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Forest Service

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Environmental Assessment
Brittle 2 Fuels Reduction Project

**Huron Shores Ranger Station
Huron-Manistee National Forests**

Iosco County, Michigan

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Table of Contents

Chapter 1: Purpose and Need for Action	5
1.1 Introduction	5
1.2 Background	5
1.3 Project Location	5
1.4 Proposed Action	5
1.5 Management Direction	8
1.6 Purpose of the Proposal	8
1.7 Need for Action	10
1.8 Decision To Be Made	13
1.9 Public Involvement	13
1.10 Key Issues	14
Chapter 2: Comparison of Alternatives, Including the Proposed Action	15
2.1 Alternatives Considered in Detail	
Alternative 1 – The No Action Alternative	15
Alternative 2 – Considered Management Action Alternative	15
Design Criteria	
Alternative 3 The Management Action Alternative	17
2.2 Summary Comparison of Alternatives	19
2.3 Monitoring	19
Chapter 3: ENVIRONMENTAL CONSEQUENCES	20
3.1 Present Condition and Effects of the Alternative	20
Vegetation	20
Wildlife	26
Soil and Water	34
Air	37
Visual Quality	38
Heritage Resources	40
Transportation	40
Fire and Fuels	42
Recreation and Social Values	43
Civil Rights Impact Analysis and Environmental Justice	45
Appendices	
Appendix A – Brittle 2 Project Maps	
A.1 Vicinity Map	
A.2 Project Activity Maps 1 - 4	
A.6 Cumulative Effects Analysis Area (specified resources)	
A.7 Cumulative Effects Analysis Area Current Vegetative Condition	
A.8 Watershed Cumulative Effects Analysis Area	
A.9 Transportation Map	
A.10 Fire Hazard Map	
A.11 Huron Forest Land Type Association Map	
A.12 Wildlife Map	

Document Structure

National Forest management is guided by congressional mandate to provide multiple benefits to American people for present and future generations. The National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Policy (CEQ) implementing regulations (40 CFR 1500-1508) establish policy, set goals and provide regulations for analyzing and documenting the environmental consequences of proposed management actions. This analysis follows the process outlined in the CEQ implementing regulations.

This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts 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.

Chapter 2: Alternatives Considered, 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 and other agencies.

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

National Forest management is guided by congressional mandate to provide multiple benefits to American people for present and future generations. The National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Policy (CEQ) implementing regulations (40 CFR 1500-1508) establish policy, set goals and provide regulations for analyzing and documenting the environmental consequences of proposed management actions. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the Brittle 2 Fuels Reduction Project proposed action and alternatives. This analysis follows the process outlined in the CEQ implementing regulations.

Planning was coordinated with appropriate federal, state, and local government entities and agencies, and local federally recognized tribes. Additional documentation, including more detailed analysis of project area resources, can be found in the project planning record located at the Huron Shores Ranger Station in Oscoda, Michigan. These records are available for public review. Documentation can also be found on the Huron-Manistee National Forests' website at: <http://www.fs.fed.us/r9/hmnf/pages/PlanningandProjects/hs.htm>.

1.2 Background

Millions of acres of land nationwide are presently classified as being at risk from catastrophic wildland fires, disease epidemics, and insect outbreaks. There has been a growing awareness that many of the past century's traditional approaches to land management, a high level of growth in the wildland-urban interface (WUI), climate change, and increasing ecosystem health problems across the landscape, have contributed to more severe wildland fires and created widespread threats to communities and ecosystems. The proposed Brittle 2 Fuels Reduction Project is designed to respond to the core components of the National Fire Plan's 10-Year Comprehensive Strategy, the National Fire Plan can be viewed on the internet at; <http://www.forestsandrangelands.gov/overview/index.shtml>.

The Brittle 2 Fuels Reduction Project proposes hazardous fuels reduction activities within WUI in recognized "at risk" areas. As a part of a nationwide effort to identify communities at high risk from wildfire, several agencies, including the Forest Service, developed a list of urban wildland interface communities in the vicinity of federal lands. This list, published in the Federal Register in 2001 (Urban Wildland Interface Communities within the Vicinity of Federal Lands that are at High Risk from Wildfire), includes the Michigan communities of Oscoda and Mio. Those townships surrounding the communities of Oscoda and Mio, including the Brittle 2 project area, meet the criteria of "at risk communities" as described in the Federal Register.

1.3 Project Location

The Brittle 2 Fuels Reduction Project is located in Iosco County, in all or portions of T22N R6E, Sections 1, 10, and 12, Grant Township; T22N R7E, Section 6, Tawas Township; T23N R7E, Sections 5, 6, and 32, Wilbur Township; T23N R6E, Sections 1, 4, 5, 6, 7, 8, 9, 10, 15, 16, 17, 18, 21, 22, Plainfield Township; T24N R5E, Sections 24, 25 and 36, Plainfield Township; T24N R6E, Sections 20, 26, 29, 30, 31, 34, 35, and 36, Oscoda Township; T24N R7E, Sections 31, and 32, Oscoda Township. (Vicinity Map and Project Area Maps, Appendix A).

1.4 Proposed Action

The Forest Service proposes to reduce and manage hazardous fuels on the Huron National Forest in Iosco County through fuelbreak creation and the use of landscape prescribed fire on National Forest lands adjacent to or near private properties in areas at risk from wildfire. The project duration will be an ongoing management of hazardous fuels for the foreseeable future. The Forest Service would conduct a series of prescribed burns, thin forested stands, and manage selected lands in a more open condition to reduce accumulated surface fuels, ladder fuels, and tree canopy base height, and to restore ecosystem health, diversity, and productivity.

The Brittle 2 Fuels Reduction Project proposes the following treatments:

- Reduce hazardous fuels in the wildland-urban interface by creating fuelbreaks through timber sales and/or hand and mechanical methods. Maintain the fuelbreaks using mechanical methods and/or prescribed fire.
 - Approximately 236 acres of pine and mixed oak/pine stands would be treated to create fuelbreaks along private property boundaries. Jack pine, small-diameter red pine, and poor form oak would be removed. Where present, larger diameter oak, hardwoods, and red and white pine would be retained to establish a semi-open condition and provide wildlife habitat. The fuelbreaks would be maintained in a semi-open condition using mechanical methods or prescribed fire on a three to seven year interval. The frequency of maintenance intervals would depend on the establishment and vigor of new growth. The fuel break along the community at the corner of Monument and Alpine Road will have a 50 ft privacy strip left along the property boundary.
 - Approximately 58 acres of red pine plantation would be thinned around the Rollways H-4 and H-5 Recreation Residence Groups. Decadent trees and hazardous fuels would be removed within the 24 acre Rollways H-4 and the 5 acre Rollways H-5 Recreation Residence Tracts.

- Reduce the existing hazardous fuels (figure 1) and restore ecological condition class to fire-adapted ecosystems through use of low to moderate intensity prescribed fire across areas of similar soil and vegetation at a landscape level. Manage the landscape to improve forest vigor and resilience to disease, and to maintain fuels reduction (figure 2).
 - Up to 5,600 acres of National Forest lands would be prescribed burned to reduce fuel loading and promote stand structure and species composition reflective of healthy and productive forested stands. Where possible, existing roads and trails would be utilized as fire control lines for the prescribed burning. Fuels reduction and condition class would be maintained through periodic use of prescribed fire with a return interval based on vegetative response, duff and litter depth and funding, usually a 3 to 7 year return interval, and in some areas that are further from structures it may be appropriate to have a return interval of 10 years.

- Enhance plant and wildlife habitats and restore ecosystem health, diversity, and productivity through creation of pine barrens ecosystems (figure 3) using prescribed fire at a landscape level. Manage the landscape as barrens to maintain viability of sensitive plant and wildlife species.
 - Approximately 5,980 acres of National Forest lands would be designated pine barrens habitat to be managed for sensitive plant and wildlife species. Of these 5,980 acres, 910 of it will not be prescribed burned, but still receive pine barrens designation for future projects.
 - Approximately 5,070 acres of the designated barrens would be prescribed burned to begin the establishment of a mosaic of open to semi-open barrens conditions. Where possible, existing roads and trails would be utilized as fire control lines for the prescribed burning. Fuels reduction and barrens development would be enhanced through periodic use of prescribed fire with a return interval based on vegetative response, duff and litter depth and funding, usually a 3 to 7 year return interval.
 - Additional habitat enhancement projects within the barrens could include topping trees for snag creation, erecting bat boxes, bluebird boxes and kestrel boxes, supplemental planting of warm season grasses, native forbs and nectaring sources, and biological and herbicide treatments of non-native invasive plant species.

Detailed information on the proposal is contained in Chapter 2.1, Alternative 2.

Table 1. Acreage for the Proposed Treatments *(All acreages are approximate)*

Proposed Treatment	Acres
Fuelbreaks Created Through Timber Removal Activities	294
Acres Landscape Rx Burned (Excluding Pine Barrens Mgt) This includes the Fuelbreak acres (294)	5,600
Acres Rx Burned to begin Pine Barrens Establishment	5,070
Total Landscape Rx Burning for hazardous fuels reduction	10,670
Acres Designated to be Managed as Pine Barrens for future projects (will not be burned)	910

Figure 1. Current condition of Brittle 2 project area.



Figure 2. Desired condition of project area after prescribed burning.



Figure 3. Desired conditions of pine barrens.



1.5 Management Direction

Huron-Manistee National Forests Land and Resource Management Plan (HMFP)

The Huron-Manistee Land and Resource Management Plan (Forest Plan) provides a programmatic framework regarding allocation of National Forest System lands and the measures necessary to protect the Forests' resources. It describes how the Huron-Manistee National Forests should be managed and what resources should be provided by these lands now and in the future. The Final Environmental Impact Statement (FEIS) displays forest-wide effects of activities such as timber harvest, wildlife habitat management, recreation and visual resource management, fire and fuels management, and transportation system management.

This analysis was designed to implement Forest Plan direction and considers site-specific effects of management activities proposed in the Brittle 2 Fuels Reduction Project. The Brittle 2 Fuels Reduction Project Environmental Assessment (EA) is tiered to the Huron-Manistee National Forests Final Environmental Impact Statement, Land and Resource Management Plan, and accompanying Record of Decision, March 20, 2006.

Brittle 2 Fuels Reduction Project addresses the Huron-Manistee National Forest Plan under Chapter III 4.2 roaded natural sandy plains & hills, 4.3 roaded natural wetlands, & 4.4 rural 5100 FIRE MANAGEMENT;

Taken from the Huron-Manistee National Forest Plan

I Suppression: A Use of tractor plows, retardant, constructed helispots and wheeled vehicles will be common.

II Fire Use and Fuels Treatment: A Constructed fuel barriers will be no longer than eight miles in length, and temporary or permanent openings will be limited to no more than 500 acres.

III Activity Fuels: slash-will be treated to a level commensurate with the allowable fire intensity and rate of spread that meets resource objectives in established prescriptions. Treatment along highways and adjacent properties will meet applicable state laws.

IV Management action: To address high fuel hazards may occur in old growth when public safety and property are at risk.

National Fire Plan and 10-Year Comprehensive Strategy

Through the Fiscal Year 2001 Interior and Other Agencies Appropriations Act (P.L. 106-291), Congress established the National Fire Plan, a long-term investment to help protect communities and natural resources and the lives of firefighters and the public. As a part of the National Fire Plan, a 10-Year Comprehensive Strategy (Comprehensive Strategy) was prepared, outlining a comprehensive approach to the management of wildland fire, hazardous fuels, and ecosystem restoration and rehabilitation on Federal and adjacent state, tribal, and private forest and range lands in the United States. Primary goals of the strategy are to 1) improve wildfire prevention and suppression, 2) reduce hazardous fuels, 3) restore fire adapted ecosystems, and 4) promote community assistance. The progress of 10-Year Comprehensive Strategy implementation is measured, in part, by the change in Fire Regime Condition Classes (condition class) of historically fire-adapted ecosystems. Condition class is a measure of general wildfire risk as it relates to departure from historical ranges of fire disturbance regimes, and vegetative composition, structure, and diversity. (Reference; A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan)

The Brittle 2 Fuels Reduction Project also follows the guidance provided in the National Fire Plan under the comprehensive strategy Goal 1; Improve Fire Prevention and Suppression and Goal 2; Reduce Hazardous Fuels. Brittle 2 also provides for the protection of National Forest System lands and for the property and safety of users, and bases fire prevention and pre-suppression activities on past fire occurrence, fire intensities, and values at risk. Implement fuels reduction and fuelbreak projects where conditions warrant for the protection of life, property, and safety.

1.6 Purpose of the Proposal

The entire 10,600 acres of the Brittle 2 Project falls within the Management Areas (MA) 4.2 & MA 4.3; roaded natural sandy plains & hills. The purpose of the proposal is to address site-specific needs and opportunities to move the project areas from the existing condition to the desired future condition within the foreseeable future. This project will maintain the condition established by previous timber removal projects in the area that typically did not deal with fuels treatment. This is an opportunity to build on these projects

to condition the landscape to better survive wildfire, reduce the risk of large crown fires, and create a safer condition for firefighters and public. The project is also working towards the enhancement of habitat and an increase in the variety of wildlife, with an emphasis given to managing deer, grouse, and adjacent habitat for the federally listed endangered Kirtland Warbler (*Dendroica kirtlandii*). Additionally, the proposed project would meet Forests' Plan and National Fire Plan objectives by restoring ecological condition class, fire-adapted ecosystems, improving habitat diversity to meet species viability needs, and preventing or controlling the development of insect and disease problems.

Historically, fire played a key role in the development and maintenance of the project area landscape ecosystem (Reference; *Great Lake Ecological Assessment of Historical Vegetation*). The broad, flat, outwash plains supported forests and barrens with fire dependent tree species such as jack pine, red pine, and northern pin oak. In addition to regenerating healthy, young stands of timber, periodic wildfire acted to reduce forest fuels, minimize insect and disease outbreaks, and stimulate diverse native ground vegetation that sustained soil productivity and habitat diversity.

Forest replacement fire regime classes (FR) are a generalized description of the role fire plays in an ecosystem characterized by fire frequency, predictability, seasonality, intensity, duration, scale (patch size), as well as regularity or variability. Over 98 percent of the project areas fall within FR 1 and the remainder is FR 2. FR 1 and FR 2 landscape ecosystems historically experienced frequent (FR 2) to very frequent (FR 1) wildfires, ranging from low to moderate-intensity surface fires to large, high-intensity, stand-replacing fires.

Fire Regime Condition Class (FRCC) measures general wildfire risk and is a function of the degree of departure from historic fire regimes. FRCC incorporates multiple stand factors into its categorization including the degree the stand structure and species composition has been altered from its historical range, if there is a risk of losing a key ecosystem component, and how many fire return intervals the stand is from its historical mean fire return interval. Activities such as fire exclusion, timber harvesting and reforestation, insects and disease, and past management practices can cause a departure in condition class. The project area would be characterized by condition classes 2 and 3. The three condition classes are as follows:

- **FRCC 1:** Fire regimes are within an historical range and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within a historical range.
- **FRCC 2:** Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals, resulting in moderate changes to fire size, intensity and severity or landscape patterns. Vegetation attributes have been moderately altered from historic ranges.
- **FRCC 3:** Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historic frequencies by multiple return intervals, resulting in dramatic changes to fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historic range.

The Huron-Manistee National Forests has identified the importance of fire regimes and is managing this need along with the Species Viability Evaluation (SVE) process. This process is a structured and reasoned series of judgments about projected amounts and distributions of habitat and the likelihood that such habitat would allow populations of species that may be at risk to remain well-distributed over the long-term. As a part of the planning process for this project, potential SVE areas were identified based on Land Type Association (LTA) and Ecological Land Type Phase (ELTP) data, and historical and current data of species existence. Plant communities of concern include fire prone and fire dependent pine barrens habitat. The Huron National Forest currently has an estimated 8% of its historic pine barrens habitat, and existing patches are small and highly isolated. Thirty-two percent of the Forests' sensitive species are associated with pine barrens habitat. (Reference; *Great Lake Ecological Assessment of Historical Vegetation*)

Approximately 98% of the Brittle 2 Fuels Reduction project area falls within land types that have historically supported pine barrens. These areas were identified because of historic and recent occurrences of both sensitive and rare species based on surveys and historical data. The Brittle 2 Fuels Reduction project area covers three of the identified SVE areas and has documented occurrences of Michigan bog grasshopper (*Appalachis arcane*), Alleghany plum (*Prunus alleghaniensis*), Hill's thistle (*Cirsium hillii*), and northern wild comfrey (*Cynoglossum boreale*). Burn blocks 6 and 7 falls within the Au Sable Massasauga Management Unit and is considered suitable habitat for eastern massasauga (*Sistrurus catenatus catenatus*), and are encompassed within old growth that is contiguous with the AuSable River old growth corridor.

The Brittle 2 Fuels Reduction Project is focused on restoring a more historic vegetative condition and reducing excessive fuel quantities that can contribute to large wildfires. The primary method to achieve these goals will be with the use of prescribed burning. With the exception of the proposed fuel breaks, mechanical fuel treatments are not being considered prior to prescribe burning. All but 8% of the Brittle 2 project area has had some form of mechanical Treatment prior to prescribe burning through other projects. Brittle 2 will also help maintain the fuels that have been reduced by these other projects with low to moderate prescribed fire. The prescribed burning will also offer ecological benefits that are not typical found with mechanical treatments;

- Open seed beds for native plant species (Reference; U.S. Forest Service Fire Effects Information System <http://www.fs.fed.us/database/feis/> / *Fire Effects Guide 2001 NFES 2394*).
- Conditioning the mature trees to better survive in the event of a wildfire (Reference; *Fire Effects Guide 2001 NFES 2394* pg.113).
- Rapid return of nurturance to the soil (Reference; *Fire Effects in Ecosystems 2005 GTR 42* pg 65, 78, 164 / *Fire Effects Guide 2001 NFES 2394*).
- Insects and disease control (Reference; U.S. Forest Service Fire Effects Information System <http://www.fs.fed.us/database/feis/> / pg. 78 / USDA Fire in Eastern Oak Forests NRS-P-1 pg 152).
- Invasive species control (Reference; U.S. Forest Service Fire Effects Information System <http://www.fs.fed.us/database/feis/>).
- Creation of snags for birds and insects.

Existing project and future projects may allow some of the project area to be commercially thinned prior to prescribed burning. These projects are addressed in the cumulative effects section in Chapter 3.

1.7 Need for Action

The need for the project is established through the comparison of the existing condition and the desired condition. The desired condition is determined using guidance from the Forests' Plan, federal and state laws and regulations, current agency direction, and consideration of the issues and concerns expressed by the public.

Current Condition:

Approximately 225,000 acres or 52% of the Huron National Forest is in Forest Replacement Fire Regime Class 1 (FR1). Within the Brittle 2 Project Area, over 8,240 acres, or 98% is FR1, and almost 2% is FR2. Most of the stands within the project area are described as significantly altered from their historical range (FRCC 3), with fewer stands meeting FRCC 2 definitions. Approximately 71% of the vegetation within the project areas is red pine plantations exhibiting contiguous tree canopies, an accumulation of needle cast, and little to no herbaceous understory vegetation. Tree densities in these stands are artificially high due to plantation stocking levels. Young, dense jack pine, over-mature jack pine/oak, and red pine/oak forest types contribute to fuel loading throughout the remainder of the project areas (see Project Record, Fire and Fuels Report).

Private residences and subdivisions, and numerous recreational trails are within or border the forested project areas, increasing the risk of wildfire ignition and therefore the risk to people, their homes, and firefighters. Stand densities, fuel structure and fuel loading contribute to increased fire intensities and conditions that may contribute to fire behavior resistant to control using traditional fire fighting response. Fire fighter safety could be compromised due to potential fire intensities including flame lengths and rates of spread (see hazardous fuels map Appendix A.10).

Desired Condition (Huron-Manistee Forest Plan 4.2, 4.3):

Fire is recognized as an integral part of the ecosystem, needed to maintain healthy stands of timber and reduce hazardous fuels. FRCC is moved toward historic landscape ecosystem patterns (FRCC 1) through use of mechanical treatments and prescribed fire. Continued emphasis is placed on mechanical fuels treatments and use of prescribed fire on a landscape ecosystem scale inherent of the Huron National Forest.

Red pine plantations on Land Type Association 1 (LTA1) systems are thinned over time to densities more indicative of natural conifer forests, and fire is reintroduced to red pine understories to reduce fuels, stimulate herbaceous vegetation, and restore forest health. Short rotation-oak and jack pine stands are regenerated after reaching maturity and are healthy and free of insect and disease

epidemics. Openings, including pine barrens, are an integral part of the landscape, and larger-scale barrens, maintained regularly by prescribed fire, become a form of fuel break.

The chance of catastrophic wildfire is reduced by strategically placed fuelbreaks around private properties and subdivisions and fuels treatment areas are integrated in the forested environment. Fire behavior has been reduced through mechanical and prescribed fire treatments, allowing effective and safer initial attack capabilities by fire fighting resources.

Need for Action:

Current conditions represent a departure from historic FRCC resulting in unnatural fuels buildup and forests vulnerable to extraordinarily destructive wildfires. Key forest components are at risk due to fire exclusion and unnaturally high forest densities. There is a need to reduce unnatural stand densities, crown closure, ladder fuels, and accumulated needle cast within stands in urban-interface areas and across the fire-prone forested environment. There is a need to stimulate hardwoods and natural herbaceous vegetation in plantation understories and within fuelbreak zones. There is a need to modify project area condition classes and reduce hazardous fuels in order to minimize the size, intensity, and severity of wildfire.

Reducing the immediate threat of wildland fire to people, communities, and the ecosystem requires the ongoing reduction of forest fuels within and around the zone where human development and undeveloped wildland fuels converge.

I. Restore Fire-Adapted Ecosystems Restore and maintain savannahs, prairies, dry grasslands, shrub/scrub and oak-pine barrens in areas where they were known to previously occur, to provide for habitat diversity and to meet species viability needs. Utilize prescribed fire to meet management direction as appropriate for the ecosystems involved. Provide ecological condition class restoration and fuel hazard reduction based on ecosystem health. Use prescribed fire to mimic natural processes to accomplish resource benefit objectives. Minimize or prevent the development of pest problems.

Current Condition:

Approximately 98% of the Brittle 2 Project areas are in Land Type Association (LTA) 1, dry sandy outwash plains, supporting conifer and oak forest types with low site indexes. Red pine plantations, planted primarily between 1930 and 1950, are overstocked and exhibit minimal growth and diversity. Tree canopies are contiguous, and the understories are lacking in herbaceous vegetation diversity. Project area fire-dependent ecosystems currently exhibit a fair to high degree of alteration from historic ranges of fire disturbance, vegetative composition, and landscape patterns. Low site oak, historically maintained in a healthy condition through wildfire, is in extreme decline with unnaturally high rates of mortality and suppressed regeneration.

The presettlement project area of Brittle 2 was red pine-jack pine and pine barrens ecosystem that were maintained by fire. The forested composition varied with fire intensity, frequency and extent. The project area was primarily made up of native grasses and large red pine in variable-density patches, and dense jack pine forests of varying ages (Reference; *USDA Forest Service /Great Lakes Ecological Assessment of Historical Vegetation of the Great Lakes 2001*). Historically, pine barrens covered approximately 33,000 acres in Iosco County (Reference; *Historical Vegetation of Michigan; Great Lakes Ecological Assessment*). Today, the upland openings within the project area is 277 acres in size, and openings account for three percent of the total number of acres. The Brittle 2 Fuels Reduction project area has been identified in forest planning as a priority area for restoring pine barrens and associated native vegetation because of historic and recent occurrences of rare and sensitive species such as dusted skipper, Michigan bog grasshopper, eastern massasauga, Hill's thistle, and Alleghany plum.

Desired Condition (Huron-Manistee Forest Plan 4.2, 4.3):

Project area vegetation is healthy and management is based on a landscape ecosystem approach. Emphasis is placed on emulating historic habitat patterns and disturbance processes through mechanical treatments and the use of prescribed fire. Restoration of natural disturbance regimes is integrated with wildlife, timber, and pest management. Vegetative composition and landscape patterns more closely resemble historic conditions.

Conifer plantations within the project area are characterized by fewer, larger diameter trees within a more open landscape, exhibiting a greater diversity of plant and animal species and habitats. Emphasis is placed on the health and vigor of the landscape ecosystem. Inclusions of hardwoods and natural

herbaceous vegetation are present throughout conifer ecosystems. A variety of snags, den trees, and down woody debris is noticeably present. The forest ecosystem is healthy and insect and disease infestations and invasive vegetation are minimal.

Upland openings characteristic of historic pine barrens are evident within the project area landscape and provide habitat for rare and sensitive species including eastern massasauga, dusted skipper, red-headed woodpecker, Michigan bog grasshopper, Hill's thistle, and Alleghany plum. Native plant and animal species and targeted communities are flourishing and are maintained through the emulation of historic habitat patterns and disturbance processes.

Need for Action:

There is need to restore the health of the project area ecosystem using mechanical treatments and prescribed fire to improve the vigor and quality of existing timber, enhance wildlife habitats, manage insect and disease outbreaks, and reestablish native plant and animal species and communities dependent on disturbance processes. Initiating the development of these barrens provides habitat that will help to ensure the continued viability of rare plant and animal species on the forest.

II. Promote Community Assistance Encourage adequate fire prevention, fire-safe construction and presuppression activities on private lands in wildland/urban interface fire prone areas. Use a combination of personal contacts, brochures, maps and informational signing to inform and educate users about forest management.

Current Condition:

"At-risk" wildland-urban interface communities are not adequately educated about the risks of fire in the wildland-urban interface and the tools and methods to reduce the risk to lives and property. Lack of knowledge among the general public, wildland-urban interface communities, and local and absentee property owners contributes to the losses caused by unplanned and unwanted wildland fire. There is also a general lack of knowledge about the importance of fire in historically fire-prone ecosystems, and the use of prescribed fire to reduce the risk of catastrophic wildland fire and to restore fire-adapted ecosystems.

Desired Condition (Huron-Manistee Forest Plan 4.2, 4.3):

People, property, and natural resources are protected from the risk of wildland fire before a fire starts, by building and maintaining private properties and communities in a way that is compatible with natural surroundings. Communities are responsible for planning and supporting the design of a safe community and effective emergency response, and individuals are responsible for safer home construction, landscaping and maintenance. Communities and landowners within the wildland-urban interface, along with the general public are educated about prescribed fire and are comfortable with its use in the forested environment.

Need for Action:

There is a need to inform the public about the hazards of wildland fire, and engage the public in the use of fuels reduction treatments. Public land agencies need to continue to implement fuels reduction projects around private property and within the forest environment through the use of timber sales and mechanical methods, as well as the use of prescribed fire. There is a need to continue to educate the public about the role they play in reducing risks to lives and property and in fire and fuels management on public lands.

III. Measure and Monitor Outcomes Monitor and evaluate effectiveness of management practices (Forests' Plan II-4). Conduct monitoring of selected projects and evaluate the effectiveness of management activities. Monitor performance and outcomes and utilize results to inform future decisions (National Fire Plan; Comprehensive Strategy – Guiding Principle).

Current Condition:

Fuels reduction and ecosystem restoration through the combination of mechanical methods and prescribed fire are only beginning to be utilized at the ecosystem scale across the Forest. Current fuels reduction projects are being implemented using a variety of practices, strategies, and methods, resulting in varying vegetative composition and landscape patterns having potentially variable fire behavior and ecosystem outcomes.

Desired Condition (Huron-Manistee Forest Plan 4.2, 4.3):

Vegetative composition and landscape patterns more closely resemble historic conditions. Fuels treatments demonstrate a positive change in reducing the threat to life, property, and safety, and show a benefit to ecosystem function and condition class through the establishment and increase in the variety of native plants, animals and organisms inherent of the fire-adapted ecosystem.

Need for Action:

There is a need to monitor the effectiveness of our fuels reduction treatments and landscape restoration activities to determine whether and how well the desired outcomes are being met, to identify needed changes, and to continue to refine projects and treatments using the information gathered. Monitoring of rare or forest sensitive species such as the eastern massasauga is an important indicator of ecosystem restoration activities.

1.8 Decision To Be Made

This Environmental Analysis (EA) analyzes the effects of the proposed action and alternatives for the Brittle 2 Fuels Reduction Project. The District Ranger must decide whether or not to implement the proposed activities or its alternatives based on the actions and methods, location of actions, and project requirements and mitigations presented in the analysis.

1.9 Public Involvement

An interdisciplinary team (ID team) of resource specialists gathered information from the project area to determine how to best implement Forests’ Plan direction. Needs and opportunities were identified that would move the area from the existing condition to the desired future condition outlined in Forests’ Plan, and project proposals were developed by the ID team. Comments on the proposed actions were solicited from resource specialists, members of the public, adjacent property owners, and public and private agencies and organizations through a listing in the Huron-Manistee National Forests NEPA Quarterly Schedule of Proposed Actions beginning in January 2009, a posting of the proposal on the Huron-Manistee National Forests website, and a direct mailing in August 2009.

Nine comments were received in response to scoping activities. Public and internal comments are used to refine issues, alternatives, and potential environmental effects of the site-specific proposed activities. A copy of the scoping letter, mailing list of individuals, government agencies, tribes, and organizations contacted, and comments received are included in the Planning Record.

1.10 Key Issues

Issues result from discussion, debate, and disagreement regarding the resource impacts directly related to the proposed activities. In order to provide concise analysis, the agency distinguishes between key issues, used in the analysis for formulating alternatives, and other comments and concerns used to track effects and develop mitigation.

Brittle 2 Fuels Reduction Project Disposition of Public Scoping Comments

Issue Determination Relevant issues are those that represent points of disagreement, dispute, or debate with the Proposed Action. Reasons for issues being considered non-relevant are:

- 1) The issue is outside the scope of the proposed action;
- 2) The issue is already determined through law, regulation, Forest Plan, etc.;
- 3) The issue is irrelevant to the decision to be made;
- 4) The issue is conjectural and not supported by scientific fact;
- 5) Acknowledges a general comment or concern/Addressed by an alternative.

Issue: An issue is an effect on a physical, biological, social, or economic resource. An issue is not an activity; instead, the predicted effects of the activity create the issue.

Example:

- a. "I do not believe trees should be cut." - This is not an issue, it is an activity (cutting trees).
- b. "Habitat loss for x species could occur if these trees are cut." This is an issue because it is an effect of an action/activity.

Table 2. Disposition of Public Scoping Comments

ID	Statement/Issue/Concern	Disposition	Response
Peg G. 08/24/09	Has no problems with proposals. Likes the the fuelbreak. Was initially concerned with burning near her home, but supportive of landscape burning No issue.	5	Comments noted.
Tom L. 08/25/09	Curious about project. Once explained—had no specific concerns.	5	Comments noted.
Ray S. 08/25/09	Believes logging has adversely affected deer populations. Does not want to see the forest thinned because it may lead to vandalism of his property.	4, 5	Comments noted. Corresponded via the phone 8/25/09.
Steve C. 08/26/09	No issue. Curious about when the project will start.	5	Comments noted.
Jim B. 08/28/09	Has no problems with proposals. Was initially concerned with burning near summer home. Agreed with the fuels management.	5	Comments noted. Requested copy of Decision Notice.
Jeff S. 09/08/09	Asked for clarification on the project & about the prescribed burning. Also asked about logging on Britt Road. All questions were address, no concerns.	5	Comments noted.
William N. 09/09/09	Asked for clarification on the project. William explained he was in favor of thinning some timber near his home on Iargo Road.	5	Comments noted.
Ray S, E R Jr, Rich F, Lawrence R. 09/09/09	Meeting with 4 land owners, see meeting notes located in project file.	4, 5	Provided information and incorporated the suggestion to leave a privacy strip along the fuel break.
Doloris 09/18/09	had no specific concerns. Had a suggestion to develop an ATV trail	5	Comments noted.
Bob S. 10/01/09	Would like scoping letter and maps from the project mailed to him.	5	Scoping letter mailed 10/01/09.
Lawrence R. 10/02/09	Received a letter with the same concerns expressed at the meeting 09/09/09	5	Comments noted. Called in response to the letter.
Ray s. 10/02/09	Sent an email with suggestions for possible fuel breaks. In reference to the meeting on 09/09/09	5	Comments noted. Mailed information on Britt Road and Slosser Flats projects.

Public and internal comments are used to refine issues, alternatives, and potential environmental effects of the site-specific proposed activities. A meeting (Sept. 9th 2009) with some concerned citizens resulted in a 50 foot strip of trees being left along the property line, and an increase in the number of trees left in the rest of the proposed fuel break near Alpine Road. Public comments and the replies to these comments are included in the Planning Record. A copy of the scoping letter and legal notice of the opportunity to comment, mailing list of individuals, government agencies, tribes, and organizations contacted, and comments received are included in the Planning Record. Alternative 3 was developed as a result of consultation with Huron-Manistee National Forest personnel. Alternative 3 is the same as Alternative 2, only there would be no change in Land Suitability Class (LSC) of the designated pine barren area. Internal discussions determined that it is not necessary to change the LSC to accomplish the objectives for the Brittle 2 Project.

CHAPTER 2

COMPARISON OF ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares the proposed management action and alternatives to the proposed action. The Proposed Action is a set of activities designed to accomplish the objectives described in the Purpose and Need for Action (Chapter 1). It is a proposal to authorize, recommend, or implement an action. This chapter describes the proposed management action for the Brittle 2 Fuels Reduction Project, and includes project design criteria and monitoring requirements associated with the proposed activities. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. This comparison is based on the objectives identified in Chapter 1.

2.1. Alternatives Considered in Detail

Three alternatives are considered in detail, the No Action Alternative, the Action Alternative 2, and Management Action Alternative 3 (no change to Land Suitability Class). The No Action Alternative, analyzes the effects of deferred treatment (no management activities taking place at this time). Alternative 2, the Management Action, follows management direction established in the Forests' Plan and the Comprehensive Strategy, as described in Section 1.5 of this document. Alternative 3 is the same as Alternative 2 with the exception of no change of the Land Suitability Class (LSC). Alternative 2 and 3 also considers public comments and values.

Alternative 1

The No Action Alternative

Under the No Action alternative, no project would be implemented in the project area at this time. No fuels reduction or wildlife habitat enhancement activities would occur. Fire-regime condition class would continue to decline, fuel loading within the forest would continue to increase causing increased risk of catastrophic fire events. Current uses of the area would continue until such uses are prohibited by changed environmental conditions. Because there are no Best Management Practice (BMP) fire areas on the Huron National Forest and all natural starting wildfires will be suppressed, wildfire is not considered (as a natural process) in the analysis of this alternative.

Alternative 1 provides a baseline by which to compare the environmental effects of the action alternatives. This is a viable alternative and responds to those who want no management activities to occur in the project area. This alternative does not respond to the need to improve fire suppression, reduce the risk of wildfire, restore fire-adapted habitats, or sustain ecosystem health.

Alternative 2

The Management Action Alternative

Direction provided in the Forests' Plan and the National Fire Plans' 10-Year Comprehensive Strategy is the basis for the proposed activities. The proposed action is designed to move the project area from the current condition toward the desired future condition described in the Forests' Plan. This action responds to the need to reduce hazardous fuels for the protection of life, property, and safety, to restore fire-adapted ecosystems and ecological condition class, and to provide habitat diversity and meet species viability needs. The Maps of Proposed Actions (Appendix A) displays the proposed activities.

A summary of the proposed federal action is as follows:

- Reduce hazardous fuels in the wildland-urban interface by creating fuelbreaks through timber sales and/or hand and mechanical methods. Maintain the fuelbreaks using mechanical methods and/or prescribed fire.
 - Approximately 236 acres of pine and mixed oak/pine stands would be treated to create fuelbreaks along private property boundaries. Jack pine, small-diameter red pine, and poor form oak would be removed. Where present, larger diameter oak, hardwoods, and red and white pine would be retained to establish a semi-open condition and provide wildlife habitat. The fuelbreaks would be maintained in a semi-open condition using mechanical methods or prescribed fire on a three to seven year interval. The frequency of maintenance intervals would depend on the establishment and vigor of new growth. The fuel break along the community at the corner of Monument and Alpine Road will have a 50 ft privacy strip left along the property boundary.

- Approximately 58 acres of red pine plantation would be thinned around the Rollways H-4 and H-5 Recreation Residence Groups. Decadent trees and hazardous fuels would be removed within the 24 acre Rollways H-4 and the 5 acre Rollways H-5 Recreation Residence Tracts.
- Reduce hazardous fuels and restore ecological condition class to fire-adapted ecosystems through use of low to moderate intensity prescribed fire at a landscape level. Manage the landscape to improve forest vigor and resilience to disease, and to maintain fuels reduction from previous projects.
 - Up to 5,600 acres of National Forest lands would be prescribed burned to reduce fuel loading and promote stand structure and species composition reflective of healthy and productive forested stands. Where possible, existing roads and trails would be utilized as fire control lines for the prescribed burning. Fuels reduction and condition class would be maintained through periodic use of prescribed fire with a return interval based on vegetative response, duff and litter depth and funding.
- Enhance plant and wildlife habitats and restore ecosystem health, diversity, and productivity through creation of pine barrens ecosystems using prescribed fire at a landscape level. Manage the landscape as barrens to maintain viability of sensitive plant and wildlife species.
 - Approximately 5,980 acres of National Forest lands would be designated pine barrens habitat to be managed for sensitive plant and wildlife species. The areas that are being designated as barrens will be changed from a Land Suitability Classification (LSC) of 500 regulated timber management to LSC 650 wildlife / fisheries emphasis.
 - Approximately 5,070 acres of the designated barrens would be prescribed burned to begin the establishment of a mosaic of open to semi-open barrens conditions. Where possible, existing roads and trails would be utilized as fire control lines for the prescribed burning. Fuels reduction and barrens development would be enhanced through periodic use of prescribed fire with a return interval based on vegetative response, duff and litter depth and funding.
 - Additional habitat enhancement projects within the barrens could include topping trees for snag creation, erecting bat boxes, bluebird boxes and kestrel boxes, supplemental planting of warm season grasses, native forbs and nectaring sources, and biological and herbicide treatments of non-native invasive plant species.
- Work in cooperation with Consumers Power in an “all lands approach” to manage the resources for enhancement of plant and wildlife habitats and restore ecosystem health, diversity, productivity, and reduce hazardous fuels. This can be pursued through the use of the Wyden Amendment (Public Law 109-54, Section 434) authorizing the Forest Service to enter into cooperative agreements to benefit resources within watersheds of National Forest Lands. This is in reference to Consumers Power property that is found in Block 27.

The following is a project map showing the location of the Brittle 2 Project Blocks (Fig. 4) followed by a table illustrating the proposed actions under Alternative 2.

Figure 4. Map of Brittle 2 Project Burn Blocks.

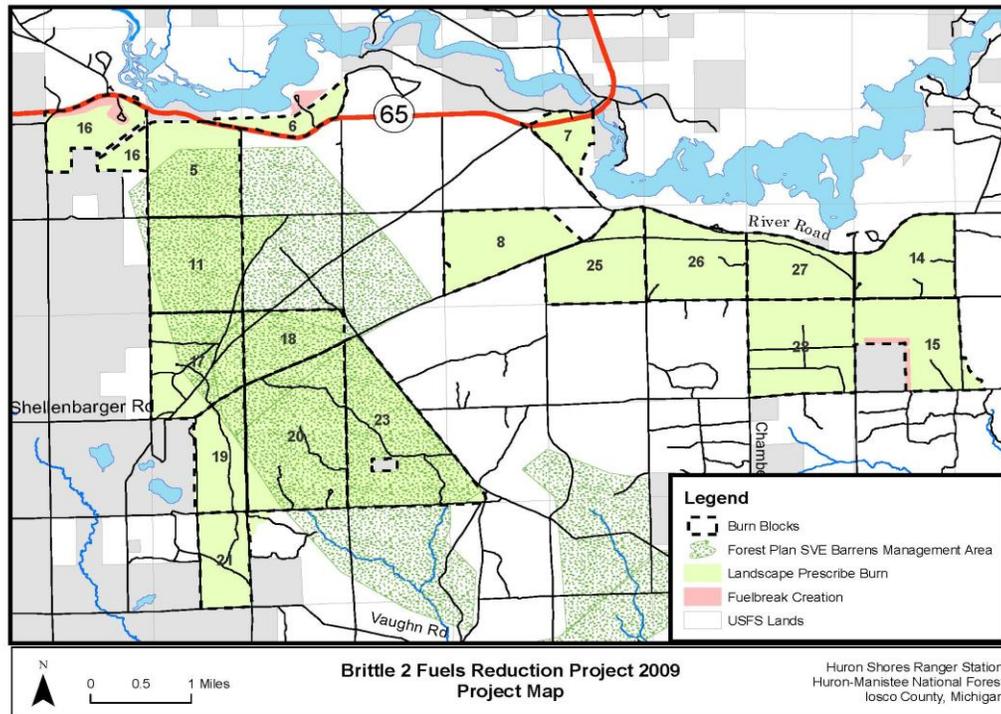


Table 3. Summary of Proposed Actions by Block Number for Brittle 2.

Block #	Proposed Action	Special Designation	LSC Change (Alternative 2)
5	Landscape Burning	Change to SVE Pine Barren	Change to 650 for wildlife
6	Fuelbreak Creation around homes / Landscape Burning	Existing Old Growth	None
7	Landscape Burning	Existing Old Growth	None
8	Landscape Burning	None	None
11	Landscape Burning	Change to SVE Pine Barren	Change to 650 for wildlife
14	Landscape Burning	None	None
15	Fuelbreak Creation around homes / Landscape Burning	None	None
16	Fuelbreak Creation around homes / Landscape Burning	None	None
17	Landscape Burning	Change to SVE Pine Barren	Change to 650 for wildlife
18	Landscape Burning	Change to SVE Pine Barren	Change to 650 for wildlife
19	Landscape Burning	Change to SVE Pine Barren	Change to 650 for wildlife
20	Landscape Burning	Change to SVE Pine Barren	Change to 650 for wildlife
21	Landscape Burning	None	
23	Landscape Burning	Change to SVE Pine Barren	Change to 650 for wildlife
25	Landscape Burning	None	None
26	Landscape Burning	None	None
27	Landscape Burning	None	None
28	Landscape Burning	None	None

Design Criteria Associated with the Proposed Action

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.

The following site specific design criteria apply to project activities:

Recreation Protection Measures

- a) No hauling or skidding would be permitted on Forest Recreation Trails within the project areas (the Michigan Shore to Shore Horse and Hiking Trail, the Iosco County Snowmobile Trail, or the Huron ORV Trail) to protect trail integrity and allow year-round use of these trail systems. Skidding or hauling forest products across the snowmobile/ATV trail and the Shore-to-Shore Trail would be permitted at designated locations at least 660 feet apart, and would directly cross the skid of the trail.
- b) Activity signs would be placed along Forest Recreation Trails to make people entering the project area aware of harvesting operations and/or prescribed burning operations to mitigate the effects of conflicts between trail users and project activities.
- c) Temporary re-routes would be designated for affected portions of the Shore-to-Shore Trail, the Snowmobile Trail and the Huron ATV Trail during prescribed burning activities. District recreation staff will be notified the day prior to burning to ensure consideration is given to scheduled events on trails. Affected portions of trails would be checked for and cleared of users prior to ignition of prescribed burning.

Wildlife Protection Measures

Project Design Criteria for eastern massasauga

- a) Prescribed burning or mechanical treatments within the Au Sable Massasauga Management Unit (Blocks 6 and 7) should be limited to periods when the eastern massasauga is not active, therefore, activities would be permitted between October 1 and May 15. However, burning may continue for several weeks after May 15 if unusually cold weather persists (<59F). Likewise, implementation of burns should be conservative during unusually warm years.

Design Criteria for northern goshawk

- b) Nest Area
 - a. There will be no activity within the 30 acre nest area or the two alternate nest areas, and no prescribed fire (Compartment 385, Stand 1).
- c) Post-Fledging Area (PFA)
 - a. Prescribed fire is permitted within the 400 acre post-fledging area, however human intrusions including actions such as building line and fuel reduction by hand removal of ladder fuels and mechanical equipment would only be permitted outside of the nesting season/brood-rearing period (Permitted from September 1 to February 27 in Compartment 385).

Design Criteria for red-headed woodpecker

- d) Existing dead trees would be retained in fuel break creation areas to provide dens, and snags to meet Forests' Plan requirements, except where they pose a safety hazard. If dead trees are cut they should be left on site to provide large downed woody debris. Skid trail locations should be designed to avoid removing large diameter (16" DBH and greater) standing dead trees, especially oaks.
- e) Provide snags using prescribed fire first or mechanical methods if necessary, to ensure 9 snags per acre at 9" dbh or greater (largest diameter practical should be used) to improve habitat for red-headed woodpecker and associated species.
- f) Oaks and other hardwoods should be chosen for leave trees (2 per 5 acres) within pine barrens and thinning units in order to increase the diameter and overall percentage of this species in the landscape.

Design Criteria for Michigan bog grasshoppers

- a) Prescribed fire would be excluded from Compartment 391 Stand 12 and the surrounding 60 feet, to protect Michigan bog grasshoppers.

Rare Plant Protection Measures

- a) To prevent introduction of non-native invasive species from outside the project area, equipment cleaning measures would be implemented. In addition, skid trails and fire plow lines would be planned in a

manner that would minimize the spread of invasive plants and seed contaminated soil (typically 5-10 m, or 16-33 feet of the road).

- b) In burn block 11(compartment 385), if the Allegheny Plumb cannot be excluded from fire then burn block 11 would be burned no more than once within a 7 year period to allow time for the plants to recover.
- c) When feasible, mowing/brushing should occur between snowmelt and July 1, after NNIS fruiting structures have collapsed and before the advent of new seed.

Vegetative Protection Measures

- a) In timber stands that are designated for timber production (LSC 500), the overall mortality should not drop the residual stands below an acceptable stocking level (B level stocking) for commercial trees. If stocking falls below B level, subsequent burning would be postponed until the stand recovers to B-level.
- b) Conduct prescribed burning in red pine stands during the period of bud dormancy, generally after mid July and prior to early May, when feasible.
- c) Within harvest units, remove or treat slash from harvest operations to reduce fuel loading and facilitate prescribed burning.
- d) Within burn block 26 in the northwest corner (near the intersection of Binder Road and River Road) is a stand of young white pine that should be excluded from fire intensities that could cause significant mortality (Compartment 364 Stand 2).
- e) It may be necessary in some areas to remove ladder fuels within or adjacent to prescribed fire units to facilitate burning.

Other Protection Measures

- a) Management activities would be excluded from identified historic cultural sites through sale design or designation of a reserve area that includes a buffer area adequate in size to protect the known site or mitigated to avoid or lessen impacts (refer to Cultural Resources Survey Records in the project file).
- b) Cultural resource sites, Federally listed Threatened and Endangered Species, or Forest Service Sensitive Species identified at any stage of the implementation process within the project area would be protected by following protection measures recommended by the appropriate resource specialists. Power lines, landline witness trees, existing signs, bat boxes and other improvements would be protected from damage or destruction during prescribed activities.
- c) Prior to burning any of the project area that includes the Michigan Highway M-65 right-of-way the Michigan Department of Transportation (MDOT) should be contacted. The point of contact is the MDOT permit coordinator in Alpena, Mi. (989) 356-2231 ext. 219 and the form MDOT-2020 should be submitted with a copy of the burn plan.
- d) The northwest boundary of Block 7 has a steep slope rising up from Highway M-65. This area should be excluded from fire to prevent erosion.

Proposed Activities Summary

Alternative 2 proposed vegetative management activities and acreages are listed by compartment and stand in [Appendix B](#). (Acreages are approximate GIS treatment acres.)

Alternative 3

The Management Action Alternative (No change to LSC)

Under the Action Alternative 3, all aspects of the project would be implemented in the project area in the exact manner as Action Alternative 2 with the exception of no change to the forest stands Land Suitability Class (LSC). The same fuels reduction or wildlife habitat enhancement activities would occur and the project would maintain its existing LSC.

2.2 Summary Comparison of Alternatives

Table 4 provides a summary of how the alternatives compare in terms of Chapter 1 objectives.

Table 4. Project Purpose and Need Indicators, Summary Comparison of Alternatives. (All acreages are approximate).

Purpose and Need Indicators and Project Objectives	Alternative 1 – No Action	Alternative 2 – Management Action	Alternative 3 – Management Action
Fuels Reduction Indicators			
Fuelbreaks Created and/or Maintained (acres)	0	294	294
Landscape Rx Burning for hazardous fuels reduction (acres)	0	10,670	10,670
Forest Health Indicators			
Acres Rx Burned to begin Pine Barrens Establishment	0	5,070	5,070
Acres Landscape Rx Burned (Excluding Pine Barrens Mgt)	0	5,600	5,600
Wildlife Habitat Indicators			
Acres Designated to be Managed as Pine Barrens	0	5,980	5,980
Forest Plan Change LSC	0	5,980	0

2.3 Monitoring

The National Forest Management Act requires National Forests to monitor and evaluate their Forest Plans [36 CFR 219]. Forest' Plan monitoring is done across the Forests on a periodic basis to ensure that activities reasonably conform to management area direction.

Project monitoring occurs before, during, and after project implementation. Administrators, inspectors, and resource specialists ensure project elements are implemented as designed and that standards and guidelines are followed for protection of resources. Evaluation of completed projects addresses how well management actions achieved desired outcomes or objectives, and the effectiveness of resource protection measures.

The surface fuel, duff, and litter depths are measured or estimated prior to burning, and then again after the burning is complete. The difference is then calculated to measure how much fuel was reduced. The methods used follow Brown's (1966) guidelines, all fuels in the 1-, 10-, 100-hour category and duff / litter depths. Photos are also taken at each of the fuel measuring plots. Data is entered in to the database at Huron Shores Ranger Station and the originals are cataloged in a file.

Chapter 3

ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social, and economic environments of the affected project area and the potential changes to those environments due to implementation of the proposed action. It also presents the scientific and analytical basis for comparison of the alternatives.

Chapter IV of the Forests' Plan EIS (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. Proposed project conditions are typical of those discussed in the Forests' Plan EIS. This analysis tiers to the EIS discussions. The actions proposed in alternative 2 are consistent with the direction of the Final Environmental Impact Statement for the Forests' Plan. The actions proposed in alternative 3 are also consistent with the Forests' Plan.

Chapter 3 is organized by resource. This section will cover the *Present Condition and Effects of the Alternatives* for each affected resource. Following is an outline of how each resource section is organized:

- *Analysis Bounds* This describes the cumulative effects analysis boundary considered for the individual resource and an explanation of the reason that particular area was considered. (This could be the project area, or a larger area that incorporates the project area.)
- *Affected Environment* This section briefly describes the current condition (affected environment) of the resource in the project areas, and how past activities have affected that condition.
- *Direct and Indirect Effects* These will be described for each alternative. This section describes the direct and indirect effects of each alternative on the present 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. Direct and indirect effects can be beneficial or detrimental.
- *Cumulative Effects* These will be described for each alternative. Cumulative effects include not only the effects of the proposed actions, but may also include the effects of past actions and reasonably foreseeable future actions on the resource. This section includes effects within a cumulative effects analysis area, which may extend outside project area boundaries. Cumulative effects of the No Action Alternative will consider the effects of not implementing this specific project, rather than not implementing all projects within the analysis area over the long term.

Acreages used for analyses in this environmental assessment are GIS acres. All acreages are approximate.

3.1 Present Condition and Effects of the Alternatives

Biological Factors

A. Vegetation

Analysis Bounds

Cumulative effects for the vegetation resource will be analyzed within the contiguous LTA 1 landscape that incorporates all project area boundaries (Appendix A.4, Cumulative Effects Analysis Area Map). These geographic bounds were chosen to reflect a contiguous area of like soils and vegetative patterns and types on a scale reflective of natural processes and disturbance regimes. This cumulative effects analysis area will be referred to as the "analysis area" for this vegetation section.

For the purpose of this analysis, cumulative effects will include all pertinent activities within the Brittle 2 Cumulative Effects Analysis Area. The time period includes the past ten years and the reasonably foreseeable future. This temporal boundary was chosen to reflect the approximate period of time it would take for vegetative fuel loading to increase to a point where past treatments would lose effectiveness. Vegetation management history is available for the past ten years and is reasonably planned based on other projects that are in varying stages of the NEPA process. Maintenance intervals are projected to continue

into the foreseeable future, recognizing that reducing fuels and restoring fire adapted ecosystems is an ongoing process.

Affected Environment

General Land Office Surveys from 1816 through 1856 indicate that the analysis area was predominantly occupied by extensive stands of mixed jack pine, red pine, and pine barrens (a coniferous savanna of scattered and clumped trees located north of the transition zone) (Figure 5). Project area landscape ecosystems historically experienced frequent fires that served to reduce the amount of woody vegetation occupying on these sites. Key elements of this ecosystem include deep, sandy soils with low nutrient holding capacity, large, semi-open landscapes, and forest types that are well adapted to fire such as short-lived jack pine forests, mixed jack and red pine forests, and barrens and savannahs. The aspen/birch community was not documented within the analysis area, although it was likely present. Swamps and wetlands made up a fraction of a percent of the historic area landscape.

Figure 5. Example of pine barrens.



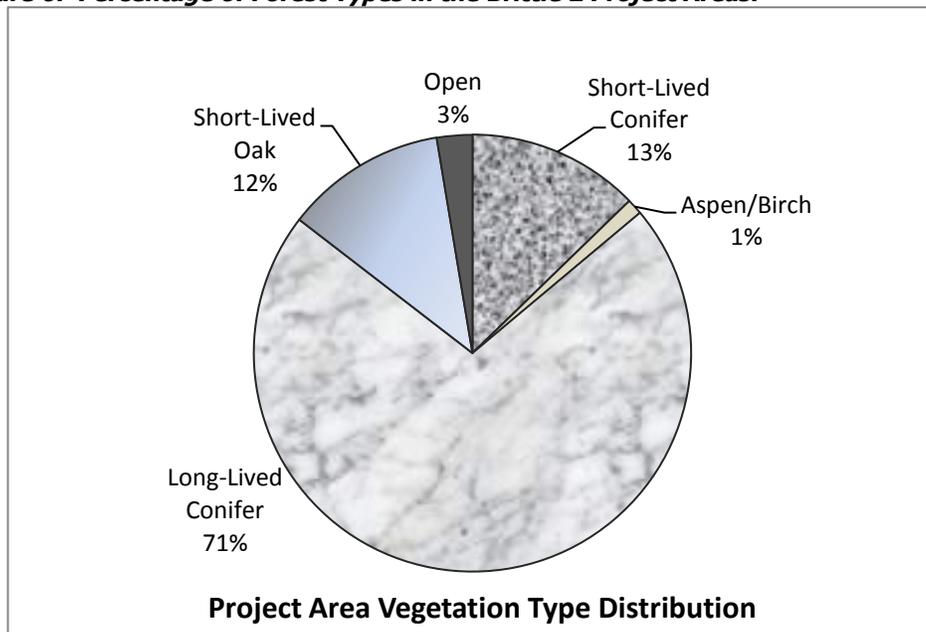
Currently the 105,136 acre cumulative effects analysis area is 84% National Forest ownership, of which about 50% is made up of short-rotation species forest types (jack pine, jack pine/oak, red pine-oak, and short rotation oak). Approximately 42% of the analysis area is red pine, about 3% is open, and the remainder is made up of small percentages of aspen, lowland vegetation types, and upland hardwood types. (Analysis Area Vegetative Composition Map, Appendix A.5).

Private property within the analysis area boundary is comprised principally of small tracts or ten to forty acre "camps", primarily in a forested condition. Aerial photographs of the private tracts show that timber harvest within the area is both traditional and recently practiced. Little is known about future plans on private lands within the analysis area, but forest management has been ongoing in the past and it is reasonable to assume it will continue.

Project Area Vegetative Composition

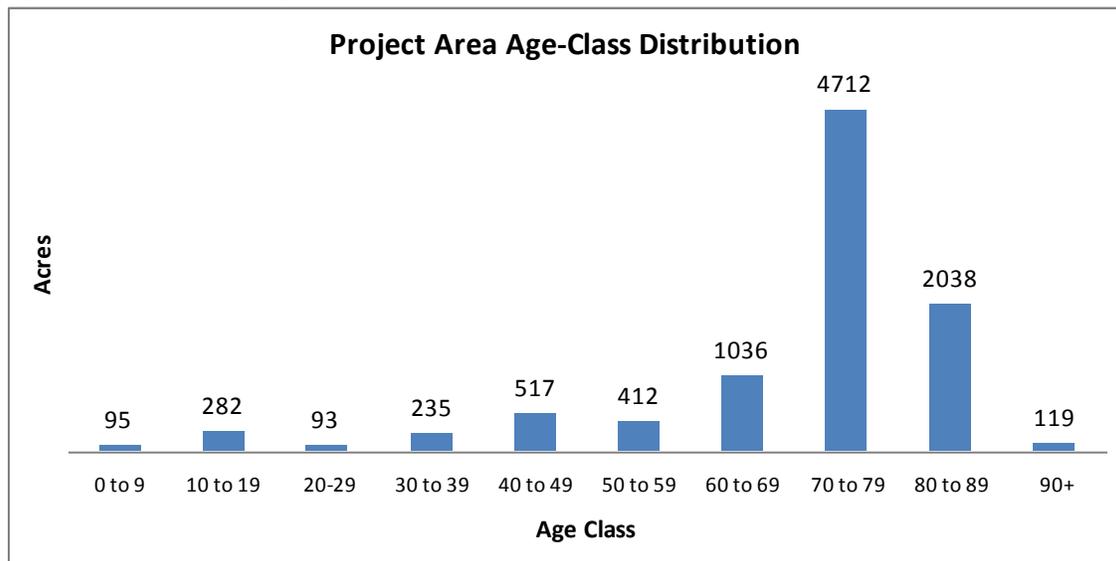
The Brittle 2 Project contain approximately 10,670 acres. Currently, red pine planted in the open landscape in the 1930's and 1940's, occupies approximately 71% of the project areas. The remainder of the area is approximately 12% short-rotation oak forest types (includes jack pine/oak and red pine/oak types), 13% jack pine (short-rotation conifer), 3% non-forest openings, and 1% aspen/birch forest types (Project Area Vegetative Composition Map, Appendix A.3 and Fig. 6).

Figure 6. Percentage of Forest Types in the Brittle 2 Project Areas.



The existing age class distribution of vegetation in the project area is unbalanced. Currently, about 63% of the project area vegetation is between 70 and 89 years old, primarily due to red pine plantings. Only about 15% of these sites are less than sixty years old (Fig. 7).

Figure 7. Project area age class distribution.



Forest-wide proposed practices and silvicultural methods for decade one are outlined in the Forests’ Plan, pages D-3 through D-5. These forest management activities are proposed to work toward the desired conditions and objectives during the first 10 years of Forests’ Plan implementation. Activities include 8,000 acres per year of mechanical and prescribed fire fuels reduction treatments; 2,000 acres per year fuelbreak creation and maintenance; 35,432 acres in decade one of thinning in the long-rotation conifer vegetation type; 4,250 acres in decade one of barrens creation from the long-rotation-conifer vegetation type; and 657 acres in decade one from old growth to barrens in the long-rotation-conifer vegetation type. Table 5 lists the Forest-wide acres of proposed practices and methods that the Brittle 2 Project proposal is contributing to.

Table 5. Proposed Forest-wide Management Practices in the First 10-Years of Forest Plan Implementation.

First Decade Average Annual Acres		First Decade Total Acres	
Hazardous Fuels Reduction	Fuelbreak Creation and Maintenance	Long-rotation-conifer Thinning	Long-rotation-conifer to Barrens
8,000	2,000	35,432	4,250
Brittle 2 Proposed First Decade Average Annual Acres		Brittle 2 Proposed First Decade Total Acres	
1524	One time of 294	294	5980

Vegetation management projects implemented in the cumulative effects analysis area in the past ten years (1999 to present) include approximately 7,993 acres of thinning; approximately 5,560 acres of clearcutting, (primarily jack pine regeneration to create Kirtland’s warbler nesting habitat); approximately 892 acres of fuelbreak creation; and approximately 1,755 acres of prescribed burning of wildlife openings and red pine plantations (Cumulative Effects Analysis Area Vegetation Projects Map, Appendix A.6).

Previous Environmental Analysis (Jumping Jack Pine E.A, Allen Road E.A, ect.) were conducted and decision made within the Brittle 2 project boundary. Some of these actions are in other NEPA documents not yet completed. These activities include thinning approximately 630 acres of red pine; clearcutting approximately 2,704 acres for creation of Kirtland’s warbler habitat; fuelbreak creation on approximately 236 acres; and prescribed fire on approximately 3,000 acres to be implemented in the next three to seven years with the Brittle 1 project (Table 6).

Table 6. Summary of other NEPA and projects within the Brittle 2 Project boundary.

Block #	Past Activities	Current Activities	Proposed Activities
5	Shore to shore Timber Sale (TS) & West Allen TS	None	None
6	Red Cookie Crumb TS '02	None	None
7	Red Cookie Crumb TS '02	None	None
8	Boiler Maker TS '05	None	None
11	Brittle Pine TS & Allen Road TS	None	May need snag creation
14	None	None	None
15	Jack pine removed near homes '03	None	None
16	Bare Bones TS, West Byway TS	None	Britt Fuels 2011, Brittle Pine 2012
17	Postal Britt & Brittle Pine TS	None	May need snag creation
18	Kokosing KW TS, Britt Road	None	None
19	Britt Fuels HFI	None	None
20	Welcome Lake TS '99	None	None
21	Huron Shores Restorations	None	Britt Fuels 2011
23	Potpouri TS	Pine 11 TS Red Trout TS	Post activity burn after Red Trout TS
25	Spartan Pine TS, Hoosier Jack TS	None	None
26	Byron Buckeye TS '00 (thinned in '79)	None	None
27	None	None	None
28	Huron Shores Restoration	King WUI	None

Regional Forester’s Sensitive Plant Species and Invasive Plant Species

Effects to Regional Forester’s sensitive species (RFSS) plants are discussed in the Plant Biological Evaluation for the Brittle 2 Project (Appendix D). Design criteria to reduce or avoid impacts have been incorporated into project proposals.

Spring, summer, and fall botanical surveys were conducted in 2002 through 2008. Hill’s thistle (*Cirsium hillii*), and Alleghany plum (*Prunus alleghaniensis*), and Northern Wild Comfrey (*Cynoglossum*

virginianum var. boreale) were found within the treatment areas. No other RFSS species are known to occur within the project areas.

Botanical surveys identified invasive plant species spotted knapweed and St. Johnswort within the proposed treatment areas. These species are widespread on National Forest lands and are mainly associated with open disturbed areas such as road rights of way and utility corridors.

Considerations on Climate Change

The best available information concerning the effects of prescribed burning and climate change show an overall zero contribution of carbon release. In cases where prescribed burning is of low to moderate intensity the overstory is not killed and the trees continue to hold and/or absorb carbon (Reference; k. Robertson Tall Timbers Research Center 2007). In cases where wildfire or prescribed burning has consumed much of the overstory, the natural system typically can regenerate new trees that will eventually reabsorb the same carbon that would have been released during the fire. The Overall effect of this cycle is a "zero" contribution of carbon into the environment (Reference; M. Ryan, 2008 *Forest and Carbon Storage*). Much of the information available on this subject is relatively new and still being studied.

Alternative 1 Effects

Direct and Indirect Effects of Alternative 1 [Vegetation]

There would be no direct effects to forest vegetation as a result of the No Action Alternative. Indirect effects would include the continued overcrowding and stagnation of red pine plantations, the continued increase in forest fuels, a continued decline in ecological condition class, and the continued risk of catastrophic wildfire across the project area landscape. The No Action Alternative would not promote Forests' Plan objectives for proposed management practices used to work toward vegetative and other multiple-use desired conditions in the first decade of Forests' Plan implementation.

There would be negative indirect impacts on *Cynoglossum virginianum var. boreale*, *Cirsium hillii*, and *Prunus alleghaniensis*, because individuals would become out-competed by more shade tolerant species. By failing to reverse successional trends, Alternative 1 would allow suitable habitat to decline with respect to RFSS barrens species. Other timber projects and/or wildfires are likely to occur in the next 10 years, maintaining habitat suitability over portions an estimated 200 acres* of the project area.

**estimate is based on projects in the foreseeable future and average wildfire acreage for the area.*

Cumulative Effects of Alternative 1 [Vegetation]

Cumulatively, selection of the No Action Alternative would not affect vegetation types, age class diversity, general stand conditions, or ecological condition class within the cumulative effects analysis area. This alternative would not make progress toward emulating the natural plant composition and structure historically sustained on the dry outwash sands landscapes. Cumulatively, the No Action Alternative would not improve project area condition classes or the overall health of the project area ecosystem.

Alternative 2 Effects

Direct and Indirect Effects of Alternative 2 [Vegetation]

Implementation of Alternative 2 would result in minimal change in vegetative types and age class diversity within the project area. An alteration of stand conditions, forest fuels, fuel loading, and ecological condition class would be observed through changes in land use objectives, stocking densities in red pine plantations, fuelbreaks, and the reintroduction of prescribed fire to the landscape.

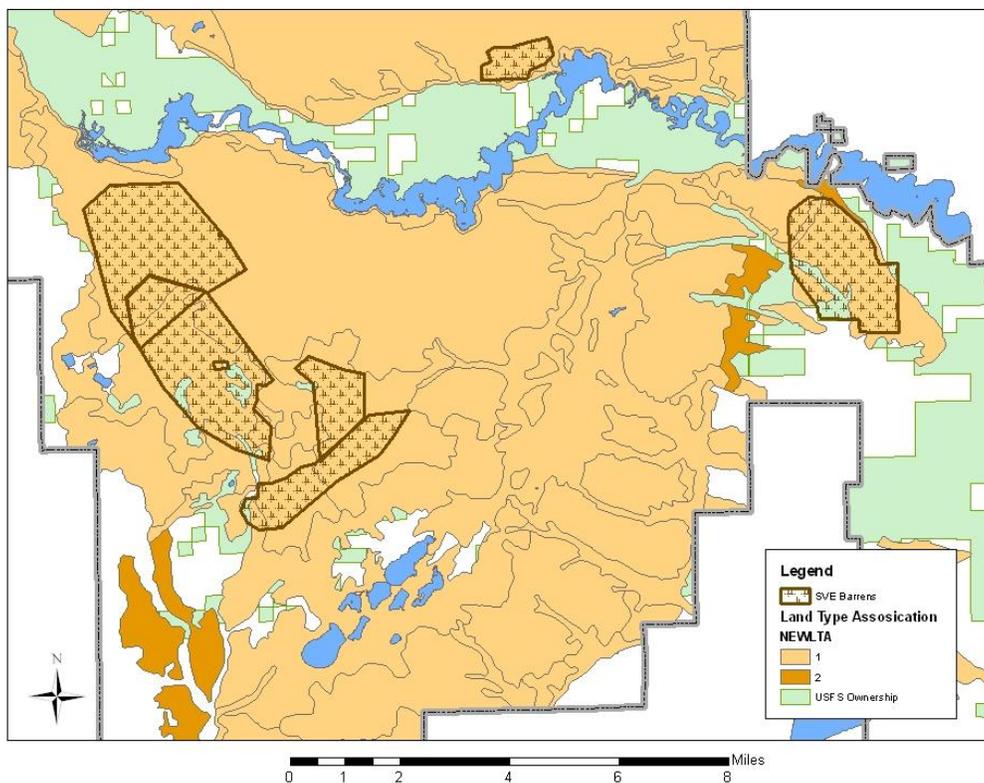
In the areas that will have fuel breaks created the thinning of conifer plantations would reduce the total number of stems per acre to a more desirable level for individual tree growth and health, and would reduce crown contact between trees. Prescribed fire in plantation understories would result in more complex and diverse ground flora, reduce the amount of surface fuel loading, and enhance the horizontal and vertical arrangement of vegetation within the thinned plantations. Random mortality of red pine (*Pinus resinosa*) caused by insects such as pine bark beetles (*Ipps* spp.), Annosum root and butt rot (*Heterobasidion annosum*) (Reference; Benzie, John W A Revised Manager's Handbook for Red Pine in the North-Central States), and wood rotting fungus (*Armillariella mellea*) (Reference; Sims, Richard A.; Kershaw, H. Maureen;

Wickware, Gregory M.). The autecology of major tree species in the north central region of Ontario), may occur for several years as the result of stress caused by logging and burning treatments. Burns conducted at low intensity outside periods of active bud growth result in minor damage to residual trees. Late summer, fall, or early spring burning reduces the risk of root and bud damage and reduces the amount of insect stress on the tree. Existing dead trees would be left to provide den and snag trees for wildlife, and eventual dead and down material. Additional snags could be created through prescribed fire or mechanical means to meet the Forest Plan guidelines of 9 snags per acre at 9" diameter at breast height (dbh) or greater.

Approximately 294 acres of fuelbreaks would be created in wildland-urban-interface areas to meet Forests' Plan and project objectives. Fuelbreaks would result in the conversion of forested lands to a semi-forested condition, resulting in vegetation "breaks" across the landscape. Fuelbreak creation would convert these areas of red pine, jack pine, and mixed stands to more open vegetative conditions indicative of historic vegetative patterns on LTA 1 systems.

The creation of approximately 5980 acres of pine "barrens" and an additional 767 acres of barrens maintenance would help to meet Forests' Plan objectives for barrens establishment, and would move the project area toward a vegetative composition and structure more indicative of historic pine barrens landscapes. Prescribed burning would greatly influence the herbaceous ground vegetation by encouraging native grasses and forbs, reducing built up needle cast and sedges, and enhancing overall vegetative diversity and ecological condition class. Below is a map showing the location of the proposed SVE pine barrens.

Figure 7. Proposed SVE Barrens within the Brittle 2 Project Boundary.



Low to moderate intensity prescribed fire applied to approximately 10,670 acres of forested landscape would act to reduce surface fuel loads and to restore healthy, resilient ecosystems in the high-density, off-site red pine plantations covering the majority of the project area landscape. Prescribed fire facilitates restoration of ecological complexity to red pine plantations by inducing natural variable density thinning, resulting in variable stand density and greater structural diversity. It also promotes native plant diversity in the herbaceous and shrub species and increases the abundance of snags and dead and down forest

materials. Table 7 displays how the proposed activities are working toward meeting Forests' Plan objectives for decade one implementation.

Table 7. Proposed Activities Acreages Compared to Forest Plan Proposed Practices Acreages for Decade 1.

Forests' Plan Proposed First Decade Average Annual Acres		Forests' Plan Proposed First Decade Total Acres		
Hazardous Fuels Reduction	Fuelbreak Creation and Maintenance	Long-rotation-conifer Thinning	Long-rotation-conifer to Barrens	Long-rotation conifer Old Growth to Barrens
8,000	2,000	35,432	4,250	657
Brittle 2 Proposed First Decade Average Annual Acres		Brittle 2 Proposed First Decade Total Acres		
1524	One time of 294	294	5980	0
Other Projects within the Cumulative Effects Area First Decade Average Annual Acres		Other Projects within the Cumulative Effects Area Proposed First Decade Total Acres		
428	One time of 236	630	0	0

The Proposed Action would have beneficial direct impacts on *Cirsium hillii* and *Prunus alleghaniensis*, because competing vegetation would be removed or the area would be burned. There would be indirect beneficial effects on barrens species from the prescribed fire and vegetation removal (thinning/clearcuts), because fire was a historically important disturbance factor that maintained an open understory allowing these shade intolerant species to compete with other vegetation. Fire would also expose some mineral soil, which is necessary for seedling establishment of most of these species. With the exception of *Cirsium hillii* and *Prunus alleghaniensis*, indirect beneficial impacts on individuals of barrens species are discountable, because none were documented to occur within the treatment areas.

Cumulative Effects of Alternative 2 [Vegetation]

Cumulatively, selection of Alternative 2 would help to move the vegetative condition of the cumulative effects analysis area toward the desired future condition described in Chapter 1 and in the Forests' Plan, pages D-3 through D-5 as described above. Table 8 shows a comparison of how analysis area past, present, and future projects are meeting Forests' Plan proposed management practice projections.

Table 8. Cumulative Effects Analysis Past, Present, and Planned Approximate Acres Comparison to Forest Practices Proposed First Decade Acres.

CUMULATIVE EFFECTS ANALYSIS FOREST PRACTICE	Brittle 2 Project	Analysis Area Implementation 1998-2009	Analysis Area Planned Projects (including Brittle 2) 2010-2017	Total Cumulative Effects Projects	Forest Plan Proposed First Decade
Hazardous Fuels Reduction - Rx fire	6,019	1,755	10,670	12,425	8,000 Annual
Fuelbreak Creation and Maintenance	1,051	1329	294	1,623	2,000 Annual
Long-rotation-conifer Thinning	1,716	7,993	0	9,709	35,432
Long-rotation-conifer to Barrens	487	0	5,980	6,467	4,250
Long-rotation-conifer to Old Growth to Barrens	280	0	0	280	657

The long-rotation-conifer vegetation type, primarily red pine plantations, makes up approximately 71% of the analysis area vegetation. Planned thinning projects in the unnatural plantations, along with past thinning in the analysis area would continue to move the landscape toward the desired condition of variable density stands having greater vegetative diversity and larger diameter trees. Projected red pine outputs on the Forest are not expected to meet Forests' Plan thinning projections due to other Forest priorities for harvest treatments.

Implementation of Alternative 2 and other activities planned in the cumulative effects analysis area would increase the openland component in the analysis area from 3% to 19% when considering the addition of pine barrens and fuelbreak creation. The increase in open-lands in the analysis area would better emulate the natural pine barrens that historically made up about one-third of the 105,136 acre analysis area.

Forests' Plan proposals are to convert 4,250 acres of long-rotation-conifer types to barrens over the course of 10 years. This figure includes old growth acres. The Brittle 2 Project proposes 5,980 acres of red pine for designation to barrens.

Prescribed fire at the landscape level can be used to restore fire-adapted ecosystems. By interacting with biological and physical components of the ecosystem, prescribed fire can help to regulate patterns in composition, structure, and age of forested landscapes, and the habitat these conditions provide(Reference; Fire Effects in Ecosystems 2005 GTR 42 | *Fire Effects Guide 2001 NFES 2394*). Forests' Plan proposed practices for the first decade of Plan implementation include hazard fuels reduction on about 8,000 acres per year across the Huron-Manistee National Forests. The Brittle 2 Project is proposing hazard-fuels reduction that includes landscape level prescribed fire on approximately 10,670 acres. Prescribed burning activities in the analysis area in the past ten years account for about 1,755 acres. The Huron Shores Fuel Restoration Project, which was recently signed, would add another approximate 7,000 acres of prescribed fire to the analysis area landscape in the next three to seven years. This would account for approximately 17,670 acres of landscape burning in the analysis area in an approximate 17 year period. Within the Forests' Plan first decade implementation period, approximately 14,000 acres of hazard-fuel reduction prescribed fire is planned within the Brittle 2 analysis area. This accounts for less than one-quarter of the Forests' Plan proposed hazard-fuel reduction across the Forests for the first decade. Considering the distribution of LTA 1/Fire Regime 1 landscape across the Forests, this acreage is well within Forests' Plan projections, and is working toward attaining Forest-wide goals and objectives for ecological condition class restoration across the Forests' fire-adapted landscape.

Selection of Alternative 2 would help move the project area and Huron-Manistee National Forests toward Forests' Plan goals and desired future condition. This alternative helps move the analysis area toward the natural vegetative composition and structure historically sustained on the dry outwash sands landscapes. Cumulatively, Alternative 2 would improve condition classes and the overall health of the analysis area ecosystem.

Alternative 3 Effects

Direct and Indirect Effects of Alternative 3 [Vegetation]

All direct and indirect effects for Alternative 3 are the same as they are for Alternative 2, only there would be no change in LSC of the designated pine barren area.

Cumulative Effects of Alternative 3 [Vegetation]

Most of the cumulative effects of Alternative 3 would be the same as Alternative 2, only the ability to administratively claim timber harvesting target can be claimed by not changing the LSC for the pine barren area.

B. Wildlife

Introduction

This section addresses how implementation of the proposed alternatives would affect wildlife species associated with the current vegetative community types of the project area. Specifically, it describes current wildlife habitat conditions (suitability) and the expected changes in suitability based upon implementation of the proposed alternatives. Wildlife habitat suitability is influenced by many factors. In the context of this document, the most important factor affecting wildlife species is the resulting change of vegetative composition (including changes that occur spatially and temporally), and the associated affects of the processes that facilitate that vegetative change. Simply stated, wildlife species are directly affected by the act of removing trees through timber harvest activities, for example and by reforestation activities (site preparation and tree replacement both natural and artificial) and other land management activities. 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 have selected 6 Management Indicator Species (4 wildlife species) due to "their emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent" (Reference; Forest Service Manual 2620.5, Washington Office Amendment 2600-91-5). Management Indicator Species (MIS) and standards and guidelines for their management can be found in the Forests' Plan (p. II-31-34). MIS provide a means of monitoring and evaluating the effects of actions on biotic resources, including specific species, communities, habitats, and interrelationships among organisms (p. IV-10; 36 CFR 219.19(a)(6)). MIS species include bald eagle, Kirtland's warbler, ruffed grouse, Karner blue butterfly, brook trout, and mottled sculpin. Project effects on bald eagle, Kirtland's warbler and Karner blue butterfly are described in the Biological Evaluation. The remaining species do not have suitable habitat within the project area and therefore would not be affected by project activities. Effects to wildlife ETS (Federally endangered, threatened, and Regional Forester's Sensitive species) are addressed in the Biological Evaluation (Appendix C), and summarized below.

Analysis bounds

Cumulative effects for the wildlife resource will be analyzed within the contiguous LTA 1 landscape that incorporates all of the project area boundaries. These geographic bounds were chosen to reflect a contiguous area of like soils and vegetative patterns and types on a scale reflective of natural processes and disturbance regimes. This cumulative effects analysis area will be referred to as the "analysis area" for this wildlife section.

For the purpose of this analysis, cumulative effects will be bounded in time by a 15 year period. This period includes the past ten years and the reasonably foreseeable future five years. This temporal boundary was chosen to reflect the approximate period of time it would take for vegetative fuel loading to increase to a point where past treatments would lose effectiveness. Vegetation management history is available for the past ten years and is reasonably planned for the next five 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.

Affected Environment

To understand the forests today it is important to understand the Forests' history, which serves to provide insights into current conditions, as well as ecological potential. The presettlement forests that were once here were cut down by loggers and used to provide raw materials for the growing country, in the east. After being cut-over, much of what is now the Huron National Forest was burned by wildfires which consumed the forest debris left from early logging. These fires killed the remaining trees and shrubs that provided food and shelter for many wildlife species. By the end of the 19th century most of the original forests had disappeared. In 1911, Congress authorized the Federal Government to purchase "forested, cut-over, or denuded" land for soil and water protection. This enabled the creation of the Huron-Manistee National Forests. These lands contained little more than scrubby oak, an occasional pine tree, silted rivers, and blackened stumps. Wildlife and fish habitat and populations had declined or were lost. Reforestation on the HMNF started in 1909 and was greatly accelerated by The Civilian Conservation Corp (CCC) era. This effort was instrumental in the reforestation of Michigan, as thousands of acres of openlands were planted to red pine and jack pine, to provide future timber for the growing country.

The majority of the Forests ecosystems and associated vegetation depend on fire to thrive. However, in an effort to protect property and natural resources, wild fire suppression has been a top priority for the Forest Service since its inception in 1905. Over this time, one hundred years of fire suppression has had a profound effect on the habitats of the Forest. Suppression has caused a change in fire regimes. Historically pine barren ecosystems had fire intervals of 15 to 25 years with frequent but low intensity fires. These fires inhibited forest growth and promoted warm season grasses and scattered jack pine and likely created upland conditions that were much more open than those that exist today. Currently, wild fires are infrequent but when they occur, they are much more likely to be high intensity stand replacing fires. Suppression has led to stand conversions from openlands to forested communities, and from pine barrens, to oak and mixed deciduous/coniferous stands.

Project Area Vegetative Composition

The project areas for the Brittle 2 Project contain approximately 10,670 acres. Today, red pine, planted in the open landscape in the 1930's and 1940's, currently occupies approximately 71% of the project area. The remainder of the areas is approximately 12% short-rotation oak forest types (includes jack pine/oak

and red pine/oak types), 13% jack pine (short-rotation conifer), 3% non-forest openings, and 1% aspen/birch forest types (Project Area Vegetative Composition Map, Appendix A.3, and *Figure 2*).

The existing age class distribution of vegetation in the project area is unbalanced. Currently, about 63% of the project area vegetation is between 70 and 89 years old, primarily due to red pine plantings. Only about 15% of these sites are less than sixty years old. Vegetative diversity and habitat capability in turn, will be the means of assessing direct and indirect effects to wildlife species.

Biodiversity in the Project Area

According to Hunter (1990), biodiversity is often measured by species richness (number of species present) and species evenness (distribution of abundance among different species). Species richness in northern dry forests tends to be lower than forests on moister sites. Species evenness in these northern dry forests tends to be low as well. The project area is composed of five vegetation classes (See *Figure 2*. Percentage of Forest Types in the Brittle II Fuels Reduction Project Area). However, three classes make up approximately 96% of the project area. Long rotation conifer (71% of project area) is the most common with short rotation conifer (13%) and short rotation oak (12%) the next most common. The long rotation conifer (LRC) stands tend to be dominated by red pine, usually as plantations. Three percent of the project area is nonforested. The ground vegetation in openings consists of plants that can survive fire, drought, and thermal extremes. There is a mosaic pattern of sedges, shrubs, or grasses and forbs.

Biodiversity within the project area is further reduced by limited age class distribution among and within vegetative classes. Approximately 63% of the project area is between 70-89 years old, primarily due to red pine plantings.

Mid to late aged upland conifer habitat in the project area is comprised mainly of red pine plantations. Four percent of the project area is in jack pine and short rotation conifer types. While jack pine habitats provide cover at multiple vertical layers, and are utilized by a wide diversity of wildlife species, ground and mid canopy cover is lacking in red pine plantations after age 30. Only 17% of project area forested stands are under 60 years old. Squirrels, an important prey species to predators such as hawks, bobcat and coyote, occur in the conifer habitat type, especially where oak is a component. Neo-tropical migrant birds such as the least flycatcher, pine warbler and Nashville warbler also forage and nest among the upper branches of these conifer species. Other species that forage among the pines include black-backed and pileated woodpeckers, black-capped chickadees, and dark-eyed juncos.

Across the project area, long rotation aged conifer stands occur primarily as red pine plantations. When grown to maximize production and return, which is the case with red pine plantations established during the 1930's and 1940's, the trees are maintained in a closed or nearly closed canopy condition in order to suppress competition from other woody species. The effect of this management is a reduction in the diversity of tree species within the plantation. The low light conditions created under a closed canopy also cause the branches of red pine trees to die and/or slough off. The effect of this is a loss of understory and mid-story cover as these stands age. Thus after approximately 20-30 years, red pine plantations lack the diversity and multi-layer structure of natural pine stands and provide comparatively fewer opportunities for wildlife species. One notable exception is the seed source from cones, which is utilized by red squirrels and some birds species. Currently, the majority of red pine stands in the project area are more than 30 years old.

Species richness and evenness are also influenced by such within stand characteristics as structural and vertical diversity, and the availability of coarse woody debris (CWD) such as snags and downed logs. For this document, structural diversity includes both vertical diversity and horizontal diversity. Vertical diversity is greatest in forests that are well stratified and are uneven aged. Stands that are even aged, such as those found in the project area, have reduced foraging and nesting opportunities for songbirds. This, along with the lack of vegetative diversity, further diminishes species richness and evenness. Large coarse woody debris is largely lacking across the sandy outwash planes. Consequently, prey species such as rodents find their habitat needs (cover and structure), are lacking. Amphibian and reptile species that are associated with conifer forest types are often closely associated with the amount of large CWD present. It can be assumed that habitat needs for species such as the red-backed salamander and garter snakes are limited due to the lack of moisture and lack of CWD. Forest's Plan guidelines call for retention of 9 snags per acre in conifer stands. However, across the project area snags are below these minimums. Project design

criteria stipulate that all non-hazardous snags be left in the project area to provide for this important within stand component.

Water sources are a limiting factor across most of the analysis area, and especially within the project area south of River Road. South of River Road the only major source of water comes from the headwaters of Vaughn Creek. This lack of water results in a loss of biodiversity among species requiring aquatic habitat types for part or all of their life cycle, or species that cannot travel long distances.

Fragmentation

Fragmentation is a concern for species that are area sensitive, such as neo-tropical migrants. Fragmentation, which is the breaking up of continuous habitats, produces many changes in the landscape such as a reduction in mature forest, increased edge, reduced interior areas, and increased isolation in the remaining interior area. Fragmented areas tend to result in greater predation on songbird nests by blue jays, grackles, raccoons, and skunks and particularly parasitism by brown-headed cowbirds (*Molothrus ater*).

Fragmentation can also increase nest parasitism by cowbirds. Brown-headed cowbirds evolved following herds of American bison across the prairies ecosystems of the Great Plains. Constantly moving with the buffalo, brown-headed cowbirds did not have time to stop and spend the time required for nesting and brood-rearing, so they adapted a strategy of laying their eggs in the nests of other host birds who would then raise the young cowbirds as their own. The cowbird chicks hatch first and out-compete the host chicks for resources. Over time these host birds developed strategies to cope with parasitism from brown-headed cowbirds. Since then, agriculture expansion and forest clearing in the Midwest and eventually into the lower peninsula of Michigan in the late 1800's, resulted in the cowbird expanding its range into northern Michigan. Many eastern birds have not adapted to parasitism from cowbirds and have no natural defenses. .

The U.S.D.I. Fish and Wildlife Service (FWS) annually conduct a brown-headed cowbird control program, to reduce the threat of cowbird parasitism on Kirtland's warblers. In his 2003 report to the Kirtland's Warbler Recovery Team, FWS biologist Chris Mensing stated that the "Kirtland's warbler population had increased to a record level, most likely due to successful, extensive habitat management and brown-headed cowbird control." This control program removes local cowbirds from KW nesting areas, but over its 33 year history, has had virtually no effect on the populations of cowbirds throughout Michigan. Brown-headed cowbirds from agricultural areas outside of KWMA's produce a continuing supply of birds which disperse into KWMA's and threaten the future of Kirtland's warblers. While cowbirds are trapped in the Tawas KWMA adjacent to the project area it is equally likely that this trapping effort has no effect on the numbers of brown-headed cowbirds in the project area and that cowbirds threaten resident neo-tropical migrants in adjacent interior forest habitats. While the type and numbers of bird species that nest in dry northern conifer forests are much lower than interior mesic forests, the potential for effects is the same.

Analysis of Effects of the Alternatives on Biodiversity

Alternative 1 and Vegetative Composition.

Implementation of the No Action Alternative would not significantly alter the existing vegetative community and composition, but would affect the age structure over time. Into the foreseeable future (5 years), young stands would mature and with no dependable mechanism for mimicking large scale natural disturbance there would be no natural regeneration. Over the long term Alternative 1 would result in static or decreasing wildlife and vegetative diversity. As younger aged stands mature and the canopy closes, and open areas fill in from woody encroachment, grassy species such as wild Canada rye, Indian grass, and big bluestem will only be found along roadsides. Species of wildlife requiring openings, early successional habitat, and mid-successional habitat would eventually be displaced from the area. Mature forest species such as woodpeckers and squirrels would benefit from the implementation of this alternative. Overall, species richness and evenness would decrease over time.

Alternative 1 and Structural Diversity.

Vegetative types would remain similar to current conditions, with long rotation conifer (red pine) continuing to be the dominant species in the project area. There would be a continual loss of horizontal structural diversity over time as limbs die, lose their needles and eventually slough off. Vertical structural diversity would gradually increase as trees die. Eventually over the very long term (50+ years), small openings in the canopy caused by tree mortality could result in a developing understory and midstory. However, within the foreseeable future (5 years) changes would be minor. Structural diversity would remain the same. Species

that require coarse woody debris, including rodents, insects, amphibians, and reptiles, would not benefit by this alternative.

Alternative 1 and Fragmentation.

Fragmentation would not increase under the No Action Alternative. Fragmentation would remain the same or slightly decrease from current conditions, into the foreseeable future, and likely over the next decade, as young stands of jack pine mature and small openings fill in from woody encroachment. Unless catastrophic natural events such as wildfire take place, landscape conditions will remain in the same proportions as they are currently. Fire suppression is likely to limit the extent of the role that wildfire will play in the fragmentation of the project area. While the adverse effects of fragmentation would still occur under this alternative, they would be small to moderate compared to the action alternative.

Cumulative Effects of Alternative 1 [wildlife]

The cumulative effects of other activities (past, present, and future federal and non-federal activities) may impact wildlife habitat in the area. The cumulative impacts on vegetation as a result of implementing Alternative 1 (*the no action alternative*) are described in the vegetation section, under cumulative effects. If no actions were implemented in the project area, changes to the vegetation would still take place, and would result in changes to the wildlife in the project area. These changes would happen slowly over time through stand succession, or relatively quickly through a single event such as a windstorm or fire, or combinations of these events.

As forested stands naturally aged and as natural disturbances occurred, dead standing (snags) and/or dead and down material would result. This dead structure is an important part of a healthy forest. The amount, type, and distribution of dead standing or down material would depend on whether it was the result of the slow process of natural succession, or a catastrophic disturbance such as a windstorm or fire. Snag density, type, size, and location are important factors influencing the distribution and abundance of primary and secondary cavity nesters such as hairy and downy woodpeckers, yellow shafted flickers, pileated woodpeckers, and eastern bluebirds. As dead trees fall, they become important to species that require dead and down logs, such as the red backed salamander, white-footed mouse, and black bear. The continuing increase in dead and down structure, represented by the lack of management in Alternative 1, would result in positive population trends for those wildlife species dependent on this component.

Disturbance dependent species, such as white-tailed deer, brown headed cowbird, snowshoe hare, and ruffed grouse, would primarily use the outer edges of the project area or private lands. These species would also be located in areas of recent natural disturbance, or in areas of high natural vegetative diversity such as the borders of wetland edges. Population trends for these species would eventually level off at fairly low levels, but would "spike" following natural disturbances, depending on the size, type and impact of the disturbance.

Management on the lands adjacent to the project area varies and is dependent on the desires of the private owners.

Disturbance would continue to occur around the project area in the adjacent private lands. The greatest impact to this area on private lands is the potential for development of subdivisions. Forested private lands within the area are very similar in forest type to those found on public lands but tend to be younger due to higher levels of harvesting activity. In the past 10 years clearcutting and hardwood thinning projects have occurred in private lands or adjacent to the project area. Large open-lands on private property do not occur. Larger inholdings are typically used for recreational activities such as hunting and are left in a forested condition. Harvesting, if any is done, is typically limited to dead or downed logs cut for firewood. Activities on these private lands can impact wildlife in a variety of ways including direct disturbance, changes to habitat (both negative and positive), and also supplemental feeding, particularly for birds, white-tailed deer and wild turkeys. In some situations negative changes to the habitat may be offset by supplemental feeding or nest box placement. Supplemental feeding would benefit cowbirds in this area, which would most likely result in increased parasitism along forest edges and within small forest blocks. Under this alternative the impact of cowbirds on public lands would be less than in alternative 2 due to not providing openings in the forest that would be attractive to cowbirds. As more people move to this area the impacts of pets on wildlife would increase. These impacts can vary from disturbance to direct mortality. In the future the main activity that will occur on private lands is most likely to be home construction, which may be primary dwellings. Species that cannot tolerate fragmentation, human altered habitats or high levels of human disturbance would be impacted the most by these activities.

Alternative 2 and Vegetative Composition. [wildlife]

The Implementation of Alternative 2 would result in minimal change in over story vegetative types and age class diversity within the project area. However, within stand conditions such as forest fuels and fuel loading, and ecological condition class would be altered through changes in land use objectives, stocking densities in red pine plantations and fuelbreaks, and through creation of landscape-scale openings and use of prescribed fire.

Thinning conifer plantations to create fuel breaks, would not change the composition of the forest type, but when combined with underburning or mechanical treatment, would enhance the herbaceous vegetative composition and could increase the establishment of native warm season grasses. Existing dead trees would be left to provide den and snag trees for wildlife, and eventual dead and down material. Additional snags would be created through prescribed fire or mechanical means to meet Forests' Plan guidelines. Approximately 236 acres of fuelbreaks would be created and maintained in wildland-urban-interface areas to meet Forests' Plan and project objectives. Fuelbreaks would result in the conversion of forested lands to a semi-forested condition, resulting in vegetation "breaks" across the landscape. The proposed fuelbreak creation, plus an additional approximately 58 acres of red pine plantation would be thinned around the Rollways H-4 and H-5 Recreation Residence Groups. Decadent trees and hazardous fuels would be removed within the 24 acre Rollways H-4 and the 5 acre Rollways H-5 Recreation Residence Tracts. These 294 acres of fuelbreak would create linear openings along the forest edge. These areas would be especially beneficial to invertebrates such as butterflies and skippers that could use them as connective corridors between larger open areas, and would also benefit woodpeckers which seem to have a higher tolerance for human related disturbances. Many of the wildlife species that benefit from openings or open areas in the forest would likely not utilize these areas to their full potential due to the disturbance levels associated with the urban interface.

Approximately 5,980 acres in the project area would be designated pine barrens habitat to be managed for sensitive plant and wildlife species, to meet Forests' Plan objectives for barrens establishment, and would begin to move the project area toward a vegetative composition and structure more indicative of historic pine barrens landscapes. Prescribed burning would greatly enhance the vegetative composition of the understory by increasing the diversity of native grasses and forbs. This action would also begin the process of restoring these ecosystems on the landscape. The value of this change in composition to the restoration of the health of the ecosystem can be measured not only through indirectly increasing numbers of popular game species such as wild turkey and white-tailed deer, but also through the potential re-establishment of populations of Regional Forester Sensitive Species like dusted skipper, red-headed woodpecker, and eastern massasauga. These activities would have a beneficial impact by increasing the openland component over the very long term (30-50 years).

The plant species and wildlife species, associated with LTA 1 are adapted to fire as the primary disturbance regime, and depend on periodic fires to thrive. The proposed low to moderate intensity prescribed fire applied to approximately 5,600 acres of the proposed pine barren area would help to bring fire back to this landscape. These activities would promote native plant diversity in the herbaceous and shrub species and increases the abundance of snags and dead and down forest materials and therefore also benefit the wildlife species that depend on these habitats to meet their yearly life requirements. Utilization of fire will remove thatch and release vital nutrients back into these depleted soils. The result is increased health and vigor for native fire dependent species and increased seed and fruit production, which in turn will benefit and increase the number and health of insects, songbirds and mammals. If prescribed burns are timed right, they can be used to set back woody encroachment and with increased resonance, to suppress encroaching oak. The degree that habitat will be effected will depend on the season and intensity of the burn.

As discussed earlier, overall species richness and species evenness is low in dry, nutrient poor areas such as the project area, however the proposed action is expected to maintain or increase the biodiversity of the project area by enhancing or increasing the varied habitats which occur there.

Alternative 2 and Structural Diversity. [wildlife]

The existing vegetative types would remain in the project area after implementation of Alternative 2, with little change to age classes and proportions. Long rotation conifer would remain as the dominant species in the project area. Thinning in red pine stands would reduce structural diversity slightly but these effects would be minimal as existing horizontal and vertical structural diversity is currently marginal. Creation of

barrens habitats would decrease nesting opportunities in those localized areas for those few species that nest in red pine plantations. However nesting opportunities overall would increase in these areas in the foreseeable future as oak stems resprout and increase the structural component of the understory. Nesting opportunities for species such as brown thrasher, vesper sparrow, and chipping sparrows would increase after the first two years until herbaceous cover begins to fill in and oak and jack pine grow to 4 to six feet tall. Species such as upland sandpiper, vesper sparrow, native warm season grasses and Hill's thistle would increase in within the project area.

Timber harvest specifications require that no snags be cut unless they pose a hazard to lives or property. After harvest it is expected that some snags would be blown over by the wind, etc. Existing snags that fall would provide downed woody debris for herps, rodents and snowshoe hares. Creation of snags through prescribed fire or mechanical methods would have the effect of increasing coarse woody debris which would benefit wildlife species such as woodpeckers and cavity nesters and rodents, insects, amphibians, and reptiles.

Alternative 2 and Fragmentation. [wildlife]

Creation of pine barrens, while beginning the process of restoring an integral ecosystem, would create fragmentation on the landscape compared to the existing condition. While this fragmentation is a natural part of pine barren ecosystems, the adverse effects from non-native species such as brown-headed cowbirds would still impact nesting birds. Trapping of cowbirds by the Fish and Wildlife Service to protect Kirtland's warbler habitat, in the adjacent Tawas KWMA and Pine River KWMA would help to reduce the impacts of cowbirds within 3 miles of trapping locations. Cowbirds would also potentially impact reproductive success of species such as the ovenbird in adjacent mature timber. Cowbirds searching for nests to parasitize tend to like more open habitats, but will travel several hundred meters toward the interior of mature stands. Increased nesting mortality rates in openland habitats due to parasitism are expected, but the overall affect on populations is unknown. Availability of pine barren habitats is the limiting factor on the landscape, but re-colonization of these areas by associated species is adversely affected by parasitism from cowbirds.

Cumulative Effects of Alternative 2 [wildlife]

Logging of the Michigan forests around 1850 had dramatic effects on the environment and wildlife associated with it. It had the effect of manipulating the successional pattern of the project area, changing ecosystems, and reducing or eliminating wildlife associated with this area. The planting of red pine plantations during the CCC era in the 1930s – 1940s also impacted the land and wildlife associated with it. These actions had the effect of not just altering habitat but reducing the richness and diversity of developing ecosystems. To this day those stands have limited wildlife value and this condition is likely to continue into the foreseeable future.

Likewise, fire suppression policies and historic forest management practices have disrupted natural disturbance regimes and historic ecosystem conditions. Forest harvesting restrictions such as those limiting the harvest of jack pine to small 40 acre blocks, have created an unnatural condition where older aged jack pine and mixed oak-pine forest communities are over-mature and suppress the development of grasses, forbs, and shrubs in the understory. Historical records indicate that the southern portion of the project area was a pine barren during pre-settlement periods.

Existing conditions are not representative of naturally occurring pine barren ecosystems; for example the closed canopy condition of red pine plantations suppresses many native grasses, forbs, and native shrubs. This condition also reduces within-stand diversity and limits the availability and quality of forage and cover that many wildlife species require. These homogenous conditions have replaced the natural conditions of a fire dominated ecosystem, a dynamic, heterogeneous community that ranges from dense thickets of brush and understory scrub oak and pine amongst a matrix of grasslands to park-like open woods of widely scattered mature oak and pines with virtually no understory shrub layer above a forb and grass floor layer. Past logging and alteration of the historical fire regime has shifted the vegetation types in the pine barren community to an unnatural condition of mature woodlands and forests. Fire suppression and tree planting policies of the 1920's and 30's resulted in the succession of open oak-pine savannahs to closed canopy forests.

Within the last ten years there has been timber harvesting through clearcuts (especially to produce occupiable Kirtland's warbler habitat in KWMA's) and thinnings on Forest Service system lands. The main activity that continues to occur on larger tracts of private lands continues to be recreational uses, such as

hunting and cutting firewood. New residences are occasionally built in this area as both permanent and secondary homes.

Implementation of Alternative 2 and the implementation of similar management actions in the future, would increase the early successional habitats in this LTA 1 and would increase numbers of species such as coyote, brown headed cowbird, eastern bluebird, and garter snakes in the area. The mature habitats maintained within the analysis area would continue to provide habitat for species dependent on this type. Population trends for species such as the ovenbird, pileated woodpecker, hairy woodpecker, fox and gray squirrel, likely remain low due to the overall lack of large stands of mast producing and older aged deciduous species.

Cowbird parasitism would cumulatively increase under this alternative into the foreseeable future. However, recent information regarding brown headed cowbird populations in the Lake States show those populations declining. Continued cowbird population decline in the Midwest over time, combined with continued population decline in the neotropical migrants, provides several outcomes not directly related to the proposed actions that further complicate this consideration.

White-tailed deer currently have low densities across the project area, as older aged red pine plantations provide minimal forage and cover. Future vegetation management similar to Alternative 2 proposals would cumulatively increase the abundance of forage and escape cover for this species in the project area. Any increases in deer numbers would be localized to the analysis area and would not affect the population of white-tailed deer across the Forest.

Management on adjacent private lands would be the same as described under the no action alternative. The effects resulting from private land management, as related to the negative and positive impacts to wildlife species, would not be significantly different between Alternative 1 and 2.

Direct and Indirect Effects of Alternative 3 [wildlife]

All direct and indirect effects for Alternative 3 are the same as they are for Alternative 2.

Cumulative Effects of Alternative 3 [wildlife]

The cumulative effects of Alternative 3 would be the same as Alternative 2.

Endangered, Threatened, and Regional Forester's Sensitive Species

A list of Federally endangered and threatened and Regional Forester Sensitive wildlife species (RFSS) considered and possible effects to those species as a result of implementation of Alternatives 1 and 3 is discussed in the Wildlife Biological Evaluation for the Brittle II Fuels Reduction Project (BE) (Appendix C, Wildlife BE). The Wildlife Biological Evaluation determined that no federally listed species were known to occur in the project area. Determinations from the BE are summarized below.

The proposals for the Brittle 2 Fuels Reduction Project are designed to reduce accumulated fuels and the potential for catastrophic wild fire in the Wildland Urban Interface while enhancing habitat for species associated with pine barren ecosystems. The proposed treatments are consistent with Forest's Plan standards and guidelines. Existing habitat conditions are common and can be found throughout the Huron Shores Ranger Station and the Huron National Forest. While there is designated essential habitat for the Kirtland's warbler adjacent to the project area, this habitat is not currently occupied. **Therefore, Kirtland's warbler would not be affected by this project. Other Federally listed species were initially considered but dropped from further consideration because they are known not to occur in this area of Michigan and/or their specific habitat requirements are not found in this project area.**

Northern goshawk have been documented nesting within the project area. While this species is not typically associated with pine barren ecosystems, their nest sites will be protected from habitat alterations as described in the project design criteria. The proposed action would improve foraging opportunities across the project area, but would also open the area up, through creation of openings and savannahs, which has the potential to attract predators that compete with northern goshawk. Across the Forests, nesting habitats for goshawk is considered widely distributed, abundant, and while over half of the known occurrences of northern goshawk in Michigan come from the Huron-Manistee N.F., the majority of suitable habitat is considered unoccupied, and not a limiting factor. Therefore, for northern goshawk, the proposed action **may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.**

Eastern massasauga rattlesnake are assumed present only in Blocks 6 and 7 and are not found in the rest of the project area. Michigan bog grasshopper have been documented within the project area in one small stand. Direct impacts are unlikely with implementation of Design Criteria and timing restrictions on proposed activities. Thinning of the canopy and underburning would improve the suitability of habitat and increase the availability and abundance of prey species for eastern massasauga and herbaceous cover for the invertebrates. However maintenance activities, such as removal of dead and downed woody debris within fuelbreaks, is likely to reduce habitat suitability by creating conditions that are too exposed for the snake or mowed too often to allow for nectaring invertebrates. Overall indirect benefits from the proposed actions are beneficial and will improve the suitability of habitat for these species. Therefore, for eastern massasauga rattlesnake and Michigan bog grasshopper the proposed actions **may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.**

There is no suitable habitat for aquatic RFSS, and no project proposed in aquatic systems. There are no other RFSS wildlife species known to occur in the project area. **Therefore the proposed actions would have no impact on any other RFSS species.**

Physical Factors

C. Soil and Water

Analysis Bounds

Analysis area boundaries for cumulative effects of soil and water resources is the combined fifth level watersheds that include the Brittle 2 project areas (Appendix A.7, Watershed Cumulative Effects Analysis Area Map). The combined watersheds are approximately 71,034 acres, or 111 square miles in size. Approximately 83% of the watersheds lie within the Huron National Forest Boundary. The Brittle 2 project areas account for approximately 3.1% of the combined watersheds. This cumulative effects analysis area will be referred to as the "analysis area" for this section.

Affected Environment

The Brittle 2 project areas are approximately 97% forested, have good ground cover, are almost entirely comprised of dry sandy plains, and major precipitation events occur when soils are frost-free. All of these conditions are very favorable for good water infiltration and sub-surface percolation. Overall, the watershed condition within the project areas is satisfactory due to the presence of forest canopy and litter cover over most of the area.

The majority of the soils in the proposed treatment areas consist of Regosols, Lithosols, alluvium sandy plains and bluffs that are poorly developed and well drained sands with slopes less than 3% (Reference; Soils and Lands of Michigan). The soils are nutrient-impoverished and contain less than 3% clay and 5% silt. Water tables are generally well below the tree rooting zone, typically six to 15 feet below the surface. Forest cover consists primarily of species adapted to xeric conditions and frequent fire, including jack pine, red pine, and northern pin oak. The soils and vegetation would recover at average rates from disturbance activities.

Approximately 63% of the project area vegetation is mature or overmature. Overall, the forested areas within the project areas are healthy. Recent harvesting levels have been below overall growth rates and the total biomass has been increasing.

Localized activities such as dispersed recreation camping, use of unclassified roads and trails, and poor maintenance of roads in some areas have caused local, less than satisfactory conditions.

Direct and Indirect Effects

Reducing the amount of forested coverage in a watershed increases the water yield; more water flows out of the watershed (Reference; Stone, Ursic and Douglas). If the vegetation is reestablished, this is a temporary effect (Reference; USDA 1986; Stone, et.al., 1978). Whenever the leaf area index of a site is lowered, the amount and timing of water flowing through the watershed is altered. Studies have shown that this generally does not become measurable unless more than 10% of the watershed is clearcut. If a site remains fully stocked in trees, the leaf area indices reach their maximums in 3-7 years for hardwood

species and 5-15 years for conifer species (Reference; Marks and Bormann, 1972). Thinned stands, left adequately stocked, have a proportionally lesser effect on watershed hydrology.

Increased oxidation (decomposition) of organic matter would occur on thinned units. The increase in sunlight hitting the ground warms the soils and increases microbial activities resulting in increased decomposition rates. These sites would have lower soil organic matter contents than similarly shaded areas, and would have higher fluxes of soluble nutrients. Accelerated post harvest nutrient losses are confined to a relatively short period of the first few years. Shorter rotations (30-45 years) tend to remove more nutrients at a faster rate than long rotations (apx. 90 years), causing excessive nitrogen drain that impedes growth in the second rotation (Reference; Cleland, 1982).

The effect of fire on soil properties is directly related to fire intensity and the resulting degree of exposure of mineral soil to heat. Soil stability is adversely affected by excessive heat. Soil properties are unaffected or may even be enhanced if the aboveground fuels are burned at sufficiently low intensity so that soil temperature is not greatly increased (Reference; Wells, et.al., 1979). Prescribed fire used in forest management is designed to minimize damage to forest ecosystems by mitigating conditions that affect fire behavior and fire intensity.

In the areas that fuelbreaks are being created the use of equipment on unfrozen soils causes compaction. Compaction reduces the amount of large air spaces in the soil. In sandy outwash soils, light to moderate compaction could improve the water holding ability of the soils and lead to an increase in site productivity in the short term (Reference; Powers, et.al., 2005 / Fire Effects in Ecosystems 2005 GTR).

Direct and Indirect Effects of Alternative 1 [Soil and Water]

Implementing no proposed treatments would result in the continuation of rising biomass levels across the analysis area. Soil productivity levels would remain unchanged or increase until the levels of organic matter stabilize. This would occur as forested stands reached old growth conditions. Barring any natural disturbance processes (i.e. insect/disease outbreak, wind event, and/or wildfire), this alternative would result in the highest total biomass levels.

Leaf area indices for most stands in the analysis area have already recovered from past management activities. Impacts from the past harvesting activities on hydrologic characteristics are minimal and would continue to recover. Barring any natural disturbance processes, there would be little or no change in current watershed characteristics.

This alternative would have the lowest overall soil bulk densities (least amount of area compacted). No new compacted areas would be associated with proposed activities, as would occur in Alternative 2.

Detrimental effects of wildfire on soil properties would be intensified in the absence of proposed treatments. Without the reduction in forest fuels, fire behavior and fire intensity would remain a threat to ecosystem components and could result in a more severe burn, leading to greater volatilization of excessive amounts of nitrogen and other essential nutrients, destruction of organic matter, disruption of soil structure, and lost productivity potential.

Cumulative Effects of Alternative 1 [Soil and Water]

Implementation of Alternative 1, along with past, present, and foreseeable future actions would have an overall positive effect on soil conditions. As stands age, biomass and soil organic matter would accumulate. This could result in somewhat higher soil productivity on sandy sites as a result of increased soil organic matter. Compaction levels from previous activities would slowly recover and conditions for rapid infiltration and root growth would improve.

Cumulatively, the watershed condition would remain relatively stable. The distribution of land classification within the watershed would be unaffected by the proposal. The potential for catastrophic effects of uncontrolled fires on soils would be greater over time in the absence of forest fuels reduction projects.

Direct and Indirect Effects of Alternative 2 [Soil and Water]

The proposed levels of management activities would cause little or no measurable change in the hydrologic characteristics within the affected watersheds. Approximately 10,670 acres would receive some type of proposed treatment. Total treatment acreage of the project accounts for approximately 3.1% of the

watersheds, with less than 1% of the area being reduced to basal areas reflecting non-forested conditions (fuel breaks). This total is well below the 10% threshold for measurable effects for water yield within the watershed. Proposed activities would follow Forest Plan standards and guidelines and State of Michigan Best Management Practices to minimize effects on water quality.

Biomass and nutrient removals would be at levels that would not reduce long-term soil productivity. Less than ten percent of the project area timber has been cut in the project areas in the past thirty years, and the total biomass in the areas has been increasing. Less than 1% of the combined project areas vegetation would be reduced to levels indicative of "clearcutting". Dead trees would be retained in harvest units, and snags would be retained or created to meet Forests' Plan guidelines and contribute to future down woody debris.

Compaction would occur to some degree on all sites harvested in frost-free conditions. Risk of compaction in sandy soils is generally low, and soil compaction levels would be maintained below levels that would preclude root penetration or adversely affect long-term site productivity.

Where fuel break creation is proposed, total tree harvesting could occur as a means of slash reduction. The impacts of total tree harvest on sandy soils have been reviewed on the forest, and it is recommended for one rotation due to erosion. In sandy out-washed plains, destructive fires and other disturbances should not adversely affect long-term productivity of soils (Reference; Cleland, 1982).

Prescribed burning in pine plantations and forest openings under the proper conditions would result in relatively minor effects to soil properties. Land productivity and soil stability would be unaffected or enhanced during a low intensity fire where soil temperature is not greatly increased. Fire severity parameters for proposed prescribed fire, as iterated in USDA Forest Service General Technical Report WO-7, are included in project design criteria. The general results of repeated annual or perennial prescribed burns for pine forests have shown that burns of 4- or 5-year intervals have little effect on the forest floor or mineral soil (Reference; Alban, 1977). Low intensity fire in the forest ecosystem would return nutrients to the soil, making them available for new plant growth, and compensate for nitrogen loss to the atmosphere that results from burning forest litter (Reference; Wells, et.al., 1979).

The northwest boundary of burn block 7 has a steep slope rising up from Highway M-65. This area should be excluded from fire to prevent erosion.

Unneeded roads within the project areas would be closed to public use or decommissioned to return to a forested condition and prevent additional soil compaction. Temporary roads and landings would be closed following harvesting activities to minimize any erosion or soil compaction.

Cumulative Effects of Alternative 2 [Soil and Water]

Implementation of Alternative 2 would pose no major cumulative impacts on the soil and water resources in the analysis area. Soil productivity would remain stable as soils affected by management activities (fuelbreak creation) are 2% of the cumulative analysis area. Management activities proposed are designed to minimize or enhance soils through project design criteria, and recovery of historic ecosystem attributes through ecosystem condition class restoration.

Water yields in the project areas could be slightly higher until forbs and ground cover returns following proposed activities, until vegetation is reestablished on cleared sites and leaf area indices reach their maximum levels. Cumulatively, over a ten year period, more than 26,000 acres of the combined watersheds would need to be in an unforested condition in order to measurably affect the hydrology of the affected watersheds. Based on past (Huron-Manistee National Forests Monitoring and Evaluation Reports, 1997-2006) and Forests' Plan projected outputs for potential opening creation (includes hazard fuels reduction, fuelbreaks, clearcuts, barrens and wildlife openings) for the Huron National Forest in the first decade (Forests' Plan, D1-D4), the affect to the Huron Forest would fall well below this critical acreage. The affected watersheds would fall below the 10% threshold for measurable hydrologic effects.

Direct and Indirect Effects of Alternative 3 [soil and water]

All direct and indirect effects for Alternative 3 are the same as they are for Alternative 2.

Cumulative Effects of Alternative 3 [soil and water]

All of the cumulative effects of Alternative 3 would be the same as Alternative 2.

D. Air

Affected Environment

Managing smoke in a manner that prevent serious impact to sensitive areas from prescribed burn activities requires knowledge of Michigan Smoke Management Plan, (SMP) weather condition that will affect smoke emission, trajectories, and dispersion. It is necessary to obtain climatology information, forecasts, and monitor conditions prior to and during the burn. Regional, and on-site observations of smoke movements, can be influenced by small variation in terrain and vegetation cover, proximity to lakes and rivers, which off-site observation usually cannot capture.

Section 109 of the Clean Air Act (CAA) requires EPA to develop primary ambient air quality standards to protect human health and secondary standards to protect welfare. In July of 1987, the EPA promulgated ambient air quality standards for those particulates less than 10 microns in diameter (PM₁₀). The PM₁₀ standards were designed to protect that portion of the population which is most susceptible to the effects of airborne respirable particles with an adequate margin of safety. However, more recent research indicated that the PM₁₀ standard did not protect those people who already had existing respiratory problems. As a result EPA issued their initial fine particulate standards in July, 1997 to regulate those particulates less than 2.5 microns in diameter (PM_{2.5}). These standards are of interest to the wildland fire community because approximately 70% of the particulate emitted from biomass burning are in this size range. More current epidemiological studies indicate a much stronger relationship between increases in PM_{2.5} concentrations and mortality and morbidity. As a result, EPA revised these standards in September, 2006 reducing the 24 hr standard from 65 to 35 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). The annual standard stayed the same at 15 ($\mu\text{g}/\text{m}^3$).

Michigan has been in attainment for PM₁₀ since October 1996. However, a review of the state's PM_{2.5} monitoring data indicates that, based on the years 2001-2003, 6 out of a total of 39 PM_{2.5} monitors in the state measured a 3-year average above the NAAQS of 15 $\mu\text{g}/\text{m}^3$ (micrograms/cubic meter). Thirteen other monitors met the standard but measured a 3-year average value greater than 85 % of the annual standard. Five of the six monitors with high values are located in the industrial area of Detroit, the sixth is just downwind from Toledo, Ohio. At all Michigan monitors, the 24-hour average PM_{2.5} NAAQS of 65 $\mu\text{g}/\text{m}^3$ is being met. However, it is uncertain if all of the monitors will be in compliance with the new 35 $\mu\text{g}/\text{m}^3$ standard. This change could affect Michigan's future non-attainment areas.

Direct, Indirect, and Cumulative Effects of Prescribed Fire on Air Quality

Prescribed fire plans would identify and evaluate potential smoke impacts on sensitive receptors. Fires would be timed to minimize exposure of sensitive populations (those that smoke may present particular health risks). Plans would avoid visibility impacts in mandatory Class I Federal areas. Sensitive receptor sites are usually defined as locations where human populations tend to concentrate and where smoke could impact the health of those populations or significantly impact visibility that may be detrimental to either health or the enjoyment of scenic qualities of the landscape. These may be residential concentrations in the form of towns or cities, or locations where people tend to gather in groups such as parks and schools. Travel routes such as highways may be labeled as sensitive receptor sites where smoke can be a factor in potential motor vehicle accidents. Particular areas along highways or other locations may be more prone to being declared sensitive receptor sites because of topographic and microclimate features. Prescribed fire plans would identify the distance and direction from the burn site to local sensitive receptor areas where appropriate. Fire prescriptions would specify minimum requirements for the atmospheric capacity for smoke dispersal such as minimum surface and upper level wind speeds, desired wind direction, minimum mixing height, and dispersion index. The Ventilation Index (below) would be utilized for minimum requirements.

Table 9. Ventilation Index for Smoke Dispersal

Ventilation Index	Dispersion Category
0 -130	Poor
131-299	Fair
300 - 599	Good
600+	Excellent Dispersal

No areas within the cumulative effects analysis area are recognized as non-attainment areas in Michigan. No direct, indirect, or cumulative effects are expected when the above parameters are employed.

E. Visual Quality

This analysis assesses the effects of the project on the scenic integrity within the analysis area. Scenic integrity is a key concept of the Scenery Management System, which is used to determine the relative value and importance of scenery in the National Forest System. The Scenery Management System is used in the context of ecosystem management to inventory and analyze scenery; assist in developing natural resource goals and objectives; monitor scenic integrity, and ensure that attractive landscapes are sustained for the future.

Scenic Integrity incorporates a defined landscape character and scenic attractiveness class, and is an indication of the state of naturalness or, conversely, the state of disturbance created by human activities or alteration. It measures how closely the landscape approaches the character desired over the long term. It is stated in degrees of deviation from this desired character. Where the desired character is reflective of the existing character, then Scenic Integrity measures deviation from the existing condition. Landscape character with a high degree of scenic integrity has a sense of wholeness or being complete. In the Scenery Management System process, Scenic Integrity is a continuum, managed in degrees over five levels from very high to very low.

Analysis Bounds

Cumulative effects on visual quality will be analyzed within the contiguous LTA 1 landscape that incorporates all of the project area boundaries (Appendix A.4, Cumulative Effects Analysis Area Map). This is an area of contiguous landscape character and scenic attractiveness defined by glacial outwash plains of indistinctive landscape having low scenic quality. This cumulative effects analysis area will be referred to as the analysis area for this section.

Affected Environment

The analysis area landscape is identified as glacial outwash plains with excessively drained sandy soils. Historically, large stand-replacing wildfires were a natural part of the ecosystem and had a major effect on vegetation types, which were predominantly xeric conifer forest with expansive pine barrens. The ground cover would have been thick sod, comprised of native grasses, sedges and forbs. Scattered red pine may have occurred within the barrens.

Today, the landscape is characterized by a forested environment dominated by extensive, one-aged red pine plantations and significant acres of jack pine plantations arranged in 200 to 300 acre treatment blocks to provide nesting habitat for Kirtland's warbler. Visual contrast is evident only in age-class differences in the Kirtland's warbler treatment blocks and along the AuSable River corridor that forms the northern boundary of the analysis area. A portion of the project area borders the River Road National Scenic Byway along the AuSable River, where scenic values are high. (Cumulative Effects Analysis Area Current Vegetative Condition Map, Appendix A.5.)

Scenic attractiveness is a measure of the scenic importance of the landscape based on human perceptions and the intrinsic beauty of the landform, hydrologic characteristic, vegetation pattern, and cultural land use. The project and analysis areas are classified "indistinctive", based on landtype association groupings that form the Fire Regime Classes on the Forest.

Due in part to the suppression of wildfires, the present Scenic Integrity level of the project areas and the analysis area could be classed as low to very low, where the valued landscape character appears moderately to heavily altered from what might be considered an unimpaired or "perfect" condition. The landscape will likely never have a high "aesthetic appeal value" based on the flat terrain and uniform patterns of vegetation able to be sustained by the poorly developed soils. However, a goal of high scenic integrity could be the goal of high ecosystem integrity, defined by the wholeness of the condition of the ecosystem. In this context, the projected future scenic integrity of the project areas and analysis area would include greater expanses of pine barrens, providing habitat for threatened and sensitive native plant and animal species, mixed with jack pine plantations that are more indicative of historic landscape vegetation patterns. Natural fuelbreaks would pervade the landscape and inclusions of conifer swamps and dry-mesic hardwoods would be visible. Signs of fire, used at the landscape level to restore and maintain fire-adapted species and ecosystem components would become an accepted landscape attribute.

Direct and Indirect Effects of Alternative 1 [Visual Quality]

The No-Action alternative would maintain the low to very low scenic integrity level of the project areas. Scenic integrity goals and desired future condition would not progress through fuelbreak creation and maintenance, barrens creation and maintenance, red pine thinning, landscape burning, or reduction in road density.

Cumulative Effects of Alternative 1 [Visual Quality]

Cumulatively, the no action alternative would maintain the low scenic integrity of the analysis area. Growth in red pine plantations and mixed conifer and conifer/oak stands would stagnate, undergrowth would be non-existent, and fuel loading would continue to increase. Differences in age-classes and stand size would become less distinguishable, displaying a continuous wall of trees along travel corridors and use areas. Lack of fire in the landscape would lead to increased fuel loading, potential increase in insect and disease outbreaks, and a greater potential for dead and dying forests and a landscape blackened by catastrophic wildfire. Lack of historic landscape characteristics, i.e. barrens and natural fuelbreaks would continue, and desired scenic integrity levels would not evolve.

Direct and Indirect Effects of Alternative 2 [Visual Quality]

Thinning red pine plantations, creating and maintaining fuelbreaks and barrens, and restoring landscape fire to the ecosystem would improve project area scenic integrity by increasing the depth of view into the forest, encouraging native ground flora, and allowing the progression of scenic integrity levels within the project areas. Fuel breaks and barrens would contribute visually to historical landscape patterns and vegetation through emulating disturbance outcomes. Prescribed fire activities could result in a short term drop in scenic attractiveness due to a "charred" appearance in prescribed burning areas. Project proposals and design criteria address the probable short-term decrease in scenic integrity along the River Road National Scenic Byway by allowing only one block along the byway to be prescribed burned in a given year, and by allowing removal of ladder fuels along the byway to preserve visual quality. Once new plant life is established and the appearance is consistent with the desired condition, the integrity level would be higher than before the activities were implemented.

Cumulative Effects of Alternative 2 [Visual Quality]

Cumulatively, the Proposed Action along with past and planned fuels reduction and ecosystem restoration activities would gradually produce the Scenic Integrity desired for the area as set forth in management direction in the Forests' Plan. These mechanical and prescribed fire activities would move the landscape toward the desired character of barrens ecosystem once maintained by frequent wildfire.

Direct and Indirect Effects of Alternative 3 [Visual Quality]

All direct and indirect effects for Alternative 3 are the same as they are for Alternative 2, only there would be no change in LSC of the designated pine barren area.

Cumulative Effects of Alternative 3 [Visual Quality]

All of the cumulative effects of Alternative 3 would be the same as Alternative 2.

F. Heritage Resources

Analysis Bounds

Cumulative effects boundaries for heritage resources include the project area and the adjacent roads, trails and potential staging areas that will be used during implementation of the project. The boundary is designated as the project area, plus a 200 foot area. Proposed activities outside these boundaries would not disturb cultural resources.

Affected Environment

Eleven cultural resource sites were located during field survey of the project area. None of the sites have been evaluated for their significance. Until such time as these sites are evaluated, each site must be protected as if it were listed on the National Register of Historic Places. A determination of no effect was made for the identified sites because management activities would be excluded from identified historic sites or mitigated in order to avoid or lessen impacts to cultural resources.

Direct and Indirect Effects of Alternative 1 [Cultural Resources]

The No Action Alternative would result in no direct effects to cultural resource sites because no activities would occur. Existing sites would remain intact. Indirect effects could include degradation of the cultural resource sites due to benign neglect.

Direct and Indirect Effects of Alternative 2 [Cultural Resources]

Alternative 2 has the potential to affect identified cultural resource sites. Design criteria have been developed to help protect the known sites from potential adverse impacts. Cultural resource sites with no surface artifacts or features that are within the prescribed burn areas would not be impacted by low- to mid- intensity fire, however high intensity fire would be excluded. Cultural resource sites with surface artifacts or features would be excluded from timber sale, prescribed fire, and all other activities.

The potential exists for unidentified cultural resources sites to be encountered as the project proceeds. If such sites were encountered in fuel break creation areas, they would be protected under conditions of the timber sale contract (avoidance through creation of additional reserve areas). Timber Sale Contract provision CT6.24-Protection of Cultural Resources provides that the Forest Service may unilaterally modify or cancel the contract to protect cultural resources, regardless of when they are identified. For the above reasons, all alternatives are considered consistent with the National Historic Preservation Act, the Archeological Resources Protection Act, the Huron-Manistee Land and Resource Management Plan (Forests' Plan, II-13) and the National Forest Management Act.

Cumulative Effects of all Alternatives on Cultural Resources

The combination of past activities, activities prescribed under the proposed action alternatives, and foreseeable future activities in the project area have no cumulative impacts on cultural resources.

Direct and Indirect Effects of Alternative 3 [Cultural Resources]

All direct and indirect effects for Alternative 3 are the same as they are for Alternative 2.

Cumulative Effects of Alternative 3 [Cultural Resources]

All of the cumulative effects of Alternative 3 would be the same as Alternative 2.

G. Transportation

Analysis Bounds

Cumulative effects on transportation will be analyzed within the contiguous LTA 1 landscape that incorporates all of the project area boundaries (Appendix A.4, Cumulative Effects Analysis Area Map). This area was chosen in order to reflect a span of interconnected public and private lands and roads across an insipid, xeric landscape. Primary uses of this transportation system would be consistent across the area and would focus on timber hauling and deer hunting. The transportation analysis area covers 19,456 acres, or approximately 30.4 square miles. National Forest system lands account for approximately 84% of the analysis area. The cumulative effects analysis area will be referred to as the analysis area for this section.

Affected Environment

The Brittle 2 Project Areas are located in Iosco County, and lie generally north of Old State Road, south of the Au Sable River, east of Britt Road, and west of Lorenz Road. Major county and state roads on the border of or within the analysis area boundaries include River Road, Monument Road, and M-65. A portion of the River Road National Scenic Byway borders a portion of the project area. Road densities within the project areas and analysis area are generally within Forests' Plan guidelines for maximum average miles of roads per square mile (*Table 10*). The project area road densities shown are slightly high, but roads bordering the project areas were counted as full miles rather than partial miles.

Table 10 shows the breakdown of the existing roads in the project and analysis areas by road type, miles, and road densities. Classified roads are defined as roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long-term motor vehicle access, including state roads, county roads, National Forest System roads, and other roads authorized by the Forest Service. Unclassified roads are roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization.

On November 9, 2005, the Forest Service published a final travel management regulation, governing the use of off-highway-vehicles and other motor vehicles on National Forest System lands. The final rule requires national forests to designate those roads, trails, and areas that are open to motor vehicle use. The rule prohibits motor vehicle use off the designated system. Beginning March 1, 2008, the Huron National Forest began implementation of the National Travel Management final rule by publishing a Motor Vehicle Use Map. As of that time, all roads not on the map (or not on the forest transportation system) are illegal to drive. For this reason, unclassified roads (roads not on the forest transportation system) are not being considered in this analysis as roads open to public access.

Table 10. Current Road Statistics for the Brittle 2 Fuels Project Roads.

Classified Road Type	Miles within Project Area	Miles/Sq. Mi.	Miles within analysis area	Miles/Sq. Mi.
County and State	7.5	0.2	16.8	0.55
National Forest System	46.8	1.5	82.0	2.7
Total Area Roads*	54.3	1.7	98.8	3.25

*Does not include private roads on private property, trails that are not a road, historic roads, roads closed to public access, or unclassified roads.

Many of the Forest System Roads within the project areas have not been maintained due to road maintenance needs exceeding current funding. Closing one or two unplanned roads within the project areas could potentially close off 50 or more acres of public land currently open to motorized vehicles. It is important that access be maintained where it has been provided in the past and does not conflict with Forest management, but it is recognized that safety is an issue and maintenance is needed.

Direct and Indirect Effects of Alternative 1 [Transportation]

Alternative 1 represents no change to the current status of the transportation system within the analysis area. No additions to the road system, road reconstruction, road closures, or road decommissioning would occur. The existing classified road density of 3.7 miles per square mile would be maintained within the project areas. Forest system roads causing sediment deposition in streams and degrading stream and wetland quality would remain open to unrestricted vehicle use. Roads needed for limited administrative use to maintain and monitor sensitive species would not be closed to general public access, potentially putting sensitive wildlife species at greater risk. Opportunities to alleviate access problems would not be recognized. Prior to burning any of the project area that includes the Michigan Highway M-65 right-of-way the Michigan Department of Transportation (MDOT) should be contacted. The point of contact is the MDOT permit coordinator in Alpena, Mi. (989) 356-2231 ext. 219 and the form MDOT-2020 should be submitted with a copy of the burn plan.

Cumulative Effects of Alternative 1 [Transportation]

Implementation of Alternative 1 would pose no appreciable cumulative effects to the transportation system in the analysis area. This alternative, when considered with past, present, and foreseeable future actions would continue the current status of the transportation system without consideration for future environmental and safety concerns. Road densities would likely remain within or near acceptable guidelines.

Direct and Indirect Effects of Alternative 2 [Transportation]

Where possible, existing system roads and open, unauthorized roads would be used for timber sale access and for control lines for prescribed fire activities. Prescribed burns would not be conducted under conditions predicted to produce smoke across heavily used travel corridors. Road guards would be employed on major highways to protect the public during burning operations and to serve as information officers during the prescribed burns. As per Forests’ Plan guidelines, no hauling or skidding of forest products would be permitted on system trails in order to protect trail integrity and allow year-round use of the trail systems. Skidding or hauling forest products across the snowmobile/ATV trail and the Shore-to-Shore Trail would be permitted at designated locations at least 660 feet apart, and would directly cross the skid of the trail.

Total road densities following implementation of Alternative 2 would result in no significant change.

Cumulative Effects of Alternative 2 [Transportation]

Road closures implemented in the analysis area in the past ten years have been primarily unauthorized roads. These closures have brought the analysis area road density to about 2.65 miles of road per square mile.

Implementation of Alternative 2 would pose no appreciable cumulative effects to the transportation system in the analysis area. This alternative, when considered with past, present, and foreseeable future actions would have negligible effects on recommended Forest Plan road densities within the analysis area.

Direct and Indirect Effects of Alternative 3 [Transportation]

All direct and indirect effects for Alternative 3 are the same as they are for Alternative 2.

Cumulative Effects of Alternative 3 [Transportation]

All of the cumulative effects of Alternative 3 would be the same as Alternative 2.

H. Fire and Fuels

Affected Environment

The project area primarily consists of three forest community types: Short rotation conifer (jack pine), short rotation oak/pine forests, and long rotation conifer (red pine) forests. All three forest types occur on dry, sandy soils and pose a high wildfire risk. Historically, these two forest communities experienced fire every 14 - 24 years. The characteristics of the project area were typified by widely spaced trees, resulting in low understory fuel loadings due to frequent ground fires (Reference; Cleland et al 2004). Modern fire suppression has limited the amount of fire in these areas and allowed fuel loading to increase. The increase in fuel loading typically increases the intensity of the fire behavior. Tree planting activities from the 1930's and 1940's created stand densities that are above natural and can contribute to a fire regime of forest replacement levels (Reference; Cleland and Dickmann, 2000).

Cumulative Effects Analysis Area [Fire and Fuels]

Cumulative effects for the vegetation resource will be analyzed within the contiguous LTA 1 landscape that incorporates all of the project area boundaries (Appendix A, Cumulative Effects Analysis Area Map). These geographic bounds were chosen to reflect a contiguous area of like fire regime and condition class on a scale reflective of natural processes and disturbance regimes. This cumulative effects analysis area will be referred to as the "analysis area" for this fire and fuels section. 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 10 years. This 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 prescribed fire treatment lasting 7 years and one time entry of mechanical treatment remaining effective for 10 years due to reduced over-story vegetation and recovery time from harvest disturbance. Typically a wildfire event in untreated fuels would result in a long term effect for the project area similar to same 10 year duration as the thinning or clear cutting projects on the district. This assumption is based on past wildfire experience and stand replacement fire intensities.

Direct and Indirect Effects of Alternative 1 [Fire and Fuels]

The proposed actions would be deferred and no fuel reduction would occur. Fuel breaks would not be created adjacent to private property and biomass would not be removed or treated, allowing fuel loading to continue increasing. The short-term effect of no action would be no immediate decrease in fuel loading, while the long term effects allow for a continued steady increase in fuel loading in the project area. Hazardous fuels would not be reduced and there would not be any reintroduction of fire into the fire adapted ecosystems.

Direct and Indirect Effects of Alternative 2 [Fire and Fuels]

Alternative 2 would meet fuel reduction objects through the use of prescribed burning, to establish pine barrens, maintain wildlife openings, maintain fuelbreaks, and reduce hazardous fuels. In areas that fuelbreaks area created, harvesting and site preparation activities would result in different short-term effects

on fuels and fire. In the short term, whole-tree harvesting of the units would result in slash or residual material left on the ground throughout the majority of the units (average increase of up to 1.5 tons per acre). This would substantially reduce the fuel loading and the chance of a wildfire carrying through the area. If tops and limbs remain on the site following harvesting operations, fuel loading on the ground could carry a wildfire that would make fire control and containment difficult. Table 11 summarizes each of the burn blocks, average fuels, considerations, and previous fuels treatments within the Brittle 2 Project Area. Alternative 2 & 3 would build upon past treatments to effectively reduce fire danger.

Table 11. Overview of the fuels for each burn block in the Brittle 2 Project Area.

Block #	Other Fuels Treatments	Average Fuels	Considerations
5	Shore to shore Timber Sale (TS) & West Allen TS	Red pine, northern pin oak, some jack pine / Fuel Model 9 / Some (80 acres) slash was left from timber sale Fuel Model 11	Power line, smoke on M-65
6	Red Cookie Crumb TS '02	Red pine, northern pin oak, some jack pine / Fuel Model 9	Sumer Home Group to the north, smoke on M-65, power line.
7	Red Cookie Crumb TS '02	Red pine, northern pin oak, some jack pine / Fuel Model 9	Power line, smoke on M-65, hill erosion along M-65
8	Boiler Maker TS '05	Red pine, northern pin oak, some jack pine / Fuel Model 9	Smoke on River Road
11	Brittle Pine TS & Allen Road TS	Red pine, northern pin oak, some jack pine / Fuel Model 9	Alleghany Plum (exclude from fire), and private property to the west,
14	None	Red pine, northern pin oak, some jack pine / Fuel Model 9	Power line, smoke on River Road, "K" monument.
15	Jack pine removed near homes '03	Red pine, northern pin oak, some jack pine / Fuel Model 9	private property to the southwest, power line, dusted skipper
16	Bare Bones TS, West Byway TS, Britt Fuels (2011), Brittle Pine (2012)	Red pine, northern pin oak, some jack pine / Fuel Model 9	Sumer Home Group to the north, smoke on M-65, power line.
17	Postal Britt & Brittle Pine TS	Red pine, northern pin oak, some jack pine / Fuel Model 9	private property to the west
18	Kokosing KW TS, Britt Road	Red pine, northern pin oak, some jack pine / Fuel Model 9	Hill's thistle
19	Britt Fuels HFI	Red pine, northern pin oak, some jack pine / Fuel Model 9	private property to the west
20	Welcome Lake TS '99	Red pine, northern pin oak, some jack pine / Fuel Model 9	Bog Grasshoppers in stand 12 (exclude from fire)
21	Huron Shores Restorations, Britt Fuels (2011)	Red pine, northern pin oak, some jack pine / Fuel Model 9	private property to the west
23	Potpouri TS, Pine 11 TS Red Trout TS	Red pine, northern pin oak, some jack pine / Fuel Model 9	private property in the middle
25	Spartan Pine TS, Hoosier Jack TS	Red pine, northern pin oak, some jack pine / Fuel Model 9	Smoke on River Road, hill's thistle
26	Byron Buckeye TS '00 (thinned in '79)	Red pine, northern pin oak, some jack pine / Fuel Model 9 stand of jack pine	Smoke on River Road, fruit trees (exclude from fire)

		along south line.	
27	None	Red pine, northern pin oak, some jack pine / Fuel Model 9	Smoke on River Road, Consumers Energy property within burn block
28	Huron Shores Restoration, King WUI	Red pine, northern pin oak, some jack pine / Fuel Model 9	Smoke on Monument Road, private property to the south

Periodic maintenance and improvement of barrens and openings through either prescribed burning or mechanical treatments (chainsawing, mowing, hydroaxing, etc.) would reduce hazardous fuels (regeneration and grasses) and fuel loading to acceptable levels. The return interval for this project would be based on historic disturbance intervals in these systems (Schmidt, G., pc), vegetative response, duff and litter depth and funding (estimated 3-10 years). Prescribed burning treatments and mechanical treatments are only effective for about seven to ten years respectively. Crown-to-crown contact and fuel loading in the red pine stands would be reduced through thinning. Without crown-to-crown contact the chances of a crown fire developing and the subsequent destruction of the trees on site would be greatly reduced. Timber harvesting may cause a minor short-term increase in fuel loading due to residual slash. However, if whole tree harvesting were employed there would be little, if any, additional slash accumulation within the treated stands. Fuel loading would thus decrease. As the slash begins to decompose or is treated by prescribed burning, fuel loading would also decrease. In the long term, fuel loading would increase as trees grow larger and the canopies expand. However, planned prescribed burning at regular intervals would reduce the more volatile and hazardous portions of the fuels.

Cumulative Effects of Alternative 2 [Fire and Fuels]

Similar activities have taken place over the past 10 years and are reflected in the vegetation section of the EA. Timber harvest, fuel breaks and prescribed fire would provide an overall positive contribution within the analysis boundary by reducing fuels by a weighted average of 6.6 tons per acre in the timbered areas. The effectiveness of the activities would decrease as biomass increased. The effectiveness of the treatments would decline over time with the fuelbreak creation (areas around the homes) the decline would initially occur over a ten year period (recovering from logging activity). Typical prescribed fire on the Tawas Ranger District takes approximately 5+ years to return to initial fuel loading (Reference; Summary for Fuels Monitoring, Huron Shores Ranger Station, 2009). The 3-10 year maintenance schedule of the fuel breaks, openings, barrens, and pine stands decreases the potential for large catastrophic wildfire.

Direct and Indirect Effects of Alternative 3 [Fire and Fuels]

All direct and indirect effects for Alternative 3 are the same as they are for Alternative 2.

Cumulative Effects of Alternative 3 [Fire and Fuels]

All of the cumulative effects of Alternative 3 would be the same as Alternative 2.

Social and Economic Factors

I. Recreation and Social Values

Opportunities for developed and dispersed recreational experiences on the forest are classified and defined by the *Recreation Opportunity Spectrum* [ROS (Forest Plan EIS, Chapter III, pages 271-275)]. The Brittle 2 Fuels Project falls within the Roded Natural and Rural ROS Classes. Forest Plan direction for management of the analysis area is to provide a mixture of recreational opportunities to meet identified needs and demands.

Analysis Bounds

The bounds for cumulative effects analysis on the recreation resource is the contiguous LTA 1 landscape that incorporates all of the project area boundaries (Appendix A.4, Cumulative Effects Analysis Area Map). This area was chosen in order to reflect a span of interconnected public and private lands across a xeric landscape. Primary recreational uses would be consistent across the area and would center on timber hauling and deer hunting. The analysis area covers 105,136 acres, or approximately 164 square miles. National Forest lands account for approximately 84% of the analysis area. The cumulative effects analysis area will be referred to as the analysis area for this section.

Affected Environment

Recreation use in the analysis area is considered low throughout most of the year. The area provides opportunities for dispersed camping, hunting, fishing, wildlife viewing, berry and mushroom picking, and hiking and horseback riding. The River Road National Scenic Byway runs along portions of the project areas. Along this part of the project, recreation use is higher, although the higher use falls into the area generally across the road from the project boundaries.

The Shore to Shore Horse and Hiking Trail that begins in Oscoda extends through the project and analysis areas. The ATV trailhead, also used to access the snowmobile trail system, receives regular use year around from the local community and from visitors. Light snowmobile use on area Forest System Roads can be observed in the winter months.

The Tawas Kirtland's warbler management areas offer unique opportunities for viewing a variety of neotropical migrant birds, including the endangered Kirtland's warbler. These areas receive moderate use from birders, and receive moderate use during the deer hunting season. Socially, most of the recreational use on the Huron National Forest revolves around motorized activities, or the ability for motorized access. Public attachment to specific recreational areas can be strong. Hunters and fishermen have traditional areas that they frequent and access routes and campsites have become established through repeated use. A strong sense of place exists in the analysis area that is a value in itself to many users.

Recreation accomplishments within the project area in the past ten years include the induction of the River Road National Scenic Byway. Recreation projects in the planning stages within the cumulative effects analysis area include the establishment of a snowmobile trail crossing the Au Sable River near highway M-65.

Direct and Indirect Effects of Alternative 1 [Recreation and Social Values]

The No Action Alternative would have little effect on the recreational setting or uses, or opportunities available in the short term. There would be no interruption to existing activities, current access levels would be unchanged, and results of recreational pursuits would remain fairly constant for several years.

Cumulative Effects of Alternative 1 [Recreation and Social Values]

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, lack of management activities within the analysis area would have little impact on recreation use and social values of the area.

Nature viewing, and hunting and berry picking success, dependent on natural processes or vegetation management, could be affected as a cumulative result of no management action. Numbers and types of wildlife species traditionally viewed or hunted, and composition of understory plant species (such as blueberries) would decrease as stands become stagnated and age class diversity declined. Opportunities for catastrophic fire events would increase, with an increase in natural fuels and more people using the forest, which would temporarily displace recreation users from potentially large wildfire areas. In the long-term, this could change the recreational character of such areas.

Opportunities for other recreational uses would remain relatively unchanged over the long term. Uses not necessarily connected to vegetation management, including fishing, camping, and snowmobiling, would not be affected.

Direct and Indirect Effects of Alternative 2 [Recreation and Social Values]

There would be little change in recreation opportunities or experiences as a result of implementing the proposed actions. The proposed action would maintain the present Recreation Opportunity Spectrum within the analysis area. Proposed activities are consistent with past management and compatible with the current recreation uses and character of the area.

Portions of the project areas along the River Road National Scenic Byway would receive higher use than other parts of the project areas. Project activities are consistent with the River Road Scenic Byway Corridor Management Plan and the associated River Road Scenic Byway Vegetation Plan. These plans emphasize

ecosystem restoration through thinning, prescribed fire and planting (River Road National Scenic Byway Corridor Management Plan, 2002).

Timber harvest and prescribed fire activities may have the potential to temporarily reduce the feeling of remoteness and displace hunters and forest users. This effect could last up to about five years for harvested stands, and up to a year for areas that are prescribed burned. Project design criteria address measures to protect forest trails and trail users during harvesting and prescribed fire activities.

Cumulative Effects of Alternative 2 [Recreation and Social Values]

The pursuit of recreational experiences is expected to continue to expand nationwide. Under Alternative 2, 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 suitable opportunities to meet expectations. Cumulative impacts to recreation resulting from road closures would be minimal. Total road densities within the analysis area would remain constant at approximately 2.9 miles per square mile. Trail projects in the planning stages are being proposed for existing travel corridors where opportunities are present, and proposed activities would not change the existing conditions or recreation experience.

Direct and Indirect Effects of Alternative 3 [Recreation and Social Values]

All direct and indirect effects for Alternative 3 are the same as they are for Alternative 2.

Cumulative Effects of Alternative 3 [Recreation and Social Values]

All of the cumulative effects of Alternative 3 would be the same as Alternative 2.

J. Civil Rights Impact Analysis and Environmental Justice

Environmental Justice means that to the greatest extent practicable, and permitted by law, all populations are provided the opportunity to comment before decisions are rendered, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by the government programs and activities affecting human health or the environment (Ref: USDA, DR 5600-2).

Analysis Bounds

The analysis area for determining effects on civil rights and environmental justice is Iosco County, Michigan.

Affected Environment

The 2000 U.S. Census shows the median household income for Iosco County is \$31,321. The census shows the median household income for the state of Michigan as \$44,667. Based on 2000 census results, the minority population in Iosco County is 3.1%. The state of Michigan is 25% minority.

Demographic information indicates that Iosco County does not qualify as environmental justice communities.

Direct, Indirect, and Cumulative Effects [Civil Rights and Environmental Justice]

None of the alternatives is expected to disproportionately impact human populations. There are no human health or safety factors associated with, or physical or biological factors influenced by the alternatives that would affect low-income or minority populations in or around the project areas. The laws, rules, and regulations governing nondiscrimination conduct in government employers and by government contractors and subcontractors would be employed in all actions associated with the alternatives. No environmental justice issues were raised during scoping of the proposed action. The proposed action and its alternatives would not affect environmental justice.

Chapter 4: List of Preparers

4.1. Interdisciplinary Team Members

Brian Stearns -- Engineering Equipment Operator /Analysis Team Leader
Joe Alyea – Assistant Fire Management Officer/Fuels Planner
Paul Thompson – Wildlife Biologist
Rebecca Riegle – Forester / Initial Analysis Team Leader
Karlis Lazda – Huron Zone Silviculturist

4.2. Consultants to the Analysis

Susan Kocis – District Ranger/Responsible Official
Greg Schmidt – Huron Zone Botanist
Cari VerPlanck – Huron Zone Archeologist
David Riegle – Timber Management Assistant
Paul Lyden -- Assistant Fire Management Officer/ Analysis Team
Gordon Haase -- Natural Resource Manager
Greg Berner – Wildlife Technician
Bob Makowski – Soils, ECS, Silviculture
Lori Hogeboom – NEPA Coordinator

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Index to Appendices

Appendix A – Brittle 2 Project Maps

- A.1 Vicinity Map**
- A.2 Project Activity Maps 1 - 4**
- A.6 Cumulative Effects Analysis Area (specified resources)**
- A.7 Cumulative Effects Analysis Area Current Vegetative Condition**
- A.8 Watershed Cumulative Effects Analysis Area**
- A.9 Transportation Map**
- A.10 Fire Hazard Map**
- A.11 Huron Forest Land Type Association Map**
- A.12 Wildlife Map**

Appendix B – Proposed Activities Summary

Appendix C – Biological Evaluation - Wildlife

Appendix D – Biological Evaluation - Plants

Appendix E – Fuels Specialist Report

Appendix F – Silvicultural Prescriptions by Stand

