Harvestable Species Plan

Apostle Islands National Lakeshore

Bayfield, Wisconsin

April 2014

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EXECUTIVE SUMMARY

A Harvestable Species Plan and Environmental Assessment was completed in May of 2014 and replaces Apostle Islands National Lakeshore's Wildlife Management Plan for Harvestable Species (2007). The following document is the action plan and includes the selected alternative as well as pertinent background information.

The purpose of the Harvestable Species Plan is to provide direction for managing harvestable species within Apostle Islands National Lakeshore (referred to as the park). Harvestable species includes wildlife that can be legally hunted or trapped, as well as plant species that can be legally gathered by the general public or tribal members as part of their treaty reserved rights.

National Park Service (NPS) objectives for harvestable species include:

1. Managing processes and preserving ecologically sound native biological communities, while recognizing factors unique to island ecosystems.
2. Providing for appropriate state regulated hunting and trapping opportunities.
3. Provide for treaty-related hunting, trapping and gathering opportunities.
4. Providing for appropriate public plant gathering.

Species/groups that are addressed by this plan include: white-tailed deer; black bear; wolves; furbearers; small game; wild turkey; waterfowl; and certain plants/berries/nuts. Fishing and harvest of aquatic species is excluded from this plan. The plan is limited to terrestrial species.

Most wildlife species are managed consistent with appropriate State of Wisconsin regulations and as part of a larger state management zone. This includes black bear, furbearers, small game and waterfowl, wild turkey, and wolves (except for the Mainland Unit, Sand Island and Long Island, which have zero quotas). In addition, special park regulations apply park-wide and access permits are required for most harvest activities on islands within the park. There are special state regulations for deer harvest within the park that allow for greater harvest opportunities.

Limited gathering of edible fruits, berries, and mushrooms by the general public is permitted. Gathering must be done using traditional hand harvest methods and is limited to personal use and consumption. Exercise of treaty related rights, including hunting and trapping, as well as gathering of wild plants, is specifically addressed within the park's General Agreement with member tribes.

INTRODUCTION

PURPOSE AND NEED

The purpose of this plan is to provide direction for managing harvestable species within Apostle Islands National Lakeshore (referred to as the park). Harvestable species includes huntable and trappable wildlife, as well as plant species that can be gathered by the general public or tribal members as part of their treaty reserved rights.

A Wildlife Management Plan for Harvestable Species and Environmental Assessment for Apostle Islands National Lakeshore was completed in 2007. Since that time, the status of certain wildlife species has changed necessitating important updates and the park has had an opportunity to determine the effectiveness of the previous plan. In addition, plant gathering has been added to the plan because certain plants are subject to harvest and were not included in the previous plan.

National Park Service (NPS) objectives for harvestable wildlife include:

1. Managing processes and preserving ecologically sound native biological communities, while recognizing factors unique to island ecosystems.
2. Providing for state regulated hunting and trapping opportunities.
3. Provide for treaty-related hunting, trapping and gathering opportunities.
4. Providing for appropriate public plant gathering.

Species/groups that will be addressed by this plan include: white-tailed deer; black bear; wolves; furbearers; small game; wild turkey; waterfowl; and certain plants/berries/nuts. Fishing and harvest of aquatic species is excluded from this plan. It is limited to terrestrial species.

LEGAL, POLICY, AND PLANNING BACKGROUND

Like all units of the NPS, the park is guided by the National Park Service Organic Act and the enabling legislation that created the park. The park was created to "conserve and develop for the benefit, inspiration, education, recreational use, and enjoyment of the public certain significant islands and shoreline of the United States and their related geographic, scenic, and scientific value…"

While hunting and trapping are prohibited by federal law in most units of the National Park System, Apostle Islands NL is one of approximately 60 NPS units where some form of legal wildlife harvest is permitted under federal law.[1] Apostle Islands NL's enabling legislation directs park management to permit hunting and trapping where and when it is appropriate, and articulates the circumstances under which these decisions are to be made:

[1] http://www.nature.nps.gov/biology/wildlifemanagement/Examples_of_Wildlife.cfm, accessed 4/1/2013.

> *The Secretary shall permit hunting, fishing, and trapping on lands and waters under his jurisdiction within the boundaries of the lakeshore in accordance with the appropriate laws of Wisconsin and the United States to the extent applicable, except that he may designate zones where, and establish periods when, no hunting, trapping, or fishing shall be permitted for reasons of public safety, administration, fish or wildlife management, or public use and enjoyment. Except in emergencies, any regulations prescribing any such restrictions shall be put into effect only after consultation with the appropriate State agency responsible for hunting, trapping, and fishing activities. (16 USC § 460w–4)*

The State of Wisconsin nonetheless possesses broad powers over fish and wildlife within its borders, including wildlife found on federal lands, including the Apostle Islands NL. There are many federal court rulings that address the interplay between federal and state authority over wildlife (Buono, 1997; Goodhart, 2008) that will not be discussed in this document. Both federal and state authorities apply concurrently, and the state rules normally take precedence except where and when Congress has delegated authority to a federal agency, as it has under some circumstances at Apostle Islands. Department of the Interior policy, codified in 43 CFR § 24,[2] directs federal agencies to prepare wildlife management plans in consultation with states where appropriate (§ 24.4(i)(1)) and consult with the appropriate state agency prior to exercising federal closure authority, except in case of emergency (§ 24.4(i)(4)). These policies are reiterated in National Park Service Management Policies 2006, §8.2.2.6.

The regulation at 36 CFR §2.1(c)(1) provides park superintendents with the authority to allow gathering of certain fruits, berries, nuts or unoccupied seashells. However, it requires "a written determination that the gathering or consumption will not adversely affect park wildlife, the reproductive potential of a plant species, or otherwise affect park resources." Park superintendents may limit the size and quantity of natural products that may be gathered or possessed, as well as the location(s) where these products can be gathered. Gathering is further restricted to traditional hand harvest methods for personal use and consumption. Conditions and maximum quantities for collecting are specified within the Superintendent's Compendium and adjusted, as needed to protect park resources. The Superintendent's Compendium is generally updated on an annual basis. This plan, upon approval, will serve as the required written determination and will be referenced in subsequent updates of the Superintendent's Compendium.

The NPS and Native American tribes have a unique relationship that is founded in and strengthened by a shared commitment to stewardship of the land and resources (NPS 2006). The park is in very close proximity to two Native American reservations. The reservation of the Red Cliff Band of Lake Superior Chippewa is to the west and includes 2/3rds of the park's Mainland Unit. The Bad River Band of Lake Superior Chippewa is just southeast of the park. The park is within territory that was ceded as part of the 1842 Treaty with the Chippewa. Within this ceded territory, the Chippewa reserved their rights to hunt, trap, and gather. These rights are recognized and respected by the National Park Service and are distinct from the public hunting, trapping, and plant collecting authorized by NPS law and federal regulations.

[2] Available at http://www.law.cornell.edu/cfr/text/43/24, accessed 4/1/2013.

Park managers are also guided by Code of Federal Regulations, Federal Court cases (e.g., NRA v Potter, 628 F. Supp. 903, 906 (D.D.C. 1986)), National Park Service policies and guidelines and park specific plans. Important guidance includes: NPS Management Policies 2006; Director's Orders (DO), including DO-77 Natural Resource Protection, DO-2 Park Planning, and DO-12: Conservation Planning, Environmental Impact Analysis, and Decision-making. Relevant park specific plans include: the General Management Plan (2011), the Wilderness Management Plan (2011), the Resources Management Plan (1999), and the Wildlife Management Plan for Harvestable Species (2007).

NPS Management Policies 2006 state that "the 'fundamental purpose' of the national park system … begins with a mandate to conserve park resources and values" and leave them unimpaired. It also directs parks to manage natural resources so that fundamental physical and biological processes are preserved, as well as individual species, features, and plant and animal communities. Biological or physical processes altered in the past by human activities may need to be actively managed to restore them to a natural condition. NPS managers are also directed to preserve and restore the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur. This may include the eradication of non-native species, where appropriate and feasible. (NPS 2006).

NPS internal guidance related to natural resource management advises that hunting and trapping must be consistent with sound resource management practices. Parks are required to obtain the necessary data or initiate studies to determine population trends, habitat conditions, appropriate harvest levels and seasons, participant levels, and harvest success. DO-77 also directs the parks to perpetuate native plant life as part of natural ecosystems.

Apostle Islands NL's 2011 General Management Plan and Wilderness Management Plan (GMP/WMP) divides the park into five management zones. The majority of the park is included within either the Backcountry or Primitive Zone. Within these zones, the park's goal for natural resources is to allow natural systems and natural processes to function with ecological integrity. Within the Frontcountry Zone, the goal for natural resources is to maintain as natural of a condition as possible while providing for visitor services and development. The primary goal within the Historic Zone is to protect cultural resources and within the Park Operation zone, the primary focus is to support management and operation of the park. Within Wilderness, the park's goal is to protect and preserve the area's natural and cultural resources and values, and the integrity of the wilderness character for present and future generations.

BRIEF DESCRIPTION OF APOSTLE ISLANDS NATIONAL LAKESHORE

Apostle Islands National Lakeshore, on the tip of the Bayfield Peninsula in northwestern Wisconsin, includes 21 islands in Lake Superior and a 12-mile narrow strip of mainland shoreline (see figure 1). The park encompasses 69,372 acres, of which 27,323 acres are submerged lands in Lake Superior; the park boundary extends a quarter mile from the shore of the mainland and from each island. The islands range in size from 3-acre Gull Island to 10,054-acre Stockton Island.

The park is at the continental northwestern limits of the hemlock-white pine-northern hardwood forest and also contains elements of the boreal forest. It is on or near the ecotones of several continental biomes. The park features a diverse collection of high quality coastal features, pristine stretches of sand beaches and coves, spectacular sea caves, remnant old growth forests, a diverse population of birds, mammals, amphibians, and fish, and the largest collection of lighthouses in the national park system. People have used the islands and nearby mainland for thousands of years. This area continues to be the traditional homeland for the Ojibwe or Chippewa people. During the historic period, people constructed residences and started farms, fishing operations, brownstone quarries, and logging camps on the islands. Several of these historic sites are listed on the National Register of Historic Places.

FACTORS INFLUENCING WILDLIFE POPULATIONS WITHIN THE APOSTLE ISLANDS

Island Biogeography

Island biogeography plays a large role in the distribution and abundance of wildlife populations within the park. During the end of the last glacial period (11,500 years before present), the islands were covered by Lake Superior. When the lake level dropped to 450 feet above sea level, around 9,500 years before present, the current archipelago was part of the mainland and the majority of terrestrial vertebrates and plant life became established. Currently, the archipelago includes 22 islands, 21 of which are in the park. The park also includes a 2,592 acre strip on the mainland – in essence, 22 discreet "patches."

Lake Superior acts as a large barrier, greatly influencing immigration and emigration. Species that are not active during the winter, such as raccoon, chipmunk, and skunk, tend not to occur on the park's islands. The only winter-inactive species that has colonized the islands is black bear. Distances from the mainland to various islands vary from as close as 1 mile to as far as 18 miles, with up to three mile gaps between islands. In addition to distance, the cold temperatures and strong currents of Lake Superior present challenges to inter-island movements. Most winters, many of the islands are accessible by ice. During exceptionally cold winters, all islands may be locked in by ice and during exceptionally warm winters, very few islands are accessible over ice.

In addition to geographic barriers that influence the demography of wildlife populations, island size can be a limiting factor for many species. Island size ranges from 3 acres to approximately

10,000 acres. Most of the islands fall in size between 100 and 500 acres (6, with 4 approx. 300 acres) and 1,000-2,000 acres (7). Two islands are less than 50 acres and two are between 500 and 1,000 acres. Only 4 are greater than 2,000 acres in size (Sand-2,949; Oak-5,078; Outer-8,000; and Stockton-10,054).

Belant et al. (2001) studied the biogeographic distribution of mammals among 20 islands within Apostle Islands National Lakeshore. He found island area to be strongly associated with the number of species present, but did not find a significant relationship between the number of species and distance to mainland or the number of species and distance to the nearest islands. Belant also found species-area relationships to be significant and larger islands to be colonized by species with greater body mass.

Historic Habitat Changes and Predicted Changes Due to Climate Change

The habitats available to wildlife in the park have undergone dramatic changes in the past 150 years and climate change is predicted to cause significant changes to habitat in the future. Natural processes such as fire and wind have affected the park's forests over time, as have human activities such as fishing, hunting, trapping, farming, quarrying, and logging. Of these, logging had by far the greatest impact: not only were forests removed, but fires followed harvesting, and intense deer browse began after the forests began to regenerate. In addition to deer, beaver numbers greatly increased, especially on Stockton and Outer Islands where nearly all drainages were dammed. The number of clearings, rare in the pre-logging era, dramatically increased, as did edge habitat. Although some logging continued into the early 1970's, the majority of logging occurred between the 1880's and 1920's. Prior to logging, 90% of the Apostle Islands were covered with northern hemlock hardwood forest, dominated by hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), and white birch (*Betula papyrifera*). As a result of logging, the abundance of hemlock and white pine was greatly reduced and forest dominance shifted to white birch, sugar and red maples, balsam fir, and aspen. Aspens are now in decline as are beaver, forest cover has increased, and the forests have matured. Although many of the forested areas within the park have been moving toward their pre-logging composition, some forest communities may take a very long time to recover (hundreds of years), if at all.

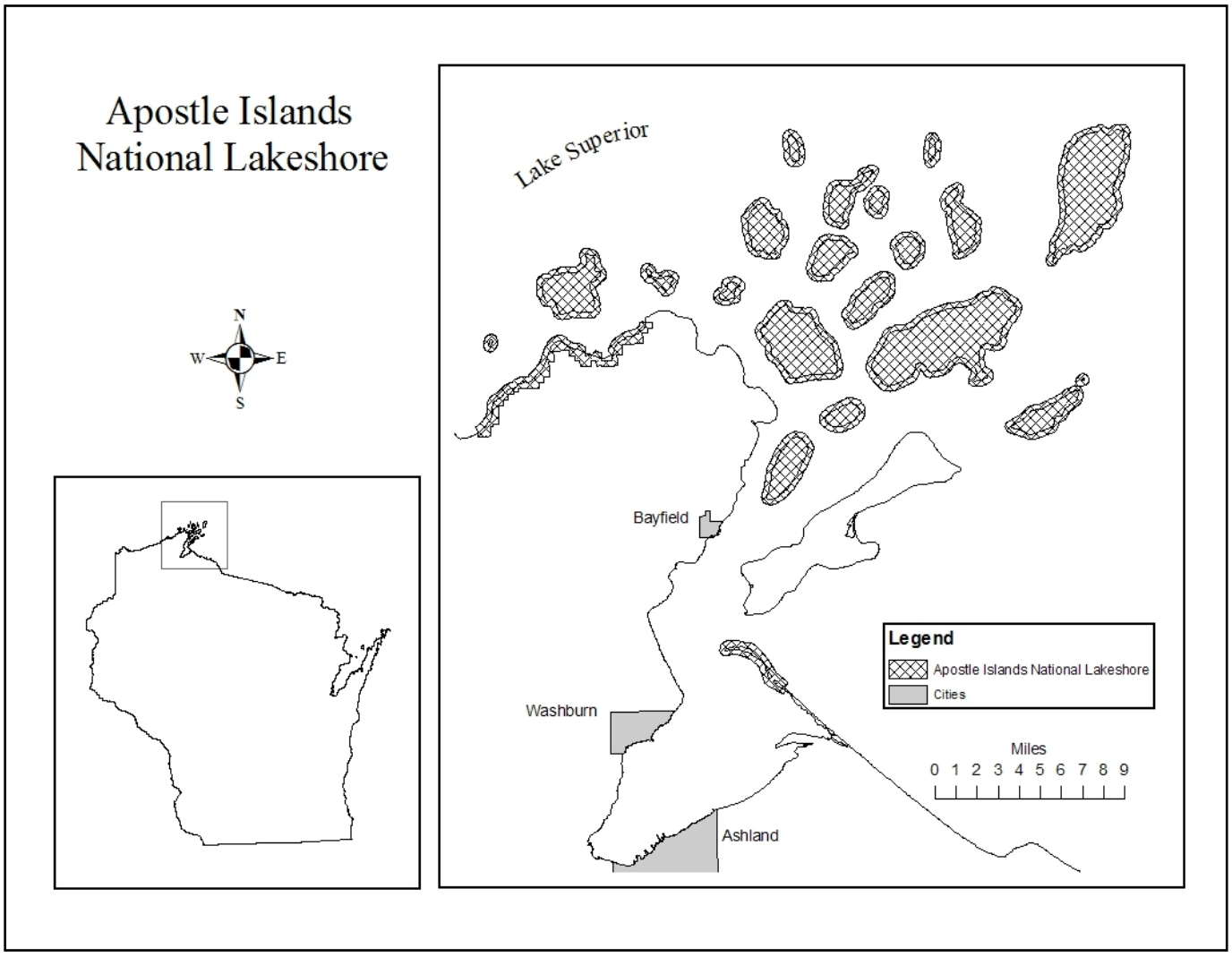
Climate change models predict a northward shift in forest habitats and increased stress on trees, including drought, wind, fires, and insects (Galatowitsch et al., 2009). Forests currently occupy 99% of park lands. The habitat for many important tree species in the park is predicted to greatly decrease, including those that were important in the park's pre-settlement forest (e.g., eastern hemlock, sugar maple, yellow birch and white birch). Mountain maple (*Acer spicatum*), a common small tree species in the park, is predicted to disappear. The park's forest habitat in the future may look very different, indeed, with species more commonly associated with central to southern Indiana. The abundance of small mammals, important prey species, is changing. Common southern small mammals, such as white-footed mouse, eastern chipmunks, and southern flying squirrels have already increased in the northern Great Lakes Region, while northern species (e.g., woodland deer mice, southern red-backed voles, woodland jumping mice, northern flying squirrels, least chipmunks) have decreased (Myers et al., 2009). Another

example of changing wildlife populations is the wild turkey, a species that historically didn't occur in far northern Wisconsin, but has moved northward and is now common on the mainland.

Mainland Populations

In addition to island biogeographic and habitat factors on the islands, the status of wildlife populations and associated habitat changes on the mainland can greatly influence whether or not various wildlife populations immigrate and potentially become established on the islands.

Figure 1. Apostle Islands National Lakeshore



OVERVIEW OF PARK WILDLIFE MANAGEMENT

For most species, the NPS has allowed hunting and trapping under standard State of Wisconsin regulations since the park was established in 1970. Because of the isolation of the islands and lack of sizeable wildlife populations, hunting and trapping pressure has tended to be very low. The 2007 Wildlife Management Plan for Harvestable Species primarily affected regulations regarding deer harvest, however, it also established a non-fee access permit for harvest of most species on islands within the park. The access permit enables the park to track harvest more accurately.

In addition to general ecological inventories that were done in the 1980's, the park has conducted recent population and browse surveys for deer. Inventories have been done for fisher and otter, however, updated information is needed. Baseline information is needed for fox, coyote, and snowshoe hare. An inventory for beaver was conducted in the late 1980's and periodic monitoring through aerial overflights has been done. Waterfowl hunting has also been conducted under standard State of Wisconsin regulations. The amount of hunting is believed to be very low. Migratory bird surveys were conducted on both Long and Outer Islands in 1990 and have been conducted periodically on Outer Island since that time. Although not specifically designed to monitor waterfowl, survey results provide baseline information on waterfowl at these locations.

There has been extensive research on the Stockton Island black bear population and recent research (Wilton et.al 2011) on the population status of black bears park-wide. From the park's establishment (1970) to 1987, the park was not specifically closed to bear hunting, however, no bear were known to have been taken. During the time period 1987-1994, a temporary closure as authorized by 36 CFR section 1.5(a)(1) prohibited bear hunting on Stockton Island (in consultation with the Wisconsin DNR) to prevent interference with black bear research. In 1994, Stockton Island was opened to bear hunting, consistent the State of Wisconsin hunting regulations. To date (2013), very little hunting has occurred and only one bear has been taken.

A special muzzleloader season for deer was established in 1985 by the NPS and the Wisconsin Department of Natural Resources (WDNR). Previous to this, deer hunting within the park was permitted consistent with current state regulations. State regulations were changed to limit hunting within Deer Management Unit 79 to an October muzzleloader hunt. From 1985 to 2003, the muzzle loading season was limited to Oak and Basswood Islands. Two two-week hunting periods (Oct. 1-15 and Oct. 16-31) were established with up to 25 permits issued for each period. In 2004, Sand Island was also opened to muzzle loading hunting. Up to 25 permits were made available for this hunt. Results of the muzzleloader hunt are shown below in Table 1. After completion of the park's 2007 Wildlife Management Plan, in coordination with the WDNR, regulations (NR 10.01(3)(e)3.b. and NR 10.01(3))(em)2.b) for islands within the park (previous DMU 79; does not include Long) were modified to provide for a wilderness hunting experience and encourage harvest to protect rare plant communities. Specifically, weapon type was limited to primitive weapons - archery or muzzleloader - and Apostle Islands specific tags were made available that allowed up to two tags per hunter to be issued. Hunters have the choice of using a statewide tag or an Apostle Islands specific tag. The Apostle Islands specific tags require that an antlerless deer be harvested before an antlered deer is harvested.

Sand and York are two islands that historically had very few, if any deer, even though they are very close to the mainland. That changed when these islands experienced a deer population explosion in the early 2000's (approx. 2000 on Sand and 2004 on York Island). This burgeoning deer population was causing extensive damage to a rare vegetation community dominated by an understory of Canada yew. Unfortunately, hunting pressure, even with the use of deer nuisance tags, was not adequate to control these populations. To protect this rare plant community, aggressive management control, consistent with the 2007 Wildlife Management Plan, was implemented on these two islands beginning in 2009. As of 2013, the deer population on Sand Island had been significantly reduced and potentially eliminated from York Island.

Lead poisoning is a continuing health concern for humans and wildlife. According to the University of Minnesota Raptor Center, 25-30 bald eagles are brought in with lead poisoning every year. The peak in lead poisoning is during and immediately following the deer gun hunting seasons in Minnesota and Wisconsin (Redig et. al 2009, Kallok 2013). Bald eagles scavenge on deer gut piles where they ingest enough lead to poison them. Because wildlife often die in remote areas where people do not find them, it is likely that many more are poisoned and not reported. Similarly, other scavengers that feed on deer gut piles may be poisoned. In a technical review of the effects on wildlife from lead poisoning by spent ammunition and fishing tackle, Rattner and others (2008) concluded that, while most studies have focused on avian species, all scavengers are at risk. More recently, Rogers and others (2009) documented 46% of grizzly bears sampled during the Montana elk/deer hunting season showed blood levels >10 *u*g/dL (twice the reference value set by the Centers for Disease Control and Prevention for human children) while none of the bears sampled prior to the hunting season showed evidence of lead exposure. That study is in progress and expected to provide data on lead exposure to wolves and coyotes. The official position of The Wildlife Society (TWS 2013), the leading professional organization of wildlife managers, is that "Ingestion [of lead] by reptiles, birds, and mammals of spent ammunition and lost fishing tackle has been documented and can cause a range of negative effects in individuals, potentially leading to population-level consequences in some species". This professional organization goes on to say that "Despite the prohibition on lead shot for waterfowl hunting, current data on raptors and avian scavengers indicate increases in lead exposure in these species, especially during hunting season. Accordingly, 24 states have instituted restrictions on the use of lead ammunition". Apostle Islands National Lakeshore requires that all federally-funded operations use lead-free ammunition. This restriction does not currently affect public hunting activities. However, Service-wide, the NPS is involved in numerous public education programs and is exploring lead-free policies in certain areas (for example, all NPS areas within the California condor range and at Grand Teton National Park). Apostle Islands will continue to explore options for educating the public on the use of lead-free ammunition.

Table 1. Muzzleloader Harvest Statistics

Year	Deer Taken Oak Island	Deer Taken Basswood Island	Deer Taken Sand Island	Total
1985	0	0	Not open	**0**
1986	0	0	Not open	**0**
1987	0	0	Not open	**0**
1988	1	0	Not open	**1**
1989	0	0	Not open	**0**
1990	2	1	Not open	**3**
1991	0	0	Not open	**0**
1992	1	0	Not open	**1**
1993	2	0	Not open	**2**
1994	3	2	Not open	**5**
1995	1	1	Not open	**2**
1996	1	0	Not open	**1**
1997	1	0	Not open	**1**
1998	4	1	Not open	**5**
1999	2	0	Not open	**2**
2000	9	1	Not open	**10**
2001	4	1	Not open	**5**
2002	2	1	Not open	**3**
2003	2	0	Not open	**2**
2004	0	0	3	**3**
2005	1	2	2	**5**
2006	3	0	4	**7**
2007	1	1	0	**2**
2008	0	0	12	**12**
2009	0	0	Not open	**0**
2010	0	0	1	**1**
2011	0	3	0	**3**
2012	0	2	0	**2**
2013	0	0	0	**0**

HARVESTABLE SPECIES MANAGEMENT

MANAGEMENT OBJECTIVES

General

- Provide both general public and treaty-related harvest opportunities.
- Utilize general public and treaty-related hunting to assist the park in meeting management goals.
- Ensure that hunting, trapping and gathering do not result in over-harvest of affected species.
- Obtain needed research and develop effective monitoring for individual species or groups.
- Develop trigger points that indicate a need for management action.

White-tailed Deer

- Keep populations at levels low enough to minimize impacts to forest composition, and which protect the exceedingly rare yew stands (and other elements of the understory) on islands that saw little to no browse in the past 100 years.

Black bear

- Maintain the natural distribution, density, age-class distribution and behavior of the park's bear population.

Wolves

- Maintain suitable habitat for established or dispersing wolves and wolf packs.
- Allow wolves to function in a natural role as predators of other park wildlife species.
- Recognize and respect the cultural significance of the wolf to the Ojibwe people in the territory ceded in 1842 and on the reservations in and adjacent to the park.

Furbearers, Small game, Wild Turkey and Waterfowl

- Maintain the natural distributions, densities, age-class distributions and behavior of the park's populations.

Rare, Threatened, Endangered or Extirpated species

- Protect species and their habitat and work toward their recovery.

MANAGEMENT ACTIONS - GENERAL

- The NPS will meet with the WDNR and the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) and other tribal representatives on an annual and as-needed basis to discuss current research, issues, and upcoming seasons.

- NPS will continue to work collaboratively with the WDNR and GLIFWC on all wildlife management issues. Whenever possible, the NPS will work with the WDNR utilizing the state's regulatory process to accomplish the goals of the Plan. If needed and appropriate, the NPS will use its authorities as a temporary measure to allow plan implementation until state regulations can be modified.

- Where appropriate, current state harvest regulations not in conflict with federal regulations will be adopted by the NPS.

- The NPS will work with the tribes through on-going agreements to achieve goals outlined in this plan.

- Target harvest levels will be determined considering both general public and treaty-related harvests. Allocation of harvest will be made in consultation with the WDNR and GLIFWC and other tribal representatives consistent with federal court decisions, other legal authorities, and NPS stewardship goals.

- Restrictions to protect resources and visitors include:
    - No hunting during peak visitor season (Memorial Day through Labor Day)
    - No hunting or trapping on Gull or Eagle Islands (protection of colonial bird nesting areas)
    - No baiting within the park (36 CFR §2,2 and §2.1) to prevent impacts associated with feeding of wildlife and the risk of introducing exotic species.
    - Other restrictions outlined in the Superintendent's Compendium and formal agreements between the NPS and Tribes.

- Should control of any wildlife populations be needed beyond that which can be accomplished with general public or treaty-related harvests, the NPS may employ more aggressive management actions such as direct reduction (by NPS or under contract or formal agreement).

- Limited gathering of edible fruits, berries, and mushrooms by the general public is permitted (36 CFR §2.1). Gathering must be done using traditional hand harvest methods and is limited to personal use and consumption. It also needs be done in a sustainable manner without harming the source plant species or substantially impacting the surrounding natural resources. Quantities under this plan which will be permitted for public gathering are limited to: one gallon per person per week for native fruits, berries, and mushrooms (not listed as nationally or state threatened or endangered species); and five gallons per person per week for apples.

- Exercise of treaty related rights, including hunting and trapping, as well as gathering of wild plants, is specifically addressed within the park's General Agreement with member tribes. Member tribes have specific treaty-related rights within the park and include The Bad River, Fond du Lac, Lac du Flambeau Band, Lac Vieux Desert, and Red Cliff Bands of Lake Superior Chippewa, St. Croix Chippewa Indians of Wisconsin, Lac Courte Oreilles and Mille Lacs Bands of Ojibwe, Sokaogon (Mole Lake) Chippewa Community, and Keweenaw Bay and Bay Mills Indian Communities. Coordination and consultation is primarily done through the Great Lakes Indian Fish and Wildlife Commission who represent member tribes, however, tribal chairmen are signatories to this agreement. The General Agreement has the following elements:
    - Tribal Off-Reservation Conservation Codes that incorporate the agreed-upon regulations governing tribal harvest activities within the Lakeshore;
    - Protocols for consultation on harvest management and regulatory issues that may arise from time to time as well as on biological and scientific issues related to the preservation and management of natural resources found in the park; and
    - Protocols for exchanging biological and harvest information for research and monitoring purposes as well as for determining annual harvestable surpluses and harvest limits for quota species.

  The General Agreement also includes specific information related to closed areas, park specific restrictions, coordination requirements, allowance for emergency harvest closures, license and permit requirements. Specific to gathering, tribal members must possess a tribal ceded territory gathering permit valid for Apostle Islands National Lakeshore with gathering limited to personal, family and community purposes.

MANAGEMENT ACTIONS – BY WILDLIFE SPECIES OR GROUP

White-tailed Deer

- Islands within the park (previous DMU 79; does not include Long) are divided into two zones with different management goals:

    - Zone 1 (11 islands; 36% of park's land acreage); islands that historically had few to no deer – Cat, Devils, Eagle, Gull, Ironwood, North Twin, Otter, Outer, Raspberry, Sand, York). The overall goal is to protect rare vegetation and native biological communities. Because the vegetation on these islands is exceptionally sensitive to deer browse, very few deer could cause long-term impacts. Therefore, the goal on these islands is to keep deer numbers as low as possible (e.g., few to no deer). NOTE: Gull and Eagle Islands are closed to hunting to protect colonial bird nesting areas.
    - Zone 2 (9 islands; historically had low to high deer populations – Basswood, Bear, Hermit, Manitou, Michigan, Oak, Rocky, South Twin, Stockton). The overall goal is to protect native biological communities; keep deer populations at or below estimated historic levels (approx. 10/mi^2) (Dahlberg and Guettinger 1956).

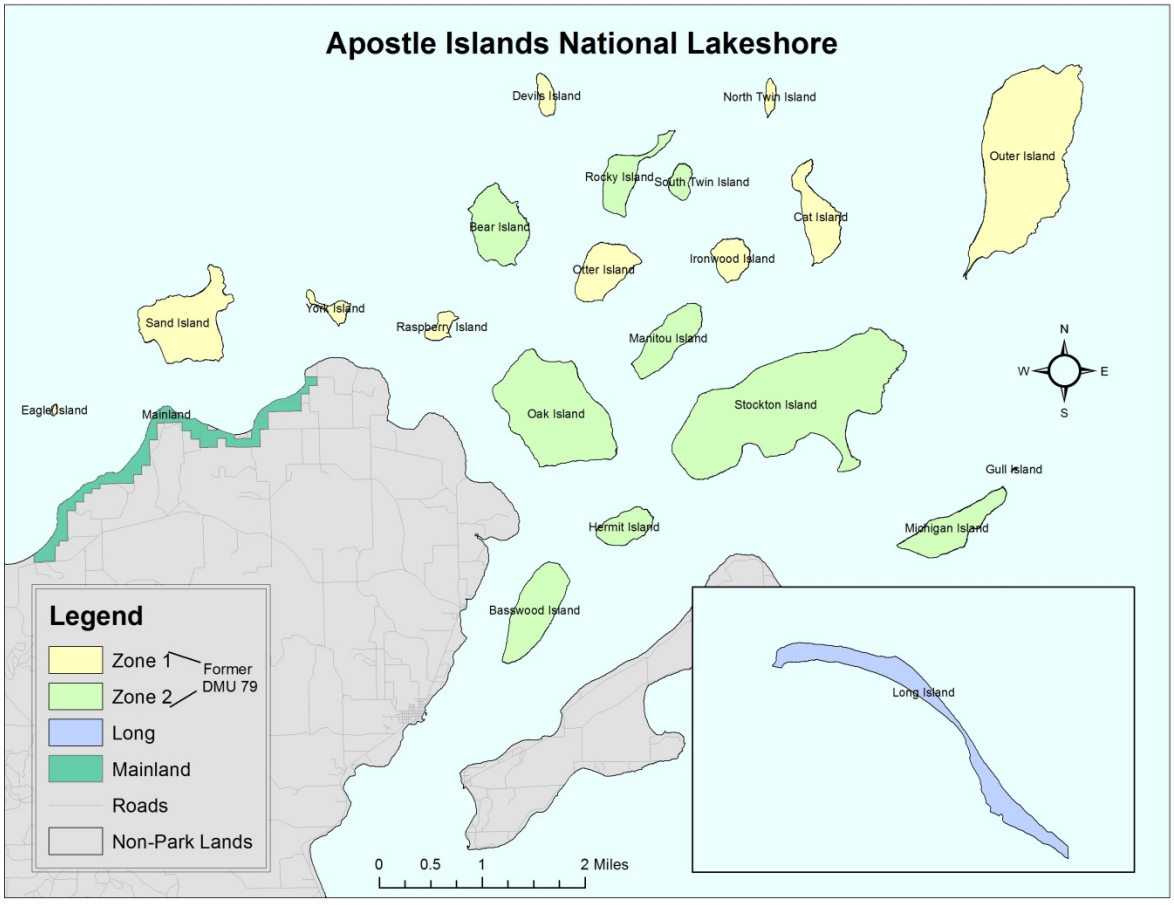
- There is a muzzleloader hunt during the month of October and an archery season that begins September 15 and closes September 30, reopening after the muzzleloader season and running from November 1 to the Sunday neared January 6.

- In May of 2008, state regulations (NR 10.01(3)(e)3.b) were amended to address the muzzleloader firearm season and archery season (NR 10.01(3)(em)2.b) on islands within the park (previous DMU 79; does not include Long). In addition to the regular season buck carcass tag, hunters can be issued Apostle Islands specific tags (2 per day) that allow the harvest of an antlerless deer prior to the harvest of an antlered deer.

- Long Island (previously in DMU 7) and the Mainland Unit (previously in DMU 3) are managed as part of larger management units. Where appropriate, current state harvest regulations not in conflict with federal regulations will be adopted by the NPS.

- Hunting is the preferred option for managing deer numbers within the park. However, if hunting is not adequate to meet management goals, management control (e.g., liberal seasons, agency or contracted herd reduction, etc.) will be used to prevent long-term impacts to other important natural resources. Although management control may be needed within Zone 1, the likelihood of needing management control on islands within Zone 2 is very low.

Figure 2. Deer Management Zones



Black Bear

- Bears within the park are managed as part of a larger state management zone (Zone D).
- Only primitive weapons (e.g., muzzleloader, bow, etc.) are allowed for hunting on islands within the park (except Long).
- Where appropriate, current state harvest regulations not in conflict with federal regulations will be adopted by the NPS.
- Park-specific access permit is required for all islands within the park.

Wolves

- A zero quota zone will be established for Sand Island, the Mainland Unit, and Long Island, including the portion of Lake Superior that is within the park boundary surrounding these areas, including winter ice. Until a zero quote zone is established by the State of Wisconsin, the NPS will exercise its legislative authority under 16 USC § 460w-4 to close these areas of the park to wolf harvest. This authority allows the NPS to close areas of the park as well as seasons to hunting and trapping for "public safety, administration, fish or wildlife management, or public use or enjoyment."
- Under current (2012/2013) state emergency regulations, only the westernmost 1/3 of the Mainland Unit is potentially open to harvest. If state regulations change to include islands within the park, with the exception of Sand and Long, other islands may be open to harvest, consistent with appropriate state regulations.
- Park-specific access permits are required for any wolf harvest activity within the park.

Furbearers

- Furbearers within the park will be managed consistent with appropriate state regulations as part of larger state management zones.
- Where appropriate, current state harvest regulations not in conflict with federal regulations will be adopted by the NPS.
- Park-specific access permit are required for islands within the park.

Small Game and Waterfowl

- Small game and waterfowl within the park will managed as part of larger state management zones.
- Where appropriate, current state harvest regulations not in conflict with federal regulations will be adopted by the NPS.

Wild Turkey

- Wild turkey will be managed as part of larger state management zones.
- Where appropriate, current state harvest regulations not in conflict with federal regulations will be adopted by the NPS.
- Park-specific access permits would be required for islands within the park.

BACKGROUND INFORMATION

GENERAL

Apostle Islands National Lakeshore (NL) is located along Northern Wisconsin's Lake Superior coast on and adjacent to the Bayfield Peninsula. It is within Bayfield and Ashland Counties. The park includes 69,372 acres (28,074 hectares), of which 27,232 acres (11,020 hectares) are submerged (park boundaries extend 0.25 miles from the shore of the mainland and from each island). There are 42,160 acres (17,061 hectares) of land area. The park includes 21 islands, ranging in size from 3 to 10,000 acres (1.2 to 4070 hectares) and a 12 mile (22.2 kilometer) segment along the mainland shore consisting of 2,565 acres (1043 hectares).

The local climate is moderated by the "maritime" situation of the islands; compared with the adjacent Bayfield Peninsula, winters are warmer, spring arrives later, summers are cooler, and fall lasts longer. The far northern islands, Devils, and Outer, have noticeably cooler climates than ones that are closer to the mainland. Prevailing storm winds blow from the northwest, north, and northeast, and winter storms from these quadrants are significant factors in determining island vegetation, especially in the northwestern and northern parts of the archipelago.

VEGETATION

Located in far northwestern Wisconsin, Apostle Islands National Lakeshore is at the continental northwestern limits of the hemlock-white pine-northern hardwood forest and also contains elements of the boreal forest. In pre-settlement times about 90% of the islands were covered by an upland mixed coniferous/hardwood forest dominated by hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), and white birch (*Betula papyrifera*). The park's current forests reflect complex disturbance histories. Forests within the park range from pristine old-growth forest without a history of deer browsing, to forests that have been subjected to logging, fires, and extensive deer browsing. Areas that escaped commercial logging include North Twin, Eagle, and Gull Islands and the lighthouse reservations on Outer, Sand, Devils and Raspberry Islands. In the case of Devils and Raspberry Islands, the reservations included the entire islands. The old-growth forest on Outer Island is one of the best examples of northern hardwood hemlock forest remaining in the upper Great Lakes (Judziewicz and Koch 1993). This stand is especially unique because it has not been affected by deer browsing. Most of the park's forests were logged, first for white and red pines (*Pinus resinosa*), white cedar (*Thuja occidentalis*) and hemlock (ca. 1870), and later for hardwoods, particularly sugar maple and yellow birch. Today, a maturing second growth northern hardwood forest exists throughout the islands. However, the effects of logging remain. Hemlock and white pine are no longer dominant; the most important tree species in the archipelago are white birch, sugar and red maples, balsam fir (*Abies balsamea*), and white cedar (Judziewicz and Koch 1993; Sanders and Grochowski 2012). The species composition of the boreal forest community was not changed due to logging. Today this community is dominated by white spruce, balsam fir, tamarack (*Larix laricina*), white cedar, birch, and aspen, as it was during pre-settlement times.

Following logging, deer populations irrupted on many of the islands, severely impacting species favored by deer, especially Canada yew (*Taxus canadensis*). However, several of the islands that did not have a history of deer populations or low population levels of deer retain lush stands of Canada yew − a species that has become nearly extirpated on the mainland due to deer browsing. Islands that historically had few to no deer based on current vegetation and aerial surveys conducted in the 1950's include: Devils, Eagle, Gull, North Twin, Outer, Raspberry, Sand and York Islands (Wisconsin Conservation Department 1946-1956). Cat, Otter and Ironwood had very low deer populations and retain a lush understory of Canada yew. Deer became established and began rapidly increasing on Sand in 2000 and York Island in 2004. Management actions have been successful in reducing deer populations on these islands, however, browse damage remains.

The importance of the unbrowsed vegetative communities on the Apostle Islands cannot be overstated. Conservation Biologist Dr. Don Waller (2005) states that "Unbrowsed vegetative communities in the Apostle Islands represent a unique resource with national and international significance. They provide a living baseline record for understanding the pervasive impacts deer are having elsewhere and an ongoing laboratory for comparative research. Deer populations have been chronically overabundant in the region for >20 years, as documented by the WDNR. Islands without deer, and those that have variable histories of deer occupation and use, provide a priceless 'living laboratory' for us to understand deer impacts. The Apostle Islands provide, in particular, a 'natural experiment' into the short- medium- and long-term impacts of deer browsing and thus a setting for evaluating the cascading effects of this 'keystone' herbivore. Landscapes like those in the Apostle Islands without deer have become vanishingly scarce elsewhere in the upper Midwest and, indeed, throughout North America. The only deer-free habitats we have in the region apart from the Apostle Islands are scattered fenced exclosures and perhaps the Indian reservations. This is robbing us not only of our ability to understand how deer affect plant communities, but also how deer have cascading impacts over time on animal communities and whole ecosystems. Impacts on birds and mammal populations, for example, are now well-documented, but we have only started to assess the full range and magnitude of deer impacts on other biotic components and ecosystem processes. In addition, the historical baseline of data from studies by Beals and Cottam in the Apostle Islands in the 1950's and 60's, the long-term monitoring of vegetation and deer browse by Sanders and Grochowski (2012), and Allison's long-term (1982-2000)(Allison 1990; 1987) research on Canada yew, provide an unparalleled opportunity to track long-term vegetation changes on landscapes with and without deer.

About one-third of the islands' coasts consist of Precambrian sandstone ledges and bluffs. Local vegetation on these rock faces depends on the microhabitat and can vary from common willows (*Salix* spp.*)* and weed species, to sub-arctic rarities and species with calcareous tendencies. Steep reddish clay bluffs are vegetated with small trees of balsam poplar, white birch, red maple and showy mountain ash (*Sorbus decora*) (Judziewicz and Koch 1993). The park has a rich assemblage of sandscapes, including sand spits, cuspate forelands, tombolos, a barrier spit (Long Island), and beaches. These are some of the most biologically diverse areas in the park. They are dominated by dune vegetation, beach grass (*Ammphila breviligulata*), and beach pea (*Lathyrus japonicus*), as well as a shrub and forest component of speckled alder (*Alnus rugosa*), quaking aspen (*Populus tremuloides*), and white birch.

Over 800 plant species occur within the park, including 26 species of concern. Because the Apostle Islands are at the extreme northern frontier of Wisconsin, they tend to provide plant habitats not found elsewhere in the state. Regionally rare habitats in the park include old-growth forest, boreal forest, northern forests (five types), forest seep, clay bluff communities, sandstone cliff communities, lagoon and bog communities, forested ridge and swale, coastal fen, Great Lakes barrens (only example in the state), and dune communities. The WDNR's Natural Heritage Inventory Program has designated four state natural areas within the park, including maritime forest, sandscape (includes beaches, sandspits, cuspate forelands, and tombolos), maritime cliff, and critical species areas.

Non-native vegetation in the park is primarily confined to disturbed landscapes, including old logging camps, farmsteads, fishing camps, light station grounds, and quarries. NPS developed areas, such as Presque Isle on Stockton Island, and developments on the Mainland Unit also contain non-native species. Sandscapes are vulnerable to invasion by non-native species, especially where native vegetation has been affected by human disturbance (NPS 1999).

There are a variety of native fruits and berries that occur within the park, including blueberries, raspberries, thimbleberries, wild cranberries and, at locations where trees were planted historically, apples. The park also has a variety of edible mushrooms. Limited gathering of edible fruits and berries and mushrooms by the general public is allowed within the park under 36 CFR §2.1. Tree species, such as balsam fir and white birch, are abundant within the park. Boughs from balsam fir, bark from paper birch, trees <3" in diameter, as well as a variety of other wild plants may be harvested by tribal members in the exercise of reserved tribal gathering rights according to agreements between the NPS and tribal governments.

RARE, THREATENED, ENDANGERED OR EXTIRPATED SPECIES

General

Apostle Islands National Lakeshore provides important habitat for federally and state listed species and is specifically directed through the Endangered Species Act (ESA) and National Park Service policy to protect these species and their habitats.

There are two federally and/or state-listed species found in and around the park. They include piping plover (*Charadrius melodus*)(federally and state endangered) and peregrine falcon (*Falco peregrinus*)(state endangered). In 2000, Canada lynx was listed as a threatened species in the contiguous 48 United States. The park falls within the potential southern range limit of the lynx (*Lynx canadensis*), however, no verified sightings have ever been recorded in the park. Lynx is a species of the boreal forest of which there is only a limited amount in the park. Additional information for lynx is provided below.

Long Island and the Michigan sandspit were designated as critical habitat for piping plover by the U.S. Fish and Wildlife Service in 2001. Long Island is the most important piping plover habitat in the park and to date (2013) has been the only successful nesting location within Wisconsin. Since 2006, piping plovers have successfully nested on Long Island. Nesting

success was sporadic between 1998 and 2005, and absent between 1983 and 1997. From 2006 to 2013, the number of successful nests has ranged from 3-5 and the number of successfully fledged chicks from 5-15. There has been rare, but occasional nesting on Outer Island. In 2006 a nest was found, but failed. In 2007, chicks were seen but the nest was not found. Since 2007, there has been plover monitors stationed on Long Island to keep track of plover nesting, provide information to visitors and make observations. Piping plover protection is a partnership effort between the National Park Service, Bad River Tribe, Wisconsin DNR, U.S. Fish and Wildlife Service, and The Nature Conservancy.

The Apostle Islands provide important habitat for spring and fall migratory peregrine falcons (*Falco peregrinus*). Peregrine falcons were taken off the federal list of endangered species in 1999, but remain a State listed endangered species. There is potential nesting habitat along the Mainland sea caves. Peregrines have occurred in this area during the nesting season, however, no nesting has been confirmed.

Apostle Islands National Lakeshore provides important habitat for five state endangered plants, 13 state threatened plants, and 20 state species of concern (see Table 4).

Caribou **(***Rangifer tarandus*)

The historic range of caribou included Wisconsin (International Mountain Caribou Committee 2006), however, their historic status in the park or the Bayfield Peninsula is unknown. The closest population of caribou is in the Slate Islands of Ontario. In 1990, the WDNR conducted a study to determine the feasibility of reintroducing caribou, moose and elk to the state. Elk were the only species found to be feasible for a reintroduction effort (WDNR 2006).

Moose *(Alces alces)*

Historically, moose were widely distributed in Wisconsin, but were never very abundant. There are specific historic records of moose in Chequamegon Bay and the Bayfield Peninsula dating back to the 1600's. By 1900, moose were virtually gone and were officially declared extirpated in 1921. In the 1960's, moose began to enter the state from Minnesota (Brander and Bailey 1983). Although uncommon and a state protected species, moose are occasionally seen in Bayfield and Ashland Counties. Wisconsin has not reintroduced moose, however, animals have wandered into the state from the reintroduced population in the Upper Peninsula of Michigan and the native population in Minnesota (WDNR 2012). Remains of a moose were found on the Stockton Island tombolo in 1995. The location was far enough inland to preclude the possibility of a carcass being washed ashore from another location (NPS 2012a). In 2002, a moose was observed on Long Island (Doolittle, pers. comm.).

Lynx **(***Lynx canadensis*)

Although Canada lynx were part of the pre- settlement fauna of northern Wisconsin, they have never been common. At one time, a breeding population may have existed, but declined as trappers caught lynx for the fur trade and its northern forest habitat was destroyed through

logging and settlement. Lynx were also subjected to bounty hunting. Beginning in 1865 and continuing until 1957, the state-financed bounty encouraged the killing of lynx, even though it is thought that lynx no longer bred in the state by the early 1900s.

Lynx are a federally threatened species. They were removed from Wisconsin's list of endangered and threatened species and are currently (2013) listed as a protected species. The park does not have any current or historic observations. However, sightings have been recorded in both Ashland and Bayfield Counties (WDNR 2005). Douglas County, adjacent to Bayfield County, had the highest number of observations of any county in the state (20) during this time period.

WILDLIFE

General

Thirty-seven species of mammals are known to occur in the park. Large mammals are not common on most of the islands and tend to be transient. Mammals that are common to most islands include red squirrel, snowshoe hare, deer mouse, and redback vole. Other species, such as black bear and white-tailed deer, are locally common on certain islands. Mammal species found on the islands less frequently include fox, coyote, bobcat, otter, and fisher. Some common mainland species that are less mobile or dormant in the winter (e.g., gray squirrel, least chipmunk, porcupine, skunk, and possibly some species of amphibians and reptiles) tend not to be present on the islands. However, Long Island, currently a barrier spit rather than an island, contains most species that occur on the mainland.

Due to its strategic geographic location and wide diversity of habitats, Apostle Islands National Lakeshore provides a refuge for birds. Through the park's long-term monitoring program for forest breeding birds, 150 species of birds have been recorded (NPS 2012d). The islands provide important habitats for resident breeding birds as well as neotropical migrant land birds (birds that migrate to Central and South America in winter). Over 89% of the breeding birds in the park are migrants, 59% of which are neotropical migrants. The Apostle Islands are an important migratory flyway stopover in the Great Lakes region. Nearly all of the islands provide habitat for migrating birds. In particular, Outer and Long Islands provide key habitats for migratory birds: Outer Island is important for passerines, hawks and falcons, while Long Island is important for waterfowl, passerines and shorebirds. Migratory bird surveys conducted on Outer and Long Islands have recorded over 200 species (NPS 2012c). The park provides important nesting habitat for the following colonial nesting birds: herring gulls, double-crested cormorants, great blue herons, and cliff swallows. Gull and Eagle Islands combined have 88% of the park's breeding herring gull populations and approximately 80% of the herring gull breeding population on the entire Wisconsin shore of Lake Superior. Eagle Island has the only great blue heron rookery in the park. The park also provides nesting habitat for bald eagles and piping plover (federally and state endangered)(see Rare, Threatened, Endangered or Extirpated Species).

Six species of salamanders, ten species of frogs and toads, and six species of reptiles are known to occur within the park, including the islands. The most common species of salamander are blue-spotted, spotted, and eastern red-backed. Four-toed salamander and Central newt are regionally uncommon, and mudpuppies are regionally local. Frogs and toads that occur in the park and are regionally common include: eastern American toad, northern spring peeper, eastern gray tree frog, green frog, northern leopard frog, mink frog, and wood frog. Chorus frogs are regionally local, Cope's gray treefrogs are regionally rare, and American bullfrogs are regionally uncommon. The park has a rather depauperate turtle fauna, with only two species, painted and snapping turtles. The most abundant snakes in the park are eastern garter snakes. Other snake species that are present include northern red-bellied snake, northern ring-necked snake, and smooth green snake (Casper 2001a and 2001b).

White-tailed Deer (*Odocoileus virginianus*)

White-tailed deer are native to the Lake Superior region, but their abundance has increased considerably over time. Prior to 1800, deer populations in northwestern Wisconsin were the lowest in the state (<3.9/km^2 or 10/mi^2; Dahlberg and Guettinger 1956) and the northern Great Lakes region was covered in old-growth coniferous forest with occasional openings or early-successional habitats as a result of fire (Christensen 1959). This habitat type was ideal for caribou, and to a lesser extent, moose, but is considered very poor habitat for white-tailed deer. Historic accounts indicate that deer were scarce in northwestern Wisconsin prior to European settlement (Lapham 1846). In Lapham's 1859 account of the Penokee Iron Range, he speaks of "the ground surface north of the Merangowin branch becoming covered with ground hemlock (Canada yew), whose low, entangled branches will be very apt to bring you prostrate to the ground" (Schorger 1970). Canada yew is near extirpation on the mainland due, in large part, deer browsing (yew is highly preferred browse). On the archipelago, it remains abundant and widespread (Judziewicz and Koch 1993; Anderson and Stowell 1985), especially on those islands that have not had historic deer populations. According to Beals (1960)"The data indicate that the lightest deer pressure on these islands will result in some vegetational change…This combination of high palatability and low resistance to browsing makes it [yew] an inefficient deer food, and it is probable that under the vegetational conditions existing on the Apostle Islands (and very likely throughout most of the northern lake states) deer and yew are incompatible." This was reconfirmed by Allison (2006), who states that, "The preference of deer for Canada yew is so great, that deer will browse this species until it becomes rare". Prior to European settlement, deer were probably very rare and quite possibly absent from most of the Apostle Islands.

Extensive logging in the late nineteenth century dramatically altered the northern Wisconsin ecosystem. The opened and regenerating forests were ideal for deer and their populations exploded throughout the Lake Superior region. The expanding deer populations on the mainland quickly colonized some of the islands nearest to shore (deer are very capable swimmers). A biologist visited 7 of the islands in 1919 and did not see any sign of deer (although local residents did report deer presence on some of the islands). A State of Wisconsin deer biologist visited Stockton Island in 1937-38 and found very light populations of deer. The biologist noted that young white cedar, mountain ash, and eastern hemlock were found in abundance on the island, along with some extremely dense stands of yew. By 1946, a survey of Stockton Island

found deer to be "abundant." He also noted that deer had first colonized Rocky Island in that same year and that the island had a dense cover of yew. By 1954, a State of Wisconsin biologist reported that Rocky Island had "the fastest buildup of a deer population and the fastest degeneration of a habitat I've seen." Deer browsing caused considerable damage to native vegetation in the 1950's, particularly to stands of Canada yew that had hitherto experienced little or no deer browsing. At about the same time the State of Wisconsin established liberal either-sex hunting quotas especially for the islands. The hunting, along with overbrowsed and deteriorating habitat, severe winters, and starvation, resulted in the overall reduction of deer populations on the islands. In spite of these efforts, significant damage had occurred to the vegetation of some islands (Beals et al. 1960, Beals and Cottam 1967). Over 50 years later, Canada yew has only minimally recovered on islands heavily impacted by deer browse. Full recovery may take nearly a hundred years (Allison 2006). (Unless otherwise noted, the preceding information comes from Brander and Bailey 1983).

An overflight that was conducted during late winter in 1954, when harvest levels were at their peak, did not find deer on Devils, Eagle, Gull, North Twin, Outer, Raspberry, Sand, and York Islands (Wisconsin Conservation Department 1955). Deer were found at various concentrations on the other islands. Table 2 includes harvest records from 1953 to 1964. Harvest records weren't kept prior to 1953, only total harvest for the islands was recorded from 1964-1971, and records stopped being kept after 1972, until a muzzleloader season began in 1985.

Currently, island deer populations are known to occur on Sand, Oak, and Basswood Islands. Islands that did not have a historic population and currently (2013) do not have populations of deer include: Devils, Eagle, Gull, North Twin, Outer, Raspberry, and York Islands. In 1954, when harvest levels were at their peak, Sand and York Islands did not have deer based on aerial surveys (WDNR 1946-1956). The absence of deer allowed Canada yew, a very rare plant on the mainland, to thrive in these locations. Deer were seen occasionally on Sand Island by summer residents; however, it wasn't until 2000 that deer were found to have become established as an overwintering population. An aerial overflight conducted in February of 2001 (Doolittle 2001) revealed overwintering deer. By February of 2003, another overflight (Doolittle 2003) found increased deer sign on Sand Island with tracks being more abundant on Sand than Oak Island. Overflights conducted in March of 2004 and 2005 continued to find abundant deer sign on Sand Island. On York Island, sign of overwintering deer was observed for the first time in 2005 (Doolittle 2005). The deer populations on both Sand and York Islands rapidly increased and with it, severe impacts on rare plant communities dominated by Canada yew.

Browse surveys and pellet counts have been conducted on Sand Island since 2003 and on York Island since 2005. By 2006, impacts to Canada yew were becoming severe, with browse being recorded in nearly every plot (97% and 99%). To protect this rare plant community, aggressive management control began in 2009 and has successfully reduced the deer population on these two islands.

Obtaining an accurate estimate of deer abundance has been very difficult. Pellet surveys provide information on relative change, but population estimates vary too greatly to be useful.
The population probably peaked on Sand and York Islands in 2009 and 2010. If you assume that culling resulted in the removal of 1/3 of the deer population on Sand Island (2,949 acres), the

estimated population in 2009 would have been over 150 (32 deer/mi2). On York Island (321 acres), if you assume that culling resulted in the removal of 50% of the deer population, the estimated population in 2009 would have been 40 (85 deer/mi2). From 2010-2012, the University of Wisconsin conducted a population study on Sand Island using remote activated cameras and a mark-recapture technique to estimate the deer population (Bartnick 2013). After the first year, York Island was dropped from the study due to low deer numbers. On Sand Island, the population estimate was 63 in 2010; 29 in 2011 and 11 in 2012. As of the summer of 2012, no deer sign was found on York Island, in spite of intensive camera monitoring.

Oak and Basswood Islands have had a population of deer since at least the late 1950's (Stowell 1984). In February 2001, an aerial survey conducted by the Bad River Wildlife Biologist (Doolittle 2001) found extensive trail sign on Oak Island. No deer and little trail sign were seen on Basswood Island. During an overflight conducted in February of 2003 (Doolittle 2003), trail sign was much more extensive on Oak than Basswood Island. During the first 2003 survey, all islands were surveyed; no sign was found on any island other than Sand, Basswood and Oak. In March of 2004 and 2005 aerial surveys continued to find a moderate amount of deer sign on Oak and very minimal sign on Basswood (Doolittle 2004 and 2005).

A browse survey was conducted on Oak Island in 2001by a Northland College class (Meeker 2001). The survey focused on browse impacts to eastern hemlock (*Tsuga Canadensis*) and sugar maple (*Acer saccarum*). Of the hemlocks sampled, 60% had been browsed; 24% had moderate to high levels of browse. Sugar maple browse was 20%. Smith (2007) conducted browse and pellet surveys on Basswood, Oak, Sand and York Islands. Based on these results, Basswood and Oak Island had low population densities. Sugar maple was the most abundant woody browse species on Basswood and Oak Islands and had browse levels of 24% and 11% respectively. The most heavily browsed species on Basswood in 2006 was white cedar (*Thuja occidentalis*)(69%) and mountain maple (*Acer spicatum*)(48%). On Oak Island, the most heavily browsed species were bigtooth aspen (*Populus grandidentata*)(38%) and eastern hemlock (27%).

The Mainland Unit of the park contains a small portion of the Sand River deer-yard, one of several along the Lake Superior coast of Wisconsin. This area has large white cedars with an understory of heavily browsed beaked hazelnut and mountain maple; Canada yew is rare. An early 1980 estimate of deer density in the Sand River deer-yard ranged from 147/km^2 in white cedar to 0/km^2 in balsam fir cover-types. Current (2012) observations are that the deer-yard is patchy in nature, and these patches represent areas of heavy use. Heavy use areas are typically under cedar trees. In addition, there is very apparent browse on mountain maple and little to no regeneration of white cedar or balsam fir.

Table 2. Harvest of White-tailed Deer on the Apostle Islands (1954-1971) (Brander and Bailey 1983)

Year	Rocky	Manitou	Hermit	Bear	Basswood	Stockton	Ironwood	Otter	Michigan	Cat	Oak	Totals
1953	5	0	2	7	4	42	0	1	3	0	6	**70**
1954	124	43	22	40	28	131	5	7	1	0	9	**411**
1955	58	38	13	39	13	74	1	7	0	0	10	**254**
1956	45	8	10	28	26	50	8	8	5	0	11	**209**
1957	6	12	11	31	16	12	6	8	0	0	6	**121**
1958	22	13	2	26	10	2	4	6	1	2	5	**95**
1959	8	18	5	8	8	2	1	0	1	1	1	**54**
1960	5	37	15	20	12	24	4	6	6	3	6	**138**
1961	7	13	0	9	13	10	7	14	0	0	17	**90**
1962	11	2	3	12	17	11	3	10	4	5	15	**93**
1963	15	0	3	6	11	4	5	12	8	9	7	**80**
1964	9	0	7	9	16	10	0	6	13	10	1	**81**
1965	Records Not Kept for Individual Islands											**144**
1966												**45**
1967												**32**
1968												**55**
1969												**18**
1970												**10**
1971												**9**
TOTALS	**315**	**184**	**93**	**235**	**174**	**372**	**44**	**85**	**42**	**30**	**94**	**2009**
Density of harvested animals/mi^2 at Peak Population Level	**72.09**	**20.19**	**19.30**	**14.04**	**9.0**	**8.34**	**6.80**	**6.73**	**5.26**	**4.76**	**2.14**	**6.22**

Black Bear (*Ursus americanus*)

Black bear were part of the pre-settlement fauna. However, habitat changes resulting from logging have undoubtedly affected their populations. Martin Kane, a resident of Oak Island during the 1920s to 1940s, is reported to have hunted black bears on Oak Island (Ashland Daily Press 1946).

Black bears, including cubs, have been seen on Stockton Island since 1980. Monitoring of the black bear population on Stockton Island began in 1984, when a 7-year-old sow and 6-year-old boar on the island were radio-tagged by Anderson and his students (Trauba 1996). Overwintering and on-island reproduction were probably occurring by 1980. Research on the Stockton Island bear population was conducted from 1984-1994. Two master's theses projects were completed. Trauba (1996) studied black bear population dynamics, home range, and habitat use on Stockton Island and Fleming (1997) conducted a demographic comparison of a hunted and an unhunted population of black bears in northern Wisconsin (including Stockton Island). Trauba's fieldwork was conducted from 1987-1990 and Fleming's from 1992-1994. The bear population on Stockton Island grew from a population of 3 animals in 1984 to a peak of 31 in 1994 and then declined to approximately 25 in 1996 (Fleming 1997). Bears from the Stockton Island population were found to regularly den on nearby islands, such as Oak, Hermit, and Basswood. However, it appeared that they rarely stayed past the denning season, returning to Stockton Island.

Results of Fleming's (1997) research indicate that bears on Stockton Island in comparison with a mainland population had significantly smaller home ranges, older age of first breeding, and were lighter in weight than those in the mainland population. Four instances of skipped breeding cycles were documented in the Stockton Island population after 1992; no females missed a breeding cycle in the mainland population. Both study areas had similar mortality rates for yearling and sub-adult bears, but the causes differed. All mortality in the Stockton Island population was due to cannibalism (n=10), whereas mortality in the mainland population was primarily due to hunting (hunting n=10; cannibalism n=1). Both Fleming (1997) and Trauba (1996) conclude that social interactions and intra-specific killings may be regulating the black bear population in a density-dependent fashion.

The black bear population in the park is currently concentrated on Stockton, Sand, and Oak Islands, and the Mainland Unit. Transient bears can occur on nearly any island and have been observed on 14 of the 21 islands.

Belant et al (2005) conducted a study to determine the population status of black bears within the park and to determine whether or not the use of DNA analysis of bear hair is a feasible method for monitoring the park's bear population. In 2002, hair snares were used on Stockton and Sand Islands. Hair from problem bears that were removed from Oak Island was also tested. Results of analysis found that there were 26 (1.7/mi^2) bears on Stockton, nearly the same as Fleming's 1996 estimate of 25 bears (1997). Six bears were identified on Sand Island (1.3/mi^2) during the recent study. Analysis also found that there is a high degree of genetic variability, with the genetic variability being

highest at Sand, intermediate at Oak, and lowest on Stockton and that islands within the park contain small high density black bear populations that are genetically distinct and apparently influenced by immigration from the mainland population.

In 2010, the park's bear population was studied, repeating the methods used by Belant (2005) and expanding the study to include obtaining a population estimate for Oak Island and sampling islands with transient bears (Wilton et. al 2011) . A significant change in the bear population was found since the previous survey (2002). The Stockton bear population estimates greatly declined, from 26 (0.64/km2) bears in 2002 to 13 (0.32/km2) in 2010. In addition, the observed sex ratio changed from 1:1 to 1M:0F – no female bears were sampled. There was a shift in the other direction on Sand Island, with the population estimate increasing from 6 (2002) to a very dense population of 10 (0.84 bears/km2) . The earlier study did not obtain a population estimate from Oak Island. During the 2010 study, Oak Island had the highest population with 18 individuals and the highest density (0.88 bears/km2). Fourteen of the eighteen bears were found to be related (1 father, 3 mothers, 10 offspring). This is the highest reported in Wisconsin (Kohn 1982, Storlid 1995, Fleming 1997, Belant et al. 2005) and among the highest reported in North America (Garshelis 1994), however, it is important to keep in mind that this is a small island population.

In addition to islands with a known bear population, islands that had bear presence were sampled, including Basswood, Hermit, Manitou, and Michigan Island. These islands were not sampled intensely enough to obtain a population estimate, however, the minimum number of bears on these islands were 3 on Basswood, 4 on Hermit, 1 on Manitou, and 2 on Michigan Island.

In addition to population estimates and additional insight on genetic composition and parentage, this study revealed a fascinating story. A female that had Sand Island ancestry was captured (hair) on Basswood Island, mated with a bear with Oak Island ancestry and deposited two young on Hermit Island. Such wandering individuals may be the only way that this meta-population can be sustained (Paetkau 2011).

Wolf **(***Canis lupus***)**

Wolves occurred throughout Wisconsin prior to European settlement. Although estimates vary, the statewide estimate is believed to have been between 3,000-5,000 (Wydevan 1993; Jackson 1961). It is not known whether or not wolf packs were ever established or the extent to which they utilized the park. There was a state bounty program from 1865 to 1957 (Thiel 1993) that resulted in the extirpation of gray wolves in Wisconsin by the late 1950's. A combination of factors, including the elimination of the bounty program in Wisconsin, Michigan, and Minnesota, as well as protection under the Endangered Species Act, allowed wolves to recolonize Wisconsin in the mid 1970's (Wydeven et al. 1995). In 1975, the gray wolf was listed as a state endangered species and formal population monitoring began in 1979. In 1999, wolves were reclassified as a state threatened species and in 2004, the gray

wolf was removed from the state list of threatened and endangered species, and was listed as a protected wild animal.

The U.S. Fish and Wildlife Service (FWS) listed the eastern gray wolf as an endangered species in 1974 under the 1973 Endangered Species Act (FWS 2006). In 1978, wolves were reclassified as threatened in Minnesota, but remained as an endangered species in Wisconsin and Michigan until they were downlisted to threatened in 2003. Because population goals for Wisconsin and Michigan were exceeded, the U.S. Fish and Wildlife Service began the delisting process during the summer of 2004. However, the Great Lakes population of wolves was not officially delisted until January 27, 2012. They are now considered a game animal in the State of Wisconsin. Interim regulations were developed by the WDNR and the first harvest season began in October of 2012. Under the interim regulations, reservations, including Red Cliff and Bad River, are part of a zero quota zone as requested by Tribal Chairmen of these and other Tribes. In addition to the zero quota zone, Tribes requested a zero quota within a six mile buffer zone around reservations, however, this was not included within the interim state regulations. This request was based wolf research that found wolves whose territory was primarily within the Bad River Reservation wandered up to six miles from the reservation boundary (Doolittle 2001).

On the Bad River and Red Cliff Reservations, wolves are a Tribally Protected Species (Hill 2013). According to Hill (2013), the "Anishinaabe share an integral bond with Ma'iingan (wolf); Ma'iingan is the brother and companion of the Anishinaabe as gifted by the creator." A "reservation wolf" is defined as a wolf or pack that part of its home range is found within the exterior boundaries of the reservation (Hill 2013).

Wolves play an important ecosystem role as a top level predator and can assist in keeping the park's deer population in check. There have been an increased amount of wolf sightings and sign in the Mainland Unit of the park, especially from Sand Point to Meyers Road. These wolves are most likely part of the Echo Valley pack that utilize both the Red Cliff Reservation and park. Because the Mainland Unit is either within or adjacent to the Red Cliff Reservation, all wolves within the Mainland Unit would be considered "reservation wolves". The Mainland Unit is a narrow coastal strip, ranging from ¼ to ½ mile wide. Wolf tracks were also seen during a track survey on Sand Island in March of 2004. More recently, wolves were seen crossing the ice to Sand Island in 2009 during late winter (Naas 2009). In 2009, in addition to tracks, two wolves were seen by park staff and a wildlife camera caught an image of a wolf during the fall. It appears, however, that they were transient on Sand Island as there has not been recent sign. Most of the islands are too small to support a resident wolf population and the largest islands lack deer, an important prey species. As a result, wolves will probably remain a transient visitor to the islands.

Furbearers

The enabling legislation of Apostle Islands National Lakeshore allows for trapping and hunting of furbearers. Currently, trapping is allowed under State of Wisconsin regulations that have been adopted by the NPS. Inventories have been conducted for fisher, otter and beaver and monitoring using aerial surveys is conducted for beaver on a periodic basis. Furbearer populations within the park tend to be small and somewhat transient. Most of the islands are too small to accommodate typical home ranges and tend to have low prey bases. Island biogeography also plays a role, creating impediments to colonization and movement. Because of these unique factors, techniques used by the state to monitor furbearer populations are not applicable to the park's furbearer population. This, in combination with logistical challenges, makes monitoring these populations extremely challenging. Furbearers in need of baseline inventory data include: bobcat, mink, muskrat, red fox, and coyote. Additional population information is needed for fisher, otter and beaver.

Bobcat *(Lynx rufus)*

Both the bobcat and lynx were in the pre-settlement fauna of northern Wisconsin. It is not known if either cat was common on the Apostle Islands, if there was sufficient food to support a population, or if Lake Superior was a barrier preventing their movement to the islands (Jackson 1961). An inventory of bobcat is needed. On Bear Island, the seasonal residents of a leased cabin reported historic sightings of bobcat and an observation of a bobcat was made on Sand Island in 1980 (Anderson et al. 1982) and by park volunteers in 1997. Under the 2007 Wildlife Management Plan, bobcat were included within the section on rare species, since there were no recent sightings on the islands. However, because harvest pressure was low to non-existent in the park, bobcat were covered under state regulations under the 2007 plan. Since then, they have been documented on Long Island and, through trail cameras, on both Sand and York Islands. Although probably not abundant, current information indicates that they are not rare.

Beaver (*Castor canadensis*)

Beaver were, most likely, not very abundant on the Apostle Islands prior to 1850, since the islands were dominated by old-growth forests of white pine, hemlock and hardwoods. Surveyors conducting the original land survey on the islands from 1852-1957 made no mention of beaver ponds (Brander and Bailey 1983). In addition, archeological investigations did not indicate historic occurrences of beaver within the park (Richner 1980). After intensive logging subsided in the 1930's and abundant forage became available in the 1940's and 1950's, beaver intensively colonized the Apostle Islands (Smith 1994). Overall beaver numbers in the park peaked in the late 1970's and then began to decline (Anderson et al., 1979; Anderson et al., 1980; Smith and Peterson, 1991).

From 1987-1989, an intensive study of beavers was conducted (Smith and Peterson 1991). In 1987, there were 38 active beaver colonies in the park, 23 on Outer, 13 on Stockton, and one each on Cat and Sand Islands. Smith and Peterson found the ecology of the beaver

population in the park to be characterized by: low fecundity; poor food resources; seasonally variable water levels; lodge site instability; and probable bear predation on Stockton Island. In addition to Outer and Stockton, beaver periodically colonize other islands, but their population tends to be transitory and limited to one colony. Other islands where beaver have occurred include: Basswood, Cat, Devils, Long, Michigan, Oak, and Sand.

On Outer Island, beaver population levels were stable during the study (23 in 1987; 24 in 1989). Beaver were foraging long distances, which was possible due to a lack of predators. In 1992, the number of colonies increased to 30, a five year high. Since 1992, however, beaver colonies have sharply declined to only 4 in 1999 and 3 in 2003 (Doolittle 2003).

No active colonies have been observed during aerial overflights on Stockton Island since 1994. However, there is an occasional sighting of beaver on the island. The extirpation of beaver on Stockton Island has been attributed to black bear (*Ursus americanus*) predation and habitat loss. The probable predation of beaver by bear was noted again on Outer Island in 2000, when bear scat (comprised dominantly of beaver hair) was collected by Doolittle (2003) at interior beaver ponds. On both islands, there appears to be a direct correlation between bear predation and a dramatic decline in beaver colonies. In addition, since Stockton Island has not been re-colonized with beaver since 1994, bear may be deterring re-colonization. There are currently active colonies on Outer, Sand and Michigan Islands.

Otter (*Lutra canadensis*)

Prior to 1850, otter were common in the region and were exploited for their fur prior to the exploitation of beaver (Schorger 1970). Otter were first recorded on Oak, Stockton, and Outer Islands as early as 1919 (Jackson 1961). Recent unconfirmed records occur from 13 of the 22 Apostle Islands (NPS 2012a). A study to determine the status and distribution of otter was conducted from 2000-2003 (Doolittle 2003). In the winters of 2000 through 2003, aerial slide and track surveys were done throughout the Apostle Islands National Lakeshore to detect the presence of otter. In 2000-2003, otter sign was observed on Outer, Stockton, and Sand Islands. Otter sign was also observed on Michigan Island at a new beaver colony in 2002 and 2003. Aerial surveys were also helpful in showing the relative distribution of otter from its potential mainland source. During the December 25, 2003 aerial survey, otter slide sign was observed throughout the entire Bad River Reservation open water habitats, through the tip of Long Island, to Madeline Island's most northern extent, and into every other Apostle Island that had large lagoons and interior open water bodies (Sand, Outer, Stockton, Michigan).

The occurrence of otter sign and abundance was related to beaver ponds on Sand, Outer, and Michigan Islands. In all years, islands without interior open water bodies did not have any observed otter slide sign from the air. On Stockton Island, otter sign was observed on old beaver flowages and the tombolo lagoon. Similarly, the Outer and Michigan Island lagoons had otter sign. On Outer Island, open water has declined 39% since 1992. In 1992 and 2003, there were 209 (114.9 acres) and 139 (69.8 acres) open water bodies, respectively, on Outer Island. The decline of open water was determined from delineations made from 1992 digital

ortho-photographs, compared to a set of aerial photographs flown on April 4, 2003. The noted decrease in open water through the 2003 aerial photographs parallels the decrease in active beaver colonies on Outer Island (see above). Aerial surveys conducted in 2005 found very little sign of beaver on Outer Island and no sign on Stockton or Michigan Islands. Sand Island continued to have one active beaver flowage (Doolittle 2005).

Based on mean otter home ranges in the Bad River Reservation (6 km^2), Outer Island (8,000 acres, 32.4 km^2) may only have enough space for two adult females and young and one male. The estimated spatial carrying capacity on Outer Island is 6-8 animals (adults and young). A factor that may increase carrying capacity is that island situations may create tighter home ranges than mainland populations. However, a factor that may decrease carrying capacity is habitat availability. Aerial surveys found consistent otter sign near the lagoon, in the island's center, and southwest of the lighthouse. Walking transects found sign of one adult with two juveniles and a single adult animal. (Doolittle 2003).

Stockton Island (10,000 acres), though larger than Outer, may be more habitat-limited due to the scarcity of interior beaver ponds and other open water habitats. Similar to Outer Island, Stockton Island's surface area may support 7-10 ten otter in the winter. In 2001, one family group of three otter was seen near Quarry Bay and slide sign was found in the tombolo lagoon drainage. In all years during winter, otter were located in the few available interior open water habitats.

Sand Island (2,949 acres) and Michigan Island (1,578 acres) had sign of one otter in 2001, related to new active beaver colonies. Doolittle (2003) estimates that Sand and Michigan Islands could likely support 4-6 otter. During an aerial overflight conducted in 2005, otter sign was not found on Sand or Michigan Islands (Doolittle 2005).

Mink (*Mustela vison*)

The status of mink (*Mustela vison*) is unknown. The earliest records of mink were reported in 1919 (Jackson 1961) for Outer and Stockton Islands. More recently there have been unconfirmed observations on Basswood, Oak, and Rocky Islands. Areas within the park that appear to have suitable mink habitat include: Oak, Rocky, Outer, Stockton, and Michigan Islands and the Mainland Unit (Brander and Bailey 1983).

Fisher (*Martes pennanti*)

Fisher (*Martes pennanti*) were eradicated in the State of Wisconsin by the 1930's. Reintroduction efforts in the state took place between 1956-1967 and have been very successful. Observations (mostly unconfirmed) of fisher have been made sporadically in the park since 1979 on the following islands: Basswood (1991); North Twin (2004); Oak (1993, 1997); Rocky (1987); Sand (1991, 1993,2010); and Stockton (1980, 1988, 1994)(NPS 2012a).

A study to determine the status and distribution of fisher was conducted in 2000 and 2001 (White Water Associates 2001). In 2000, Sand, Oak, and Stockton Islands were surveyed using sooted track boxes; fisher were only found on Sand Island (female with young). Sand, Stockton, and Basswood Islands and the Mainland Unit were sampled in 2001. Fisher were detected in all locations. Results of the track data indicated that Basswood and Stockton Islands had at least one male and one female; Sand had at least one male. Both male and female tracks also were found on the Mainland Unit. In addition, a male track was recovered from a box set in 2000 on Stockton and not recovered in that year. The shift in genders on Sand suggests dispersal of fishers among the islands or between the islands and the mainland.

It seems likely that fisher are moving to and from (and perhaps between) the islands far more readily than previously expected (White Water Associates 2001). Perhaps fishers on the mainland, needing to expand to new territories or find mates during the February-March breeding season, strike off across the ice at near points (Sand Point, Roys Point) to an island. Fisher may also respond to population booms of prey species on a particular island. It is possible that they leave the island again, perhaps the following winter, if there is insufficient food. If young are born on an island, there is almost certain to be dispersal or attempted dispersal. Although not generally thought of, fishers may be swimming between islands as well, as was reported once from islands in Georgian Bay, Ontario (Douglas and Strickland 1987). Whereas the Apostle Islands National Lakeshore appears consistently to have a small number of resident fisher (that is part of the Bayfield Peninsula population) any one island may have resident fishers only periodically through the years and seasons, exploiting booms in prey populations or responding to pressures for dispersal (White Water Associates 2001).

White Water Associates (2001) concluded that the islands surveyed in 2001 might only support, at the most, 10 fishers. Actual estimated numbers from track box records indicated a more likely abundance of 5-6 fishers on these three islands in 2001. The Mainland Unit may only harbor 2-6 individuals with the most liberal estimate being 4-12. Even extrapolating sub-population estimates to other islands (farther from the mainland and thus less likely to have fishers on a regular basis), the total sub-population of the islands would still be a very small number.

Muskrat (*Ondatra zibethicus*)

Historically, muskrat occurred throughout Wisconsin, as it does today (Brander and Bailey 1983). Tracks of muskrat were observed on Outer and Stockton Islands as early as 1919 (Jackson 1961). Little is known about the current muskrat population in the park. Likely muskrat habitat occurs on the mainland at Sand River and the lagoons of Michigan, Outer, and Stockton Islands (Brander and Bailey 1983).

Red Fox (*Vulpes vulpes*) and **Gray Fox** (*Urocyon cinereoargenteus*)

While there is little quantitative data, field observations indicate that red fox are fairly widespread in the park. Fox travel freely over the ice in the winter to the islands. During track surveys on Stockton Island from 1954-1960, an average of 0.3 fox tracks per mile were

observed (Brander and Bailey 1983). There are field observations (mostly unconfirmed) from Basswood, Bear, Devils, Ironwood, Long, Manitou, Michigan, North Twin, Otter, Ironwood, Raspberry, Rocky, Sand, South Twin, and Stockton Islands (Anderson 1980), and the Mainland Unit. Gray fox have become more common in recent years in northern Wisconsin, but remain uncommon in the park. In 1989, there was a record of a gray fox on Oak Island (NPS 2012a).

Coyote (*Canis latrans*)

Similar to fox, the abundance and distribution of coyote (*Canis latrans*) in the park is relatively unknown. Early observations date back to 1919 (Jackson 1961) when a coyote was collected on Basswood Island. During the fall of 1950, there were at least three, and probably seven, coyote on Outer (Keener 1951). Three of these were shot as part of a predator control program. During track surveys on Stockton Island from 1954-1960, an average of 1.4 coyote tracks per mile were observed (Brander and Bailey 1983). Field observations (1975-2004) of coyote have been made from Basswood, Long, Manitou, Michigan, Oak, Outer, Raspberry, Rocky, Sand and Stockton Islands, and the Mainland Unit. Recently, remote trail cameras have captured coyote on both Sand (2012) and York Islands (2011) where they were deployed for a deer study. Coyote sign is abundant on the Mainland Unit year-round (Brander and Bailey 1983) and coyote are frequently seen on the ice in the winter.

Raccoon (*Procyon lotor*)

Raccoon are common on the mainland and occur on Long Island. They are very rare on the islands. Raccoons were captured in 2012 on a remote trail camera on Sand Island and tracks were also seen.

Small Game

Small game that occur within the park include: red and gray squirrel, snowshoe hare, cottontail rabbit, ruffed grouse, crows, mourning dove, woodcock, snipe, sora and Virginia rails, raccoons, fox (red and gray), coyote, and bobcat. Raccoons are not known to occur on the islands, with the exception of Long and Sand Islands.

Squirrels

Red squirrels (*Tamiasciurus vulgaris*) were part of the park's fauna historically and remain widespread in the park, occurring on most, if not nearly all of the islands. Early observations (Shorger 1970) take note of their excellent swimming abilities.

Gray squirrels (*Sciurus carolinensis)* have only been observed on the mainland and Long Island.

Snowshoe Hare (*Lepus americanus*)

Past studies and observations indicate that snowshoe hare occur on every island except Eagle and Gull (Anderson 1983 and 1978; NPS 2012a; Brander et al. 1978; Jackson 1961; Patzoldt 1978; Schulz 1976; Stadnyk et al. 1974; Wisconsin Conservation Department 1946-1956). On islands without deer, snowshoe hare are, most likely, the most important herbivore. Baseline inventory data is needed to determine the status and distribution of snowshoe hare within the park.

Ruffed Grouse (*Bonasa umbellus*)

Ruffed grouse have been observed on Basswood, Long, Manitou, North Twin, Rocky, Sand, and Stockton Islands and the Mainland Unit (NPS 2012a). The park has participated in the Wisconsin statewide ruffed grouse survey (4-1, Ashland County) on an annual basis since 1989. This route is outside, but close to the Mainland Unit of the park. Numbers of grouse heard during this spring survey have varied from 18 in 2001 to 2 in 2012, with an average of 8.3 birds per year. The abundance of ruffed grouse along this route has been declining. From 1990-1999, the average number of grouse heard was 9.8. This dropped to 7.7 during the subsequent decade (2000-2009). More recently, it has dropped further to an average of 4.3 birds heard from 2010-2012.

Four walking routes were surveyed in 1989, 1991, 1993 and 1996. Route 1 (near Sand River) had the highest numbers of birds during all four surveys. The total number of birds heard on all four routes was highest in 1991 (26) and lowest in 1993 (9), averaging 18.

Woodcock (*Scolopax minor*)

Woodcock have been observed on the Mainland Unit, Basswood, Outer, and Stockton Islands. The NPS surveyed U.S. Fish and Wildlife Service's (FWS) route 1 during the annual woodcock singing-ground survey from 1989 until 2004. Since that time, local F&WS staff have conducted the route. Route 1, Bayfield County, follows nearly the same route as the Wisconsin ruffed grouse survey and is close to, but outside the boundary of the Mainland Unit. The range of birds recorded during these surveys has ranged from 0 to 20. Between 1989 and 1994, the range was 7-16 (avg. 10.5), from1995-2004, the range was 0 to 6 (avg. 4.1) and from 2005-2012 the range of bird recorded was 4-20 (avg. 8.2).

Crows, Mourning dove, Snipe, Sora and Virginia Rail

Crows are abundant in the park and mourning doves have been recorded from the mainland as well as a number of islands (NPS 2012d). Sora rail have been recorded on Sand, Stockton and Long Islands (NPS 2012d). Virginia rail and snipe have not been recorded in the park, however, they may occur in some of the park's wetland habitats.

Wild Turkey *(Meleagris gallopavo*)

Historically, wild turkeys occurred south of a line between Green Bay and Prairie du Chien and were extirpated in Wisconsin during the late 1800's. They were reintroduced into Wisconsin in 1976 and have continued to expand. Spreading north of their historic distribution on their own and through introductions, they now occur throughout the state. Wild turkeys were introduced into Bayfield and Douglas Counties during the winter of 2003/2004. During the spring of 2003, a few birds appear to have been illegally introduced into the park on Oak and Stockton Islands. None are believed to have survived. Since the writing of the 2007 plan, turkeys have become well established and abundant in northwestern Wisconsin. Most of their expansion has been due to changes in climate and habitat that have allowed the wild turkey population to expand. As mentioned in Revisiting Leopold (2013), an overarching goal of NPS resource management involves managing for continuous change. Therefore, the action alternatives change their status from historically non-native to a game species. Wild turkeys are regularly seen in and near the park's Mainland Unit, but have not been documented from the islands. Wild turkey have a very limited ability to fly long-distances, however, there is potential for them to immigrate to the islands on their own.

Waterfowl

The park provides important habitat for waterfowl, especially during migration. Nineteen species of waterfowl have been recorded during migratory bird surveys (Table 3). These surveys were designed to monitor all migratory birds, not specifically waterfowl. Surveys have been conducted on both Outer and Long Islands, however, the only year that both islands were surveyed was 1991 (Van Stappen and Doolittle 1992). Results of the 1991 survey indicate that although the number of waterfowl species recorded was similar for each island (14 on Outer; 15 on Long), the total number of waterfowl and their relative abundance compared to other birds groups was markedly different. On Long Island, waterfowl made up the highest percentage of any bird group (66%). However, on Outer Island, waterfowl consisted of only 1% of the total number of birds recorded. Since 1990, the amount of standing water on Long Island has decreased. It is not known whether or not this has affected the numbers of waterfowl that currently utilize this location.

CULTURAL RESOURCES (*Ethnographic Resources*)

Ethnographic resources are the cultural and natural features of a park that are of traditional significance to traditionally associated peoples (NPS 2006). The park is within the ancestral homeland of the Anishinaabe (also known as Chippewa or Ojibwe) and is in very close proximity to two Native American reservations. The reservation of the Red Cliff Band of Lake Superior Chippewa is to the west and includes 2/3rds of the park's Mainland Unit. The Bad River Band of Lake Superior Chippewa is just southwest of the park. The park is within territory that was ceded to the United States in the 1842 Treaty with the Chippewa. Within this ceded territory, the Chippewa reserved their rights to hunt, trap, and gather, along with

the "other usual privileges of occupancy." Twelve tribes in Minnesota, Wisconsin and Michigan have reserved rights within the ceded territory. These rights are recognized and respected by the National Park Service.

Only limited research has been completed for the ethnographic significance of the Apostle Islands to associated Native American groups. In 1999, a team from the University of Arizona conducted field interviews with Ojibwe elders to begin the process (Stoffle 2000). This study provided some valuable preliminary information; however, given the archipelago's central role to the Ojibwe, it is likely that there is much yet to be learned. In the course of the University of Arizona study, Native consultants reported that all the islands were used by their people, primarily on a seasonal basis. Responses evidenced a pattern according to which the islands closer to the mainland were generally inhabited for longer periods of time than those further from the shore. Consultants also stressed that environmental constraints and uneven resource distribution both spatially and temporally forced Ojibwe people to constantly move from island to island, to the mainland, and to places in the interior. In addition, Ojibwe people utilized the park for hunting. Use of the park resources extended to Ojibwe bands from the entire Lake Superior region.

Canada yew (ne'bagandag) is a native species to the region and has been traditionally utilized by the Great Lakes Ojibwe. In his book *Plants Used by the Great Lakes Ojibwe*, Jim Meeker (1994) states that "While Canada yew is a favorite browse of deer, the needles and seeds contain poisonous alkaloids to humans…A compound decoction of twigs was traditionally used as an herbal steam for rheumatism. It is also one ingredient used in thirty-two medicine." In a paper titled *Medicinal Use of Forest Trees and Shrubs by Indigenous People of Northeastern North America*, author Glen Blouin (year) states that "…by far yew's most common use was to treat rheumatism: Abenaki in Maine, Algonquin in Quebec, Ojibway in Minnesota and Ontario, and Menominee in Wisconsin all used it for this purpose, the needles steeped into a tea for internal consumption, or steamed in their sweat baths (Smith 1923, Gilmore 1933, Rousseau 1947, Black 1980)."

Wolves have a high degree of cultural significance to the Anishinaabe (also known as Chippewa or Ojibwe). Wolves are an integral component of the Anishinaabe creation story, in which wolves were sent to be the Peoples' companion and brother. It is believed that they would live parallel lives. "What happens to one will also befall the other," the Creator said (Hill 2013). Wolves are a tribally protected species on both the Red Cliff and Bad River Reservations.

VISITOR USE AND EXPERIENCE

Enjoying the park and its resources is a fundamental part of the visitor experience. Natural and cultural resources and park facilities provide opportunities for a variety of visitor experiences at Apostle Islands National Lakeshore. Visitors to the park have an opportunity for both wilderness and non-wilderness related experiences. Recreational users of the park include sailors, kayakers, motorboaters, hikers, sightseers, picnickers, swimmers, campers,

fishers, hunters, photographers, birdwatchers, divers, skiers, snowshoers, berry pickers, nature students, and lighthouse buffs. The most popular activities on the islands tend to be sightseeing, lighthouse tours, day hikes, and camping, although many visitors who come to the park participate in more than one activity.

The average number of annual recreational visitors to Apostle Islands National Lakeshore in the period from 1995-2012 was 176,937 (NPS 2013). In 2012 there were a little more than 163,000 recreational visitors in the park. Approximately 51,000 of these were island visitors. An additional 17,000 visitors toured the Apostle Islands by the concessioner's cruise boat. The seasonal visitation patterns for this period show that the vast majority of visitation occurs in the summer months, from June-August. Peak use is during July and August, on weekends. Visitation rapidly drops off in September and October. In 2012, two-thirds of park visitation occurred in July and August. Most motorboaters and sailboaters congregate at relatively secure anchorages or docks at Stockton, Rocky/South Twin, Raspberry, Oak and Sand Islands. These islands also receive the highest use levels. Also, islands that are closer to the mainland tend to receive higher use levels, while the more remote islands receive lower use levels. Eagle and Gull Islands are closed to visitors in the summer (May 15 to September 15) due to the presence of nesting colonial birds.

There are 63 developed campsites on 16 islands; eight of these campsites are group campsites on five islands. All park visitors that camp on the islands are required to obtain a permit. The number of camping permits issued in 2012 was 1,458. . A total of about 55 miles of trails are maintained on 12 islands. These trails provide hiking opportunities for visitors, as well as opportunities to experience and enjoy a variety of natural and historic features. There are also interpretive facilities and programs available for visitors.

There are a variety of hunting and trapping opportunities in the park. The islands offer a unique primitive hunting experience. For deer and bear, only primitive weapons are allowed and there is a special October muzzleloader season for deer on the Apostle Islands (except Long). However, Lake Superior sea conditions are unpredictable and change rapidly, especially during the fall hunting seasons, making access difficult. The Mainland Unit offers a hunting/trapping experience similar to those lands outside of the park, however, special regulations apply (e.g., no baiting).

REFERENCES

Allison, T. D. 2006. Canada yew and white-tailed deer at the Apostle Islands: Summary of research to date with recommendations for continued monitoring and management. National Park Service Great Lakes Inventory and Monitoring Network Report GLKN/2006/04.

Allison, T.D. 1990. Pollen production and plant density affect pollination and seed production in Taxus Canadensis. Ecology, 71(2), 1990, pp. 516-522.

Allison, T.D. 1987. The reproductive biology of Canada yew (Taxus canadensis) and its modification by herbivory: Implications for wind-pollination. Univ. Minn. Ph.D. thesis.

Allombert S., A. Gaston, and J. Martin. 2005. A natural experiment on the impact of overabundant deer on songbird populations. Biological Conservation 126(2005)1-13.

Anderson, R. K. and L. R. Stowell. 1985. Final report. Wildlife management plan for select habitats and species of the Apostle Islands National Lakeshore. National Park Service Contract CX-6000-7-R059. University of Wisconsin - Stevens Point. 184pp.

Anderson, R. K. and C. J. Milfred. 1983. Final report. Basic ecological and recreational resource inventory of Basswood, Manitou, and Hermit Islands, Apostle Islands National Lakeshore. National Park Service, Contract CX-6000-7-R059. College of Natural Resources, University of Wisconsin - Stevens Point. 169pp.

Anderson, R. K., C. J. Milfred, L. R. Stowell, and S. Fisher. 1982. Basic ecological and recreational resources inventory of Sand Island at Apostle Islands National Lakeshore. Final report to the National Park Service, University of Wisconsin - Stevens Point. 155pp

Anderson, R. K., C. J. Milfred, G. J. Kraft, and W. J. Fraundorf. 1980. Inventory of select Stockton Island resources for recreational planning. Final report to the National Park Service, University of Wisconsin - Stevens Point. 169pp.

Anderson, R. K., C. J. Milfred, W. J. Fraundorf, and G. J. Kraft. 1979. Basic ecological study of Outer Island at Apostle Islands National Lakeshore. College of Natural Resources, University of Wisconsin - Stevens Point. Final report to National Park Service. 163pp.

Ashland Daily Press. 1946. Article about Martin Kane of Oak Island.

Bartnick, T. 2011. Estimating the white-tailed deer population using remote cameras on Apostle Islands National Lakeshore. Progress report to Apostle Islands National Lakeshore, Bayfield, WI.

Beals, E. W. and G. Cottam. 1967. Survey of Apostle Islands vegetation. Wisconsin Conservation Department, Job Completion Report No. W-141-R-2.

Beals, E. W., G. Cottam, and R. J. Vogl. 1960. Influence of deer on vegetation of the Apostle Islands, Wisconsin. J. Wildl. Mgmt., 24(l):68-80.

Beals, E. 1958. The phytosociology of the Apostle Islands and the influence of deer on the vegetation. Univ. Wis., M.S. thesis.

Belant, J., J. Van Stappen, and D. Paetkau. 2005. American black bear population size and genetic diversity at Apostle Islands National Lakeshore. Ursus 16(1):85-92.

Belant, J. and J. Van Stappen. 2001. Island biogeography of mammals in Apostle Islands National Lakeshore. Bayfield, WI.

Black, M. 1980. Algonquin ethnobotany: An interpretation of aboriginal adaptation in southwestern Quebec. National Mueseum of Man Mercury Series 65, Canadian Ethnology Service, Ottawa, Ontario, 266 p.

Brander, R. and M. Bailey. 1983. Environmental assessment: Natural resources inventory and management, Apostle Islands National Lakeshore. U.S. Dept. Interior, Nat. Park Serv. Amended from 1981 Assessment. 185pp.

Brander, R., R. Maxwell, and C. Wickman. 1978. An inventory of selected natural and cultural resources on eight islands of the Apostle Islands National Lakeshore. Sigurd Olson Institute Special Report No. 24, Northland College. 163pp.

Buono, F. 1997. Managing wildlife in the parks: the legal basis. George Wright Forum 14:1(18-24). Available at http://www.georgewright.org/141buono.pdf (accessed 4/1/2013).

Callan, R., N. Nibbelink, T. Rooney, J. Wiedenhoeft, and A. Wydeven. 2013. Recolonizing wolves trigger a trophic cascase in Wisconsin (USA). Journal of Ecology

Casper, G. 2001a. Amphibian inventory of the Apostle Islands National Lakeshore, with an evaluation of malformity rates, monitoring recommendations, and notes on reptiles. Report to Apostle Islands National Lakeshore, Bayfield, WI.

Casper, G. 2001b. Reptile surveys of Long, Michigan, and Stockton Island, and Little Sand Bay, in the Apostle Islands National Lakeshore, with notes on amphibians. Report to Apostle Islands National Lakeshore, Bayfield, WI.

Christensen, E. 1959. A historical view of the ranges of the white-tailed deer in northern Wisconsin forests. American Midland Naturalist 61:230-238.

Dahlberg, B.L. and R.C. Guettinger. 1956. The white-tailed deer in Wisconsin. Wisconsin Conservation Department Tech. Bull. No. 14.

Doolittle, T. 2005; 2004; 2003; 2001. Results of aerial observations of wildlife. Reported to Apostle Islands National Lakeshore, Bayfield, WI.

Doolittle, T. 2003. Non-statistical habitat predictions using digital aerial photography and relative abundance of American otter (*Lutra canadensis*) in the Apostle Islands National Lakeshore and Bad River Reservation, Wisconsin. Report provided to Apostle Islands National Lakeshore, Bayfield, WI.

Doolittle, T. 2001. Boreal forest restoration project, Bad River Reservation, Wisconsin. Submitted to the Environmental Protection Agency, grant number GL985931-01-0. Odanah, WI.

Douglas, C. and M. Strickland. 1987. Fisher. Chapter 40 in: Wild Furbearer Management and Conservation in North America. M. Novak, J.A. Baker, M.E. Obbard, and B. Malloch, eds. Ontario Ministry of Natural Resources, Toronto, Ontario, Canada.

Fleming, K. 1997. A Demographic Comparison of a Hunted and an Unhunted Population of Black Bears in Northern Wisconsin. A thesis submitted in partial fulfillment of the requirements of the degree Master of Science, College of Natural Resources, University of Wisconsin, Stevens Point, Wisconsin. 74pp.

Galatowitsch, S., Frelich, L., Phillips-Mao, L. 2009. Regional climate changes adaptation strategies for biodiversity conservation in a midcontinental region of North America. Biological Conservation 142:2012-2022.

Garshelis, D. L. 1994. Density-dependent population regulation of black bears. Pages 3-14 *in* M. Taylor, editor. Density-dependent population regulation in black, brown, and polar bears. International Conference on Bear Research and Management Monograph Series 3.

Gilmore, M. 1919. Uses of plants by the Indians of the Missouri River region. University of Nebraska Press, Lincoln, Nebraska, 125 p.

Goodhart, J.F. 2008. Federal/State jurisdiction over wildlife. Paper presented at the 73rd North American Wildlife and Natural Resources Conference. March 26, 2008.

Hill, L., Bad River Band of Chippewa Indians Natural Resources Department (BRB NRD). 2013. Bad River Bands Ma'iingan (Wolf) Management Plan. Bad River Band of Lake Superior Tribe of Chippewa Indians Natural Resource Department, Odanah, WI, USA.

International Mountain Caribou Committee. 2006. Caribou FAQS. (www.imctc.com/ caribou_faqs.htm),

Jackson, H. 1961. Mammals of Wisconsin. University of Wisconsin Press. 504pp.

Judziewicz, E.J., and R.G. Koch. 1993. Flora and Vegetation of the Apostle Islands National Lakeshore and Madeline Island, Ashland and Bayfield Counties, Wisconsin. Dept. of Botany, Univ. of Wisconsin - Madison; Dept. of Biology, Univ of Wisconsin - La Crosse. 196 pp.

Kallok, M. A. 2013. The case for cooper: Research uncovers problems with lead bullets for deer hunting and points to copper bullets as a practical alternative. Minnesota Conservation Volunteer, 76 (450) 17-23).

Keener, J. 1951. Capercaillie and black grouse research. Wis. Conservation Dept., quarterly progress report, surveys and investigations. Vol. X, No. 2. Pages 107 and 109.

Kohn, B. 1982. Status and management of black bears in Wisconsin. Wisconsin Department of Natural Resources Technical Bulletin 129.

Kubisiak, J. R. Rolley, R. Paisley, R. Wright. 2001. Wild turkey ecology and management in Wisconsin. Wisconsin Department of Natural Resources, Madison, WI.

Lapham, I. 1846. Wisconsin: its geography and topography. Milwaukee. 70pp.

Meeker, J., J. Elias, and J. Heim. 1994. Plants used by the Great Lakes Ojibwa. Great Lakes Indian and Fish and Wildlife Commission, Odanah, WI.

National Park Service. 2013. NPS Stats, National Park Service visitor use statistics. https://irma.nps.gov/Stats/Reports/ReportList

National Park Service. 2012. Revising Leopold: resource stewardship in the National Parks. A report of the National Park System Advisory Board Science Committee.

National Park Service. 2012a. Apostle Islands National Lakeshore natural resource database-observations. Bayfield, WI.

National Park Service. 2012b. Apostle Islands National Lakeshore natural resource database - ruffed grouse and woodcock. Bayfield, WI.

National Park Service. 2012c. Apostle Islands National Lakeshore natural resource database – migratory birds. Bayfield, WI.

National Park Service. 2012d. Apostle Islands National Lakeshore natural resource database – breeding birds. Bayfield, WI.

National Park Service. 2012e. Apostle Islands National Lakeshore Superintendent's Compendiuum. Bayfield, WI.

National Park Service. 2011. General Management Plan and Wilderness Management Plan for Apostle Islands National Lakeshore. Bayfield, WI. http://www.nps.gov/apis/parkmgmt/gmp.htm

National Park Service. 2010, 2008, 2006, 2003. Apostle Islands National Lakeshore bi-annual research and monitoring report. Bayfield, WI.

National Park Service. 2007. Wildlife management plan and environmental assessment for harvestable species, Apostle Islands National Lakeshore. Bayfield, WI. http://www.nps.gov/apis/parkmgmt/hwp.htm

National Park Service. 2006. National Park Service Management Policies. http://www.nps.gov/policy/MP2006.pdf

National Park Service. 2002. Director's Order 77: Natural resources management guideline. http://www.nature.nps.gov/rm77/pm77_2/procedures.cfm

National Park Service. 1999. Resources management plan: Apostle Islands National Lakeshore. Bayfield, WI.

Paetkau, D. 2011. Genetic analysis of bear sample from Apostle Islands National Lakeshore. Report to Apostle Islands National Lakeshore, Bayfield, WI.

Patzoldt, K. 1978. Demography of the vertebrate populations of Raspberry, Rocky, York, and Oak Islands, Apostle Islands National Lakeshore, Wisconsin. Dept. Biological Sciences, Michigan Technological Univ., Houghton, MI. 151pp.

Rattner, B.A., J.C. Franson, S.R. Sheffield, C.I. Goddard, N.J. Leonard, D. Stand, and P.J. White. 2008. Sources and implications of lead-based ammunition and fishing tackle on natural resources. Wildlife Society Technical Review. The Wildlife Society, Bethesda, MD, USA.

Redig, P. D. Smith and L Cruz-Martinez. 2009. Potential sources of lead exposure for bald eagles: A retrospective study. In R.T. Watson, M. Fuller, M. Pokras, and W.G. Hunt (Eds.). Ingestion of lead from spena ammunition: Implications for wildlife and humans. The Peregrine Fund, Boise, Idaho.

Richner, Jeffrey. 1980. 1980 Fieldwork at the P-Flat site (47AS47). Investigator's Annual Report to Apostle Islands National Lakeshore. 2pp.

Rogers, T. B. Bedrosian, D. Craighead, H. Quigley, and K. Foresman. 2009. Lead ingestion by scavenging mammalian carnivores in the Yellowstone Ecosystem. *In* R.T. Watson, M. Fuller, M. Pokras, and W.G. Hunt (Eds.). Ingestion of lead spent ammunition: Implications for wildlife and humans. The Peregrine Fund, Boise, ID.

Rousseau, J. 1945. Le folklore botanique de I'lle aux Coudres. Contributions de I'Institut Botanique de I'Universite de Montreal 55:75-111.

Sanders, S. and J. Grochowski. 2012. Impelmentation of a long-term vegetation monitoring program at Apostle Islands National Lakeshore. U.S. National Park Service Technical Report NPS/GLKN/NRTR-2012-613.

Schorger, A. 1970. Wildlife in early Wisconsin, compiled by Robert McCabe. University of Wisconsin, Madison, WI.

Schulz, R. 1976. Animal ecology of Bear Island, Wisconsin, Apostle Islands National Lakeshore. Michigan Technological Univ., Houghton, MI. M.S. thesis. 48 pp.

Smith, Douglas. 2007. White-tailed deer population increase and response by understory saplings and shrubs in the Apostle Islands National Lakeshore: final report. Submitted to: Apostle Islands National Lakeshore, Bayfield, WI.

Smith, Douglas. 2006. Apostle Islands deer survey – 2005. Report to Apostle Islands National Lakeshore. Bayfield, WI.

Smith, Douglas W. 1994. Apostle Islands beaver survey 1994. Biology Department, University of Nevada, Reno, NV. 11 pp.

Smith, Douglas W. and Rolf O. Peterson. 1991. Beaver ecology in Apostle Islands National Lakeshore. School of Forestry and Wood Products, Michigan Technological Univ., Houghton, Michigan. 46 pp.

Smith, H. 1923. Ethnobotany of the Menomini Indians. Bulletin of Public Museum City of Milwaukee 4:1-174.

Stadnyk, L., R. Verch, and B. Goetz. 1974. Stockton Island Survey. Northland College, Ashland, WI. 71pp.

Stoffle, R. 2001. Traditional Ojibway resources in the western Great Lakes: an ethnographic inventory of the states of Michigan, Minnesota, and Wisconsin. Report to National Park Service, Midwest Regional Office, Omaha, NE.

Storlid, S. A. 1995. Spring and summer habitat use and food habits of black bears in northern Wisconsin. Thesis, University of Wisconsin, Stevens Point, Wisconsin, USA.

The Wildlife Society. 2013. Lead and Wildlife Fact. Accessed December, 2013. Available on-line at http://joomla.wildlife.org/documents/policy/Lead.Fact.Sheet.pdf.

Thiel, R. 1993. The Timber Wolf in Wisconsin: the Death and Life of a Magnificent Predator. Univ. Wisconsin Press, Madison. 253 pp.

Trauba, David R. 1996. Black Bear Population Dynamics, Home Range, and Habitat Use on an Island in Lake Superior. A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Natural Resources, College of Natural Resources, Univ. Of Wisconsin - Stevens Point, Wisconsin. 91pp.

U.S. Fish and Wildlife Service. 2006. Gray wolves in the upper Midwest. www.fws.gov/midwest/wolf.

Van Stappen, J. and T. Doolittle. 1992. 1991 Migratory bird survey, Apostle Islands National Lakeshore. Bayfield, WI. 8 pp.

Waller, D. 2005. Importance of unbrowsed vegetation communities. Personal communication.

Waller, D. and W. Alverson. 1997. The white-tailed deer: a keystone herbivore. Wildlife Society Bulletin 25(2):217-226.

White Water Associates. 2001. Survey to determine population status of fisher on selected Apostle Islands and the Mainland Unit. Report submitted to: Apostle Islands National Lakeshore, Bayfield, WI.

Wilton, C., J. Belant, J. Van Stappen, and D. Paetkau. 2011. American black bear population size at Apostle Islands National Lakeshore. Report submitted to : Apostle Islands Natioanl Lakeshore, Bayfield, WI.

Wisconsin Conservation Department. 1946—1956. Management of deer on the Apostle Islands. Copies of Wis. Conserv. Dept. files, at Apostle Islands National Lakeshore, Bayfield, WI.

Wisconsin Department of Natural Resources. 2013. The wild turkey. http://dnr.wi.gov/eek/critter/bird/wildturkey.htm and http://dnr.wi.gov/topic/WildlifeHabitat/turkeymanagement.html

Wisconsin Department of Natural Resources. 2012. Hunters cautioned to watch for elk, moose. http://dnr.wi.gov/news/Weekly/Article_Lookup.asp?id=2379.

Wisconsin Department of Natural Resources. 2013. Canada lynx. http://dnr.wi.gov/eek/critter/mammal/lynx.htm

Wisconsin Department of Natural Resources. 2013. Elk in Wisconsin. http://dnr.wi.gov/topic/wildlifehabitat/elk.html

Wydeven, A. 1993. Wolves in Wisconsin: recolonization underway. Int. Wolf 3(1): 18-19.

Wydeven, A., R. Schultz, and R. Thiel. 1995. Monitoring of a recovering gray wolf population in Wisconsin, 1979-1991. pp. 147-156 in L.N. Carbyn, S.H. Fritts, and D.R. Seip (eds.). Ecology and Conservation of Wolves in a Changing World. Canadian Circumpolar Institute, Occasional Publication No. 35, 642 pp.

Wydevan, A. and J. Wiedenhoeft. 2005. Wisconsin endangered resources report #132, status of the timber wolf in Wisconsin, performance report 1 July 2004 through 30.

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PUBLIC INVOLVEMENT

The draft plan/EA was made available for public review February 25 through March 28, 2014 following internal and partner review. A public meeting was held on March 18, 2014 to provide additional opportunities for input.

Table 3. List of waterfowl recorded during migratory bird surveys on Long and Outer Islands

Common Name	Scientific Name
American Black Duck	*Anas rubripes*
American Coot	*Fulica americana*
American Wigeon	*Anas americana*
Blue-winged Teal	*Anas discors*
Bufflehead	*Bucephala albeola*
Canvasback	*Aythya valisineria*
Common Goldeneye	*Bucephala clangula*
Common Merganser	*Mergus merganser*
Greater Scaup	*Aythya marila*
Green-winged Teal	*Anas crecca*
Hooded Merganser	*Lophodytes cucullatus*
Lesser Scaup	*Aythya affinis*
Mallard	*Anas platyrhynchos*
Northern Pintail	*Anas acuta*
Northern Shoveler	*Anas clypeata*
Red-breasted Merganser	*Mergus serrator*
Redhead	*Aythya americana*
Ring-necked Duck	*Aythya collaris*
Wood Duck	*Aix sponsa*

Table 4. Wisconsin State Endangered and Threatened Plant Species

Species	State Status
Butterwort (*Pinguicula vulgaris)*	Endangered
Lake cress (*Armoracia lacustris)*	Endangered (probably extirpated)
Moonwort (*Botrychium lunaria)*	Endangered
Mountain cranberry (*Vaccinium vitis-idaea)*	Endangered
Satiny willow (*Salix pellita)*	Endangered
Beautiful sedge (*Carex concinna)*	Threatened
Broad-lipped twayblade (*Listera convallarioides)*	Threatened
Calypso orchid (*Calypso bulbosa)*	Threatened (probably extirpated)
Coast sedge (*Carex exilis)*	Threatened
Drooping sedge (*Carex prasina)*	Threatened
English sundew (*Drosera anglica*)	Threatened
Marsh grass-of-parnassus (*Parnassia palustris)*	Threatened
Michaux's sedge (*Carex michauxiana)*	Threatened
Northern Gooseberry (*Ribes oxyacanthoides)*	Threatened
Plains ragwort (*Senecio indecorus)*	Threatened
Satiny willow (*Salix planifolia)*	Threatened
Shore sedge (*Carex lenticularis)*	Threatened
Spike trisetum (*Trisetum spicatum)*	Threatened