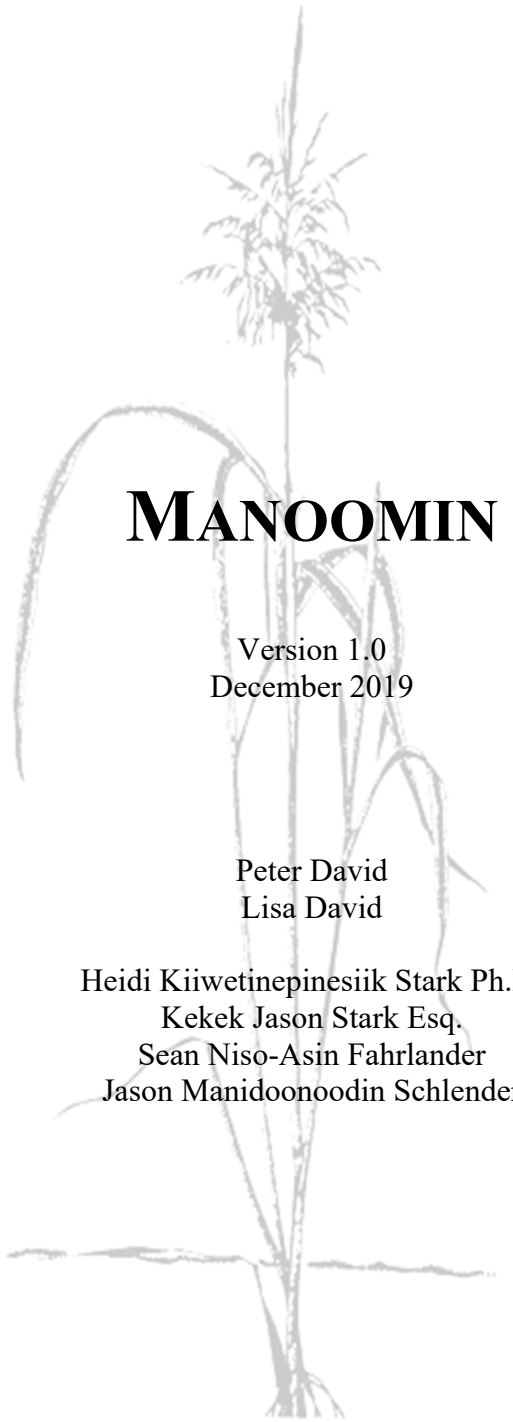

# MANOOMIN

Version 1.0
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## DEDICATION

*This document is dedicated to the elders, ricers, and especially the off-reservation rice chiefs who have shared their manoomin knowledge and insights with the authors over the years. The generous sharing from these knowledge holders provided the foundation and the framework for everything that follows.*

*Additionally, these knowledge holders have unfailingly recognized the contributions of those who came before them by sharing their knowledge and stories of manoomin as well.*

*It is therefore impossible to recognize all the individuals who contributed to this document in meaningful ways, but we recognize those who made extraordinary contributions, namely:*

| | | | |
|---|---|---|---|
| Joe Chosa | Lac du Flambeau | Roger McGeshick Sr. | Sokaogon Chippewa |
| Dewey Isham | Lac Courte Oreilles | James Peterson | Lac du Flambeau |
| Roger LaBine | Lac Vieux Desert | Brian Poupart | Lac du Flambeau |
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| Archie McGeshick | Lac Vieux Desert | William Wildcat | Lac du Flambeau |
| Peter McGeshick Jr. | Sokaogon Chippewa | | |

*A sincere Chi Miigwech for sharing your spirit, knowledge, dedication to and love of manoomin, and we ask your forgiveness for our failures to adequately capture your wisdom.*

*The Authors*


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# INTRODUCTION

*"Then Kitche Manitou made the plant beings. To each he gave a spirt of life, growth, healing and beauty. Each he placed where it would be most beneficial, and lend to earth the greatest beauty and harmony and order."*
Basil Johnston, Ojibway Heritage

**Figure 1. The gift of manoomin.**

*<u>Primary Goal</u>: to increase the health of the human/manoomin relationship, so that the generations yet to come will always know and be able to give thanks for the generosity of manoomin.*

Manoomin, like all plant beings, is part of the second order of creation (Figure 1). The rock, water, fire and wind created in the first order needed to be in place to create the space where manoomin belonged. Similarly, the animal beings created in the third order were dependent on what came before them. The product of the fourth order – humans – was, and remains, the most dependent being of all.

Today, manoomin remains dependent upon the creations of the first order, but it maintains relationships with beings from all orders of creation as well.

This document attempts to review the relationships manoomin holds with all orders of creation, and to examine in detail the relationship which exists between manoomin and humans.

# BEZHIG (1): Manoomin's Relationships with the Orders of Creation

## MANOOMIN – THE PLANTS AND WHERE THEY WERE PLACED

Manoomin, or wild rice, is the common name for plants in the genus *Zizania*. In Ojibwemowin, the name *Manoomin* is most often translated as "the good fruit" or "the good berry," but some have translated it to mean "Spirit delicacy." Globally, only four close relatives comprise the genus. Two are perennials: *Z. latifolia* is found in Asia and *Z. texana* is an endangered species found only in a single population in the San Marcos River in central Texas. The remaining two, *Z. palustris* and *Z. aquatica,* are both annual grasses whom Kitche Manitou placed only in eastern North America. *Z. palustris* is the plant commonly referred to as northern wild rice, and *Z. aquatica* as southern wild rice (Figure 2). While both of these species can be found in the treaty territories and both possess major ecological significance, most Anishinaabeg harvest is the gift of *Z. palustris*, and that being is the primary focus of this document.

**Figure 2. The original herbarium sample for *Zizania*. Image used with permission of the Linnean Society of London.**

Unfortunately, beyond the genus level, the taxonomy of wild rice has been clouded over time through differing interpretations of specific and varietal variation, and through inconsistent application of scientific nomenclature. Currently, most references consider both *Z. palustris* and *Z. aquatica* to consist of two varieties (*Z. palustris* varieties: *palustris* and *interior;* and *Z. aquatica* varieties: *aquatica* and *brevis*). However, because of the inconsistent application of scientific nomenclature, it is difficult to determine the historic distribution of the two species in the treaty territories using only the names used in older herbarium records. According to Juniper Sundance (personal communication) who studied *Zizania* distribution in Wisconsin, a few older herbarium vouchers have been examined and annotated with the current taxonomic name, but this has not been systematically done for the majority of the Wisconsin vouchers, and so these vouchers are best used only to provide insights to the collective distribution of the two species. The same situation likely exists in herbarium collections in other states.

However, collectively these vouchers indicate that manoomin once had a broad distribution in the 1837 and 1984 treaty territories. Eleven of the 12 counties which now have area within the Minnesota 1837 treaty territory have herbarium records within the University of Minnesota's Bell Museum, and the University of Wisconsin-Madison herbarium holds specimens for 26 of the 30 counties in the Wisconsin 1837 and 1842 treaty territories. The University of Michigan herbarium similarly documents presence in 4 of the 10 counties in the Michigan 1842 treaty territory. In addition, manoomin is believed to have at least some current presence in several treaty territory counties (such as Chisago in Minnesota, Iron and Dunn in Wisconsin, and Baraga in Michigan) currently lacking herbarium vouchers.

A substantial number of historical references to the plant also exist scattered in various records made by early European explorers to the area, under a wide host of names (see side bar). Collectively, this information suggests that while rice distribution in the treaty territories was limited to localized areas with suitable habitat, the entire area could be considered to be within the range of one of the two species. This is not surprising, since (as will be discussed later) the distribution of manoomin on the landscape greatly influenced the distribution of the Anishinaabeg.

***The Many Names of Manoomin***

Albert Ernest Jenks, in his Ph.D. thesis submitted to the University of Wisconsin in 1899, was one of the first to compile the many names that have been applied to manoomin, especially by early European explorers.

His list included, among others: American Rice, Blackbird Oats, Canadian Oats, Canadian Rice, False Oats, Indian Oats, Indian Rice, Mad Oats, Marsh Rice, Psin (the Dakota term) and many others.

In addition, the French term *Folle Avoine*, and the Ojibwe *Manoomin* appear with a wide variety of spelling variations. Thus, while historical references to rice are many, it can be difficult to search electronic versions of these documents for references to rice without knowing which term may have been used in each.

Finer definition of manoomin range to the species and varietal level, as mentioned above, currently remains clouded. While there is general consensus that the rice of northern Wisconsin, Minnesota, Michigan and adjacent Canada consists of northern wild rice (*Z. palustris*), and that which grows along the eastern seaboard, the Gulf of Mexico and St. Lawrence River is southern wild rice (*Z. aquatica*), confusion – and likely overlap – exists in other geographic areas. Manoomin in southern Wisconsin and Michigan, for example, has been classified as a variety of *Z. palustris* by some references and *Z. aquatica* by others. It appears that the vast majority of the manoomin in the 1837 and 1842 treaty territories is *Z. palustris*, but some stands of *Z. aquatica* likely also exist, especially in riverine habitats near the southern edge of the territories.

Efforts to document the current abundance and distribution of manoomin in the treaty territories have varied from state-to-state. Perhaps the best documentation available comes from the Wisconsin portion of the treaty territories, where intensive inventory efforts have identified over 356 locations with a known presence (Great Lakes Indian Fish and Wildlife Commission 2017). The best information on rice distribution in Minnesota, including the treaty territories, has been assembled by the Minnesota Pollution Control Agency (MPCA), as part of their evaluation of the state sulfate standard. After compiling various data sources, MPCA identified 162 waterbodies with some known or suspected manoomin presence within the Minnesota portion of the 1837 ceded territory.

Data are more limited for the Michigan portion of the 1842 treaty territory, despite this state having relatively low manoomin abundance. Approximately 20 waters in this area currently are known to support manoomin, with perhaps about a quarter of these being large enough to

provide appreciable human harvest. Some of these waters are the product of fairly recent seeding efforts, and their long-term success may not be certain; new waters may also be added to the list if current seeding efforts prove successful.

Although the emphasis of this document is on the 1837 and 1842 treaty territories, it is worth noting that better documentation of rice abundance is needed both within and outside of this focus area, since the health of manoomin stands within the treaty territories may be linked to and influenced by the health of stands elsewhere.

Regardless of scientific nomenclature, it is clear that manoomin plants display a great deal of phenotypic variation across their range. Relative to southern wild rice, the northern species is shorter (typically 2-6 feet above the water surface), less robust, and has the larger seeds that are of importance to human harvesters. Southern wild rice grows quite tall (5-8 feet above the water) with corn-stalk like stems, but produces a more slender seed. While southern wild rice is still an important plant to wildlife and thus wildlife stewards, it is rarely harvested by humans. Its range appears to be limited primarily to riverine habitats.

Many harvesters of northern wild rice differentiate between “lake” and “river” rice. In particular, they note that manoomin growing in riverine habitats tends to ripen earlier, be shorter, denser, and produces more but smaller seeds than rice growing in more lake-like habitats (Figure 3). However, these differences are less pronounced than the differences between northern and southern wild rice, and they may reflect responses to local growing conditions rather than genetic differences. However, the genetics of natural manoomin have been little studied and are poorly understood.

**Figure 3. The larger seeds on the left are more typically produced on lakes; the smaller seeds on the right are more commonly found on rivers.**

## MANOOMIN AND THE FIRST ORDER OF CREATION

*Manoomin's existence depends on the beings created in the first order of creation: rock, water, fire and wind.*

### *SEDIMENTS*

Manoomin grows best in soft, organic muck from several inches to several feet deep. However, rice appears to be fairly tolerant of this variable, and will grow on a wide variety of bottom types, including moderately sandy and semi-rocky types when other conditions are good. Manoomin is more likely to be found growing on firmer substrates in riverine than lake habitats. Although extremely flocculent or unconsolidated bottoms are unsuitable, moderately flocculent sites are a preferred habitat type, with manoomin being able to take hold in locations too soft for many other plants. Root development is typically extensive on soft sediments (Figure 4).

**Figure 4. Wild rice's root masses can help hold soft sediments together and keep nutrients in the sediment.**

One component of sediments clearly deleterious to manoomin at certain levels is sulfates or sulfides. While natural background environmental levels of sulfides rarely limit manoomin, it can become damaging when mining or waste water treatments elevate sulfate levels. (See the Threats section later in this document for further discussion.)

### *WATER*

In areas of generally suitable habitat, water characteristics such as depth, quality and flow tend to be the most significant factors affecting manoomin abundance. Manoomin requires flowing water (Figure 5). Examples of optimal locations include slow-flowing river meanders, flowages, and lakes that have inlets and outlets. The upper and lower thresholds for flow have not been precisely determined. Swift flow hinders plant development, and where plants are able to root in swift water, they sometimes are unable to advance beyond the submerged growth stage. At the other end of the spectrum, intermittent, seasonal flow may be adequate, but rice abundance may fluctuate more between years on these sites, or it may fail to persist altogether. On headwater lakes, water input from springs may substitute for flow supplied by inlets. On large lakes, flow may not be generally detectible, yet it remains of significance since manoomin

**Figure 5. Rice Creek provides the flow needed to support manoomin on Gary Lake, Oneida County, WI.**

has not been known to persist on land-locked waters, perhaps because the nutrient inputs that flow provides are lacking. In rare cases, high levels of ground water flow may substitute for surface water inlets and outlets.

Water depth is also critical. Manoomin in the treaty territories grows best in about 0.5-3 feet of water, with the middle of this range being optimal. Manoomin will grow in somewhat deeper water, especially on the outer edges of beds, but like plants growing in swiftly flowing water these plants lag in development, and often do not successfully produce seed. While they may provide protection to the bed behind them by absorbing and dampening large waves, beds are not usually sustainable at these depths without shallower areas behind them; robust manoomin beds generally have a significant portion of their area in the most optimal depths.

Of course, water levels rarely remain consistent over the growing season of the plant. Greater depths can be tolerated early in the spring, or for short periods at other times in the growing season. Drought may leave manoomin growing on mud flats or even relatively dry soil, but plants in this condition may be more likely to topple, or be stressed to the point of reduced seed production (Figure 6). Within a particular year, water levels that are relatively stable or decline gradually during the growing season are most favorable. However, it is equally important that water levels *not* be kept too stable over the long-term (multiple years). Long-term stability will tend to favor perennial vegetation over an annual like manoomin, which benefits from occasional hydrological/ecological disturbances, such as high or low water years, even though those same disturbances may have a negative impact on the rice in the short term.

**Figure 6. Although these plants superficially appear healthy, they are likely stressed by growing on mud flats. Photo provided by W. Hall, WDNR.**

Relatively clear water is preferred, as darkly stained water may limit sunlight penetration and hinder seed germination and early plant development. However, manoomin beds can be supported on moderately stained waters, particularly when water depths are on the lower side of the suitable range. The pH of most beds is in the 6.0-8.0 range. Most measures of pH on rice waters have consisted of single samples taken during the primary growing season; the possible impacts, if any, of seasonal variation in pH (such as acidity spikes following spring snow melt) are unknown.

### *FIRE*

Manoomin has a limited relationship with terrestrial fire, but of course is dependent upon the "fire" of the sun for growth.

### *Wind*

Wind plays a critical role in manoomin's continued existence and genetic make-up, carrying pollen from the plants' male flowers to the female (see life cycle below). However, excessive wind and associated waves may uproot or topple plants at other points in the life cycle.

### *Manoomin's Influence on the First Order of Creation*

While manoomin is clearly dependent upon and influenced by the first order of creation, it also influences the components of it as well. For example, manoomin's interactions with sediment and wind may provide benefits to the water.

Manoomin is capable of growing in sediments too soft for many aquatic plants. The large root masses manoomin develops at these locations (see Figure 4) help hold sediments together, and because of the slow decay of these roots, this benefit extends well beyond the growing season. The above-water portion of the plant slows the wind across the shallows where manoomin grows. Together, these attributes help keep nutrients in lake sediments, instead of allowing them to mix into the water column where they could contribute to algae blooms and related water quality problems. Although unproven, it is possible that the great attractiveness of manoomin to wildlife and humans could act to mine excessive nutrients out of wetlands when the nutritious seeds are harvested and transported out of the local water body.

### *Life Cycle*

The simplified life cycle of manoomin essentially depicts its relationship with the first order of creation. This annual aquatic grass goes through submerged, floating leaf and emergent stages in the course of its annual development (Figures 7 and 8).

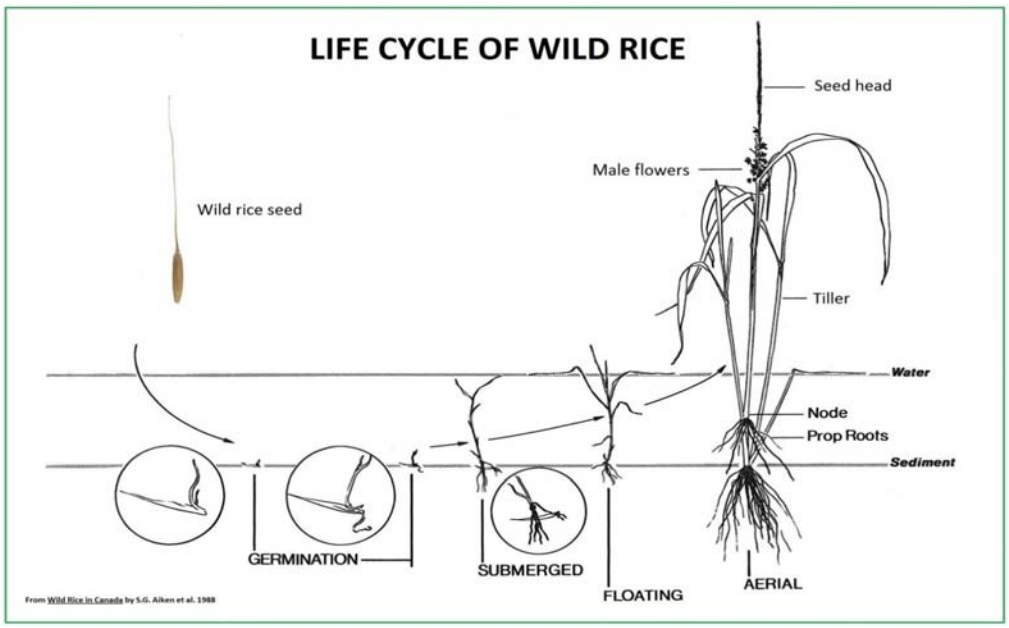


**Figure 7. The life cycle of manoomin, adapted from Wild Rice in Canada, A.G. Aiken, et al.**


**Figure 8. Seasonal variation of a manoomin water.**

Germination generally takes place in April. By mid-May submerged plants may be approximately 6-12" long. June is marked by plants passing through the floating-leaf stage. By the end of the month, the aerial shoots break the water's surface, and the plant becomes an emergent. The emergent stems will eventually reach a height of 2-6 feet above the surface. Plants may have a single emergent stem, or secondary stems (tillers) may develop. Tillering tends to be more pronounced in shallow water, and where plant density is low. Each stem will produce a flower head at its tip (if it is not browsed). The flowers begin to open in late-July, with the tiny, inconspicuous white female flowers at the top of a stem opening before the male flowers below them (Figures 9 and 10), to promote cross-pollination. However, self-pollination likely also occurs to an unknown degree on plants with multiple tillers, since tillers lag in development relative to the main stem. Some plants also reportedly have a small number of bi-sexual flowers in a transition zone between the female and male flowers (Liu et al. 1998).

**Figure 9. Female flowers.**

**Figure 10. Male flowers.**

Manoomin is wind pollinated. Although bees often gather pollen from the male flowers, they do not visit the female flowers, and are considered "pollen predators" (Terrell, Batra 1984). Very hot, calm weather may hinder pollination. The effective dispersal range of pollen is not well

understood, but some information suggests it may be fairly limited under typical conditions; one study even found genetic differences in the manoomin growing on the east and west ends of the very large rice bed found on Rice Lake on the Rice Lake National Wildlife Refuge. Nevertheless, except where mediated by human intervention, gene flow between manoomin populations is much more likely to be influenced by pollen dispersal than by seed dispersal, due to the very limited dispersal of seeds under most conditions.

Manoomin seeds generally begin to reach maturity in late-August or early-September, but maturation is quite variable. River beds tend to mature earlier than lake beds, shallow plants will ripen earlier than those in deeper water, "main stems" will ripen before tillers, and beds on harder bottoms may ripen before those on softer substrates. There is also individual site variation with some lakes or rivers consistently being earlier or later than others. Seeds on a single stem also ripen gradually, with those at the top ripening first. The length of time for a single head to mature likely varies with head length and the number of seeds produced, highly variable traits themselves. Thus, the total period of seed maturation may last approximately 2-4 weeks on a single water body, and 4-6 weeks across a region.

Mature seed drops from the stem, and generally buries into the sediment fairly close to the mother plant. The short, stiff hairs along the awn help drive the seed into the sediment. Seeds remain dormant over winter; if conditions for growth are unsuitable the following spring, they may remain dormant until a subsequent growing season. Just how many years seed remains viable is poorly documented; up to 5 years may be fairly common, and anecdotal reports suggest that much longer lengths – up to multiple decades – may occasionally occur under certain conditions. In any event, a particular year's stand of manoomin on a well-established bed has plants that grew from seeds that were deposited over a number of different years.

Natural seed dispersal is generally quite limited, except to spots lower in the watershed through flood events. The reason "river rice" tends to produce more but smaller seeds (see Figure 3), may be that this is a better evolutionary strategy in locations with a greater likelihood for seed dispersal, while lake environments favor the development of large seeds which may have a developmental advantage under the competitive conditions likely to exist in established beds.

On manoomin, the seed hulls fully form in an empty condition, and then are filled in by the developing seeds. Poor pollination, diseases, or other stresses can result in what harvesters refer to as "ghost rice" or empty hulls that never fill. However, it is possible that some reports of ghost rice originate simply when waters are picked before the plants have had adequate time to mature.

Because manoomin is an annual plant, it naturally varies in abundance from year-to-year, sometimes dramatically (Figure 11). Many tribal ricers contend that historically a typical four-year period was likely to have a boom year, a bust year, and a couple of middling years. Recent studies suggest that at least part of this variation results from nutrient cycling in manoomin beds. Manoomin straw and roots decompose slowly enough that the nutrients in them, especially nitrogen, are not available for the next growing season. Thus a good stand one year may result in a temporary nutrient shortage the following year (Walker et al. 2006). Riverine beds appear to fluctuate less from year-to-year, likely as a result of the regular addition of nutrients to these systems. However, nutrient cycling is only one variable that affects rice abundance in any given

year; water levels, spring temperatures, disease outbreaks and other factors may all influence fall abundance levels. Thus, while abundance varies greatly from year-to-year, beds do not usually cycle in abundance in a regular or predictable manner.

**Figure 11. Examples of annual abundance variation on Lower Dean Lake, Crow Wing County, MN.**

## MANOOMIN AND THE SECOND ORDER OF CREATION: THE PLANTS

We lack understanding of many of the relationships that exist between manoomin and other plant beings. Furthermore, the nature of those relationships may vary from place-to-place depending on the unique conditions that exist in each location.

The ability of manoomin to compete with other native vegetation depends on the suitability of the site for manoomin versus its suitability for the other aquatic plant species present. While manoomin rarely grows in monotypic stands, at optimal locations it may be the dominant plant present. Although manoomin waters usually have diverse plant communities with a mix of submersed and floating leaf plants, manoomin will often visually appear to be more dominant than it is because of its substantial above-water biomass late in the growing season, and the extent of other vegetation may only be apparent in years when the manoomin crop is poor (Figure 12). While it can be difficult to establish manoomin on sites with extensive, well-established vegetation without invoking an environmental disturbance of some sort, manoomin is also able to maintain its presence for decades or centuries in areas of high suitability that are subject to periodic natural or human-induced disturbances. Generally, manoomin's greatest competitors are perennial species, which can come to dominate areas where disturbances are naturally infrequent or have been reduced because of human alteration of hydrology.

**Figure 12. Other members of the plant community growing with rice may only be apparent when the manoomin crop fails (right).**

Manoomin's place in the world is also increasingly challenged when humans alter the natural distribution of plants on the landscape. (See Threats section later in this document.) Finally, while we often focus on the negative relationships manoomin may have with other plants, positive relationships also exist. On northwestern Ontario lakes over mineral soils, a positive relationship has been observed between *Potamogeton robbinsii* and wild rice, likely because the former adds organic matter to the sediment (Aiken et al. 1988). "Moose ears" or pickerel weed is often viewed as a competitor with wild rice, but in some situations it also appears to protect rice beds behind it by absorbing wind and wave action on the outer edges of rice beds.

## MANOOMIN AND THE THIRD ORDER OF CREATION: THE ANIMALS

For many people, manoomin is most recognized as a prized food for the fall-migrating waterfowl which feed on its highly nutritious seed. This attraction to waterfowl, long known and utilized by Native Americans, was also immediately recognized by early European explorers. Their journals hold many references to this new plant and the waterfowl they found teeming in its beds. Manoomin stands can produce well over 500 pounds of seed per acre under good conditions, and since only a small portion of this production is needed to maintain the bed, a great surplus is available for wildlife (and human) consumption. Becoming available at a time when many species are preparing for or actively migrating, manoomin beds are incredibly attractive to waterfowl and provide an important energy source at a critical time.

> *"... we came to a shallow lake where you could see water, but in the canoe tracks the wild oats were so thick that the Indians could scarcely get one of their small canoes into it, to gather it, and the wild ducks when they rose made a noise like thunder. We got as many of them as we choose, fat and good."*
>
> *Peter Pond, 1775*
> *Near Lake Butte des Mortes*

The range of depths suitable for manoomin growth ensures that seed is available to both dabbling and diving species. More than 15 species of wildlife listed in the Minnesota Department of Natural Resources (MNDNR) Comprehensive Wildlife Conservation Strategy as "species of greatest conservation need" use wild rice lakes as habitat for reproduction or foraging (Norrgard 2008). The Wisconsin All-Bird Conservation Plan lists wood duck, mallard, blue-winged teal, black duck, northern pintail, lesser scaup, redhead, canvasback, and ring-necked duck among the species that feed on wild rice (Kreitinger et al. 2013). The affinity of this last species for manoomin seed is perhaps the best documented; in the second week of October in 1994, over 1 million waterfowl were observed on Minnesota's massive Rice Lake National Wildlife Refuge (known as East Lake to many Mille Lacs members), with 600,000 being ring-necks. Coots, Canada geese, trumpeter and tundra swans, blackbirds and bobolinks also readily feed on rice in the fall. Rails, primarily soras but also Virginias, also heavily utilize manoomin beds for food and cover in autumn. The Ojibwe historical references to "rice birds" or manoominikeshiinh are believed to be referring to soras (Cooke 1884).

Less appreciated is the use of rice waters by migrant waterfowl in the spring. Because manoomin beds are invariably associated with flowing water, they tend to open up earlier than near-by stagnant waters. The rice seed bank, and the abundant invertebrate populations that typically exist at these sites, provides a critically important food source at this time of the year as well.

While rice does not become emergent early enough to provide appreciable nesting cover, it does provide excellent brood rearing cover for several species of ducks, Canada geese, and trumpeter swans. For the latter two species, manoomin provides not only habitat with high invertebrate populations for hatchlings, but also rich green forage important for developing young. A high proportion of the region's trumpeter swan population has been selecting rice waters for nesting and brood rearing. Sub-adult resident Canada geese and swans also feed heavily on manoomin in some areas – sometimes to a level that may be detrimental to the stand.

Wazhashk (muskrats) also forage heavily on the green tissue, and build houses from rice straw (Figure 13). Muskrat presence appears to enhance waterfowl use of some manoomin beds by creating openings in dense stands that are utilized by puddle ducks. Their houses are used as nesting sites by trumpeter swans and Canada geese, and as perching and feeding sites for eagles and herons and sunning areas for turtles. Many tribal members contend muskrats enhance rice beds by cultivating sediments, and feeding to a greater extent on plants with which manoomin competes.

**Figure 13. Muskrat houses are a common fixture in manoomin beds.**

Waawaashkeshi (white-tailed deer) (and the occasional mooz or moose) also forage on manoomin where it is available.

Black terns (State and Tribal Endangered status in Wisconsin; Species of Greatest Conservation Need in Minnesota, Species of Special Concern in Michigan) are another species which will nest in manoomin beds. They use rice directly as a nesting substrate, while the rich biotic communities associated with manoomin provide necessary food and cover.

All of the species which benefit from manoomin discussed thus far are relatively large, easily observed "mega-fauna," but undoubtedly the longer list of species which benefit from this plant is made up of less conspicuous species. For example, manoomin provides important nursery areas for young fish because of the cover it provides and the high invertebrate populations it supports. Many fishermen have discovered good fishing along the edges of manoomin beds, especially for bass, walleye, northern pike and panfish.

Documentation of the insect populations supported by rice, both above and below the water surface, has been little explored, except for those species considered pests to cultivated manoomin production. However, ricers are well aware that a canoe loaded with freshly picked seed invariably teems with spiders, small beetles, and "rice worms," the larval stage of the moth *Apamea apamiformis* (Figure 14), which lays its eggs in manoomin's female spikelets. During pollination, rice beds have also been known to literally hum with the sound of certain bee species which gather pollen (but which do not visit the female flowers, and thus do not act as pollinators).

**Figure 14. Rice worm moth, *Apamea apamiformis*, Baileys Harbor, Door County, WI. Photo provided by J. Stiefel.**

All of this biotic diversity in rice beds seems to build upon itself. Amphibian and small fish populations attract herons, loons and mink; ducks and fish attract the attention of eagles, osprey and other raptors. In short,

manoomin beds simply are places of high biological diversity and vibrancy.

Many other relationships exist between manoomin and other members of the third order of creation. While it is not clear if manoomin provides significant benefits to amik (beaver), it is clear that amik can greatly impact manoomin both positively and negatively depending on the local circumstances. Some species, such as carp may negatively impact manoomin while benefiting from rice. Relationships which negatively impact rice often seem to occur when humans move species beyond the areas Kitche Manitou placed them, or alter the natural landscape in ways that increase or decrease the populations of certain beings. (Also see Threats section.)

## MANOOMIN AND THE FOURTH ORDER OF CREATION: HUMANS

### *CULTURAL SIGNIFICANCE OVERVIEW*

It is probably difficult to find another member of the more-than-human world that has greater cultural significance to the Anishinaabeg than manoomin. While this document cannot begin to fully capture this significance, much of the information included in it is placed in a more meaningful context by framing it within a cultural perspective.

### *A CULTURE OF MANOOMIN*

In her introduction to "Natural Wild Rice in Minnesota," Erma Vizenor, former Chairwoman of the White Earth Nation, provides one review of the cultural significance of manoomin, drawing on her own experience as well the thoughts of Basil Johnston, Joe LaGarde and Thomas Vennum:

> *"Wild rice, or manoomin, is a sacred food and medicine integral to the religion, culture, livelihood, and identity of the Anishinaabeg.*
>
> *In our Ojibwe language, manoomin is animate, grammatically referred to as "him/her" not "it," a non-human being, not just an inanimate "resource." It is both difficult and of utmost importance to adequately translate and appreciate this worldview in the language of mainstream culture and society with its scientific advisory boards for the study of humans and animals but not plants. According to Anishinaabe author, Basil Johnston, "... in essence each plant ... was a composite being, possessing an incorporeal substance, its own unique soul-spirit. It was the vitalizing substance that gave to its physical form growth, and self-healing."*
>
> *Our ceremonies and aadizookanag – sacred stories – also tell of our people's relations with this plant. White Earth Anishinaabe, Joe LaGarde, notes that wild rice and water are the only two things required at every ceremony. Manoomin accompanies our celebrations, mourning, initiations, and feasts, as both a food and a spiritual presence. It holds special significance in traditional stories, which are only told during ricing time or when the ground is frozen. 'In these stories, wild rice is a crucial element in the realm of the supernaturals and in their interactions with animals and humans; these legends explain the origin of wild rice and recount its discovery ...' by Wenabozho, or Nenabozho, the principal manidoo or spirit in our sacred aadizookanag."*
>
> *Manoomin is just as central to our future survival as our past. While we try to overcome tremendous obstacles to our collective health, the sacred food of manoomin is both food and medicine. "Wild rice is consequently a very special gift, with medicinal as well as nutritional values – a belief reflected in the Ojibway use of wild rice as a food to promote recovery from sickness as well as*

*for ceremonial feasts"* (Vennum 1988). *Manoomin is inextricably bound to the religion and identity of the Anishinaabeg.*

*Joe LaGarde puts it plainly, "If we lose our rice, we won't exist as a people for long. We'll be done too.""*

### *THE DISCOVERY OF MANOOMIN*

Revered as a special gift from the Creator, the Anishinaabeg special tie to manoomin is also demonstrated in the following stories relating the discovery of manoomin:

Ogii-pabaamendaan ge-miijinid iniw anishinaaben biboooninig a'aw Wenabozho. Ginwenzh gii-kagwaadagitoowag ongow anishinaabeg onzaam gii-pangiiwad omiijimiwaan. Ogii-inenimaan iniw anishinaaben da-gagwaadagitoosinid geyaabi a'aw Wenabozho gaa-onji-gii'igoshimod niiyogon wiigiwaaming.

*Wenabozho was worried about what his people would eat during the long winter months. For several winters there had been very little food and the people had suffered. Wenabozho wanted to put a stop to the suffering, so he went into the woods and fasted for four days in a wigwam.*

Niiyogonagak gii-maajiiyosed (ginwenzh gii-pabaamosed) ogii-naanaagadawenimaan iniw wiijanishinaaben ge-izhi-gawanaandansinid.

*On the fourth day he started on a long walk, and as he walked, he thought about how to keep his people from starving.*

Geyaabi gii-pabaamose biinish dagoshing ziibiing. Aniishnaa gii-ayekozi. Gii-kawishimo imaa da-anwebid gaa-izhi-ani-nibaad.

*He continued walking until he came to the edge of a river. By that time, he was very tired, so he lay down to rest and fell asleep.*

Gii-koshkozi ishpi-dibikak waabamaad iniw Dibiki-giizisoon ishpi-giizhigong egoojinid. Gii-chiigeweyaazhagaame gaa-izhi-waabamaad aya'aan nibiikaang naaminid. Gii-inendam gaa-waabandang miigwani-wiiwakwaanan ininiwan baazikaminid.

*Wenabozho awoke late in the night when the moon was high in the sky. He walked along the edge of the river and saw what looked like dancers in the water. Wenabozho thought he saw the feathers of the headdresses worn by Ojibwe men.*

Ogii-nazikawaan gaaizhi-gagwejimaad giishpin ge-niimid gaye wiin. Gii-chi-niimi a'aw Wenabozho biinish ayekozid. Gii-kawishimo gaa-izhi-nibaad miinawaa. Gii-anwaatin gigizheb goshkozid. Gii-inendam ganabaj gaa-bawaanaad iniw naaminijin.

*He walked a little closer and asked if he could dance along. He danced and danced until he grew tired. He lay down and fell asleep again. The next morning when he awoke everything was calm. Wenabozho remembered the dancers but thought it all had been a dream.*

Gii-inaadagaazii gaa-izhi-waabandang gegoo egoodenig. Aanind onow miinikaanensan ogii-mamaan izhiwidood owiigiwaaming.

*Then he looked out at the tassels waving above the water. He waded out and found long seeds that hung from these tassels. He gathered some of these seeds in the palm of his hand and carried them with him back to his wigwam.*

Mii imaa gaa-aanike-gii'igoshimod. Geget miinawaa gii-ani-ayekozi gaa-izhi-nibaad. Nibaad dash gii-pawaajige. Ogii-pi-gikendaan gaa-mamood manoomin da-miijid. Ogii-kojipidaan i'iw manoomin. Geget ogii-minopidaan.

*There he continued fasting. Once again he grew tired and fell asleep, and as he slept, he had a vision. In the vision he learned that he had gathered wild rice and that it was to be eaten. He tasted the rice and found that it was good.*

Gii-zhegiiwe da-dibaajimotawaad iniw anishinaaben i'iw manoomin. Gii-maamawi-manoominikewag da-de-wiisiniwaad ani-biboonig.

*Wenabozho returned to the village and told his people about the rice. Together, they harvested enough to provide food for the long winter* [Manoomin, Wild Rice**.** Gaa-azhe-dibaadodamowaad. An Ojibwe legend retold by Heather Cardinal and Becky Maki. Translated and transcribed by Gimiwan (Burnette)].

Another story depicting the discovery of manoomin is as follows:

Wenabozho dibaajimaa gaa-izhi-waabanda'igod manoomin iniw zhiishiiban, Anishinaabe enaajimod.

*As the Anishinaabeg Ojibwe tell the story, Wenabozho, the cultural hero of the Anishinaabeg, was introduced to wild rice by fortune, and by a duck.*

Ingoding gii-azhe-giiwe a'aw Wenabozho giizhi-giiyosed, gaawiin dash awiiya ogii-ayaawaasiin. Ani-naazikang ishkode ogii-waabamaan zhiishiiban namadabinid okaadakikong dazhi-ondeg.

*One evening Wenabozho returned from hunting, but he had no game. As he came towards his fire, there was a duck sitting on the edge of his kettle of boiling water.*

Baanimaa animisenid iniw zhiishiiban gii-piinzaabi okaadakikong a'aw Wenabozho wayaabandang manoomin agwandeg. Gaawiin ogii-

nisidawinanziin. Ogii-miijin i'iw okookaakakikong eteg. Ogii-maamo-minopidaan i'iw naboob apiich dash akina ishkweyaang gaa-kojipidang.

*After the duck flew away, Wenabozho looked into the kettle and found wild rice floating upon the water, but he did not know what it was. He ate his supper from the kettle, and it was the best soup he had ever tasted.*

Mii dash gaa-izhi-gagwe mikan i'iw miijim gaa-mikang a'aw Zhiishiib gaa-ashamd. Baanamaa aanind gonagakin, Nenabozho gii-bakade. Nenabozho ogii-bimizha'aanan ingiw Zhiishiibag biinish dagoshiwag iwidi zaaga'iganing. Ogii-mikaan gitigaanan imaa zaaga'iganing. 'Gidaa-miijin niinawind' gaa-ikidowag ingiw gitigaanan.' Ni-chi-wiingipogozimin.' Omiijinan, Nenabozho ogii-nisidawanaan I'iw miijim gaa-miinaad a'aw Zhiishiib. "Aaniin ezhinikaazoyeg," Nenabozho gaa-kagwejimaag ingiw gitigaansan. "Manoomin indizhinikaazomin, Nenabozho," ingiw manoomin manidoog imaa aadazookaanag gaa-nakwetaagewaad.

*Later, Wenabozho set out to find the food that Zhiishiib (duck) had served him. After several days, Wenabozho, hungry, followed a flock of ducks to a lake. He found tall, slender plants growing from the water. "Eat us, Wenabozho," the plants said. "We're good to eat." Eating some, he realized it was the food Zhiishiib had given him. "What do you call yourselves," Wenabozho asked the beautiful plants. "We are called manoomin, Wenabozho," the manoomin manidoog (spirit) in the aadizookaanag answered.*

Niigaan ogii-kikendaan geget ge-dazhi-mikang miijim mizhodansig giiyosed.

*After that, when Wenabozho did not kill a deer, he knew where to find food to eat.* [The Wild Rice Moon. Manoominike-giizis - Gaa-pi-izhi-mikang manoomin a'aw Anishinaabe. An Ojibwe legend about the discovery of wild rice. Translated and transcribed by Gimiwan (Dustin Burnette) and Animikiins (Animikiins Stark)].

### *MIGRATION OF THE ANISHINAABE*

Manoomin also is central in the story of the Anishinaabeg migration from the east:

Erma Vizenor, former Chairwoman of the White Earth Nation, introduces the migration story of the Anishinaabe as follows: "According to our sacred migration story, in the long ago a prophet at the third of seven fires beheld a vision from the Creator calling the Anishinaabe to move west (to a land previously occupied long ago) until they found the place "where food grows on the water." The Anishinaabeg of the upper Mississippi and western Great Lakes have for generations understood their connection to Anishinaabe Akiing (the land of the people) in terms of the presence of this plant as a gift from the Creator. In the words of White Earth Tribal Historian Andy Favorite, 'Wild rice is part of our prophecy, our process of being human, our process of being Anishinaabe ... we are here because of the wild rice. We are living a prophecy fulfilled.'" (Vizenor 2008).

Gii-apiitendaagozi a'aw miigis gaa-pi-aanjigozid iwidi Gichigami-ziibiing a'aw Anishinaabe. Anishinaabeg odebweyenimaawaan iniw miigisan gii-pi-naagoziwan endaso-noogishkaawaad i'iw apii bi-aanjigoziwaad.

*For the Anishinaabe, the Miigis Shell played an important role in their migration from the St. Lawrence Seaway area. According to the Ojibwe, each major stopping point during the Anishinaabe migration would be marked by the appearance of the Sacred Miigis Shell.*

Ongow Anishinaabeg ogii-piminizha'aawaan iniw miigisan. Mii iw gaa-izhi-dagoshinowaad eteg wiisiniwin imaa nibiikaang.

*The Anishinaabe people were to follow the direction of the Miigis Shell and by doing so would find their final destination; a place identifiable because it was where "food grows on water."*

Niibowa daswaak dasobiboon ogii-piminizha'aawaan iniw miigisan bi-naagozinid. Geget gii-izhiwinaawag gaa-maanazaadiikaang gaa-izhi-mikamowaad manoomin zayaagiging nibiikaang.

*After centuries of following the Sacred Miigis Shell's appearance, the Anishinaabe were eventually led to Northern Minnesota where they found manoomin (wild rice) growing on water.* [The Migration Story: In search of wild rice. *Ayanjigozing, Manoomin Nandawaabanjigaadeg.* As translated and transcribed by Gimiwan (Dustin Burnette)].

As a result, the Anishinaabeg consider this region a spiritual homeland, and manoomin a sacred gift – and medicine – from the Creator (Ackley 1999). Manoomin is a cultural centerpiece interwoven in the lives of the people. Manoomin is harvested not only for the benefits provided, but also because *not* harvesting would show a lack of appreciation for this gift, and disrespect for the Creator.

In addition, by accepting this gift from the Creator, and from manoomin itself, the Anishinaabe have entered into a relationship with manoomin which entails correlative duties and responsibilities to the sacred plant.

## NUTRITIONAL VALUE

Part of manoomin's great cultural significance is tied to its remarkable nutritive qualities. The "food that grows on water" not only marked the chosen land of the Anishinaabe, but also provided for the people richly. Manoomin seeds (the only part of the plant harvested and consumed by humans) are an excellent source of complex carbohydrates, vitamins, minerals, fiber and protein, while being low in fat and cholesterol (see side bar) (Great Lakes Indian Fish and Wildlife Commission 2010). Wild rice is a particularly good source of potassium, zinc and riboflavin. Manoomin was more nutritious on the whole than any other vegetable, grain, animal or fruit available for the traditional diet (Vennum 1988).

Prior to European settlement of the western Great Lakes, natural wild rice was the most important grain available to native peoples, early explorers, and fur traders (Vennum 1988). While rice harvesting and finishing was a labor intensive undertaking, manoomin was often seasonally available in substantial abundance, and could be preserved for utilization year-round, when other foods were difficult to obtain. Properly finished, and stored in clean, dry conditions, uncooked wild rice has an estimated shelf life of up to 10 years, and one pound can yield up to ten and a half cups of cooked wild rice (Oelke 2007).

The significance of this nutritive abundance was great. Albert Jenks, writing in 1901 about the region rich in wild rice, concluded "The Indian diet of this grain, combined with maple sugar and with bison, deer and other meats, was probably richer than that of the average American family of today." (Jenks 1901).

Bebakaan iko inizekwewag ozhitoowaad iw manoomin. Aanind wiiyaas odagozaanaawaa. Miinawaa aanind miinan odagonaanaawaa imaa manoomining. Gizhideg minopogwad miinawaa ge daki-ayaag minopogwad. Manido gimiinigonaan i`iw manoomin da-miijiyang. Geget, ga-minokaagon i`iw manoomin miijiyan apane. Gego awiiya oga-baapinandanziin i`iw manoomin.

*They cook up rice in different ways to make it. Some cook it with meat. And some add berries into the wild rice. It tastes good hot or cold. The Creator gave us that wild rice to eat. That wild rice is good for you when you eat it all the time. Don't take that wild rice for granted.*

**The Nutrition of Manoomin**

Serving size: 1 cup cooked. Percent Daily Value based on a 2,000 calorie diet. Calories: 166; calories from fat: 5

| | | |
|---|---|---|
| Total fat | 1g | 1% |
| Saturated fat | 0g | 0% |
| Cholesterol | 0mg | 0% |
| Sodium | 5mg | 0% |
| Total Carbohydrate | 35g | 12% |
| Dietary Fiber | 3g | 12% |
| Protein | 7g | 13% |
| Vitamins | | |
| Thiamin | | 6% |
| Riboflavin | | 8% |
| Niacin | | 11% |
| B6 | | 11% |
| Folate | | 11% |
| Minerals | | |
| Iron | | 5% |
| Manganese | | 23% |
| Magnesium | | 13% |
| Phosphorus | | 13% |
| Potassium | | 5% |
| Zinc | | 15% |
| Copper | | 10% |

The loss of traditional ricing areas and the access to the nutritional components they contained often resulted in the people suffering as healthy spiritual food was replaced by non-traditional, less nourishing commodities.

## Manoomin as a Foundation for Other Subsistence Harvests

Another Ojibwemowin term for rice beds is *Manito Gitigaan*, or the Great Spirit's Garden. Among the layers of meaning in this term is the implication of the great variety of non-human beings commonly associated with manoomin. In the same way that manoomin provided for the Anishinaabe, rice also provided nutrition, cover and habitat for a wide array of other beings (see Manoomin and the Third Order of Creation above), many of whom the people also depended upon. As such, manoomin was fundamentally linked to the abundance and harvest of other important subsistence resources.

These links were captured in testimony taken from Lac Courte Oreilles members nearly a century ago, who were questioned about what losses they might experience if the Chippewa Flowage was created. First, they discussed the loss of the rice itself (which would be flooded out), equating it culturally to the non-Indians' use of bread. They went on to discuss the loss of waterfowl harvest that would take place, the decline in furbearer harvest, and even the loss in fish harvest, noting the manoomin beds were the source for all of these subsistence needs. The Anishinaabe world view was markedly shaped by their awareness of these kinds of interconnections in nature. (See *A Story of Loss*, page 52).

## Economic Significance

As a dietary staple that was easily stored and used, manoomin had considerable economic value (Norrgard 2008). Long a trade item, wild rice rapidly came to be a critical staple for the first Europeans who ventured into the region. References to the plant are peppered throughout historical records, appearing within the oldest documents and surveyors' notes. This contact undoubtedly elevated the significance of rice as a trade good, as manoomin became a mainstay for the fur-trapping industry.

Zebulon Pike (as referenced in Coues 1895) for example, writing about the Northwest Company's outposts in Minnesota in the early 1800's, wrote of a store of 500 bushels of wild rice at Leech Lake. Regarding the nearby Sandy Lake post he noted:

> *"They raise plenty of Irish potatoes, catch pike, suckers, pickerel, and white-fish in abundance. They have also beaver, deer, and moose; but the provision they chiefly depend upon is wild oats, of which they purchase great quantities from the [natives], giving at the rate of about one dollar and a half per bushel."*

Another reference indicates that twelve to fifteen hundred bushels of manoomin were purchased by the company annually in that region. An 1820 article in the Detroit Gazette about this same area read, "The fish and the wild rice are the chief sustenance of the traders, and without them the trade could scarcely be carried on." (Jenks 1901).

The economic significance of manoomin did not end with the conclusion of the fur era. Many elders relate stories of the opportunity to buy new shoes and clothes for the school year, or other necessities, that the annual manoomin harvest provided. Although clouded by competition with

cultivated wild rice today, natural manoomin still continues to provide significant economic benefits to some Anishinaabeg.

## Other Health Benefits

The gifts manoomin provides extend even beyond the areas already discussed. Wild rice is central to Anishinaabe identity, and there is a growing appreciation that the health of indigenous individuals and communities is enhanced through active participation in cultural practices and traditions (Ballinger 2018, Fond du Lac Band 2018). Harvesting rice is a healthy, physical activity that builds social relations as well as connections to the land and community. Harvesting reinforces cultural identity while enhancing food security. The gifts of manoomin are many, and the loss of manoomin is felt in many ways.

## The Contemporary Relationship Between Humans and Manoomin

While the traditional relationship of human dependency upon the earlier orders of creation still exists, that relationship is not consistently acknowledged. Many tribal and non-tribal individuals value manoomin, are thankful for rice, and embrace the responsibility to care for a being which cares so much for us. At the same time, others don't recognize the gifts of manoomin and intentionally or unintentionally negatively impact manoomin.

Four other aspects of the relationship between manoomin and the fourth order of creation are examined in greater detail in the following chapters.

## NIIZH (2): Fourth Order Relationships: Legal Frameworks

Contemporary stewardship of manoomin in the treaty territories is interwoven in the treaties themselves and in the court cases which reaffirmed and defined treaty rights. A broad review of the court cases that affect the implementation of treaty territory rights can be found in the preface to this chapter; here we will review the particularly significant role of manoomin in the treaties, and summarize the details of manoomin regulation and management agreements that stemmed from these court cases.

### Explicit Reservation of Manoomin

When the Anishinaabe entered into treaties with the United States government, the protection of, and access to rice beds was a paramount concern. Article 5 of the Treaty of 1837 reads: "The privilege of hunting, fishing, and *gathering the wild rice*, upon the lands, the rivers and the lakes included in the territory ceded, is guaranteed to the Indians, during the pleasure of the President of the United States." Manoomin is the only more-than-human being specifically mentioned in that treaty. Later, when negotiations were underway for the establishment of reservations, a petition from the head chiefs of the tribe dated February 7, 1849, read: "That our people… desire a donation of twenty-four sections of land, covering the graves of our fathers, our sugar orchards, *and our rice lakes and rivers*, at seven different places now occupied by us as villages…." Many of the lines that mark the boundaries of Ojibwe reservations on contemporary maps still reflect the consideration and eventual (at least partial) accommodation of this request, as many reservations were sited to include or have frontage on significant manoomin waters.

### Treaty Reserved Rights Recognition and Affirmation

In treaties signed in 1837 and 1842 (Treaty of 1842, 7 Stat. 591) [as well as in 1836 (Treaty of 1836, 7 Stat. 491) and 1854 (Treaty of 1854, 10 Stat. 1109)], the Anishinaabe reserved hunting, fishing and gathering rights in the areas (land and water) ceded to the United States. It must be emphasized that these treaty territory rights were not given or granted by the United States, but were ones tribes previously had and specifically retained in the treaty.

The exercise of these rights was and continues to be fundamental to the Anishinaabe way of life, and explains the tribes' insistence on explicitly reserving them in the treaties. The bands share a traditional and continuing reliance upon fish, wildlife, manoomin and other plants to meet their religious, ceremonial, medicinal, subsistence and economic needs. Therefore, to maintain this lifeway and meet these needs, the tribes reserved the rights to hunt, fish and gather in the treaty territories. In affirming the treaty rights of Great Lakes Indian Fish and Wildlife Commission (GLIFWC) member tribes, the courts took a "snapshot" of Ojibwe life at treaty times in order to determine the nature and extent of the rights that were reserved. In reaching their decisions, the courts made extensive findings on the Ojibwe's extensive knowledge and use of natural resources where each species played a role in supporting some part of the Ojibwe's lifeway and constituted the essence of Ojibwe culture. (See, e.g. *LCO III).* This reservation of aboriginal rights is part of the ongoing struggle of the Anishinaabe to maintain a culture, a way of life and a set of deeply held values that is best understood in terms of the bands' relationship to *Aki* (earth) and the circle of the seasons.

Although the bands never doubted the continued existence and viability of these rights, other governments did. The bands' efforts to gain recognition and re-affirmation of their treaty reserved rights have been the subject of numerous court cases over the past forty years. Courts, including the Supreme Court in its *Minnesota v. Mille Lacs* ruling in 1999, have consistently recognized and upheld these rights.

However, not all aspects of treaty rights affirmation and implementation have been the subject of contentious court proceedings. When the parties were able to agree on at least some aspects of treaty rights affirmation and/or implementation, they entered into stipulations to resolve certain issues. All manoomin related issues addressed by the courts were settled by mutual stipulation.

In considering these stipulations, it is important to recall that the treaties represent a reservation of rights by each tribe individually, but also by all the signatory tribes collectively. Each band regulates its members in the treaty exercise; however, the rights are also shared inter-tribally. This means that tribes must jointly address various issues related to manoomin stewardship. Implementation of this intertribal coordination is addressed in the document titled *"Chippewa Intertribal Agreement Governing Resource Management and Regulation of Off-Reservation Treaty Rights in the Ceded Territory"* (Appendix A).

Additionally, in addressing how the bands can preempt state regulation of their treaty territory rights, courts have said that the tribes must be able to effectively regulate themselves and address legitimate state conservation, health and safety interests (*LCO IV*). This involves another aspect of co-management: communication and coordination with non-tribal governments that exercise management authority within the ceded territory. The Great Lakes Indian Fish and Wildlife Commission was created by its member tribes in part to help fulfill these self-regulatory requirements.

## Treaty Territory Manoomin Self-Regulatory System: The Manoomin Provisions

The specific legal underpinnings to the contemporary exercise of ceded territory manoomin harvest and stewardship can be found in the manoomin stipulation (in Wisconsin), tribal model codes, and related documents. These documents vary to some degree between the various court cases, and as a result, regulations vary in different areas of the treaty territory, following state lines.

### Wisconsin

#### *Stipulation and Consent Decree in Regard to the Tribal Harvest of Wild Rice: Lac Courte Oreilles Band v. Wisconsin*

Manoomin harvest and stewardship issues in the *LCO* case (often referred to as the *Voigt Decision)* can be found in the Stipulation for the Wild Rice Trial, hereafter referred to as the wild rice stipulation.

The tribes' strong interest in protecting manoomin is incorporated in the wild rice stipulation. The stipulation consists of three primary sections summarizing the biology of manoomin, tribal enforcement capabilities and the preemption of state law, and the management of manoomin (Appendix B). The management section of the stipulation is of particular significance. Among the provisions of this section are an agreement by the state to consult with the tribes' Voigt Intertribal Task Force:

> before the issuance of any permit which is required to be obtained from the state regarding any activity which may reasonably be expected to directly affect the abundance or habitat of wild rice in the ceded territory (Stipulation for Wild Rice Trail C.1.).

This stipulation also establishes a "Wild Rice Management Committee" and assigns it a number of purposes including: a) evaluating necessary regulatory changes from a technical perspective for recommendation to the parties; b) establishing a shared database regarding wild rice habitat, abundance and harvest, including maintaining a wild rice inventory; c) maintaining harvest data; d) exchanging information, including historical data; e) developing guidelines and objectives for the protection and enhancement of wild rice for recommendation to the parties, including establishing wild rice abundance objectives; f) establishing guidelines for reseeding projects; g) examining the impact of water flow alteration or diversion on wild rice beds; and h) considering and making recommendations on any other matter which may affect wild rice abundance, habitat or harvest or which specifically is referred to the committee by any party (Wild Rice Consent Decree).

The Wild Rice Management Committee is composed of biologists of the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) and the Wisconsin Department of Natural Resources (WDNR), plus any representative or expert of any party (Wild Rice Consent Decree Section C.3.). The Committee is required to meet on a regular basis, but in no case less than once per year. GLIFWC is responsible for calling meetings, providing minutes, and following through on committee actions. The Committee is required to make all reasonable efforts to reach consensus on any decision or recommendation (Wild Rice Consent Decree Section C.4.). The parties retained the right to follow or not follow the recommendations of the Committee and to challenge any action taken by another party (Wild Rice Consent Decree Section C.5.).

In this stipulation, the bands agreed to amend the *Voigt Intertribal Task Force Protocol on Manoominikewin (Wild Rice Harvest) Levels* (Appendix C) so that it does not purport to allow for the establishment of an exclusive tribal manoomin harvest on any waters of the state (Wild Rice Consent Decree Section C.6.). Although the bands reserved their rights to pursue such a claim in a later proceeding, to-date they have not, and currently both state and tribal licensees enjoy equal access opportunities to harvest manoomin from the natural navigable lakes and other public waters in the ceded territory (Wild Rice Consent Decree Section C.6.). (Note that under Wisconsin state law, the beds of natural navigable lakes are considered public but the beds of rivers or flowages are generally considered owned by the riparian landowner, and so may be public or private. In addition, since the *LCO* case was between the state and the tribes, it did not address wild rice harvesting on federal lands, over which the state has no jurisdiction.)

### *VOIGT INTERTRIBAL TASK FORCE PROTOCOL ON MANOOMINIKEWIN (WILD RICE HARVEST) LEVELS*

A portion of Wild Rice Stipulation provides for annually regulating the opening of certain wild rice waters for harvesting. The particular waters to which this provision applies are listed in *Voigt Intertribal Task Force Protocol on Manoominikewin (Wild Rice Harvest) Levels* (Appendix C). In the stipulation, the parties agreed to open these waters concurrently, with consultation between tribal Wild Rice Authorities and WDNR managers (Wild Rice Consent Decree Section C.7.). Wild rice waters not listed in the Protocol do not have a closed season, thus on those sites individual harvesters make the determination of whether the rice is mature enough to harvest.

The *Manoominikewin Protocol* (as modified 08/02/07) lists fifty-three (53) off-reservation waterbodies that are date-regulated (Appendix C, Section 2). One significant provision of this protocol is the ability of the bands to amend the list of date-regulated waterbodies by adding additional waters upon the recommendation of the Biological Services Division of GLIFWC (Appendix C, Section 3). However, while the tribes can easily add waters to the list and place this additional restriction on tribal members, the state process is more complex, taking several years to complete. Since the stipulation was signed in 1989, neither the state nor the tribes have modified the stipulated list of date-regulated lakes, although prior to 1989, the state regularly modified the list of waters it regulated.

Although the stipulation indicates that the decision to open date-regulated lakes is to be made jointly by a WDNR representative and a tribal representative (who is generally referred to by the traditional title of *Rice Chief),* in application local agreements have frequently been made between local tribal and state designees which allow one party greater control of the opening decision. Furthermore, during interim negotiations conducted in 1985, it was agreed that either party could open a lake without consultation if: a) either party made good faith repeated efforts to contact the other's delegate for 24 hours; or b) if either party had failed to respond to messages for 24 hours; or c) if either party had failed to appear at a site following meeting arrangements. This agreement has continued in practice, although it is not part of the final wild rice stipulation from the *LCO* case.

The *Manoominikewin Protocol* also includes several other provisions which, in hindsight, have proven inappropriate (such as the inclusion of some on-reservation waters) or unnecessary. It also includes several factual errors, such as listing the wrong name for a particular lake. This protocol would benefit from revision.

### *MODEL CODE*

The specific regulations that apply to tribal members harvesting off-reservation can be found in the model code adopted in the *LCO v Wisconsin* (*Voigt*) litigation (see GLIFWC website at www.glifwc.org). Individual tribal codes can be more restrictive, but not more liberal, than the model code. At this time, none of the codes actually adopted by individual tribes are believed to be more restrictive than the model code in regards to ricing regulations. These harvesting regulations are discussed in more detail in Niswi (3).

### *Other Matters Pertaining to Manoomin in Wisconsin*

In Wisconsin, designated wild rice waters carry the designation of being an "area of special natural resource interest" and receive additional consideration under certain regulated activities.

Pursuant to Wis. Stat. 30.01(1am)(d), wild rice waters in the state are to be identified in a written agreement between the WDNR and GLIFWC and shown on a map published on the department's internet site. However, this has never formally been done. WDNR and GLIFWC worked jointly to identify wild rice waters in the Wisconsin portion of the treaty territory, but these findings have never been formally agreed to, nor have the parties agreed to a methodology to use to update the list as new waters are established or discovered. Finally, efforts to inventory wild rice waters outside the treaty territory in Wisconsin have never been completed.

In 2014, after the WDNR declined to endorse a cooperative manoomin stewardship plan that had been jointly developed between the state and GLIFWC, the WDNR established its own wild rice advisory committee, outside of the State/Tribal Wild Rice Management Committee established by *LCO v Wisconsin*. GLIFWC has one position on the state committee; there is no other tribal representation on the state's committee.

One of the first charges given to the state committee was the development of a state wild rice management plan. As of January 2019, the state was working on developing its plan but no drafts have been released for tribal or public comment. GLIFWC is hopeful that the state's efforts will result in a greater commitment by the state to wild rice stewardship statewide. However, it will be important that the state advisory committee does not attempt to usurp the functions of the State/Tribal Wild Rice Management Committee agreed to in the wild rice stipulation.

## Minnesota

The reaffirmation of treaty territory rights in Minnesota was confirmed in a separate federal court case known as *Minnesota v. Mille Lacs Band*. This process was distinct from the *LCO* case in Wisconsin, and a number of differences exist in tribal regulations between the two states.

The *Mille Lacs* decisions approved a number of protocols that govern ongoing management and regulatory relationships to establish binding mechanisms for intertribal co-management in the Minnesota 1837 treaty territory in the same way as the Chippewa Intertribal Agreement and Voigt Intertribal Task Force Harvest Declaration Protocols operate in the Wisconsin portion of the 1837 and 1842 treaty territories. Protocol #2 has the greatest significance for manoomin.

Protocol #2 establishes an 1837 Ceded Territory Wildlife and Plant Resources Committee. The purpose of the Wildlife and Plant Resources Committee is to facilitate free and open communications between the state and the bands regarding natural resource management within the boundaries of the 1837 Ceded Territory.

The Wildlife and Plant Resources Committee is delegated several responsibilities, including to develop, analyze and review data relevant to plant management within the 1837 Ceded Territory; provide for coordination among state and band studies and surveys in the 1837 Ceded Territory;

review proposed changes in band and state gathering regulations and codes; and address other plant management issues.

### *Treaty Conservation Code in Minnesota*

As in Wisconsin, a model code was developed to regulate manoomin harvest in the Minnesota portion of the 1837 treaty territory (See GLIFWC website at www.glifwc.org). While the regulations contained therein are very similar to those found in the Wisconsin model code, differences do exist. These are discussed in detail in Niswi (3).

In the implementation of this intertribal co-management system, the 1837 Treaty Conservation Code for the Minnesota ceded territory establishes a general prohibition on the harvesting or gathering of manoomin until the body of water is posted open by the Wild Rice Authority of either the Mille Lacs or Fond du Lac Bands (MN 1837 Treaty Conservation Code Section 5.06). The Wild Rice Authority is delegated the authority to act in the manner of the traditional band members (rice chiefs) for the purposes of regulating the harvest and conservation of manoomin [MN 1837 Treaty Conservation Code Section 5.01 (2)]. In this capacity, the Wild Rice Authority may designate the open and closed dates for harvesting wild rice growing within the Minnesota ceded territory by posting notice of the open dates on the shores of and at places of access to such waters [MN 1837 Treaty Conservation Code Section 5.01 (3)]. The authority must work with the Minnesota Department of Natural Resources (MNDNR) so that at least 24 hours' notice is given before such open dates. The posting of an open date for harvesting manoomin is deemed sufficient notice of such opening date and no other publication thereof is required [MN 1837 Treaty Conservation Code Section 5.01 (4)].

However, despite these provisions, the state of Minnesota has since concluded that the MNDNR does not have the authority to date-regulate rice waters for non-tribal members, thus these provisions are not actually being implemented. Thus the date-regulation provisions are no longer being implemented.

### *Other Matters Pertaining to Manoomin In Minnesota*

The definition of public waters differs from state-to-state. Minnesota's definition can be found in Statute 103G.005 Subdivision 15. Perhaps the most notable difference from Wisconsin is that Minnesota considers river beds to be public, while in Wisconsin they are considered to be the property of the riparian landowner.

Minnesota has recognized the importance of manoomin by adopting a water quality standard specifically targeted toward protecting wild rice waters. The rule sets a water quality standard of "10 mg/L sulfate applicable to water used for production of wild rice during periods when the rice may be susceptible to damage by high sulfate levels" (Minn. R. 7050.224, subp. 2). This standard was adopted in 1973 based on observations by Dr. John Moyle, who noticed that no large stands of wild rice occurred when sulfate levels were greater than 10 mg/L. Unfortunately, this standard has not been widely enforced, although in recent years tribes have been urging the state to take a more active role in ensuring that permit conditions include the standard and that dischargers comply. (See the Threats section later in this document for further discussion).

In addition to water quality standards, there are two state statutes that reflect the importance of manoomin in Minnesota, although they do not provide additional protections for the resource. One statute, adopted in 1977, recognizes wild rice as the State Grain of Minnesota (although it erroneously identifies only *Zizania aquatica* in this recognition) (MN Statutes 1.148).

Another important state statute is the labeling law for packaged wild rice (MN Statutes 30.49). This Statute was adopted in 1989 following a joint effort between tribal governments and the Minnesota Cultivated Wild Rice Council. Consumers of wild rice benefit from this law in that it distinguishes among natural lake or river wild rice that is hand-harvested, that is machine harvested, and wild rice that is cultivated. This legislation further distinguishes between wild rice that is grown in Minnesota and that which is grown outside of the state. The tribal model code adopted parallel provisions for tribal members selling manoomin to non-members.

## MICHIGAN CEDED TERRITORY: TREATY TERRITORY MANOOMIN SELF-REGULATORY SYSTEM

While the 1842 treaty territory includes lands that now comprise part of the western half of the Upper Peninsula of Michigan, Michigan is in a different federal judicial district than either Minnesota or Wisconsin, and the extent and application of treaty-reserved rights has not been adjudicated for the Michigan portion of the treaty territory.

As a result, there is currently no intertribal co-management mechanism in operation applicable to the Michigan portion of the 1842 ceded territory. Informally, the member tribes of the Voigt Intertribal Task Force adhere to the principles of the Chippewa Intertribal Agreement and the Voigt Intertribal Task Force Harvest Declaration Protocols (adopted in Wisconsin) with regard to the harvest and conservation of manoomin in Michigan.

In addition, the Lac Vieux Desert Band and Keweenaw Bay Indian Community have both established harvesting codes for their members that address manoomin harvest.

### *OTHER MATTERS PERTAINING TO MANOOMIN IN MICHIGAN*

Unlike Wisconsin and Minnesota, the State of Michigan does not have wild rice harvesting regulations. In recent years, efforts have been made to re-establish both manoomin abundance and the manoomin harvesting culture in the state. This resurgence has made the lack of harvest regulations more notable. In 2017, the state initiated a dialogue with the tribes and GLIFWC to explore potential manoomin stewardship opportunities in the state. It appears that the development of harvesting regulations is one product that may eventually come of this effort.

The definitions of public and private waters in Michigan also differs from both of the other states. Perhaps of greatest significance, under Michigan state law, the beds of natural lakes are considered to be owned by the riparian (lakeshore) owners, in a theoretical “pie” shaped wedge to the center of the lake. This shared ownership adds great complexity to water regulatory activities in the state, and significantly reduces the amount of aquatic habitat in the state considers public.

## FEDERAL LANDS

Harvesting manoomin from federal lands was not addressed in the original model codes. However, harvesting from these lands is generally legal if the area is open to harvest by non-tribal members. This issue is currently being addressed in consultations between GLIFWC and various federal agencies, and eventual modifications to the codes are expected.

Federal – and state and private – land ownership definitions also vary from state-to-state. For example, the bed of a lake whose entire shoreline is owned by the U.S. Forest Service would be considered to be owned by the U.S. Forest Service in Michigan, but by the state in Wisconsin. Tribal members should consult their tribe's legal department if they have questions regarding harvesting rice from particular federal lands.

# NISWI (3): Fourth Order Relationships: Manoomin Harvest

## THE RICING MOON: TRADITIONAL HARVESTING AND FINISHING

Harvesting manoomin is integral to Anishinaabeg culture. However, the practices and specifics of harvesting were established and regulated locally, and while all harvesting was founded in respectful and humble reverence towards manoomin, local variations in practices were common. The discussion below is not meant to provide an exhaustive review of the variations in practices which occurred, or to suggest some practices or approaches were superior to others. They are provided only to illustrate some of the typical approaches to manoomin harvest and extensive regulation which occurred.

It is also worth noting that while the discussion here is on harvesting and finishing activities, traditional manoomin stewardship entails honoring and respecting manoomin throughout the year.

## TRADITIONAL RICE CHIEFS

Traditional rice chiefs yielded significant authority over the practices, timing and distribution of harvest.

The selection of a manoomin elder or manoomin chief was by consensus. This person was chosen because of their life-long knowledge of manoomin and for their individual character. They had to have shown leadership skills and good and fair judgment. They needed the force of personality to skillfully negotiate any incident that might arise.

From the beginning of August until the opening of the bed for harvest, rice chiefs would ramp up their visits to the manoomin beds. They would be looking at the flowers and checking the fullness of the rice heads. As the hulls filled in and the manoomin ripened, the chiefs would check the milkiness of the kernel, and watch for changes in color, moisture and starch content.

## OPENING OF THE MANOOMIN BEDS / RICING CAMPS

Traditionally, manoomin harvest promoted social interaction in late summer each year. Once manoomin ripened most energy was focused on harvesting.

Gaiashkibos, former Lac Courte Oreilles Tribal Chairman, recalled that Waasegiizhig or Louis Barber talked about how everyone that was at the rice camp had a role. Families would be out ricing and the ones that were not in the rice fields would look after the young children and hunt for ducks and rice birds. The old ladies in the camp would cook those ducks and birds along with freshly finished manoomin. That would be part of the feast to celebrate the successful harvest of wild rice. A feast must be given before any manoomin is shared with other people in the community.

When it was determined by the rice chief that the rice was ready to harvest, word was sent out to the community to congregate at the manoomin beds. Often families had used their individual

campsites for generations. The morning before the general opening of the manoomin beds, the rice chief would select a ricing team to enter the bed and knock a small amount of rice, usually between 2 to 4 pounds of rice. When they reached this amount they would immediately return to the landing where the rice would be taken and parched, thrashed and winnowed. When the processing was done the rice was cooked and brought to the rice chief. Either the rice chief or an elder the chief selected would take a handful of the cooked rice and address the gathering of ricers.

The speaker would address the spirit who watches out for the rice calling him by the name *Hemino* (The Berry Sees Us). It is important to remember that this is the name of a spirit who watches out for the rice. He would remind the people of their obligation to the rice, including how to take care of it, and if the community did these things the rice would take care of them in return. When the speaker was done talking he would offer the rice to the spirits, then the rest of the cooked rice would be given to all assembled.

It is important to remember the care taken in speaking about manoomin and in how the people were told to behave towards the rice. Anishinaabe people believe not that the rice *had* a spirit but rather that the rice *is* a spirit. The Anishinaabe take care when interacting with the spirit world. It is an important belief that the spirit world isn't some far off place but rather that the spirit world exists along with the physical world seen every day; a person cannot separate one from the other.

Anishinaabe people believe that care and caution must be used in all their dealings with spirits, because they understand that the spirits are unpredictable and that the spirits have unlimited power that they could choose to exercise in any way that they want.

***Niso-asin, a Mille Lacs Band member, recollects***:

My earliest memories of manoominike are watching my mom and dad disappear into the tall rice of Big Rice Lake in Minnesota. My mom and dad left us on the shore along with about 30 other kids who were too small to make rice. There may have been adults watching us but I don't remember that at all. I do remember that they seemed to be gone a long time, but I wasn't worried because I had my brothers with me. My dad had bought us a half moon of longhorn cheese, a can of hash and a loaf of white bread. That was supposed to be our lunch. I believe my brothers and I ate that all up before ten.

Earlier that morning there was a gathering of all the ricers on the landing; there must have been 50 canoes and over a hundred people. I remember one canoe going into the rice for just a little while then coming back. Everybody came to see what they got. They took the rice to some women who had set up a small round wash tub by a little fire and they parched it on the spot. When it was done a little boy danced the rice by a tree that had two poles tied to it. Then one old lady winnowed the rice. This all seemed to take no time at all.

When this was all done the woman cooked the rice in a pot checking it to make sure it wouldn't scorch. She then took the kettle to an old man, I think his name was Fox but I can't remember. I do remember him taking a handful of that rice and then beginning to talk. He seemed to talk forever and I remember asking my mom when he would be done. She shushed me saying that he was talking to the Creator and for me to be quiet. When he was done talking two men took the rice around to feed everyone a spoonful from the same spoon.

It was after that all of the ricers left, leaving us kids. My brothers and I played with other kids until my parents returned that afternoon. I remember my brother and I helping my mom and dad put the rice into sacks. At first I didn't want to touch the rice because of all the spiders but I saw my older brother diving right in so I did too. I love the smell of just harvested rice. It smells like fresh cut hay with rich nutty smell added. But I always hated how the rice beards made my arms itch. When I was done helping I went down to the lake to wash off but it only seemed to make it worse.

When we got home my dad laid out tarps on the ground in the yard and emptied the sacks of rice on them. Then he went into the garage and got our cast iron kettle and set it up by the fire pit and started a small fire under it. Then he put a small amount of rice in it and started to stir it with a paddle. My dad had a special paddle just for this and no one was allowed to touch it. I remember one time I was digging in the sand with a spoon to make a fort for my little army men. The spoon was going too slow so I went into the garage and took my dad's paddle and started to use that. When my dad came out and seen what I was doing he yanked that paddle out of my hands and slapped me on the butt with it saying that I was never to touch it again. And that's how I figured out why they call it a paddle.

My dad would parch rice all day long, he had another kettle off to the side and he would take the parched rice and put it in that one and my brothers and I would take turns jigging the rice. When we were done my dad set up the fan from the house on the deck and would pour the rice out in front of the fan into a bucket set below. When he did this the dust and chaff would go everywhere. These are my earliest memories of manoominikewin.

## HARVESTING TECHNIQUES

### *ASEMAAKEWIN (OFFERING TOBACCO)*

Mii izhichigewaad ingiw Anishinaabeg dibwaa bawa`amowaad akawe asemaakewag biindaakoojigewag. Mii aw asemaa ayaabadizid biindaakoonind a`aw Manidoo. Geget apiitendaagozi asemaa. Mii akina ge izhichigeyangiban gegoo mamooyan imaa zayaaga`kiigin, gidaa-biindaakoojigemin.

*The first thing Anishinaabe does is make an offering of tobacco before they harvest wild rice. Tobacco is used when making an offering to the spirit. Tobacco is highly valued. When we take from nature, we should make an offering of tobacco* (Great Lakes Indian Fish and Wildlife Commission 2010).

### *MANOOMINIKEWIN (MAKING WILD RICE)*

Traditionally, manoomin was harvested using two significantly different techniques, commonly referred to as either knocking or binding/bundling. Knocking was the more common practice and is the harvesting practice that continues today.

### *BAWA'AM MANOOMIN (KNOCKING WILD RICE)*

Harvesting rice by "knocking" involves two people who work as a team in a canoe. The "poler" stands at one end and propels the canoe slowly through the rice bed using a 16 to 19-foot gaandakii`iganaak (push pole) with a forked end. Many push poles are made of tamarack or other light, straight wood, often with a hardwood crotch spliced into it. Poles are carefully smoothed so they do not snag and uproot rice plants while in use (Figure 15).

While the poler glides the canoe through the bed, the "knocker" gently harvests the grain using a pair of bawa`iganaakoog (smooth, rounded wooden ricing sticks), commonly made of cedar or similar light wood. These "knockers" are commonly about 3 feet long. One stick is used to

**Figure 15. Tools used to harvest manoomin: forked push pole and wooden knockers.**

**Figure 16. Wooden knockers leaning rice over the canoe.**

lean the manoomin stalks over the canoe, while the second is used to dislodge the ripe grain from the seed heads (Figure 16). Typically, the knocker will alternate from one side of the canoe to the other, developing a steady rhythm of harvest. The mature seed will separate easily – sometimes even before the heads are brought over the canoe. The rice will form a carpet on the floor of the canoe, awns upright, as the manoomin accumulates in depth. With the seed come "rice worms," spiders and insects, but carefully picked rice should have few of the leaves or seed heads that suggest too much force was being used.

Although the actual harvesting is done by the knocker, in many ways the poler had the greater role, reading the bed for ripeness and density, patterning the bed methodically, and adjusting the speed of poling depending upon how the rice is falling.

The arrangement of the poler and the knocker in the canoe varied regionally, with the most common arrangements being: 1) poler in the back, with the knocker directly in front of him or her, facing the front; 2) poler in the back, knocker in the front, facing the back, or 3) poler in the front, knocker in the back facing forward. The technique and arrangement was also influenced by conditions: in thin rice, the canoe was sometimes propelled by paddle instead of pole; under windy conditions, the knocker might work only one side of the canoe. Ricing sticks also tended to be shorter in regions that typically had the densest rice (such as parts of Minnesota) and longer where density was typically less. (Long "shepherds' hooks" were apparently sometimes used in the harvest of the taller "southern" wild rice, but this practice was likely not used to any significant extent in the treaty territory.)

Harvesting was and is done gently, not only to respect the gift of the Creator, but because the gradual ripening of the bed meant that the rice can be harvested repeatedly over the course of the season. Uprooting plants, breaking stems or gathering unripe rice is not only disrespectful, but it could make the next trip less successful.

An experienced team of ricers can harvest a substantial amount of rice this way – sometimes hundreds of pounds a day when conditions are optimal. However, the methodology is also understood to be relatively inefficient (likely taking less than 15% of the seeds produced over the entire harvesting season) and substantial amounts of seed are planted in this harvesting process. This ensures that abundant seed remained to seed the bed for following years, and to provide for the other parts of creation that depended on manoomin for their survival.

### *Gashkibidoon Manoomin (Binding Wild Rice)*

Historically, manoomin was also harvested through a practice called gashkibidoon (bundling, binding or tying) (Figure 17). The practice consisted of carefully tying up the seed heads from a 2 to 3-foot circle into shocks. This was done in the early milk stage of seed development, taking care not to crush or kink the stems. The seed heads were totally covered to protect the developing seeds from animals and the elements. Binding was done in a methodical fashion on both sides of the canoe, creating an open channel between the parallel rows of shocks. The twine used in the process was often made from the inner bark of basswood or cedar, and particular knots or dyes were used to indicate ownership of the tied rice. Several weeks later, after the seeds had fully

matured, the harvester would return and gather the seed simply by untying the rice and shaking the bundles over the canoe.


**Figure 17. Bound manoomin. Photo courtesy of the Minnesota Historical Society.**

The following account of binding was recorded by Gardner P. Stickney at Bad River in 1896:

> "In the Ojibwa tongue August is Manominikegisiss, the "rice-making moon." About the first of this month these Indians prepare large quantities of cedar-bark rope or twine, using the inner bark torn into long, narrow strips, which are then tied together. This twine is rolled into a large ball for convenience in handling. Toward the middle of August, when the rice is in the milk, they visit the rice fields in their canoes. Two women usually work together. One paddles or pushes the canoe; the other sits or kneels, with her roll of cedar twine behind her, the end passing forward through a ring on her shoulder. This woman gathers as many rice-stalks as she can conveniently reach and fastens them together in a sheaf by passing her twine around the stalks just below the heads and tying it. This enables her later to gather a large harvest with less trouble, the sheaf being handled more easily and more securely than the loose stalks, and less grain is knocked into the water in the handling. The sheaves stand in rows just far enough apart to allow a canoe to pass between the rows: After allowing them to stand about two weeks, the grain then being ripe, the women return in their canoes and harvest the crop. Formerly the heads were sometimes cut off with a knife and carried to the shore, but this could not be done to advantage when the seeds were ripe.
>
> Some of the Indians, instead of using the twine, would formerly gather a handful of stalks and twist them together and downward, leaving the grain thus to ripen; they proceeded in this manner over a considerable district. When they came later to gather the seed, each woman knew her own by some peculiarity of the twist, and the rights of this ownership were respected."

Father Marquette probably referred to this practice when he wrote: “They divide the ground whereon this wild rice grows, so that each one can reap his own separately without trespassing on his neighbor's patch.” (Stickney 1896).

The practice of binding largely died out about a century ago, when the advent of non-Indians into rice harvesting eroded tribal control of the harvest. Many of the subtleties associated with the practice are likely poorly understood today. Some evidence suggests that in most cases only women would tie manoomin and usually only when they were without help from their families or were widowed. Binding allowed elderly or individual harvesters an opportunity for a significant harvest, and bound rice reportedly finished with a high yield because of its full maturation. The binding of the manoomin beds was also used to limit conflict. Often the binding of manoomin in short stretches indicated that the next area was under the control of a different family group. Each bound area was for the exclusive use of the family group to whom the area was assigned. Binding was also used to ensure that everyone had access to a portion of the manoomin bed and no one was excluded. The initial sectioning of a manoomin bed was accomplished by consensus, however, once the bed was allocated then the area was governed by the manoomin chief and any ruling by the manoomin chief was final.

Because of the intense investment in binding, it likely was only practiced on waters close to tribal communities. Beds between communities, which conflicting tribes might contest, were likely harvested only by knocking.

Finally, because of the much higher efficiency of binding, there were likely additional constraints associated with its use, such as limiting the portion of a bed that could be bound, or requiring a portion of the rice harvested to be reseeded. However, these details have been poorly documented in the written record. (Some sources of information on binding include; Stickney 1896, Jenks 1901, Moose 1969, Aiken et. al. 1988, Vennum 1988, Roufs 2019.)

## FINISHING

Regardless of how the manoomin was harvested, many steps remained necessary to “finish” the rice, or to prepare the seed for storage and eventual use. As with harvesting, variations in technique and modification of practices occurred over space and time – many of which are still practiced today to finish and preserve the rice for later use.

### *BAATE MANOOMIN (DRYING WILD RICE)*

Freshly harvested rice would be air dried soon after it came off the lake. Rice was carried to the campsites in bark trays and spread out to dry on woven mats, animal skins, layers of grass or sheets of birch bark sewn together into large sheets (apakwaan). While spread out, the rice was picked over to remove pieces of stalks, leaves and insects (Figure 18). Good air drying keeps the rice from getting moldy before parching, and reduces the parching time.

**Figure 18. Cleaning and drying green rice today spread out on a tarp.**

### *GIDASIGE MANOOMIN (PARCHING WILD RICE)*

Parching or roasting the kernel was and is an important step in preserving the manoomin for later use. This process serves several functions: it reduces the moisture in the grain so it can be preserved; it destroys the germ so it will not re-sprout, and it loosens the hull from the grain.

**Figure 19. Parching manoomin in a kettle.**

Okaadakik (large cast iron kettles) acquired through trade were used for parching. The kettle was heated over a small fire (Figure 19). Once the manoomin was added, finishers stirred constantly so the seed would not scorch or pop. The ice was parched for about 20 to 30 minutes, until enough moisture was removed, and a de-hulled grain would snap cleanly when broken. (Before European contact, rice was not parched, but slowly dried on tightly woven mats erected over low fires.)

### *Mimigoshkan Manoomin (Threshing Wild Rice)*

After parching, the manoomin is hulled or threshed to remove the chaff from the rice kernel. This was a labor intensive process that was often referred to as "dancing" or "jigging" the rice. A small bootaagan (threshing pit), about 18 inches deep and 2 to 3 feet in diameter, was dug and lined with wooden slats or a hide (Figure 20). (After European contact, wooden or metal buckets were sometimes used.) Two poles forming a V-shaped railing were erected over the pit. These poles provided support for the individual who would dance the rice, and kept too much weight from being placed on the grain. Youth were also used to dance the rice, due to their lighter weight.

**Figure 20. Dancing or jigging manoomin.**

Freshly parched rice was placed in the pit. The dancer wore special, unadorned moccasins used only for this purpose. These moccasins were knee-high to protect the huller's legs from the itchy chaff. Using the poles to help support his or her weight, the dancer then gently stepped onto the rice, and "danced" on the grain, rolling the them against each other, the sides of the pit, and the moccasins. This process separated the now dried hulls from the grain.

In some communities, only men danced the rice; in others, long wooden poles were used in a method similar to a mortar and pestle to separate the hulls, instead of dancing.

### *Nooshkaachige Manoomin (Winnowing Wild Rice)*

The final step in finishing involves separating the hulls or chaff from the grain. Traditionally, the rice would be taken to high ground or a rock outcropping near a lake so the wind could aid in this process. Danced rice was placed in a broad birch bark winnowing tray called a nooshkaachinaagan (Figure 21). A covering was placed on the ground, and the rice gently tossed in the air. With the action of the tosser and the aid of the wind, the light chaff was carried away and the rice kernels fell back in the winnowing tray. This method also helped grade the rice. The chaff blew away, bits of broken rice fell on the covering on the ground, and the full kernels remained in the tray. The manoomin was now ready for cooking or storage.

**Figure 21. Winnowing manoomin.**

## Consequences for not Following Anishinaabe Law

It has been documented that the consequences for not following the regulations established by traditional Anishinaabe law or the directions of the rice chief ranged from shaming to banishment.

> Shaming was used for minor infractions such as knocking the manoomin too hard.
>
> Sinking of a jiimaan (canoe) was used for larger infractions, like ricing before the bed was declared open.
>
> Beatings were sometimes used for repeat offensives.
>
> In cases of gross negligence, the individual was banished from the manoomin harvest for the remainder of the year. This action essentially constituted banishment from the village, because manoomin was such a critical dietary staple that the individual punished would have to leave and seek another ricing area in order to secure stores for the winter.

Many elders believe that when the Anishinaabe don't follow traditional teachings there is inadvertent damage to traditional foods. Many attribute the lack of rice to the failure to comply with the teachings that have been in place for centuries.

It is important to note that all of these consequences were enforced to secure the harmony of the band as a whole. No one single person or family group had any special privilege that outweighed any other family group or individual. In addition, the sharing of excess manoomin with those less fortunate was a common practice. No one knew when misfortune would befall them, so the Anishinaabe supported each other through difficult times as they could.

## Contemporary Harvesting and Regulation

The tradition of hand-harvesting manoomin continues to the present. As discussed in Part 2, this tradition has been preserved through tribal code and reflects the codification of some of the traditional methods of harvesting. However, as in the past, regulations vary in ways from area-to-area. In particular, as a result of various court cases, tribal ricing regulations now tend to vary in some details from state-to-state. This variation in ricing regulations is summarized in Table 1. (Note that tribal off-reservation regulations will also vary from on-reservation regulations, and from state regulations for non-tribal members.)

The harvest regulations which apply to off-reservation treaty harvesters today are few in number. These regulations limit harvest to the inherently inefficient method of "knocking." Even under heavy harvesting pressure, this method removes only 10-14% of the available seed (Fannucchi et al. 1986), leaving an ample amount for the benefit of wildlife and to reseed the bed.

Harvest regulations apply to public waters. As noted in Part 2, the legal definition of public water varies by state, so it is important to be familiar with local law. (While it is possible to harvest rice

from private waters with landowner consent, that activity would not be an exercise of the treaty-reserved right, and the harvest regulations discussed here would not legally apply.)

Table 1. A summary of tribal off-reservation ricing regulations by state.

| Regulation | Minnesota 1837 Treaty Territory | Wisconsin 1837 & 1842 Treaty Territory | Michigan 1842 Treaty Territory |
|---|---|---|---|
| **Ricing Stick Composition & Design** | "smooth, rounded cedar rods or sticks" | "smooth, rounded cedar rods or sticks" | Tribal regulations regarding the harvest and protection of wild rice within the Michigan 1842 Treaty Territory vary from tribe-to-tribe. Individual tribal governments or their natural resource departments should be contacted for regulatory details. |
| **Maximum Ricing Stick Length** | 32" | 38" | |
| **Boats Length & Width** | 18' & 38" | 17' & 38" | |
| **Boat Modifications** | Gunwales cannot be modified to capture rice outside the boat; must be propelled by muscular power using a push pole or canoe paddle. | | |
| **Hours** | 9:00 AM to sunset | 10:00 AM to sunset | |
| **Season Dates** | "as posted open by the Mille Lacs Wild Rice Authority"* | "no closed season" except for a designated list of date-regulated waters | |
| **Date-regulated Lakes** | None* | 53 | |
| **Permits** | Annual permit required for all ricers regardless of age. | | |
| **Binding** | Not allowed. | | |
| **Sale** | Permitted; labeling restrictions may apply. | Sale of legally harvested wild rice is permitted. | |

*see discussion under season dates below

Full copies of wild rice harvesting regulation chapters from tribal model codes can be found at GLIFWC's website at www.glifwc.org.

## *Miscellaneous Notes on Primary Harvest Regulations*

### *Permits*

Harvesting permits are available at tribal conservation departments.

### *Ricing Sticks*

Must be operated by hand.

### *Ricing Hours*

Closed hours were established to allow the plants to dry in the morning, and to allow wildlife an undisturbed opportunity to utilize the rice beds. In Wisconsin, hours (and other regulations) apply regardless of whether the water is date-regulated or not.

### *Date-regulated Lakes (Wisconsin)*

No ricing is allowed on the fifty-three (53) off-reservation lakes listed as date-regulated except for the days they have been named open by the tribal ricing authority. The dates that a date-regulated lake is open for harvesting must be posted at access points to the lake at least 24 hours before the first open date. Date-regulated waters may remain open for the duration of the season once opened, or may open and close several times over the course of the season. According to stipulation, the decision to open date-regulated waters is made jointly by a state and tribal representative; in practice the state frequently defers to the tribes on opening decisions. Lakes that are not on the date-regulated list can be closed for a season by the tribal rice authority if necessary for conservation purposes.

Although the Minnesota Model Code indicates lakes will be opened by the Mille Lacs Wild Rice Authority, in practice this has not been done for off-reservation waters, as the State of Minnesota no longer date-regulates any openings.

In addition to the posting at access points, opening information is also transmitted from tribal rice authorities to GLIFWC staff, who post opening information on the Commission website.

### *Boundary Waters and Federal Lands*

The Wisconsin model code originally prohibited harvesting rice from Minnesota/Wisconsin boundary waters (though this was not the case with the later-enacted Minnesota code). In addition, the court cases which reaffirmed the off-reservation harvesting rights did not address the exercise of rights on federal lands. These issues are currently in the process of being addressed in negotiations with federal and state agencies. Code modifications and separate agreements with federal land agencies (such as the U.S. Forest Service and the National Park Service) will address this issue. In the meantime, tribal harvesters can assume that if a water is open to rice harvest by the non-tribal public, it is open to tribal members as well. Individuals with questions about particular federal properties should contact GLIFWC or their tribal natural resource departments for more information.

### *Harvest Monitoring*

Tribal manoomin harvesters are required to cooperate with harvest monitoring efforts conducted by their tribe or GLIFWC.

For more on the purposes and stewardship components of date-regulation, see Naanan (5).

## HARVESTING "*IN A GOOD WAY*" OR HOW TO PICK RICE WHILE RESPECTING AND PROTECTING MANOOMIN

While the harvest regulations included in tribal model codes provide a level of protection for manoomin, they cannot capture many of the nuances of harvesting that many ricers consider important for a respectful and protective relationship.

Many treaty territory manoomin waters have been harvested for decades or even centuries. In addition, the Anishinaabe have a spiritual relationship with the plant and see harvesting as an incredibly important activity, even a sacred obligation pursuant to Anishinaabe law. Under this law, failing to harvest manoomin suggests a lack of appreciation for this special gift from the Creator, and could lead to its decline. In the same vein, improper ricing techniques are viewed by many harvesters as damaging to the plant, counter-productive, disrespectful to manoomin and a violation of Anishinaabe law.

**Figure 22. The parallel passes visible on this manoomin bed reflect a careful and experienced picker.**

Utilizing good harvesting techniques, or minochigewin (acting in a good way), takes many forms beyond simple adherence to regulations. Generally, the intent is to harvest only seed that is mature and nearly ready to drop off the plant, and do it in a manner that minimizes negative impacts on the bed. This general goal is realized in many ways, such as: not picking until a substantial portion of the rice is ripe; knocking the rice gently ("coaxing" might be a better term) so that stems don't kink or break and so that immature rice is not dislodged; ricing in parallel passes rather than a random route through the beds (Figure 22); turning the boat in a manner that minimizes the number of stalks that are submerged; and ensuring that the push pole is smooth so that it doesn't inadvertently snag and uproot plants. Some ricers apply additional standards to themselves; some will not rice in the rain, for example, feeling that stalks may be more likely to break or kink if weighted by moisture. Finally, there are also rules of etiquette that apply while harvesting, such as not being too loud on the water, and not crowding other ricers picking in the same area.

Another practice that many harvesters consider part of ricing in a good way entails replanting a portion of the seed harvested back into the bed if there are areas that appear to be thinning due to intensive herbivory, illegal removal or other negative impacts.

While many of these informal rules of ricing have a practical component (for example utilizing proper technique early in the season helps to preserve subsequent harvesting opportunity), they also reflect the respectful relationship that many ricers develop with manoomin over time. This relationship may express itself in many ways, such as in offering tobacco or expressions of thanksgiving for the harvest. And while this relationship tends to be highly personal and extends beyond the scope of this document, many harvesters feel that some understanding of this topic is incredibly important to impart to novice ricers.

## Comparing Historic and Contemporary Harvest Regulation

While the roots of many contemporary harvest regulations can be seen in traditional harvesting practices, it is noteworthy that, taken in their entirety, contemporary regulations provide less harvest control than their historic counterparts. When nearly all harvesting was being done by tribal members acting under the authority and direction of the rice chiefs, it was possible to implement detailed harvest control, such as opening or closing only portions of particular rice beds at certain times, limiting the number of ricers on a water, directing all the harvesters to pick in parallel rows, or adjusting harvesting regulations mid-season in response to storms or other environmental events. While some of this intensive stewardship may still be occurring on some on-reservation manoomin waters, it is not generally possible under the regulations currently in place for off-reservation waters that are being harvested by both tribal and state licensed ricers.

## Harvest Monitoring and Data

Manoomin stewardship can be enhanced with a good understanding of the nature and impacts of harvesting. In addition, there is often great value in documenting the exercise of treaty-reserved harvesting rights. For these reasons, model codes include provisions that require harvesters to cooperate with harvest monitoring activities undertaken by GLIFWC or the tribes themselves.

The quality of manoomin harvesting data for tribal (and state) ricers varies greatly by state. The best information available comes from Wisconsin, where GLIFWC has been conducting manoomin harvest surveys of both tribal (off-reservation) and state (statewide) licensed ricers since the late 1980s. From 1992 to 2015 off-reservation harvest in the state has averaged approximately 61,250 pounds of green rice per year, with about one-third coming from tribal members. Nearly all of this harvest comes from the ceded territory. A summary of this data, and examples of how the information is used, can be found in Appendix D.

Unfortunately, harvest information for both tribal and state ricers is largely lacking in Minnesota and Michigan.

The only estimate of wild rice harvest in Minnesota conducted in the last 30 years was for 2006, and includes only harvest from state-licensed ricers. The state estimated that approximately 700,000 pounds of unprocessed rice was harvested that year, by 1,625 licensed ricers. The great

majority of the harvest came from waters north of the 1837 ceded territory. Harvest by tribal harvesters is unknown. While estimated harvest from 2006 was significant, from 1957-1963 wild rice license sales in the state averaged over 10,000 per year, and harvest was presumably much higher. However, license sales may again be increasing slightly in recent years. From 2013-2017, seasonal resident license sales averaged 1,656, similar to the 2006 figure, but the state also sold an average of 400 resident or non-resident one-day licenses that were not available in 2006.

Any effort to estimate harvest in the future will be confounded by another change the state made in 2016, when it opted to allow any tribal band member from a federally recognized tribe located in Minnesota to use their tribal ID card as a harvesting license, valid anywhere in the state. This effectively makes it nearly impossible to estimate off-reservation harvest by tribal members, and may result in tribal members not getting a tribal permit to exercise their treaty right off-reservation.

The State of Michigan currently does not regulate wild rice harvest, and essentially no harvest or license sales data exists for the state. Much of the very limited harvest that is occurring in the state is likely coming from waters in the 1842 ceded territory, but some manoomin harvesting is also known to take place on select waters in other areas, including the Lower Peninsula. The state is currently considering the development of harvest regulations. If a permitting system is established, it would be valuable to immediately begin monitoring harvest in the state.

# NIIWIN (4): Fourth Order Relationships: Manoomin Threats

## THREATS TO MANOOMIN

Manoomin beds in the treaty territories face a variety of threats. In the Ojibwe world view, these threats might be considered disruptions in the relationships manoomin shares with the various members of the other orders of creation. In nearly all cases, these disruptions result from the actions of humans. For example, negative interactions with sulfide (part of the first order) tend to occur when sulfide levels become elevated from industrial activity. Even intensive herbivory by Canada geese (part of third order) may be related to goose populations increasing as a result of human-induced landscape changes. As a result, the threats discussion is organized by the threats which tend to challenge manoomin on an individual stand basis versus those that threaten rice across broader portions of its range.

While this discussion recognizes some of the greatest threats to manoomin, it is not an exhaustive list. In addition, each rice bed is unique, and the relationships manoomin shares with other beings can vary from place-to-place. For example, a foot increase in water levels from okoniman (beaver dams) may be detrimental or positive depending on the location. Stewards must always use care when determining which threats are most significant at particular locations.

### *STAND LEVEL THREATS*

#### *Hydrological Changes*

It is likely that more treaty territory manoomin beds have been lost to hydrological alterations than any other cause. The shallow wetlands that manoomin depends on have been subject to both damming and draining. While the negative impacts of drainage are straightforward, the impact from dams can be both more variable and less obvious.

Dams can both destroy and create manoomin habitat depending on where they are placed and how they are operated. Damming can be the result of human or beaver activity, the accumulation of debris, or the expansion of vegetation. The addition of a dam at the site of an existing rice bed is likely to have significant negative impacts to the bed (see *A Story of Loss*, page 52). However, dams can also create suitable habitat where none previously existed. Artificial impoundments created primarily for waterfowl management, for example, often provide excellent habitat for rice and many have been successfully seeded. Overall, nearly half (47%) of the reported rice harvest in the State of Wisconsin from 1992-2009 came from sites influenced by human-made dams (GLIFWC unpublished data).

Dam operation often determines rice suitability. In general, run-of-river type operations, or other approaches that maintain natural variability in water levels throughout the year and between years will be more suitable than highly unnatural water level regimes that are maintained for other purposes. The large (4-7 foot) annual variability that is imposed on some reservoirs is incompatible with manoomin. At the other end of the spectrum, the highly consistent annual water levels desired by many lakeshore property owners can also be unsuitable, favoring

## *A Story of Loss*

The Chippewa Flowage is considered by many to be one of the landmark water bodies in the State of Wisconsin, but its creation came at a great cost to members of the Lac Courte Oreilles (LCO) Tribe (Figure 23). On May 17, 1921, a public hearing was held in the Town of Reserve, where LCO members explained why they were opposed to building the flowage. Second only to their objections to flooding the graves of their ancestors were concerns about the loss of the natural resources upon which the people depended. As the following excerpts from their testimony shows, manoomin was not only the first of these resources, but in the interconnectedness of nature, it was also the foundation for many other subsistence staples upon which the tribe depended:

**Figure 23. Construction of the Chippewa Flowage.**

***"As people eat bread and use it for food, we use rice."***

***"I have made rice from one year to another. With an ordinary crop I harvest as many as 24 sacks. The sack I refer to are the 49-pound flour sacks... The rice is sufficient to keep my family from one rice season to another."***

***"From the very place I get rice from my allotment, I get fish there."***
***"All this territory or streams that I have here mentioned is considered good fishing for muskellunge, pike (walleye) and bass. The waters and rivers have more or less rice on their banks and it is into these rice stalks, or rushes that these fish seem to make their home."***

***"One of the reasons I think it is the best* [area to trap] *is there is considerable rice there, and the muskrats make their homes among the rice fields."***

***"They* [ducks] *come here to feed on the rice, and of course that means a living to us as well."***

Nearly a century later, the contemporary values of the Chippewa Flowage are appreciated by many, but the value of what was lost is known by few.

perennial vegetation over an annual like manoomin which benefits from some water level variation. Regular or periodic overwinter drawdowns of modest levels (1.5-2.5 feet) appear to be highly compatible with manoomin, as these conditions generally favor plants that overwinter as seeds rather than in a vegetative state. These drawdowns are also sometimes favored by fishery managers, who contend the likelihood of low overwinter oxygen conditions is reduced by removing this mass of decomposing plant biomass from the water column over the winter months.

Damming can occur in ways that are not always apparent. The sensitivity of manoomin to water level changes means that even fairly modest changes in the elevation or size of a culvert, for example, can have a marked effect on abundance. Even changes in the plant community near a lake outlet can impact manoomin abundance if it alters the hydrology of the site, a situation which seems to be becoming more common with the expansion of the non-native species of phragmites and cattails.

### *Intensive Herbivory*

Many species of wildlife feed on manoomin, generally with relatively little long-term impact, but species which browse on green tissue (as opposed to consuming seeds) can occasionally have a significant impact, especially on small, sparse or newly-seeded stands.

Although migratory geese and swans have little impact on manoomin, summer "resident" Canada geese and trumpeter swans can have significant impacts, especially where large groups of non-breeding sub-adults congregate, or large broods (or groups of broods) are raised. Herbivory by resident Canada geese reportedly led to a major decline of manoomin in tidal marshes of the Patuxent River (Haramis, Kearns 2004). The stand recovered after a program of goose population reduction and seeding enclosures was implemented. Locally, a small but well-established manoomin bed on the Gile Flowage appears to have declined when high water caused the thinning of the bed, which subsequently was heavily browsed by resident geese. (Geese on the Gile Flowage have also been observed selectively feeding on manoomin male flowers when available, but it is unknown if this activity has a significant impact.) Recent efforts to restore historic rice beds on the St. Louis River estuary have been hampered by intensive goose browsing (Thomas Howes, personal communication). Nesting trumpeter swans can also sometimes significantly reduce local manoomin abundance, especially when a large brood is produced on a water with a fairly small stand. Some seeding efforts also appear to have been hampered by heavy muskrat herbivory. While plants can likely recover from light browsing, heavily browsed plants often fail to produce a seed head, or produce it too late for effective pollination and seed development (Figure 24). Dense stands seem to be less impacted by geese or swans, perhaps because the birds may avoid areas of heavy cover where their view of predators is

**Figure 24. Heavily browsed plants may never produce seed.**

limited. However, it is notable that resident populations of both geese and swans have increased tremendously in the treaty territories over the last two decades, and swans in particular seem to be nesting on smaller rice lakes – where their impacts tend to be more pronounced – as their population grows.

Red-winged blackbirds have also sometimes been considered a problem for manoomin, as large flocks are often found in beds where they reportedly not only eat the seed, but dislodge them, making them unavailable for human harvest (Aiken et al. 1988). Some tribal elders, however, feel that flocks of blackbirds have declined in recent years, concurrent with increases in the populations of rice worms. The relationships and interconnections between blackbirds, rice worms, rice abundance and even ricers may be more complex than they superficially appear.

### *Direct Human Impacts*

Humans can have direct negative impacts on manoomin in a variety of ways. Shoreline development can lead to individuals creating wide navigation channels to open water, or desiring wide-scale removal to create a more open view-scape (Figure 25).

**Figure 25. Vegetation removal can be a particular problem at locations where the flowage bed is privately owned.**

Also problematic is a desire by many shore owners on impounded waters to hold water levels too deep and/or stable for manoomin to survive. Humans are also frequently a vector for introducing non-native species to an area. Heavy boating activity, especially early in the growing season, can also lead to young plants being uprooted by props or large boat wakes (Figure 26). Damage can occur during early teal and goose hunting seasons, when hunters uproot rice that has not yet set seed in order to access hunting locations.

**Figure 26. This manoomin bed was likely damaged by boats early in the growing season.**

### *Plant Competition*

While all plants compete for space and nutrients, competition between manoomin and other native aquatic species is usually not considered a problem ecologically. However, when natural conditions are altered, such as from climate change or through the artificial manipulation of water levels, the competitive balance between various plant species can be altered as well. In these cases, restoration may entail not only restoring more natural environmental conditions, but possibly removal or reduction of the vegetative species that had been favored while the unnatural conditions prevailed.

At Rice Lake on the Sokaogon Reservation, for example, rice habitat was restored through the mechanical removal of competing vegetation that apparently became more abundant after a stand of native cattails altered the historic circulation of water in the lake.

(Also see Non-native Invasive Species below.)

### *Mining and Other Industrial Activity*

Mining and other industrial activities can impact manoomin in several different ways. Hydrologic alterations caused by both water appropriations and water discharges at mine sites can permanently alter water levels in a down-gradient lake or stream making them unsuitable for manoomin. Rapid changes in water levels caused by seasonal discharges of mine waste water, or discharges from water treatment plants, can uproot manoomin during the floating leaf stage or even drown established plants.

In addition to hydrologic impacts, mine-related changes in water quality – sulfur discharges in particular – affect manoomin. Sulfate is one of the most common pollutants discharged in mine waste water. Sulfate is found in discharges from tailings basins as well as process waste water from ore processing plants. In the 1940s, Minnesota Department of Natural Resource Scientist Dr. John Moyle conducted extensive field research on the distribution of wild rice in Minnesota. Moyle's data showed that waters with sulfate levels over 10 parts per million (ppm) did not support robust stands of wild rice (Moyle 1944). These conclusions have since been confirmed by a series of research projects conducted in Minnesota. It is now known that sulfate discharged by mines is converted to sulfides in the sediment where manoomin germinates and grows and it is the sulfide that is toxic to the plant. In Minnesota, there is a water quality standard of 10 mg/L (10 ppm) of sulfate to protect manoomin. This standard has been upheld in a recent ruling by an administrative law judge in Minnesota when reviewing a proposed change to the standard. Wisconsin and Michigan lack a similar protective standard.

## *Landscape Level Threats*

### *Diseases and Damaging Insects*

Diseases and damaging insects do not generally threaten manoomin beds with permanent damage, though concern is rising that the negative impacts associated with these vectors may be increasing as a result of climate change.

A good review of the major diseases and insects that affect manoomin can be found in *Wild Rice in Canada (*Aiken et al. 1988). While manoomin is susceptible to a variety of fungal, bacterial and viral diseases, most of these seem to rarely reach significant levels of impact in natural stands with the exception of fungal brown spot disease. Brown spot creates lesions on the leaf tissue of the plant (Figure 27), causing destruction of photosynthetic tissue and reduction in seed production. Outbreaks are favored by high day- and night-time temperatures, high humidity, leaf wetness periods in excess of 8 hours, and high plant densities. Under these conditions, the air-borne spores produced on infected tissue can spread rapidly. Significant outbreaks occurred in Wisconsin in 2005 and 2010, two of the warmest years in the last century, and harvest was markedly reduced both years, including a near failure in 2010 (David 2012). In 2012, a year with an unusually warm and early spring, stem rot, which reportedly is another expression of this disease, appeared to decimate the rice stand on Blaisdell Lake, Sawyer County, WI, an event not believed to have been previously witnessed in the state. Commercial manoomin paddies in Minnesota are treated with fungicides to combat brown spot

**Figure 27. Manoomin at Pacwawong Lake, Sawyer County, WI, displaying a moderate infestation of brown spot disease.**

outbreaks. In addition, the bed thinning that is done in cultivated stands to promote greater seed production likely also helps combat this disease.

While *Wild Rice in Canada* also discusses leaf sheath and stem rot, leaf blotch, smut and other bacterial and viral diseases, the only other disease that harvesters commonly reference is ergot, another fungal disease (Aiken et al. 1988). Ergot is familiar to ricers because it produces a sclerotium (generally dark colored but occasionally bright orange) that develops in the place of the seed, looking something like an oversized seed bursting out of its hull or sheath (Figure 28). Sclerotium often remain on the stem long after seed drop has taken place. They also are often incidentally gathered in the harvesting process, and need to be removed (usually in or after the finishing process by screening, flotation or hand removal) before cooking. Ergot abundance seems to be consistently higher on some beds (such as the Clam River Flowage, Burnett County, WI) than others. Abundance also likely varies from year-to-year.

**Figure 28. Seed head infected with ergot.**

Of the various insects that may cause damage to manoomin, the one most familiar to ricers, and the only one that likely regularly has significant negative impacts to manoomin beds is the "rice worm," the larval form of the moth species *Apamea apamiformis* (Figures 14 and 29). The adult moth lays its eggs in the seed sheath, and the developing larvae feed on the developing seed, eventually eating an exit hole through the sheath to feed on other seeds or other parts of the plant. Larvae migrating on the flower head will spin silk threads that tend to tie the panicle together; these bound panicles often hold little but empty hulls at harvest season.

While all manoomin beds seem to support rice worms, their populations vary markedly from site-to-site and year-to-year. Beds that have a lot of shoreline relative to bed size, such as rivers or long, narrow lakes, may be more prone to higher populations. When populations are high, harvested manoomin seems alive with these larvae, and since each individual can reportedly consume 7-8 grains, their impact on seed production can be substantial.

**Figure 29. Rice worm with manoomin seed.**

### *Non-native Invasive Species*

Many problems can arise when human activities move species beyond the locations where Kitche Manitou deemed they would be most beneficial. Although it has generally been difficult to quantify the direct impact of various non-native invasive species on rice, a number of species raise significant concern.

Aquatic plant species such as Eurasian water milfoil (*Myriophyllum spicatum* L.) and curly leaf pondweed (*Potamogeton crispus* L.) can compete with manoomin for space and nutrients. Purple loosestrife (*Lythrum salicaria* L.) has been found on a number of rice waters, and although it generally does not compete directly with manoomin, it may reduce suitable habitat in some areas if the loosestrife extent expands down-elevation under drought conditions. Narrow-leaf cattail (*Typha angustifolia* L.) and the hybrid it forms with native cattail can compete directly with manoomin for suitable habitat especially when these plants form floating mats that move into deeper waters (Figure 30). When flooded, sections of these mats may also break free, creating floating islands that can plug lake outlets or water control structures (Norrgard 2008).

**Figure 30. Narrow-leaf cattail expansion at Loon Lake (also known as Carters Bridge), Burnett County, WI, from 2006 to 2016.**

Stands of the non-native species of phragmites, or common reed, (*Phragmites australis* (Cav.) Trin.), have also been found at some current or historic manoomin waters, such as Allouez and Pokegama bays near Superior, WI, and waters outside the treaty territories including Green Bay. These plants also have the ability to expand rapidly and compete with rice for suitable habitat.

Another plant which has recently become a concern in Minnesota is the non-native flowering rush (*Butomus umbellatus* L.) (Norrgard 2008). Found in similar habitats as native bulrush (*Scirpus* L. spp.), which it resembles, flowering rush can persist in either emergent or submergent forms. Although it has only been documented in about a half dozen sites in the Wisconsin treaty territory, its range is expanding. Flowering rush spreads primarily through rootstalks.

Attempts to control invasive aquatic plants may also have unintended consequences on adjacent manoomin beds, while raising health concerns about the human consumption of manoomin from waters that may have been treated with herbicides (see Aquatic Plant Management section later in this document). This issue is growing in significance as many lake associations seek chemical

treatment permits for invasive or nuisance plant growth. Given the great variability in environmental conditions from site-to-site, it can be extremely difficult to determine the optimal methodology for treatment at a particular location, or to accurately predict the actual outcome of a proposed treatment once it has been selected. Spring and summer herbicide applications likely have the most negative impacts on manoomin. Frequently, a judgment must be made between the level of threat posed by the treatment, versus the threat posed by the invasive itself.

Rusty crayfish (*Orconectes rusticus*) have not appeared to have a marked impact on natural stands of manoomin to-date, perhaps because they generally prefer firmer sediments than those that typically support manoomin.

The impact from common carp (*Cyprinus carpio*) has been much more significant south of the treaty territories than within it, but that may be changing, perhaps as a result of climate change. Feeding and spawning carp uproot young plants, and increase lake turbidity to a level that likely reduces seed germination and early growth (Figure 31). In addition, carp may feed on rice seeds in the sediment. (Also see *A Story of Recovery*, page 75.)

**Figure 31. Manoomin flourishes in a seeded carp exclosure on Clam Lake, Burnett County, WI. Photo provided by T. Havranek.**

Finally, many are concerned that the most threatening invasive may be the next one, the unknown invasive yet to come. The increasing influx of new invasives makes it difficult for biologists to predict which new threat may be the most significant.

### *Climate Change*

Climate change is likely to be one of the most significant challenges to preserving the long-term presence of manoomin in the treaty territories. Manoomin is a northern-adapted plant at the southern edge of its range of abundance in the treaty territories, and alterations to the region's climate could have devastating effects on the plant.

Nearly every prediction of climate change for the region brings impacts that are likely negative for manoomin. For example, Burnett County, WI, has the greatest abundance of wild rice in the state. From 1950-2006 the growing season increased by approximately four weeks in this area (Wisconsin's Changing Climate*:* Impacts and Adaptation 2011). Increases in the length of the growing season are likely to increase competition with plants better adapted for warmer climates. Increases in summer temperatures (including nighttime temperatures) may also increase disease outbreaks. The unusually warm years of 2005 and 2010 were marked by significant outbreaks of brown spot disease (Figure 27 and Figure 32) for example. These years produced the lowest harvests since 1993, when the number of active ricers was considerably lower (Appendix D). Even increases in average winter temperatures and shortening of winter may by problematic, either through reduced seed germination or increased overwinter survival of pest species.

Expected increases in the frequency of heavy rainfall events will lead to increased flooding and uprooting of rice beds during the growing season. A dramatic example of this was seen in 2012, when the most damaging flood in Duluth's history brought up to 8 inches of rain to parts of northeast Minnesota when manoomin was in the floating leaf stage. Complete failures of the rice crop were common in the area that year. Heavy rain fall events can also overwhelm the dikes and water control structures that support many treaty territory rice beds. In 2018, the dike at the Radigan Flowage in Douglas County, WI, blew out after a foot or more of rain fell in the area – despite having been rebuilt to contemporary standards less than a decade earlier.

**Figure 32. Pacwawong Lake, Sawyer County, WI, in a year with a healthy stand (above) and a year with a heavy infestation of brown spot disease (below).**

All of these climate related changes are occurring across the entire range of rice, and are likely taking place at a pace that will be difficult for manoomin to adapt to. It is not surprising that northern wild rice was identified as the most vulnerable being/species evaluated in GLIFWC's initial Climate Change Vulnerability Assessment report (Panci et al. 2018).

### *Loss of Natural Genetic Variation*

The genetic make-up and variability of natural wild rice stands has been little studied and is poorly understood. However, there may be reason to be concerned about the genetics of manoomin in the treaty territories. Our understanding of gene flow between populations is limited, but presumably some genetic interchange between populations benefits manoomin stands by introducing variability that may help the population respond to changing environmental conditions. Gene flow in the form of seed transport is quite limited without human intervention. Without this intervention seed dispersal is limited to animal transport or hydrological flows downstream in riverine systems. It is likely that the primary mechanism for gene flow takes place in the form of pollen transfer.

The effective range of pollen dispersal and the factors affecting it are again poorly understood. It is suspected that evolutionary forces discourage long distance dispersal since the likelihood of landing on a receptive flower generally decreases as dispersal distance increases, and rice pollen is relatively heavy for a wind-pollinated plant. If typical dispersal distances are limited, we may have lost important gene-flow "stepping stones" between more distant beds when we lost many

of the historic manoomin beds which once occurred in the treaty territories, inadvertently reducing beneficial gene flow between populations.

A second concern stems from the advent of the cultivated wild rice industry. While very few cultivated beds currently occur in Wisconsin or Michigan, thousands of acres can be found in Minnesota. The cultivated varieties of wild rice currently used in the industry have been developed through traditional breeding programs that were initiated with atypical plants taken from natural stands. Although these varieties have been bred to have a relatively high proportion of traits that are unusual or undesirable in natural stands, they likely pose relatively little risk to natural stands, since their genetic origin is from wild plants and the primary trait being selected for (non-shattering) is not advantageous in nature.

However, the possibility of genetic engineering in cultivated wild rice raises both ecological and cultural concerns. For the Anishinaabe, manoomin is a sacred plant, and as such it should not be altered from the form it was given by the Creator. There is also a significant biological concern. DNA combinations that could never arise in nature could be engineered in the lab. If these plants are sown in paddies in close proximity to natural stands, pollen and/or seed transfer (Figure 33) could genetically contaminate natural stands. The consequences of such an action could be difficult or impossible to predict or, more importantly, to reverse. For these reasons, many bands as well as individual tribal members have expressed strong opposition to genetic engineering of manoomin. Because of the relatively high cost of genetic engineering, the relatively small size of the cultivated wild rice industry, and because of growing public concern about genetically engineered crops, it does not appear the industry is currently pursing genetic engineering. However, the cost of this technology is likely to drop in the future, and should it occur, the biological and cultural impacts could be highly significant. The release of genetically engineered wild rice anywhere within the range of the native plant should be prohibited.

**Figure 33. Wind can carry pollen from cultivated rice varieties to natural stands.**

The 2006 Minnesota Legislature provided the state Environmental Quality Board (EQB) additional authority over issues related to manoomin. The EQB is now required to notify the bands if a permit to release genetically engineered wild rice is issued anywhere in the United States (MN Statutes 116C.92, Subd. 2). The 2006 legislation also required that the EQB adopt rules requiring an environmental impact statement (EIS) for any proposed release, and a permit for an actual release of genetically engineered wild rice (MN Statutes 116C.94, Subd. 1b.).

### *Lack of Recruitment and Retention of Harvesters*

The future of manoomin in the treaty territories is likely to be greatly influenced by the number of people who appreciate and protect rice. This concept is also deeply embodied in the

Anishinaabe understanding that failing to honor this gift from the Creator by not harvesting it could result in its decline. Tribal and state harvesters, waterfowl hunters, trappers and others who value manoomin are often the first to notice damage or decline on particular beds, to work to protect them, or to suggest new areas for restoration. Having an appreciable cohort of tribal and non-tribal ricers is likely to enhance the long-term presence of manoomin in the treaty territories.

### *Cumulative Impacts*

Finally, it should be noted that many of the threats that manoomin faces do not act singularly, but in concert. The impacts of carp, for example, may be enhanced by climate change, or a bed thinned by high water may be more susceptible to intensive herbivory by geese. Multiple stressors at various locations are likely to have cumulative impacts on the resource. Manoomin stewards will be challenged in their ability to preserve and protect rice beds in the face of a host of interacting stressors.

# NAANAN (5): Fourth Order Relationships: Manoomin Stewardship

## Historical Accounts of Rice Management

Many European accounts of manoomin harvesting assumed – incorrectly – that tribal members simply took advantage of the offering of nature when utilizing rice. For example, when discussing the region that supported wild rice, Jenks (1901) wrote "No other section of the North American continent was so characteristically an Indian paradise so far as *spontaneous vegetal food* is concerned, as was this territory in Wisconsin and Minnesota."

This perspective missed the long stewardship relationship that existed between the Anishinaabeg and manoomin. Certainly wild rice provided for the people, but the people also had a responsibility to appreciate and care for manoomin in turn. This is one of the layers of meaning inherent in the older term for rice beds: *Manito Gitigaan*, or the Great Spirit's Garden. This term captures, (among other concepts) the perspective that while manoomin is a natural part of the landscape, careful tending to the crop can enhance its health and productivity, in the same way a dedicated gardener benefits her plants.

This stewardship had both spiritual and biological components (see also *A Story of Recovery*, page 75). The role of the rice chief during harvest season was discussed in Niswi (3), but this individual had responsibilities at other times of the year as well. For example, ceremonies honoring manoomin were conducted in the spring to help protect the crop and ensure abundance. These spiritual practices were coupled with the application of Traditional Ecological Knowledge (TEK) that had been gained over centuries. The rice chief would monitor the manoomin as well as the other components of the community, such as the water, muskrats, geese, swans and beaver – and take action as necessary and feasible. These actions might include things such as altering water levels, regulating muskrat numbers and beaver impacts, shooing away blackbirds or erecting perches in the rice beds for predatory birds to use, removing competing vegetation or seeding manoomin in new areas (Kinew 1995).

## Contemporary Biological Stewardship

*<u>Goal</u>: To actively participate in multi-agency or organization efforts that enhance manoomin stewardship.*

Many contemporary stewardship activities simply reflect the continuation of traditional practices, although new technologies can bring new approaches and techniques. Many forms of stewardship can be best realized through cooperative efforts with other partners dedicated to the preservation of manoomin. The places manoomin grows cross many different jurisdictions, and intersect with the interests of many different organizations. Each of the goals which follow can be better realized by working cooperatively with a broad range of governmental and non-governmental organizations which can contribute to manoomin stewardship.

## HARVEST STEWARDSHIP

*Goal: To accept the gift of manoomin respectfully, and in a culturally and biologically sound manner. To enhance the stewardship of manoomin through appropriate harvest regulation and monitoring.*

*Strategy: Work with tribal rice chiefs, biologists and ricers to review and update the list of date-regulated waters.*

While all contemporary harvest regulations exist at least in part due to stewardship or protection concerns, most (such as the prohibition on mechanical harvesting) are relatively straight-forward and will not be further discussed here. However, "date-regulation" or controlling the dates which individual waters can be picked, is one of the most complex, and sometimes most controversial harvesting regulation, and a review of the purposes and practical application of date-regulation is worthwhile.

### *DATE-REGULATION*

The practice of date-regulation stems from Anishinaabe law and is an important component of tribal self-governance. Date-regulation is a common practice for on-reservation waters, and it had been practiced in the past for select off-reservation waters in Minnesota. However, Wisconsin is the only state in which some off-reservation waters are currently date-regulated.

In Wisconsin, date-regulated lakes must be posted for opening at public access points at least 24 hours prior to the initial opening. Most commonly, lakes remain open for the remainder of the season once opened, but in some instances lakes cycle through several open and closed periods early in the season before remaining open for the duration. This cycling is done to allow the lake to "rest" and further mature between harvest days. This presumably helps protect the rice, and increases the efficiency of the harvest.

Generally, only lakes are date-regulated because the state contends it does not have the authority to regulate rice harvest on rivers or flowages where the bed of the water body – and thus presumably the rice growing in it – is privately owned. However, flowages and river sections in public ownership could be date-regulated.

In theory, there are both biological and social benefits to date-regulation. Biologically, some people contend that it benefits a stand to prevent harvest until a significant portion of the seed is ripe. Harvesters are well aware that harvesting is also planting; that is, many of the seeds that are dislodged in the harvesting process fall not into the canoe but into the lake or river. While harvesting at the right time and with the proper technique ensures only ripe seed is harvested *and planted*, harvesting too early (or with too much force at any time in the season) may dislodge seed before it is fully mature. Grain that has incompletely matured has a lower germination rate, and it is possible that plants germinated from this seed are less competitive as well (Aiken et al. 1988). The biological benefits of date-regulation would be most pronounced where harvest pressure is substantial and where the bed is naturally late to ripen, and thus more likely to be subject to pre-mature harvesting.

The social benefits of date-regulation are more straight-forward. The first of these is simple convenience to the ricer. Many people do not have the time to scout prior to ricing, and they rely on opening information to help them decide when and where to harvest. Even some ricers that harvest non-date-regulated waters have learned to use this information by noting similarities in maturation between particular date-regulated and non-date-regulated sites.

Date-regulation also provides special benefits to novice ricers who lack the knowledge and experience necessary to determine when rice is ripe. Maturity in manoomin is less obvious than in many wild plants, and novices are often uncomfortable making this determination, being concerned about unintentionally harming the beds. If their first harvest experience is on a properly opened, date-regulated water, it helps them learn how ripe rice should be before being harvested. With harvest records indicating that since 2012-2017, nearly half (44%) of the Wisconsin state-licensed ricers begin the harvest season with 2 or fewer years of ricing experience (or having made about 4 or fewer previous ricing trips) (GLIFWC unpublished data) this educational benefit is likely important.

Finally, date-regulation may increase the efficiency of the harvest. Comparing the average number of pounds of freshly harvested "green" rice per trip reported from date-regulated and non-date-regulated waters is problematic because the harvest is coming from two different sets of waters which may not be fully comparable. However, harvest from sites with at least 25 reported trips from 1992-2009 averaged about 10% higher on date-regulated (42 versus 38 pounds per trip) than non-date-regulated waters. Relatively low rates of harvest on some non-date-regulated sites are particularly noteworthy. For example, the average pounds of harvest per trip on the heavily harvested Pacwawong Lake in Sawyer County and Chippewa Lake in Bayfield County averaged about 29.3 and 31.2 pounds per trip respectively, both well below the statewide average of 40.3 pounds. Since mature seed finishes at a higher rate than immature seed, the difference in finished yield is even greater than is reported for freshly-harvested manoomin.

Nevertheless, some ricers feel date-regulation is unnecessarily restrictive, and contend that ricing is at least partially a self-regulating activity: if the rice isn't ripe, picking won't be fruitful and the harvesters will discontinue their effort. Date-regulation also requires inputs of time and resources to survey and post lakes since date-regulated lakes cannot be legally harvested unless posted open. It also creates a need to disseminate information about openings when they occur. Determination of maturation is also somewhat subjective and can also be a challenge for opening authorities; invariably some harvesters complain each year that particular lakes were opened too early or too late. Finally, date-regulation can sometimes lead to some reduction in human harvest, particularly when lakes are cycled opened/closed early in the season, and a storm event impacts the lake on a day it is open for picking.

As noted above, the biological benefits of date-regulation would be most pronounced where harvest pressure is substantial and where the bed is naturally late to ripen, and thus more prone to pre-mature harvesting. The social benefits are greatest under these same conditions, and when a large proportion of the ricing population has relatively little experience, or has limited time to scout potential harvesting locations before picking.

While ricing efficiency appears to be greater at date-regulated sites, it is difficult to demonstrate the biological benefits of date-regulation. Under current levels of harvest pressure, which are appreciably lighter than several decades ago, it does not appear that waters which are not date-regulated are doing more poorly than waters which are date-regulated.

Overall, however, a strong majority of tribal ricers favour continuing date-regulation at least on some sites. Among tribal harvesters with an opinion, nearly 88% supported keeping at least some lakes date-regulated when asked their opinion in the 2013 through 2015 harvest surveys (and the same was true of 82% of state-licensed ricers) (GLIFWC unpublished data).

Due to the costs and logistical consequences of date-regulation, it seems that the benefits of date-regulation can be maximized by carefully selecting waters on the basis of harvesting pressure and maturation chronology. Little is gained, biologically or socially, by date-regulating lightly harvested sites, and the inclusion of low priority sites burdens rice chiefs and reduces their ability to focus on important waters.

### *Harvest Data Collection*

Harvest data can be an important tool for manoomin stewards, and tribal codes require cooperation with harvest survey efforts. Harvest data, especially when coupled with abundance data, can provide many insights into the health of the manoomin resource, and the exercise of the treaty-reserved harvest. Without basic harvest information, many manoomin issues – like understanding the pressure on the resource, the distribution of the harvest or the likely value of date-regulating a water – are difficult to evaluate objectively.

Fortunately, a stipulation from the *LCO* (*Voigt)* case provides for cooperative harvest monitoring of both state and tribal off-reservation harvesting in Wisconsin. The annual harvest surveys resulting from this have provided a wealth of information on ricing in Wisconsin that is not available for the other states. Examples of how this information can be used can be found in Appendix D.

### *Possible Regulatory Changes*

#### *Permits*

A permit should continue to be required to harvest manoomin off-reservation.

While this document is focused on tribal stewardship, manoomin stewardship in general would be enhanced if the states also required a license or free permit for all state ricers, regardless of age, so that all ricers could be included in harvest surveys. In addition, the State of Wisconsin is encouraged to create a non-resident/landowner license. Such a license may increase the stewardship interests of non-residents who own property on rice lakes in the treaty territories, while having little impact on harvest pressure.

#### *Ricing Sticks*

Some tribal members have expressed an interest in allowing bawa`iganaakoog (rice knockers) made of basswood or similar light-weight woods in addition to cedar, but

demand for this change appears limited. As a result, no regulation changes regarding the requirement to use cedar are proposed at this time. Should changes be considered, it may be better to regulate the weight of sticks rather than the material of their composition.

### *Boats*

Some individuals have expressed an interest in allowing jiimaanag (canoes or boats) up to 18 feet in length in areas outside of Minnesota, but demand for this change appears limited so no changes are proposed at this time for regulations concerning jiiman dimensions, propulsion, or gunwale modifications.

### *Hours*

Some ricers in Wisconsin have expressed an interest in allowing ricing to begin at 9:00 AM, which is the opening time in Minnesota, but interest in this change appears limited and no changes are proposed at this time. (Some people in Minnesota are interested in lengthening hours for state-licensed ricers beyond the current closing time of 3 PM; this change might help recruit more young ricers by allowing "after-school" ricing and enlarge the pool of manoomin proponents.)

### *Wisconsin Date-Regulated Waters*

Tribal representatives have expressed interest in modifying the existing list of date-regulated waters in Wisconsin.

The current list of waters in the *Voigt Intertribal Task Force Protocol on Manoominikewin (Wild Rice Harvest) Levels*, includes fifty-three (53) named off-reservation waters in the ceded territory. (On-reservation waters are outside the scope of this document.) However, several problems exist with the current list.

About 25 of the listed lakes have little or no rice, and little or no demonstrated harvest since 1992. Keeping lakes with little or no manoomin listed is confusing to novice ricers, who expect lakes on the list to generally provide an appreciable harvest opportunity most years. In addition, little is gained by date-regulating waters with little or no harvest pressure, yet these waters cannot be legally picked until opened, and so they detract from the limited time and resources available to tribal wild rice authorities, or they become unavailable for legal harvest when the tribal wild rice authority are unable to survey these low priority sites.

Several lakes on the list also have very limited public access. While access is generally possible through either navigable rivers or streams, or by gaining permission to enter through private land, these lakes also garner relatively light attention from harvesters. They are difficult for the tribal wild rice authorities to access or post, but again cannot be legally harvested unless opened.

Two listed lakes (Nye Lake, Polk County and Sand Lake, Vilas County) appear to be erroneous listings, as no lakes with these specific names exist in these counties. They may have been local names for other lakes, but no clear correlation to another water

body has been determined. (Nye Lake is believed by some to be a reference to Horse Lake, near the town of Nye, but this lake has never been known to have more than a very minor presence of rice; Sand Lake might be a reference to White Sand Lake, which may have some suitable habitat, but currently has no established manoomin beds.)

While a number of lakes on the list appear suitable for removal, there are also some waters in the State of Wisconsin that currently are not date-regulated where harvesting pressure is heavy, maturation is on the late side, and the benefits of date-regulation could be appreciable.

The WDNR-Tribal Wild Rice Management Committee is currently developing a recommendation to modify the list of date-regulated waters. This proposal is expected to remove a number of waters with little or no reported harvest from the date-regulated list identified in the *Voigt Intertribal Task Force Protocol on Manoominikewin (Wild Rice Harvest) Levels*, but add several waters with substantial harvest to the protocol, and thus is expected to increase the amount of harvest that is date-regulated while substantially reducing work load for tribal wild rice authorities.

### *Michigan Harvest Regulations*

The State of Michigan does not currently have wild rice harvesting regulations, and several Michigan tribes also lack them as well. This has led to some confusion and conflict among people attempting to harvest. We encourage the state to work closely with the tribes and develop ricing regulations that help protect Michigan's remaining manoomin waters.

## HABITAT STEWARDSHIP

*Goal: To protect, enhance and expand the abundance of manoomin by protecting rice and rice habitat and conducting active restoration.*

### *SEEDING*

In areas with suitable habitat, seeding is often the simplest method of increasing rice abundance (Figure 34). Seeding at both historic and non-historic sites can be worthwhile and necessary – worthwhile because of the many ecological and cultural benefits rice provides and because rice abundance in the state remains lower than it was prior to European contact, and necessary because rice seed has a very limited natural ability to disperse.

**Figure 34. Hand-broadcasting manoomin.**

There is a long history of seeding rice in the treaty territories, though much of it is poorly

documented. Tribal governments, individual tribal members and other harvesters, waterfowl hunters and natural resource agencies all have expended considerable resources in efforts to increase the abundance of this sacred plant. While some sites have met with great success, many other locations have showed little response.

Since the reaffirmation of treaty rights in the Great Lakes region there has been a significant expansion of seeding efforts in the treaty territories. In 1987, GLIFWC began off-reservation seeding activities by planting 200 pounds of seed in Pat Shay Lake, Vilas County, WI, in cooperation with the Nicolet National Forest, and providing approximately 100 pounds of seed to the Wisconsin Department of Natural Resources for seeding on a state wildlife area. The seeding program grew gradually over the next several years, until it expanded significantly in 1991 (Figure 35) with support of funding from the Bureau of Indian Affairs Circle of Flight Program. The bands and GLIFWC have served as a catalyst and coordinator of many of these efforts, stimulating an existing interest in manoomin restoration in other natural resource agencies. (A summary of past "Manoomin (wild rice) enhancement and research in the ceded territories" reports are available online at www.data.glifwc.org/reports.) (Seed purchases by GLIFWC have declined in recent years in part because GLIFWC has increasingly coordinated seed sales directly between sellers and cooperators where we had previously served as intermediaries.)

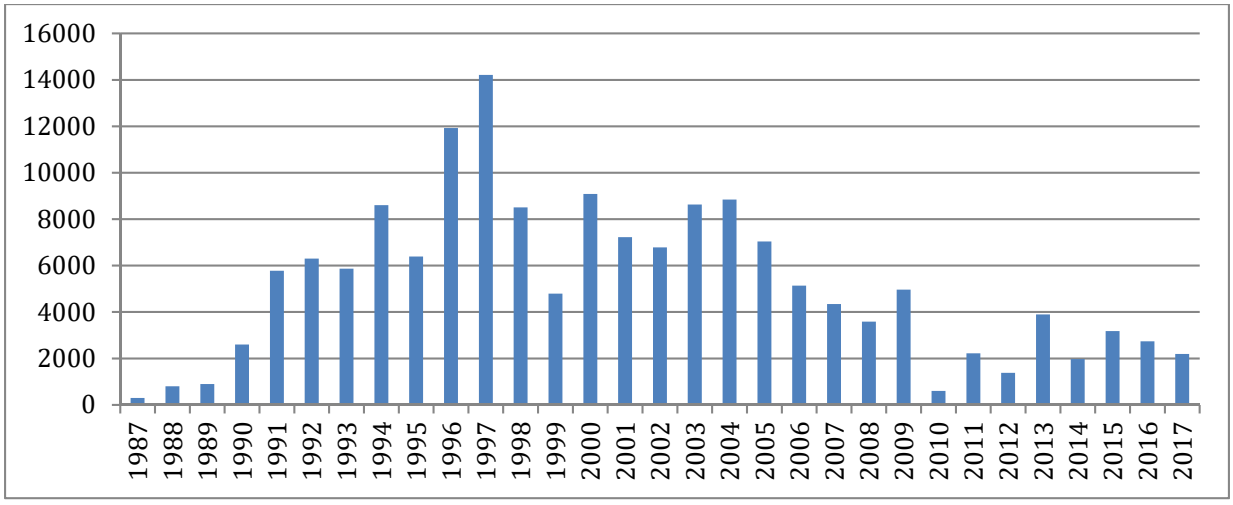


**Figure 35. Pounds of manoomin seed purchased by GLIFWC and seeded by GLIFWC, its member tribes, or cooperators, 1987-2017.**

Over the last three decades, a highly cooperative, interagency restoration program has developed that includes many cooperators, including not only the state and tribes, but federal agencies such as the Bureau of Indian Affairs, the U.S. Forest Service, the U.S. Fish and Wildlife Service, and the Environmental Protection Agency; county governments; private organizations such as Ducks Unlimited and Wisconsin Waterfowl Association; local lake associations, sporting groups and even private individuals. Restoration efforts continue to be an important part of GLIFWC's manoomin management program.

**Figure 36. The successful seeding of the North Fork Flowage makes it one of the flagship rice waters on the Crex Meadows Wildlife Area, Burnett County, WI.**

It is clear that seeding efforts have had a landscape level impact on manoomin abundance in the ceded territory. One measure of manoomin beds on the Crex Meadows (Figure 36) and Fish Lake properties in Wisconsin estimated that nearly 550 acres of rice existed in 2009 (a year with a generally good crop) as a result of seeding efforts (Unpublished WDNR Report on the establishment of wild rice on the Crex Meadows and Fish Lake properties. GLIFWC files). While these two properties have been a primary focus area for seeding efforts, successful efforts have taken place across the treaty territory, ranging from relatively small beds established primarily for the benefit of wildlife, to large beds that have also come to provide significant human harvest.

Harvest records indicate that the percent of harvest coming from seeded sites in the State of Wisconsin has grown markedly over time (Appendix D). From 2005 to 2015, seeded sites accounted for 25% of the harvest reported from named waters.

At the same time, many seeding efforts have undoubtedly been attempted at locations of poor suitability or using poor methodology. This was true of many early seeding efforts, which often involved seeding with a "shot gun" approach that involved minimal evaluation of habitat suitability prior to planting, or adequate follow-up evaluation. It can also be the case when the desire to establish manoomin becomes too focused on a particular geographic area, rather than seeking out areas that provide the optimal growing conditions.

In areas where seeding efforts have been underway for an extended period of time, further seeding efforts may become more challenging as some of the best opportunities for this form of restoration have already been accomplished. While seeding at sites like waterfowl impoundments may be fairly simple and straightforward to accomplish, other locations, especially historic sites, can raise a number of ecological and social considerations (e.g. water level manipulations) that can add complexity to restoration efforts.

GLIFWC has developed manoomin seeding guidelines that attempt to identify and address most of these considerations (Appendix E). These guidelines review issues such as seed source, seeding rates, the need for multiple years of seeding, monitoring, and other concerns. Resource managers are encouraged to follow these guidelines when pursuing seeding efforts, and to consult with more experienced managers if they are unfamiliar with manoomin restoration techniques.

In summary, it is clear that seeding can be an effective stewardship tool and a relatively inexpensive way to significantly enhance the ecological value of wetlands. Seeding can also be one of the best ways to restore some of the lost abundance of manoomin, by introducing it to new areas of suitable habitat, or re-establishing lost stands after site suitability has been restored through other management actions. However, like all other forms of manoomin stewardship, seeding should proceed in a respectful way. This includes things such as: applying the best TEK and scientific information available to help in the selection of sites with the best likelihood of success; purchasing seed that has been properly harvested and handling it properly; and committing to other steps (such as subsequent monitoring) that both enhance the likelihood of success and increase our understanding of manoomin stewardship.

### *Water Level Management*

On areas of generally suitable habitat, hydrology is one of the most significant factors influencing manoomin abundance. There is a long history of manoomin stewardship through water level management, going back to Anishinaabe efforts to remove beaver dams or create simple dams as needed on select waters. While rice is often able to persist on natural waters without artificial water level management, many contemporary manoomin beds are found on lakes or impoundments whose water levels are regulated (to varying degrees) by human-made dams. Beavers can also frequently impact rice beds, both positively and negatively. Finally, many sites that may superficially appear "natural" may still have their hydrology modified by roads, culverts, changes in the vegetative community, development, or other alterations in the watershed. Thus, successful manoomin stewardship is oftentimes dependent upon careful water level regulation.

### *Dams*

Water level management on dammed sites generally consists of maintaining conditions suitable for rice as discussed in the habitat and life cycle sections above. Thus, some of the concerns for managers include:

- Maintaining adequate areas of habitat in the 0.5 to 3-foot range throughout the growing season, and especially providing habitat in the most optimal depths near the middle of this range.
- Keeping water levels within these depths during late April and early May to promote germination.
- Generally encouraging relatively stable or gradually receding water levels during the growing season.
- Attempting to prevent or minimize rapid increases in water depths, especially when the plant is in the floating leaf stage and is susceptible to uprooting or drowning.
- Allowing or introducing some year-to-year and seasonal variability in water levels to prevent creating overly stable conditions that favor perennial vegetation.

How these concerns play out will vary from site to site. For example, sites that are particularly "flashy" after rainfall events may have to be closely watched especially during the floating leaf stage, because while plants that have reached this stage can drown if re-submersed, they can also survive if the period of being re-submersed is relatively brief.

One of the most effective management tools appears to be regular or occasional overwinter drawdowns. Overwinter drawdowns of 1.5 to 3 feet have been very effective at reducing competition and enhancing rice production at several sites in the state (Figure 37).

**Figure 37. Annual overwinter drawdowns on Little Rice Lake, Forest County, WI, have been very compatible with manoomin production.**

These drawdowns may also provide some benefits in creating storage capacity to reduce spring flooding. Additionally, they may benefit fisheries by reducing overwinter oxygen demand by taking decaying vegetation out of the water column. These drawdowns are best conducted shortly after the rice harvest season, but before herptiles have entered lake sediments for winter dormancy.

Water level management should also consider the needs of harvesters where they can be accommodated. If water levels are very low during the summer for example, raising them modestly prior to the harvest season (where possible) may facilitate ricer access to the beds without causing negative impacts to plants.

It is important to note that while dams can both destroy and create manoomin habitat, many contemporary rice beds are found behind dams. Dam and dike maintenance is growing increasingly expensive, and many dams are owned by entities with limited financial resources or limited interest in manoomin stewardship. It is likely that at least some existing manoomin beds will be lost in the years ahead as some dams are removed, and it will be important to find opportunities to increase rice abundance in other areas to counter these losses.

### *Amik (Beaver)*

It is not surprising that the stewardship of a plant that is so strongly influenced by water levels would intersect with the stewardship of a species that can markedly impact those levels. Amik and manoomin have shared the treaty territory landscape for centuries, and while it's clear that amik (or more specifically their dams) can markedly impact manoomin, it's also clear that those impacts can be positive or negative, and vary from site-to-site and even year-to-year depending on environmental conditions. However, human-induced changes to the treaty territory landscape since European contact have increased the carrying-capacity for beaver while decreasing rice abundance, making it important for stewards to consider amik impacts on manoomin.

**Figure 38. Seeding efforts on Chippewa Lake, Bayfield County, WI, would not have been successful without concurrent beaver management.**

Stewards must use care when drawing general inferences about the relationship between manoomin and this furbearer. Perhaps the best generality that one may draw is that the addition of a beaver dam to an otherwise productive manoomin bed is likely to have negative impacts, while beaver dams may have positive impacts by creating or enlarging suitable habitat where little or none previously existed. However, even this generality must be taken with a grain of salt; sometimes beaver dams can also help maintain suitable water levels on existing rice beds subject to drought conditions.

Thus, while beaver management should not be considered to be synonymous with amik control – amik control and dam removal clearly have a place in the manoomin steward's tool box (Figure 38). In Minnesota over 200 rice waters are monitored annually for beaver impact and control under a program conducted cooperatively between the state and Ducks Unlimited (Norrgard 2008). However, the application of this tool should generally be reserved for sites with well-established stands that are showing negative impacts, or can be expected to do so. At these sites, ongoing control may be called for, but widespread beaver control across the regional landscape is not necessary. The focus should be on specific locations and specific animals and their dams.

Manoomin stewardship concerns should also be incorporated into beaver management plans and control strategies. Under Wisconsin state law, landowners, leasees, or occupants may remove beaver dams causing damage or a nuisance without any sort of permit, permission or authorization from the WDNR (Bureau of Wildlife Management 2005). Permits are also not required to remove dams from a neighbor's land if a dam on their property is damaging your land, nor is this removal considered trespass. However, there are specific definitions of "damage," "molest," "private property holder," "removal," and other terms related to beaver control and dam removal under Wisconsin law. Loss of rice beds is not included in the current definition of damage, which should be rectified, as there have been situations where private landowners have resisted allowing the removal of dams that have led to the loss of manoomin beds on upstream lakes (Figure 39). Where beaver control or dam removal is needed, that control will generally need to be conducted outside of the normal trapping season, as a management action rather than a subsistence harvest. More details on legal beaver control activities in Wisconsin can be found in the WDNR document *Beaver damage control* (Bureau of Wildlife Management 2005).

**Figure 39. This beaver dam caused a major decline in manoomin abundance on an upstream lake.**

The impacts of amik control should also be considered from both the short- and the long-term. While control will often offer positive benefits in the short term, there may be some negative impacts from consistently applying control to certain waters over the long-term. Manoomin again tends to benefit from occasional disturbances, and the occasional flooding of areas may be one of those disturbances. For example, a high water year may kill back the woody vegetation that may encroach on the edges of rice habitat in low water years. It may be necessary to let the rice crop on a particular water fail due to high water periodically to maintain the long-term suitability of the site. This need is another argument for maintaining substantial levels of rice abundance in areas, so that when some waters fail, others are available to provide for both human and more-than-human harvesters.

### *Culverts*

Culverts can act very much like beaver dams, both destroying manoomin beds, and occasionally creating suitable habitat by acting as dams. Especially in past years, culverts appear to have often been set by local officials in a fairly haphazard manner, yet their impacts on rice beds can be dramatic. Perching a culvert above the natural level of stream flow can increase water levels on upstream lakes, or cause flow in the system to become more seasonal, making areas unsuitable for rice (Figure 40). Similarly, undersized or partially clogged culverts can increase the "flashiness" of the system's hydrology. Even seemingly small errors in culvert placement or design can be problematic, and stewards are wise to carefully consider the impacts of culverts on the wetlands they manage. While culverts may occasionally create suitable habitat, negative impacts are far more likely, and fish passage and other issues will generally dictate that the best culverts are those that have the least effect on the hydrology of the system. Although they are often more expensive to install, large "bottomless" culverts are often the best ecologically. Culvert sizing in many areas also needs to increase to reduce the negative hydrological impacts created by climate change.

**Figure 40. An example of a perched culvert.**

## *A Story of Recovery:*
## *The Meshing of Culture and Ecology at Clam Lake*

The loss of the 300+ acres of manoomin that graced Wisconsin's flagship rice lake was sudden and dramatic. A spectacular crop in 2006 was followed by a complete failure, then another and another and another (Figure 41). Something was seriously wrong at Clam Lake.

**Figure 41. Lone Star Bay before and after the crash.**

The St. Croix Tribe, which holds reservation lands on the lake and had harvested this water for centuries, led the way on restoration efforts. They tackled the issue by seeking the advice and cooperation of tribal elders and spiritual leaders; biological staff from the tribe, the WDNR and GLIFWC; and members of the local lake association.

Carmen Butler approached elders of GLIFWC's member tribes with an offering of asemaa (tobacco), requesting their participation at a ceremony to be held on the lake's shore, where a longhouse was erected. There, the spirits of the lake were honored and feasted, and a pipe passed while all present shared their knowledge and experience in hopes of restoring Clam Lake's ecological and spiritual health.

Biologists meanwhile were working on their side of the story. Over time, a biological tale emerged: it appeared that the loss of the manoomin was triggered by a die-off in the bluegill community. Whether from winter-kill or disease, a crash in this panfish population meant bluegills were not present to consume carp eggs. And with the lack of this control, the population of the introduced carp – present in the lake for decades – exploded. As they grew in size, they destroyed the manoomin, likely by eating seeds, uprooting plants, and making the water too turbid for spring germination.

As ceremonies and honoring of the lake were re-instated, efforts to address the carp were also put into place. Transmitters placed in a few fish helped biologists monitor the movements of large groups. Barriers were erected across a bay mouth to keep the carp out of a large span of water. Carp were captured and removed. Areas were seeded. And the rice is coming back (Figure 42).

**Figure 42. Clam Lake's southern bay before and after carp barriers were installed by the St Croix Tribe.**

Full restoration has not yet been achieved. But a remarkable recovery is underway, and humble and thankful ricers once more can accept this gift from the Creator, thanks to a meshing of cultural and ecological restoration.

### *Establishment of No-Wake Zones and Designated Boating Channels*

While many treaty territory manoomin waters are relatively small and undeveloped, manoomin is also found on a number of large lakes and heavily traveled river systems. On these waters, impacts from boating may be significant, especially during the early growth periods when power boats may cut multiple channels through the manoomin beds, or the large wakes they produce uproot seedlings from the soft sediments where they typically are found (Figure 26). This problem may be exacerbated at some locations by high-speed personal watercraft capable of utilizing shallower areas than traditional motor boats. At problem areas, it may be valuable to establish slow/no-wake zones and designated boating channels to minimize the negative impacts of power boats.

However, the benefits of these types of regulations may be difficult to quantify. Slow/no wake regulations are typically implemented at the local (often township) level, and effective enforcement is often lacking. Their greatest benefit may be subtler, acting in an educational way to encourage resource protection in the long-term.

Designating boating channels can help confine negative impacts to particular areas. Especially early in the growing season it can be difficult for boaters to follow the natural stream meanders through some areas. Restricting boating to the primary channel (which is often too deep for good manoomin growth) not only improves boating, but keeps boats from randomly passing through developing beds.

Similarly, where adjacent shoreland owners are seeking rice removal permits to gain open-water access from docks, it may be possible to lessen the impact on manoomin and reduce labor for the riparian owner by encouraging adjacent owners to share access channels (Figure 43).

**Figure 43. By sharing an access channel, these landowners reduce their impact on the rice bed.**

Finally, it should be noted that the recently enacted "early teal hunting seasons" in Wisconsin and Michigan appear to be having negative impacts on some rice waters. Traditionally, most duck hunting took place after rice had matured and dropped seed, and damage from hunters was minimal. The early teal season occurs while some rice is still maturing, and overlaps the rice harvest season. There have been a number of reports of duck hunters opening channels in rice beds to access hunting blinds, or to create open shooting lanes or even areas to place decoys. WDNR law enforcement contends there is little that can be done regarding this damage since perpetrators only need to indicate it is simply a side-effect of legal navigation. Possibly law changes or no-wake zones could help minimize these negative impacts; education material in duck hunting regulations could increase voluntary protection.

### *AQUATIC PLANT MANAGEMENT*

There is a growing need to incorporate manoomin concerns into general aquatic plant management (APM) efforts. Aquatic plant management issues have been growing greatly in recent years as lake associations become increasingly involved in various activities including the development of lake management plans and implementing mechanical and chemical removal of invasive or nuisance aquatic plants. Some lakeshore owners consider manoomin a nuisance, seeing rice only as a plant that inhibits navigation or blocks their view of an open lake. At many locations, APM activities have the potential to impact rice directly, or indirectly through the secondary impacts of actions such as the application of herbicide to invasive species (Figure 44).

**Figure 44. Invasive Eurasian water milfoil. WDNR photo.**

Clearly manoomin habitat is protected by efforts to curtail the expansion of invasive species. Other benefits can be gained by incorporating manoomin stewardship concerns into the development and review of the various plans and permits associated with aquatic plant management. However, greater long-term impacts could be gained by increasing participation in the development of management plans for waters that presently or historically supported manoomin. The ongoing relationship that can develop between biologists and lake associations under these conditions can provide an opportunity to educate lake users about the benefits of manoomin and other native vegetation.

While the stipulations from *LCO v Wisconsin* require the state to consult with the Voigt Task Force before issuing permits that may affect rice or rice habitat, similar provisions are unfortunately lacking for the Minnesota and Michigan portions of the treaty territory.

### *ACCESS MANAGEMENT*

Managing access entails managing ricers more than manoomin, but access management should remain a consideration for resource managers. While not every manoomin water needs to have substantially developed access, there are some appreciable manoomin waters (such as Rice Lake, southern Polk County; Rice Lake, Washburn County; Gary Lake, Oneida County; and Frost Lake, Vilas County, all in Wisconsin) that would provide more human harvest if greater access was available. The opportunity to develop access at these locations such as these should be pursued whenever possible. In addition, as a matter of safety it would be beneficial to provide some small opportunity for off-road parking at locations where none currently exists. Furthermore, any lake whose harvest is date-regulated should have an adequate access point and a clear posting location to avoid harvester confusion regarding lake openings.

### *Land Acquisition*

Intensive lakeshore development typically has negative impacts on manoomin beds, both through immediate impacts, such as the development of docks, boating lanes and view corridors, and through longer-term impacts such as the pressure that often comes from lakeshore owners to modify water level regimes where dams exist. Important protection can be provided to manoomin beds and the myriad of wildlife species they support by placing adjacent shoreline habitats in public ownership when possible. Public land acquisition programs should place a priority on manoomin water shorelands, and in the case of flowages, bottom lands.

### *Placement on the National Register of Historic Places*

Many manoomin beds are have been critical centers of human utilization for centuries, and may qualify for inclusion on the National Register of Historic Places. Rice Bay on Lac Vieux Desert was included in 2016, and other sites are currently in the nomination process. The biggest benefit of this recognition is likely that an Advisory Council on Historic Preservation must be allowed to review and comment on all projects involving federal funding which may affect the property.

## Abundance Monitoring

*Strategy: To maintain a long-term program of annual manoomin abundance monitoring to direct and enhance rice stewardship, using the most suitable methodologies available.*

Annual monitoring of the abundance and health of manoomin is fundamental to long-term rice stewardship. Monitoring can provide insights into long-term trends in abundance, identify sites experiencing problems, document responses to stewardship activities, provide information on disease outbreaks, and enhance harvesting efficiency. As a result, tribal biologists often need to establish programs to monitor rice abundance, but specific monitoring needs can vary widely between programs, and monitoring ability is often constrained by time and budget concerns.

Most monitoring programs share some common characteristics, such as incorporating standardized methods. In addition, due to the great natural annual variation rice can display, most monitoring programs need to be in place many years in order to provide good insights into trends in the abundance and health of manoomin. However, the monitoring approach that is most appropriate will vary with the needs and abilities of the group doing the monitoring.

When information is needed from a fairly small number of waters – such as within a reservation boundary – it may be possible to gather quite detailed information on rice production. An excellent methodology for this situation was developed by Tonya Kjerland as part of her M.S. degree at the University of Minnesota. Her products, a wild rice monitoring handbook (Kjerland 2015a) and associated field guide (Kjerland 2015b), are available through the University of Minnesota Sea Grant Program. These materials provide resource managers with the methods and rationale to estimate a water body's annual wild rice biomass, density, and productivity. In addition, her methods were developed in cooperation with several Native American consultants, and are designed to respect manoomin and those who consider manoomin sacred. Rice stewards

are encouraged to apply Kjerland's methodology where possible and appropriate to bring greater consistency to rice monitoring in different areas.

When information is desired from a large number of waters, or when courser information is adequate for the needs identified, Kjerland's methodology may prove too intensive and expensive to apply. GLIFWC, for example, often attempts to gather approximate rice abundance information for 200+ waters each year. Aerial surveys have proven to be a cost effective way of gathering baseline information of this nature, particularly when flights are conducted under similar conditions (minimal cloud cover, consistent camera angles, time of day, etc.) (Figure 45).


**Figure 45. Aerial surveys can provide valuable information on annual trends in rice abundance in a cost effective manner.**

Currently, efforts are underway to improve the ability to monitor manoomin remotely through satellite imagery, multispectral imagery shot from planes, or the use of drones. Each of these methods brings its own costs and benefits. The practicality of applying them remains to be fully determined, but it is likely these approaches will become part of the manoomin stewards tool box in the foreseeable future.

## DATA MANAGEMENT

The information collected during annual manoomin monitoring, management and restoration efforts provides a valuable long-term database that can be used to document historic trends in harvest, the successes and shortcomings of management efforts, and inform the likely impacts of proposed activities on wild rice. This information is collected in a variety of ways including handwritten notes, mail surveys, digital imagery, and customized digital forms on mobile devices and personal computers. The information is stored in GLIFWC's PostgreSQL database and managed by GLIFWC's data manager. This enables the information to be accessible to GLIFWC staff for analysis and to tribal members and the general public via custom applications on GLIFWC's website that draw data directly from the database as it is updated. Data collection methods which record information in a digital format can be uploaded and made available to these data users in a shorter time frame. Additionally, custom digital data entry forms can be constructed to enforce data quality standards and reduce errors. These methods should be developed and adopted wherever possible to increase the efficiency of manoomin data management and reduce errors.

A currently available web application that uses this information provides interactive maps and tables depicting relative abundance, aerial imagery, and opening dates for harvesters (www.data.glifwc.org/manoomin.harvest.info). A long-term harvest application designed for use by GLIFWC staff is also under construction which will allow for custom spatial and temporal queries (www.data.glifwc.org/wildlife.harvest.summary).

## EDUCATION AND INFORMATION

*Goal: To educate and inform the tribal and non-tribal public of all ages on the cultural and ecological significance of manoomin, how to protect rice, and how to harvest rice in an appropriate and respectful manner.*

There is a significant need for education and information efforts related to manoomin, in both the tribal and non-tribal communities. However, the type of information that is most needed varies across the treaty territories, and by the target audience.

Within the tribal community manoomin education can also be used as a springboard for cultural revitalization. Tribal schools are increasingly taking youth out to rice lakes to harvest and developing bi-lingual lesson plans to infuse native teachings and practices. On-reservation stewardship activities can also yield educational opportunities. For example, at Lac Courte Oreilles (LCO) a cranberry marsh was successfully converted to grow wild rice with the assistance of Great Lakes Restoration Initiative funding. In addition to their ecological benefits these beds are used as a training area for the K-5 classes at the LCO Ojibwe School. Gaining traditional knowledge and exercising treaty rights under the mentorship of school staff benefits a community that often times has busy working families with limited time and resources.

Among the general public the benefits and values of manoomin are often unknown, misunderstood, or under-appreciated, even while manoomin remains one of the most valuable wetland plants on the treaty territory landscape. Lakeshore owners or boaters sometimes view manoomin as a nuisance rather than a benefit, considering it a hindrance to navigation or an impediment to the viewscape. Others don't understand why manoomin is worth protecting, or why rice should be accommodated in lake management plans or water level management operations. Lake associations in Wisconsin often don't understand why the state must consult with the bands and the Voigt Intertribal Task Force when they propose undertaking activities that may affect manoomin abundance or habitat.

**Figure 46. Participants in a manoomin camp held in cooperation with UW-Stevens Point.**

At the same time, there are a growing number of people interested in protecting manoomin. Some are interested in planting manoomin to attract wildlife or provide improved hunting or trapping opportunities. Others are interested in harvesting (Figure 46), even while a fair number of non-Indians continue to mistakenly believe that manoomin harvesting is an activity that is legal only for tribal members. All of these individuals need or are looking for more information on manoomin, yet the resources available for them are often limited or hard to locate. As a result, the opportunities for public education and information are significant.

GLIFWC and its member tribes have worked with state natural resource agencies and other partners to develop brochures on the ecology, cultural significance and stewardship of manoomin. GLIFWC has also widely shared its own seeding guidelines with individuals and other agencies, some of which have adopted them for their own use. GLIFWC and tribal staff also frequently give presentations regarding manoomin at professional conferences, to school groups, lake associations, other organizations, or the general public, but many additional opportunities remain. Several particular education needs exist, including (in no particular order):

- Educational materials on manoomin and the respect and responsibility principles of upholding the treaty obligations to manoomin. Education is needed to present manoomin as a gift of creation, keeping the balance between creation and the people.

- The continuation of the *Canoomin* (canoe and manoomin) safety course taught by the Conservation Enforcement Division of GLIFWC to instruct new and novice harvesters on the sacredness of manoomin as well as conservation and safety parameters.

- A video targeting new or novice ricers, explaining and depicting how to determine maturity in manoomin, how to harvest in a good way, and how to finish rice appropriately.

- Manoomin camps that offer opportunities to demonstrate harvesting and finishing activities for both the tribal and non-tribal public, including youth.

- Expanded ecological and cultural materials targeting lake associations and lakeshore owners, encouraging stewardship of manoomin.

- Summary information on the ecological benefits of manoomin and its unique legal status that can be included in management plans being developed for important rice waters.

- Outreach to land stewards and public officials on the need and benefit of rice stewardship.

- Development of a detailed, multi-faceted power point presentation that can be shared with biologists who receive requests for manoomin presentations.

It would also be beneficial to have additional staff time directed to public education efforts, especially during the summer and early fall, when lake associations commonly hold their meetings, when many lake fairs are held, and when demonstration camps need to be held.

Another undertaking that would bridge public education, research and management needs would be to develop a program to involve schools, lake associations and other outdoor education facilities in an "Adopt a Rice Water" monitoring effort. A citizen-science program of this nature, involving annual monitoring of manoomin abundance and water quality/level information on various waters could be coupled with education efforts to gather needed biological data, while encouraging local stewardship and recruitment of harvesters.

## RESEARCH

*Goal: To promote, conduct and cooperate with culturally appropriate research that enhances our understanding of manoomin and our ability to steward rice for future generations.*

While a great deal is known about the basic ecological requirements of manoomin, there are also great gaps in our understanding of many of the subtler aspects of rice ecology, and of the relationships between rice and the other physical and biological components of the wetland communities where it grows.

Historically, most manoomin management has been based on the Traditional Ecological Knowledge (TEK) of the plant held by those most familiar with rice. In recent decades, scientific studies of the plant have increasingly contributed towards our understanding of manoomin. However, too often TEK and scientific studies have advanced in relative isolation from each other. There are great opportunities to further advance our understanding and stewardship of manoomin by bringing together the TEK and western scientific disciplines. Some areas with identified research needs include:

### *REMOTE SENSING*

Many stewardship and research efforts benefit from good abundance and distribution information. The development of efficient and cost-effective remote sensing technologies could expand the database on abundance and annual variation, and reduce inconsistencies in current abundance estimation methodologies. Developing these techniques will be challenging given the variability that exists in stand size, shape, density, and composition (including the presence of other species) of rice beds; diseases such as brown spot may also alter the appearance or spectral fingerprint of plants in particular years. Nevertheless, it is likely that at some point in the future abundance information will be routinely gathered using remote sensing techniques. Recent use of drone technology to monitor agricultural crop conditions could likely be modified for manoomin applications. Multispectral identification studies are currently underway.

### *ESTABLISHING HISTORIC PRESENCE/ABUNDANCE*

Restoration of some historic manoomin beds is impeded by a lack of records on the abundance and distribution of manoomin on the water over time. Methods to recreate this history using pollen, phytoliths (long lasting silica structures created by manoomin and other plants), or other information extracted from lake cores are currently being developed, but these techniques need to be refined and reduced in cost to increase their applicability.

### *Declining Average Harvest Per Trip*

Wisconsin off-reservation harvest data suggest that the average number of pounds of rice harvested per trip has decline for both tribal and non-tribal harvesters (Appendix D). It would be valuable to know if this is due to a decline in seed production, reduced harvester effort or effectiveness, or a combination of these factors. (It may be possible to gain some initial insight into this question by comparing the number of seed scars on older herbarium samples with contemporary plants from the same water.)

### *Genetic Variability of Natural Stands and Gene Flow Between Populations*

Our understanding of the genetic variability of natural stands is in its infancy. A better understanding of this variability could profoundly affect the future stewardship and protection of natural stands. For example, adequate levels of gene flow between populations may provide some resiliency against climate change, yet the effective range of pollen dispersal and the dynamics of natural seed dispersal are poorly understood. The loss of "genetic stepping stone" populations may be placing remaining manoomin stands at a greater risk of decline in a way that is not readily apparent to stewards. Studies could also identify unique genetic variability that needs to be preserved. Understanding gene flow is also likely to be critical to evaluating the potential impacts of cultivated manoomin on natural stands. For example, documenting gene flow from cultivated to natural stands would provide a powerful argument against permitting the release of genetically modified manoomin within historic rice range (should genetically modified manoomin be developed).

### *TEK Studies*

A tremendous source of Traditional Ecological Knowledge (TEK) of manoomin exists among the Anishinaabe people who have been managing, protecting, harvesting and finishing rice for generations, yet much of this knowledge has not been adequately recorded and preserved. For example, knowledge of historic beds that have been lost and of the variability in plant and seed types between various beds could greatly influence restoration and research efforts. It would also be beneficial to document the methods used by rice chiefs to determine maturation, to facilitate passing that information on to new generations.

### *Ecological Benefits*

For those most familiar with manoomin, its ecological benefits are often seen as so extensive and apparent that little justification is needed to pursue restoration and enhancement efforts. However, the general public that lives on or utilizes waters slated for stewardship often need to be convinced of the benefits of manoomin. Better scientific documentation of the ecological benefits of manoomin can help garner public support for restoration efforts. Particular focus should be placed on the association of manoomin with various fish communities, since this is often an area that triggers high public interest.

### *Impacts of Genetics and Site Characteristics on Plant Phenotypes*

Manoomin plants and seeds show significant variation from site-to-site. This variation likely is influenced by both genetics and local site characteristics, such as nutrient levels, yet the relative contribution of each of these factors is poorly understood. Greater understanding could shape and refine restoration efforts, and clarify the impacts of using different seed sources in restoration efforts.

### *Climate Change*

As an annual species on the southern edge of its range in the treaty territory, manoomin is likely to be quite sensitive to climate change. A host of pathways for negative impacts (e.g. more frequent flooding, more extensive disease outbreaks, changes in community competition, increases in the populations of damaging insects, reduced seed production, reduced seed germination due to shorter winters) exist, and understanding the overall impacts and the relative role of particular pathways could help managers attempt to preserve manoomin abundance in the face of climate change.

It is also likely that the sensitivity of various manoomin waters to some climate change impacts varies with the size and ecological/physical composition the watershed, the size of inlets and the outlet, the presence or lack or water control structures and other factors. Modeling this sensitivity could help stewards identify the areas most at risk, or most easily protected.

Research with related grains such as rice has also indicated that the level of many nutrients declined when the plants were grown under elevated levels of CO2. Given the high levels of consumption of manoomin in tribal communities, it will be important to determine if similar declines are likely to occur in wild rice as well.

### *Competition With Native Species*

Although a number of different negative-impact species ranging from rice worms to trumpeter swans have been identified as affecting manoomin, the relative impacts from each, the year-to-year variability in their impacts, and the variability in their impacts across the manoomin range remain little understood. The huge expansion of resident giant Canada geese over the last two decades may be having particularly significant impacts, especially on smaller beds (Figure 47). Similarly, rice worm numbers fluctuate greatly, and may be increasing due to climate change or reductions in blackbirds, yet no good index to rice worm abundance has been developed, and little is understood about the year-to-year impact of rice worms on natural stands.

**Figure 47. Resident Canada geese may impact rice beds. Photo provided by T. Moser.**

### *Nutrient Cycling*

The dramatic annual variability in manoomin abundance remains more documented than understood. While there is growing scientific evidence that nutrient cycling plays an important role in this variability, most of the evidence comes from artificial small tank experiments. It would be beneficial to better document the role of nutrient cycling *in situ*, and to determine to what extent other factors play a role in annual variability as well.

### *Long-Term Community Dynamics*

Manoomin has been competing with native and non-native plants throughout its history. In some waters manoomin appears to have maintained a foothold in particular areas for decades or longer; in other waters manoomin appears to have lost out permanently to other plants. In all cases, our perspectives of these community dynamics have largely been limited to the relatively brief (from an ecological perspective) time period of human lives. A better understanding of plant community dynamics, and the most significant factors which help manoomin to preserve its place on the landscape could be important to stewards working to preserve manoomin for future generations.

### *Invasive Species*

**Figure 48. Common carp.**

The presence of invasive species is increasing in treaty territory waters, but their direct impacts are generally poorly understood, as are the possible unanticipated impacts of their control. In addition, climate change and other factors may be altering the traditional interplay between invasives and manoomin, as appears to be the case on Clam Lake, Burnett County, where common carp (Figure 48), present for decades, had relatively little impact until a combination of conditions lead to a marked carp population expansion. It is often very difficult to determine the best course of action to protect manoomin stands in the face of new threats where both TEK and scientific knowledge is limited. Research is greatly needed to help determine which species pose the greatest threat to manoomin, and to determine the best methodologies to protect threatened stands. Any invasive control efforts should have intensive monitoring components to determine if intended impacts are being achieved and if unintended impacts are occurring.

### *Seed Dormancy*

The factors which result in a seed breaking dormancy and germinating are not well defined. These factors may be important in determining the effective life of seed banks on existing manoomin waters. It may also be an important component of the impact of climate change, or annual production variability. Better determination of the factors that determine dormancy and the life of the seed bank could improve restoration strategies.

### *Distribution of Northern vs. Southern Wild Rice*

It appears that Wisconsin, Minnesota, and Michigan all support both *Zizania palustris* (northern wild rice) and *Zizania aquatic* (southern wild rice) stands. However, the definition of these species, and the application of scientific nomenclature has varied over time. As a result, clear descriptions of the historic and contemporary range of both species are lacking. A consistent review of all available herbarium samples could clarify this issue, and help determine if ranges are changing due to climate change or other factors.

### *Impacts of Early Harvesting*

Harvesting manoomin too early or knocking it too hard at any point in the season could result in some seeds being dislodged from the plant before they are fully mature. These seeds may have a lower viability or be at a competitive disadvantage when germinating. However, documentation of these possible impacts is limited. A benefit of date-regulation could be clarified if this issue were better understood.

### *Innovative Plant Management Techniques*

Maintaining manoomin on the landscape for the long term or restoring it to places where it has declined often requires providing it with an edge over competing vegetation. Generally, this is best accomplished using natural processes, such as water level management, rather than chemical means.

Another experimental, non-chemical method which has shown some potential involves plowing the snow off shallow portions of rice lakes to encourage hard freezing of the water column to the sediment layer (Figure 49). This technique appears to set back perennial vegetation, enhancing subsequent growth opportunities for plants like manoomin which overwinter as seeds. The effectiveness and practicality of applying this approach on a functional scale should be further explored, along with other innovative techniques.

**Figure 49. Competing vegetation was reduced on Big Rice Lake (St Louis County, MN) where snow was removed from the ice.**

### *Sulfates*

Evidence gathered in Minnesota shows that sulfate levels markedly influence habitat suitability and manoomin abundance. This led Minnesota to establish a standard of 10 ppm sulfates in surface waters supporting natural or cultivated manoomin beds. While important gains have been

made in recent years through the efforts led by Dr. John Pastor, better understanding of how sulfates (or sulfides) impact manoomin could help determine if a standard would be appropriate to protect Wisconsin and Michigan rice beds as well.

### *Ricer Recruitment and Retention*

The long-term presence of manoomin in the treaty territories is likely to be markedly influenced by the number of people who come to value this resource. Manoomin harvesters tend to be among the most avid stewards of manoomin. Maintaining the ricing tradition among the tribal and state public will help ensure that these stewards continue to care for manoomin. Determining the factors influencing the recruitment and retention of harvesters can help ensure this tradition is preserved. This may be among the greatest research needs, for without a sizable and active constituency advocating for manoomin, losses are likely to increase.

### *Long-Term Research Waters*

Many of the individual research needs overlap or complement other studies. Even fundamental relationships such as the long-term correlations between water levels and manoomin abundance have been relatively poorly documented in natural stands. Selecting a few rice waters as focus areas for both long-term and shorter-term studies could help elucidate the complex biological interactions that influence the presence and abundance of manoomin. The installation of data-recording water level gauges and water temperature recording devices should be among the first actions taken at these locations. It may also merit designating one or two locations, particularly non-historic sites established through seeding, where harvest regulations could be altered in order to conduct research aimed at better determining the impacts of potential changes to harvest regulations.

### *Gashkibidoon (Binding, Bundling or Tying) Study*

The traditional practice of binding rice as part of the harvesting process has essentially been lost, yet this practice may offer important opportunities to increase harvest without negative ecological impact, if done correctly. In addition, it may offer a technique to reduce high nutrient levels from particular waterways where levels are excessive, and it may offer an approach to mitigate storm-loss which may be occurring more frequently with climate change. It would be beneficial to carefully construct and implement studies of this practice, over multiple years. This would best be done on-reservation, or in an area normally closed to harvesting off-reservation.

### *Wazhashk (Muskrat) and Asiginaak (Blackbird) Studies*

TEK observations suggest that complex and intricate relationships exist between manoomin and muskrats and blackbirds. Carefully designed studies may shed further light on the positive and negative interactions that may exist between these species.

## Site Specific Recommendations and Restoration Priorities

Appendix F highlights some specific locations with known or suspected management issues, or with a known history of loss. The intent is that this appendix be updated as necessary, adding

new sites when needed and removing those that have had successful restoration. While these sites merit particular attention, this appendix does not list all waters that are important from a cultural or stewardship perspective. Additional information on most of the Wisconsin sites discussed in Appendix F can be found in the *Wisconsin Ceded Territory Manoomin Inventory*.

## IMPLEMENTATION STRATEGIES

Like the stewardship of any other non-human being in the treaty territories, manoomin stewardship cannot take place effectively without adequate commitments of time and resources.

Different aspects of manoomin stewardship are also best accomplished at different scales. Some activities, such as abundance and harvest monitoring, and some education and research efforts are best implemented on a broad landscape, one that may even extend outside the boundaries of the treaty territories, while certain on-the-ground management activities such as seeding and beaver control are best considered on a local level.

Existing and potential rice habitat is also spread across a wide geographic area within the treaty territories, and across a multitude of different jurisdictions. This plan is focused on the stewardship of manoomin in the treaty territories. Stewardship over this broad area requires cooperation on a government-to-government level between the States of Wisconsin, Minnesota, and Michigan and the bands with off-reservation treaty rights. However, effective protection and management of manoomin in the region also requires the assistance and participation of many other agencies and individuals, including federal agencies such as the U.S. Forest Service, U.S. Fish and Wildlife Service, Natural Resource Conservation Service, Environmental Protection Agency, U.S. Department of Agriculture Animal and Plant Health Inspection Service, and the Bureau of Indian Affairs; local, county and town governments; private organizations such as Ducks Unlimited, Wisconsin Waterfowl Association, and Wisconsin Wetlands Association; local lake associations; education and research facilities ranging from colleges to local environmental education associations; and even private individuals. Each of these entities has the ability to make important contributions to manoomin stewardship.

Nevertheless, the leadership role for rice stewardship remains vested in the bands as well as the states, and it is here that the biggest commitment to manoomin needs to be made. Historically, that commitment has been present, but in a relatively diffused status; that is, many efforts, including seeding, water level manipulation, and impoundment creation have taken place that benefit manoomin, but much of this work was done in an uncoordinated fashion, at a local level, and with rice stewardship as a secondary objective to other efforts. It is hoped that this plan will help elevate manoomin stewardship to a higher level, with a broader regional perspective and an increased commitment of resources and coordination of effort.

The joint WDNR-Tribal Wild Rice Management Committee established pursuant to the *LCO Case* and the 1837 Ceded Territory Wildlife and Plant Resources Committee established pursuant to the *Mille Lacs Case*, continue to provide a useful venue for coordinating manoomin stewardship activities. The recently developed State/Tribal Wild Rice Initiative Team in Michigan will hopefully come to serve a similar function.

As noted above, improving the condition of manoomin in the treaty territories and the region will require commitments of time and resources, but regional land managers must embrace their responsibility as the global stewards of rice. Some active steps that should be taken to make that commitment include:

Land and wildlife managers in manoomin range should have manoomin management activities specifically written into their position descriptions and job duties. Training and education on manoomin stewardship, on the tenets of the Treaty Territory Manoomin Self-Regulatory System's, and the Treaty with Manoomin should be provided to all appropriate staff.

Sites with restoration needs should be recognized by adding them to Appendix F, which should be updated on a regular basis; restoration emphasis should be placed on the waters included on this list. Where restoration efforts are undertaken, summaries of both successes and failures should be added to this appendix to assist managers in future restoration efforts.

Opportunities to provide or enhance access at appreciable rice waters where it is currently limited should be pursued where possible; adequate access and signage should be ensured for those waters whose harvest is date-regulated.

The benefits, opportunities and costs of establishing an "Adopt a Rice Water" monitoring program for schools, lake associations and other groups to enhance data collection, local stewardship, public education and recruitment of harvesters should be explored.

The bands should recommend to the U.S. Fish and Wildlife that a portion of the collected duck stamp funds should be dedicated to annually fund band-led manoomin work including: treaty territory surveys, beaver management, restoration activities, education efforts, and research programs. Other stewardship activities undertaken which secondarily benefit manoomin should also be documented so that the public better understands the commitment already being made to this resource.

The bands should encourage their rice chiefs and traditional leaders to take a lead in the re-kindling of their traditional teachings surrounding manoomin in fulfillment of their treaty obligations by recognizing manoomin as a gift of creation and by keeping balance between creation and themselves.

## CONCLUSION

After centuries of human utilization, manoomin remains steeped in cultural and ecological significance. Whether viewed as a simple food stuff, a medicine, a wildlife provider or a sacred gift, the Anishinaabe are grateful that their treaty territories contain a significant portion of the world's natural manoomin range. Anishinaabe people have had a relationship with manoomin for centuries, have fought battles over manoomin, and have planted rice wherever they chose to live. They promised they would protect this sacred gift from harm. The Anishinaabe accept

responsibility for receiving manoomin as a gift of creation, and uphold their treaty obligations with this being, and thereby ensuring manoomin's blessings for our nindaanikoobijiganag (great-grandchildren) (Figure 50).

**Figure 50. Gidaa miigwechiwendam awegodogwen ge-ayaaman.**
**We are thankful for what we have.**

*"One of the greatest moments happened in my life last year as I was ricing with my brother. We went in and out of the rice bed, but we weren't alone. We could hear singing resonate throughout the rice bed. It wasn't contemporary music, it was our music… Ojibwe music. We looked around to see who and what it was. To our delight it was the kids from Waadookodaading [LCO Ojibwe language immersion school]. I was able to see the children singing, harvesting rice, enjoying the day and I couldn't help but think about my parents, the spirits in the water and the spirit of that rice. How happy they must be to hear our children singing to them. It's been a long time since that has happened at least that I could remember." Gaiashkibos, former Lac Courte Oreilles Tribal Chairman*

## LITERATURE CITATIONS


Ackley, F. 1999. Manoomin – A gift from the creator. In Proceedings of the Wild Rice Research and Management Conference. Great Lakes Indian Fish and Wildlife Commission, 7-8 July 1999. Carlton, MN.

Aiken, S.G., P.F. Lee, D. Punter, and J.M. Stewart. 1988. *Wild Rice in Canada*. Agriculture Canada. Publication 1830. NC Press Limited: Toronto, Ontario, Canada. 130 pages.

Ballinger, J. 2018. Potential health impacts due to cultural changes from manoomin (*Zizania palustris*) loss for the Fond du Lac Band of Lake Superior Chippewa. Public Health Review Vol. 1. No. 1.

Burnette, D. The Migration Story: In search of wild rice. *Ayanjigozing, manoomin nandawaabanjigaadeg.* As translated and transcribed by Gimiwan (Dustin Burnette).

Burnette, D. and A. Stark. The wild rice moon. Manoominike-giizis - gaa-pi-izhi-mikang manoomin a'aw Anishinaabe. An Ojibwe legend about the discovery of wild rice as translated and transcribed by Gimiwan (Dustin Burnette) and Animikiins (Animikiins Stark).

Bureau of Wildlife Management. 2005. Beaver damage control, guidelines for people with beaver damage problems. WDNR Publication WM-007-05 REV. 15 pages.

Cardinal, H. and B. Maki. Manoomin, Wild rice**.** Gaa-azhe-dibaadodamowaad. An Ojibwe legend retold by Heather Cardinal and Becky Maki and translated and transcribed by Gimiwan (Dustin Burnette).

Cooke, W.W. 1884. Bird nomenclature of the Chippewa Indians. American Ornithologists' Union. 1(3):248.

Coues, E. 1895. The expeditions of Zebulon Montgomery Pike, Volume 1 (of 3). To Headwaters of the Mississippi River through Louisiana Territory, and in New Spain, during the years 1805-6-7.

David, P. 2012. Manoomin (wild rice) abundance and harvest in northern Wisconsin in 2010. Great Lakes Indian Fish and Wildlife Commission Administrative Report 12-04.

Fannucchi, G.T., W.A. Fannucchi, and S. Craven. 1986. Wild rice in Wisconsin: Its ecology and cultivation. University of Wisconsin-Extension. 8 pages.

Fond du Lac Band. 2018. Expanding the narrative of tribal health: The effects of wild rice water quality rule changes on tribal health. Fond du Lac Band of Lake Superior Chippewa, Health Impact Assessment. 68 pages.

Haramis, G.M. and G.D. Kearns. 2004. "Invasive herbivory: Resident Canada geese and the decline of wild rice along the tidal Patuxent River." Pages 37-38 *in* M. C. Perry, ed.

Proceedings of a symposium: Mute Swans and Their Chesapeake Bay Habitats. U.S. Geological Survey, Biological Resources Discipline Information and Technology Report USGS/BRD/ITR-2004–0005.

Great Lakes Indian Fish and Wildlife Commission. 2010. Inaadiziwin. Odanah: GLIFWC Press.

Great Lakes Indian Fish and Wildlife Commission. 2017. *Wisconsin Ceded Territory Manoomin Inventory*. Version 2.

Howes, T. Fond du Lac Tribal Natural Resources Department. Personal communication.

Jenks, A.E. 1901. The Wild Rice Gatherers of the Upper Lakes: A study in American primitive economics. In nineteenth annual report of the Bureau of American Ethnology, 1897-1898. Government Printing Office, Washington, D.C. Pages 1013-1137.

Kinew, K.A. 1995. Manito Gitigaan. Governing in the Great Spirit's garden: Wild rice in Treaty #3. Thesis. The University of Manitoba, Winnipeg, Manitoba. 382 pages.

Kjerland, T. 2015a. *Wild rice monitoring handbook*. The University of Minnesota Sea Grant Program Publication #SH16.

Kjerland, T. 2015b. *Wild rice monitoring field guide*. The University of Minnesota Sea Grant Program, Publication #SH15. ISBN 978-0-9965959-0-2.

Kreitinger, K., Y. Steele and A. Paulios, editors. 2013. The Wisconsin all-bird conservation plan, Version 2.0. Wisconsin Bird Conservation Initiative. WDNR, Madison, WI.

*LCO III. Lac Courte Oreilles Band v. Wisconsin* (*LCO III*), 653 F. Supp. 1420, 1422-1429 (W.D. Wis. 1987); Mille Lacs Band v. Minnesota, 861 F.Supp. 784, 791-793 (D. Minn. 1994)

*LCO IV. Lac Courte Oreilles v. Voigt* (*LCO IV*), 668 F. Supp. 1233, 1241-2 (W.D. Wis. 1987), U.S. v. Michigan, 471 F. Supp. 192, 273 (W.D. Mich. 1979), Mille Lacs v. Minnesota, 861 F. Supp. 784, 836 (D. Minn. 1994).

Liu, Q., E.A. Oelke, R.A. Porter, R. Reuter. 1998. Formation of panicles and hermaphroditic florets in wild-rice. International Journal of Plant Sciences 159(4):550-558.

MN 1837 Treaty Conservation Code. 1837 Treaty conservation code for the Minnesota ceded territory.

MN Statutes. Minnesota State Statutes. (see appropriate references).

Moose, A. 1969. *Indian Compass*. Mille Lacs booklet. 95 pages.

Moyle, J.B. 1944. Wild rice in Minnesota. The Journal of Wildlife Management 8(3):177-184.

Norrgard, R. 2008. Natural wild rice in Minnesota: A wild rice study document submitted to the Minnesota legislature by the MNDNR. February 8, 2008.

Oelke, E.A. 2007. *Saga of the Grain: A Tribute to Minnesota Cultivated Wild Rice Growers*. Hobar Publications. Lakeville, MN.

Panci, H., M. Montano, A. Schultz, T. Bartnik, K. Stone. 2018. Climate change vulnerability Assessment, Version 1: Integrating scientific and traditional ecological knowledge. Great Lakes Indian Fish and Wildlife Commission. 34 pages.

Roufs, T.G. (Ed.) When everybody called me Gabe-bines, "Forever-Flying-Bird": Teachings from Paul Buffalo. http://www.d.umn.edu/cla/faculty/troufs/Buffalo/pbwww.html#title

Stickney, G.P. 1896. Indian use of wild rice. American Anthropologist. April, 1896.

Sundance, J. Personal communication.

Terrell, E.E. and S.W.T. Batra. 1984. Insects collect pollen of eastern wildrice, *Zizania aquatica* (Poaceae). Castanea 49(1):31-34.

Treaty of 1836. Treaty of Washington. 7 Stat. 491. For additional treaty information see https://data.glifwc.org/ceded/

Treaty of 1842. Treaty of La Pointe. 7 Stat. 591. For additional treaty information see https://data.glifwc.org/ceded/

Treaty of 1854. Treaty of La Pointe. 10 Stat. 1109. For additional treaty information see https://data.glifwc.org/ceded/

Unpublished WDNR report on the establishment of wild rice on the Crex Meadows and Fish Lake properties. GLIFWC files.

Vennum Jr., T. 1988. *Wild Rice and the Ojibway People*. St. Paul: Minnesota Historical Society Press. 358 pages.

Vizenor, E. 2008. As citied in natural wild rice in Minnesota: A wild rice study document submitted to the Minnesota legislature by the MNDNR. February 8, 2008.

Walker, R.D., J. Pastor, B.W. Dewey. 2006. Effects of wild rice (*Zizania palustris* L.) straw on biomass and seed production in northern Minnesota. Canadian Journal of Botany 84(6): 1019-1024.

Wild Rice Consent Decree. *Lac Courte Oreilles Band v. Wisconsin*. Stipulation and consent decree in regard to the tribal harvest of wild rice on issues related to the biology of wild rice, tribal enforcement and preemption of state law, and management of wild rice (Docket Number 1222).

Wisconsin's Changing Climate: Impact and Adaptation. 2011. Wisconsin Initiative on Climate Change Impacts. Nelson Institute for Environmental Studies, University of Wisconsin-Madison and the Wisconsin Department of Natural Resources, Madison, Wisconsin.

List of Appendices

**APPENDIX A.**

## CHIPPEWA INTERTRIBAL AGREEMENT GOVERNING RESOURCE MANAGEMENT AND REGULATION OF OFF-RESERVATION TREATY RIGHTS IN THE CEDED TERRITORY

**WHEREAS**, the Chippewa tribes of Wisconsin have established off-reservation usufructuary rights reserved by the Treaty of 1837, 7 Stat. 536, and the Treaty of 1842, 7 Stat. 591;

**WHEREAS**, the tribes are co-plaintiffs in the litigation filed to secure those rights, *Lac Courte Oreilles Band. et al. v. State of Wisconsin, et al.*, W.D. Wis. No. 74-C-313; and

**WHEREAS**, the tribes are all members of the Great Lakes Indian Fish and Wildlife Commission, which has provided biological and other technical services for the development of management plans and regulations, conservation law enforcement services for the enforcement of codes and ordinances, and other supportive services; and

**WHEREAS**, the tribes have formed and are all members of the Voigt Intertribal Task Force Committee of the Commission, which since 1983 has successfully developed intertribal agreements on regulations governing the exercise of treaty rights; and

**WHEREAS**, the tribes have the capability and responsibility to regulate the exercise of treaty rights and to co-manage the resources in cooperation with the State of Wisconsin; and

**WHEREAS**, intertribal cooperation is required in order to make co-management feasible and self-regulation effective;

**NOW, THEREFORE, THE TRIBES DO HEREBY COVENANT AND AGREE AS FOLLOWS:**

### Section 1: Purpose

The purpose of this Agreement is to protect the resources of the ceded territory and promote, preserve and protect the exercise of treaty rights by establishing an effective intertribal mechanism for co-management of the resources subject to the treaty right and for tribal self-regulation of the exercise of the treaty right.

### Section 2: Intent

It is the intent of the tribes by means of this Agreement to establish a binding mechanism for intertribal co-management and regulation, in recognition of the fact that each tribe cannot on its own effectively manage and regulate the exercise of treaty rights in the ceded territory.

**Section 3: Application**

This Agreement applies to the co-management of resources and the regulation of the exercise of treaty rights in the off-reservation portions of the ceded territory, except for the waters of Lake Superior. It does not apply to resources or activities on the reservations of the tribes.

**Section 4: Definitions**

As used in this Agreement:

(a) "Ceded territory" means the area of Wisconsin ceded by the tribes to the United States in
the Treaty of 1837, 7 Stat. 536, and the Treaty of 1842, 7 Stat. 591, excluding the waters of Lake Superior.

(b) "Commission" means the Great Lakes Indian Fish and Wildlife Commission.

(c) "DNR" means the Wisconsin Department of Natural Resources.

(d) "Task Force" means the Voigt Intertribal Task Force Committee of the Commission.

(e) "Treaty right" means the off-reservation usufructuary rights to hunt, fish and gather within the ceded territory.

(f) "Tribes" means the Lac Courte Oreilles Band of Lake Superior Chippewa Indians; the Red Cliff Band of Lake Superior Chippewa Indians; the Sokaogon Chippewa Indian Community, Mole Lake Band of Wisconsin; the St. Croix Chippewa Indians of Wisconsin; the Bad River Band of Lake Superior Chippewa Indians; and the Lac du Flambeau Band of Lake Superior Chippewa Indians.

**Section 5: Task Force Responsibilities**

(a) The Task Force shall have the primary responsibility for intertribal co-management and regulation. It shall review and approve resource management plans, develop and recommend seasonal agreements and regulations, and coordinate consultation with the DNR.

(b) All Task Force actions affecting the treaty right must be approved by an affirmative vote of a majority of the tribes as defined in § 4(f) who have adopted this Agreement.

**Section 6: Commission Responsibilities**

The Commission shall have the primary responsibility for the provision of biological and resource management support services, and for the enforcement of tribal treaty right regulations through Commission conservation law enforcement personnel, as adopted by each individual tribe.

**Section 7: Management Plans: Harvest Goals and Quotas**

(a) The Task Force shall with the assistance of Commission biologists develop and approve management plans for the resources within the ceded territory subject to treaty right harvest. The tribes agree to regulate the exercise of the treaty right in accordance with the management plans developed and approved by the Task Force.

(b) The Commission biologists shall develop, and the Task Force shall review and approve, intertribal harvest goals and quotas which shall insure that the tribes shall not harvest more of any resource than is permitted under the treaty right allocation of that resource.

(c) The tribes agree to regulate the exercise of the treaty right in a manner which assures that the intertribal harvest goals and quotas adopted by the Task Force shall not be exceeded.

(d) No treaty right harvest of any resource for which the Task Force has not adopted harvest goals and quotas shall be authorized or permitted.

**Section 8: Regulation of the Treaty Right**

(a) The Task Force shall develop intertribal seasonal agreements and model regulations for each harvest activity which are consistent with the management plans and which insure that the intertribal harvest goals and quotas shall not be exceeded.

(b) The seasonal agreements shall allocate harvest opportunity and shall assure the protection of public health and safety.

(c) The tribes shall employ their best efforts to secure tribal adoption of the seasonal agreements and regulations in conformity therewith; provided, that nothing herein shall prevent a tribe from adopting more restrictive regulations.

(d) The tribes shall authorize the enforcement of tribal treaty right regulations by Commission conservation law enforcement personnel.

(e) No treaty right harvest of any resource shall be authorized or permitted except in accordance with the seasonal agreement adopted by the Task Force to govern that harvest.

**Section 9: Harvest Data**

The tribes agree to develop and implement methods for gathering data on treaty right harvest of resources by tribal members, and to provide such data promptly to the Commission biologists upon request.

**Section 10: Emergency Closures**

(a) Notwithstanding any other provision of this Agreement or of tribal law, the Director of the Biological Services Division of the Commission is hereby authorized and empowered to order the closure of any harvest activity, generally or with respect to a particular location or body of water, whenever in his or her professional opinion and judgment the continuation of the harvest activity is likely to result in a harvest exceeding the harvest goals and quotas adopted pursuant to Section 7 or would otherwise cause biological harm to the resource.

(b) Every reasonable effort shall be made to consult with and obtain the approval of the Task Force prior to ordering an emergency closure, but such closure may be ordered without consultation or approval if circumstances require.

(c) An emergency closure shall become effective immediately upon issuance or at such other time or date as the closure order may direct. Such closure shall be communicated to the tribes by the best and swiftest practicable method.

**Section 11: Cooperation with DNR**

The tribes acknowledge the responsibility and authority of the DNR to co-manage the resources subject to the treaty right and to regulate the harvest activities of persons not entitled to exercise the treaty right. The tribes pledge to cooperate with the DNR in the following ways:

(a) By sharing harvest data and other biological information through the Commission biological staff in a timely and professional manner.

(b) By inviting DNR consultation and review of management plans and harvest goals and quotas prior to their adoption by the Task Force.

(c) By inviting DNR consultation and review of seasonal agreements and model regulations prior to their development by the Task Force and recommendation to the tribes.

(d) By coordinating emergency closure activities with the DNR, should closure of activities by non-treaty harvesters be required.

(e) By providing DNR with copies of tribal ordinances regulating the exercise of treaty rights.

(f) By adopting harvest goals and quotas, seasonal agreements, and regulations in a timely fashion, recognizing that the DNR may need to adjust its regulations governing the non-treaty harvest to take account of the treaty right harvest, and that the state administrative process requires some lead time for the development and adoption of such regulations.

(g) By continuing Commission staff cooperation in joint technical working groups to develop biological data, population models, overall harvest limits, and the like.

(h) By reviewing and commenting upon DNR management plans and regulations, and by advocating for the resource before state legislative, executive and administrative bodies.

(i) By authorizing DNR conservation wardens and deputy conservation wardens to enforce tribal regulations regulating the exercise of the treaty right by instituting proceedings in tribal court.

(j) By otherwise fostering a spirit of cooperation with the DNR.

**Section 12: Adoption of Agreement**

This Agreement shall take effect among the tribes adopting it upon its adoption by a majority of the tribes.

**Section 13: Withdrawal from Agreement**

A tribe may withdraw from the Agreement only upon provision of 90 days written notice of intent to withdraw, which shall be sent to each tribe, the Commission, and the DNR, and shall be filed with the court in *Lac Courte Oreilles Band v. State of Wisconsin*, W.D. Wis. No. 74-C-313.

**APPENDIX B.** Wild Rice Regulatory Phase Consent Decree and Stipulation for Wild Rice

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF WISCONSIN

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LAC COURTE OREILLES BAND OF LAKE SUPERIOR CHIPPEWA INDIANS, RED CLIFF BAND OF LAKE SUPERIOR CHIPPEWA INDIANS; SOKAOGAON CHIPPEWA INDIAN COMMUNITY, MOLE LAKE BAND OF WISCONSIN; ST. CROIX CHIPPEWA INDIANS OF WISCONSIN; BAD RIVER BAND OF THE LAKE SUPERIOR CHIPPEWA INDIANS; and LAC DU FLAMBEAU BAND OF LAKE SUPERIOR CHIPPEWA INDIANS,

Plaintiffs,

v. Case No. 74-C-313-C

STATE OF WISCONSIN, WISCONSIN NATURAL RESOURCES BOARD; CARROLL D. BESADNY; JAMES T. ADDIS; and GEORGE MEYER,

Defendants.

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WILD RICE REGULATORY PHASE
CONSENT DECREE

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WHEREAS, the plaintiffs, Lac Courte Oreilles Band of Lake Superior Chippewa Indians and others (the Tribes"), and the defendants, State of Wisconsin and others, having entered into the attached stipulation concerning the substance and scope of wild rice harvest regulations applicable to members of the Tribes, and

WHEREAS, said stipulation constitutes resolution by the parties of all existing issues related to off-reservation harvest by the Tribes' members in the case area of wild rice resource, and

WHEREAS, the parties have further agreed to the entry of a Consent Order and Injunction implementing the stipulation, and

WHEREAS, this court is satisfied that the entry of such an order is appropriate,

NOW, THEREFORE, IT IS ORDERED:

1. That the attached stipulation is hereby made an order of this Court as it relates to management of the wild rice resources in the case area and regulation and enforcement of harvesting regulations applicable to plaintiffs' members.

2. That the defendants State of Wisconsin, Wisconsin Natural Resources Board, Carroll D. Besadny, James T. Addis and George E. Meyer, and their successors in office, their agents, employees and representatives, and any and all persons claiming an interest through said defendants, are herein enjoined from interfering in the regulation of plaintiffs' off-reservation usufructuary right to harvest wild rice within the ceded territory in Wisconsin, except insofar as plaintiffs have agreed to such regulation by the stipulation.

3. That regulation of plaintiffs' usufructuary right to harvest wild rice within the ceded territory is reserved to plaintiffs on the condition that they enact a management system which confonns with the provisions of the Model Off-Reservation Conservation Code (June 23,1989), previously filed with this court.

4. That failure by any plaintiff Tribe to enact a system that conforms to said Model Code, or the withdrawal from such a system after enactment, or failure to comply with the provisions of the system and its enforcement as provided in the stipulation of the parties, will subject such a plaintiff Tribe to regulation by the defendants.

5. That this decree and injunction shall be effective as to each plaintiff Tribe upon filing with this court and service upon defendants l counsel of a copy of the enacted wild rice management system.

Dated this 1st day of November, 1989.

BY THE COURT:

BARBARA B. CRABB, District Judge

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF WISCONSIN

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LAC COURTE OREILLES BAND OF LAKE SUPERIOR CHIPPEWA INDIANS, RED CLIFF BAND OF LAKE SUPERIOR CHIPPEWA INDIANS; SOKAOGAON CHIPPEWA INDIAN COMMUNITY, MOLE LAKE BAND OF WISCONSIN; ST. CROIX CHIPPEWA INDIANS OF WISCONSIN; BAD RIVER BAND OF THE LAKE SUPERIOR CHIPPEWA INDIANS; and LAC DU FLAMBEAU BAND OF LAKE SUPERIOR CHIPPEWA INDIANS,

Plaintiffs,

v. Case No. 74-C-313-C

STATE OF WISCONSIN, WISCONSIN NATURAL RESOURCES BOARD; CARROLL D. BESADNY; JAMES T. ADDIS; and GEORGE MEYER,

Defendants.

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# STIPULATION FOR WILD RICE TRIAL

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Plaintiffs filed suit against defendants seeking among other types of relief an injunction enjoining defendants from enforcing state statutes and regulations against plaintiffs in the exercise of their treaty rights. Defendants have raised defenses to the nature, scope and regulation of plaintiffs' treaty rights. This stipulation concerns the third subphase of the regulatory phase of this litigation. The trial for this subphase is scheduled to begin September 25, 1989, and address the permissible scope of state regulation and adequacy of tribal regulation concerning the (A) Biology of Wild Rice, (B) Tribal Enforcement and Preemption of state Law, and (C) Management of Wild Rice. The parties agree that the issues stipulated below shall not be

construed as an admission of fact or law by any of the parties in future subphases concerning the regulation of other species or activities or in other litigation between the parties.

The United States District Court for the Western District of Wisconsin may incorporate the terms and provisions of this stipulation in an order (such as the proposed consent order to which this stipulation is attached) without further hearing. The requirements of this stipulation shall become effective immediately upon entry of said order for those Tribes with conservation codes conforming to the Court's order and this stipulation. For those Tribes enacting conforming codes after entry of this Court's order, the requirements of this stipulation shall become effective thirty (30) days after notice to defendants of such enactment.

The parties desiring to settle issues pending for the wild rice trial hereby STIPULATE and AGREE to the following:

A. BIOLOGY OF WILD RICE

1. Wild rice (zizania sp.) is an annual aquatic grass that ranges throughout the northeastern United States, along the Atlantic coast to central Florida, and along the Gulf coast from central Florida to Louisiana.
2. In the United States, wild rice reaches its greatest abundance in northern Minnesota and northern Wisconsin. Approximately 6,000 acres of wild rice grow in Wisconsin, with approximately 5,000 acres within the ceded territory.
3. Short-term fluctuations in wild rice abundance are normal; for a particular stand a typical four-year period will include one bumper crop year, two average years, and one poor year.

4. The long-term trend in wild rice abundance has been downward, primarily as a result of habitat alteration and destruction; wild rice wetlands are considered a scarce resource.

5. Wild rice grows in a wide variety of soil types, but the best stands are usually found on soft, alluvial, organic mucks, which provide necessary nutrients and are dense enough to allow seed lodging, root development and nutrient uptake. The optimal water quality parameters for wild rice have not been well-defined, although dark waters may reduce seed growth by limiting sunlight penetration.

6. Rice grows best in depths of 0.5 to 3.0 feet, with stable or gradually receding water levels; rapidly rising water levels may uproot or drown the plant.

7. Slowly flowing water along streams or flowages generally produces the densest stands; river rice grows denser stands, ripens earlier, and generally has shorter seeds than lake rice.

8. Wild rice seeds drop directly to the water bed and typically do not disperse far from the parent plant; the seed's barbed awn helps anchor the seed in the sediment. The seed leaving the parent plant is in a dormant state which inhibits germination until spring. Over winter, cold temperatures and low oxygen concentrations gradually act to reduce dormancy in a process called "afterripening." Approximately 10% of the seeds require more than one winter of afterripening to break primary dormancy.

9. [Open].

10. Primary and secondary dormancy allow the wild rice to carry over between years of unfavorable conditions and allow maximum production when conditions are

optimal. Typically, less than half of a year's seed production will germinate in the spring following disposition due to primary and secondary dormancy.

11. Germination occurs in late April, May and early June, at temperatures of 54-77 degrees F and under low oxygen concentrations.

12. Following germination, the plant enters the "submerged leaf stage" of development, during which 1 to 4 short leaves form. The optimal temperature for growth during the submerged leaf stage is approximately 68 degrees F, but is dependent upon the amount of light available.

13. The submerged leaf stage is followed by the "floating leaf stage," when approximately 2 to 3 buoyant leaves develop that rise to the water surface and lie flat upon it. The floating leaf stage general lasts 2 to 3 weeks and occurs in the ceded territory waters near the end of May and early June.

14. The floating leaf stage is followed by the "aerial leaf stage," when the plant may send out secondary shoots, or tillers, such that a single seed may produce several blossom stalks. Tillering is more frequent in shallow water and under low plant densities. The blossom stalks grow to a height of 2 to 8 feet above the water's surface, and bear female flowers above the male.

15. Flowering occurs in late July and early August. The pollen is dispersed by wind; cross-pollination is encouraged by the superior position of the female flowers and their opening prior to pollen dispersal.

16. Wild rice seeds mature in late August and September over a 10 to 14 day period, beginning at the top of the seed head.

17. The number and length of kernels produced varies widely among blossom stalks, ranging from 15 to 212 kernels per stalk with kernel length ranging from 8 to 18 mm; and stand density also is highly variable, ranging from very sparse to over 185 stalks per square meter.

18. Wild rice is susceptible to diseases such as leaf blight, leaf and head smut and ergot. It also is attacked by insects such as leaf miners, stem maggots, stem borers, midges, and moth larvae or white "rice worms."

19. Animals that feed on wild rice include muskrats, blackbirds and waterfowl. Beaver also impact on wild rice stands with their dams either providing water for wild rice or destroying rice beds with their manipulation of water levels.

20. Severe wind, rain or hail can severely damage developing wild rice plants; a long period of hot, dry, calm weather can greatly reduce seed production.

21. Introduced species such as carp, rusty crayfish and purple loosestrife also alter and degrade the habitat, which has a negative impact on wild rice stands.

22. Typical yields from hand-harvesting with ricing sticks range from 40 to 75 lbs. per acre; this method harvests only 5 - 20% of the annual production of rice.

B. TRIBAL ENFORCEMENT AND PREEMPTION OF STATE LAW

1. The plaintiff Tribes shall authorize the State of Wisconsin Department of Natural Resources (WDNR), enforcement personnel, to enforce the provisions of each plaintiff's Off-Reservation Conservation Code.

2. The defendants State of Wisconsin, Wisconsin Natural Resources Board, Carroll D. Besadny, James T. Addis, and George E. Meyer, are hereby enjoined from

prosecuting in state court any violation of state or tribal regulations governing the acts of harvesting wild rice against a member of a tribe maintaining a court and code of regulations as described in this stipulation, except as state prosecution may be permitted in this stipulation. Nothing in this stipulation precludes the state from prosecuting in state court criminal code violations in chs. 940 through 948, and 951, Stats., or secs. 29.64 or 29.641. Further, nothing in this stipulation precludes the state or the Tribes from prosecuting in their respective courts alleged wild rice harvesting, trespass or theft violations of their laws committed by tribal members in harvesting rice growing on privately owned flowage or stream beds unless and until the courts determine the treaty right extends to wild rice growing on such beds. Furthermore, the application of ch. 30, Stats., to tribal harvest activities is not covered by this stipulation .

3. This stipulation and injunction shall remain in full force and effect as to all parties to this action, their successors in office, their agents, employees and representatives, and any and all persons claiming an interest through said parties, until or unless any party shall prove, to the satisfaction of this Court, that enforcement or adjudication by a plaintiff Tribe of the provisions of its Off-Reservation Conservation Code is not fair, uniform and diligent or that a tribal court is not operating according to the provisions as set forth in Exhibit 1 attached hereto.

4. The law enforcement personnel of the plaintiffs are trained for and competent to provide effective enforcement of a code such as the plaintiffs' Model Off-Reservation Conservation Code (June 23, 1989). A copy of that code is attached

hereto as Exhibit 2. On the date of this stipulation, however, they are not able to provide for exclusive enforcement of such codes throughout the ceded territory to the preemption of enforcement activities by the law enforcement officers of the Wisconsin Department of Natural Resources.

5. Each plaintiff has competent and responsible leadership, which is able to promulgate and apply tribal off-reservation harvesting regulations, through the enactment of relevant tribal ordinances and codes.

6. Each plaintiff has issued and does require photograph identification cards for those members who harvest natural resources off-reservation pursuant to tribal authorization.

7. Each plaintiff has established a tribal court, with jurisdiction to adjudicate alleged violations by a tribal member of his or her Tribe's off-reservation harvesting regulations. Each court is organized according to the provisions of attached Exhibit 1.

8. Each of the plaintiffs' tribal courts is capable of adjudicating alleged violations of a code such as the Model Off-Reservation Conservation Code (June 23, 1989), in a fair, uniform and diligent manner, and such adjudicatory capability is adequate to ensure effective enforcement of the provisions of said code.

9. All records of tribal courts involving the exercise of usufructuary rights (except those isolated records protected by law such as juvenile records) shall be open for inspection and copying by the Department of Natural Resources at reasonable times upon reasonable notice. The actual proceedings in said courts also shall be open to the Department of Natural Resources.

10. It is the express intent of all parties that their respective enforcement officers work cooperatively in enforcing Off-Reservation Conservation Codes. The Wisconsin Department of Natural Resources agrees to make good faith efforts to coordinate with tribal wardens in its enforcement activities. Specifically, the Wisconsin Department of Natural Resources agrees to involve, as practicable, tribal wardens in contacts with tribal members concerning compliance with Off-Reservation Conservation Codes. The Tribes agree to make good faith efforts to coordinate with Department of Natural Resources wardens in their enforcement activities. To facilitate the cooperative intent of this paragraph, the chief wardens of said parties shall meet semi annually to discuss matters of mutual concern.

11. The defendants stipulate that the treaty wild rice harvesting rights apply to all natural navigable lakes, and to those areas where the beds of streams and flowages are owned by the state or its political subdivisions, excluding the Wisconsin-Minnesota boundary waters and Lake Superior.

12. Except as otherwise provided herein, the tribal court of each tribe which maintains a court and a code of regulations as described in this stipulation shall be vested with exclusive jurisdiction over violations involving ricing activities regulated by that code. No violation of regulations governing the act of ricing may be prosecuted in a state court against members of a tribe maintaining a court and a code of regulations as described above except as may be specifically provided in this Stipulation.

C. MANAGEMENT

1. The defendants agree to consult with the Voigt Task Force before the issuance of any permit which is required to be obtained from the State regarding any activity which may reasonably be expected to directly affect the abundance or habitat of wild rice in the ceded territory, including, but not limited to, permitting activities under Wis. Admin. Code secs. NR 19.09(1), 80.02 and 80.03, secs. 29.29(4), 30.11, 30.12, 30.18-.20, 31.04, 144.025(2)(i) and ch. 147, Stats.; the defendants agree to consult with the Voigt Task Force before the State undertakes any activity that does not require a permit but which may reasonably be expected to directly affect wild rice abundance or habitat; the Voigt Task Force will be afforded an opportunity to participate in any meeting or decision which may affect wild rice abundance or habitat.

2. The parties shall establish a "Wild Rice Management Committee" for the purposes of:

   a. evaluating necessary regulatory changes from a technical perspective for recommendation to the parties;

   b. establishing a shared data base regarding wild rice habitat, abundance and harvest, including maintaining a wild rice inventory, maintaining harvest data, and monitoring and documenting expenditures on wild rice management;

   c. exchanging complete and ongoing information, including historical data from local WDNR managers and representatives of the various plaintiff tribes;

d. developing guidelines and objectives for protection and enhancement of wild rice for recommendation to the parties, including establishing wild rice abundance objectives, establishing guideline for reseeding projects, examining the impact of water flow alteration or diversion on wild rice beds, and controlling purple loosestrife;

e. exchanging the names and addresses of all licensed wild rice harvesters no later than February 1 of every year to facilitate harvest monitoring; however, the parties agree to attempt to provide each other by November 1 of every year information regarding licenses; and

f. considering and making recommendations on any other matter which may affect wild rice abundance, habitat or harvest or which specifically is referred to the Committee by any party.

g. Committee Updates

i. The parties agree to amend *Section C.2* of this *Stipulation* to establish the following:

(1) The parties agree that the following DNR committees are established with a recognized tribal representative as an official member:

(a) Bureau of Wildlife Management

(1) Wild Rice

(2) Invasives

(2) The parties agree that a tribal representative shall be recognized as an official member of any current or future

DNR committees that are formed to address management issues of any treaty reserved resource.

(3) The parties agree that a consensus approach shall be used and agree to make all reasonable efforts to reach a consensus in all committees or processes outlined in this Stipulation.

(4) The parties agree that this section shall not affect the established and/or stipulated management responsibilities of any of the following: any committee listed in *Section C.2*, or the Biological Issues Group.

3. The "Wild Rice Management Committee" shall be composed of biologists of the Great Lakes Indian Fish and Wildlife Commission and the Wisconsin Department of Natural Resources, plus any representative or expert of any party.

4. The Committee shall meet on a regular basis, but in no case less than once per year. GLIFWC shall be responsible for calling meetings, providing minutes, and following through on committee actions. Costs of meetings shall be shared equally. The Committee shall make all reasonable efforts to reach consensus on any decision or recommendation.

5. The parties retain the right to follow or not follow the recommendations of the Committee and to challenge any action taken by another party.

6. No later than sixty days after the entry of an order incorporating the terms of this stipulation, the plaintiffs agree to modify the Voigt Intertribal Task Force Protocol On Wild Rice Harvest Levels ("Protocol") so that it does not purport to allow the

establishment of an exclusive tribal wild rice harvest on any waters of the State of Wisconsin. The plaintiffs agree, because the harvest of wild rice is not regulated by a quota, that they will not pursue in this or any other court any present or future claim to an exclusive tribal wild rice harvest on any waters of the State of Wisconsin prior to the entry of a final judgment in the above-captioned proceeding, i.e., until after the conclusion of the so-called "Phase III" proceedings to determine the damages, if any, to which the plaintiffs may be entitled. The plaintiffs reserve their rights to pursue such a claim in any later proceeding. The defendants reserve their rights to defend such claims on the grounds that they are unsupported by fact or law. Plaintiffs stipulate that as of September 25, 1989, if required to do so at trial, they would be unable to produce sufficient evidence of current need or capacity to support a determination by the court that they are entitled to an exclusive harvest for wild rice. Until such time, if ever, that a court authorizes an exclusive tribal wild rice harvest or imposes a harvest quota, the licensees of both parties shall enjoy equal access opportunities to harvest wild rice from the natural navigable lakes in the ceded territory. In light of this agreement, the defendants withdraw as moot their previously filed motion to join as defendants in the wild rice trial those riparians owning property along flowages and streams containing wild rice.

7. The parties stipulate and agree to open waters for wild rice harvesting concurrently and with the consultation between the WDNR managers and the corresponding local Wild Rice Authorities listed pursuant to the Protocol.

8. Meetings of the Agency Leadership

a. The parties agree that the agency leadership, through the Executive Administrator of the Great Lakes Indian Fish and Wildlife Commission and the Secretary of the Department of Natural Resources, shall make good faith efforts to coordinate regarding their respective management and regulatory activities.

9. Biennial Stipulation Review

a. The parties agree to make good faith efforts to coordinate discussion of proposed management and regulatory issues pertaining to the amendment of the *Lac Courte Oreilles Indians v. State of Wis.,* stipulations as established in the parties' 2001 joint motion to amend the final judgment. To facilitate the cooperative intent of this paragraph and to provide a regular schedule for stipulation review and possible amendment, the parties shall try to review and propose appropriate changes to the stipulations no less than biennially. Where the parties agree on particular stipulation amendments, they will first seek approval of those amendments by their respective legal counsel, and after legal counsel have executed a stipulation proposing such amendment, the parties will seek approval by the court.

b. The parties agree to make good faith efforts to: exchange a list of potential stipulation amendment issues in the first six months of a given biennium; to conduct an initial meeting to discuss the issues during the first summer of the biennium; to refer issues to study committees as necessary during

the second six months of the biennium; and to follow the foregoing with further negotiations during the third six month period of the biennium. New issues may be added for discussion at any time during the first three six month periods of the biennium or as otherwise mutually agreed upon by the parties.

10. Technical Updates and Amendments

a. The parties agree that the GLIFWC Executive Administrator may issue a Commission Order, thereby amending the pertinent portion of this stipulation.

i. Basis Standard:

(1) This stipulation as entered into the final judgment between the tribal and state parties to Lac Courte Oreilles Band, et al. v. State of Wisconsin, et al., Case No. 74-C-313 (United States District Court, Western District of Wisconsin) provides for the basis regulation standard

ii. Technical Amendments:

(1) The Great Lakes Indian Fish and Wildlife Commission Executive Administrator may, without consultation with the State, issue a Commission Order to provide tribal members more treaty harvest opportunities in line with state harvesters subject to this Stipulation and Voigt Case parameters pertaining to the following: age restrictions, disability exemptions, method restrictions, equipment

restrictions, hunting hours, season length, new places to hunt, or caliber restrictions;

iii. Other Liberalization Amendments:

(1) The Great Lakes Indian Fish and Wildlife Commission Executive Administrator may, after consultation with the State and upon agreement of the parties (where consent may not be unreasonably withheld), issue a Commission Order to provide tribal members more treaty harvest opportunities in line with state harvesters subject to this Stipulation and Voigt Case parameters pertaining to other fish and game related regulatory amendments of the Model Code;

iv. Mechanism for Amendment:

(1) A Commission Order can be administered detailing the technical amendment to be updated in the tribal off-reservation conservation code;

v. Consultation:

(1) The Tribes agree that they will inform the State of the issuance of a Commission Order;

vi. Amendment Implementation:

(1) Unless a Tribe has adopted more restrictive measures, the regulations established above in a Commission Order shall be that Tribe's regulations as provided in that Tribe's Code;

vii. Mandatory Reversion:

(1) Each Tribe must mandatorily revert through the issuance of a subsequent Commission Order issued simultaneously with the State as if and when State regulations revert toward the basis regulation standard. If the Tribes dispute the basis for the State's reversion, they may object, in which case the formal stipulation review process should be followed.

b. Upon the issuance of a Commission Order under part 8.A. of this stipulation, unless a Tribe chooses to adopt more restrictive measures, the regulations established therein shall be the Tribe's regulations as provided in that Tribe's Code.

c. The parties agree that the Tribes will amend § 3.33 of the Model Code in the manner reflected in attached Appendix A regarding this technical update amendment.

d. The parties agree that nothing in a Commission Order is intended to, or shall be construed to, limit the authority of each Tribe to establish regulations or other measures that are more restrictive than what is provided in a Commission Order, thereby reserving each Tribe's authority.

Dated: October 27, 1989

DONALD J. HANAWAY
Attorney General

THOMAS L. DOSCH

Assistant Attorney General
Attorneys for the Defendants

Dated: September 20, 1989

KATHRYN L TIERNEY
Attorney for Lac du Flambeau Band of Lake Superior Chippewa Indians

Dated: October 10, 1989

HOWARD J. BICHLER
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Dated: September 25, 1989

TRACY L. SCHWALBE
Attorney for Lac Courte Oreilles Band of Lake Superior Chippewa Indians

Dated: September 12, 1989

MILTON ROSENBERG
Attorney for Red Cliff Band of Lake Superior Chippewa Indians

Dated: October 25, 1989

EARL A. CHARLTON
Attorney for Sokaogon Chippewa Community of Mole Lake Band

Dated: October 18, 1989

DAVID J. SIEGLER
Attorney for Bad River Band of Lake Superior Chippewa Indians

**History:**

- **This Stipulation was originally submitted to the court on November 1, 1989.**
- **Section C(2)(g) was amended by Section XV(A) of the *Stipulation for Technical, Management and Other Updates: Second Amendment of Stipulations Incorporated into Final Judgment.***
- **Section C(8)(a) was amended by Section I(A) of the *Stipulation for Technical, Management and Other Updates: Second Amendment of Stipulations Incorporated into Final Judgment.***
- **Section C(9)(a-b) was amended by Section II(A) of the *Stipulation for Technical, Management and Other Updates: Second Amendment of Stipulations Incorporated into Final Judgment.***

- **Section C(10)(a-d) was amended by Section V(A-B) of the *Stipulation for Technical, Management and Other Updates: First Amendment of Stipulations Incorporated into Final Judgment* and further amended by Section III(A-C) *Stipulation for Technical, Management and Other Updates: Second Amendment of Stipulations Incorporated into Final Judgment.***

**APPENDIX C.**

ADOPTED: 08 / 02 / 07

## VOIGT INTERTRIBAL TASK FORCE PROTOCOL ON MANOOMINIKEWIN (WILD RICE HARVEST) LEVELS

Pursuant to and as an implementation of the ***Chippewa Intertribal Agreement Governing the Resource Management and Regulation of Off-Reservation Treaty Rights in the Ceded Territory***, and as an implementation of the stipulation reached between the tribal and state parties in ***Lac Courte Oreilles, et al. v. State of Wisconsin*** regarding wild rice issues, the Voigt Intertribal Task Force Committee (hereinafter termed "Task Force") of the Great Lakes Indian Fish and Wildlife Commission (hereinafter termed "GLIFWC") hereby adopts and enacts the following system for wild rice management and regulation:

1. **Biological Services Designation of Wild Rice Waters Available for Harvest.** The Task Force hereby authorizes and designates the Biological Services Division (hereinafter termed "BSD") of GLIFWC to provide to the several Bands, no later than July 15 of each year, the list of waters with harvestable wild rice beds in the ceded territory. The BSD shall also provide an estimate of the number of pounds of wild rice harvested in the ceded territory by the several Bands in the previous year and an estimate, if available, of the potential yield of wild rice (in pounds) for each of the waters listed.

2. **Waters Subject to Opening through Tribal Ricing Authority.** The following lakes shall be subject to opening by the Tribal Wild Rice Authority for each specified Tribe:

| | | |
|---|---|---|
| **a.** | **Barron County:** | |
| | Bear, Beaver Dam, Red Cedar | St. Croix |
| **b.** | **Bayfield County:** | |
| | Totagatic | Lac Courte Oreilles |
| **c.** | **Burnett County:** | |
| | Bashaw, Big Clam, Big Sand, Briggs, Gaslyn, Long, Mud (Town Of Oakland), Mud (Town of Swiss), Mud Hen, Spencer, Trade | St Croix |
| **d.** | **Douglas County:** | |
| | 1. Allouez Bay | St Croix |
| | 2. Mulligan | Lac Courte Oreilles |

**e. Forest County:**

| | |
|---|---|
| Atkins, Riley, Big Rice, Wabigon | Mole Lake |

**f. Oneida County:**

| | | |
|---|---|---|
| 1. | Big, Big Lake Thoroughfare, Gary, Little Rice, Rice | Lac du Flambeau |
| 2. | Spur | Mole Lake |

**g. Polk County:**

| | |
|---|---|
| Balsam Branch, Big Round, East, Glenton, Little Butternut, Nye, Rice, White Ash | St Croix |

**h. Vilas County:**

| | |
|---|---|
| Allequash, Aurora, Devine, Frost, Irving, Little Rice, Michey Mud, Nixon, Rice, Sand, West Ellerson, West Plum | Lac du Flambeau |

**i. Washburn County:**

| | | |
|---|---|---|
| 1. | Bear, Gilmore, Little Mud, Long, Mud, Nancy, Spring | St Croix |
| 2. | Rice (Smith's Bridge), Tranus | Lac Courte Oreilles |

3. **Additional Waters.** Upon the Recommendation of the Biological Services Division of GLIFWC that additional waters require management through the imposition of a closure provision, or through enhancement effort protection, the Task Force shall identify a Tribal Wild Rice Authority for each additional body of water.

4. **Tribal Notification to BSD**. The Tribes will notify the BSD immediately after the Tribe's Wild Rice Authority posts notice when a body of water will be open or closed for wild rice harvesting. The BSD immediately shall notify the Wisconsin Department of Natural Resources when a Tribe's Wild Rice Authority has opened or closed a body of water for wild rice harvesting.

5. **Repeal of Previous Protocols.** The Task Force Protocol of Wild Rice Harvest Levels dated July 3, 1991, is hereby rescinded and replaced by this protocol.

**APPENDIX D.** Wisconsin Harvest Data Summary, 1992-2015

## BACKGROUND

Because of the reaffirmation of off-reservation treaty rights, Wisconsin has an excellent database of manoomin harvest information. As a stipulation of the wild rice portion of the *LCO* (*Voigt)* case, the state agreed to annually provide the names and addresses of state permittees to GLIFWC, so that harvest surveys could be conducted. For the purposes of this summary, harvest records were reviewed from the 24-year period from 1992 through 2015, during which survey methodology was fairly consistent. This database provides a unique picture of off-reservation manoomin harvesting in Wisconsin that is not available for other parts of rice's range.

The information in this summary is derived from annual harvest reports, and those reports should be reviewed by those interested in the specifics of how each annual survey was conducted. However, there were some general differences between how the state and tribal harvest estimates were made, and what the harvest estimates represent for each group.

All state data were gathered by mail surveys of state licensees. Because the state license must be purchased, the activity rate among state license holders is high, ranging from 76-93% annually, and averaging 88% over the study period (Table 1).

State harvest estimates reflect all harvest conducted by state licensees, including a (typically) small amount reported from on-reservation waters. However, it does not include harvest by individuals older than 65 or younger than 16, since these individuals are not required to purchase a state license. It is unknown how much harvest may be made by individuals in these groups, but the harvest by individuals older than 65 may be appreciable, as the most experienced ricers tend to harvest the most rice per trip. It is also important to note that harvest reported under a single state license may include harvest by more than one individual, because the state license also permits harvest by immediate family members of the license holder (spouse and children living at home).

Tribal data were gathered by either mail or phone surveys, with both methods being used some years. In addition, since the tribal rice harvesting permit is free, and is essentially an option on a general natural resources harvesting permit, it is often obtained by individuals with a modest interest in ricing. As a result, the activity rate has been much lower than for state-licensees, averaging 17% over the study period (Table 1).

Unlike state surveys, the tribal harvest figures do not include on-reservation harvest, but do include harvest for ricers of all ages. Also, estimates of harvest per license reflect only the harvest reported by the individual license holder, not the mix of individuals and families which occurs under the state license.

Both the state and tribal surveys depend on self-reported harvest. Surveys of this type can include intentional and/or unintentional errors in the data. While obvious errors (such as listing a

lake in the wrong county) were corrected during data entry, some errors are not detectable, and remain in the database at an unknown, but likely minor level. Despite these small errors, the harvest database provides a wealth of information on harvest levels, trends in harvest, and the distribution of harvest geographically and among permit holders. It can also provide an important tool to evaluate certain regulatory issues, such as the utility of date-regulating the harvest on particular waters.

**Table 1.** Summary of Wisconsin Manoomin Harvest, 1992-2015 (page 1 of 3).

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|
| EST. TRIBAL HARV | 9,850 | 13,500 | 20,429 | 36,524 | 32,643 | 41,332 | 17,868 | 14,766 |
| EST. TRIBAL TRIPS | 164 | 205 | 324 | 891 | 680 | 592 | 396 | 370 |
| EST. STATE HARV | 23,800 | 24,000 | 43,534 | 47,164 | 50,517 | 71,741 | 28,451 | 28,310 |
| EST. STATE TRIPS | 506 | 558 | 888 | 1,091 | 1,094 | 1,246 | 954 | 971 |
| COMBINED TRIPS | 670 | 763 | 1,212 | 1,982 | 1,774 | 1,838 | 1,350 | 1,341 |
| COMBINED HARV | 33,650 | 37,500 | 63,963 | 83,688 | 83,160 | 113,073 | 46,319 | 43,076 |
| COMB. OFF-REZ HARV | 33,650 | 37,500 | 63,963 | 83,443 | 82,949 | 113,073 | 46,161 | 42,752 |
| COMBINED # ACTIVE | 404 | 391 | 499 | 529 | 563 | 641 | 574 | 540 |
| % TRIBAL | 0.29 | 0.36 | 0.32 | 0.44 | 0.39 | 0.37 | 0.39 | 0.34 |
| # TRIBAL PERMITS | 607 | 774 | 827 | 857 | 729 | 922 | 911 | 907 |
| EST. TRIBAL ACTIVE | 162 | 186 | 122 | 171 | 213 | 176 | 158 | 140 |
| % TRIBAL ACTIVE | 0.27 | 0.24 | 0.15 | 0.2 | 0.29 | 0.19 | 0.17 | 0.15 |
| TRIBAL AVE # TRIPS | 1 | 1.1 | 2.7 | 5.2 | 3.2 | 3.4 | 2.5 | 2.6 |
| TRIBAL LBS/TRIP | 60 | 66 | 63 | 41 | 48 | 70 | 45 | 40 |
| TRIBAL HARV/ACTIVE | 61 | 73 | 167 | 214 | 153 | 235 | 113 | 105 |
| # STATE PERMITS | 285 | 225 | 405 | 402 | 388 | 508 | 488 | 467 |
| EST. STATE ACTIVE | 242 | 205 | 377 | 358 | 350 | 465 | 416 | 400 |
| % STATE ACTIVE | 0.85 | 0.91 | 0.93 | 0.89 | 0.9 | 0.92 | 0.85 | 0.86 |
| STATE AVE # TRIPS | 2.1 | 2.7 | 2.4 | 3 | 3.1 | 2.7 | 2.3 | 2.4 |
| STATE LBS/TRIP | 47 | 43 | 49 | 43 | 46 | 58 | 30 | 29 |
| STATE HARV/ACTIVE | 98 | 117 | 115 | 132 | 144 | 154 | 68 | 71 |
| COMBINED # PER TRIP | 50 | 49 | 53 | 42 | 47 | 62 | 34 | 32 |
| # SITES w/ 1+LB HARV | 35 | 50 | 53 | 65 | 71 | 68 | 66 | 76 |

**Table 1.** Summary of Wisconsin Manoomin Harvest, 1992-2015 (page 2 of 3).

| YEAR | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| EST. TRIBAL HARV | 14,925 | 17,098 | 11,713 | 27,802 | 24,265 | 9,378 | 21,830 | 30,123 |
| EST. TRIBAL TRIPS | 268 | 432 | 352 | 511 | 515 | 255 | 405 | 545 |
| EST. STATE HARV | 27,698 | 36,668 | 32,073 | 49,358 | 57,607 | 29,041 | 62,091 | 33,120 |
| EST. STATE TRIPS | 881 | 1,076 | 984 | 1,453 | 1,581 | 1,324 | 1,660 | 1,316 |
| COMBINED TRIPS | 1,149 | 1,508 | 1,336 | 1,964 | 2,096 | 1,579 | 2,065 | 1,861 |
| COMBINED HARV | 42,623 | 53,766 | 43,786 | 77,160 | 81,872 | 38,419 | 83,921 | 63,243 |
| COMB. OFF-REZ HARV | 42,333 | 52,736 | 43,542 | 76,943 | 81,633 | 38,186 | 83,771 | 63,243 |
| COMBINED # ACTIVE | 460 | 563 | 497 | 663 | 666 | 544 | 721 | 608 |
| % TRIBAL | 0.35 | 0.32 | 0.27 | 0.36 | 0.30 | 0.24 | 0.26 | 0.48 |
| # TRIBAL PERMITS | 897 | 884 | 781 | 944 | 831 | 850 | 910 | 1,248 |
| EST. TRIBAL ACTIVE | 116 | 139 | 104 | 96 | 86 | 72 | 116 | 101 |
| % TRIBAL ACTIVE | 0.14 | 0.16 | 0.13 | 0.10 | 0.10 | 0.08 | 0.13 | 0.08 |
| TRIBAL AVE # TRIPS | 2.3 | 3.1 | 3.4 | 5.3 | 6.0 | 3.5 | 3.5 | 5.4 |
| TRIBAL LBS/TRIP | 56 | 40 | 33 | 54 | 47 | 37 | 54 | 55 |
| TRIBAL HARV/ACTIVE | 129 | 123 | 113 | 290 | 282 | 130 | 188 | 298 |
| # STATE PERMITS | 396 | 488 | 432 | 621 | 665 | 585 | 659 | 605 |
| EST. STATE ACTIVE | 344 | 424 | 393 | 567 | 580 | 472 | 605 | 507 |
| % STATE ACTIVE | 0.87 | 0.87 | 0.91 | 0.91 | 0.87 | 0.81 | 0.92 | 0.84 |
| STATE AVE # TRIPS | 2.6 | 2.5 | 2.5 | 2.6 | 2.7 | 2.8 | 2.7 | 2.6 |
| STATE LBS/TRIP | 31 | 34 | 33 | 34 | 36 | 22 | 37 | 25 |
| STATE HARV/ACTIVE | 81 | 86 | 82 | 87 | 99 | 62 | 103 | 65 |
| COMBINED # PER TRIP | 37 | 36 | 33 | 39 | 39 | 24 | 41 | 34 |
| # SITES w/ 1+LB HARV | 65 | 74 | 71 | 92 | 94 | 110 | 89 | 98 |

**Table 1.** Summary of Wisconsin Manoomin Harvest, 1992-2015 (page 3 of 3).

| YEAR | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015* | AVE. |
|---|---|---|---|---|---|---|---|---|---|
| EST. TRIBAL HARV | 24,055 | 26,805 | 2,032 | 12,773 | 6,975 | 12,715 | 18,605 | 24,939 | 19,706 |
| EST. TRIBAL TRIPS | 552 | 731 | 263 | 422 | 396 | 238 | 520 | 524 | 440 |
| EST. STATE HARV | 50,433 | 88,008 | 10,302 | 36,006 | 27,947 | 52,914 | 34,283 | 58,935 | 41,833 |
| EST. STATE TRIPS | 1,456 | 2,135 | 1,032 | 1,668 | 1,351 | 1,749 | 1,430 | 1,957 | 1,265 |
| COMBINED TRIPS | 2,008 | 2,866 | 1,295 | 2,090 | 1,747 | 1,987 | 1,950 | 2,481 | 1,705 |
| COMBINED HARV | 74,488 | 114,813 | 12,334 | 48,779 | 34,922 | 65,629 | 52,888 | 83,874 | 61,539 |
| COMB. OFF-REZ HARV | 74,247 | 114,523 | 12,334 | 48,080 | 34,922 | 65,432 | 50,862 | 83,860 | 61,256 |
| COMBINED # ACTIVE | 717 | 1,040 | 558 | 796 | 652 | 754 | 773 | 931 | 629 |
| % TRIBAL | 0.32 | 0.23 | 0.16 | 0.26 | 0.20 | 0.19 | 0.37 | 0.30 | 0.31 |
| # TRIBAL PERMITS | 1,306 | 858 | 1,019 | 566 | 638 | 628 | 787 | 756 | 852 |
| EST. TRIBAL ACTIVE | 153 | 197 | 95 | 149 | 143 | 73 | 162 | 145 | 136 |
| % TRIBAL ACTIVE | 0.12 | 0.23 | 0.09 | 0.26 | 0.22 | 0.12 | 0.21 | 0.19 | 0.17 |
| TRIBAL AVE # TRIPS | 3.6 | 3.7 | 2.8 | 2.8 | 2.8 | 3.3 | 3.2 | 3.6 | 3.3 |
| TRIBAL LBS/TRIP | 44 | 37 | 8 | 30 | 18 | 53 | 36 | 48 | 45 |
| TRIBAL HARV/ACTIVE | 157 | 136 | 21 | 86 | 49 | 174 | 115 | 172 | 149 |
| # STATE PERMITS | 651 | 914 | 611 | 740 | 592 | 757 | 698 | 854 | 560 |
| EST. STATE ACTIVE | 564 | 843 | 463 | 647 | 509 | 681 | 611 | 786 | 492 |
| % STATE ACTIVE | 0.87 | 0.92 | 0.76 | 0.87 | 0.86 | 0.90 | 0.88 | 0.92 | 0.88 |
| STATE AVE # TRIPS | 2.6 | 2.5 | 2.2 | 2.6 | 2.7 | 2.6 | 2.3 | 2.5 | 2.6 |
| STATE LBS/TRIP | 35 | 41 | 10 | 22 | 21 | 30 | 24 | 30 | 34 |
| STATE HARV/ACTIVE | 89 | 104 | 22 | 56 | 55 | 78 | 56 | 75 | 87 |
| COMBINED # PER TRIP | 37 | 40 | 10 | 23 | 20 | 33 | 27 | 34 | 37 |
| # SITES w/ 1+LB HARV | 102 | 102 | 70 | 87 | 69 | 96 | 88 | 87 | 78 |

* 2015 figures preliminary.

## HARVEST INFORMATION

Manoomin harvest in Wisconsin varies greatly from year to year as crop abundance, harvester effort, and other factors vary. A summary of harvest data is available in Table 1 (above). All pound figures in the discussion below refer to freshly harvested, "green" (unfinished) rice.

Over the study period, the estimated annual Wisconsin off-reservation harvest varied more than tenfold, ranging from 12,334 to 114,813 pounds (Table 1 and Figure 1), and averaging 61,539 pounds. Over the study period, state ricers and tribal ricers accounted for roughly two-thirds and one-third of the total harvest respectively.

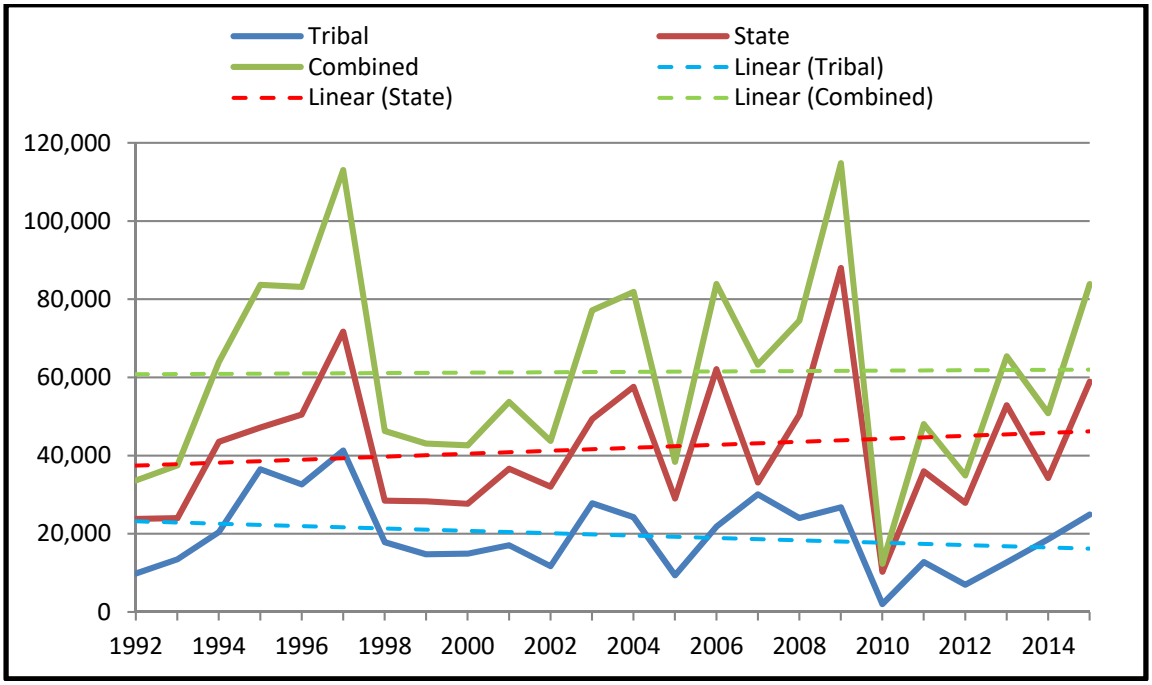


**Figure 1. Estimated state, tribal and combined annual manoomin harvest in pounds, with trendlines (2015 figures preliminary).**

Harvest data also reflect the uneven distribution of manoomin in the state. While 37 counties had at least one pound of reported harvest over the 24-year period, only 10 counties exceeded 1% of the total reported harvest (Table 2 and Figure 2). The two most heavily harvested counties, Burnett and Vilas, were the only counties to account for more than 10% of the total reported harvest, at 31% and 16% respectively. Collectively these two counties were responsible for nearly half of the reported harvest in the state (47%).

Similarly, manoomin harvest is heavily concentrated on particular waters. While 273 identified waters had at least 1 pound of reported harvest over the 24-year period (some waters were not named by respondents), 248 of these individually accounted for less than 1% of the total reported harvest, and only 17 accounted for more than 2% of the total each. The top 5 waters accounted for nearly 3 out of every 10 pounds harvested and the top 13 waters yielded slightly over half of the harvest collectively (Tables 2 and 4). The most heavily harvested water in the state, Clam Lake in Burnett County, accounted for 7% of the total harvest, despite having had almost no

reported harvest over the last 9 years of the study period due to a massive decline in manoomin abundance, apparently due to carp. (The manoomin beds at Clam Lake have begun to recover in the post study period years, due to restoration efforts led by the St. Croix Tribe.)

Over the study period, date-regulated waters accounted for 39% of the total reported harvest (assuming unnamed sites were not date-regulated). However, this figure has been changing over time. Over the first 10 years of the study period, the percentage of harvest coming from date-regulated waters trended fairly strongly downward (Figure 3). Since 2002, however, this figure has varied from year to year, but has not appreciably trended upward or downward, averaging 30% over this period (Figure 3). This decline is thought to be largely due to the addition of many newly seeded sites to the Wisconsin landscape, none of which are currently date-regulated. This position is supported by a general increase in the percentage of the harvest which comes each year from seeded sites (Figure 4) and a general increase in the number of sites reported harvested each year (Figure 5). However, it is also possible that a decline in manoomin abundance on date-regulated lakes (like Clam Lake) is contributing to this trend.

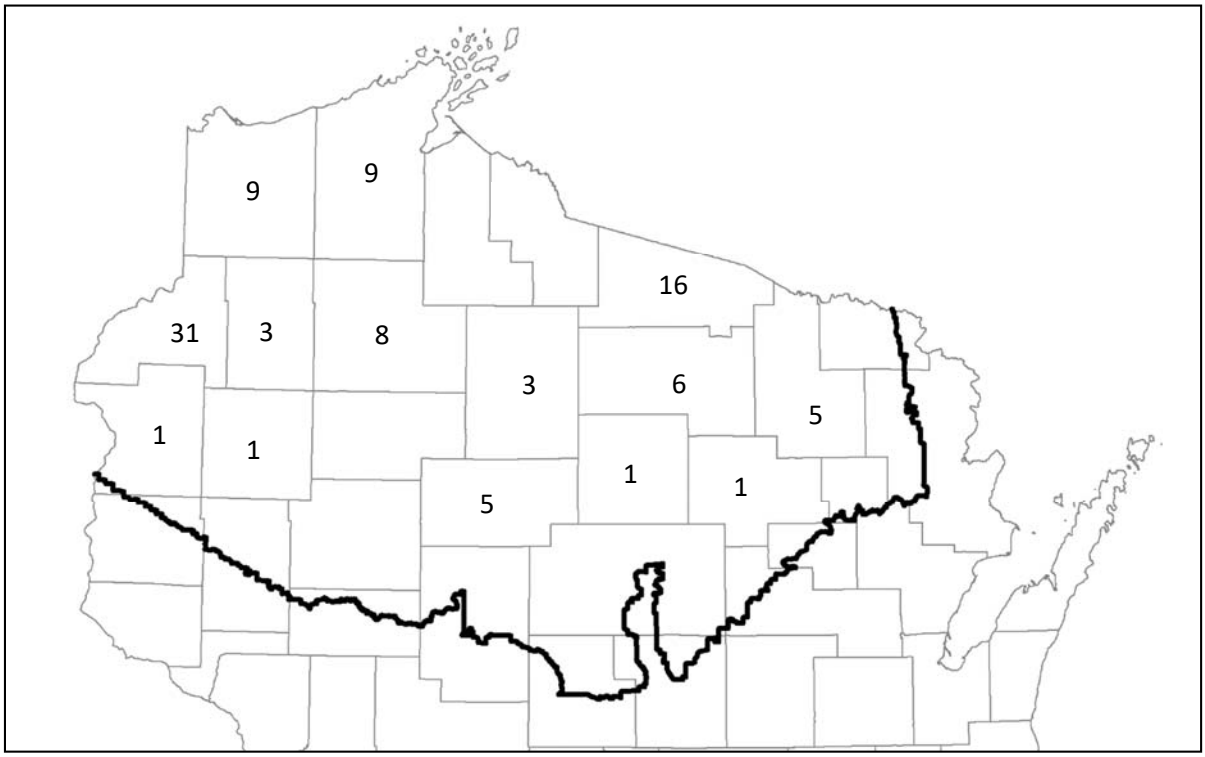


**Figure 2. Percent of 1992-2015 reported manoomin harvest by county (for counties accounting for 1% or more of the total).**

**Table 2.** Top 13 manoomin harvest waters, 1992-2015, in reported harvest of pounds of green rice. Date-regulated waters are bolded.

| County | Water | Reported Harvest (lbs of green rice) | Percent of Total Reported Harvest |
|---|---|---|---|
| BURNETT | **CLAM LAKE** | 47,464 | 7.4% |
| SAWYER | **TOTOGATIC LAKE** | 39,679 | 6.1% |
| BAYFIELD | PACWAWONG FLOWAGE | 39,333 | 6.1% |
| BURNETT | **LONG LAKE** | 35,567 | 5.5% |
| BURNETT | PHANTOM FLOWAGE | 28,644 | 4.4% |
| VILAS | **AURORA LAKE** | 20,503 | 3.2% |
| DOUGLAS | MINONG FLOWAGE (SMITHS BRG) | 20,338 | 3.1% |
| VILAS | UPPER NINEMILE FLOWAGE* | 20,327 | 3.1% |
| PRICE | SPRING CREEK WA. | 16,864 | 2.6% |
| BAYFIELD | CHIPPEWA LAKE | 16,823 | 2.6% |
| TAYLOR | CHEQUAMEGON WATERS FLOWGE | 16,696 | 2.6% |
| BURNETT | NORTH FORK FLOWAGE | 14,796 | 2.3% |
| DOUGLAS | ST. CROIX RIVER | 14,431 | 2.2% |

* This flowage was reduced to a stream in 2014 when the dam was lost during spring snow melt.

As with harvest in general, harvest among date-regulated waters is concentrated on a small number of sites. Of the 53 off-reservation, date-regulated waters, the top 10 most heavily harvested lakes accounted for 84% of the total reported date-regulated harvest (Table 3).

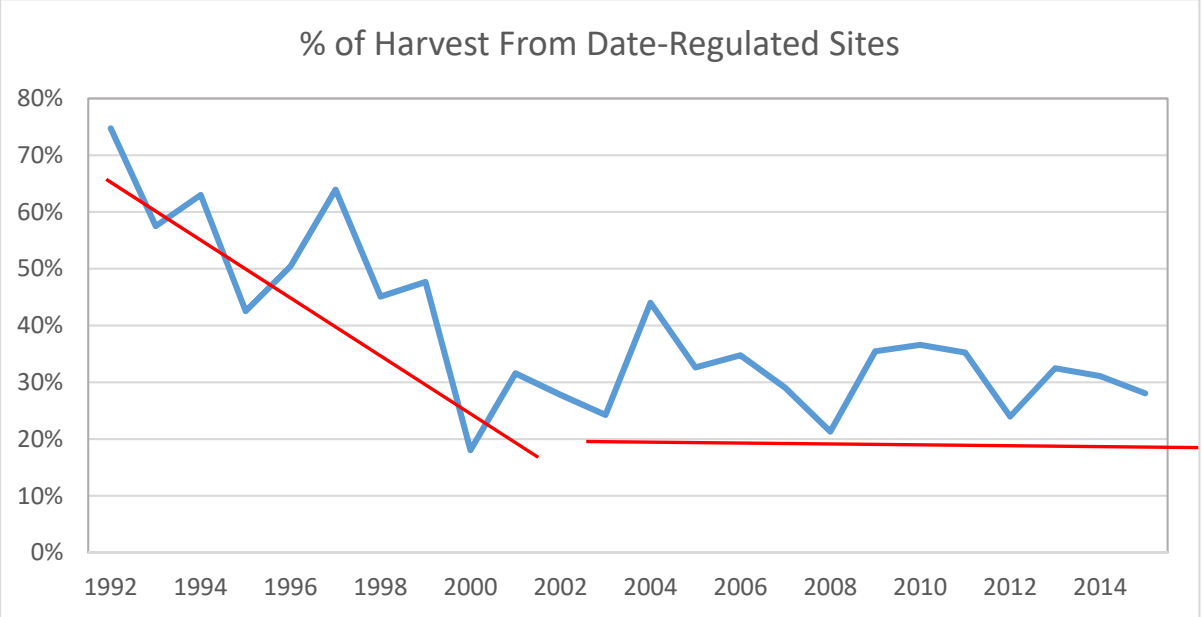


**Figure 3. Percentage of harvest coming from date-regulated waters, by year. Red lines show trends during the 1992- 2001 and 2002- 2015 periods.**

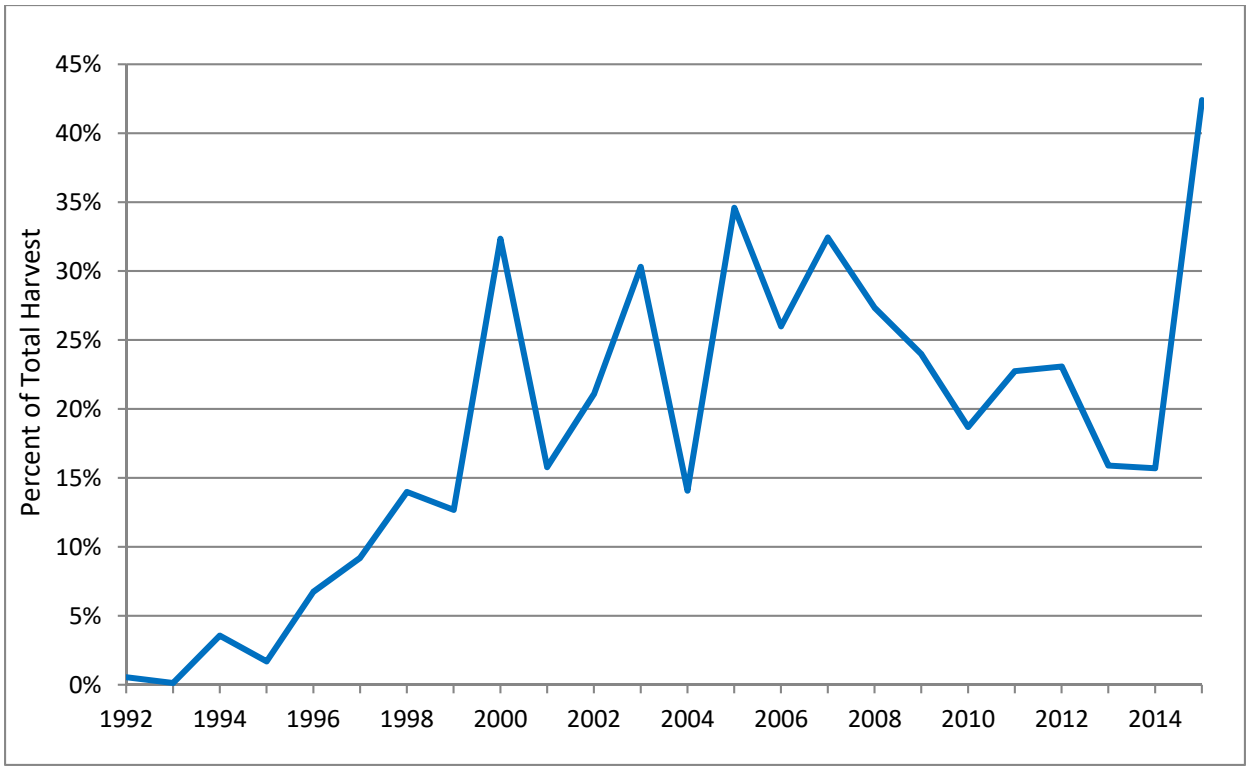


**Figure 4. Percentage of harvest from named sites coming from seeded waters, by year.**

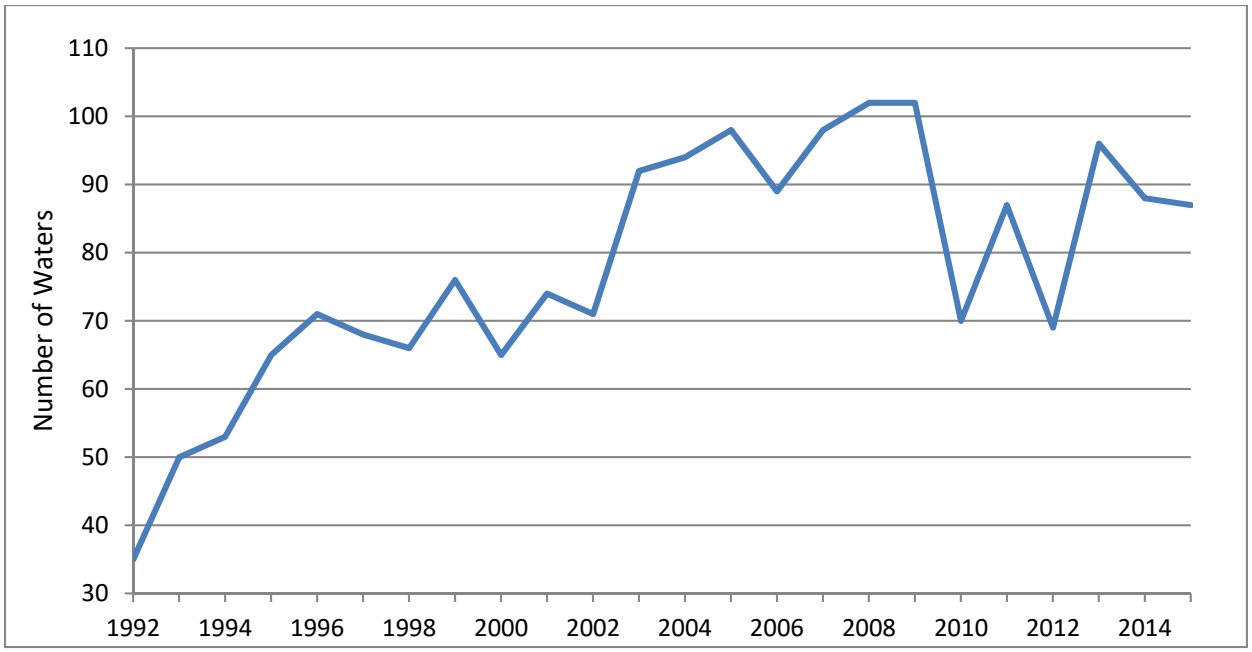


**Figure 5. Number of named waters with at least 1 pound of reported harvest, by year.**

**Table 3.** Percentage of the total reported harvest from off-reservation, date-regulated waters coming from individual date-regulated waters, 1992-2015. (Results shown for top 20 date-regulated waters; each of the 33 remaining date-regulated waters accounted for less than 0.5% of the date-regulated harvest.)

| COUNTY | WATER | PERCENT of ALL DATE-REGULATED HARVEST | CUMULATIVE PERCENTAGE |
|---|---|---|---|
| BURNETT | CLAM LAKE | 19.62% | 19.62% |
| BAYFIELD | TOTOGATIC LAKE | 16.40% | 36.02% |
| BURNETT | LONG LAKE | 14.70% | 50.72% |
| VILAS | AURORA LAKE | 8.47% | 59.19% |
| BURNETT | BRIGGS LAKE | 5.42% | 64.61% |
| ONEIDA | BIG LAKE THOROUGHFARE | 5.40% | 70.01% |
| VILAS | IRVING LAKE | 4.25% | 74.26% |
| VILAS | ALLEQUASH LAKE | 4.14% | 78.39% |
| ONEIDA | SPUR LAKE | 3.65% | 82.04% |
| BARRON | BEAR LAKE | 1.92% | 83.96% |
| BURNETT | GASLYN LAKE | 1.88% | 85.84% |
| WASHBURN | SPRING LAKE | 1.87% | 87.71% |
| BURNETT | MUD LAKE | 1.70% | 89.41% |
| VILAS | NIXON CREEK/LAKE | 1.44% | 90.85% |
| VILAS | LITTLE RICE LAKE | 1.33% | 92.18% |
| DOUGLAS | MULLIGAN LAKE | 1.29% | 93.46% |
| WASHBURN | TRANUS LAKE | 0.91% | 94.37% |
| ONEIDA | BIG LAKE | 0.76% | 95.13% |
| POLK | RICE LAKE | 0.56% | 95.69% |
| ONEIDA | GARY LAKE | 0.53% | 96.22% |

The amount of manoomin harvested per trip is also highly variable. The average over the study period for state and tribal ricers combined has been about 37 pounds per trip (Table 1). However, likely because of their greater experience (see below), the average for tribal ricers tends to be higher, averaging 45 pounds, versus 34 pounds for state ricers. Since 1994, tribal ricers have also tended to make about one more ricing trip per year than state ricers, averaging about 3.5 versus 2.6 trips. (Data from 1992 and 1993 were excluded because the low number of tribal trips made those years may have been a product of the relative recentness of the reaffirmation of the off-reservation exercise.) As a result, tribal members have accounted for 32% of the total reported harvest, while making up 22% of the estimated number of active ricers. Annual harvest per licensee has averaged 149 and 87 pounds for tribal and state ricers respectively.

The average harvest per trip has been trending downward over time (Figure 6). Two primary reasons for this have been hypothesized: a decline in the amount of effort being made per trip,

and/or a decline in the productivity of the plants. Available harvest data does not measure effort per trip, but many long-time ricers contend that they do not harvest as intensively as they did years ago, and it is likely that this factor is responsible for at least a portion of the decline. However, it is possible that reduced plant productivity is also contributing to the observed decline. Data for the 2010 season showed a record low harvest per trip, which was clearly influenced by low plant productivity associated with an extensive brown spot disease outbreak that year (David 2012).

The number of pounds harvested per trip also varies greatly by water body. For many sites, the total number of trips reported is too low to make good comparisons, but for waters with at least 100 reported ricing trips, average harvest varied greatly, ranging from 14 to 60 pounds per trip, and averaging 36. The relatively high levels of harvest on some waters may be influenced not only by production of the stand, but the individuals picking it, as more experienced pickers may be selecting waters that generally offer a higher harvest.

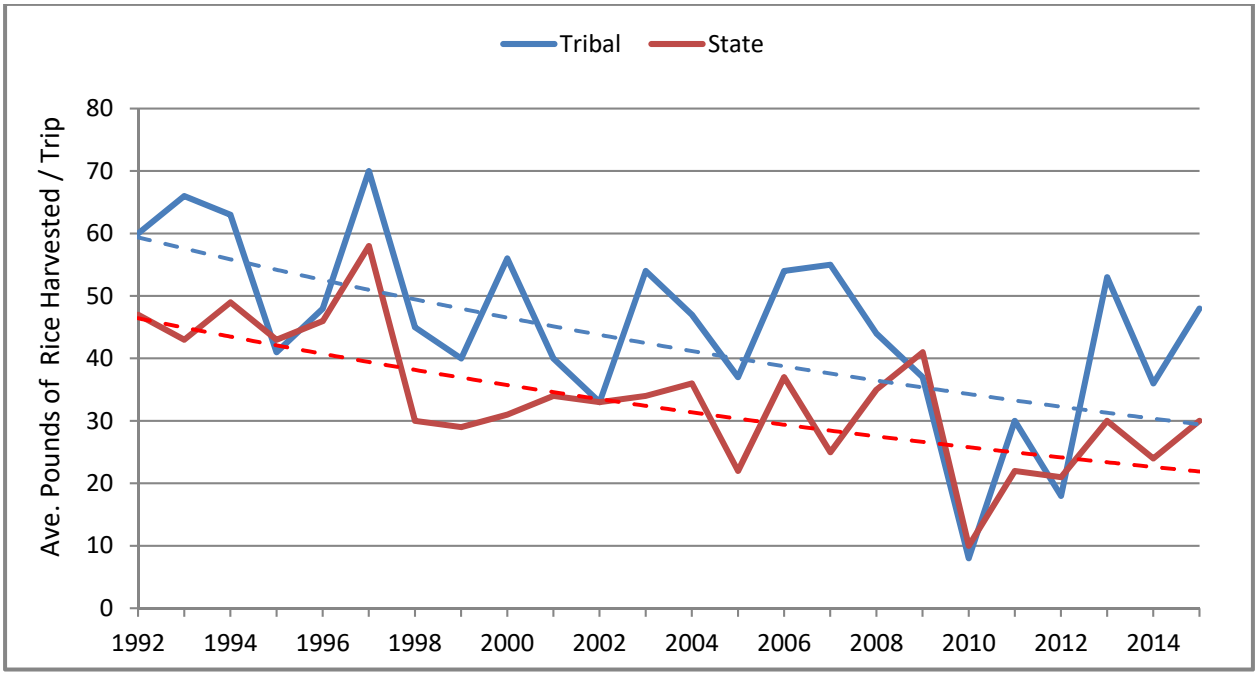


**Figure 6. Average manoomin harvest per trip, state and tribal harvesters, by year, with exponential trendlines.**

While even novice ricers occasionally report appreciable harvests, experience is strongly correlated with harvest levels. Over years of harvesting, individuals learn when and where to pick, and hone their overall rice harvesting skills. As a result, the average harvest per trip trends upward as experience increases (Figure 7). This trend has been remarkably consistent over all experience levels.

The distribution of harvest among ricers is very uneven (Figure 8), in part because there is no maximum allowable harvest, and because harvesting is done by people with widely differing harvesting interests, ranging from individuals interested only in experiencing this unique and

historic activity, to those looking to provide important sustenance for their families or for economic benefits. While nearly 80% of state ricers will end their season with 100 pounds of harvest or less, more than 40% of the tribal ricers will pick over 100 pounds a year, and a small number of individuals in both groups will harvest over 1,000 pounds a season if the crop allows.

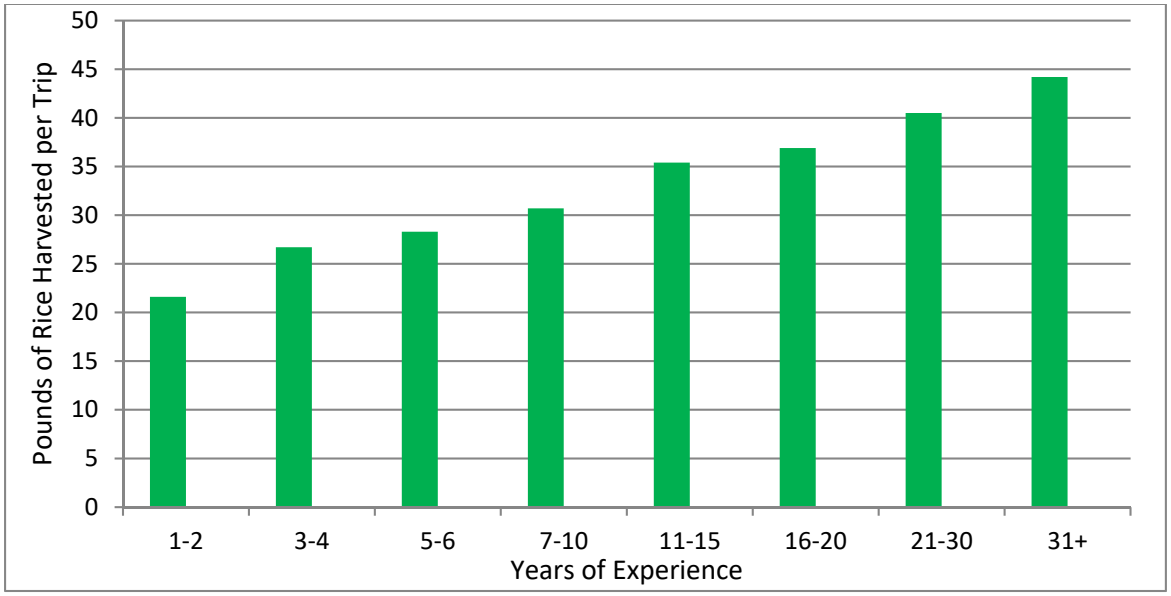


**Figure 7. Average harvest per trip versus years of experience, 2003-2015, state and tribal ricers combined.**

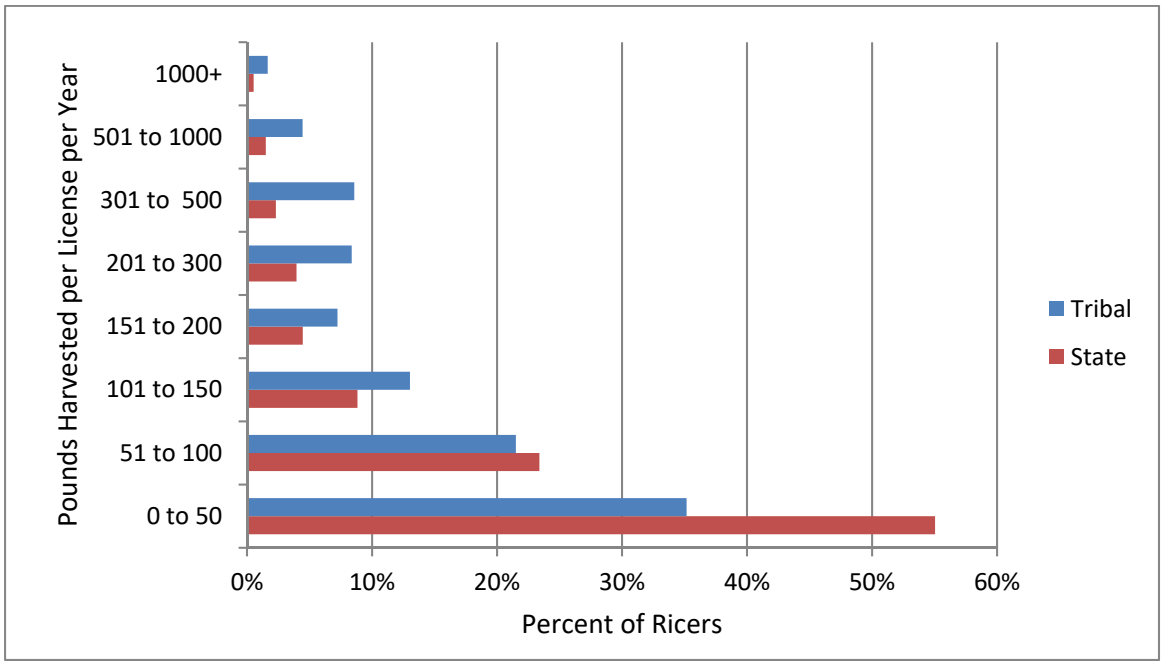


**Figure 8. Pounds of rice harvested per year per license (based on 1992 through 2015 data).**

APPENDIX E.

# Manoomin (Wild Rice) Seeding Guidelines

by
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Wildlife Biologist

Administrative Report 18-09
May 2018

**Great Lakes Indian Fish & Wildlife Commission**
Biological Services Division
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# MANOOMIN (WILD RICE) SEEDING GUIDELINES

## INTRODUCTION

Manoomin has tremendous ecological, cultural, and subsistence values, yet its abundance has declined across much of its range since European contact. As a result, many natural resource agencies and private individuals are interested in seeding manoomin to restore historic beds or to establish new beds in areas of suitable habitat. This interest may be as localized as an individual who hopes to establish rice on a private wetland to enhance their opportunity to view or hunt wildlife, or as broad as an agency's interest in reestablishing some of the historic abundance of rice on a landscape level. At any scale, there are a number of social and ecological considerations that should be made to determine if a site is suitable for seeding, to maximize the likelihood of success, and (depending on the site) to minimize possible conflicts with other resources or resource users.

These guidelines are the product of nearly 3 decades of seeding efforts which have been conducted by GLIFWC and its cooperators. While not hard and fast rules, they should provide useful guidance to individuals interested in attempting seeding projects - particularly to those individuals whose familiarity with manoomin is not extensive. They are intended only to be applied within the historic range of the plant, particularly within northern Minnesota, Wisconsin and Michigan.

The general approach to seeding outlined in these guidelines is intentionally low-tech and low-cost, to have the widest application in the most efficient manner. However, despite the significant amount of experience and ecology that have been incorporated into these guidelines, manoomin establishment retains a component of art as well as science. Any particular location is likely to have some unique characteristics that are difficult to address in a set of general guidelines. We encourage any group or individual interested in pursuing a seeding project to contact GLIFWC staff, both to gain possible assistance in project evaluation and to contribute to the refinement of these guidelines as new understanding is gained through the success or failure of each seeding effort.

## BACKGROUND

Wild rice (a term applied to both *Zizania palustris* or northern wild rice, and *Zizania aquatica* or southern wild rice) is an aquatic plant with significant ecological value. It is best known for its nutritious seed, which is a favored food of many species of ducks, geese and swans. Production can be substantial, with an acre of wild rice yielding well over 500 pounds of seed under good conditions.

***A dense manoomin stand can produce hundreds of pounds of nutritious seed per acre, a boon to both wildlife and human harvesters.***

Manoomin has other ecological values as well. It provides good cover and brood rearing habitat for waterfowl and other wetland birds, while muskrats, deer, geese, swans and other herbivores readily feed on the green portions of the plant. Wild rice beds can be important nursery areas for young fish and amphibians, and they

attract rails, red-winged blackbirds and other species of birds in the fall. Rice beds can also help maintain wetland water quality by tying up nutrients, stabilizing loose soils, and forming a natural windbreak over shallow-water areas, preventing soil nutrients from being stirred into the water column. Living and decaying straw from this annual plant supports high populations of invertebrates, the building block of the food web for many wetland-dependent species.

***Manoomin's dense root masses help stabilize soft sediments, keeping nutrients out of the water column.***

Wild rice also has significant historical and cultural value. Its seed has long been a staple in the diet and traditions of Native Americans living within its range, including the Ojibwe (who refer to it as manoomin), the Menominee (who take their name from this plant), and the Dakota. It also has long been an economic commodity, traded with the early fur traders and voyageurs, who also came to rely upon the nutritious seed for survival.

Although once a fairly common plant within its range, many historic wild rice beds have been lost to various human-induced alterations of the landscape. The damming of lakes and rivers and the artificial control of water levels has likely led to the greatest losses, but pollution, heavy boat traffic, the introduction of invasive species and other factors likely have contributed to the decline. Some lakeshore owners, boaters, and even anglers view rice as a nuisance plant. Beaver can negatively impact manoomin by raising water levels beyond the range of suitable depth. Climate change likely poses new and significant threats to northern wild rice, the species which is critical to human harvesters. The need for stewardship is real and substantial.

***Native Americans have harvested manoomin for centuries.***

## HABITAT REQUIREMENTS AND LIFE CYCLE

Anyone considering seeding manoomin should have a basic understanding of its habitat requirements and life cycle before proceeding.

### Habitat Requirements

*Water:* Rice requires flowing water. Examples of optimal locations include slow-flowing river meanders, flowages and lakes that have inlets and outlets. Intermittent, seasonal flow may be adequate, but rice abundance may fluctuate more between years on these sites, or it may fail to persist altogether.

Water depth is critical. Rice grows best in about 0.5-3 feet of water, with the middle of this range being optimal. Although rice may grow in slightly deeper water, especially on the outer edges of beds and in areas of optimal habitat, these plants often do not successfully produce seed. Most beds need to have a significant portion of their area in the more optimal depths to persist. It is unwise to try to establish a bed that would be predominantly in 2.5+ feet of water, particularly where water level fluctuations are substantial.

***Little Rice Creek provides the water flow needed to support rice on Gary Lake in Oneida County, WI.***

Clearer water is preferred, as darkly stained water limits sunlight penetration and may hinder seed germination and early plant development. However, rice beds can be supported on moderately stained waters, particularly when water depths are limited. Water pH in most beds is in the 6.0 - 8.0 range; wetlands characterized by "boggy" species indicative of acidic conditions should be avoided.

Within a particular year water level fluctuations should generally be limited to approximately 2 feet or less, and a foot or less over the growing season. Generally, water levels that are relatively stable or decline gradually during the growing season are preferred, and sudden, prolonged increases during the floating leaf stage (see below) should be avoided whenever possible. However, it is equally important that water levels *not* be kept too stable over the long term (multiple years). Long-term stability will tend to favor perennial vegetation over an annual like wild rice, which benefits from occasional ecological disturbances, such as high or low water years.

*Soils:* Several inches to a foot or more of soft organic muck is considered ideal. However, rice will grow on a variety of bottom types, including moderately sandy or rocky types when other site conditions are optimal. Although extremely flocculent (unconsolidated) bottoms may be unsuitable, moderately flocculent sites are a preferred habitat type, as manoomin is able to establish itself on sediments too soft for many other aquatics. Areas high in sulfates/sulfides should be avoided, as studies in Minnesota indicate that rice growth declines in areas with more than 10 ppm sulfates, and largely ceases above 50 ppm. (In most areas, sulfate/sulfide levels will not be limiting unless they have been elevated as a result of human activity such as mining.)

***Boat traffic can exclude rice from otherwise suitable areas.***

*Existing Vegetation:* Generally, you will want to avoid sites with excessive amounts of well-established, perennial vegetation. However, it may be possible to induce a disturbance where competing vegetation is significant. For example, where water control exists, it may be possible to reduce perennial vegetation with an over-winter drawdown of 2-3 feet as needed. Occasional increases in water levels may also be effective. Private individuals considering water level manipulation should contact their state and/or tribal natural resource departments, as a permit is usually required for this activity.

*Wave Action:* Waves from heavy boat traffic can exclude rice from otherwise suitable areas (see picture previous page). However, if the boat traffic is restricted to channels, rice can generally establish itself on adjacent areas. Establishing defined boating channels or slow/no wake zones can minimize the negative impacts boats might otherwise cause.

**Manoomin Life Cycle**

Wild rice is an annual aquatic grass. It is unusual in that it goes through submerged, floating-leaf and emergent stages in the course of its yearly life cycle.

Wild rice seed normally needs to spend several months under freezing or near freezing conditions in order for germination to occur. After spending the winter in the sediment, the seed begins to germinate in early spring, and by mid-May a cluster of short, underwater leaves begins to form. Subsequent leaves eventually reach up to the water's surface and float upon it, in what is termed the "floating leaf stage," typically by early to mid-June. This is often considered a critical growth stage, for the buoyant plants can be uprooted from soft sediments by high wind or waves. Manoomin can also drown at this stage if water levels suddenly increase and re-submerge plants, which begin exchanging gasses with the air after the floating leaf stage is reached.

***Manoomin in the floating leaf stage.***

By late June, the aerial shoots break the water's surface and the plant becomes an emergent. The emergent stems will eventually reach a height of 2-8 feet above the surface. Plants may have a single emergent stem, or multiple tillers may develop. Tillering tends to be more pronounced in shallow water, and when the plant density is low. Each stem will produce a flower head at its tip if the stem is not browsed. The flowers begin to open in late July, with the tiny, white female flowers at the top of a stem opening before the larger, yellow/pink male flowers below them, promoting cross-pollination. Although bees often gather pollen from the male flowers, they do not visit the female flowers; pollination is accomplished by wind.


***Male flowers in bloom.***

The seeds generally begin to reach maturity in late August or early September, but maturation is variable. River beds tend to mature earlier than lake beds, shallow plants will ripen earlier than those in deeper water, and "main stems" will ripen before tillers. There also appears to be individual site variation with some lakes or rivers consistently being earlier or later than others. Seeds on a single stem also ripen gradually, with those at the top ripening first. Thus, the total period of seed maturation may last 2-3 weeks on a single water, and a month or more across a region. Mature seed drops from the stem and generally buries into the sediment fairly close to the mother plant; this limited natural seed dispersal is one of the reasons why manoomin benefits from reseeding efforts.

Because wild rice is an annual plant, it is important to realize that it will vary in abundance from year-to-year, sometimes dramatically. An old rule of thumb among rice harvesters is that a 4-year period is likely to have a boom year, a bust year, and a couple of middling years. Generally, the more water that flows through a site, the more consistent the production will be, likely as a result of continuous nutrient input.

## HOW TO PROCEED WITH SEEDING

### Site Evaluation

*Site Ownership*: You should determine whether the site you are interested in seeding is privately or publicly owned. The legal definition of private vs. public water varies from state to state, and from tribe to tribe, and may differ depending upon whether the site is a river, flowage or natural lake. In addition, the seeding of manoomin may be regulated in your area, so you should contact your state and/or tribal natural resources department, or any other landowners who may be involved or affected before proceeding. If you are considering planting within federal lands (US Forest Service, National Park Service, etc.), work with the appropriate federal agency to be sure that required environmental analyses have been conducted.

*Site History:* It is very helpful to have some knowledge of the history of the site before proceeding, especially if the site being considered is a natural body of water. In particular, a different approach may be needed to restore a historic rice water as opposed to establishing rice at a location where it hasn't previously existed. Try to determine if manoomin was ever present; if it was, it is important to determine how many years have passed since a bed existed, and what may have led to its loss.

You should not seed a site that has produced a crop within the past 8-10 years. On these sites it is possible that a viable seed bank still exists, but some other negative factor is affecting the rice. Perhaps a beaver dam has raised water levels, a downstream culvert was altered or the carp population has markedly increased. In these instances, it is best to try to determine and address the factor causing the decline, and give the remnant seed bank a chance to reestablish the bed before considering seeding. In some instances, it may be worthwhile to collect sediment samples to verify the presence or absence of a manoomin seed bank.

*Site Suitability:* You should make a field visit to the site to evaluate its suitability. Determine if the site has proper depths, water clarity and flow, soil sediments, and that competing perennial vegetation is not too dense. It's often best to visit the site in late July or August when any existing wild rice plants are the most obvious – but remember to look for plants which may have been browsed as well. A lake map or GPS is often useful for recording your observations. This evaluation is often best done from a canoe or kayak; marking 3-inch increments on your paddle can facilitate quick, frequent measurements of water depth. If you feel unsure of your ability to make the field evaluation yourself, seek assistance from a local natural resource agency.

### Seeding

*Seed Sources:* There are 3 options for obtaining wild rice seed: harvest it yourself, buy it directly from a harvester, or purchase it from a wild plant nursery. There are advantages and disadvantages to each approach.

***Freshly harvested rice seed.***

Harvesting the rice yourself is the least expensive, and it allows you to select the source of the seed and ensure its quality. Harvesting may also increase your understanding of wild rice habitat, and you may also be able to receive

credit for your time, or the value of the seed gathered, if your seeding effort is being funded through a grant.

Gathering wild rice is not particularly difficult, and even relative novices can be successful. However, there are a few basic regulations which must be followed, and a state or tribal permit is often required. Novices should gain some understanding of appropriate and respectful harvesting techniques before gathering. One good way is to find an experienced ricer to mentor you; another resource is the Great Lakes Indian Fish & Wildlife Commission's brochure "*Harvesting Wild Rice in a Good Way*."

You can also purchase rice directly from a harvester. One way to do this is to visit good ricing waters in your area during the harvest season. This approach will be moderate in cost (seed purchased this way in Wisconsin in 2017 was selling for around $3 per pound; generally less in Minnesota) but still allows you to select a local seed source and assures the seed you obtain will be fresh. In some instances, it is also possible to buy seed from tribal natural resource agencies, who typically have bought it directly from harvesters themselves.

The most expensive, but easiest approach is to buy seed from a wild plant nursery. This seed should be of good quality, but you likely will not know where the rice was originally harvested. Do not use any commercial variety of wild rice that is sold for use in the "paddy" or cultivated wild rice industry; this rice has been bred to grow best in cultivated conditions and is not appropriate for establishing natural stands. Use only wild-origin seed.

*Should I plant Zizania palustris or Zizania aquatica:* Both northern wild rice (*Zizania palustris)* and southern wild rice *(Zizania aquatica)* are native to the region. The northern species grows across the region (but is more common in the north), while the southern one is more limited to southern parts of the region, where it is generally associated with river systems. Both have great value to wildlife, but the northern species tends to be shorter in height and has larger seeds – traits that are greatly favored for human harvesting. Typically, only northern wild rice is available from wild plant nurseries, although it may be sold as either *Z. palustris* or *Z. aquatica*.

In northern areas, northern wild rice should be planted. In the southern parts of the region, either variety can be tried. In all cases, it is preferable to obtain seed from a relatively local source when possible. If your site is southern and riverine and appears more suitable for the southern species, you will likely need to harvest the seed for planting yourself.

*When to Plant:* Fall planting is recommended, to allow the seed to overwinter in the sediments and naturally break its dormancy. The easiest option is to plant the seed within a couple of days of getting it. Immediate seeding is often the least amount of work, but it may have the drawback that some seed may be consumed by ducks or other animals during the remainder of the fall. For this reason, some people store the rice as described below, and plant it later in the fall when most of the duck migration has passed.

Spring seeding is sometimes done, but it must be done immediately after ice-out to be successful – and even then the seed may not break dormancy until another year has passed. Although rarely done, it is also possible to seed on the ice in late winter. The biggest benefit to this approach is that it is easy to tell which areas have been seeded and how heavily. Its drawbacks are that it is fairly labor intensive, and requires storing the seed for a long period of time. It can also be more difficult to determine that the appropriate areas are being planted, and shifting ice can move seed to unsuitable areas.

*Seed Care:* The viability of manoomin seed will decline if it dries excessively, heats up, or molds between harvesting and planting. (Wild rice that has been "finished" for human consumption cannot be used for planting.) As a result, it is generally best to plant rice as quickly as possible, and/or take steps to preserve its viability.

Rice seed is usually purchased in large plastic-weave grain sacks. (These sacks may be quite heavy, weighing 50 pounds or more.) For short-term storage (about 1-3 days) it is generally adequate to simply keep the seed cool and damp. However, if you are planning on doing this, you should make sure that the picker has not already stored the rice this way.

If seed must be stored for longer periods, it is best stored in cool, fresh, flowing water. A great option is to place the sacks in a cool, flowing stream (weighing them down to keep them from moving). They can also be stored in the shallows of a lake, or even in large water-filled tanks, if the water is changed regularly. These latter methods, however, will tend to not keep the rice as cool, and so should be used only for shorter periods of time. Alternatively, if you have the facilities, seed can be stored in a near frozen condition for long periods of time, if steps are taken to prevent drying.

Soaking bags of seed may attract muskrats or even bears. And any seed that is soaked for very long is likely to take on a rather rank smell. The smell itself doesn't seem to reduce viability, but seed that has been allowed to mold will be hard to hand-broadcast, and likely has reduced viability. In all cases, try to keep seed out of the sun. Warm, wet rice may begin to ferment, generating heat and reducing viability.

*Seeding Method and Rates:* Seeding is best done from a canoe or small boat travelling slowly enough to ensure proper distribution. Scatter the seed by hand-broadcasting it as evenly as possible over the target area. (Break up any clumps of seed that may have formed in storage before broadcasting it.) It is not necessary to roll the seed into mud balls as some historical efforts have done. We recommend seeding at a rate of roughly 50 pounds per acre, as this level is generally adequate. However, this rate is suggested in large part because of financial concerns; existing beds typically seed themselves at much heavier rates. If cost is not a great concern, heavier seeding rates will not be detrimental, and may have some advantage in areas where heavy browsing by geese, swans or muskrats is a concern. Note that good quality seed is heavy and should sink quickly, but some lighter seeds or empty hulls ("floaters") are usually present.

***Rice is easily sown by hand.***

*Multiple-Year Seeding:* On natural beds, the manoomin stand which grows in any particular year will be the product of at least 4-5 different years of seed production. It is generally beneficial to replicate this in seeding efforts by continuing to seed sites for multiple years. Although some seedings will show immediate response, it is best to begin each seeding effort with the expectation that it may take 3-5 years to determine if a site can be successfully established. A lack of results the first year could indicate that poor quality seed was used or that poor environmental conditions existed that spring, however, the lack of a first year response does not necessarily mean the site is unsuitable.

***The results of a successful initial seeding.***

*Size of the Seeding Area:* Because of its great attractiveness to various species of wildlife, small or linear stands of wild rice may be vulnerable to excessive herbivory, especially if habitat conditions are sub-optimal. Thus, seeding areas of less than an acre, or where the bed would be limited to a narrow band of suitable depth, are usually not recommended.

Where a large area of wild rice is the ultimate goal, it is generally best to begin with a test seeding of smaller areas 2-3 acres in size, and establishing some success on those sites before expanding into the labor and expense associated with larger seedings. You may wish to delineate the boundary of your seeding area using GPS technology to assist with follow-up monitoring.

***Monitoring can help determine if excessive herbivory is occurring.***

*Monitoring:* It is very helpful to monitor seeding efforts. The first step is simply to document which areas were seeded, and the source and amount of seed planted. Depending on the project, a simple sketch on a lake map may suffice, or you may want to track the pathway of the seeding boat using GPS.

Over the subsequent growing season, make several visits to the site to document how plant development is proceeding, keeping detailed notes. If plants initially grow well but later wither and die, there may a nutrient or disease problem; if plants grow well, but get nipped at/near the water line, heavy herbivory may be occurring; if no growth occurs, there may have been a problem with seed viability, the site may be unsuitable, or its suitability may have been affected by a temporary change in water levels or some other factor. A good response will confirm the suitability of the site and suggest the seeding can be expanded. It's often useful to take pre/post planting pictures of the area. Good monitoring is critical to determining future actions - and it's equally important to archive all this information in a way that can be retrieved by yourself or others in future years.

*Exclosures:* Exclosures, used to keep carp, geese or other herbivores out of recently seeded areas, are expensive, labor intensive, and generally unnecessary. Occasionally, however, exclosures can provide important insights into site suitability, or suggest why a historic bed may have declined. And certain geographic configurations can allow fairly large areas to be fenced off in a cost effective manner, allowing identified problems to be addressed. On Clam Lake (Burnett County, WI) for example, small exclosures were used to help establish that the rice bed was being negatively impacted by carp (later, underwater nets were used to exclude carp from a large bay of rice habitat).

***Exclosures suggest that carp contributed to the decline of rice on this lake (T. Havranek photo).***

Erecting exclosures on public waters requires a permit. Contact your state or tribal natural resource agency if you are considering using exclosures as part of a restoration effort.

## REASONABLE EXPECTATIONS

As noted above, wild rice abundance on established beds can vary significantly from year to year. This variability, which even includes occasional crop failures, is natural, does not require reseeding, and should be expected to occur on restored sites as well. However, long-term annual monitoring can help determine if a bed is declining. If a well-established bed gradually weakens over several years, it may suggest that water levels are being held too stable, or that some disturbance is needed to benefit the rice. If you have concerns, contact a natural resource biologist familiar with manoomin management or the Great Lakes Indian Fish and Wildlife Commission for assistance.

***Annual variation in abundance should be expected with manoomin.***

## ACKNOWLEDGEMENTS

The author would like to thank Lisa David, Miles Falck and Pam Nankervis for their review of this document, and the many elders who have willingly shared their knowledge of manoomin with him over the years. *Miigwech!*

**APPENDIX F.** Site Specific Recommendations / Restoration Priorities (February, 2019)

Below are some specific locations in the ceded territory with known or suspected management issues or with a known history of loss. It does not include potential seeding sites not known to previously support manoomin. While these sites merit particular attention, this section does not list all waters which are important from a stewardship perspective. Additional information on most of these sites can be found in the *Wisconsin Ceded Territory Manoomin Inventory*.

BARRON COUNTY

**Bear Lake** (WBIC 2105100): The rice beds on Bear Lake have a long history of significance to human harvesters, many of whom contend the quality of seed at this site is unusually high. However, these beds appear to be experiencing a long-term decline in robustness.

The primary beds on Bear are locate on the large, southern-most lobe of the lake (Figure 1), and in 2011 the Bear Lake Association took the lead in establishing no-wake and no motorboat zones around these beds in order to protect them. However, GLIFWC surveys of the lake suggest that in many years, this lake – whose water levels are influenced by the Bear Lake or Haugen Dam – is held slightly too high for optimal rice growth. While the watercraft restrictions may help preserve and protect the remaining beds, the higher levels of rice abundance anecdotally reported seem unlikely to return without water level management, an issue which is frequently controversial among lake shore property owners. Management to influence the composition of the aquatic plant community is also likely to be important at this site, as well as efforts to address invasive species.

**Figure 1. In 2011, this rice bed on Bear Lake, Barron County, showed little of its historic robustness.**

**Prairie Lake** (WBIC 2094100): This water currently has no known manoomin presence, despite it historically being a premier water. The very name of the lake comes from the large rice beds which once covered this water. An apt historical description of this lake can be found in *The Wild Rice Gatherers of the Upper Lakes* (Jenks, 1901, pg. 1042): "It is about 8 miles long and averages less than a quarter of a mile wide. It is a shallow, miry-bottomed, and almost entirely covered with wild rice, which is so thick and luxuriant that the Indians have to cut paths through it for their canoes."

Prairie Lake has been significantly altered from its historic condition, and even partial restoration will not be possible without a significant commitment of resources and attitudes. However, water quality issues and other ecological problems at Prairie Lake has increased the interest of some of the local public to explore restoration possibilities, and natural resource agencies should be prepared to help devise appropriate restoration strategies.

BURNETT COUNTY

**Bashaw Lake** (WBIC 2662400): This is another lake where rice abundance has shown a significant decline from historic levels. While the causes of the decline on this lake are not clear, they are likely related to declines in water quality, and restoration efforts may be necessary at a watershed level in order to be effective. (Some rice has been established in recent years on the Bashaw Lake outlet through seeding efforts.)

**Big Sand Lake** (WBIC 2676800): Big Sand Lake is a bit of an enigma at this time. This lake was added to the list of waters whose harvest is data-regulated in 1985 (the last time the list was modified), but recent stands have been very limited, and historical abundance is poorly documented. It appears that both the inputs and outputs of this lake have been altered hydrologically. It would be good to better reconstruct the historic presence of manoomin on this water, and determine if restoration is needed and feasible.

**Black Brook Flowage** (WBIC 2655000): This flowage on the Amsterdam Sloughs Wildlife Area showed a great initial response to rice seeding, but rice abundance has declined markedly in recent years. It is not clear if this is due to inherent biological limitations at the site, or if it reflects sub-optimal water level management or some other issue. A new seeding effort was initiated in the fall of 2017, but the results of this effort are not yet clear.

**Loon Lake** (WBIC 2671200): Concern has been raised about expansion of cattails at this site (Figure 2), which is heavily harvested, and is locally referred to as Carters Bridge. Monitoring of the extent of the bed would be wise given its significance to human harvesters as well as wildlife species.

**Figure 2. Cattail expansion at Loon Lake (Carters Bridge) from 2006 (left) to 2016 (right).**

**Upper Clam Lake** (WBIC 2656200): Upper Clam Lake may be the most significant off-reservation manoomin lake in the Wisconsin ceded territory, but the expansive rice beds – approaching 300 acres in a good year – all but disappeared in 2007 (Figure 3). Evidence suggests that the beds declined when carp – present in the system for decades – markedly increased following a blue-gill die off. (Blue-gill are effective predators of carp eggs.)

Cooperative restoration efforts, led by the St. Croix Tribe, are underway. Significant recovery has occurred in the southern-most bay, thanks to carp exclosures and carp removal efforts. Some recovery has occurred in more recent years in the southeast bay, and in Lonestar Bay, but former levels of abundance still have not been reached in those areas. It will likely take years of concerted, adaptive management efforts and significant application of resources to carry out and maintain a full recovery.

**Figure 3. The rice beds on Upper Clam Lake's Lonestar Bay have not yet recovered to the level of abundance seen in this 2006 photo.**

DOUGLAS COUNTY

**Allouez Bay** (unique WBIC not available; this bay is considered part of Lake Superior on the WDNR Surface Water Viewer): This water has a long history of supporting a substantial rice bed along its east end, but the presence of manoomin has been minimal for the past three decades. Interest in restoration is high, and staff at the Lake Superior Research Institute at UW-Superior are currently working on restoration efforts, but these efforts have been hampered by high levels of goose herbivory and record high levels of Lake Superior. Ongoing challenges associated with water quality, invasive species and sulfides also likely exist. It would also be helpful to better document the extent of the historic beds and the cause of their decline, if possible.

**Minong Flowage** (WBIC 2692900): Although most of the Minong Flowage is in Washburn County, its rice beds lie on the far northeastern bays that lie in Douglas County. Harvesters commonly refer to this location as Smiths Bridge. Rice has a bit of an up and down long-term history at this site. The 1966 WDNR lake map indicates rice beds present in these areas, though the areas west of the bridge had declined until exhibiting resurgence in recent years.

The Minong Flowage is an example of the complex challenges facing natural resource managers as they attempt to balance competing interests and concerns, and it highlights the need for good resource monitoring, and high levels of communication between state and tribal biologists and their respective publics. Current issues at the site include addressing invasive species and water level management. A major dam reconstruction was successfully completed in 2013, so fortunately the infrastructure that creates this water body should be secure for many years. It is noteworthy that the manoomin stand was robust in 2014 – despite being dewatered for the 2013 season for dam repairs. That dewatering also resulted in a decline in invasive abundance.

There is also an administrative issue regarding the Minong Flowage. Although this site has not been date-regulated in recent years, it was from 1964-1978. In addition, it is believed that the listing of Nancy Lake, done in 1985, is actually an erroneous reference to this lake, which previously was also previously known as Nancy Lake. Although this water is a flowage, the area which supports the most manoomin appears to be owned by Douglas County, and so could be date-regulated.

**Mulligan Lake** (WBIC 2700200): Mulligan Lake has a long history of manoomin. It was on the list of date-regulated waters from 1964 to 1978; was off from 1979 to 1984, and was put back on in during the last update in 1985. However, the last harvestable stand occurred about 2007. Since that time, lake levels have been elevated due to a beaver dam on Snake Creek, the lake's outlet, on private property. This land owner has resisted suggestions at removing the dam and beaver. This property may have changed hands recently, and opportunities to remove the dam and restore appropriate lake levels should continue to be explored.

**Radigan Flowage** (WBIC 2687500): Although the water control structure at the Radigan Flowage was rebuilt in 2011, a massive rainfall event in June, 2018 resulted in failure of the dikes adjacent to the structure. As of July, 2018 the full extent of the damage has yet to be determined, and it is unclear if another rebuild will be feasible. This is a high quality and significant rice water, and restoration is a priority if economically feasible (Figure 4).

**Figure 4. The dike on Radigan Flowage failed in June 2018 after a major rainfall event; its future is uncertain.**

**St. Croix (Gordon) Flowage** (WBIC 2740300): Manoomin has likely been present in the area of the St. Croix Flowage for centuries; a map from an expedition in the 1830's indicates the presence of beds. Anecdotal references suggest these beds may have originally been expanded by the development of the flowage, but today rice presence on the flowage appears to be in decline, while remaining abundant on the St. Croix River above the flowage in the area locally referred to as Cutaway Dam.

It is possible that rice presence on the flowage could be enhanced through water level management. In particular, water levels in recent decades may have been held too stable, favoring perennial vegetation. It is also possible the reduced stands are being further suppressed by expanding giant Canada goose populations. Interest in restoration has been expressed by some members of the local lake association, and further restoration efforts should be investigated.

FOREST COUNTY

**Atkins Lake** (WBIC 1578400): Anecdotal reports indicate that Atkins Lake (Figure 5) was once a harvestable ricing lake in Wisconsin, and it was added to the list of date-regulated waters during its last update in 1985. However, since that listing, Atkins has not been known to support appreciable areas of rice. Atkins may present a great restoration opportunity, because much of the lake is in public ownership, and conflicting management concerns are minimal. In addition, the lake is relatively remotely located, and has few negative factors affecting it. Nevertheless, manoomin has all but disappeared from this lake, which is now nearly wholly covered with competing floating leaf vegetation. Like nearby Spur Lake, this lake appears to be shifting towards perennial vegetation due to a very long period of above average water levels. This lake needs to be evaluated to determine if the causes of the rice decline can be confirmed and corrected.

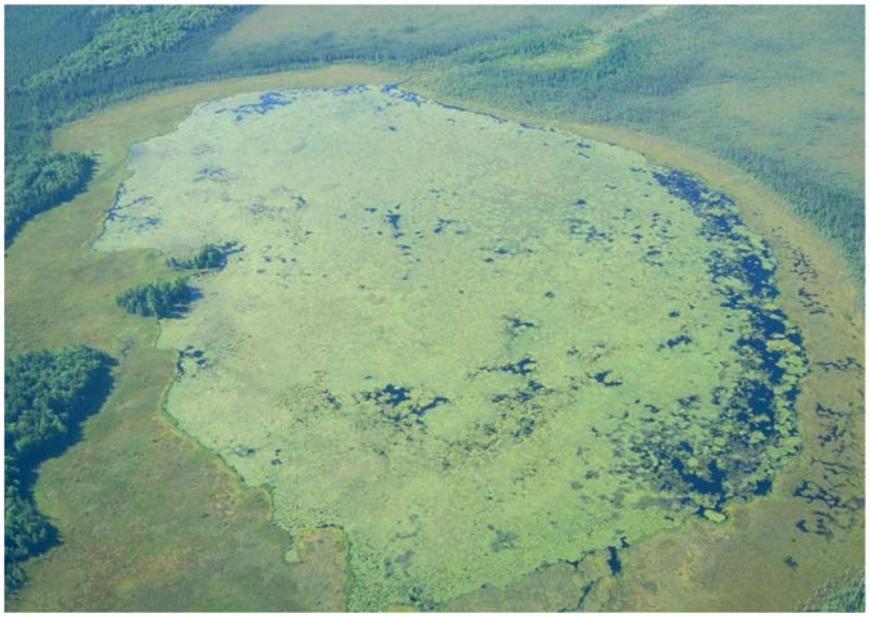

**Figure 5. Other vegetation has displaced the rice on Atkins Lake for at the last three decades.**

**Bishop Lake** (WBIC 392100): Sokaogon tribal elders indicate that Bishop Lake once supported harvestable stands of rice, and the western boundary of the Sokaogon Chippewa Reservation likely was designed to include access to this lake because of this. However, beds have been quite small in recent years despite generally suitable habitat, especially on the north end of the lake in the inlet area. It appears the hydrology of this lake has been altered through beaver, culvert

misplacement, or both. A recent seeding effort by the tribe produced little results, suggesting water level management likely will be necessary to restore these beds.

**Wabikon Lake** (WBIC 556900): While this lake has produced some good crops in recent years, it appears that it is very important to keep beaver dams off the outlet steam to maximize rice crops. GLIFWC has also received a possible report of deliberate damage to the small rice bed that can occur on the north end of the lake, apparently by individuals desiring an open shoreline.

ONEIDA COUNTY

**Rice Lake** (WBIC 1617200): Although its name suggests that this was once a significant rice water, it was only added to the list of date-regulated waters during the last update in 1985, and it has only supported a very thin stand in recent years. Site suitability at this undeveloped lake appears to remain good, but water levels may be problematic, as the hydrology of this area – including Little Rice and Thunder Lakes – has been altered in ways that may be limiting rice suitability. Currently, this lake seems to be in a region that includes Spur and Atkins Lake that seem to be impacted by an extended period with very high water levels. Correcting these factors will not be easy, but should remain a goal for managers.

**Rocky Run Flowage** (WBIC 1525500): The Rocky Run Flowage is associated with a cranberry farm. This site supported fairly substantial, harvestable beds for many years, but beds have declined markedly over the last decade. There is local interest in restoring higher levels of abundance. Initial investigation indicates a high level of plant competition, and relatively high levels of herbivory on remnant stands. The opportunity to reduce competition through an over-winter drawdown should be investigated.

**Spur Lake** (WBIC 1571800): Spur is another example of a lake with a long history of importance as a rice water, that has recently been unable to support appreciable beds. Oddly, site visits and mapping done in recent years by the Sokaogon Tribe and GLIFWC, suggest this lake is currently about 12-18 inches too deep to support good stands, despite the addition of a second culvert at the outlet by the DNR, some years with below average precipitation, and the lack of obvious obstructions on the outlet. In the fall of 2018, the WDNR worked with the landowner and GLIFWC to remove a restriction about 3/4ths of a mile downstream that may have been holding water levels up (Figure 6). The lake will


**Figure 6. In 2018 an effort to lower water levels on Spur Lake was made by removing restrictions downstream (WDNR**

be monitored in upcoming years to see if it responds favorably to this effort.

**Thunder Lake** (WBIC 1618100): Thunder Lake is another historically important rice water with a long contemporary period of near-absence. As discussed, the hydrology of this region, which includes Rice Lake in the Thunder Marsh Wildlife Area and Little Rice Lake, has been altered, and efforts to restore more natural hydrology are likely important to rice restoration on all 3 waters.

POLK COUNTY

**Little Butternut Lake** (WBIC 2640700): While the beds on Little Butternut Lake were never extensive, the lake has been on the list of date-regulated waters since 1964. Anecdotal evidence suggests these beds have declined in recent years for unknown reasons. Some investigation on site would be worthwhile to determine if corrective steps can be taken to prevent further erosion of the rice presence on this lake.

**Lotus (East) Lake** (WBIC 2616900): The history of manoomin on Lotus on East Lake remains poorly documented. Although this lake is on the list of date-regulated waters, it was not added to that list until its last update in 1985, and GLIFWC is unaware of any appreciable manoomin presence on the lake in the years since then. However, suitable habitat exists – particularly if the carp population can be controlled, and the St. Croix Tribe is currently attempting to establish a manoomin bed on this lake, especially near the inlet on the northeast part of the lake.

**Rice (Glenton) Lake (at Milltown)** (WBIC 2621600): Like many Polk County rice waters, this lake has displayed a marked decline in rice abundance (Figure 7). Some of the history of this water is documented in the DNR publication *Restoring Rice Lake at Milltown Wisconsin* (Engel and Nichols, 1994), which recognized the need for a high degree of integrated ecosystem management between water resource, fish and wildlife managers for successful restoration of this lake. Water quality on this water appears to be improving in recent years, and the St. Croix Tribe has attempted reseeding the site. Most recently, extensive beaver removal on the outlet has been conducted in an effort to modestly lower water levels. Further monitoring, evaluation and management may yet restore this lake's namesake plant.

**Figure 7. Rice Lake at Milltown, Polk County, is now nearly devoid of its name-sake plant.**

PRICE COUNTY

**Blockhouse Lake** (WBIC 2256800): Roughly 28 years ago, Blockhouse Lake still supported good rice stands on its north bay and in pockets along its western shore. These beds have all but disappeared, for unknown reasons. One hypothesis that has been raised is that the oxygenator installed on this lake may be preventing the low oxygen conditions necessary for seeds to break dormancy from occurring; water levels have also been influenced at times by sections of floating bogs. It is also possible that the lake elevation has been raised by beaver. This lake should be investigated and evaluated for possible restoration efforts.

**(Lower) Steve Creek Flowage** (WBIC 2191400): Although not a huge bed, the Steve Creek Flowage has supported some quality manoomin stands in recent years, in an area that is not particularly rich in them. Currently, there are structural problems with the dikes, spillway and water-control structure here, and repair costs could easily exceed $250,000. Once engineering work is done and a better cost estimate is available, it will take a coalition of interested parties to raise the funds needed to preserve this bed.

VILAS COUNTY

**Irving Lake** (WBIC 2340900): Although the long-term historic presence of rice on Irving is unclear, the water has been date-regulated since the original list of lakes was established in 1964. A large culvert replacement that took place in 2018 is not expected to impact manoomin. However, crops have frequently been spotty in recent years, a disappointment to some pickers who like the unusually large seed the Irving bed produces. It is possible that implementation of slow-no wake conditions could help protect the beds at Irving, although the effectiveness of this type of regulation is largely dependent upon self-enforcement.

**Lac Vieux Desert** (WBIC 1631900): Although the rice beds on "LVD" (Figure 8) are on the Michigan side of this border lake in Gogebic County, the dam that greatly impacts the abundance of those beds rests on the Wisconsin side at the head of the Wisconsin River. After a protracted effort to modify the FERC (Federal Energy Regulatory Commission) license for this dam for an experimental restoration effort, substantial rice beds (approaching 100 acres) have reappeared on this lake for the first time in over half a century. Long-term stewardship at this location will require on-going cooperation and coordination with a wide variety of interested parties.

**Figure 8. The highly successful restoration of manoomin at LVD must be preserved.**

**(Mickeys) Mud Lake** (WBIC 1619400): While not a large lake, (Mickeys) Mud Lake once held a harvestable stand of manoomin, and attracted waterfowl and hunters as a result. However, despite having a relatively undeveloped watershed offering few obvious negative environmental impacts, the rice from this lake also has largely disappeared in recent years. Efforts should be made to determine the cause of the decline and remedy it. In addition, the beds on this lake may be small enough that some reduction in muskrat or goose/swan use may be necessary to protect the bed for the future.

**Upper Ninemile Flowage** (WBIC1608300): Unfortunately, this flowage is no longer in existence, having been lost in the spring of when the remains of an old beaver dam washed out under a period of high water. While much of the previous shoreline was in ownership of the Forest Service, there are also about 6 smaller private parcels, and bigger parcel at the outlet owned by the Wisconsin Valley Improvement Company. Currently, this parcel has no functional significance to WVIC, but they have resisted efforts to pass the parcel on to the Forest Service for possible inclusion in the Chequamegon/Nicolet. The Forest Service has also indicated some reluctance to add any property which may require future operations and maintenance costs. IF this situation is not rectified, this jewel of a rice water may be permanently lost.

WASHBURN COUNTY

**Spring Lake** (WBIC 2691200): At its best, undeveloped Spring Lake was an outstanding rice water (Figure 9). Like the other waters on this list, it has generally done poorly in recent years. There may be multiple, overlapping reasons for this decline. At one time, the outlet of the lake was altered in an effort to improve trout habitat on the outlet stream. This likely affected water circulation as well as water levels in the lake, and may have led to changes in the plant community. The St. Croix Tribe has led efforts to restore this water. The original outlet has been restored, and an herbicide treatment was used to knock-back competing vegetation. The lake responded in 2006 with the first good crop since 1998, and with an excellent crop in 2007. Since then, however, production has again been very poor, although beaver control has been implemented, and water levels seem to be staying within a suitable range. Additional monitoring of the plant community should help direct future management efforts. Late in 2017, the St. Croix Tribe conducted some experimental removal of competing vegetation; the results of that effort remain to be determined. Current changes in land ownership around the lake could also result in more limited public access.

**Figure 9. Historically, Spring Lake was a favorite of manoomin harvesters because of its high finishing rate.**