, or export sediment from watersheds, nor would it increase the concentration of nitrogen (N), phosphorous (P), calcium (Ca), magnesium (Mg), or potassium (K) in the water of ephemeral streams (Dickmann, 1993). However, there would be a short-term transfer of phosphorus, potassium, calcium, magnesium, and nitrogen from the litter to the soil (Pyne, 1996).

The nitrogen content of mineral soil would not be reduced by prescribed burning. Total phosphorous would be reduced in the forest floor but would be in increased availability in the top several inches of the mineral soil. Calcium would also transfer from the forest floor to the mineral soil. Although the total nitrogen capital of the prescribed burned areas might be reduced, available nitrogen would increase along with nitrogen fixation (Martin, 1978). Most of the nitrogen that would be lost was already used by plants or that was, as litter, unavailable; in either case, the loss would not affect the ability of the system to recover quickly. Moreover, if lost in one form, nitrogen might become more abundant in other forms. The concentrations of ammonium and nitrate generally increase after fire (Pyne, 1996).

Prescribed burning would have no deleterious effects on organic matter or N in surface mineral soil; beneficial effects would be increased availability of P and Ca. Nutrients and organic matter would shift from the forest floor to the mineral soil. Decomposition processes concentrate N in the lower layers of the forest floor. The high moisture content here prevents combustion of the organic matter.

A steep moisture gradient between the surface of the forest floor and the mineral soil tends to restrict combustion to the surface of the litter layer; usually less than one-third of the forest floor mass is consumed (Dickmann, 1993). The higher pH due to the release of mineral bases in the soluble ash would provide a more favorable soil environment for free-living, nitrogen-fixing bacteria, and thus result in a long-term net increase in soil nitrogen (Spurr, 1973).

Most studies show an increase in available plant nutrients following burning (Brown, 1973). Most of the nutrients would remain on site after the prescribed burn. They would be held by plant roots, microorganisms, and the soil (Martin, 1978). Soil fertility would also increase (Armson, 1977). Soil acidity might decrease but most trees do not seem to be significantly affected by the change in soil acidity brought about by fire. This change might be enough to stimulate nitrification and growth of subordinate vegetation (Brown, 1973).

Generally, immediately following a fire, there is a flush of nutrients from the consumed organic layer. Post-fire, in jack pine plantations, the nitrogen pool in the litter decreases annually for the first 14 years. Only beyond 14 years does the organic layer accumulate enough nitrogen to be percolated into the soil. (Yermakov, 2006).

Pyne (Pyne S. J., 1997) has found: "in many environments fire is the most effective form of decomposition, the dominant selective force for determining the relative distribution of certain species, and the means of effective nutrient recycling and even the recycling of whole communities. A biota's nutrients are stored in various portions of its systems – in the soil, in the stand vegetative cover, and in the mobile layer of dead organic matter called litter and duff. The geologic production of new chemicals proceeds too slowly to satisfy the needs of biological communities, and some of what new organisms require has a biochemical rather that a geochemical origin. They must come primarily from the mobile layer of litter, and it is this layer that is affected by fire"

Low-intensity prescribed burning would burn light surface fuels and most likely not expose mineral soil causing soil displacement. Pile burning does expose bare soil, burned at high intensity and nutrient loss is expected at these sites. However these sites are typically less than a 1/10 acre and would not be burned on a landscape scale.

Cumulative Effects

Short-term effects would be expected to occur after harvest and during the first growing season or the time it takes the exposed soil to become stabilized and re-vegetated. Long-term effects could be expected in subsequent growing seasons, where skid trails caused soil erosion or compaction on steeper slopes. These skid trails may take several years to stabilize and reclaim to preexisting conditions. Heavy truck traffic over temporary roads would redistribute some fines with wind and water erosion at negligible amounts for extremely localized distances during the harvest periods.

Due to the generally flat topography, well-drained soils, and low-to-moderate erosion hazard of soils there is not expected to be any measurable cumulative impact to soil resources within the project area or the watershed as a whole.

Biomass removal from timber harvest would occur primarily in the form of thinning overstocked red pine plantations or clearcutting. Biomass would be regenerated through natural (fire) processes and/or re-planting. These harvests are in timber which is of the appropriate rotation age and would retain adequate stocking. "Management impacts on soil productivity are generally restricted to the specific site where the treatment occurs. Activities on National Forest

System lands are not expected to have measurable impacts on other lands nor are activities on adjacent lands of other ownership expected to have measurable impacts to the soils on the Huron-Manistee National Forests" (USDA Forest Service, 2006).

Closure of user-created motorized vehicle routes would not cause additional soil resource damage as these areas are already disturbed. However, the closure of these sites would improve the soil resource through elimination of vehicular traffic and reforestation. Sites that are closed would have a beneficial impact to the soil resource on those specific sites.

Closure and reforestation of areas with illegal motorized use would have a minor beneficial cumulative impact by eliminating the continued expansion of illegal motorized routes within the closure area.

3.9.1 Predicted Attainment of Rehabilitating User-Created Resource Damage (Objective 5)

Water Resources

Affected Environment

The affected environment for water resources is Wallace, Vandercook, Roy, and Bryant Creeks within the project boundary. Water quality for both Alcona and Iosco Counties is rated "good" by the EPA (Sperlings Best Places - Alcona County, 2014) and (Sperlings Best Places - Iosco County, 2014). On a scale of 1-100 Alcona Country is rated at 60 while Iosco County is rated at 80. The average for the United States is 55. (The higher the ratings number the better the water quality.)

Several of the proposed timber treatments have intermittent streams or wet areas adjacent or in the cutting units. None of the treatment sites have perennial streams within or immediately adjacent to them. The projects intermittent streams are entrenched into sandy glacial outwash and moraines and are low gradient streams. The low gradient stream systems have low stream power and are not generally capable of transporting sediment any appreciable distance. Sedimentation is minimal due to well drained soils, low intermittent stream power, and generally flat or gently sloping terrain. Once sediment is introduced into the system it takes a relatively long time for it to move down stream due to the soil and terrain features described.

Cumulative Effects Analysis Boundary

The cumulative effects area for water resources encompasses the 6th level watershed boundaries that lie within and outside the project area. These boundaries were chosen because this watershed size would provide the most comprehensive boundary when analyzing the effects to water quality from timber harvesting within similar landform characteristics. The temporal boundary is within five years after completion of an activity. It is reasonable to expect that project effects would occur within this area and that disturbed areas would stabilize during this timeframe.

Alternative 1 (No Action)

Direct and Indirect Effects
Without implementation of the proposed action, the affected environment described in this section would persist. Since no earth disturbing activities are proposed in this alternative, it presents the least risk to potential sedimentation. However if forest roads are not properly maintained within these watersheds, the chance of erosion and sedimentation from these roads could increase.

Under the No Action Alternative no erosion control work would be performed on FR 3429 where the old road bed crosses McDonald Creek. Sediment would continue to enter the creek causing a slight degradation of water quality. Continued crossing of the creek by off-road vehicles would continue to expand the existing eroded area.

Cumulative Effects
There are no management activities from this alternative; therefore there would be no cumulative effects.

Alternative 2 (Proposed Action)

Direct and Indirect Effects
Most of the sites proposed for treatment have a low NRCS soil erosion hazard rating due to flat topography and excessively drained course sandy soils. There are areas with finer bands of sand, but they are still considered somewhat excessively drained. A few sites have rolling topography with slope ≤ 30 percent. When feasible, areas with slope are delineated and excluded during timber sale layout. According to NRCS, the finer sands and sloped areas have a moderate soil erosion hazard rating. These sites would be harvested in late fall and winter when the ground may be frozen or snow covered to mitigate sedimentation into intermittent streams. This alternative does not involve crossing any streams.

The State of Michigan's Best Management Practices would also help eliminate impact to the intermittent stream water resource within the project area. Specific Streamside Management Zone (SMZ) guidelines would be used where intermittent streams or water bodies occur. Typically a minimum of a 100 foot buffer is used along these streams. Neither harvesting nor mechanized equipment would not be allowed within the buffered streams and sediment transport into perennial streams system is not likely. Short term effects would be expected to occur during the first growing season or the time it takes the exposed soil to become stabilized and re-vegetated. Long-term effects could be expected in subsequent growing seasons, where skid trails caused soil erosion on steeper slopes. These skid trails may take several years to stabilize and reclaim to preexisting conditions. Due to the generally flat topography, well drained soils, low to moderate erosion hazard of soils, and timber harvest conducted during periods of frozen soils, measurable impact to water resources within the project area is not expected.

Road reconstruction and maintenance including temporary roads, skid trails, landings and fire plow lines tend to increase the chance for sedimentation to occur in the short term due to removal of vegetation and earth disturbance. However, initial disturbances usually tend to stabilize after one growing season. Standard road and landing design with erosion control

features such as waterbars, placement of slash and organic material, and seeding would be implemented to stabilize and revegetate these sites.

All temporary roads and landings would be physically closed (gates, slash, stumps, berms, etc.), signed as such, seeded where appropriate, and erosion control feature constructed to ensure recovery of those impacted sites. Obliteration is required within one year after the temporary road is no longer needed for management activities.

The erosion control work and road closure proposed for a portion of Forest Road 3429 would greatly reduce or eliminate sediment from entering Roy Creek. The rehabilitation of the creek crossing would provide protection and rebuild the bank where it has washed into the creek. This would further reduce or eliminate sediment from entering the creek.
Water temperature would not be affected by implementing this alternative since there would not be enough canopy removal along any of the streams in the project area to cause such an effect.

Cumulative Effects
An increase in open forested conditions created by two clearcuts, early successional habitat creation, along with road reconstruction and maintenance in the past, present, and future may increase the possibility of short-term sedimentation. However, in the long term the acres proposed for treatment are small relative to watershed size and no cumulative impacts are expected.

Air Resources

Affected Environment
The affected environment for air resources is Iosco and Alcona Counties. Air quality is generally good for both counties with the Air Quality Index (AQI) for Alcona County at 37 and 38 for Iosco County (usa.com - Alcona County, 2014) and (usa.com - Iosco County , 2014). (An AQI of 50 or less is considered good.) Neither county is in a non-attainment status for any of the criteria pollutants and in both counties the criteria pollutants levels are far below National Ambient Air Quality Standards (epa.gov, 2014).

Table 52 displays the various air quality parameters from 2009 (latest year data is available) against the Michigan and US averages. With the exception of two criteria pollutants (NO2 and PM10) both counties are at or below State of Michigan and US averages. The trend from 1999 to 2009 has general been downward for the listed parameters (usa.com - Alcona County, 2014) and (usa.com - Iosco County , 2014).

Table 52: Criteria Pollutant Levels for Alcona and Iosco Counties; State of Michigan and USA Average

Criteria Pollutants (from EPA)									
Area	AQI	TSP (µg/Meter³)	CO (ppm)	SO2 (ppm)	NO2 (ppm)	Ozone (ppm)	PM10 (µg/Meter³)	PM2.5 (µg/Meter³)	Lead (µg/Meter³)
Alcona Co.	37	19.5	0.28	0.002	0.0125	0.0433	20	8.1	0.0128
Iosco Co.	38	19.5	0.29	0.002	0.0125	0.045	20	8.1	0.0128
Michigan Average	38	28.3	0.31	0.0023	0.0118	0.0453	15.8	8.9	0.225
US Average	38	39.2	0.34	0.0022	0.0091	0.0447	18.9	9.5	0.158

Cumulative Effects Analysis Boundary
The cumulative effects airshed boundary for this project is the State of Michigan as this is the level at which smoke emissions are regulated. Currently there are no non-attainment areas within Michigan for PM2.5 or PM10. Class I air sheds within Michigan are: Isle Royale National Park with a distance of approximately 350 air miles from the project area, and Seney Wilderness Area of the Seney Wildlife Refuge is approximately150 air miles. Both Class 1 air sheds are in a northwesterly direction from the project area, and not likely to be affected due to the distance from the project area and prevalent wind direction commonly used on prescribed burns.

This analysis will only consider impacts for the week after prescribed burning is conducted. The majority of emissions would occur within the first 4 to 8 hours of the prescribed burn being initiated. Residual smoldering, with small amounts of smoke production would continue for several days afterward in 100-hour and 1000-hour fuel sizes. Smoke produced from the prescribed burn and then residual smoldering would disperse quickly.

Alternative 1 (No Action)

Direct and Indirect Effects
Air resources are analyzed at the State wide level for State of Michigan, as regulated by the Department of Environmental Quality. There would be no direct or indirect effects on air resources from this alternative as no smoke and associated emissions would be created.

Cumulative Effects
Based on limited to no direct or indirect effects to the air resource, there is no potential for a cumulative effect to the air resource from this alternative.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

The project area is not within any Nonattainment area for any measured pollutant (EPA, 2010). This alternative would generate short-term vehicle emissions from mechanical timber harvest and associated activities. Prescribed burning would generate primarily short-term smoke emissions. All of the exhaust, smoke, and dust from this alternative would disperse quickly and have no effect on any measured air quality parameter in the State Implementation Plan.

Prescribed burning prescriptions are designed with atmospheric lift and wind direction criteria to ensure the proper lift and direction of dispersal of smoke. It is expected that smoke from the prescribed burns could impact roads, commercial and residential areas downwind causing visibility reduction and very short-term local air quality reduction. The duration of this impact would be from a few minutes to as long as 12-18 hours in areas that smoke may settle overnight. Smoke impacts would be monitored both by ground and air patrol (if available) in order to identify any roadways were visibility may be compromised. Signage and emergency vehicles would be used to warn motorists to slow down along sections of roadways if visibility is greatly reduced. The activities proposed in the action alternative are similar to management actions undertaken for nearly the entire 100+ year history of the Huron National Forest and have not contributed to the area in question being designated as a Nonattainment area. Smoke from prescribed burning could cause short-term visibility reduction and be an irritant to some people during the prescribed burn, especially people with compromised breathing. The effects would last for minutes to a few hours on the day of the prescribed burns. When prescribed burns are implemented people may be inconvenienced and chose to temporarily leave the area.

Smoke emissions do contain greenhouse gases such as carbon dioxide and nitrogen oxides. Based on analysis of natural and expected fire return intervals, the release of these gasses is very likely within the next 60 years in the no action alternative. Alternative 2 would release these gasses within the next 10 years and possibly sequester a small amount of biomass due to timber harvest and long-term use of wood products. Harvest of small-diameter jack pine would not sequester greenhouse gasses as this material would likely be burned in local electrical generation stations. This alternative does not change the amount of carbon or nitrogen in the system, it only changes the timing of when it moves from one storage stage (air, water, soil, biomass) to the next. The burning of fossil fuels to implement the action alternative would add small amounts of carbon and nitrogen and other greenhouse gases to the atmosphere from burning of fossil fuels which naturally would be sequestered geologically. It is not predicted that the action alternative would have any significant impact to the air resource.

All prescribed burning activities would follow the current Michigan Smoke Management plan regulations at the time of the ignitions, to ensure that air quality is maintained.

Cumulative Effects

Based on limited to no direct or indirect effects to the air resource, there is no potential for a cumulative effect to the air resource from this alternative.

3.10 Socio-Economic Assessment

This section analyzes the social and economic impacts and issues related to the production of timber products (Objective 1) and the reduction of fuels to protect property (Objective 2).

Affected Environment

Chapter 3 of the Final Environmental Impact Statement for the Forest Plan (USDA Forest Service, 2006) details the social environment of the Huron National Forest (HNF) in terms of populations, demographics and uses of the Forest. The affected environment for production of timber products (Objective 1, Produce a diverse mix of timber products) includes Alcona and Iosco Counties, Michigan.

Local Economics

The seasonally adjusted unemployment rate in Michigan in December 2014 was 6.4%. The Alcona County unemployment rate in December 2014 was 8.4% while the unemployment rate for Iosco County was 7.7% (Bureau of Labor Statistics - Alcona County, 2014), (Bureau of Labor Statistics - Iosco County, 2014), and (Bureau of Labor Statistics - State of Michigan, 2014).

Alcona and Iosco Counties are among the least populated counties in all of Lower Michigan with 10,454 and 25,420 residents respectively according to the 2014 Census Estimate. (In 2010, Alcona County had a population of 10,942 while the; the 2010 population of Iosco County was 25,887 (usa.com - Iosco County, 2014) and (usa.com - Alcona County, 2014)). The median household income for Alcona County for the 2009-2013 timeframe was $37,169; while the median household income for Iosco County was $36,236. Both counties lag behind the state average of $48,411 and the national average of $53,046 (U.S. Census Bureau - Alcona County, 2014) and (U.S. Census Bureau - Alcona County, 2014).

Because of the relatively low median income in both counties, the median property value of owner-occupied housing (2009-2013 timeframe) in Alcona County is $102,800 and $90,300 in Iosco County. However, the Michigan average is $121,700 (U.S. Census Bureau - Alcona County, 2014) and (U.S. Census Bureau - Iosco County, 2014). Hazardous fuels reduction is meant to protect life and property. This analysis will make no attempt to assign a dollar value to life or the value of property.

The majority of the population in both counties lives along the US-23 corridor and in the cities of Tawas City, East Tawas, Oscoda, Harrisville, and Lincoln. Both counties experience a large influx of seasonal residents and weekend tourists especially during the summer months. Many of the local businesses cater to tourists and seasonal residents' needs. Alcona and Iosco Counties are bordered on the east by the second largest Great Lake, Lake Huron. Ninety five (95) % of the property along the Lake Huron's shoreline is privately owned. The county seat is Tawas City for Iosco County and Harrisville for Alcona County.

Educational, health and social services account for about 24.7% of the employment in Iosco County while retail trade accounts for about 14.6%, manufacturing approximately 12.5%, and the arts, entertainment, recreation, accommodation and food services about 10.4% Agriculture, Forestry, Fishing, Hunting, Mining account for about 1.2% (usa.com - Iosco County, 2014). In Alcona County educational, health and social services account for approximately 21.2% of the jobs, with the retail trade counting for about 13.8%, and manufacturing about 13.5%, Agriculture, Forestry, Fishing, Hunting, Mining account for about 4.5% (usa.com - Alcona

County, 2014). Both counties are dependent on agriculture, forestry, manufacturing, and retail trade for their economic livelihood and have approximately 50% public ownership in U.S. Forest Service and State of Michigan forest lands.

The Michigan Department of Labor and Growth predicts statewide employment in the agriculture, forestry, and fishing category to remain almost unchanged but decline somewhat in Northeast Lower Michigan (Michigan Department of Labor and Growth - Northeast Lower Michigan, 2014) and (Michigan Department of Labor and Growth - East Central Michigan, 2014). This component of the Alcona and Iosco County economic picture is larger than the state and national averages, but is still a small component of the overall local economy, contributing just less than 5% of the employment. However, some manufacturing jobs in the area are also related to the forestry and wood products industry.

The Northeast Michigan Comprehensive Economic Development Strategy (Northeast Michigan Council of Governments, 2011) states that: "value added wood and agricultural products are a niche that presents opportunities for the region's economic development". The timber industry continues to be a stable segment of the economy for the county.

One of the objectives stated in the Iosco County Economic Plan is to further "preserve the economic viability of farming and timbering by working with local, regional and state organizations to attract value added industries for such products" (Iosco County Master Plan (draft)). One of the stated goals of the Alcona County Community Action Plan is to "strengthen and expand all economic sectors, including manufacturing, service, retail, and agriculture" (Alcona County Community Action Plan , 2005).

Fuel prices continue to affect most sectors of the economy. This is especially true for the timber industry due to mechanized harvest methods, raw material transport, and processing. This factor makes it important for manufacturing centers to be close to raw material sources in order to stay competitive. Long transportation of low value raw materials is not economical at this time.

Environmental Justice

Approximately 3.6% of Alcona County and approximately 5.4% of Iosco County is considered to be minority populations (White alone, not Hispanic or Latino). The minority population is 0.8% American Indian and 2.0% Hispanic in Iosco County. In Alcona County the minority population is comprised of 0.8% American Indian and 1.4% Hispanic. The state of Michigan minority population is approximately 24 percent (U.S. Census Bureau - Michigan, 2014), (U.S. Census Bureau - Iosco County, 2014), and (U.S. Census Bureau - Alcona County, 2014).

The poverty rates for the 2008-2012 time period was 15.1% for Alcona County and 19.6% for Iosco County. The state average was 16.3%, while the national average was 14.9% (U.S. Census Bureau - Alcona County, 2014) and (U.S. Census Bureau - Iosco County, 2014). No concerns about these populations were raised during scoping. A very low potential exists for minority and low-income populations to be disproportionately affected by the proposed activities. Management activities would occur across the entire project area (see maps) and are not concentrated adjacent to subdivisions.

The affected environment for determining effects on civil rights and environmental justice is Alcona and Iosco County, Michigan. As contained in the Michigan Environmental Justice Plan the guidelines for a minority or low-income community to which U.S. EPA environmental justice activities apply is if the low-income population or minority population percentage is greater than twice the state-wide percentages (State of Michigan, 2009). Given this definition and given the demographic information of Alcona and Iosco Counties, they do not qualify as environmental justice communities.

Cumulative Effects Analysis Boundary

The cumulative effects boundary for analyzing the economic impacts of this project (Objectives 1 and 2) will be Alcona and Iosco County. Commercial timber products do leave Alcona and Iosco County to mills in northern Lower Michigan or the Upper Peninsula. The cumulative effects analysis area was not expanded to that larger area. The overall volume and potential impact of this project would not have an impact large enough to be measured at that scale. However, the effects of the project on the small businesses and local government in both counties could result in tangible impacts depending on the alternative selected. Businesses farther away have different primary suppliers for wood products and thus would not be affected by changes in timber production from one project. This is especially true due to high fuel costs making transport of wood products for long distances less likely. Only local governments within Alcona and Iosco Counties receive payments from the sale of federal timber within the county. The primary use of those funds is for roads infrastructure and public schools, emergency services, and *Firewise* programs. From 2011-2013, approximately 93% of the timber sales were sold to purchasers that are located within 200 miles of the forest.

The temporal boundaries for this analysis will be ten years, from 2008-2017. This time span represents past, present and future trends in timber sale values. Timber receipts tend to cycle approximately every ten years.

The cumulative effects analysis area would be Alcona and Iosco Counties. The spatial and temporal boundaries would be the same as stated above.

Past, Present, and Future Actions

Table 26 lists the past, present, and future actions within the cumulative effects analysis area. Table 53 shows historic volumes and sale amounts for 2008 through 2010. This table is included to highlight the differences in average sale volume and value over time. From 2011 through 2013 the Huron Shores Ranger District sold three to four timber sales each year. As illustrated in

Table 54 recent harvest volume levels and values have increased by approximately 60% between 2008 and 2013.

demonstrates the estimated timber sale volume and value that are projected for next three years (2014-2017).

It should be noted the volume and sale value information is only for the Huron Shores Ranger Station. Alcona and Iosco Counties makes up the majority of the land base for the District, but not all of the timber sales below occurred within these Counties. A minority percentage of the harvest volume did originate Ogemaw County depending on the year and sale.

Table 53: 2008 to 2010 Timber Sale Volumes and Sale Value

2008	**Volume CCF**	**Sale Value ($)**
Match	1,145	94,677.66
Pine 11	9,517	303,306.97
Total	**10,662**	**397,984.63**
2009	**Vol. (CCF)**	**Sale Value ($)**
Tawas 5 KW	9113	272,648.59
Pine 8A	5,896	129,999.38
Wicker Hills	2,680	91,053.46
Allen Road	6,343	274,556.04
Total	**24,032**	**768,257.47**
2010	**Volume (CCF)**	**Sale Value ($)**
Jolly Rogers	9,578	345,715.05
Canada Warbler II	8,561	501,204.89
Queen Wui	2,682	119,113.77
Total	**20,821**	**966,033.71**
Average	**Volume (CCF)**	**Sale Value ($)**
2008-2010	**18,505**	**710,758.60**

Table 54: Timber Sale Volumes and Sale Value for 2011-2013

2011	**Volume (CCF)**	**Sale Value ($)**
Bodacious	10,289	923,920.02
Wawa	8,861	914,770.96
Total	**19,150**	**1,838,690.98**
2012	**Volume (CCF)**	**Sale Value ($)**
Golden Eagle	6,984	619,762.25
Trix	3,049	143,949.30
Lighter	2,837	106,710.00
Mix	3,132	202,139.13
Total	**15,912**	**1,072,560.68**
2013	**Volume (CCF)**	**Sale Value ($)**
Britt	4,416	230,670.53
Iargo Webb	3,287	190,583.88
Wells Road	6,167	243,523.20
Total	**13,870**	**664,776.61**
Average	**Volume (CCF)**	**Sale Value ($)**
2011-2013	**16,311**	**1,192,009.42**

In addition to the commercial timber sale program the Huron Shores Ranger District has undertaken numerous fuels reduction projects within Alcona and Iosco Counties during the last several years. The projects consist primarily of prescribed burning and non-commercial construction and maintenance of fuelbreaks and wildlife openings. These projects were included in the following documents:

- Restoration Fuels Project (2008)
- Jumpin Jack Pine Project (2008)
- 2010 Huron Shores Fuelbreak and Opening Maintenance Project (2010)
- Brittle II Project (2010)
- Pine River-Snowbird Project (2011)
- Tawas-New Dawn Project (2012)
- Corsair Project (2014)

(The date following the project name is the year the document was signed. Implementation of projects described within these documents have already taken place or will take place over the next 1-10 years.)

Alternative 1 (No Action)

Direct and Indirect Effects

Under Alternative 1, no timber would be harvested and no hazardous fuels reduction actions would be implemented in the project area as proposed.

Selection of the no action alternative in regards to timber sale production could create a situation where approximately 34,497 CCF of expected timber production is eliminated within Alcona and Iosco Counties. This would equate to approximately $1,500,000 in timber sale receipts not being collected, much of which is used locally for eligible projects or for schools and roads. Alternative 1 would have a minor negative effect on timber harvesting companies in the Counties. They would have to find timber sales outside of the area and be at a competitive disadvantage to the local operators in those areas due to higher fuel and transportation costs.

Local mills and users of timber products would not have or would have reduced local sources of raw products for one to two years depending on how the other approved timber sales are offered by the Forest Service.

Another direct effect of this alternative would be to leave hazardous fuels conditions in the areas proposed for treatment. The indirect effect of this fuel condition would be a higher probability of high-intensity wildfire and resulting timber and structure loss in and adjacent to the project area. The lack of fuels reductions treatments would contribute to these areas having an elevated risk of major timber and property loss from wildfire is another indirect effect of implementing this alternative.

Alternative 1 would have minor negative indirect and direct effects on the local timber industry and fuels conditions that could lead to property loss and economic loss. Because of the small size of this project none of these negative effects are significant. Alternative 1 would not meet objectives 1 and 2 of the project to provide timber products and reduce fuel loading.

Selection of Alternative 1 does not preclude future analysis or implementation of on-going management proposals within the project areas. This alternative provides a baseline by which

to compare the environmental effects of the action alternatives. In the long term, the proposed project could be revisited and another alternative could be implemented. However, the time and agency funds invested in this project would not produce any products or meet any objectives. This lost time precludes investment of those dollars and time in another project that could have produced outputs and met resource management objectives.

Cumulative Effects

Choosing Alternative 1 would leave property owners in Alcona and Iosco Counties more susceptible to loss of life and property due to wildfire. Numerous wildfires have historically occurred throughout the area, and have caused major loss and/or damage to private property as well as loss of natural resources on all ownerships

In summary, this alternative would not help meet the desired future condition as described in the Forest Plan, or to achieve the Purpose and Need for Action as described in Chapter 1 of this document. The objective of producing timber products would not be attained as well as the objective of hazardous fuels reduction to protect people, property, and natural resources.

Since a portion of Forest Service timber receipts are returned to the counties to help maintain schools and roads, Alternative 1 would have a modest negative cumulative effect on the rolling average calculation for these payments. Given the high poverty level, low income of residents, generally poor economic conditions predicted for the local area, recent downturn of assessed property values it is expected that reductions in timber receipt payments would combine to impact local government funding for roads, school, services, and potentially employment.

In terms of economics, Alternative 1 would have an adverse cumulative effect. In terms of social justice, Alternative 1 would have no effect.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

Alternative 2 would provide timber products over the next 1-3 years and would provide an estimated volume of approximately 34,497 Ccf. The direct effect of this would be a diverse mix of forest products being available to the local economy for the next 1-3 years at current volume levels of approximately 21,000 Ccf per year. The harvest of timber would meet Objective 1, providing timber products. As shown in Table 55, the sale of the timber would produce approximately $1,546,956 in timber sale receipts. Much of this revenue would be used locally for eligible projects on Forest Service land or be used by the Counties for schools and roads funding.

Table 55: Estimated Timber Volume and Sale Value of Alternative 2

Vegetative Timber Management Treatments Roy Creek Project	Acres Treated (approx.)	Estimated Volume (CCF)	Value ($)
Red Pine Clearcut (KW) and Jack Pine & other Clearcut (KW)	740	11,501	621,947
Temporary KW Fuelbreak	6	37	37
Red Pine Thinning	1,626	14,560	647,192
White Pine Thinning	168	1,517	30,628
Oak Thinning-LSO	80	648	7,070
Oak Thinning-HSO	37	299	3,262
Oak Shelterwood-LSO	16	160	1,746
Aspen clearcut	10	200	6,988
Early Successional Habitat Creation	395	2,873	155,372
Fuelbreaks/Shelterwood	172	1,702	75,654
Total	**3,250**	**33,497**	**1,546,956**

The 324 acres of red pine plantations clearcut would provide 6500 CCF of volume. These acres would be planted with 1,452 jack pine trees per acre, to create Kirtland's warbler (KW) habitat. Jack pine timber is significantly less valuable than red pine timber and future red pine revenues would be lost. According to the latest Transaction Evidence Report, red pine sawlogs are valued at $74.07 CCF and jack pine sawlogs are $22.32 CCF. Typically the timber receipts from red pine thinning harvests help finance the reforestation costs of planting KW habitat. –

Fuels reduction projects would reduce the risk to life and private property from wildfire within the project area. The harvest of timber and prescribed burning in Alternative 2 would meet Objective 2 (reduced fuel loading).

Cumulative Effects

Alternative 2 would have a beneficial effect on economic conditions within both counties. It would help maintain timber production levels for the next 1-3 years in combination with other authorized timber harvest projects. The overall cumulative effect would be slightly beneficial by increasing the number of authorized timber sales and thus improving private business confidence of available timber production for the next 1-3 years.

The amount of timber harvest and prescribed burning would increase the amount of acreage that has had some type of fuels reduction treatment in the project area and within Alcona and Iosco counties. This combined with other past and future projects would have a beneficial cumulative effect in regards to wildfire suppression and protection of timber resources and property.

The volume of timber being harvested would not be reduced, and thus timber receipts returned to local government for schools and roads would not go down other than from fluctuations in the market driven value of the timber from year to year.

In terms of economics, Alternative 2 would have the most beneficial cumulative effect of the two alternatives by continuing to provide timber products to private businesses and timber receipts to the local government and economy. In terms of social justice, Alternative 2 would have no effect since neither county meets the definition of a social justice community.

3.11 Visual Quality

Affected Environment

The Forest Service utilizes the Scenery Management System (USDA Forest Service, 1995). Within this system, landscape character is defined as the combination of physical, biological and cultural attributes that give a geographic area its visual and cultural image. Landscape character contains those features that make each landscape identifiable or unique.

In Appendix A of the Forest Plan, the landscape character of the Huron National Forest is described as having been shaped and influenced by natural as well as cultural influences. Landforms observed today are the results of glacial action and subsequent postglacial erosion and continuing soil formation processes. The Roy Creek Project area is primarily identified as glacial outwash plain with soils that are excessively-drained sands. Fire has been a major influence on historical vegetation patterns for outwash plains. Historically, large stand-replacing wildfires were common and often spread for many miles.

Scenic attractiveness is described in Appendix A of the Forest Plan as the measure of the scenic importance of a landscape based on human perceptions of the intrinsic beauty of landform, water characteristics, vegetation pattern, and cultural land use. Scenic attractiveness is classified in three categories relative to the established Fire Regime Classes, described below in Table 56 (see also Figure 27).

Table 56: Scenic Attractiveness for the Roy Creek Project Area

Scenic Attractiveness Category	Description	Fire Regime Classes	Percent of Project Area
Distinctive	Landscapes whose attributes and patterns combine to provide unusual, unique or outstanding scenic quality	FR3W, FR4W	2.3
Typical	Common quality	FR3, FR4	0
Indistinctive	Landscapes having low scenic quality	FR1, FR2	97.6

The starting point that is utilized by the Huron National Forest to determine scenic attractiveness is the land type association groupings that most closely represent the inherent variety and scenic interest that form the Fire Regime classes. Fire regime (FR) classes are categorized 1-4. FR 1 represents landscape ecosystems historically experiencing frequent, large catastrophic stand-replacing fires. The dominant forest types are short-lived jack pine forests

and consist primarily of pine-barren landscapes. A FR 4 on the other hand, represents landscape ecosystems historically experiencing very infrequent stand-replacing fires. The dominant forest types are long-lived northern hardwoods, basswood and white ash.

The Fire Regime Classes that comprise the Roy Creek Project area are shown in Figure 27. Approximately 97.6% of the Roy Creek project area falls within FR1 and FR2 and is therefore defined as having an *Indistinctive* scenic attractiveness rating. None of the project area falls in the *Typical* scenic attractiveness category while only about 2.3% of the project area is represented by Distinctive scenic attractiveness. The *Distinctive* scenic attractiveness is directly associated with the waterways and associated features of Roy, Bryant, McDonald, and Vandercook Creeks.

The project's affected Visual Quality (VQ) condition is indicative of its human-made and natural landscape attributes and how they interact within this environment. The distinct natural landscape attributes are landform, vegetation (timber or fuel type), surface water and cultural features. The Project's visual environment takes into consideration the Forest's Plan Scenic Integrity Objectives (SIOs) for MA 4.2 and has established long-term Scenic Integrity assignments ranging of high, moderate and low with associated Scenic Class numbers 1 to 7 (Forest's Plan Appendix A, Table A-2). Even though MA 4.2's landscape includes the full range of Scenic Integrity levels; it leans toward a much higher percentage of "Low" due to the type of vegetation and how it has been managed over time, as well as the greater percentage of conifer type vegetation within the Management Area's land-base is proposed for thinning and clearcut timber harvest treatments. Additionally, MA 4.2 vegetative composition (timber or fuel type) is mostly indicative of the established Forest Plan's Fire Regime (FR) classes 1 and 2. (FR class 1: KW jack pine historically frequent, large catastrophic stand-replacing fires and FR class 2: red pine, jack pine, and white pine historically experience large, catastrophic stand-replacing fires at lower frequencies, hence longer fire rotations than FR 1.) This short and long-lived coniferous fuel type is conventionally ranked Indistinctive (Class C) – "LOW" Scenic Attractiveness level (Forest Plan, A-7) and is illustrated in Figure 27.

Cumulative Effects Analysis Boundary

Roy Creek Project's effects analysis area is comprised of treatment areas that vary in acreage and locations dispersed within the analysis boundary over MA 4.2's land-base. The cumulative effects analysis area for the visual resource discussion will be defined as the project boundary. This geographic area was chosen because the project area would receive similar management and treatments over the next ten year project implementation period. Temporal cumulative effects will be bound by a twenty year period. This period includes the past ten years of management activities and the reasonably foreseeable future project implementation of ten years. This temporal boundary was chosen to reflect an "age class" of timber, and the approximate ten-year timber sale program planned for the project area.

The proposed project's management actions would be analyzed to determine the time period (short, interim and long-term) and geographic location relative to the landscape character and attributes that define the expected VQ conditions and comply with the Forest Plan's MA 4.2's SIOs. The visual analysis will discuss the short- and long-term effects on the potential impacts of the proposed management actions close (¼ mile or less) to residential areas or along

travelways. The cumulative effects analysis boundaries relative to VQ conditions of the natural resources (timber/fuel type) would primarily focus on the "Elements of Landscape Visibility".

The Elements are broken down into three components:

1. Travelways and Use Areas – are categorized as primary or secondary and ranked high, moderate or low use.
2. Concern Levels – are ranked for their scenery interest as high, moderate or low.
3. Distance Zones – are categorized with specified distance zones from a viewing platform or travelway.

The three elements categorize or rank the natural resources (timber/fuel type) and scenery interest in conjunction with landscape attributes such as: closeness to an urban setting or type of viewing platform and amount of area use, and the frequency of roads or the location of roads within the ¼ mile or less Distance Zone for proposed treatment areas (USDA Forest Service, 1995) (Chapter 4)).

Alternative 1 (No Action)

Direct and Indirect Effects

Alternative 1 would not have any direct effect on visual aesthetics within the project area as no actions would be taken and current conditions would persist. Indirect effect would be for natural succession to continue to take place with increasing fuels loads and the ongoing risk of a crown fire. Scenic attractiveness would continue to be indistinctive (Class C) throughout the majority of the project area and treatment areas. Scenic Integrity Objectives within project area would continue to be attained and remain unchanged.

Cumulative Effects

Indirect effects of the no action alternative would be increased fuel loading. In the long-term, if a high- intensity wildfire ignites the scenic integrity of area affected by that fire could be reduced below Forest Plan Scenic Integrity guidelines of Low or Moderate. There is a minor negative cumulative effect on visual quality by not managing short and long-lived coniferous timber/fuel types for fuel loads and the increased potential for crown fire within the project area.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

The project-wide direct and indirect effects of Alternative 2 – Proposed action on VQ condition within or next to the proposed Project's treatment areas is relative to ecological landtype vegetation status, past and present even-aged timber management applications, and established Fire Regime classes. During the proposed treatment area implementation work, it is expected that the direct and indirect effects of Alternative 2 proposed management actions within the primary Distance Zone of ¼ mile or less would retain the ranking of "Low" for Scenery Interest along the majority of viewing platforms associated with the Project's Secondary Travelways and Use Areas. In specific the Secondary Travelways or viewing platform's such as Highway M-65/Bissonette Road or nearby residential area locations, the Project's SIO may strive to attain "Moderate" because the treatment area's location leans toward Scenic Class 2, but achieving a

"Moderate" ranking would tend to be a Project's longer-term VQ condition objective. This remains the case for treatment areas along these busier Secondary Travelways and Use areas, because they do receive "Moderate" use, but still retain a "Low" or at times a "Moderate" for Scenery Interest. Additionally, the Fire Regime classes 1 and 2 ranking of Indistinctive (Class C) – "Low"- Scenic Attractiveness level still prevails in the vicinity of the residential areas, because the Ecological Landtype composition – VEGETATION – comprised of the short and long-lived coniferous timber/fuel types are naturally fire-dependent species, mono-culture in nature, the plantations are grown on flatter topography and are best managed by even-aged harvest methods.

Direct and indirect effects of prescribed burning management action would not affect the "Low" ranking for Scenery Interest along the Secondary Travelways or Use areas. In the short-term, VQ in the primary ¼ mile or less Distance Zone may be impacted, but is not likely to adversely impact this primary Distance Zone during the initial implementation phase for lower intensity prescribed burns. However, if a higher intensity fire ignites, impacts are expected to produce recognizable visual resource impacts to the current landscape character, because evidence of burned vegetation would be more prevalent for a longer period on the landscape. Fire Regime classes 1 and 2 ranking of Indistinctive (Class C) "Low" Scenic Attractiveness level would be sustained, as it is independent of fire intensity for timber/fuel type comprised of the short and long-lived conifers.

Direct and indirect effects of the proposed harvest management action of clearcutting a timber stand, in the short-term and interim project phases, would noticeably change and may adversely, but is not likely to affect Scenery Interest ranking of "Low" that primarily depicts the project's area. Clearcutting impacts on Scenic attractiveness of a landscape's character and attributes are subjective, relative to an individual observer's perception and viewing location during the initial and interim project phases. Spatially, the clearcut stand's vegetation density (trees per acre and/or basal area) within the ¼ mile or less Distance Zone would be impacted, because the majority of all live coniferous trees would be removed over the harvested area. It is expected, due to flatter topography (position on the landscape) and acres cut, that as this clearcut timber stand/treatment area is once again cultivated to produce a mature pine (monoculture) stand of timber or a created opening rejuvenates, it would take a more natural appearance. VQ conditions would improve and the Forest's Plan SIOs rating would continue to naturally bump up from a "Very Low" (initial treatment phase) to the interim "Low" and the established MA 4.2 SIO of "Low" for timber/fuel type comprised of the short and long-lived conifers within the Fire Regime Classes 1 or 2. The duration of the impact on visual quality would last five to ten years.

Whereas, shelterwood harvest management actions would produce short-term recognizable visual effects, but are not likely to adversely affect the current landscape character or change the ranking of Indistinctive (Class C) "Low" for the Scenic attractiveness level during initial or interim treatment to timber/fuel type comprised of the short and long-lived conifers. Proposed management action of thinning a red pine stand would retain the same (monoculture) vegetation. Spatially a stand's vegetation density (trees per acre and/or basal area) would decrease in the short-term and interim giving the red pine stand a more open appearance. It is expected that thinning would have a negligible effect on the primary ¼ mile or less Distance

Zone. A Scenery Interest ranking of "Low" for the visual appearance of the red pine stand would be sustained, because the prescribed basal area volume would contain fewer trees per acre, but the remaining trees would retain an even spacing appearance within the plantation. In the long-term, the pine stand would regain basal area volume per acre as the remaining trees' diameters increase until the final harvest. Over the scheduled thinning period for a red pine stand/treatment area and any interim management actions until final harvest, it is expected that the Forest's Plan SIOs of "Low" would be retain or may naturally bump up to "Moderate", because impacts to VQ produced during thinning operations are short-term in nature and would naturally blend into the plantation within a year or two at the most.

Cumulative Effects

The Stout-Snowbird timber sale will be occurring within the Roy Creek project area boundary. The proposed actions of that timber sale are to harvest approximately 263 acres of short-lived conifer. A cumulative effect may be that there may be a perception of more and larger open space. The scenic integrity objective rating of "low" would remain unchanged.

3.12 Climate Change

Agencies apply the rule of reason to ensure that their discussion pertains to the issues that deserve study and deemphasizes issues that are less useful to the decision regarding the proposal, its alternatives, and mitigation options. 40 CFR 1500.4(f), (g), 1501.7, 1508.25. In addressing greenhouse gas (GHG) emissions, consistent with this proposed guidance, CEQ expects agencies to ensure that such description is commensurate with the importance of the GHG emissions of the proposed action, avoiding useless bulk and boilerplate documentation, so that the NEPA document may concentrate attention on important issues. 40 CFR 1502.5, 1502.24.

Because it is not possible to predict the actual effects of a particular project on global climate change or local climate, a baseline comparison of climate change cannot generally be made using the no action alternative and comparison of alternatives is generally not essential to a reasoned choice among them.

However it should be noted that national forests in this region continue to be a net carbon sink. That is, they take up more carbon than they release. This is true of U.S. forests generally (USDA Forest Service - Eastern Region, 2013a). Total forest ecosystem carbon stored in the Eastern Region slowly increased from 1990 to 2001, after which period the increase was more rapid…. During this period the Huron-Manistee, Mark Twain, Ottawa, Shawnee, Hiawatha….. generally increased in total forest ecosystem carbon…. (USDA Forest Service - Eastern Region, 2013a). Huron-Manistee National Forests timber harvest levels are expected to be similar to what they were during this time frame (which ranged from a low of approximately 26,784 MBF in 2003 to a high of 57,176 MBF in 2010), and the Forests position as carbon sink would be expected to continue. Further, much of the wood harvested from the Forests still stores carbon after it is cut. Using the IPPC/EPA production accounting approach the eastern region had 11,958,121 MgC total carbon stored in harvested wood products in 2000. In 2005 the region had 12,358,148 MgC and in 2010 the region had 12,552,233 MgC, (Loeffler, 2013)

We believe that the scope of our analysis is, in fact, commensurate with the effects of our proposal. The proposal is for sustainable forestry, which is considered to contribute to carbon sequestration.

Currently, forest management in the U.S. results in net sequestration. The likelihood that alternatives for a particular project will make a measurable difference in this pattern (which includes past, similar projects) is limited.

"Land use, land-use change, and forestry activities in 2011 resulted in a net C sequestration of 905.0 Tg CO2 Eq.... This represents an offset of approximately 13.5 percent of total U.S. CO2 emissions (EPA, 2015).

Effects of climate change on forest resources and ecosystem services

Modeled predictions of future climactic conditions vary widely depending on assumptions used and on future greenhouse gas (GHG) emission scenarios. For example, "Projected climate trends for the next 100 years using downscaled global climate model data indicted a potential increase in mean annual temperature of 1.3 to 7.1 ºF for the assessment area. Projections for precipitation indicate an increase in winter and spring precipitation, and summer and fall precipitation projections vary by scenario" (USDA Forest Service, 2014). Such models are therefore insufficient (and not intended) for making detailed site specific land management decisions in the present day.

Since it is not possible to predict with real certainty what the change in precipitation or temperature throughout the year would be in the future for any given specific site, it is impossible to say with any certainty what additional stressors may affect species and habitats in the future. Therefore, a clear evaluation of the effects of an uncertain change in climate on the natural environment is not possible at this time. Accordingly, a relative comparison among alternatives for the most desirable outcome is not realistic.

However, "Studies have consistently shown that more diverse systems are more resilient to disturbance, and low-diversity systems have fewer options to respond to change" (USDA Forest Service, 2014).

This project is in accordance with the Huron-Manistee National Forests Plan and adheres to the Forest Service Silvicultural Handbook practices designed to produce wood products while sustaining and enhancing forest productivity and maintaining forest health. This project is designed to make the forest less susceptible to catastrophic losses from severe wildfire or pest outbreaks and maintain a diversity of species types in the project area.

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6 Appendices

Appendix A: Fire and Fuels Management Maps

Figure 26: Land Type Association

Figure 27: Fire Regime Map

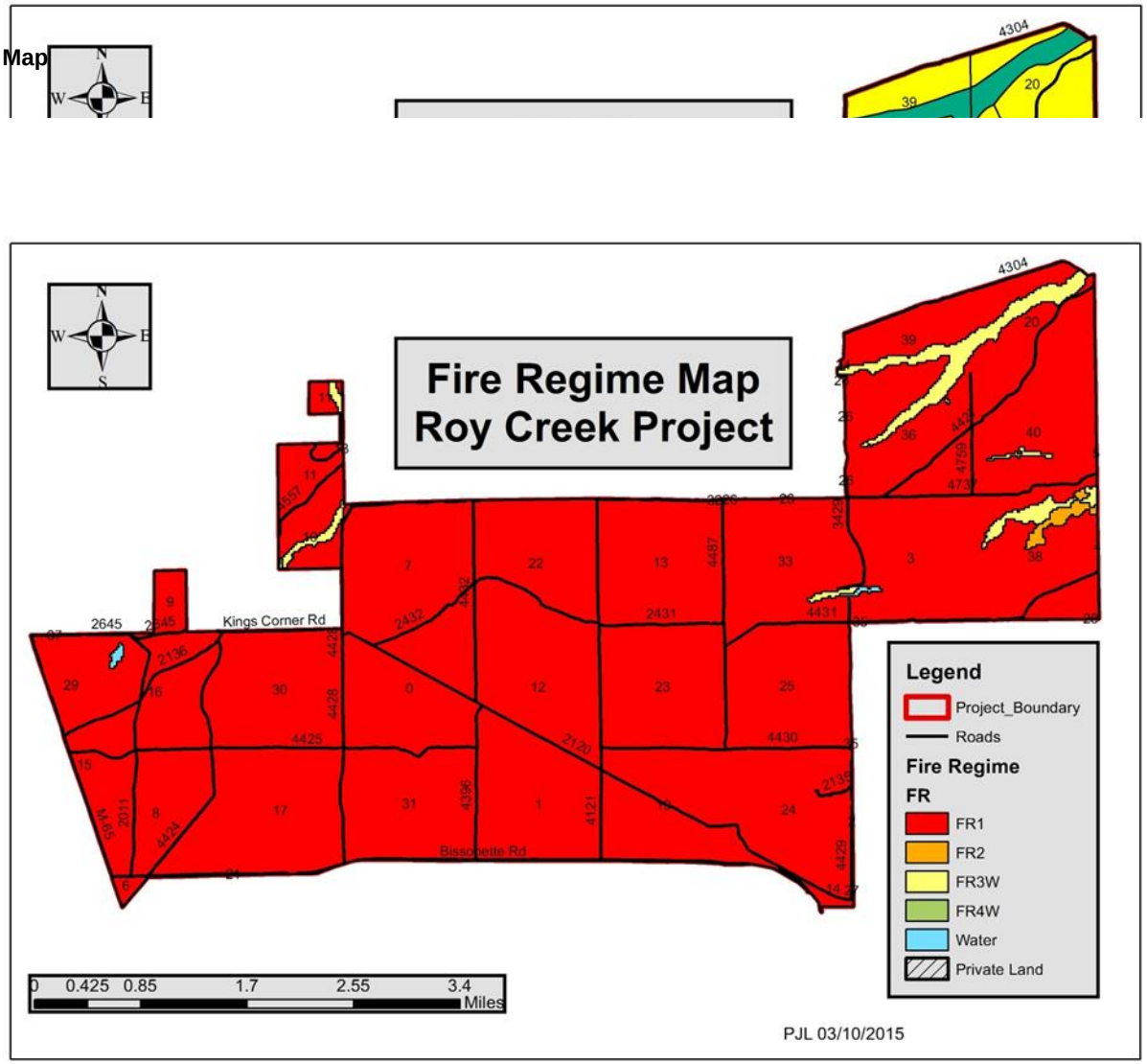


Figure 28: Prescribed Burn Blocks

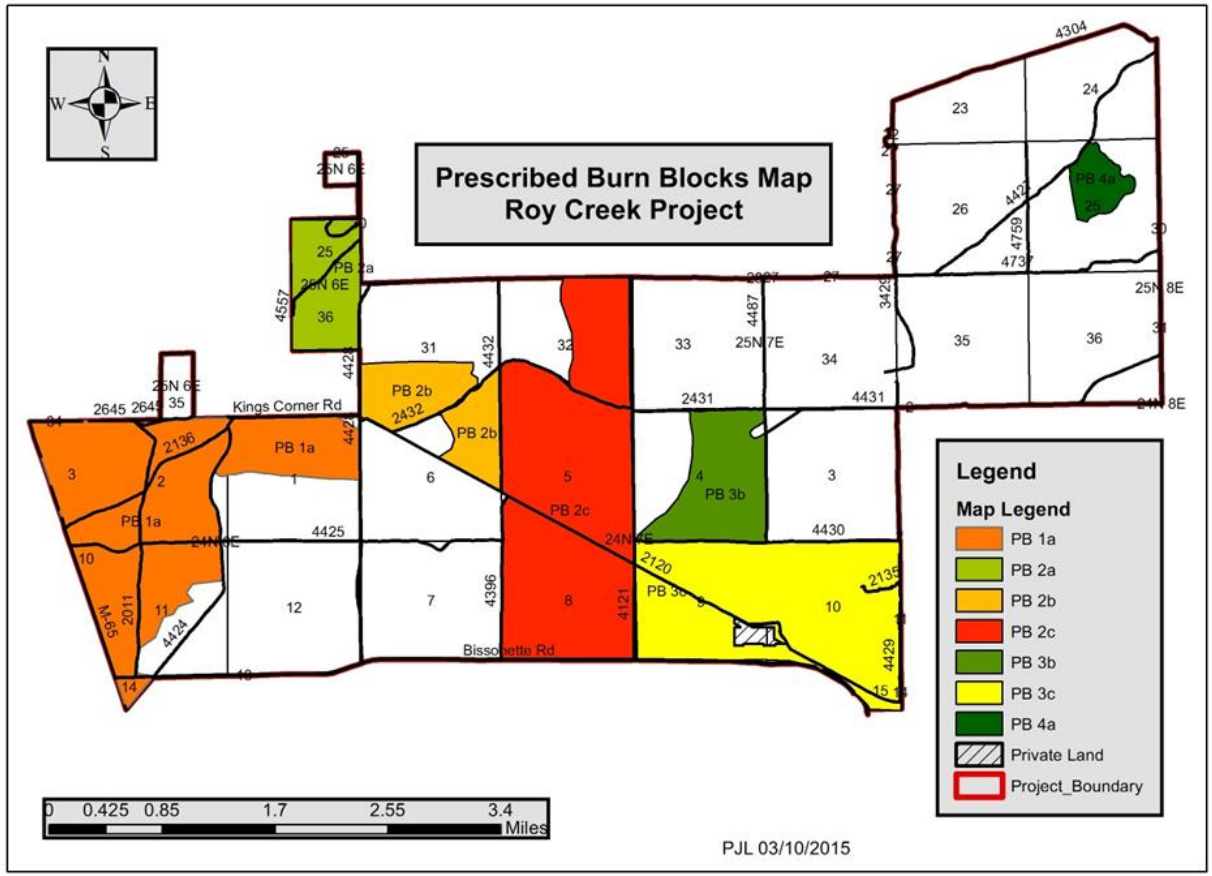


Figure 29: Biophysical Settings Map

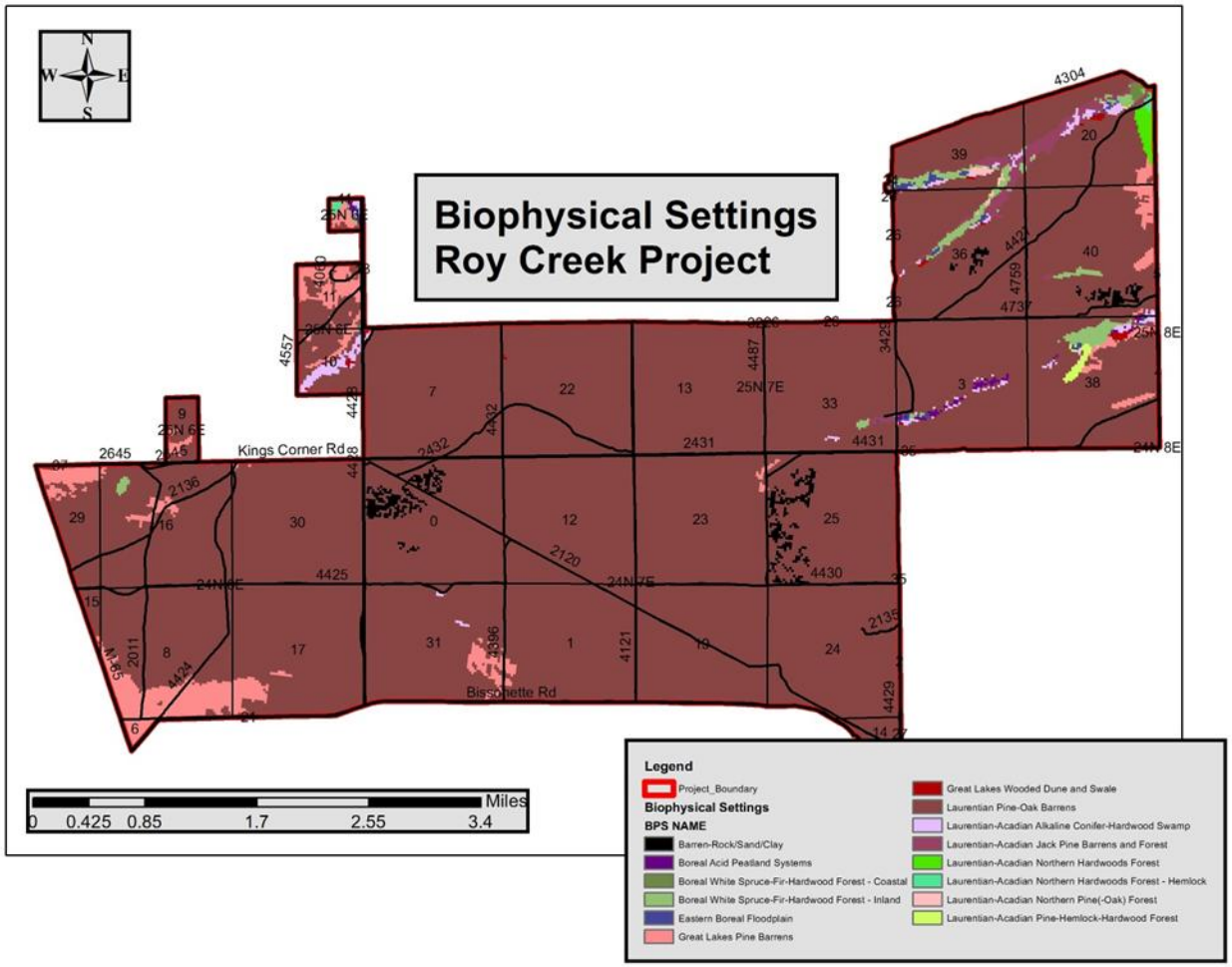


Figure 30: Fire Occurrences and Perimeters Map

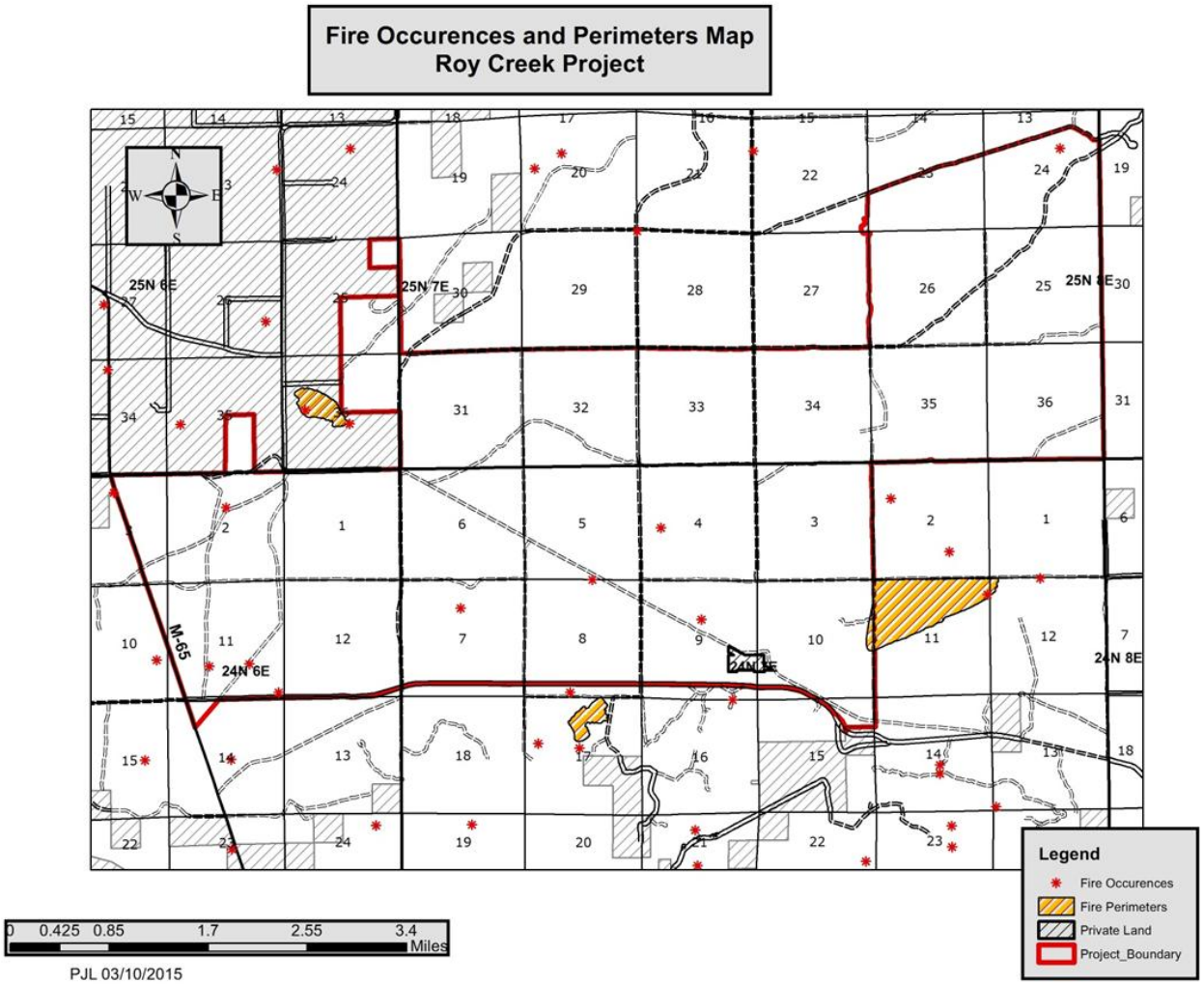


Figure 31: Expected Fire Hazard - Average Year

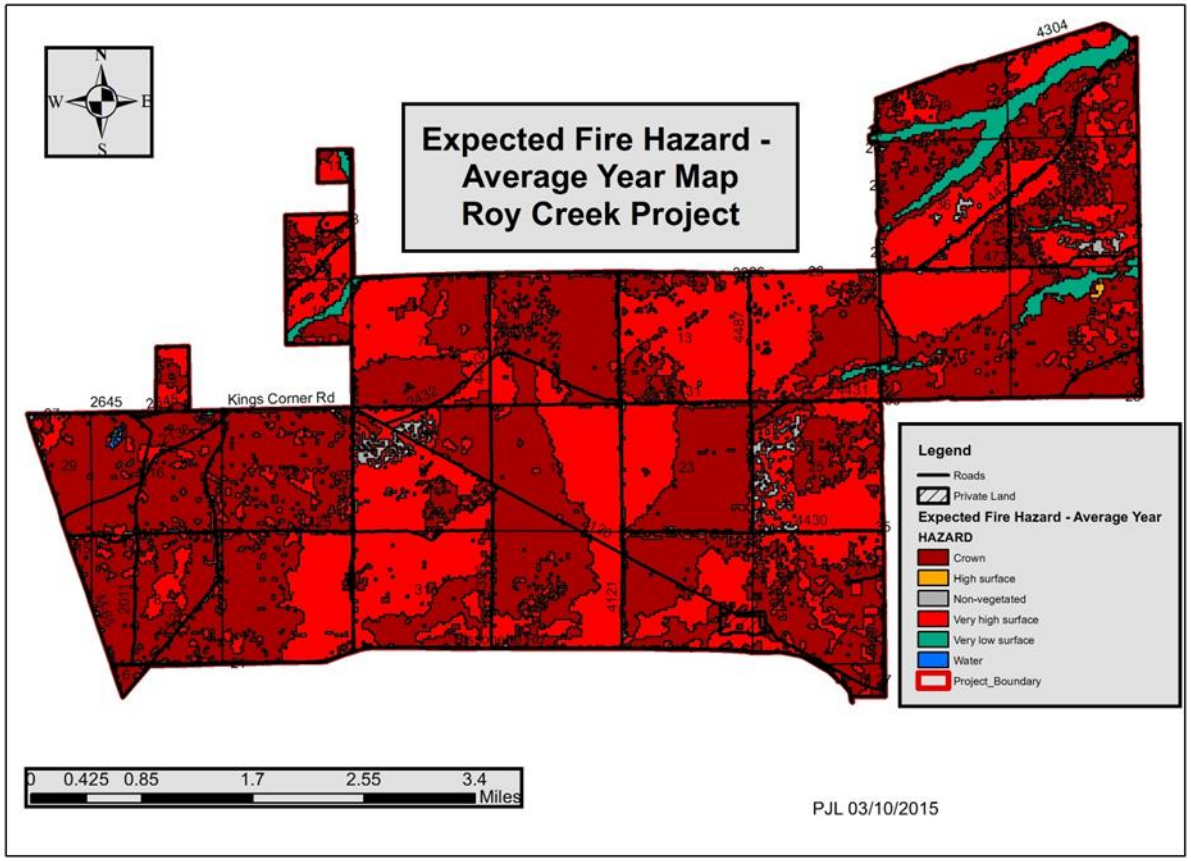


Figure 32: Expected Fire Behavior - Drought Year

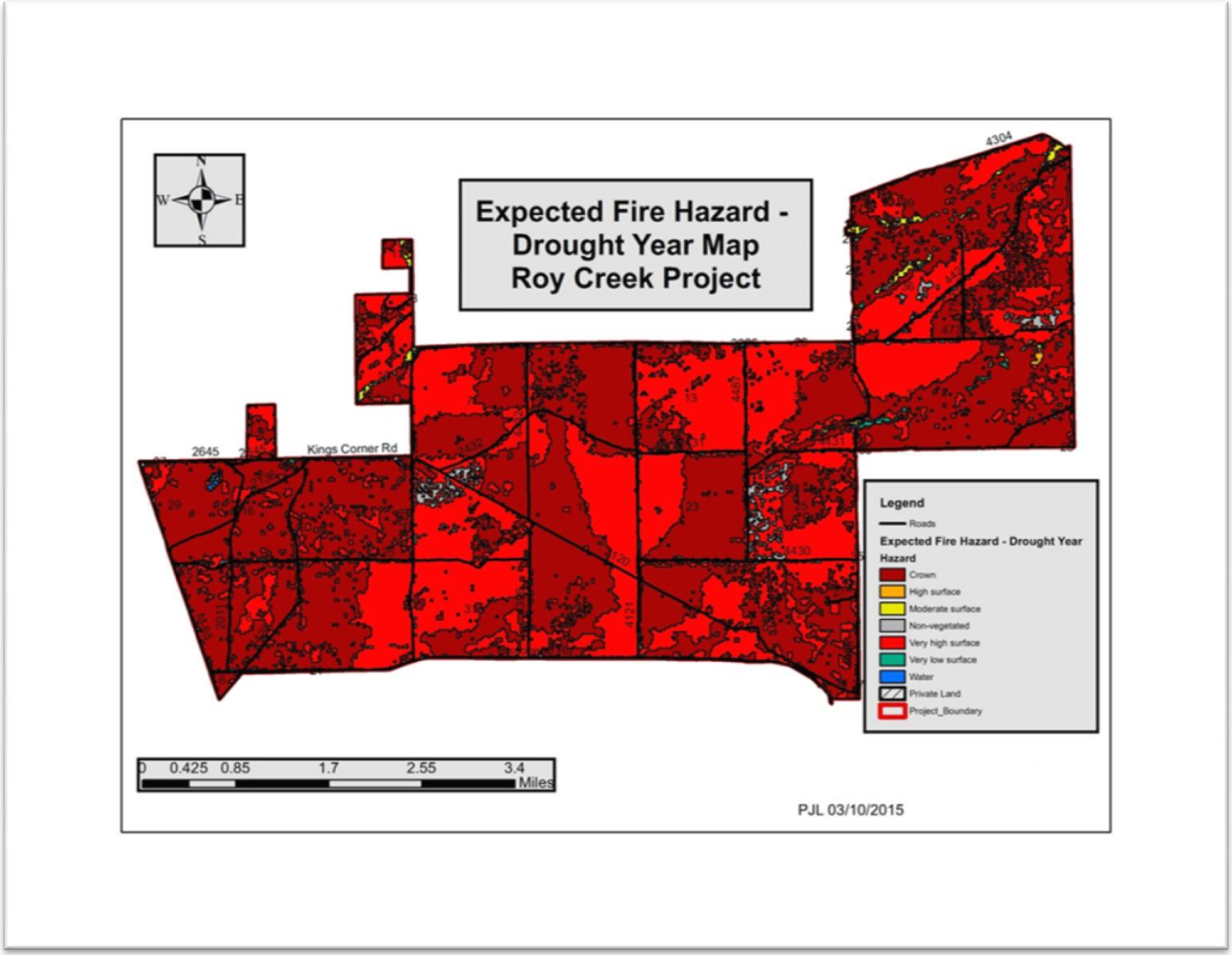


Figure 33: Values at Risk - Private Property and Structures

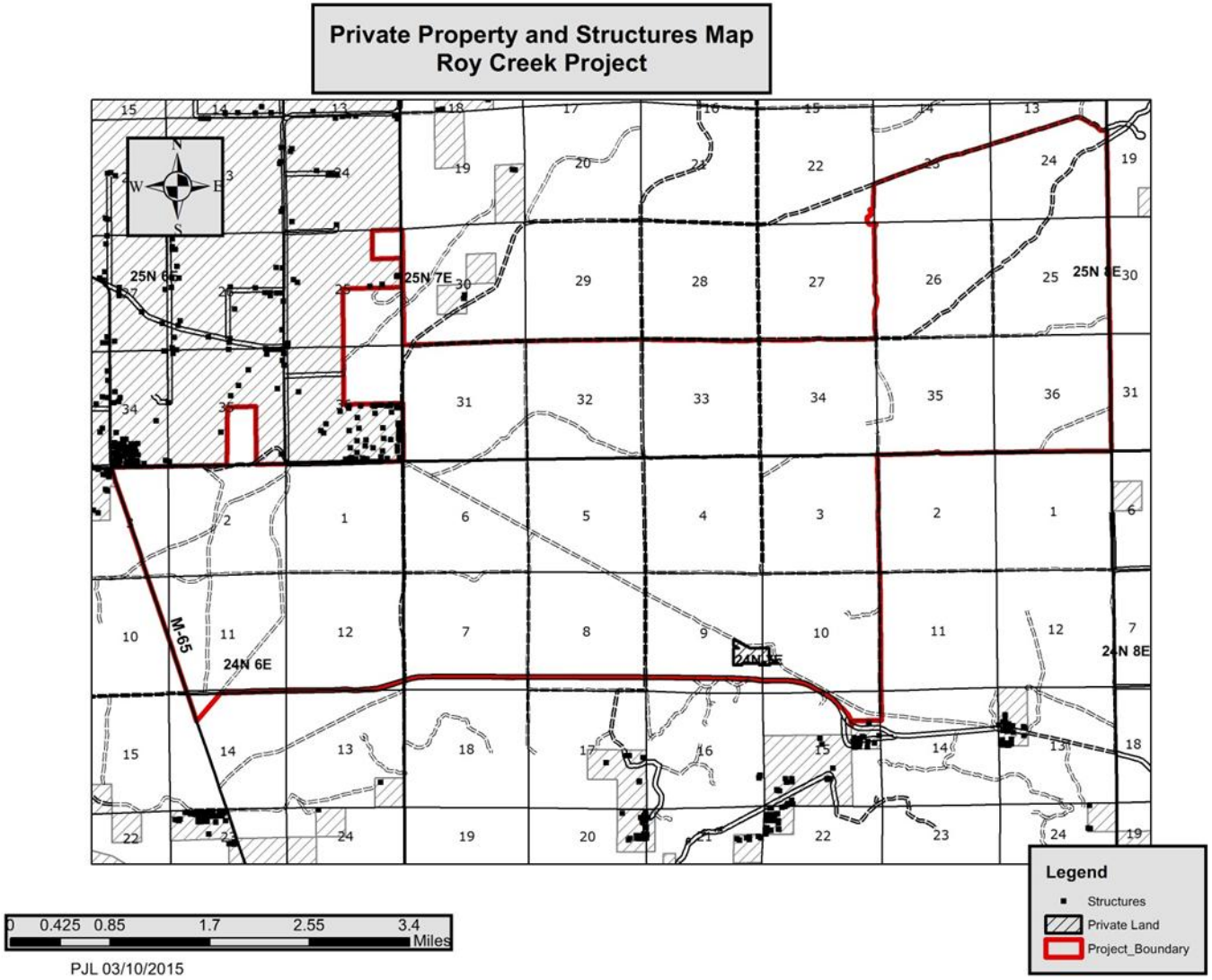


Figure 34: Values at Risk - Kirtland's Warbler Habitat

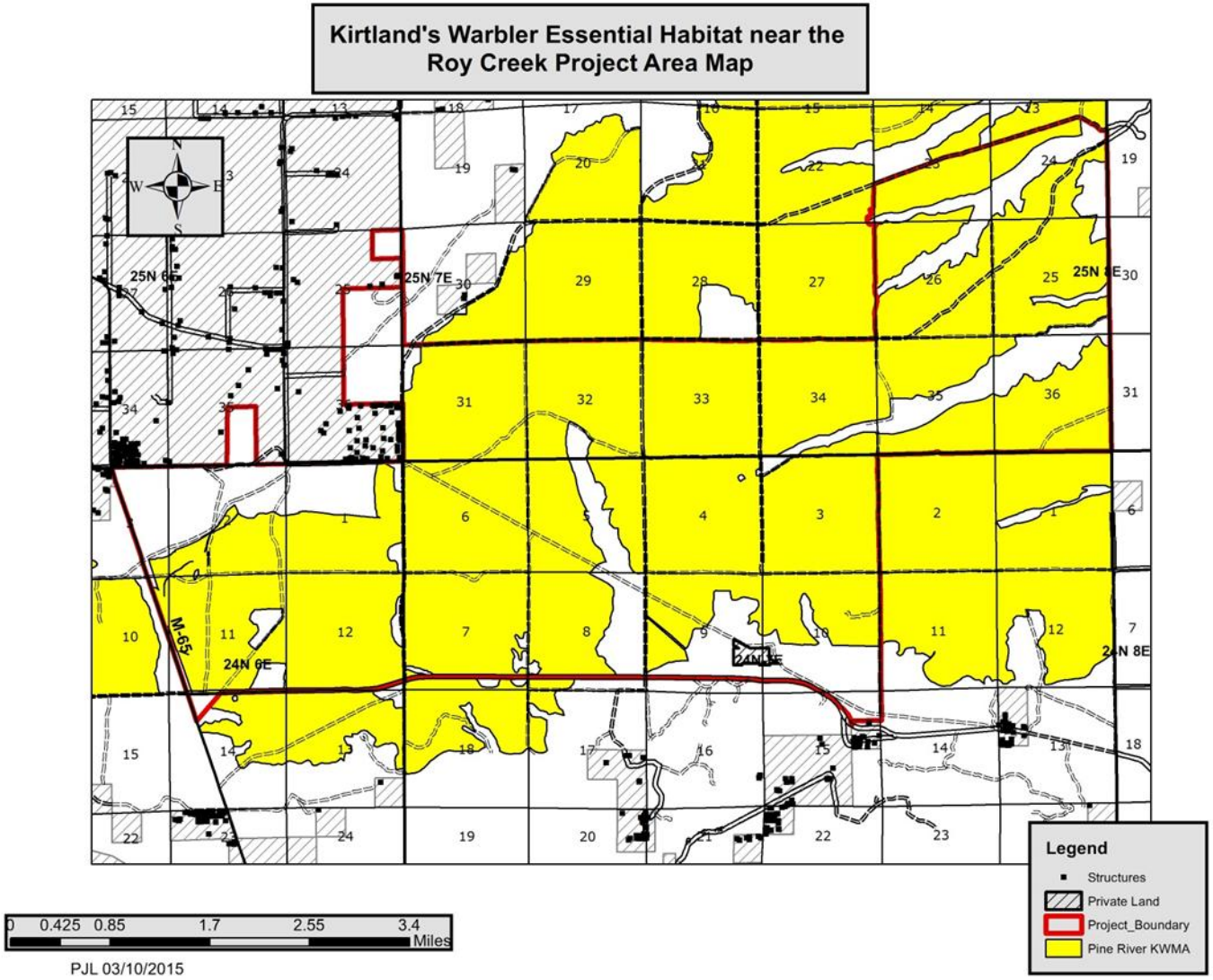


Figure 35: Fire Regime Condition Class (numeric) Map

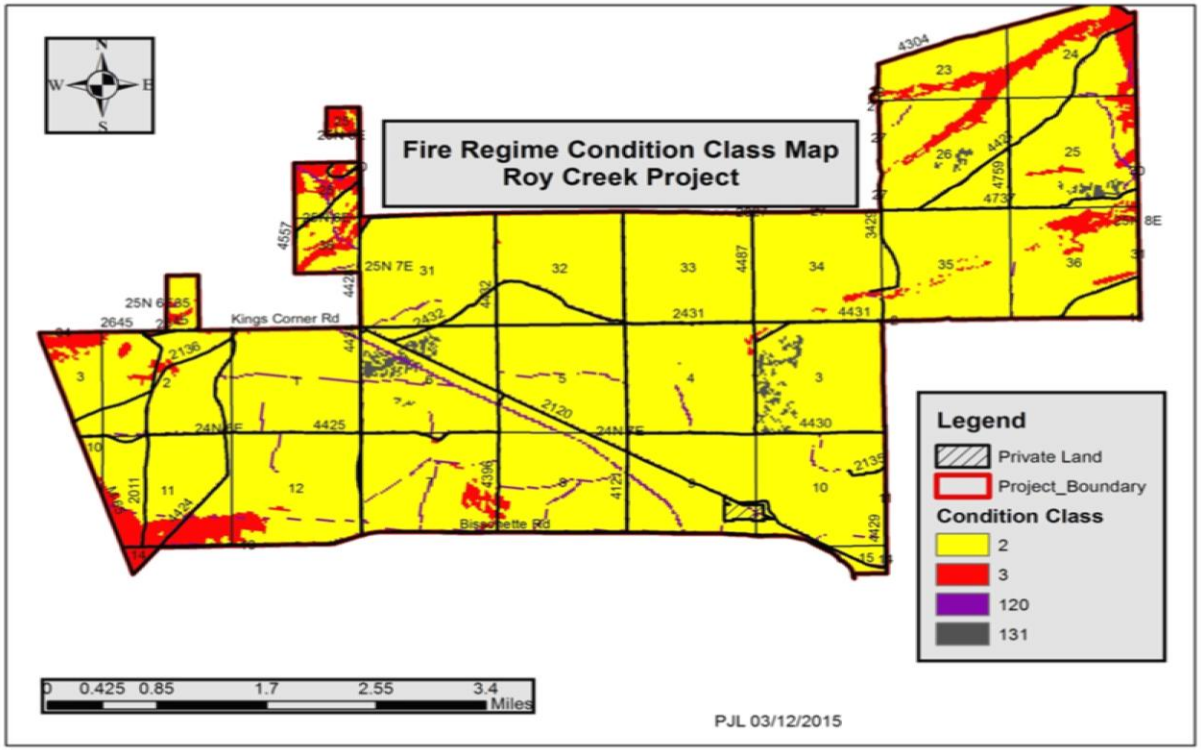


Figure 36: Fire Regime Condition Class (descriptive) Map

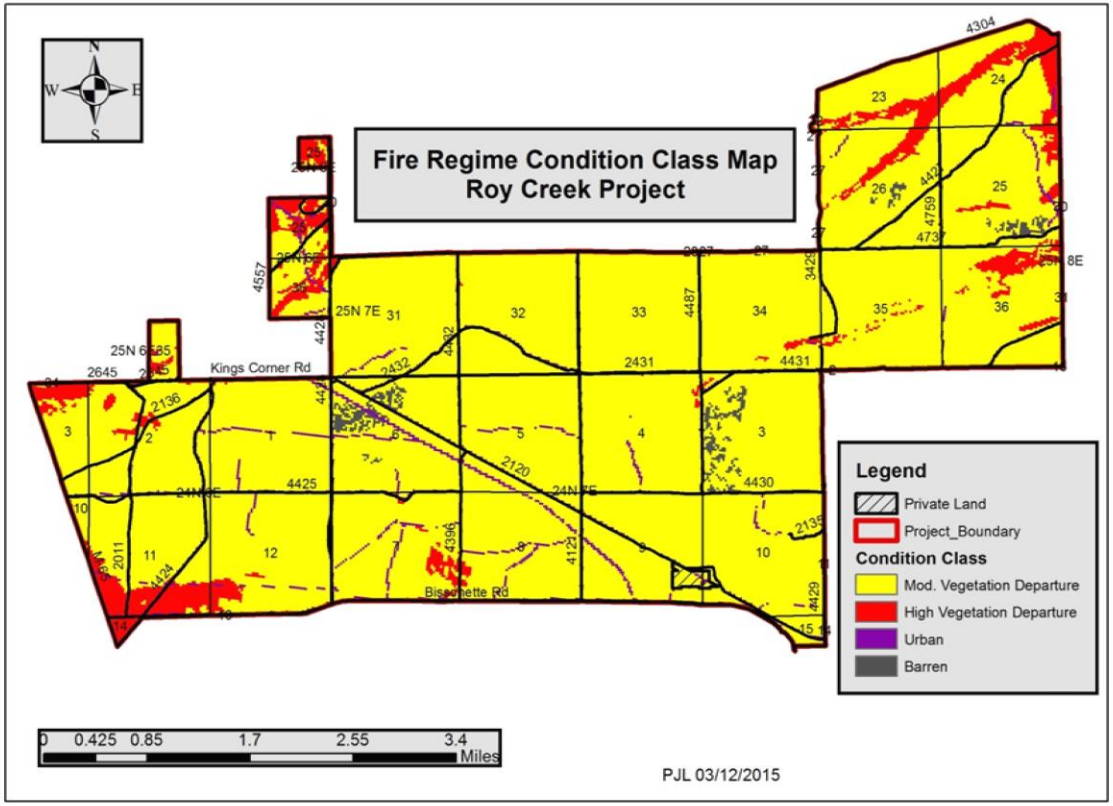


Figure 37. Private Property and Structures Map with Proposed Fuelbreak and ESHC Areas

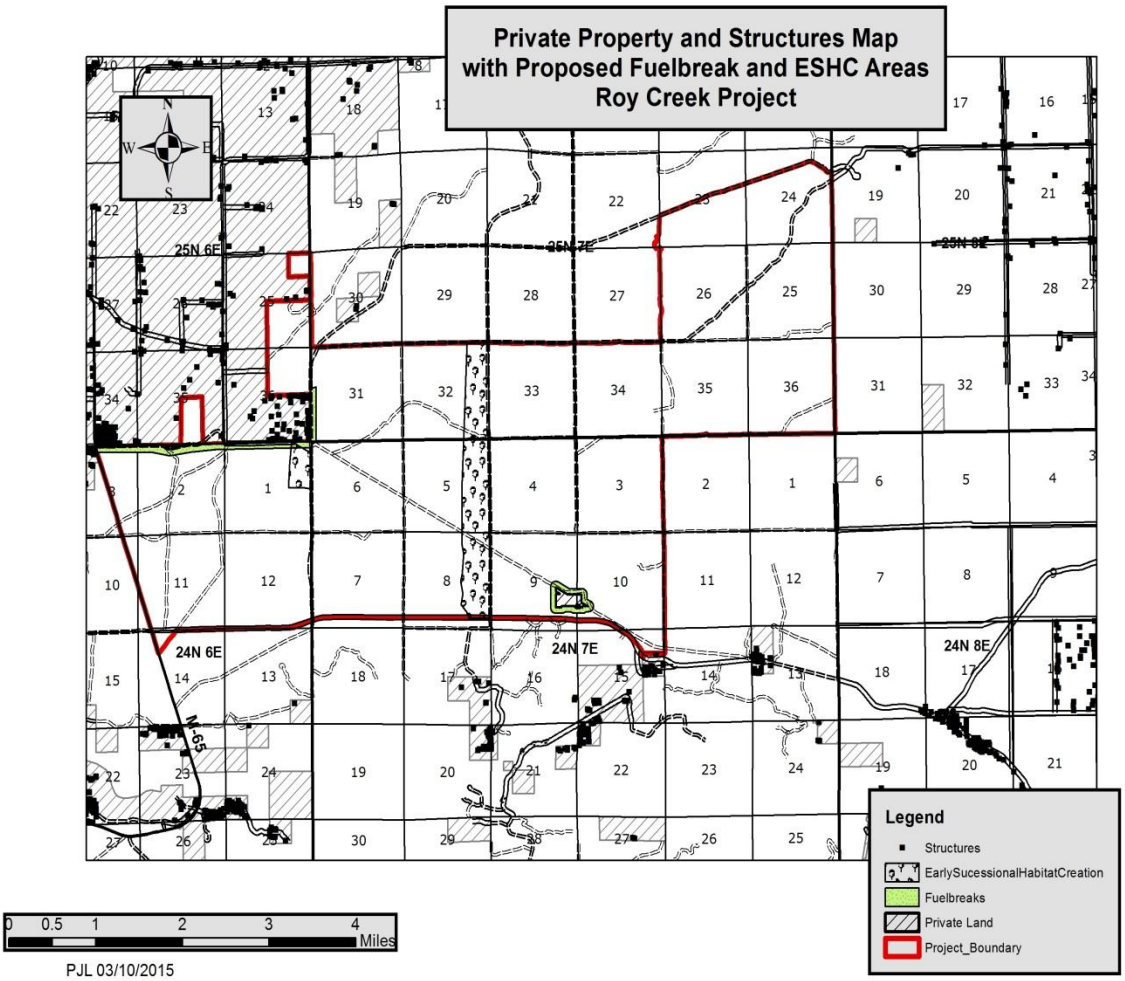
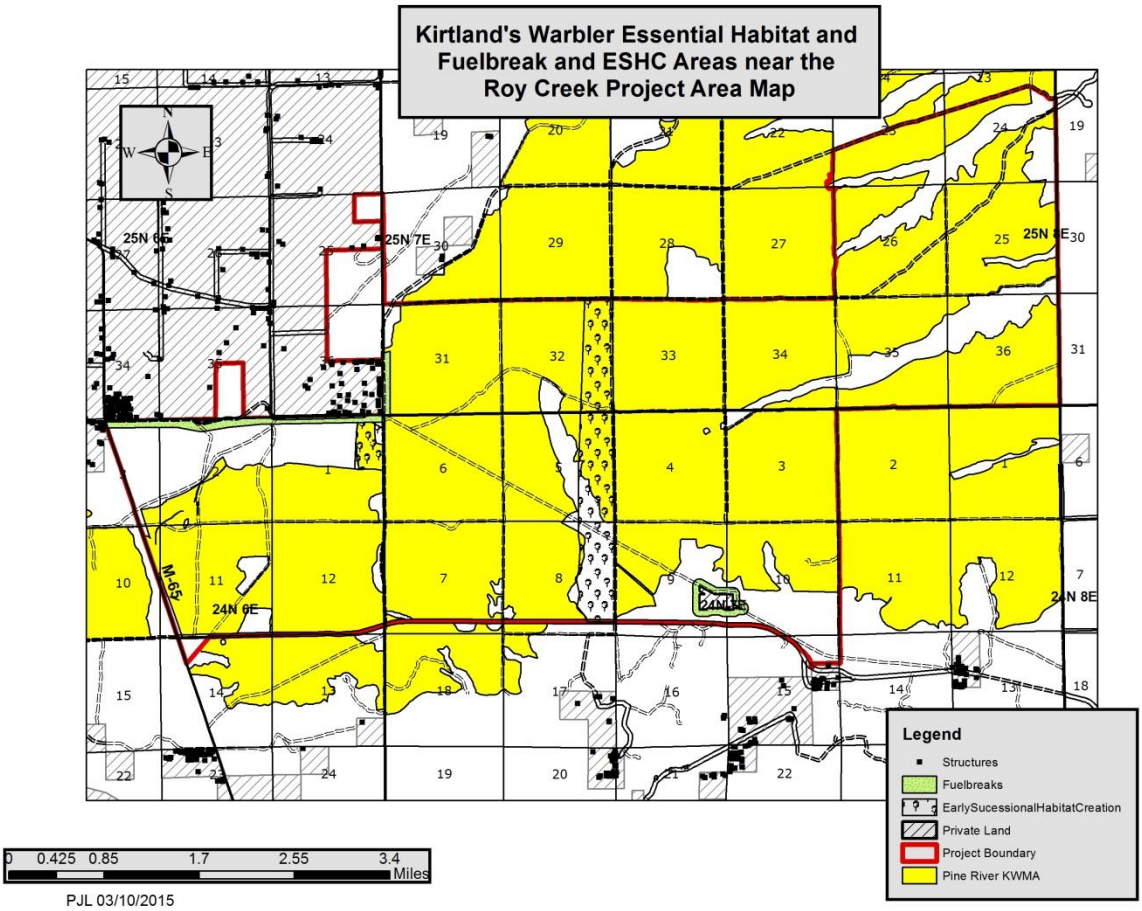


Figure 38. Kirtland's Warbler Essential Habitat and Fuelbreak and ESCH Areas



Appendix B: Management Policy by NNIS for the Huron-Manistee

Common Name	Species	Forest Rank		Common Name	Species	Forest Rank
Norway maple	*Acer platanoides*	3		Baby's breath	*Gypsophila paniculata*	1
Goutweed	*Aegopodium podagraria*	2		Giant hogweed	*Heracleum mantegazzianum*	1
Tree-of-heaven	*Ailanthus altissima*	2		Dame's rocket	*Hesperis matronalis*	1
Garlic mustard	*Alliaria petiolata*	2		Japanese hops	*Humulus japonicus*	1
Wild garlic	*Allium vineale*	5		Common St. John's-wort	*Hypericum perforatum*	4
Porcelainberry	*Ampelopsis brevipedunculata*	1		Lathco flatpea	*Lathyrus sylvestris*	5
Greater burdock	*Arctium lappa*	2		Lyme grass	*Leymus arenarius*	2
Common burdock	*Arctium minus*	3		Border privet	*Ligustrum ovalifolium*	2
Yellow rocket	*Barbarea vulgaris*	5		European privet	*Ligustrum vulgare*	2
Common barberry	*Berberis vulgaris*	2		Amur honeysuckle	*Lonicera maackii*	3
Japanese barberry	*Berberis thunbergii*	2		Morrow's honeysuckle	*Lonicera morrowii*	3
Hoary alyssum	*Berteroa incana*	4		Tatarian honeysuckle	*Lonicera tatarica*	3
Indian mustard	*Brassica juncea*	5		Whitebell honeysuckle	*Lonicera x bella*	3
Black mustard	*Brassica nigra*	5		Purple loosestrife	*Lythrum salicaria*	3
Smooth brome	*Bromus inermis*	4		Oregon grape	*Mahonia bealei*	1
Cheatgrass	*Bromus tectorum*	2		Yellow sweet clover	*Melilotus officinalis*	3
Flowering rush	*Butomus umbellatus*	2		Japanese stilt grass	*Microstegium vimineum*	1
Siberian peashrub	*Caragana arborescens*	1		Eurasian water-milfoil	*Myriophyllum spicatum*	3
Musk thistle	*Carduus nutans*	1		Scotch thistle	*Onopordum acanthium*	2
Asian bittersweet	*Celastrus orbiculatus*	2		Wild parsnip	*Pastinaca sativa*	2
Spreading star thistle	*Centaurea diffusa*	1		Mile-a-minute weed	*Persicaria perfoliata*	1

Spotted knapweed	*Centaurea stoebe*	4		Reed canary grass	*Phalaris arundinacea*	4
Canada thistle	*Cirsium arvense*	4		Common reed	*Phragmites australis ssp. australis*	3
Marsh thistle	*Cirsium palustre*	2		Scotch pine	*Pinus sylvestris*	3
Bull thistle	*Cirsium vulgare*	4		White poplar	*Populus alba*	3
Field bindweed	*Convolvulus arvensis*	5		Lombardy poplar	*Populus nigra*	3
Flax dodder	*Cuscuta epilinum*	5		Curly pondweed	*Potamogeton crispus*	3
Clover dodder	*Cuscuta epithymum*	5		Kudzu	*Pueraria montana*	2
Black swallow-wort	*Cynanchum louiseae*	1		Russian thistle	*Rhaponticum repens*	5
Pale swallow-wort	*Cynanchum rossicum*	1		Common buckthorn	*Rhamnus cathartica*	1
Houndstongue	*Cynoglossum officinale*	2		Bristly locust	*Robinia hispida*	2
Orchard grass	*Dactylus glomerata*	4		Black locust	*Robinia pseudoacacia*	3
Queen Anne's Lace	*Daucus carota*	4		Multiflora rose	*Rosa multiflora*	2
Chinese yam	*Dioscorea polystachya*	5		Purple crown vetch	*Securigera varia*	2
Common teasel	*Dipsacus fullonum*	1		Perennial sow thistle	*Sonchus arvensis*	5
Cut-leaved teasel	*Dipsacus laciniatus*	1		Lilac	*Syringa vulgaris*	3
Autumn olive	*Elaeagnus umbellata*	4		Saltcedar	*Tamarix chinensis*	1
Burningbush	*Euonymus alatus*	2		Common tansy	*Tanacetum vulgare*	3
European spindletree	*Euonymus europaeus*	2		Wild parsley	*Torilis japonica*	3
Cypress spurge	*Euphorbia cyparissias*	2		Coltsfoot	*Tussilago farfara*	2
Leafy spurge	*Euphorbia esula*	3		Common valerian	*Valeriana officinalis*	1
Japanese knotweed	*Fallopia japonica*	2		Common mullein	*Verbascum thapsus*	3
Giant knotweed	*Fallopia sachalinensis*	1		Periwinkle	*Vinca minor*	4
Glossy buckthorn	*Frangula alnus*	2				

Forest Rank
1 = Not on Forests yet; eradicate new occurrences immediately upon discovery
2 = Eradicate wherever found
3 = Control source populations, eradicate outliers
4 = Prevent invasion of last areas not invaded, eradicate in high priority areas
5 = Status on Forest uncertain, control/eradication site specific

Appendix C: NNIS Treatment Methods, Herbicide Use, and Herbicides

Manual and Mechanical Treatment Methods

Manual or mechanical methods would be the principle method of control for small spot infestations. Examples of hand tools that might be used include shovels, saws, axes, loppers, hoes, or weed-wrenches. Mechanical methods may include cutting with a string trimmer, chainsaw, brush saw, aquatic harvester, or mower. Plowing or disking may be used in gravel pits or other heavily disturbed sites.

Small infestations of herbaceous plants with shallow roots, such as garlic mustard and Eurasian water-milfoil, would typically be hand-pulled. Deeper-rooted herbaceous plants such as autumn olive would be dug up with a shovel. Larger infestations would be mowed or otherwise cut. Individual bushes or small groups of bushes, of exotic honeysuckle, buckthorn, and Japanese barberry would typically be dug up or girdled. Large infestations of exotic bushes would generally not be treated with manual or mechanical methods.

Herbicide Use

The objectives of herbicide use would be to control invasive plant species at sites where manual or mechanical means would be cost-prohibitive or result in excessive soil disturbance or other resource damage. Herbicide application may also be the preferred treatment for certain NNIS species that do not adequately respond to mechanical treatment. Herbicide drift is much reduced with spot treatment. In most cases, herbicides would be directly applied to non-native invasive plants using spot treatments or linear treatment along travel corridors.
Treatments consist of various techniques for applying herbicides to target NNIS without impacting desirable vegetation and other non-target organisms, including humans. Techniques that may be used include:

- Spraying foliage using hand held wands, backpack sprayers, or a sprayer mounted on an ATV or tractor;
- Basal bark and stem treatments using spraying or painting (wiping) methods;
- Cut surface treatments (spraying or wiping); and
- Woody stem injections.

No herbicides would be applied aerially. Only formulations approved for aquatic-use would be applied in or adjacent to wetlands, lakes, and streams, following label direction.

Herbicides

All herbicides would be used in strict accordance with manufacturer's labeling directions concerning concentrations, rates, exposure times, and application methods (Data from (Tu, Hurd, & Randall, Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas, 2001) (Czarapata E. J., 2005)).

2, 4-D ([2, 4-dichlorophenoxy] acetic acid) is a selective herbicide that controls invasive broadleaf herbaceous plants and woody seedlings, but does not harm certain monocots (including grasses). 2,4-D has been found to be effective at controlling leafy spurge, purple loosestrife, buckthorn, spotted knapweed, exotic thistles, and crown vetch ((Lajeunesse, Sheley, Duncan, & Lym, 1999), (Mullin, 1999), (Larson, 1996), (Converse, 1984), (Sheley, Jacobs, &

Carpinelli, 1999), (Hoffman & Kearns, 1997), (Tu M. , 2003). Aquatic formulations of 2,4-D are effective for the control of Eurasian water-milfoil in lakes (MDEQ, 2005).

Glyphosate (N-[phosphonomethyl] glycine) is a non-selective, broad spectrum, systemic herbicide that is used to control many grasses, forbs, vines, shrubs, and trees. Glyphosate is effective against garlic mustard, Japanese barberry, leafy spurge, honeysuckle, purple loosestrife, buckthorn, crown vetch, and Japanese knotweed (Hoffman & Kearns, 1997), (Johnson, 1996), (Seiger, 1991).

Sethoxydim (2-[1-{ethoxyimino} butyl] -5[-2-{ethylthio} propyl]-3-hydroxy-2-cyclohexen-1-one) is a selective herbicide used to control annual and perennial grasses (Tu, Hurd, & Randall, Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas, 2001). It has little or no impact on broadleaf herbs or woody plants. Species of concern on the Forests that may be controlled by Sethoxydim would be smooth brome or reed canary grass.

Triclopyr ([{3, 5, 6-trichloro-2-pyridinyl} oxy] acetic acid) is a selective herbicide that controls invasive, broadleaf herbaceous and woody plants, but does not harm certain monocots (grasses). It is particularly effective at controlling woody species with cut-stump or basal bark treatments. Triclopyr is effective against garlic mustard, Japanese barberry, honeysuckle, buckthorn, and crown vetch (Hoffman & Kearns, 1997).

Clopyralid (3, 6-dichloro-2-pyridinecarboxylic acid) controls many annual and perennial broadleaf weeds. It is particularly effective against members of the sunflower, nightshade, and knotweed families. Clopyralid may be used against spotted knapweed, thistles, and crown vetch (Hoffman & Kearns, 1997), (Beck, 1999), (Morishita, 1999). Clopyralid is a pre-emergent and post-emergent herbicide, and so can be effective not only on the plants to which it is applied, but can also prevent germination from seeds in the seed bank.

Fosamine ammonium salt (FAS) (ethyl hydrogen [aminocarbonyl] phosphonate) is a selective herbicide that inhibits growth in undesirable woody species. It is commonly used for brush control (Tu, Hurd, & Randall, Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas, 2001). FAS works through absorption by leaves, stems, and buds. FAS may be used on honeysuckle, buckthorn, and Japanese barberry.

Dicamba (3, 6-Dichloro-o-anisic acid) is a growth regulator effective against broadleaf species. It is effective against leafy spurge, spotted knapweed, and thistles (Lajeunesse, Sheley, Duncan, & Lym, 1999), (Hoffman & Kearns, 1997). It is typically applied in a mix with other herbicides.

Fluazifop-p-Butyl ((R)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl] oxy] phenoxy] propanoic acid) is a selective herbicide that is toxic to most grasses except annual bluegrass and all fine fescues. If needed Fluazifop-p-Butyl would be used on grasses such as smooth brome.

Appendix D: NNIS Treatment Herbicide Use and Information

Table 57: Non-Work Protection Standard Uses and Restriced Entry Interval

Herbicide	Non-Worker Protection Standard Uses	Restricted Entry Interval (REI) (under Worker Protection Standard, 40 CFR 170.112)
2,4-D acetic acid	Do not allow people or pets on treatment area during application, or until sprayed areas have dried.	48 hours
Aminopyralid	Not stated on label.	12 hours
Clopyralid	Not stated on label	12 hours
Glyphosate	Keep people and pets off treated areas until spray solution has dried.	12 hours
Triclopyr	Not stated on label	48 hours

Table 58: Mobility and Persistence of Herbicides in Soil

Herbicide	Characteristics		
	Mechanisms of degradation	Half-life in soil	Mobility
2,4-D acetic acid	Degradation is primarily due to microbes in the soil	7 to 10 days (EXTOXNET, 1996)	Most formulations do not bind tightly with soils, and therefore have the potential to leach down into the soil and migrate off-site. However, in many instances, extensive leaching does not occur, most likely because of the rapid degradation of the herbicide.
Clopyralid	Clopyralid is degraded by soil microbes.	40 days	Does not bind strongly to soils. During the first few weeks, potential for leaching and possible contamination of groundwater is strong, but adsorption may increase over time.
Glyphosate	Degradation is primarily due to soil microbes (Tu, Hurd, & Randall, Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas, 2001)	Average of 47 days (Tu, Hurd, & Randall, Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas, 2001)	Glyphosate has an extremely high ability to bind to soil particles, preventing it from being mobile in the environment (Tu, Hurd, & Randall, Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas, 2001).
Triclopyr	Triclopyr is rapidly degraded to triclopyr acid by photolysis, microbes in the soil, and hydrolysis.	30 days	Ester formulation binds readily with the soil, giving it low mobility. The salt formulation binds only weakly in soil, giving it higher mobility. However, both formulations are rapidly degraded to triclopyr acid, which has an intermediate adsorption capacity, thus limiting mobility.

Note: Unless otherwise noted, data are from (Tu, Hurd, & Randall, Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas, 2001).

Table 59: Herbicide Solubility, Half Life and Aquatic Toxicity Data

Herbicide	Solubility	Half-life	Aquatic Toxicity and Bioaccumulation
2,4-D	Water soluble at pH>7. At lower pH, is more likely to adsorb to organic particles present in water, thus increasing its persistence.	1 week to several weeks (EXTOXNET, 1996)	Many ester formulations are toxic to fish as well as aquatic invertebrates. Some formulations, especially many salt formulations, are registered for use against aquatic weeds and are non-toxic to aquatic species. Conflicting reports on bioaccumulation. According to some studies, nearly all of the dose of 2,4-D is excreted in urine and does not accumulate in animals (EXTOXNET, 1996). Field studies indicate that application of 2,4-D amine or ester to a lake, at high application rates, did not result in the bioconcentration of 2,4-D in game fish (USDA Forest Service, 2006). According to other studies, 2,4-D can accumulate in fish and aquatic invertebrates. However, highest concentrations of 2,4-D were reached shortly after application, and dissipated within three weeks after exposure (Tu, Hurd, & Randall, Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas, 2001).
Clopyralid	Highly soluble in water and will not bind with particles in water column.	8 to 40 days.	Low toxicity to aquatic animals. No evidence of bioaccumulation in fish tissues (USDA Forest Service, 2004) and (USDA Forest Service, 2015).
Glyphosate	Rapidly dissipated through adsorption to suspended and bottom sediments.	12 days to 10 weeks.	Technical grade is moderately toxic to fish. A formulation registered for aquatic use is practically non-toxic to fish, aquatic invertebrates, and amphibians. Does not bioaccumulate in fish (USDA Forest Service, 2003) and (USDA Forest Service, 2015).
Triclopyr	Salt formulation is water-soluble. The ester formulation is insoluble in water.	Salt formulation can degrade in sunlight with a half-life of several hours. The ester formulation takes longer to degrade.	Ester formulation is extremely toxic to fish and aquatic invertebrates. Acid and salt formulation is slightly toxic to fish and aquatic invertebrates. The hydrophobic nature of the ester formulation allows it to be readily absorbed through fish tissues, where it is converted to triclopyr acid, which can be accumulated to a toxic level. However, most authors concluded that if applied properly, triclopyr would not be found in concentrations adequate to harm aquatic organisms (USDA Forest Service, 2015).

Table 60: Toxicity Data for Birds, Fish, and Insects

Herbicide Formulation	Avian Receptors				Terrestrial Invertebrates		Aquatic Receptors			
(Technical product unless specific formulation noted)	Bobwhite Quail		Mallard Duck		Earthworm	Honey bee	Daphnia	Bluegill	Rainbow Trout	Amphibian Tadpoles
	Oral LD50	8-day dietary LC50	Oral LD50	8-day dietary LC50	LC50	Topical LD50	48-hour LC50	96-hour LC50	96-hour LC50	48-hour LC50
	mg/kg BW	ppm (in food)	mg/kg BW	ppm (in food)	ppm (in soil)	ug/ bee	Mg/L (in water)			
2,4-D										
2,4-D acid	500 - 668	>5620	>1000	>5620	2 – 350	11.5	>25	263	358 - 377	359
2,4-D Dimethyl-amine salt	500	>5620		5620			184	524	377	
2,4-D Isooctyl ester		>5620	663	>5620			5.2	>5	>5	
Clopyralid										
Clopyralid acid		>4640	1465	>4640	1000	>100	232	125	104	413
Glyphosate										
Glyphosate acid	>4640	>4640		4640		>100	780	120	86	81 - 121
Glyphosate trimethylsulfo-nium salt		>5000	950	>5000		>62.1	71	3500	1800	
ROUNDUP™					>5000	>100	5.3	2.8 - 5.8	8.2 - 25	0.3 - 1
RODEO™							930	>1000	>1000	5407
Triclopyr										
Triclopyr acid		2934	1698	>5620		>100	133	148	117	
Triclopyr butoxyethyl ester		5401-9026		>5401		>100	1.7	0.36	0.65	0.8 – 9.3
Triclopyr triethylamine salt		>10000	3176	>10000		>100	775 - 1496	891	552 - 613	162

LD50 - Lethal Dose to 50% of receptors; LC50 - Lethal Concentration to 50% of receptors; TL50 - Threshold Level to 50% of receptors.

Fosamine Ammonium Salt (FAS, Krenite) data are from (DuPont, 2004) and (Petersen, 2001). Endothall (Aquathol K) data are from (Cerexagri, 2003).

2,4-D data are from (USDA Forest Service, 2006) and (EXTOXNET, 1996). Roundup data are from (Relyea, 2005). Triclopyr data are from (Antunes-Kenyon & Kennedy, 2004). Imazapyr

data are from (DuPont, 2003), (U.S. Environmental Protection Agency, 2006), (BASF Corp., 2001), (BASF Corp., 2008), (BASF Corp., 2014), (USDA Forest Service, 2011). Fluridone data are from (Siemering, David, Hayworth, Franz, & Malamud-Roam, 2003 revised 2005), (Cornell University, 1986), (Mattson, Godfrey, Barletta, & Aiello, 2004), (SePRO, 2001), and (Washington Department of Agriculture, 2003). Metsulfuron-methyl data are from (DuPont, 2005), (DuPont, 2007), (DuPont, 2012), (EXTOXNET, 2015), (Washington State Department of Transportation, Undated), (Pest Management Regulatory Agency, 1987). Imazapic data are from (USDOI Bureau of Land Management, 2005), (NuFarm, 2015). Aminopyralid data are from (USDA Forest Service, 2007), (U.S. Office of Prevention, Pesticides, Environmental Protection and Toxic Substances Agency, 2005), (Texas State Department of Transportation, 2006), (Dow AgroSciences, 2006).

*Extoxnet ppm 5-day dietary LC50s and contact LD50s in mg/bee.

Table 61: Mammalian Toxicity Data

Herbicide	Acute Toxicity						Chronic Toxicity		
(Technical product unless specific formulation noted)	Oral LD50 (rat)	Dermal LD50 (rabbit)	4-Hour Inhalation LC50 (rat)	Skin Irritation (rabbit)	Skin Sensitization (guinea pig)	Eye Irritation (rabbit)	24-Month Dietary NOEL (mouse)	24-Month Dietary NOEL (rat)	12-Month Dietary NOEL (dog)
	mg/kg BW		mg/L				mg/kg BW/day		
2,4-D									
2,4-D acid	639	>2000	1.79	None	No	Severe	5	5	1
2,4-D Dimethylamine salt	>1000	909	3.5	None	No	Severe	Chronic toxicity data available only for technical 2,4-D acid		
2,4-D Isooctyl ester	1045	>5000	5.7	None	Yes	Moderate			

Clopyralid									
Clopyralid acid	>5000	>2000	>1.3 (unspec.)	V. Slight	No	Severe	500 (18mo) (mouse)	50 (rat)	100 (dog)
STINGER™	>5000	NA	NA	NA	NA	NA	Chronic toxicity data available only for technical clopyralid acid		
Glyphosate									
Glyphosate acid	5600	>5000	NA	None	No	Slight	4500	400	500
Glyphosate isopropylamine salt	>5000	>5000	NA	None	No	Slight	Chronic toxicity data available only for technical glyphosate acid		
Glyphosate trime-thylsulfonium salt	748	>2000	>5.18 (unspec.)	Mild	Mild	Mild			
ROUNDUP™	>5000	>5000	3.2	None	No	Moderate			
RODEO™	>5000	>5000	1.3	None	No	None			
LANDMASTER™ (Glyphosate+2,4D)	3860	6366	NA	Moderate	NA	Severe			
Triclopyr									
Triclopyr acid	713	>2000	NA	None	Positive	Mild	5.3 (22mo)	3	NA
GARLON 3A™	2574	>5000	>2.6 (unspec.)	NA	NA	Severe	Chronic toxicity data available only for technical triclopyr acid		
GARLON 4™	1581	>2000	>5.2 (unspec.)	Moderate	Positive	Slight			

Source: Herbicide Handbook (Weed Science Society of America, 2002), (DuPont, 2004), (Cerexagri, 2003), (ELF Atochem North America, Inc., 2000), (Cornell University, 1986), (Mattson, Godfrey, Barletta, & Aiello, 2004).

NA = Not Available

Table 62: Herbicide Types of Usage and Characteristics

Herbicide	Sample Trade Names	Target Plants	Selectivity	Site Selection	Time of Application	Method of Application
2,4-D	Weed-B-Gon, Brash, many others	Broadleaf herbs & woody seedlings	Broad Spectrum, selective only. Kills dicots.	Would be considered for use if other herbicides did not work. Upland where groundwater is > 10 feet deep.	Growing season preferred.	Ground broadcast or spot treatment
2,4-D (aquatic-approved)	Aqua-Kleen, Navigate, Aquicide	Eurasian water-milfoil	Broad Spectrum	Lakes.	Spring or early Summer.	Air, surface, or subsurface
Clopyralid	Stinger, Transline, Curtail	Herbaceous plants, such as spotted knapweed, crown vetch Canada thistle, wild parsnip, spot spray only, it affects native plants of the sunflower and pea families as well	Most Conifer and hardwoods are tolerant. Well suited for NNIS control and wildlife management.	Generally would not be used on well-drained soils where water table is within 10 feet of the surface due to rapid movement through soil.	Growing season Aug-Oct in combination with Accord or Arsenal (for legumes such as mimosa).	Ground broadcast applications and cut-stump.

Herbicide	Sample Trade Names	Target Plants	Selectivity	Site Selection	Time of Application	Method of Application
Glyphosate	Round-Up, Round-Up Pro, many others	Annual and perennial grasses, herbaceous plants and woody plants (non-selective). Same as above for aquatic areas	Non-selective	Uplands	Year round applications.	Ground or cut-stump.
Glyphosate (wetland-approved)	Rodeo, Accord	Non-selective. Would be targeted against purple loosestrife, buckthorn, and European swamp-thistle.	Broad Spectrum	Wetlands. Herbicide of first choice for non-aquatic wetland sites. Also recommended for young pine plantations in late summer to early fall applications.	Sept-Oct in combination with Transline (legumes such as mimosa).	Ground
Triclopyr	Garlon 3A, Pathfinder II, Access, Brush-B-Gon, Renovate	Broadleaf weeds and woody trees and shrubs.	Broad Spectrum	Uplands and wetlands.	Woody plants as foliar application, basal bark and cut-stump treatment. Herbaceous plants, spot spray only. Still works in freezing temperatures.	Ground

Herbicide	Sample Trade Names	Target Plants	Selectivity	Site Selection	Time of Application	Method of Application
Triclopyr	Renovate 3	Milfoil species, Nuphar (spatterdock), Parrotfeather, Pennywort, Phragmities, Alligatorweed, American lotus, American frogbit, aquatic soda apple, Eurasian watermilfoil, Pickerelweed, purple loosestrife, Waterhyacinth, Waterlily, Watershield, Water primrose, Broadleaf and woody vegetation on shorelines	Broad Spectrum	Ponds, lakes, canals, and shorelines.	Spring or early summer.	Surface, subsurface.

Appendix E: Response to Comments: 30-Day Comment

Response to 30-day comments will be included as an appendix in the Final Environmental Assessment.

Initial scoping comments are located in the project file

Appendix F: Glossary of Terms

Alternative	One of several projects (plan, option, choice) proposed for the decision-making process.
Arterial Road	Provides service to large land areas and usually is a public highway connecting with other Forests' arterial roads to form an integrated network of primary travel routes. Arterial roads are maintenance level 4 and 5 roads (see Road Maintenance Level below).
ATV	All-Terrain Vehicle (see ORV/OHV for definition).
Barrens	A semi-open natural vegetation type occurring in an otherwise forested region that is maintained [as open] by poor droughty soils and fire. Tree cover in barrens typically ranges from 5% to 60% and consists mainly of oak or pine species with an understory of prairie/grassland species.
Biodiversity	The diversity of life in all its forms and all its levels of organization (Hunter, 1990)
Biomass	The total mass of living matter within a given unit of environmental area.
Breeding Habitat	A large area of essential habitat that provides for the biological needs of the Kirtland's warbler within its breeding range. Breeding habitat is typically a large area (300 acres or larger) of dense young jack pine between 6 and 16 years old.
CCF	Hundred cubic feet of timber. 1 standard cord = 0.79 CCF.
CEQ	Council of Environmental Quality, established by the National Environmental Policy Act of 1969. The Council is part of the Executive Branch of Federal Government.
CEQ Regulations	Regulations that tell how to implement NEPA.
Clearcutting	A regeneration method used to establish even-aged stands whereby all trees are removed in one harvest.
CFR	Code of Federal Regulations
Compartment	A portion of a forest usually under one ownership, usually contiguous and composed of a variety of forest stand types, defined for purposes of location reference and as a basis for forest management. (The percentage of land owned by the U. S. Forest Service in any one compartment may vary from 0 to 100%).
Crown Fire	A fire that advances across the tops of trees or shrubs more or less independently of the surface fire.
Cumulative Effects	Past, present, and reasonably foreseeable effects (regardless of who or what has caused, is causing, and might cause these effects) analyzed together with the effects from the management actions.
Decision maker	Huron Shores District Ranger
Desired Condition	Description of land and resource conditions if all long-term goals are achieved.

DFC	Desired Future Condition (a.k.a. Desired Condition)
DN	Decision Notice. The decision to implement or not implement an alternative is recorded in a Decision Notice.
EA	Environmental Assessment
Ecosystems	All the interacting populations of plants, animals, and microorganisms occupying an area, plus their physical environment (Hunter, 1990).
Effective treatment	An activity resulting in a full benefit at year 1, then declining linearly over time until there are minimal benefits. Varies depending on activity.
Erosion	The wearing away of the land's surface by running water, wind, ice, other geological agents, and human activity.
ESA	Endangered Species Act of 1973, as amended
Essential Habitat	Land identified as biologically appropriate and necessary for the development of breeding habitat for the Kirtland's warbler. Contiguous areas of essential habitat are called Kirtland's Warbler Management Areas (KWMAs). Within a KMWA, essential habitat is managed on a 50-year rotation.
ETS Species	Endangered, Threatened and Sensitive Species
Even-aged	The condition of a forest or stand composed of trees having no or relatively small differences in age.
FEIS	Final Environmental Impact Statement for the Huron-Manistee National Forests' Land and Resource Management Plan (USDA Forest Service, 2006)
Fire Behavior	The manner in which a fire reacts to the influences of fuel, weather, and topography.
Fire Regimes	The general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning.
Fire Regime Condition Classes	Condition Class 1: Within the natural (historic) range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances. Condition Class 2: Moderate departure from the natural (historic) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances. Condition Class 3: High departure from the natural (historic) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances.

Flame Length	Flame length is the distance measured from the average flame tip to the middle of the flaming zone at the base of the fire. It is measured on a slant when the flames are tilted due to effects of wind and slope. Flame length is an indicator of fireline intensity.
FOFEM	First Order Fire Effects Modeling: a modeling program.
Forest Plan	Short for the Huron-Manistee National Forests' Land and Resource Management Plan (USDA Forest Service, 2006)
Fuel Break	A natural or manmade change in fuel characteristics which affects fire behavior so that fires burning into them can be more readily controlled. A generally wide (60 to 1,000 ft. or 18 to 305 m) strip of land on which native vegetation has been permanently modified so that a fire burning into it can be more readily controlled.
Fuels	Plants and woody vegetation, both alive and dead, that is capable of burning.
Guideline	Preferable limit to management actions that may be followed to achieve desired conditions.
Hazardous Fuel Reduction	Any treatment of living or dead fuels that reduces the threat of ignition and spread of fire
ID Team or IDT	Interdisciplinary Team: a group of resource specialists who conducted the environmental analysis and who wrote this Environmental Assessment.
Issue	An environmental resource about which someone has a concern. Issues are identified in NEPA § 102(2) (E) as unresolved conflicts.
KW	Abbreviation for Kirtland's warbler.
KWMA	Kirtland's Warbler Management Area: a contiguous area of essential habitat where habitat development activities are planned and implemented over the long term (50 years).
Ladder Fuels	Combustible material that provides vertical continuity between vegetation strata and allows fire to climb into the crowns of trees or shrubs with relative ease – note ladder fuels help initiate and ensure the continuation of a crown fire.
LSC	Land Suitability Class: land suitability is the fitness of a given type of land for a defined use. Lands classified as LSC 500 are suitable for timber production.
LTA	Land Type Association
Management Area	A portion of a landscape with similar management objectives and a common management prescription; management areas have specific direction regarding their desired condition, objectives, and Standards and Guidelines as provided in the Forest Plan.
MDNR	Michigan Department of Natural Resources
Monitoring Report	The annual HMNF Monitoring and Evaluation Report
MPA	Management Prescription Area, defined in the Forest Plan.

National Fire Plan	A report that recommends how best to reduce the impacts of wildland fires on rural communities, and ensure sufficient firefighting resources in the future (http://www.fireplan.gov/).
Natural Regeneration	Tree seedlings that become established without artificial efforts.
NEPA	National Environmental Policy Act: a public law that outlines specific procedures for integrating environmental considerations into agency planning, and requires analyzing possible environmental effects of any major action on public land, and the disclosure of the possible effects to the public and other agencies for review and comment.
NFMA	National Forest Management Act (36 CFR 219.27)
NHPA	National Historic Preservation Act (Public Law 102-575, 16 U.S.C. 470)
No Action Alternative	The most likely condition expected to exist in the future if current management direction continues unchanged; used as the baseline in evaluating possible effects of implementing the action alternatives.
NRHP	National Register of Historic Places.
NWCG	National Wildfire Coordinating Group
Objectives	Concise, time-specific statement of measurable and planned results that respond to identified desired conditions; forms the basis for further planning; and are action items oriented and specifically describe measurable results.
ORV, OHV or ATV	Off-Road/Highway Vehicle or All-Terrain Vehicle: a motorized vehicle with at least three low pressure tires, with an engine displacement of less than 650cc, that is made to be straddled, and is less than 50 inches wide
Plantation	An area planted to trees, typically with a planting machine or by hand planting
Prescribed Fire syn. Prescribed Burning	Deliberately ignited fire for the purpose of forest management, often to remove a heavy fuel buildup or simulate natural cycles of fire in an ecosystem.
Propagule	Any organ from a plant or a seed that results in new individuals; a unit of plant dispersal.
Recovery Plan	Kirtland's Warbler Recovery Plan (USDI Fish and Wildlife Service, 1985)This plan provides goals and objective for the management of the Kirtland's warbler.
Reforestation	To establish trees on a site by natural or artificial means.
Responsible Official	Huron Shores District Ranger

RFSS	Regional Forester's Sensitive Species: those plant and animal species identified by the Regional Forester for which population viability is a concern. These species are included in the Eastern Region Sensitive Species list.
Road Maintenance Level	The established criterion that prescribes the intensity of maintenance necessary for the planning operation of a road. There are five levels from level 1 to level 5, with level 5 requiring the highest intensity of maintenance.
Road Maintenance Level 1	This level is used for intermittent service roads during the period of time that management direction requires the road to be closed or blocked to traffic. Basic custodial maintenance is performed as required to protect the road investment and to see that damage to adjacent lands and resources is minimal. Drainage facilities and runoff patterns are maintained. While being maintained at Level 1, roads will be closed or blocked to traffic.
Road Maintenance Level 2	This level is used on roads where management direction requires that the road be open for a limited amount of traffic. Traffic normally is minor, usually consisting of one use or a combination of uses: administrative, permitted, dispersed recreation, or other specialized uses. Level 2 roads are normally characterized as single lane, primitive-type facilities intended for use by high clearance vehicles; passenger car traffic is not a consideration.
Rotation	The number of years required to establish and grow timber crops, to a specified condition of maturity.
Scenic Integrity Objectives	Scenic Integrity Objectives guide the amount, degree, intensity, and distribution of management activities needed to achieve desired scenic conditions. Objectives range from very high to very low (see Appendix F in the Forest Plan for objective definitions).
Section 106	Section of NHPA that requires federal agencies to consider the effects on historic properties.
Self Sustaining	See Species Viability. Populations that are sufficiently abundant and have sufficient diversity to display the array of life history strategies and forms to provide for their long-term persistence and adaptability over time.
Short and Long Term	Generally, short term means the duration of the activity plus a few months. Long term means after the short term, extending out to a specified number of years. The definition of long term (and in some cases, short term) will differ for each resource (e.g. fire, heritage, wildlife, etc): for example, long term for Kirtland's warbler habitat creation is about 50 years, the normal rotation cycle for jack pine on the Huron-Manistee National Forests. Definitions of short term and long term for each resource can be found in their respective specialist reports located in the Project File.
Short and Long Term (Fire/Fuels)	Short term is one to two years following implementation. Long term is two to ten years following implementation.

SHPO	State Historic Preservation Officer (SHPO) means the official appointed or designated pursuant to section 101(b) (1) of the National Historic Preservation Act to administer the State [Michigan] historic preservation program or a representative designated to act for the State historic preservation officer.
Slash	Limbs, branches and tops of trees left after timber harvest.
Snag	A standing dead tree used by wildlife for breeding, roosting, perching and/or foraging purposes.
Species Viability	A viable species consists of self-sustaining and interacting populations that are well distributed through the species' range.
Stand	A contiguous group of trees sufficiently uniform in species composition, arrangement of age classes, and condition to be a distinguishable unit.
Standards	Requirements found in the Forest Plan, which impose limits on natural resource management activities, generally for environmental protection. Standards are required limits to activities.
Stocking Density	Density of trees in an area, usually expressed in trees per acre.
Structural Diversity	The diversity in a community that results from having many horizontal or vertical physical elements (e.g. layers of canopy, supercanopy trees, down wood, etc.).
Surface Fire	A fire that burns only surface fuels such as litter, loose debris, and small vegetation.
Treatment	Any activities undertaken to modify or maintain the existing condition of the vegetation.
USDA	United States Department of Agriculture
USDI	United States Department of Interior
Viable Population	A population that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its range.