

Appendix A – Summary of the Analysis of the Management Situation

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Appendix A – Summary of the Analysis of the Management Situation

Introduction and Summary

The analysis of the management situation (AMS) is a determination of the ability of the planning area covered by the final Forest Plan (herein referred to as the Forest Plan) to supply goods and services in response to society's demands. In the case of a Forest Plan revision, an AMS provides an assessment of the need to change management direction and the ability of the Forest to respond. The primary purpose of this analysis is to help provide a basis for formulating a range of reasonable responses to revision topics discussed in the Notice of Intent to revise the 1986 Forest Plan and to develop a reasonable range of alternatives.

Using resource assessments (discussed in the following section), the 1986 Forest Plan, and the Forest Plan Monitoring and Evaluation Reports as background, the AMS documents Forest Plan direction for a particular resource. It also documents the challenges associated with current resource direction, and discusses the need to resolve resource problems in the revision process. This review has assisted the determination of what aspects of resource issues present a critical and compelling need for change in management direction, and the type and range of resource management the Forest can propose.

Resource Assessments

1. Off-highway Vehicle Use
2. Wildlife-based Recreation
3. Recreation
4. Timber Consumption Trends
5. Dams
6. Wildland Fire
7. Minerals

Numerous analyses associated with Forest Plan revision resource topics were conducted and materials from and/or briefings of the analyses are presented in appendices to the Final Environmental Impact Statement (FEIS) or Forest Plan and will not be repeated here.

This includes the following FEIS Appendices:

- Species Viability Evaluation
- Roadless Inventory
- Wilderness Evaluation
- Wild and Scenic River Inventory Update
- Special Interest Areas
- Management Indicator Species

- Research Natural Areas
- Description of the Analysis Process (Timber Suitability)
- Description of the Analysis Process (Benchmark Analyses)
- Threatened and Endangered Species

This also includes the following Forest Plan Appendices:

- Recreation Opportunity Spectrum
- Scenery Management

Off-Highway Vehicles

Off-highway vehicle use, including all-terrain vehicles (ATVs), on the Ottawa National Forest (the Ottawa) and Forest roadways has changed over the past 20 years (see Glossary for a definition of terms). Since the 1986 Forest plan was developed, use of OHVs and demand for recreational opportunities has grown substantially. When the 1986 Forest Plan was approved, the majority of OHV use was by hunters to access the Ottawa or to access dispersed hunting camps on federal, corporate, and private lands. At present, designated trails on the Ottawa include two OHV (multiple-use) routes on State of Michigan-owned railroad grades and the Ottawa's multi-use trail from Bergland to Rockland. All are non-loop, unconnected trails. Generally, the Ottawa is considered "open unless posted closed", one of the more liberal policies as compared to other Lake States National Forests. As use has grown, impacts from people riding off roads or trails have been observed. However, since use is largely unregulated or unmanaged at this time, there is little opportunity to mitigate present or potential future resource impacts.

Direction in the 1986 Forest Plan for OHVs (referred to as both off-road and all-terrain vehicles in the 1986 document) is combined with snowmobile management direction. In general, in the roaded natural recreational opportunity areas (e.g., Management Areas 1.1, 2.1, 3.1, 4.1, 4.2, and 7.1), OHVs are allowed to use roads and Forest lands unless they are specifically designated closed to OHV use. Main collector roads - objective maintenance level (OML) 3 roads are closed to OHVs, while OML 1 and 2 roads are open. There are a few other closures and exceptions; however, the 1986 Forest Plan standard and guideline language on these exceptions tend to be confusing.

The desired condition for management area (MA) 6.1, classified as a semi-primitive non-motorized recreation opportunity area, is to close areas to motorized recreation uses, including OHVs, except where specific roads and trails are designated open. However, motorized vehicle use, including OHVs, is occurring in these areas and has occurred since the 1986 Forest Plan was issued. Management Area 6.2, classified as a semi-primitive motorized area, allows use of OHVs only on trails specifically designated open and on OML 1 and 2 roads. Cross-country use is not allowed in MA 6.2. Although it is recognized that the desired condition for MAs 6.1 and 6.2 has not been achieved, it does not necessitate a need to change the desired condition in these management areas.

Summary of Outputs and Activities on the Ottawa and in the Associated Area

The Forest Service Chief has identified unmanaged recreation, especially impacts from cross-country vehicle use, as one of the key concerns facing the nation's forests and grasslands today. The following list characterizes the current recreational vehicle access on the Ottawa and adjacent lands.

- The all-terrain/off-road trail and route system in Michigan covers 3,100 miles with 73% on state forests. Of the system, 40% is cycle trail, 43% is ATV trail and 17% is route (Michigan Department of Natural Resources [MICHIGAN DNR] 2002a).
- Type of use on the Ottawa has evolved within the last five years from people using OHVs primarily to access camps (on former Upper Peninsula Power Company [UPPCO] and other private lands), baiting for white-tailed deer and black bear, and hunting during the fall, to more individuals and groups looking for places to ride for the recreational aspect of the sport.
- The local governments for those counties in which the Ottawa is located have opened up county road systems to use by OHVs to varying degrees. These road systems often intersect or end at a Forest Service road and can be in conflict with the road system designation, as far as the use of OHVs.
- The Ottawa has received repeated requests from ATV user groups for trails connecting to State of Michigan trails or county road routes over the past several years. The Ottawa is a key land holder in the western Upper Peninsula of Michigan and is able to provide opportunities to connect to State of Michigan and county OHV routes and trails.
- According to a 1997 Wisconsin DNR survey of ATV owners, the Chequamegon National Forest (located near the Ottawa) was named more often as a destination (21% of ATV owners) than any other single landowner with more than 13% of the state's designated trails (USDA Forest Service 2003i).
- Sales and registrations of ATVs in both Michigan and Wisconsin have steadily increased over the past five years, creating more demand for places to ride.
- Increased negative impacts on wetlands and soils in general, have been noted across the Ottawa and are detailed in the resource sections in Chapter 3 of the FEIS.
- Two cooperatively funded projects have occurred on the Ottawa within the last eight years. The multiple-use trail in Bergland was a cooperative effort between the former TRALE-UP organization, the Michigan DNR, and the Forest Service. Forest road 6150 was improved through funding from the Michigan DNR's cross-country vehicle program.
- While not defined as an OHV, cross-country use of snowmobiles is allowed and use is characterized as minimal. Some unplowed Forest Service roads are used and occasional off-trail use to access a hunting camp is observed. Some snowmobile use of powerline corridors near designated snowmobile trail crossings is also seen.
- Currently, use of off-highway motorcycles on the Ottawa is low.

- See attached charts for comparison of current and proposed policies for neighboring national forests. See attached charts for policy and management comparison information on state and county lands.
- Cross-country vehicle use in Michigan involves over 125,000 ORVs that are annually licensed by the State of Michigan (Michigan DNR 2003a).
- Michigan OHV riding trip expenditures on public land exceeds \$40 million annually and another \$134 million is spent annually in Michigan on ORVs and related equipment (Michigan DNR 2003a).
- Tables A-1 and A-2 provide an overview of current or recently approved OHV policies in the Lakes States National Forests. Table A-3 shows a comparison of State DNR ATV policies for Michigan, Minnesota and Wisconsin.
- The State of Michigan is currently undertaking an assessment of its OHV policies in the Upper Peninsula.

Local government OHV policies vary by the counties that are located in the Ottawa. These policies are not shown in a table as they tend to be dynamic; some counties are currently reviewing their policies for changes.

Table A-1. Current OHV Policies (pre-Forest Plan Revision), Michigan National Forests

| Feature | Ottawa National Forest | Hiawatha National Forest | Huron Manistee National Forest |
|------------------------------|--|--|---|
| OHV(ATV) Trail System | One Designated Trail (Multi-use Trail) About 20 miles | Three designated Trails About 50 miles | Five designated Trails About 330 miles |
| OML 1 Roads | Allowed | Allowed | Not Permitted |
| OML 2 Roads | Allowed | Allowed | Not Permitted |
| OML 3 Roads | Not permitted | Allowed on some OML 3, 4, and 5 roads as part of a trail | Not Permitted |
| Cross-country Use | Permitted on about 80% of the Ottawa | Not permitted | Not Permitted |
| “Challenge” Areas | None | Yes – one area | Yes |

Table A-2. Current OHV Policies (updated in 2004 with Forest Plan Revisions), Wisconsin and Minnesota National Forests

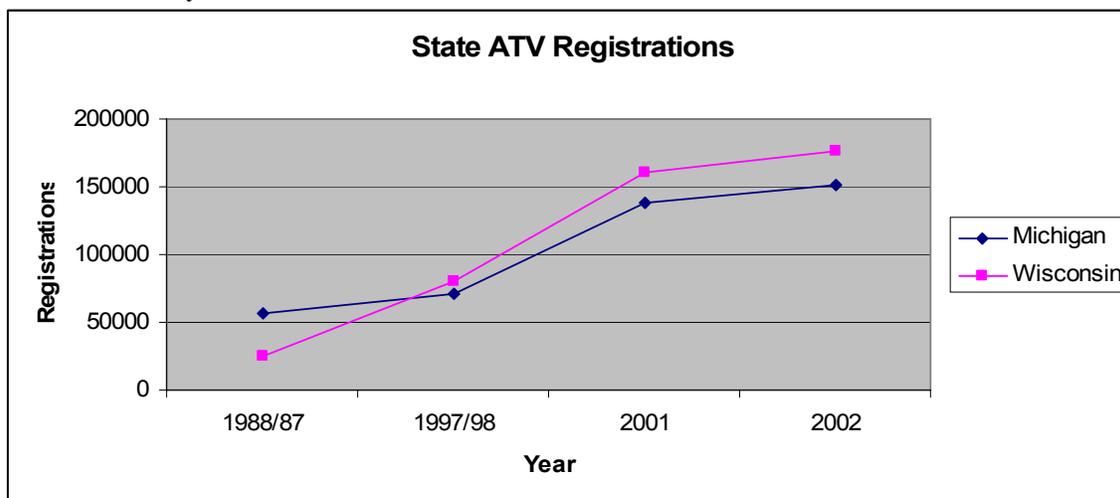
| Feature | Chequamegon/Nicolet National Forest | Chippewa National Forest | Superior National Forest |
|------------------------------|--|---|---|
| OHV(ATV) Trail System | Yes About 284 miles current and up 185 additional new miles | Yes About 20 miles current and up to 90 additional new miles | Yes About 40 miles current and up to 90 additional new miles |
| OML 1 Roads | Generally not allowed | Allowed | Allowed |

| | | | |
|--------------------------|-----------------------------------|---------------------|---------------------|
| OML 2 Roads | Allowed as posted open | Allowed | Allowed |
| OML 3 Roads | Allowed as posted open | Not permitted | Not permitted |
| Cross-country Use | Not permitted | Not permitted | Not permitted |
| “Challenge” Areas | One area closed, no new permitted | None, not permitted | None, not permitted |

Table A-3. Current OHV Policies, State DNR (Wisconsin, Michigan, Minnesota)

| Feature | Wisconsin | Michigan | | Minnesota |
|------------------------------|---|---|-----------------------------------|---|
| | | Upper Peninsula | Lower Peninsula | |
| OHV(ATV) Trail System | Yes Posted and designated open | Yes About 400 miles | Yes About 1,100 miles | Yes Posted and designated open |
| Use of Roads | No, unless marked as part of a designated route | Mostly open, only on roads in state forests | Mostly closed, unless posted open | Yes if posted and designated open |
| Cross-country Use | Not permitted | Permitted only for retrieval of big game at speeds of 5 mph or less | | In state forests only for big game hunting and trapping related purposes |
| “Challenge” Areas | None | No areas in the UP | Yes | None |
| Other | Most state properties are closed to ATV use | ATV use not allowed in state game areas or state parks and recreation areas (except Silver Lake State Park) | | Policies vary by state forest classifications. Not allowed in most state parks, state recreation areas, state historic sites, wildlife management areas, or state scientific and natural areas. |

Figure A-1. Summary of Growth and Demand for ATV Use



- Michigan registrations have grown 150% from 1987 to 2002 (MICHIGAN DNR 2002b).
- In Wisconsin ATV registrations grew from 25,600 in 1997 to 176,000 in 2002 (Wisconsin DNR 2003).
- The Michigan Social and Economic Assessment states that securing long-term trail corridors through the lands of willing private owners is a priority.
- Presently, maintenance and restoration grant dollars derived from OHV permits and awarded by the Off-Road Vehicle Advisory Board of Michigan, have increased.
 - 2002 - \$1,070,485 (26 grant recipients)
 - 2003 - \$1,374,500 (22 grant recipients)
- The popularity of ATVs is noted by a five-fold sales increase since 1993 in the United States. In 2002, unit sales reached 847,000.
- The mean number of riding days in Michigan's Upper Peninsula for ATVs supporting hunting and fishing is 6.1 (or 15.7% of the total state riding days). The Upper Peninsula has the highest percentage of ATV use for hunting than any other region in Michigan (4.9 mean days, 12.5% of the total state riding days) (Nelson et al. 2000).
- The Forest Service Eastern Region is working on a strategy to manage OHV use in the Eastern Region. This strategy is in response to the rapidly increasing demand for OHV opportunities.

User Preferences

- The top three important changes from the user perspective include: more trails/routes/areas and connections to services (30.1%), allow use of road shoulders (13.1%), and improve and maintain signage 10.5% (Nelson et al. 2000).
- The 1999 study conducted by Nelson found that 7.7% (1,123 respondents) of the respondents supported a less restrictive ATV access in the Upper Peninsula (Nelson et al. 2000).
- Additional trail mileage is a demand in many areas of Michigan (Michigan DNR 2002b).

Other Factors affecting future use

- Loss of access to private lands has further increased demand for OHV use on public lands. Larger private landowners, such as timber companies, have liquidated large land parcels in northern Wisconsin and the Upper Peninsula of Michigan over the past several years. The trend is for these lands to be divided into smaller acreage parcels such as 40 and 80-acre parcels, and sold to individual private landowners the majority of which do not allow access by the general public.
- Landowners who place their lands in Forest Crop Law status in Wisconsin or the Commercial Forest Act program in Michigan are not required to permit motorized public access.
- The mean age of the OHV licensees is about 44 years of age according to a 1999 study as compared to the mean age of 30 in the 1988 study. Over 93% in 1999 were male, residing in Michigan (95.6%), and own a second home (23.7%). Almost half of the people obtaining a license had at least 1 year or more of higher education (Nelson et al. 2000).

Representative Public Comments

The statements below are representative of comments and concerns received from the public during the Forest Plan revision process. They are not listed in any particular order and represent a wide range of views regarding OHV use and management. Appendix J of the FEIS contains the responses to comments received on the Proposed Forest Plan and DEIS.

Many visitors to the Ottawa seek a remote setting and provided comments in favor of reducing or eliminating OHV use: too much cross-country OHV traffic causing damage; OHV use destroys land, churns streambeds, and transports exotic plant species; OHV use causes noise, soil, water, and air pollution; OHV use causes detrimental effects to wildlife, botany, and watershed resources; pristine, peaceful habitats will disappear; all areas of the Ottawa should be closed to OHVs unless posted open; do not use temporary logging roads as OHV trails; eliminate cross-country use; do not develop new OHV trails.

Many visitors provided comments for continuing or increasing OHV use: there is a growth in motorized recreation demand; need to provide a designated trail system; impacts from OHVs would be less if distributed over wider area vs. concentrated in small area; OHVs provide access for people with mobility impairments, and for hunting, camping, and recreational use; OHV users enhance tourism and related income; open all roads to OHVs (or just all OML 3 roads); use old roads to create trails; connect current trail systems; keep the Ottawa open to OHVs unless posted closed; there are no loops or connectors – need to create an interconnecting trail system.

Other comments: Provide a balance in amount of OHV trails vs. non-motorized areas; use MICHIGAN DNR regulations on OHV usage to provide uniformity between federal and state; keep trails 500 feet from waterbodies/wetlands; provide for multiple-use trails; the best place for OHVs is in spoil mounds, gravel pits, and other areas that have substantial disturbance caused by human activity; ban OHVs from roads where there is no suitable shoulder; cooperate with user groups; provide forest trail atlas and maps; institute user fees/trail permits or vehicle license; sign roads and trails that are open rather than ones closed; need to regulate and enforce rules and regulations; close trails immediately when adverse effects identified.

OHV damage to soils, watershed, wildlife, fisheries, and rare plants and animals can be characterized as erosion, loss of native vegetation, potential introduction of invasive species, loss of wildlife habitat. Under the current Forest Plan (1986 Forest Plan), the potential for impacts to natural resources associated with OHV use in the future will increase as the number of users increase. See Chapter 3 of the FEIS for discussions on impacts to natural resources from OHV use.

Wildlife-Based Recreation

The forests, streams, and lakes of the Ottawa are very important to the area as a source of forest products and recreation opportunities. The land used for hunting, fishing and other wildlife-based recreation is an asset to the lifestyle of local residents and are an attraction to out of the area visitors. Wildlife is an integral part of the local lifestyle. Many area residents return to the same hunting or fishing areas year after year. The dominant types of wildlife-based recreational opportunities on the Ottawa are categorized by the following activities: hunting, fishing, and wildlife viewing.

Hunting: The nearly one million acres of the Ottawa provide opportunities for small and big game hunting. Individuals may hunt for supplemental sustenance or for sport hunting. Popular big game species include white-tailed deer and black bear. There are a variety of opportunities for hunting small game and numerous species can be found statewide. Some of the more popular species hunted are snowshoe hare, woodcock, and ruffed grouse.

Fishing: Fishing harvest opportunities in the Great Lakes Region include supplemental sustenance fishing, sport fishing, and commercial fishing. There are over 500 lakes, 2,000 miles of rivers and streams, and access to Lake Superior on the Ottawa. Common species that provide fishing opportunities include: trout, walleye, perch, largemouth and smallmouth bass, northern pike, and salmon. Some species may provide sustenance and sport fishing opportunities (i.e. rainbow trout). Some species, such as lake trout, may provide opportunities for all three types of fishing. Population and harvest trends are readily available from the Michigan DNR for these species.

Wildlife Viewing: Individuals may specialize in wildlife viewing such as bird watching. For others, wildlife viewing may be a side benefit of other activities such as camping, boating, hiking, hunting, or fishing. This opportunity also includes wildlife photography and nature study. Wildlife viewing is quickly becoming a major industry in the state and nationwide. Eighty-five percent of the households surveyed (2003) in the eastern Upper Peninsula of Michigan stated that one of their favorite activities was wildlife viewing. The state and especially the Upper Peninsula have large expanses of remote areas where animals can be viewed in their natural settings. Many organized outdoor events focus on wildlife viewing as one of the important components of the events.

The amount or “supply” of wildlife-based recreation opportunity is difficult to define. An indirect analysis of opportunity can help estimate actual supply. Harvest records and population trends may be used to show the change in supply over time for hunting and fishing without actually showing the quantity of opportunities. Change over time of expenditures on wildlife

viewing within the state can suggest an index of supply rather than an actual quantity. This data is readily available from the Michigan DNR and US Census Bureau.

- About 935,000 people hunt annually in Michigan, accounting for 18.4 million hunter days. This is the largest number of hunters of any state in the US. Hunters annually spend \$303 million on Michigan hunting trips and \$733 million on hunting related equipment in Michigan (Michigan DNR 2003a and USDI Fish and Wildlife Service and US Bureau of the Census 2001).
- Over 1.8 million people annually fish in Michigan. Anglers logged almost 29 million angling days, fourth in the nation only behind Florida, California and Texas. Expenditures on Michigan fishing trips exceed \$583 million annually and another \$821 million is annually spent on fishing related equipment, including tackle and boats (Michigan DNR 2003a and USDI Fish and Wildlife Service and US Bureau of the Census 2001).
- Various data sources suggest that hunting and fishing have remained relatively static over the past decade, power boating is now static although it grew within the past decade and wildlife viewing, OHV riding and snowmobiling have grown in the past decade.
- Wildlife viewing involves almost 2.8 million people annually in Michigan, with over 1.1 million involved in some travel to participate in wildlife viewing. Wildlife viewing trip expenditures in Michigan are annually \$267 million with another \$934 million spent on equipment (USDI Fish and Wildlife Service and US Bureau of the Census, 2001).
- Both seasonal and permanent residents listed fishing, hunting and walking/hiking as their top three activities. (Leefers et al. 2003)

Figure A-2. Trends in User Days (1991-2001), USDI Fish and Wildlife Service National Survey–Michigan 2001

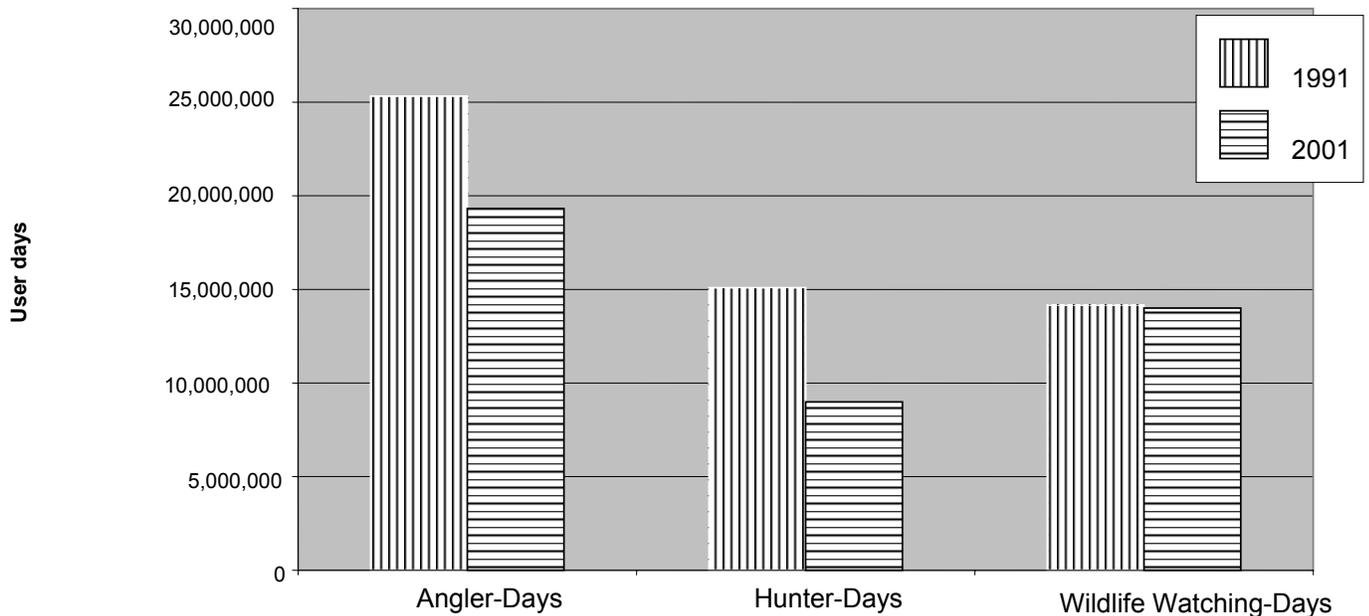


Table A-4. Michigan Licenses and Permits Sold Statewide from 1997 to 2003

| | Fishing | Deer | Bear | Small Game | Furbearer | Total |
|------|-----------|-----------|--------|------------|-----------|-----------|
| 2003 | 1,324,558 | 1,865,024 | 63,914 | 332,692 | 20,711 | 3,848,385 |
| 2002 | 1,359,068 | 1,863,616 | 62,515 | 331,317 | 19,574 | 3,876,278 |
| 1998 | 1,474,861 | 1,582,174 | 44,060 | 362,619 | 18,520 | 3,628,831 |
| 1997 | 767,504 | 1,824,728 | 27,495 | 292,552 | 14,233 | 2,956,081 |

Data source: Michigan DNR, Includes resident and non-resident licenses. Values shown are applications filed for black bear tags.

Table A-5. Michigan Licenses and Permits by Western Upper Peninsula County

| | Fishing | Deer | Bear | Small Game | Furbearer |
|-----------|---------|--------|-------|------------|-----------|
| Gogebic | 17,998 | 7,191 | 734 | 2,523 | 127 |
| Ontonagon | 7,636 | 6,332 | 801 | 2,037 | 122 |
| Iron | 12,788 | 9,904 | 738 | 2,551 | 157 |
| Houghton | 9,278 | 9,758 | 846 | 3,309 | 194 |
| Baraga | 3,521 | 4,212 | 465 | 1,443 | 119 |
| Total | 51,221 | 37,397 | 3,584 | 11,863 | 719 |

Data source: Michigan DNR

In summary, wildlife-based recreation is an important part of the culture for the Upper Peninsula of Michigan. Various opportunities exist for the local residents and public to enjoy the Ottawa's wildlife resources. The popularity of different activities associated with these opportunities has changed over time. Wildlife-based recreation is strongly linked to the wildlife resource. As the wildlife values are maintained, the opportunities associated with the wildlife resource (i.e., hunting) are also maintained.

Recreation Resources Assessment

The Ottawa is a large supplier of public recreation lands within the western Upper Peninsula of the State of Michigan. Michigan has the largest, dedicated state forest system in the United States. The Michigan National Forests (Ottawa, Hiawatha, and Huron-Manistee) are the largest federal ownership category. There are about 1.9 million acres enrolled in the Commercial Forest Program in the Upper Peninsula, which provides access for hunting and fishing. The Michigan Department of Natural Resources (Michigan DNR) manages approximately 4.5 million acres (12% of the state) with the majority (3.8 million acres) being state forests. A majority of those lands are also available for public recreation.

The Ottawa strives to provide quality developed recreation facilities while maintaining the wild and remote character of the Ottawa. The Ottawa has about 50,000 acres in three wildernesses. They are about equal in size, but each has its own unique features.

Developed recreation sites are those areas containing a concentration of improvements, facilities, and services which were built primarily to encourage participation in a recreation activity and

enhance visitor experiences. The Ottawa provides a mix of developed recreation facilities and currently has 22 campgrounds, 47 boat landings, 11 swimming areas, 21 picnic areas, 8 developed canoe landings, and 5 waterfall day use areas. Unique developed recreation areas include the Ottawa National Forest Visitor Center, Lake Nesbit Organization Camp, Black River Harbor, Sylvania Recreation Area, and Lake Ottawa Recreation Area.

Dispersed recreation occurs virtually everywhere on the Ottawa, except at developed or administrative sites. They may contain some level of development, however; improvements are made to accommodate recreation use with the primary purpose of protecting natural resources and/or recreation experiences. Dispersed activities include backpacking, hiking, cross-country skiing, driving for pleasure, and horseback riding to name a few. Snowmobiling, hunting and fishing are important and popular dispersed recreation activities on the Ottawa. There are over 500 lakes, 200 miles of fishable streams including 300 miles of designated and 200 miles of study National Wild and Scenic Rivers, and access to Lake Superior at Black River Harbor (the only safe harbor on Lake Superior administered by the Forest Service).

The Ottawa has over 240 miles of snowmobile trails located on National Forest System lands. There are 450 miles of snowmobile trails within the administrative boundary. Snowmobiling is the most popular and widely participated winter sports activity on the Ottawa. There are over 250 miles of non-motorized trails on the Ottawa, including 19 hiking trails, four ski trails, and three mountain bike trails. Included in this total are about 116 miles of the North Country National Scenic Trail, and Potawatomi-Gorge, State Line Mile Post Zero, and Agonikak National Recreation Trails (NRT). The Agonikak NRT also allows motorized uses.

The Ottawa has one designated National Forest Scenic Byway, the Black River Scenic Byway, located on 11 miles of County Road 513. The byway leads to the Black River Recreation area, where visitors find access to the North Country National Scenic Trail, waterfall viewing sites, and Black River harbor.

Recreation use is measured using the National Visitor Use Monitoring (NVUM) survey for each Forest. The NVUM project is a recreation use sampling system designed to collect data on all national forests over a four year cycle. Results of the NVUM on the Ottawa for 2003 were reported in site visits, Forest visits, and wilderness visits as follows: 878,300 site visits, 638,000 national forest visits, and 20,000 wilderness visits; equaling about 1.3 million recreation visitor days (RVDs) (USDA Forest Service, 2004h).

An RVD is defined as recreational use of NFS land, which aggregates 12 hours (e.g., one person recreating in an activity for 12 hours; two people for six hours, etc.). A national forest visit is the entry of one person upon a national forest to participate in recreation activities for an unspecified period of time. A national forest visit can be composed of multiple site visits, such as to a campground, trail, or other facilities all on one trip; whereas a site visit is the entry of one person onto a national forest site or area to participate in recreation activities for an unspecified period of time. Visitors were asked to select the primary reason for their visit and the top primary activities were: downhill skiing, hunting, snowmobiling, viewing natural features and fishing. Although downhill skiing ranked high in the survey, this information may be skewed due to the survey location. The selected survey location was in the parking lot of the ski hill, thus capturing

a high number of survey participants and a high number of visitors engaging in downhill skiing as their primary activity.

A realistic carrying capacity maximum considers a national forest's physical and recreation variables such as useable vs. unusable acres, weekend vs. weekday use, occupancy rate, etc. The Recreation Opportunity Spectrum (ROS) Users Guide outlines the approach to determine capacity. The 1986 Forest Plan utilized ROS to assign a spectrum of settings that provides visitors with an array of experiences ranging from high probability of solitude and recreational challenge to a very social experience where recreational challenge is relatively minor. Comparing the calculated carrying capacity with use derived from the NVUM provides the following information. Developed recreation represents approximately 276,000 RVDs for 35% of the Ottawa's total carrying capacity. Dispersed recreation sites represent 1,075 million RVDs or 27% of the Ottawa's total dispersed recreation carrying capacity.

Timber Consumption Trends

The Ottawa is one of many landowners in the western Upper Peninsula of Michigan. The Ottawa is however the largest landowner, accounting for approximately 19 percent of the forestland in the western Upper Peninsula. From a timber standpoint, the Ottawa accounts for 18 percent of the standing volume, 16 percent of the growth, and during the period of 1980-1992 accounted for approximately 15 percent of removals (USDA Forest Service 1994b). Therefore, the Ottawa, along with other local landowner/managers and some outside our region, have had a role in supplying wood raw materials to the regional timber products market. During the 17 year period of implementation of the 1986 Forest Plan (1987 to 2003), the average volume of timber sold and harvested from the Ottawa was about 69 million board feet (MMBF) annually.

Regional trend information from various sources such as the Lake States Assessment, applicable research publications, and local knowledge of market demand in combination with historic regional and local trends were used to establish out-year consumption estimates (Great Lakes Forest Alliance, 2004).

On the Ottawa, bidding on Forest timber sales over the past few years has been very competitive, and has resulted in multiple bidders, and substantial overbids on timber sales being offered. The average bid prices have increased over the years, and average selling price is 3 to 4 times higher than when the 1986 Forest Plan was first implemented. There has also been a trend in bidders from greater distances now routinely bidding on sales. In addition, some consumers (mills) have purchased roundwood from Canada.

The level of harvest has also increased in recent years, and has by far exceeded the level of timber offered or sold in recent years. This has also resulted in a drop in the uncut volume under contract, which can limit harvest levels.

Historical Trends

Past regional and local trends in timber consumptions were considered in the estimation of potential future consumption increases.

According to Robert Stone (1992), between 1952 and 1992 growing stock removals rose 51% in total. The average would exceed 12% each decade over the 40-year period.

Ottawa harvest data from the past 50 years was also analyzed for trends. The tables below display the results of this analysis. Removals (harvest) on the Ottawa have been increasing at a higher rate than the regional trend. This is most likely due to the shift to better utilization of hardwood pulpwood. This trend is expected to continue because of improvements in paper making and changes in OSB technology that better utilize the lower priced hardwood pulpwood as a substitute for softwood and aspen pulpwood.

Table A-6. 30-Year Harvest Trends by 5-year Intervals

| Fiscal Year | MMBF Harvested | 5-Year Average | % Increase |
|--------------------|-----------------------|-----------------------|-------------------|
| 1972-1976 | 185.0 | 37.0 | --- |
| 1977-1981 | 236.6 | 47.3 | 27.8 |
| 1982-1986 | 261.0 | 52.2 | 10.4 |
| 1987-1991 | 338.2 | 67.6 | 29.5 |
| 1992-1996 | 335.7 | 67.1 | -0.7 |
| 1997-2001 | 392.1 | 78.4 | 16.8 |

The average increase per 5-year interval was 16.8 percent.

Table A-7. 50-Year Harvest Trends by 10-year Intervals

| Fiscal Year | MMBF Harvested | 10-year Average | % Increase |
|--------------------|-----------------------|------------------------|-------------------|
| 1952-1961 | 392.7 | 39.3 | --- |
| 1962-1971 | 467.3 | 46.7 | 18.8 |
| 1972-1981 | 421.6 | 42.2 | -9.0 |
| 1982-1991 | 599.2 | 59.9 | 41.9 |
| 1992-2001 | 727.8 | 72.8 | 21.5 |

Average increase per 10 years over the past 40 years was 18.3 percent.

Average increase per 10 years over the past 30 years was 18.1 percent.

Average increase per 10 years over the past 20 years was 31.7 percent.

Average increase per 10 years over the past 10 years was 21.5 percent.

An examination of the data for harvest volume by fiscal year (FY) and uncut volume under contract levels by fiscal year, shown below, helps interpret recent Ottawa timber sale activity.

Uncut volume from 1989 to 1998 was close to 200 MMBF or greater. Beginning in FY 1999, the uncut volume started to drop each year to the estimated present level of 72 MMBF. The average harvest level over the period of 1987 to 2003 has been 68.7 MMBF. At the beginning of FY 2001, the uncut volume was 129 MMBF or nearly 2 times (1.9) the annual harvest level. At the end of FY 2001 the level of uncut volume under contract had dropped to 105 MMBF or about 1.5 times the average harvest level. Uncut volume continued to decline in FY 2002 and 2003. Therefore, harvest levels in FY 2002 and 2003 were estimated to be negatively affected by the reduced level of volume under contract.

Table A-8. Sold and Harvest Volume and Value by Fiscal Year

| Fiscal Year | Sold Volume | Sold Value | | Harvest Volume | | Harvest Value |
|-------------|-------------|------------|--------|----------------|-------|---------------|
| | (MMBF) | \$M | \$/MBF | MMBF | \$M | \$/MBF |
| 1987 | 76.1 | 1,506 | 19.79 | 59.1 | 1,299 | 21.98 |
| 1988 | 61.9 | 1,716 | 27.72 | 63.0 | 1,447 | 22.97 |
| 1989 | 75.7 | 2,373 | 31.35 | 76.3 | 1,322 | 17.33 |
| 1990 | 66.0 | 2,623 | 39.74 | 75.7 | 1,579 | 20.89 |
| 1991 | 78.1 | 2,786 | 35.67 | 64.1 | 1,599 | 24.95 |
| 1992 | 66.8 | 2,241 | 33.55 | 61.3 | 1,872 | 30.54 |
| 1993 | 86.7 | 3,783 | 46.63 | 68.2 | 2,244 | 32.90 |
| 1994 | 72.1 | 4,243 | 58.85 | 68.7 | 2,528 | 36.80 |
| 1995 | 47.1 | 3,172 | 67.35 | 72.0 | 2,779 | 38.60 |
| 1996 | 50.9 | 3,145 | 61.79 | 65.5 | 3,110 | 47.48 |
| 1997 | 70.5 | 4,916 | 69.73 | 69.8 | 3,764 | 53.93 |
| 1998 | 81.3 | 5,371 | 66.06 | 83.4 | 4,983 | 59.75 |
| 1999 | 54.0 | 3,393 | 62.83 | 90.8 | 5,426 | 59.76 |
| 2000 | 44.7 | 3,371 | 75.41 | 82.0 | 5,800 | 70.73 |
| 2001 | 40.9 | 4,602 | 112.52 | 66.1 | 4,539 | 68.67 |
| 2002 | 31.3 | 3,056 | 97.64 | 46.1 | 3,577 | 77.59 |
| 2003 | 38.7 | 2,254 | 58.24 | 55.9 | 4,482 | 80.18 |

Note: Dollar values are actual for the year recorded, rounded to the nearest thousand dollars. Volumes are rounded to the nearest 100 MBF.

Table A-9. Uncut Volume under Contract FY 1989 to 2003

| Fiscal Year | Volume (MMBF) |
|-------------|---------------|
| 1989 | 197 |
| 1990 | 187 |
| 1991 | 200 |
| 1992 | 207 |
| 1993 | 228 |
| 1994 | 232 |
| 1995 | 208 |
| 1996 | 197 |
| 1997 | 198 |
| 1998 | 199 |
| 1999 | 164 |
| 2000 | 129 |
| 2001 | 105 |
| 2002 | 89 |
| 2003 | 72 |

Future Consumption Trends

On the Ottawa, the markets for hardwood lumber and saw logs are important components of the Forest's capability. Structural panel or oriented strand board (OSB) has also been a rapidly

growing market for products in the Lake States and the Ottawa market areas. This product is expected to be one of the strongest areas of growth in the industry as it continues to increase in market share as a substitute for softwood plywood. The OSB industry is also adapting its technology to utilize species other than aspen. They have shifted from using 100 percent aspen to a current mix of approximately 80 percent aspen and 20 percent other hardwoods and softwoods. This trend is expected to continue to some degree, driven by the limited supply and increasing price of aspen products.

Pulpwood production in the Lake States has grown over time in response to increased population, and demand for publishing and tissue paper products. Further increases may be met within current mill capacity, or expansion of existing mills. However, increasing global competition could affect this industry.

Hardwood saw logs account for approximately 10 percent of the current production on the Ottawa. This product will increase in importance in the future as the vast northern hardwood forests, and sugar maple in particular, begin to mature and improve in quality with continued uneven-aged management. The Ottawa has the capability to increase this percentage and hardwood saw log volume significantly over the next 50 years.

Approximately 26 percent of the harvest on the Ottawa has been aspen products. This has declined in recent years, and in the short-term this decline will continue, until younger stands reach maturity. In recent years an increasing proportion of the aspen volume has been utilized to help meet the demand for OSB products. Aspen products should continue to account for 20-30 percent of the total production.

Hardwood pulpwood currently accounts for about 45 percent of current production and softwood pulpwood about 15 percent. The Ottawa has the capability to increase production in these areas as well in the short-term, through the treatment of an increased number of acres of overstocked, second growth hardwood stands, and overstocked Civilian Conservation Corps (CCC) planted and younger red pine plantations. In the longer term, as stands mature, these products will decline somewhat as sawtimber products increase. The pulp and paper mills in the local market area are also shifting the species mix to favor the use of more hardwoods.

Utilization of CCC plantation red pine and jack pine is also expanding. Local sawmills have adapted to utilize small diameter pine, spruce and balsam for the manufacture of softwood lumber, with a heavy emphasis on 2x4 studs, and treated lumber markets. Much of the volume sold as pine pulpwood is currently being utilized by these markets. There has also been a growing market for utility poles and log home material from the higher quality pine saw logs.

These trends were based, in part, on research publications dealing with timber consumption in the Lake States. Regional trends information was also utilized (Haynes 2003).

Dams

There are currently at least 24 dams on the Ottawa. Eight are under Forest Service jurisdiction: Paint Lake Dam, Bulldog-White Deer Lakes Dam, Lower Dam, Calderwood Dam, Paulding Pond Dam, Robbins Pond Dam, Sucker Lake Dam, and Marion Lake Dam. Five dams are hydropower dams under the control of UPPCO: Bergland Dam, Prickett Dam, Victoria Dam,

Bond Falls, and Cisco Dam. One dam is under MICHIGAN DNR control, the Presque Isle wildlife dam. The remaining eleven dams on the Forest are under local governmental, institutional, or private control: Kitchen Dam, Mallard Lake Dam, Spaulding Dam, Unnamed Dam (Paint Creek), Nordine Impoundment, Trout Creek Dam, Upper Dam, Wolf Lake Dam, Brule Lake Dam, Holmes Dam, and the Duck Lake Dam.

The dams were constructed for a variety of purposes. The UPPCO dams are for power generation with a complementary recreation use. The majority of the other dams were constructed to promote recreational activities such as fishing, to create wildlife habitat, or for logging. The original purpose of a number of the dams is not known.

The dams were constructed from a variety of materials including earth, steel, wood, and concrete. The majority of the dams are earthen. The earliest recorded year of completion for any of these dams is 1906 for the Bergland dam. The year of completion is not presently known for nine of the dams. Several of these are old splash dams and could considerably predate the year 1906. Only 11 of the dams on the Ottawa have inspection records since 1978. Three dams have hazard rankings of high (UPPCO dams); and other dams include one ranked as a significant hazard, one as a moderate hazard, 10 as low hazards, and nine are unranked. These nine unranked dams are also the same dams of which little is known (six are private and three are Forest Service: Marion Lake, Sucker Lake, and Paint Lake). None of the dams have a known predicted lifespan.

There are a number of known issues with dams on the Ottawa. The northern end of the Presque Isle wildlife dam blew out in 2002 because of high spring run-off. The impoundment behind the dam provided habitat for black terns and wild rice was seeded in the shallows. The impoundment has since disappeared and the river has returned to its natural channel. The dam on Paulding Creek was re-lined in 2002. This dam also marks the upper end of habitat for the creek heelsplitter mussel, a regionally sensitive species. This is the only known site for this species on the Ottawa. The stream above the dam flows through a meadow and is not suitable habitat for the mussel; it appears that the dam actually helps maintain the downstream habitat. Seven dams are known to be passage barriers and the remaining 16 are unknown. If they are currently functioning as dams, it is reasonable to assume that they are barriers. However, Bond Falls and Victoria dams are not considered barriers to the passage of aquatic organisms.

Prediction of Future Change in Dams on the Ottawa

The State of Michigan is currently working to decrease the number of dams it administers. The dam at Paulding Creek was turned over to the Ottawa from the state. The dam on the Presque Isle River will be repaired and the impoundment refilled for wildlife resource benefits. The age of many of the dams on the Ottawa, and their attendant risk of failure, suggest that decisions about their continued maintenance or decommissioning will need to be made in the relatively near future. There is also the potential for new low-head dams, for recreation or wildlife, to be constructed.

Wildland Fire

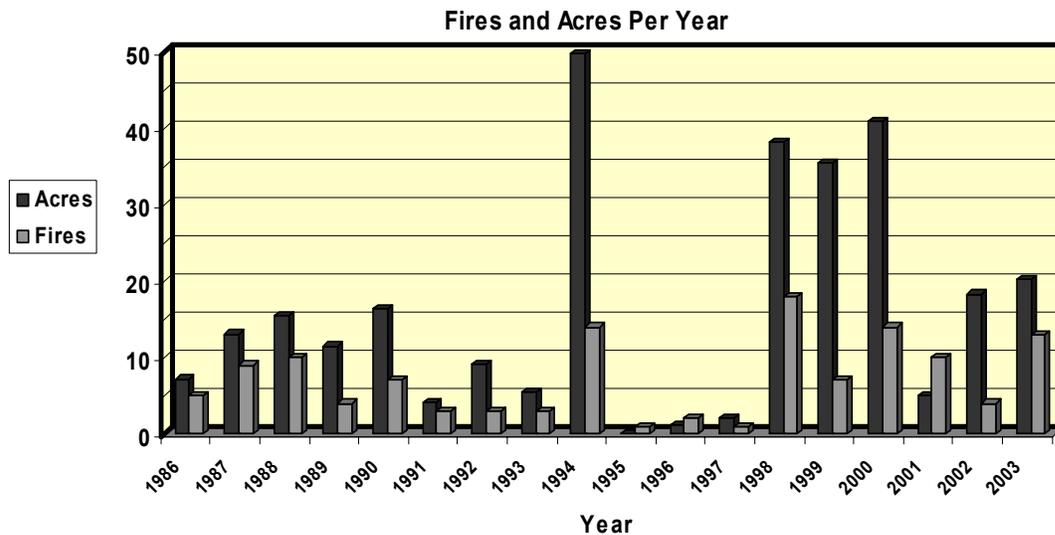
Wildfire was not a primary issue in development of the 1986 Forest Plan. High humidity, frequent rainfall, the predominance of deciduous forests, and normally cool temperatures combine to keep available fuel moist and limit ignitions. Access within the Forest and an established prevention program has contributed to keeping the risk of wildland fire low.

Use of prescribed fire was infrequent with the majority of fuels or site prep work completed by mechanical methods.

Current Situation

Since implementation of the 1986 Forest Plan, the Ottawa suppressed about 112 fires that burned approximately 267 acres. This includes only the fires that were within the Ottawa's protection area. The areas of the Ottawa under other agency protection are less susceptible to catastrophic fire (e.g., MAs 1.1, 2.1, 3.1, and 3.2), except for the extreme northeast part of the Forest within the Baraga Plains area.

Figure A-3. Number of fires and acres burned within Forest Service protection area (1986-2003)



Major causes of fires in the last 20 years were lightning, debris burning, and miscellaneous human-caused ignitions (see Table A-10). Approximately 18% of the known ignitions were natural starts (lightning), 73% were man-caused, and 9% are of unknown origin.

Table A-10. Number of Fires by Source of Ignition

| Code | Type | Number of Fires | Code | Type | Number of Fires |
|------|----------------|-----------------|------|---------------|-----------------|
| 1 | Lightning | 20 | 6 | Railroad | 1 |
| 2 | Equipment Use | 2 | 7 | Arson | 14 |
| 3 | Smoking | 5 | 8 | Children | 3 |
| 4 | Campfire | 16 | 9 | Miscellaneous | 20 |
| 5 | Debris Burning | 21 | | Unknown | 10 |

Response to all wildland fire has been immediate and control of the fire is normally achieved in the first operational period. Since 1986, no fire has gone beyond a Type IV incident response (e.g., where several local resources, such as a small strike team or task force, are used) on the Ottawa.

The fuels management program has averaged about 50 acres accomplishment per year over the last few years, but is increasing as knowledge about fuels and fire has increased. Treatment mostly consists of mechanical methods using chippers, chainsaws, hand piling, and pile burning.

Expected Future Conditions

The future condition of the Ottawa is predicted to be generally low risk for catastrophic fire potential. This is due to current and expected vegetation compositions and moderate weather conditions with high relative humidity following spring green-up conditions.

Generally, frequent precipitation well-distributed during the year, good access, an abundance of deciduous forest types, an established prevention program, and an aggressive detection and suppression program will minimize the threat posed by wildfire. For these same reasons (weather patterns and vegetation composition) opportunities to use fire as a management tool and meet prescription goals will also be limited.

It is suspected that development of private infra-structure (i.e., deer camps, summer residences, and permanent residences) has increased inside the Ottawa’s protection area since implementation of the 1986 Forest Plan. It is expected to continue increasing during the foreseeable future. This may be related to the increased number of ignitions shown in recent years (1998 to the present, see Figure A3) and may affect the Ottawa’s opportunities to let natural ignitions burn and increase efforts to manage fuel loads.

Minerals

Minerals of interest on the Ottawa are broadly classified as consolidated (hardrock and mineral resources), and unconsolidated (common variety mineral materials such as sand and gravel). This summary report contains supporting evidence of the types of materials present or potentially present on the Ottawa and their potential for development. The mineral and mineral material resources are separated into categories of potential and speculative potential. Potential meaning that it is probable that these materials are on Forest Service lands and there will be some interest in developing those resources. Speculative potential identifies those resources that could potentially be found on the Ottawa; however not much is known about the deposits or they have only been found in sub-economic qualities.

Mineral Resource Potential

Copper: Most native copper was mined from about 1850 to 1920 from amygdaloidal and fissure vein deposits found in the basalt flows of the Portage Lake Volcanics of the Middle Proterozoic. The White Pine Copper Mine, of Ontonagon County, was the most recent in the area to cease operation and production in the early 1990s. The second type of native copper deposits (associated with the copper sulfide deposits) can be found in the sediments of the uppermost Copper Harbor Conglomerate and the lowermost Nonesuch Formation. The deposits occur as thin sheets along bedding planes and fractures in shale and as pore fillings in sandstones (Cannon et al. 1995).

Two large copper sulfide deposits, mostly chalcocite, can be found near the Ottawa boundaries. They are the White Pine deposit and the Presque Isle deposit. The known portions of the White Pine deposit have been documented or mined from the lower Nonesuch Formation. The Presque Isle deposit has not been mined at present due to engineering problems (Cannon et al. 1995). There is potential for these deposits to extend to within the national forest boundaries, as well as the potential for the copper resources to be found in undeveloped or undiscovered deposits.

Sulfides: Magmatic sulfide deposits can contain nickel, copper, cobalt, platinum group metals and other important economic metals. The general geologic setting of the formation of these deposits is in areas of sub-marine volcanic activity combined with their associated sedimentary deposits (Cannon 1982). There have been several episodes of submarine volcanic activity throughout the geologic history of the area. These deposits and the intrusions associated with their activity have the potential to contain the magmatic sulfide deposits.

The glacial deposits, which have extensively covered the Ottawa, limit the bedrock outcrops exposed in the area. Only areas of intensive mapping or those that have undergone geophysical exploration have enough information to provide the minimal potential of magmatic sulfide deposits. With increased exploration, there is the potential to find unmapped deposits overlain by younger formations. Recent exploration by prospecting companies and governmental agencies, along with comparisons of similar deposits found around the world, have led to a better understanding of the deposits and their potential occurrences. One such example is the Echo Lake Gabbro, a potential sulfide deposit found beneath the Jacobsville Sandstone, associated with the Midcontinental rift system (Schulz and Cannon 1997).

Iron: The mining iron ranges are topographic highs formed by resistant quartzite units associated with the iron formations. There are three iron ranges present in the Upper Peninsula of Michigan and northern Wisconsin. They are the Marquette, Menominee, and the Gogebic of Early Proterozoic age. The latter lies within the Ottawa's boundaries, specifically named the Ironwood Iron Formation. The steeply dipping iron range extends from Namekagon Lake in Bayfield County, Wisconsin, to Lake Gogebic in Michigan (Paull and Paull, 1977). The other iron formations are located east of the Ottawa boundary, near the cities of Iron River and Marquette, Michigan.

Originally high grade ore (50-60% iron) was mined, but as mining practices changed, lower grade ore (~30% iron), known as taconite, is now mined (Cannon 1982). Taconite contains silica and iron rich minerals that, when mined, would be crushed, separated, and then coalesced into

pellets (Paull and Paull 1977). Productive mining is problematic because of the steep dipping, thin formations and the additional production of waste rock associated with taconite (Cannon, 1982). Though iron formations exist within and near the Ottawa boundaries, mineralogical testing is needed to determine its economic potential (Klasner et al. 1998).

Diamonds: A kimberlite pipe, a host rock for diamonds, was found northeast of Crystal Falls, Michigan, near Lake Ellen. This pipe has intruded into rocks of Lower Proterozoic age. Its presence is evident in a magnetic anomaly that roughly defines the size and shape of the kimberlite body. Similar magnetic anomalies have been discovered from subsequent surveys, including two found near Pelkie, Michigan, just north of the Ottawa boundary (Cannon and Mudrey 1981). Further investigations and exploration may indicate the presence of other pipes on and near the Ottawa. There is also potential for diamonds to be present in glacially transported material derived from kimberlite pipes. These two factors make the entire Ottawa a speculative potential for diamonds.

Uranium and Phosphate: Uranium and phosphate ores have been found in conglomerates of the Marquette Range Supergroup near parts of the Marquette District (LaBerge 1994). Additional low-grade occurrences of uranium-phosphate deposits have been found in the Gogebic Range. These deposits are associated with unconformities between older crystalline rocks and much younger meta-sedimentary rocks (Cannon 1982). Uranium has also been found in contact with some of the iron-ore bodies east of Iron River. Most of the uranium and phosphate deposits that have been found are small and of sub-economic value. There is speculative potential for the exploration for these types of deposits.

Oil and Gas: There is no known large accumulation of oil and/or gas in the area, however there is potential for its presence. The Nonesuch Formation of the Middle Proterozoic has been found to contain petroleum. There have been minor oil leaks in exposed cracks from the White Pine Mine in Ontonagon County (LaBerge 1994). The entire Ottawa has speculative potential for the development of oil and gas.

Other Minerals: There is potential for lead, gold, silver and other minerals to be found on the Ottawa. These minerals may be found transported from their original location, known as placers, or found associated with some of the deposits listed above.

Sand and Gravel: Glacial deposits extensively cover the Ottawa. Glacial lobes emerging from the Lake Superior and Green Bay areas deposited materials during the most recent glaciation, about 10,000 years ago. A general description of the deposits that cover the Ottawa are lacustrine silts and clays in the northeast, stratified sand, gravel, and till in the south and southeast, and thin till cover over bedrock in the northwest (Peterson 1985). Both Forest Service and private sand and gravel pits are distributed throughout the Ottawa. Currently, the potential remains for sand and gravel resources to be found on the Ottawa; however it is a nonrenewable supply that varies across the Forest.

References

- Cannon, W.F. and M.G. Mudrey Jr., 1981. The Potential for Diamond-Bearing Kimberlite in Northern Michigan and Wisconsin. US Geological Survey: Circular 842.
- Cannon, W.F. et al. 1982. Mineral-Resource Assessment of the Iron River 1° x 2° Quadrangle, Michigan and Wisconsin. U.S. Geological Survey: Open-File Report 82-223.
- Cannon, W.F. et al. 1995. Geologic Map of the Ontonagon and Part of the Wakefield 30° x 60° Quadrangles, Michigan. U.S. Geological Survey: Miscellaneous Investigations Series, MAP 1-2499
- Haynes, Richard W. 2003. An Analysis of the Timber Situation in the United States: 1952 to 2050. GTR PNW-GTR-560. pp.76-78, 237, 248.
- Klasner, J.S. 1998. Geologic Map of the Eastern Gogebic Iron Range, Gogebic County, Michigan. U.S. Survey: Miscellaneous Investigations Series, MAP 12606.
- LaBerge, G.L. 1994.-Geology of the Lake Superior Region. Geoscience Press, Inc. Tucson, AZ.
- Leefers, Larry, Karen Potter-Witter and Maureen McDonough. 2003. Social and Economic Assessment for the Michigan National Forests. Department of Forestry, Michigan State University, Lansing, Michigan.
- Michigan Department of Natural Resources. 2002a. ORV/ATV Riding in Michigan. http://www.michigan.gov/printerFriendly/0,1687,7-153-10365_15070-33290--00.html. Accessed 11/15/2004.
- Michigan Department of Natural Resources. 2002b. State ATV Registrations. Michigan and Wisconsin. 1 p.
- Michigan Department of Natural Resources. 2003a. Draft 2003-2007 Michigan Comprehensive Outdoor Recreation Plan (SCOR Plan). Michigan Department of Natural Resources and Department of Park, Recreation and Tourism Resources. Michigan State University. 28 pp.
- Nelson, C., J., Lynch, and D. Stynes. 2000. Michigan Licensed Cross Country Vehicle Use and Users: 1998-1999.-Department of Park, Recreation and Tourism Resources. 45 pp.
- Paull, R.A., R.K. Paull. 1977. Geology of Wisconsin and Upper Michigan. Kendall/Hunt Publishing Company. Dubuque, IA
- Peterson, W.L. 1985. Surficial Geologic Map of the Iron River 1° x 2° Quadrangle, Michigan and Wisconsin. U.S. Geological Survey: Miscellaneous Investigations Series, MAP 1-1360-C
- Schultz, K.J. and W.F. Cannon. 1997. Potential for New Nickel, Copper Sulfide Deposits in the Lake Superior Region U.S. Geological Survey: USGS Information Handout.

Stone, Robert. 1992. Great Lake States Forest Trends, 1952-1992. *In*: Lake States Regional Forest Resources Assessment: Technical papers. North Central Research Station General Technical Report NC-189. pp. 39, 49

US Department of Agriculture, Forest Service. 1994b. North Central Forest Experiment Station .Resource Bulletin NC-153-Forest Statistics for Michigan's Western Upper Peninsula Unit, 1993. 45 pp.

US Department of Agriculture, Forest Service. 2003i. ATV-AMS: Chequamegon-Nicolet National Forest: Land and Resource Management Plan. 2003-30 pp.

US Department of Agriculture, Forest Service. 2004h. National Visitor Use Monitoring Results for the Ottawa. Ottawa National Forest. 25 pp.

US Department of Interior Fish and Wildlife Service, U.S. Department of Commerce, U.S. Census Bureau. 2001. National Survey of Fishing, Hunting, and Wildlife Association Recreation in Michigan. 84 pp.

Wisconsin Department of Natural Resources. 2003. Wisconsin ATV Registrations 1992-2002. 1 pp.