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This poster is dedicated to the children of Michigan...

INTRODUCTION

As plants and animals followed the northward retreat of the glaciers 12,000 to 16,000 years ago, they formed a variety of natural communities. The warm climate and moist, rich soils of the southern half of the Lower Peninsula (LP) eventually fostered the growth of deciduous forests. Farther north, as the Wisconsin ice sheet melted, it deposited a glacial till and left a sandy outwash plain which was dry and nutrient-poor. The plants and animals which came to dominate this large area formed the coniferous forests. One of the most fascinating of these northern forests is the jack pine ecosystem.

The jack pine ecosystem is characterized by dense stands of relatively young trees interspersed with small grass and sedge openings and is often called the jack pine “plains” or “barrens.” Except for lowland areas of aspen, birch, maple, or cedar and spruce, its vegetation is dry and sparse. This ecosystem experiences extreme temperature and dryness and is prone to fire. The jack pine ecosystem is extremely well adapted to fire—so well adapted that it is dependent upon fire for its very existence.

Succession is the process by which early, pioneering plant communities are replaced, or succeeded, by later communities. While we often think of forests as progressing toward “climax” communities of very large, old trees, the jack pine forest contains few old trees. On these sandy plains, the jack pine represents both the early and late successional stages. All of the native wildlife species are adapted to a dynamic, ever-changing landscape perpetuated by the recurrence of fire. Early-successional plant communities, such as jack pine forests, actually have greater productivity than mature systems, because they capture the sun’s energy more efficiently and produce plant and animal material (biomass) as a faster rate than mature forests.

The jack pine forest is amazingly diverse, forming a rich mosaic of habitats including prairie or grassland species, coniferous and deciduous forest species and enough mixing of these habitats to support “edge” species. Many of the plants and animals found here are endangered, threatened, or rare, and some, such as the Kirtland’s warbler, are found nowhere on earth. Taken together, the jack pine ecosystem is anything but “barren”!

Today, we play an active role in the jack pine ecosystem, resulting in conflicts between the competing needs of wildlife and the various human uses of the forest. To appreciate and enjoy the unique jack pine ecosystem, we need to understand it.

MICHIGAN’S GEOLOGICAL LANDSCAPE

The shaping of Michigan’s geological landscape began more than one million years ago, during the great Ice Age. Her features were sculpted by four massive continental glaciers scouring across the Midwest. Michigan experienced the last great ice sheet, known as the Wisconsin Glacier, about fourteen thousand years ago. This huge ice mass was a mile thick and almost four million miles square. Its northernmost head touched Hudson Bay, and its icy tongue reached toward the banks of the Ohio River. As this “river of ice” crept over the underlying rocks, its base scraped millions of tons of earth like a giant bulldozer over the land. This debris composed of soil, pebbles, cobbles and boulders was pushed forward, grinding rocks into glacial dust, while boulders scratched their signatures on the bedrock.

Then the climate began to warm. Meltwater carried the soils and rocks away from the melting glacier, depositing its drift over the landscape. As this blend of soils and rocks was dropped away from the ice, the low hills, or moraines, were created across the state. Michigan’s glacial drift averages 200 to 300 feet; however, the thickness of drift has measured over 1,000 feet in a few of Michigan locations. The grinding of boulders created particles of various sizes and weights. The heaviest pieces fell first, forming stony ridges which formed the streams flow direction and the edge of the glacier as it melted. Lighter materials were carried farther, dropping along the way as the flowing water slowed. These materials dried in sheets forming vast, flat multi-colored areas of sand, silt, clay and a mixture of the three called outwash plains.

The weight of the glacier over the Michigan basin was lessening, and the earth began to rebound, like a sponge returning to its original shape when the squeezing stops. The Michigan landscape began to emerge like a slowly rising phoenix. Plants began to appear on the drying landscape.

Communities formed as various plants found a suitable growing environment near each other. One of these sandy communities on the outwash plains was dominated by the jack pine tree.

JACK PINE

Among all Michigan tree species, the jack pine (*Pinus banksiana*) is uniquely adapted to exist and reproduce on the hottest and driest sites in Michigan. It thrives on dune sand and on the sandy glacial plains, where it often occurs in dense stands. It is called a “fire species” because wildfires sweep through jack pine stands, killing the trees and preparing the ground for a new stand, thus releasing seeds from its cones.

Jack pine once thought to poison the ground on which it stood because no other trees and few ground plants would grow near it. In truth, many species grow with the jack pine.

Most jack pine cones are sealed with a special resin. This resin prevents the cones from drying out and releasing their seeds except under certain conditions. The resin melts at 112° F, a temperature easily reached during a forest fire, but which also may be achieved on bare ground in open sunlight on a bright summer day. After the resin is melted the cones open, releasing the seeds from within. These resinous cones are called **serotinous** cones.

Not all jack pine cones are serotinous. Almost every jack pine has a few cones each year which are **non-serotinous**. These cones open in the fall and provide a source of seeds in case fires do not occur.

Given proper conditions, the seeds will germinate almost immediately after falling, but if moisture is lacking when they fall, some seeds go into dormancy which may last up to three years or more. Studies have shown jack pine seedlings will continue to sprout up to three years after a forest fire. This adaptation guards against the loss of all of the young seedlings due to an unusually dry summer or because of a hard frost.

Jack pines in Michigan are often crooked and short—generally not a favorite tree of most. However, in some places in the Upper Peninsula and farther north into Ontario, they grow much straighter and taller. Much of the difference is due to insects and other problems that plague the jack pine in Lower Michigan, which is the southern limit of the tree’s natural range.

The long wood fibers of jack pine make it ideal for the manufacture of strong papers. Harvest is usually by clearcut to mimic the effects of a wildfire. The soil is then prepared for seeding or planting, and a new stand is established.

Jack pine pollen is shed in late May or early June and sometimes forms large clouds resembling smoke rising from the tops of the trees. It settles on the ground and forms a yellow border around puddles and a thin, yellow film on everything within miles.

FOREST HISTORY

Prior to European settlement, the outwash plains, with their plant communities of jack pine and associated species, were hot, dry places during the summer months. Once in a while, lightning would start a fire that would smolder in an old pine stump for a few days or weeks until finally, on a hot windy day, it would be fanned into a raging fire that roared across the land leaving everything behind it blackened and desolate. Native Americans, either accidentally or intentionally, also caused fires in the jack pine.

The desolation was only temporary. Soon the jack pine seeds would flutter to the ground, and, in only a few weeks, the area would be green with new growth. This process was repeated every 30 to 100 years, and the jack pine continued to dominate these fire-prone areas.

When Europeans arrived to clearcut the white and red pine that grew near the jack pine plains, large amounts of slash were left after logging. Thus the stage was set for an expansion of the jack pine community through huge forest fires that burned millions of acres.

In response to the loss of Michigan’s forests and the continued threat of forest fire, the department of conservation (now called the Department of Natural Resources) was formed in 1920. One of its purposes was to bring the forest fire problem under control. These efforts were quite successful, and as a result, the area occupied by jack pine and its community began to decline to its historical ranges.

Pine plantations, especially red pine, were also established throughout much of the historic pine plains. Forest fires were prevented and controlled in the jack pine plains, too, and the jack pine community began to be replaced by tree species more tolerant of shade.

One species that suffered from this reduction and maturing of jack pine communities was the Kirtland’s warbler, *Dendroica kirtlandii*. This endangered bird builds its nest on the ground under young jack pine trees, where they occur in dense clusters. The conditions were typically created by a forest fire.



Commercial timber cutting, prescribed fire, and jack pine planting and seeding are a major management “tools” used to provide the young quality of the forest, which is necessary for Kirtland’s warbler nesting.

The Kirtland’s warbler prefers nesting areas of at least 80 acres in size with thickly branched jack pine trees at least five feet high. This occurs when stands are about eight years old. Nesting will continue in jack pine forests until the trees begin losing their lower branches, at about 20 years of age. Jack pine plantations are cut at stand maturity (about 50 years of age). This reduces mortality caused by the jack pine bud worm and other factors. This ecologically narrow band of relatively young jack pine forest is essential for the survival of the Kirtland’s warbler. A reliable nesting stand is dependent of forest manipulation which includes cutting and burning.

This exciting complex restoration program has evolved, through scientific research, into a precise design which has succeeded in restoring habitat for the Kirtland’s warbler in Michigan.

The future of the Kirtland’s warbler is dependent on the continued funding of this ecologically based habitat management program.

TREES FROM ASHES

Fire has shaped the Michigan landscape for thousands of years. Remnants of fire can be found as charcoal in bogs and glacial deposits. Historically, forests cycled because of wind, insect outbreaks, and fires, which occurred naturally and were not controlled by fire suppression programs. Fires kept Michigan’s jack pine forests at age levels that provided an abundance of desirable nesting sites for the Kirtland’s warbler and a diverse mix of other wildlife and plants.

Fire prevention programs reduced the frequency and size of fires in the jack pine ecosystem, which had a direct impact on the population of the Kirtland’s warbler. Without fires, nesting habitat became scarce.

Jack pines do not grow in the shade and are fire-dependent. Without fire (or commercial timber harvest) to create sunlit areas, competing species such as oak or cherry would soon dominate the stand.

HABITAT MANAGEMENT

Forest managers are using methods that mimic historical forest recycling patterns and processes in the management of the endangered Kirtland’s warbler.

INDICATOR SPECIES

As you enter this forest community, you may notice some plants and animals that seem to be the most abundant. These are generally the most conspicuous and can be indicators of a type of ecosystem. Of course, you see the jack pine clumps, which seem to be mixed in all openings of grasses, sedges, blueberry, sweet fern and wildflowers. Many of these plants are seldom found elsewhere in Michigan.

Plants are dependent on a particular soil type, topography and climate through biological adaptation. Because of their immobility, plants generally require those components that are specific to a site. You would not expect to see a large stand of sugar maples growing in the sandy soils of a jack pine forest. Oaks and cherry would become the dominant trees in a jack pine forest if fire, cutting, insects or disease did not act as a control.

In a jack pine forest, sprouting stumps of northern pin oak create thin, green snake-like stalks. Certain fragrances are apparent as you move through a jack pine forest: the delicate perfume of sweet fern, the pungent aroma of pine, mushrooms with their musty earthy scent, and the fruity odor of blueberries.

Certain animal life is also characteristics of the jack pine ecosystem. Bluebirds seek the standard snags with shallow cavities for nesting and roosting; upland sand pipers can be seen perching on stumps of northern pin oaks. Black bears and white-tailed deer move through the area, and the Kirtland's warbler will only nest in these Michigan jack pine forests.

Indicator species are used as a standard in identifying similar communities. Their decline may indicate a disturbance that alters the ecosystem. Disturbances may result from natural events: glaciations, climatic changes, volcanic activity, fires, floods, disease and wind.

Some species depend on a frequent disturbance, as does the jack pine. The endangered Kirtland's warbler is also dependent on these disturbances.

Animals and Plants of the Jack Pine

Kirtland's Warbler (*Dendroica kirtlandi*), Wood Warbler of the Jack Pines

You may notice a small movement on the edge of the jack pine woods: a bobbing tail or perhaps just a flash of bright yellow darting among the charcoal-colored, twisted trunks and dark green branches of a young jack pine forest. Its voice is loud, yet low-pitched, ending with an upward inflection. Who would imagine that what appears to be a dry, shrubby, pine barren offers an ideal nesting site for the endangered Kirtland's warbler?

This small, steely gray "wood warbler" has a distinctive long, pointed black bill, gray head with black band bisecting the side of its face, white broken eye ring and lemon yellow underparts, with dark streaks along its flanks and chest. Kirtland's warblers return to Michigan in the spring after wintering in the Bahamas. In June, Kirtland's warblers typically lay four to five cream-white eggs speckled and blotched with brown. Nests are constructed on the ground, made of dead grasses and lined with mosses or deer hair. Kirtland's warblers will nest only in young jack pine woodlands of Michigan's northern Lower Peninsula. Most of these sites are located in the Au Sable River watershed.

Brown-headed Cowbirds (*Molothrus ater*)

In presettlement times, the brown-headed cowbird was primarily a bird of the prairies and gained its name from the habit of following buffalo and then cattle to eat the insects stirred up by great herds. There may have been a limited population of brown-headed cowbirds in Michigan during

pre-logging days, but only in the southern Lower Peninsula. However, the clearing of forests allowed the cowbird to expand its range into areas also occupied by the Kirtland's warbler.



Kirtland's warbler nest with a cowbird egg.

Cowbirds are the "tricksters of the bird world." Nest parasitism by cowbirds is a major factor in declining migratory songbird populations in much of the United States. They use existing songbird nests, frequently removing an egg or two from the nest and laying their own larger eggs in the nest. After hatching, the young cowbirds are much larger than the young songbirds and demand greater amounts of food from their foster parents. This often results in the death of smaller songbirds.

The spread of cowbirds into Kirtland's warbler habitat had a major impact on nest success. Prior to cowbird control, as many as 69 percent of Kirtland's warbler nest were parasitized by cowbirds. The U.S. Fish and Wildlife Service has used trapping as a means of reducing the cowbird population in Kirtland's warbler nesting areas. To improve nest success some alternative controls maybe used, such as reducing amount of forest edges and feeding areas. Unfortunately, fragmentation of forest habitats by current land use practices will continue to keep the cowbird in Michigan.

Upland Sandpiper (*Bartramia longicauda*)

Historically nesting in native Michigan prairies and burnt meadows, the grassland plover-like shorebird continues to return to scattered remnants of grassy openings in jack pine forests and other ranges in Michigan during its spring migration. Upland sandpipers winter in South America. They

prefer to “roost” or perch on old stumps, fence posts or utility poles, creating a distinct profile which aids in field identification.

Upland sandpipers have large, dull brown bodies and long legs, which are featherless above the heel. They are nearly 12.5 inches in height, with a long tail and small, pigeon-like head and short bill balanced on a thin, stalk-like neck. This shorebird lands on its perch with wings elevated like a triangle.

Its call is a crisp “kip-ip-ip” and is audible for a long distance. The call is very distinct for the upland sandpiper and is similar to a wolf whistle. Feeding in grasslands or meadows, it will consume vast amounts of insects and seeds. Its grassland habitat is at risk due to development. Present management of the jack pine ecosystem for endangered Kirtland’s warbler has benefited this bird and other grassland species by creating or maintaining scattered savanna-like openings.

Common Crow (*Corvus brachyrhynchos*)

Common throughout Michigan, this large, 17- to 20-inch bird’s entire body is blue-black, tending to appear purplish black in sunlight. Crows prefer to build lined stick nests or platforms in trees, often in colonies. Eggs number four to six and are greenish. Crows are very gregarious, sociable birds, sometimes forming large flocks numbering into the hundreds.

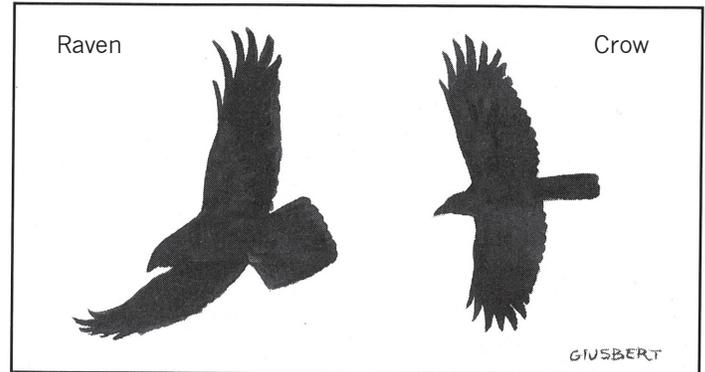
Crows are omnivorous and will eat carrion, rodents, young bird reptiles and vegetation, including garden and farm crops. Crows and ravens are wary of humans or other threats and will “explode” out of roosting site in a blast of black feathers when startled. Many will challenge hawks or owls who venture into their nesting area.

Common Raven (*Corvis corax*)

This is a large, 12- to 27-inch long, glossy black bird. Its bill is large and heavy, with nostrils covered by bristly feathers called filoplumes. A raven has a large tuft of feathers covering its throat, which is visible from a distance. In flight a raven will flap, soar, and then flap. Its wedge-shaped tail distinguishes it from the common crow.

Ravens build large stick nests in tall trees or breaks on a rocky cliff or ledge. Eggs are five to seven in number, greenish with brown spots. Ravens have a loud, deep, throaty call or croak. They are omnivorous and will eat carrion, small mammals, young birds and vegetation.

Ravens are very territorial and will attack owls, hawks and even eagles who encroach on their habitat. Their Michigan range is in the Upper Peninsula and northern Lower Peninsula, and they are common in the jack pine forest.



Ravens and crows are superb fliers. Their aerial displays are a delight to watch and are just one of the natural wonders that await you when you visit this part of Michigan’s natural heritage: the jack pine ecosystem.

Spruce Grouse (*Canachites Canadensis*)

This grouse lives in a young, middle-aged to mature Michigan jack pine forests in the Lower and Upper peninsulas. It is larger than a pigeon and stands about 15 to 17 inches in height.

The female is deep brown in color and has black barred feathers, with facial feathers extending down the beak. Her body lacks the black belly feathers of the male and is tan colored and mottled. The tail is unbarred with a buff colored band. Her flank feathers are blotched with white.

Flanks on a male spruce grouse are white spotted. The male also has a patch of red-colored skin above the back of the eye, and the tail is tipped with a chestnut band. This blending of colors allows the spruce grouse to blend with the colors of needles, leaves and lichens.

Spruce grouse walk with jerky heads and a stiff-legged gait, as if planting each foot with purpose as they strut among the duff on the forest floor. They leave three-pronged footprints as lasting images of their explorations in the soft forest soils. In winter snows, their toes, which are edged with hair-like feathers, create miniature snowshoe imprints.

The nesting hen makes a small depression of about five to six inches in diameter and one to two inches deep among needles and leaf litter underneath young jack pine branches and bent bracken fern stems. Clutch size maybe five to as many as 16 eggs. An incubating hen will remain on the nest throughout most forest disturbances, even those that are obvious threats to her safety.

Hatching occurs in June. Chicks will leave the nest as soon as they can walk. Just after hatching they rarely venture more than a foot or two from their nest. Soon they are exploring the forest floor under the watchful eye of the hen. Within a short time, the young are flying on their own.

Predation of spruce grouse is by coyotes, red foxes, weasels, hawks and owls. The tame personality of the spruce grouse often allows people to approach to a close range. Spruce grouse are sometimes mistaken for ruffed grouse.

Spruce grouse are fully protected in Michigan and, because they are rare, are listed on the Special Concern list. To see one in its natural habitat provides an enriching experience for anyone so lucky.

Badger (*Taxidea taxus*)

This muscular, grizzled, brownish gray, long-haired member of the weasel family is found in grassy clearings or edges in the jack pine ecosystem. Its black face is bisected by a narrow, white strip extending to the tip of a slightly pointed black nose. This nocturnal hunting carnivore sports a short, flattened, rudder-like tail and stubby legs, ending in pebbly black feet and front toes tipped with long, stout, curved, sharp nails and has a wide flat appearance. Badgers may reach 2.5 feet in length and 30 pounds in weight. Badgers are amazingly adept at burrowing. In soft soils adults use their claws and teeth to move aside obstacles like a steam shovel, digging themselves into the ground and out of sight in a few minutes. Their dens may occupy old enlarged fox, coyote or wood chuck holes or newly dug, deep burrows up to 60 feet long.

Badgers prefer hunting in grassy openings, which can be found in most jack pine ecosystems. They consume a variety of prey such as mice, voles, chipmunks, ground squirrels, skunks, snakes, eggs and ground-nesting birds. Carrion rounds out their diet. Some kills may be buried for later consumption.

When challenged or frightened, they will release a musky, skunk-like scent. Courageous and territorial, badgers will attack if concerned. Other predators have difficulty grabbing this strong animal because it has a set of dense muscles forming a hidden protective collar around its neck and throat.

Badgers are an important living component of many Michigan Ecosystems. You can feel fortunate if you ever see one of these secretive animals. Although fairly common, they are often not seen.



Northern Pin Oak (Hill's Oak) (*Quercus ellipsoidalis*)

Interspersed within the jack pine community is northern pin oak, also called Hill's oak. This species is characterized by its somewhat narrower or more columnar form in comparison to other oak species. Another characteristic is its drooping branches and stubs—the latter sometimes referred to as “pin branches” —on the lower portion of the tree trunk. Northern pin oak, like jack pine, is adapted to the sandy soils and droughty conditions of the pine plains and can be readily sprout again when the trunk and crown are killed by wildfire.

Alleghany Plum (*Prunus alleghaniensis*)

Alleghany plum, sometimes referred to as “sloe plum,” is a rare species and is listed on the Special Concern list in Michigan. Its main range is in the eastern United States, principally from Pennsylvania to West Virginia. In Michigan, this plum is considered to be a different variety of the species and is being recommended for listing under the Federal Endangered Species Act. Alleghany plum frequently grows in thicket-like clusters or clones. The clones often contain numerous dead branches and twigs; this “dead-looking” appearance can be used as an identification feature. The fruit is a small, bluish plum prized by a variety of wildlife.

Little Bluestem (*Andropogon scoparius*)

Little bluestem is a widespread prairie grass common throughout the jack pine plains. The species can be recognized by its roundish clumps of stems that are somewhat reddish-purple in color. The stems turn yellowish-orange as the plants mature and go to seed. Less common in the jack pine plains but more imposing is the related big bluestem (*Andropogon gerardii*), a much taller grass that is also called “turkey-foot.” It is so named for the terminal seed spikes that resemble the bird's foot.

Blazing Star (*Liatris aspera* and *L. cylindracea*)

Blazing stars, *Liatris* species, are prairie plants characteristics of the mid to late summer flora of the jack pine savannas and barrens. The species noted above are two of the most common in the jack pine ecosystem. These striking plants of the daisy family have light to deep purple flower heads that are similar in structure to the flower heads of thistles. They, too, are most abundant following fires.

Blueberry (*Vaccinium species*)

Blueberries are well known plants of the jack pine plains. They flourish in the acidic, sandy soils and provide an important food source for numerous species of wildlife, and for humans as well. The two common species are *Vaccinium angustifolium* and *V. myrtilloides*, which are considered lowbush berries. These plants occur throughout the jack pine ecosystem, as well as in many other kinds of habitats, including wetland habitats such as bogs and meadows. As many berry pickers and bears know, blueberries are especially abundant following wildfires.

Pale Agoseris (*Agoseris glauca*)

Pale agoseris is a rare prairie plant of the jack pine landscape, occurring in grassy, savanna-like openings of the Pine Barrens. The plant is a member of the aster or composite family, and, in Michigan, it is mainly restricted to the jack pine plains of the northerner Lower Peninsula. This species, however, is common in the northern Great Plains, which is the main portion of its range. Thus, in Michigan this plant is considered a “disjunct” species (small populations occurring outside the normal range). Rough fescue, *Festuca scabrella*, also featured in the poster, is another rare disjunct that also occurs in the jack pine forest of the Lower Peninsula with pale agoseris. Both plants are excellent indicators of historic savanna-like openings.

ECOTOURISM: WATCHABLE WILDLIFE

The picturesque jack pine forests that cover the hills and valleys of northern Michigan offer many recreational opportunities. To introduce you to the jack pine nesting grounds of the endangered Kirtland’s warbler, we invite you to participate in an internationally acclaimed watchable wildlife viewing opportunity.

Join us in the historic northern Michigan communities of Grayling and Mio for this unique wildlife tour. Tour dates are usually May 15 through July 4. Please contact the chamber of commerce offices in these communities for more information.

The natural beauty of the area offers you and your family many enriching outdoor experiences: canoeing the world class Au Sable River, mushrooming, berry picking, hunting and fishing. Explore the jack pine forests that line the banks of the historic Au Sable River on the scenic McKinley Road near Mio. Enjoy birding—the black-backed woodpecker is an occasional visitor to this area, and the snags and old fence posts provide additional habitat for a variety of cavity nesters, including bluebird. Deer are common. Look for signs of bears, turkeys, coyotes, and badgers. Tracks are exciting to find. Visit the new Michigan Forest Visitor Center among the pines in the Hartwick Pines State Park near Grayling. Plan to spend more than a day in this beautiful northern Michigan area.

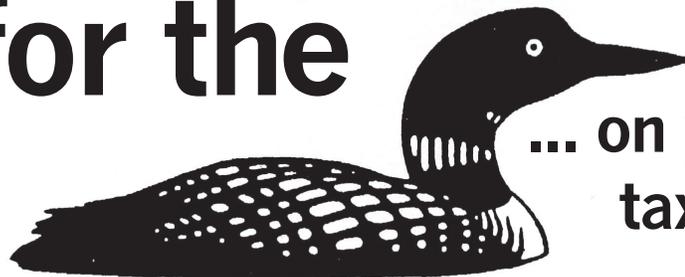
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Eve Rolandson, Project Coordinator

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- bring back trumpeter swans to Michigan's wetlands.
- provide school children with educational posters and teaching activities on Kirtland's warblers, gray wolves, raptors and bluebirds.
- provide information to landowners on protected Great Lakes plants.
- create watchable wildlife opportunities.
- offer tips on creating butterfly gardens, wildlife nest boxes and wildflower gardens.

For more information or to make a donation to this important wildlife program, contact: Michigan Department of Natural Resources, Nongame Wildlife Fund, P.O. Box 30180, Lansing, MI 48909-7680.

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