

# **Natural Wild Rice In Minnesota**

**A Wild Rice Study document submitted to  
the Minnesota Legislature by the Minnesota  
Department of Natural Resources  
February 15, 2008**



## **Fiscal Disclosure**

Pursuant to Minnesota Statutes, Section 3.197, we estimate that it cost approximately \$72,614 to produce this report. This includes Minnesota Department of Natural Resources (MNDNR) staff time for conducting the inventory, attending meetings, drafting and reviewing the report and compiling comments and recommendations (\$45,159) and meeting expenses, including travel, for consultation with the Technical and Partnership Teams (\$1,772). In addition, costs accrued to other agencies and individuals participating on the Technical Team are \$22,618 for time and \$3,065 for travel. These costs do not include the costs of preceding research and public participation efforts conducted by the MNDNR or Team members prior to the requirement that this report be prepared.

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# Executive Summary

## Introduction

This report fulfills the requirements of Session Law 2007, Chapter 57, Article 1, Section 163 requiring the Commissioner of Natural Resources to prepare a study for natural wild rice that includes: (1) the current location and estimated acreage and area of natural stands; (2) potential threats to natural stands, including, but not limited to, development pressure, water levels, pollution, invasive species, and genetically engineered strains; and (3) recommendations to the house and senate committees with jurisdiction over natural resources on protecting and increasing natural wild rice stands in the state.

In fulfilling these requirements, the Minnesota Department of Natural Resources (MNDNR) established a Technical Team of wild rice experts from State, Tribal, and Federal governments, as well as academia and the private sector. The MNDNR also established a Partnership Team representing major stakeholders.

## Importance of Natural Wild Rice

Nowhere has natural wild rice been more important, nor had a richer history, than in Minnesota. No other native Minnesota plant approaches the level of cultural, ecological, and economic values embodied by this species. Natural wild rice has been hand harvested as a source of food in the Great Lakes region for thousands of years.

The Ojibwe people have a special cultural and spiritual tie to natural wild rice. Known to their people as Manoomin, it is revered as a special gift from the Creator. In addition many immigrants to Minnesota adopted hand harvesting of natural wild rice as an annual ritual. Annual sales of state licenses for wild rice harvesting peaked in 1968 at over 16,000. In recent years, annual sales have averaged fewer than 1500. In many instances, though, tribal harvesters are not required to buy state licenses. It is thought that more than 3000 tribal members participate in wild rice harvesting, providing a statewide total (tribal and nontribal) of 4000-5000 individuals annually.

The value of natural wild rice to wildlife has been long appreciated by American Indians and was marveled at by early European explorers. Research since then has documented that wild rice provides food and shelter for many fish and wildlife species. It is one of the most important foods for waterfowl in North America. More than 17 species of wildlife listed in the MNDNR's Comprehensive Wildlife Conservation Strategy as "species of greatest conservation need" use wild rice lakes as habitat for reproduction or foraging.

Wild rice harvest has provided important economic benefits to local economies. As with other commodities, the price paid for unprocessed natural wild rice can vary considerably. Although pricing is mainly determined by supply, marketing also plays a role. During the past 70 years, the price of one pound of unprocessed wild rice has ranged from \$0.10 in 1940 to \$2.17 in 1966. Adjusted for inflation these prices in today's dollars are equivalent to \$0.75 and \$13 per pound, respectively. As an example, the 1966 harvest of 924,000 lbs would have been worth over \$12 million today.

Prior to 1970, Minnesota provided half of the global market supply of wild rice. Most of this rice was from hand harvested natural stands. By 1990, the large-scale production of cultivated wild rice had expanded, and natural wild rice accounted for less than 10% of the global market supply. The total annual yield of cultivated and hand harvested wild rice in Minnesota today ranges from four to eight million pounds. A recent MNDNR survey found the average annual hand harvest of natural stands to be 430 pounds per individual.

## **Background**

Although stands of natural wild rice occur most commonly in central and north-central Minnesota, the historic range of wild rice included all of the state. Based on the inventory conducted for this report, the range of natural wild rice today includes 55 counties in Minnesota. Significant stands of natural wild rice were present or occurred in recent history on approximately 1286 lakes and river/stream segments. These areas support a minimum of 64,328 acres of natural wild rice when growing conditions are favorable.

The greatest concentration of lakes supporting natural wild rice is in Aitkin (4,859 acres), Cass (8,323 acres), Crow Wing (3,751 acres), Itasca (8,448 acres), and St. Louis (8,939 acres) counties. These counties contain over 60% of the inventoried natural wild rice acreage in Minnesota. These counties also account for over 70% of the harvesting trips for natural wild rice.

Natural wild rice generally requires some moving water, with rivers, flowages, and lakes with inlets and outlets being optimal areas for growth. Wild rice grows well at depths of 0.5 to 3 feet of water, although some plants may be found in deeper waters. As an annual plant, natural wild rice develops each spring from seeds that fell into the water during a previous fall. Germination requires a dormancy period of three to four months of cold, nearly freezing water (35° F or colder). Seeds are unlikely to survive prolonged dry conditions.

The entire process, from germination of a new plant to dropping of mature seeds, requires about 110 to 130 days, depending on temperature and other environmental factors. Seeds begin ripening at the top of the stem and then ripen over several days on an individual plant. Plants within a stand ripen at different times because of genetic, developmental, and environmental variation. This staggered maturation process means that ripe seeds may be available within individual stands for several weeks, and across the entire range of natural wild rice in Minnesota for a month or longer.

The earliest laws and regulations concerning wild rice in Minnesota focused on wild rice harvest and date back more than 75 years. Today, there is a complex mix of tribal, federal, state, and local laws and regulations. These are associated with the formal recognition of the significance of natural wild rice and its protection, management, and harvest. The application of regulations varies by jurisdiction (i.e., tribal versus state) and geography (i.e., on-reservation versus off-reservation, or within various ceded territories). Regulatory authority governing different aspects of wild rice management occurs within several state agencies yet within state statutes there is no unifying policy to provide overall guidance in implementation.

## **Threats**

Despite its rich history and abundance in Minnesota, natural wild rice faces many current and potential threats in this region. In general, any factor that can affect water quality, seasonal water levels, lakebed conditions, regional climate, aquatic vegetation, or the natural genetic diversity of wild rice could potentially threaten natural stands. These threats may work in concert or individually to damage wild rice stands.

Important threats that impact local stands of natural wild rice include changes in local hydrology due to dams and channelization, water-based recreation and shoreland development, and mining and other industrial activities. Although the impacts are to local stands, the cumulative effect of these threats can have statewide implications. Hydrological impacts and shoreland development are particularly important.

On a statewide and regional scale, the most important threats are the potential loss of genetic integrity, invasive species, and climate change. Nearly all of the concern expressed about wild rice genetics focuses on the potential of genetic engineering. Invasive species are an ongoing statewide issue impacting aquatic systems in general. Climate change has the potential for the greatest long-term impacts on natural wild rice.

As citizens become more distant from positive experiences with natural wild rice through harvesting, hunting, trapping, or wildlife watching, they are less likely to recognize the very real impacts that the previously noted threats could have on natural wild rice in Minnesota. This loss of appreciation, while not a direct threat to the wild rice resource, nevertheless increases the risks because the level of resource protection and management is often based on the perceived value of a resource.

Unfortunately wild rice harvesters are relatively few in number and have experienced a long-term decline, although the number of tribal harvesters has rebounded in recent years. Only about 4000-5000 people participate in hand harvesting natural stands of wild rice annually.

The future of natural wild rice in Minnesota will depend in large part on its protection and management by state and tribal natural resource agencies. The role of the agencies is complicated by the limitations of their authority and the challenges posed by multiple jurisdictions, annual variability of wild rice crops due to weather and other factors, and lack of information concerning the natural ecology of wild rice, historical losses, trends in abundance and distribution, threats to its future, and a better understanding of wild rice harvesters.

## **Recommendations**

The following recommendations were developed with valuable input and discussion from the members of the Wild Rice Study Technical Team and Partnership Team. However, the MNDNR assumes sole responsibility for these recommendations as written and presented here.

MNDNR recognizes the importance of protecting natural wild rice beds from genetic modification and agrees with wild rice stakeholders that this protection is critical to the future of this resource. We strongly support the Minnesota Environmental Quality Board in adopting rules

that require an Environmental Impact Statement for a proposed release of genetically engineered wild rice (MS 116C.94 Subd.1b).

**Recommendation 1**

**Recodify current wild rice harvest statutes and rules to remove duplication and inconsistencies.**

**Rationale:** The state's wild rice statutes and rules have been developed and modified piecemeal over a long period of time. As a result they contain a number of inconsistencies and duplication.

**Recommendation 2**

**Establish statutory policy guidance on wild rice and its management.**

**Rationale:** Within state statutes there is no unifying policy that provides direction to agencies responsible for some aspect of wild rice management.

**Recommendation 3**

**The MNDNR will convene an interagency workgroup in 2008 to identify desired statutory updates in harvest regulations.**

**Rationale:** Harvest regulations and license fee structure should be reviewed by an interagency work group for suggested changes.

**Recommendation 4**

**The MNDNR will designate and publish a list of important natural wild rice areas.**

**Rationale:** Recognizing important wild rice areas and publishing the list would call attention to the importance of these areas, indicate management priorities, and provide a formal list that may prove useful for local units of government that are considering zoning and surface use restrictions.

**Recommendation 5**

**The MNDNR will convene a standing interagency wild rice workgroup to share information and develop recommendations for inventory methodology and trend assessments, education and information outreach, lake planning and management, harvester recruitment and retention, and other management issues as they arise.**

**Rationale:** Comprehensive protection and management of wild rice involves multiple agencies. Management needs include better inventory information including consistent methodology for trend analysis, documenting natural genetic diversity, and establishing long-term case studies on identified lakes.

**Recommendation 6**

**Increase intensive natural wild rice lake management efforts and accelerate the restoration of wild rice stands within its historic range.**

**Rationale:** Protecting and managing natural wild rice resources on many lakes requires active annual management activities to maintain free flowing outlets. Active management is also required to restore wild rice to wildlife habitat areas within its historic range. These efforts should be accelerated as funding, time, and opportunity permit.

## ***Sacred Food and Medicine***

*Wild rice, or manoomin, is a sacred food and medicine integral to the religion, culture, livelihood, and identity of the Anishinaabeg. 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’s 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.”*

*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 Johnson, “...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.” The Anishinaabeg believe that wild rice will always grow where they live. Menominee chief Chieg Nio’pet said his people did not need to sow rice because it would follow them wherever they went. He told of how Shawano Lake never had manoomin until the Menominee moved there. Similarly when they were banned from Lake Winnebago, the rice that had been plentiful there all but disappeared. Whatever happens to the land and to manoomin happens to the Anishinaabe.*

*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 Wenabozhoo, or Nanabozho, 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—belief reflected in the Ojibwe use of wild rice as a food to promote recovery from sickness as well as for ceremonial purposes.” (Vennum 62). Manoomin is inextricably bound to the religion and identity of the Anishinaabeg. This is why these threats are potentially so devastating and why it is essential that the sanctity and integrity of this plant be preserved. If artificially produced or engineered varieties of wild rice were to compromise the wild manoomin that has existed in the lakes for thousands of years, it will compromise the Anishinaabe people and our way of life. Joe LaGarde puts it plainly, “If we lose our rice, we won’t exist as a people for long. We’ll be done too.”*

*Erma Vizenor, Tribal Chairwoman, White Earth Nation  
With the participation of Carlton College Students.*



## Introduction

This report fulfills the requirements of Session Law 2007, Chapter 57, Article 1, Section 163:

*By February 15, 2008, the commissioner of natural resources must prepare a study for natural wild rice that includes: (1) the current location and estimated acreage and area of natural stands; (2) potential threats to natural stands, including, but not limited to, development pressure, water levels, pollution, invasive species, and genetically engineered strains; and (3) recommendations to the house and senate committees with jurisdiction over natural resources on protecting and increasing natural wild rice stands in the state.*

*In developing the study, the commissioner must contact and ask for comments from the state's wild rice industry, the commissioner of agriculture, local officials with significant areas of wild rice within their jurisdictions, tribal leaders within affected federally recognized tribes, and interested citizens.*

In fulfilling these requirements, the Minnesota Department of Natural Resources (MNDNR) established a Technical Team of wild rice experts from State, Tribal, and Federal governments; the Minnesota cultivated wild rice industry; Ducks Unlimited; Save Our Rice Alliance (SORA), an organization of interested citizens who hand harvest natural wild rice; White Earth Land Recovery Project; the University of Minnesota; and the University of Wisconsin (Appendix A). The MNDNR also established a Partnership Team representing the Minnesota wild rice industry, the state commissioner of agriculture, the Association of Minnesota Counties, tribal leaders within affected federally recognized tribes, the United States Fish and Wildlife Service, Ducks Unlimited, Minnesota Waterfowl Association, and SORA (Appendix A).

The Technical Team, working with MNDNR staff, developed drafts of the wild rice study document for review by the Partnership Team. The collaboration of these two teams was instrumental in producing this document for MNDNR review and approval. The MNDNR is indebted to team members for their contributions of time, expertise, and hard work. It should be clear, however, that the MNDNR assumes sole responsibility for the content and recommendations of this document.

The wild rice study document and its appendices are intended to provide the reader with a thorough background on the importance of natural wild rice to Minnesota, its natural ecology and distribution, threats to its future, challenges in managing the resource, and recommendations to insure its abundance for future generations.

## **Importance of Natural Wild Rice in Minnesota**

As directed by the legislature, the wild rice study document focuses on natural wild rice. For this study, we define natural wild rice as native species of wild rice (*Zizania*) that are growing in public waters and are not subject to cultivation. The simplest description of natural wild rice in Minnesota is that it is an annual aquatic grass that produces an edible grain.

This simple description, of course, does not do justice to this unique and valuable plant. History is replete with examples of its importance to wildlife and value to humans both nutritionally and culturally. Wild rice (manoomin to the Ojibwe) is a spiritually significant resource for Native Americans in the Great Lakes region, and it has been for centuries. Nowhere has this grain been more important, nor had a richer history, than in Minnesota. No state harbors more acres of natural wild rice than Minnesota (Moyle and Krueger 1964). No other native Minnesota plant approaches the level of cultural, ecological, and economic values embodied by natural wild rice.

### **Cultural Importance**

Natural wild rice has been hand harvested as a source of food in the Great Lakes region for thousands of years. Evidence of its human use dates back to the Late Archaic and Early Woodland periods, more than 2000 years ago (Valppu 2000). Archeological evidence indicates that from the 1600s to the 1800s wild rice was a staple food for the Algonquian and Dakota peoples throughout the area now known as Minnesota. It has been important historically for gifting and trading, as well. For example, when Dakota Chief Wabasha hosted Zebulon Pike in 1805 he offered gifts of wild rice to the explorer (Vennum 1988).

The Ojibwe people have a special cultural and spiritual tie to natural wild rice. Their Migration Story describes how they undertook a westward migration from the eastern coast of North America. Tribal prophets had foretold that this migration would continue until the Ojibwe people found “the food that grows on water” (Benton-Banai 1988). That food was wild rice, known as manoomin, and is revered to this day by the Ojibwe as a special gift from the Creator (Ackley 2000; Schlender 2000).

Early European explorers and fur traders were impressed with the availability and nutritional quality of wild rice, and attempts were made to import it to Europe as early as 1790 (Oelke 2007). Many immigrants to Minnesota adopted hand harvesting of natural wild rice as an annual ritual. The importance of this harvest to European settlers lessened only when cultivated non-native grains became more readily available.

The tradition of hand harvesting natural wild rice continues to this day among both tribal and nontribal cultures. This tradition has been preserved through tribal code and state regulations that reflect traditional methods of harvesting. State statutes in Minnesota include regulations that restrict the maximum length (18 feet) and width (36 inches) of the harvesting boat, as well as the maximum weight (1 pound) and length (30 inches) of hand flails. The regulations also require that push poles have forks 12 inches or less in length. The use of any machine or mechanical device to harvest natural wild rice is generally prohibited.

Annual sales of state licenses for wild rice harvesting peaked in 1968 at over 16,000. In recent years, annual sales have averaged fewer than 1500. However, because in many instances tribal harvesters are not required to buy state licenses, state numbers do not adequately reflect the numbers of individuals participating in wild rice harvesting. It is thought that more than 3000 tribal members participate in wild rice harvesting providing the statewide total (tribal and nontribal) of 4,000 to 5,000 individuals.

Annual harvests can vary greatly. Rice productivity, weather, and harvester participation are all important factors. The MNDNR survey of state licensees from 2004 to 2006 found the average annual harvest to be 430 pounds per individual (MNDNR 2007). Aitkin, Cass, Crow Wing, Itasca, and St. Louis counties accounted for over 70% of the harvesting trips for natural wild rice. Estimates of annual harvest of natural stands in Minnesota between 1940 and 1972 ranged from 20 thousand to nearly 4 million pounds of unprocessed grain (Oelke et al. 1973).

Another aspect of the cultural importance of wild rice is its nutritional value. Noted for its importance as a whole grain, wild rice is an excellent source of complex carbohydrates, vitamins, minerals, fiber and protein. It is a particularly good source of potassium, zinc and riboflavin (Oelke 2007). Access to traditional foods is felt to be an important element of restoring individual and community health of the Ojibwe people (W. LaDuke, personal communication). Natural wild rice is one of the mainstays of traditional foods for the Ojibwe community.

Concerns for the preservation of hand harvesting traditions and related issues led to the formation in 2007 of a tribal and nontribal partnership called Save Our Rice Alliance (SORA). The stated mission of SORA is “To preserve and enhance the culture, economy, and sustainability of native wild rice” (A. Drewes, personal communication).

### **Ecological Importance**

The value of natural wild rice to wildlife has been long appreciated by American Indians and was marveled at by early European explorers (Jenks 1900). Jonathan Carver traveled through eastern portions of North America in the 1760s and observed of wild rice that “the sweetness and nutritious quality of it attracts an infinite number of wild fowl of every kind which flock from distant climes to enjoy this rare repast, and by it become inexpressively fat and delicious” (Stoddard 1957).

Both migrating and resident wildlife rely on the nutritious and abundant seeds of natural wild rice. One acre of natural wild rice can produce more than 500 pounds of seed. These seeds have long been recognized as an important source of food during fall migrations (McAtee 1917). Martin and Uhler (1939) listed wild rice as the ninth most important source of food for ducks throughout the United States and Canada, and the third most important source of food for ducks in the eastern portions of the continent. Research conducted on the Chippewa National Forest found that natural wild rice was the most important food for mallards during the fall (Stoudt 1944). Although the value of wild rice to mallards, wood ducks, and ring-necked ducks is most commonly recognized, other ducks such as black ducks, pintail, teal, wigeon, redheads, and lesser scaup also use stands of wild rice (Rossman et al. 1982, Huseby 1997).

The stems of wild rice provide nesting material for such species as common loons, red-necked grebes, and muskrats; and critical brood cover for waterfowl. The entire wild rice plant provides food during the summer for herbivores such as Canada geese, trumpeter swans, muskrats, beaver, white-tailed deer, and moose (Martin et al.1951, Tester 1995). In addition, rice worms and other insect larvae feed heavily on natural wild rice. These, in turn, provide a rich source of food for blackbirds, bobolinks, rails, and wrens. In the spring, decaying rice straw supports a diverse community of invertebrates and thus provides an important source of food for a variety of wetland wildlife including birds, small fish, and amphibians. Indeed, every stage of growth of natural wild rice provides food for wildlife (McAtee 1917, Stoudt 1944).

As a result, wild rice lakes and streams are breeding and nesting areas for many species. More than 17 species of wildlife listed in the MNDNR’s Comprehensive Wildlife Conservation Strategy (2006) as “species of greatest conservation need” use wild rice lakes as habitat for reproduction or foraging (Henderson 1980, Martin et al.1951). Listed bird species can be found in Table 1.

**Table 1. Minnesota birds that utilize wild rice habitat and are listed in *Tomorrow’s Habitat for the Wild and Rare* as species of special concern.**

| <b>Birds of Special Concern</b> | <b>Life Cycle Stage</b> |
|---------------------------------|-------------------------|
| American Black Duck             | Breeding and migration  |
| Lesser Scaup                    | Migrant                 |
| Northern Pintail                | Migration, Rare Breeder |
| Trumpeter Swan                  | Breeding and migration  |
| American Bittern                | Breeding and migration  |
| Least Bittern                   | Breeding and migration  |
| Red-necked Grebe                | Breeding and migration  |
| Common Loon                     | Breeding and migration  |
| Sora Rail                       | Breeding and migration  |
| King Rail                       | Casual migrant          |
| Virginia Rail                   | Breeding and migration  |
| Yellow Rail                     | Breeding and migration  |
| Black Tern                      | Breeding and migration  |
| Bobolink                        | Foraging and migration  |
| Rusty Blackbird                 | Foraging and migration  |
| Sedge Wren                      | Breeding and migration  |
| Bald Eagle                      | Foraging and migration  |

Natural wild rice has other ecological values as well. Emergent aquatic plants such as wild rice, bulrush, and cattails protect shorelines and provide habitat for fish (Radomski and Goeman 2001). Dense stands of wild rice stabilize loose soils and form natural windbreaks that can limit the mixing of soil nutrients into the water column (Meeker 2000). In addition, natural wild rice has relatively high requirements for nutrients such as phosphorus and nitrogen (Oelke et al. 2000). During periods of rapid growth, which occurs in spring and summer, the plants sequester

these nutrients. Thus stands of natural wild rice counter the effects of nutrient loading and the potential increases in algal growth and lake turbidity.

**Economic Importance**

Prior to European settlement of Minnesota, natural wild rice was the most important grain available to native peoples, early explorers, and fur traders (Vennum1988). Properly dried, and stored in clean, dry conditions, uncooked wild rice has an estimated shelf life of up to 10 years. One pound yields up to ten and a half cups of cooked wild rice (Oelke 2007). As a dietary staple that was so easily stored and used, wild rice had considerable economic value. With the influx of immigrant settlers and the agricultural production of non-native grains, the overall economic value of wild rice waned. Nevertheless, harvest of natural wild rice continued to be popular in Minnesota. During the 1960s, sales of state licenses averaged over 10,000 per year.

The economic value of wild rice is reflected in the efforts of many to expand its occurrence into new waters. Native peoples have long sown wild rice to create additional sources of grain (Vennum 1988). Waterfowl hunters have commonly planted wild rice to attract ducks. The demand for seed of wild rice and other aquatic wildlife foods presumably fostered the establishment of Wildlife Nurseries, Inc. in Oshkosh, Wisconsin in 1898 (Oelke 2007). This firm continues selling wild rice for planting today. Conservation agencies have long participated in planting efforts as well, working to establish new stands of wild rice and perpetuate traditional areas (Moyle 1944b).

David Owens noted the potential benefits of cultivating wild rice as early as 1852 (Vennum 1988). In 1853, Oliver H. Kelley published an article discussing the merits of wild rice cultivation. Albert E. Jenks discussed wild rice cultivation as part of “agricultural development” in 1901. Yet not until 50 years later did James and Gerald Godward pioneer the first real efforts. They began production of cultivated wild rice in central Minnesota, near Merrifield, in 1950 (Oelke 2007).

The 1950s and 1960s may well have been the peak of modern hand harvesting of wild rice. From 1957 to 1963 the state of Minnesota sold an average of 10,012 wild rice harvest licenses (Table 2). The average annual harvest of unprocessed wild rice exceeded 2 million pounds or about 227 pounds per picker per year (Moyle and Krueger 1964).

As with other commodities, the price paid for unprocessed natural wild rice can vary considerably. Although pricing is mainly determined by supply, marketing also plays a role. During the past 70 years, the price of one pound of unprocessed wild rice has ranged from \$0.10 in 1940 to \$2.17 in 1966 (Oelke 2007). Adjusted for inflation these prices in today’s dollars are equivalent to \$0.75 and \$13 per pound, respectively. The 1966 harvest of 924,000 lbs would have been worth over \$12 million today. Since 1990, the price paid for unprocessed rice from the Leech Lake Reservation has varied between \$1.00 and \$1.50 per pound (R. Robinson,

**Table 2. Hand harvesting of natural wild rice 1957-1963.**

| Year | Licenses sold | Harvest * |
|------|---------------|-----------|
| 1957 | 7,535         | 1,057,000 |
| 1958 | 9,702         | 3,224,000 |
| 1959 | 9,332         | 2,067,000 |
| 1960 | 9,664         | 2,301,000 |
| 1961 | 14,660        | 2,772,000 |
| 1962 | 6,709         | 1,292,000 |
| 1963 | 12,482        | 3,212,000 |

\*Harvest is in unprocessed pounds

Jr., personal communication). Sales during this period ranged from approximately 7,400 to 280,000 pounds.

Prior to 1970, Minnesota provided half of the global market supply of wild rice. Most of this rice was from hand harvested natural stands. By 1990, the large-scale production of cultivated wild rice had expanded, and natural wild rice accounted for less than 10% of the global market supply. Cultivated wild rice from Minnesota provided 40% of the market and California provided 50% (Lee 2000). California still leads the cultivated wild rice industry. The total annual yield of cultivated and hand harvested wild rice in Minnesota today ranges from four to eight million pounds.

Although cultivated rice dominates these production numbers, hand harvested natural wild rice remains a vital component of tribal and local economies in Minnesota. The MNDNR survey of 2004 – 2006 state license buyers found an average annual individual harvest of 430 pounds. In 2007, nearly 300,000 pounds of unprocessed rice were purchased from LLBO-licensed harvesters. At \$1.50 per pound, this harvest generated more than \$400,000 of income for tribal members (R. Robinson, Jr., personal communication).

## Wild Rice Background

### Taxonomy

Native North American wild rice is classified as a grass in the family *Poaceae* and the genus *Zizania*. The most common species throughout Minnesota is northern wild rice, or *Zizania palustris* L. (Ownbey and Morley, 1991). Two varieties of natural wild rice occur in this region and in other parts of the Upper Midwest: *Z. palustris* var. *palustris* and *Z. palustris* var. *interior* (Gleason and Cronquist, 1991; Flora of North America, 1993+).

A more southern and eastern species, *Zizania aquatica* L., is uncommon but thought by many to occur in Minnesota as well. The precise distribution of *Z. aquatica* is unclear because of differences in taxonomic interpretations and potentially overlapping ranges. *Z. aquatica* is physically larger than *Z. palustris* but its grain is more slender and difficult to harvest. Both of these species are native only to North America.

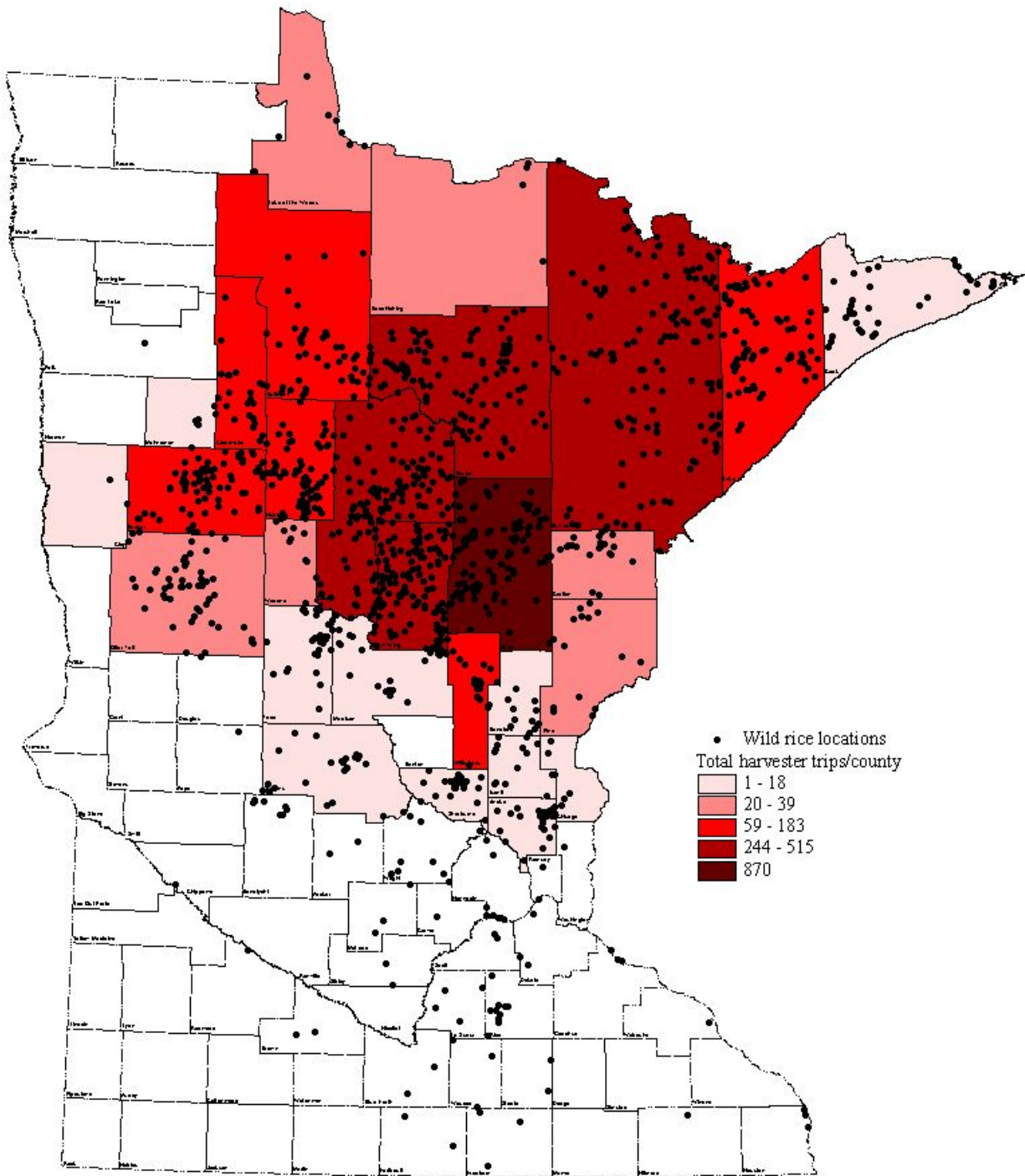
### Distribution and Abundance

Minnesota historically harbored more acres of natural wild rice than any other state (Moyle and Krueger 1964). Despite losses of wild rice habitat, the importance of Minnesota as a center of natural wild rice abundance has actually increased as wild rice acreage has declined elsewhere in the United States. For thousands of years, wild rice thrived in shallow lakes, rivers, and streams left behind by melting glaciers. Although stands of natural wild rice occur most commonly in areas of glacial moraines, such as in central and north-central Minnesota, the historic range of wild rice included all of Minnesota (Moyle 1944b).

Its range also extended westward into the present-day Dakotas and eastward to the Atlantic coast. While not distributed evenly, wild rice likely occurred in many places where its ecological requirements were met. Because wild rice also was planted in areas where it did not occur naturally, it is sometimes difficult today to distinguish between historically natural stands and successfully seeded stands (Vennum 1988).

An updated inventory of the distribution and abundance of natural wild rice was compiled for this study by selected members of the Technical Team and the MNDNR (Appendix B). Data are from lake-habitat surveys, reported observations, and interviews with field personnel of state, federal, and tribal agencies. Although this inventory provides a marked improvement in our understanding of natural wild rice distribution in Minnesota, it should be considered a minimum estimate. The data for many wild rice lakes, streams and rivers is incomplete or totally lacking.

Based on this inventory, the range of natural wild rice today includes 55 counties in Minnesota (Figure 1). The only Minnesota counties without significant populations of natural wild rice are along the western and southwestern boundaries of the state. It should be noted, however, that historical records of wild rice include herbarium specimens that were collected in several western counties not documented by the current inventory. These counties include Pipestone, Cottonwood, Chippewa, Swift, Clay, and western Polk (Moyle 1939, Ownbey and Morley, 1991).



**Figure 1.** Distribution of wild rice lakes and wild rice harvesting pressure in Minnesota.



Stands of natural wild rice were present or occurred in recent history on approximately 1,292 lakes and river/stream segments (Figure 1). These areas support a minimum of 64,328 acres of natural wild rice when growing conditions are favorable. These areas vary from large, shallow lakes dominated by natural wild rice stands (i.e. Nature's Lake in Cass County) to significant bays within large fish lakes (i.e. Leech Lake) to a narrow fringe along lake/river shorelines. The greatest concentrations of lakes that support natural wild rice are in Aitkin (4,859 acres), Cass (8,323 acres), Crow Wing (3,751 acres), Itasca (8,448 acres), and St. Louis (8,939 acres) counties. These counties contain over 60% of the inventoried natural wild rice acreage in Minnesota. These counties also account for over 70% of the harvesting trips for natural wild rice (MNDNR 2006 harvest survey, Appendix C).

The abundance of natural wild rice in Minnesota today is largely due to abundant suitable habitat, favorable climate, and natural genetic variability that allows for environmental selection of traits that perform well under varying conditions. Studies in Wisconsin found sufficient genetic diversity between geographically separated stands of wild rice to potentially identify regional populations. Within-stand diversity also varied greatly, with larger and denser stands having greater genetic diversity (Waller et al. 2000).

## **Life History**

While the historical range of natural wild rice illustrates its broad distribution, its specific occurrence and abundance is in large part dependent on local environmental conditions. For example, clear to moderately colored (stained) water is preferred, as darkly stained water can limit sunlight and may hinder early plant development.

Wild rice grows within a wide range of chemical parameters (i.e. alkalinity, salinity, pH, and iron; Meeker 2000). However, productivity is highest in water with a pH of 6.0 to 8.0 and alkalinity greater than 40 ppm. While researchers have observed that natural wild rice stands are relatively nutrient rich, excess levels of some nutrients, especially phosphorus, can have significant adverse effects on productivity (Persell and Swan 1986).

Natural wild rice generally requires some moving water, with rivers, flowages, and lakes with inlets and outlets being optimal areas for growth. Seasonal water depth is critical, however. Water levels that are relatively stable or decline gradually during the growing season are preferred. In particular, abrupt increases during the early growing season can uproot plants. Wild rice grows well at depths of 0.5 to 3 feet of water, although some plants may be found in deeper waters (M. McDowell, J. Persell personal communication).

Shallower sites can allow strong competition from perennial emergent plant species, while deeper sites can stress wild rice plants and limit seed production. Although wild rice may occur in a variety of lake bottoms, the most consistently productive stands are those with soft, organic sediment (Lee 1986). Nitrogen and phosphorus are limiting nutrients for wild rice (Carson 2002).

As an annual plant, natural wild rice develops each spring from seeds that fell into the water and settled into the sediment during a previous fall. Germination requires a dormancy period of three

to four months of cold, nearly freezing water (35° F or colder). Seeds are unlikely to survive prolonged dry conditions.

Seed germination typically occurs when the substrate and surrounding water temperatures reach about 40° F. Depending on water depth, latitude, and the progression of spring weather, wild rice germinates in Minnesota sometime in April, well ahead of most but not all perennial plants. Within three weeks, the seedlings develop roots and submerged leaves.

The emergent stage begins with the development of one or two floating leaves and continues with the development of several aerial leaves two to three weeks later. The floating leaves appear in late May to mid June in Minnesota, again dependent on water depth, latitude, and weather. Because of the natural buoyancy of the plant, it is at this stage of growth that wild rice is most susceptible to uprooting by rapidly rising water levels. Plants can be significantly stressed even when they remain rooted.

Natural wild rice begins to flower in mid to late July in Minnesota. Flowering times are dependent on both day length and temperature. Flowers are produced in a branching panicle. Female flowers (pistillate or seed-producing) occur at the top of the panicle on appressed branches. Male flowers (staminate or pollen-producing) occur on the lower portion of the panicle on nearly horizontal branches. Natural wild rice is primarily pollinated by wind. High temperatures and low humidity can negatively affect fertilization rates.

Cross-pollination is typical in natural wild rice stands because female flowers develop, become receptive, and are pollinated before male flowers on the same plant shed pollen. Cross-pollination is further enhanced by plant-to-plant variation in flowering times within stands. This cross-pollination within and among wild rice populations helps to preserve the genetic variability and thus biologic potential for wild rice to adapt to changing conditions such as the highly variable climate of the Great Lakes region.

The genetic variability that exists today in natural wild rice may be a critical determinant of whether stands of wild rice can adapt to long-term changes in regional climate. Studies in northern Wisconsin found sufficient genetic diversity among geographically distinct stands of natural wild rice to identify four regional populations. The degree of diversity within stands varied widely as well, with larger and denser stands having greater diversity (Waller et al. 2000).

Wild rice seeds are visible two weeks after fertilization, and they mature in four to five weeks. Immature seeds have a green outer layer that typically turns purplish black as the seed reaches maturity. Seeds begin ripening at the top of the stem and then ripen over several days on an individual plant. Plants within a stand ripen at different times because of genetic and developmental variation. In general, natural wild rice in rivers ripens earlier than that in lakes, rice in shallow waters earlier than that in deeper waters, and rice in northern Minnesota earlier than that in more southerly stands.

This staggered maturation process means that ripe seeds may be available within individual stands for several weeks, and across the entire range of natural wild rice in Minnesota for a month or longer. This extended period of “shattering”, or dropping of ripened seed, is an

important mechanism to ensure that some seeds will survive environmental conditions and perpetuate the natural stand. The entire process, from germination of a new plant to dropping of mature seeds, requires about 110 to 130 days, depending on water and air temperatures and other environmental factors.

Not all wild rice seeds germinate the following year. Seeds may remain dormant in the bottom sediment for many years to several decades if conditions are not suitable for germination. This mechanism allows wild rice populations to survive through years of high water levels or storms that reduce or eliminate productivity. Moreover, natural wild rice can germinate and re-colonize sites after other species have been reduced or eliminated by environmental disturbance (Meeker 2000).

Even under ideal growing conditions, populations of natural wild rice undergo approximately three to five year cycles in which productivity can vary greatly (Jenks 1900, Moyle 1944b, Pastor and Durkee Walker 2006, Durkee Walker et al. 2006). Highly productive years are frequently followed by a year of low productivity, that is then followed by a gradual recovery in wild rice yield (Moyle 1944b, Grava and Raisanen 1978, Atkins 1986, Lee 1986, Aiken et al. 1988, Archibold et al. 1989).

Recent studies suggest that oscillations in wild rice productivity may be caused in part by the accumulation of old straw from previous growth that inhibits plant growth and seed production (Pastor and Durkee Walker 2006, Durkee Walker et al. 2006). In particular, the amount of wild rice straw, its stage of decay, and its tissue chemistry likely affect nutrient availability, influence wild rice productivity, and thus drive cycling of wild rice populations (Durkee Walker, Ph.D. thesis 2008).

## **Legal Considerations**

The earliest laws and regulations concerning wild rice in Minnesota date back more than 75 years. While some harvesting regulations existed through earlier session laws and statutes, comprehensive state regulation of the wild rice harvest was apparently first codified in 1939. These regulations controlled methods and locations of harvest to reduce damage to natural beds and to distribute the harvest.

Today, there is a complex mix of tribal, federal, state, and local laws and regulations. These are associated with the formal recognition of the significance of natural wild rice and its protection, management, and harvest. It is difficult to capture all the important details that exist within these myriad regulations in a summary overview. The application of regulations varies by jurisdiction (i.e., tribal versus state) and geography (i.e., on-reservation versus off-reservation, or within various ceded territories). In addition, some regulations may be changed over time.

The following discussion is not intended to provide a complete legal brief of the law as it relates to natural wild rice. Rather the intent is to indicate the complexity of this law and to make clear the multiple jurisdictions that have recognized legal interests in Minnesota wild rice.

## Treaties and Tribal Regulations

Tribal regulations of the harvest and protection of wild rice within reservation boundaries vary from tribe to tribe. Therefore individual tribal governments or their natural resource departments should be contacted for details.

In addition to tribal regulations, treaties and other agreements with the U.S. government reserved off-reservation harvesting rights for some tribes. For example, the Ojibwe tribes that co-signed the Treaty of 1837 reserved the right to gather wild rice from the lands ceded in that treaty. These include an area that eventually became part of east-central Minnesota. The standing of these off-reservation rights was upheld by the U.S. Supreme Court in 1999.<sup>1,2,3</sup>

Similar off-reservation rights are reserved for other Ojibwe tribes in the 1854 ceded territory, in northeastern Minnesota. Rights of traditional tribal harvesting have also been preserved through other agreements between tribes and the U.S. government. For example, in the early 1900s the U.S. began buying lands adjacent to wild rice stands on Minnesota lakes. These were stands that had traditionally been harvested or lands that were to be used as rice camps by the Minnesota Chippewa Tribe (MCT). Lands were purchased and placed into trust status on Swamp, Mallard and Minnewawa Lakes in Aitkin County; on Basswood Lake in Becker County; on Leech, Mud, and Laura Lakes in Cass County; on Lower Dean Lake in Crow Wing County; on Sugar and Bowstring Lakes in Itasca County; on Onamia and Ogechie Lakes in Mille Lacs County; and on Star Lake in Ottertail County.

MCT members can harvest wild rice on these lakes with a tribal identification card issued under the sovereign authority of their respective tribal governments and current Minnesota statute (MS 84.10). Similarly, local tribal members can harvest wild rice on Rice Lake National Wildlife Refuge and on Tamarack National Wildlife Refuge under the 1936 Collier agreement between the U.S. Bureau of Indian Affairs and Bureau of Biological Survey (predecessor to the U.S. Fish and Wildlife Service).

This Wild Rice Study document is not intended to provide an indepth analysis of treaties and subsequent agreements affecting tribal harvest of wild rice in Minnesota. Tribal governments have sovereignty over the harvest of wild rice within the boundaries of their reservations. Some tribal governments also have the authority to regulate harvest by tribal members within certain ceded lands, while other tribal rights exist for specific off-reservation waters. The state of Minnesota has jurisdiction over the wild rice harvest by nontribal harvesters within ceded territories and over all off-reservation wild rice harvest outside of the ceded lands.

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<sup>1,2,3</sup>[Minnesota, et al., Petitioners v. Mille Lacs Band of Chippewa Indians et al. [No. 97-1337].

<sup>2</sup> See McClurken et al., 2003: 30 for a map of ceded lands in Minnesota under this and subsequent treaties.

<sup>3</sup> See McClurken et al., 2003: 486 for exact treaty language pertaining to cession of land and gathering wild rice.

## State and Local Regulations

State laws addressing issues of wild rice in Minnesota date back to 1929 or perhaps earlier. These statutes state that wild rice and other aquatic vegetation is owned by the state and that a person may not acquire a property interest in or destroy wild rice except as allowed by law (MS 84.091). State statutes also regulate the harvest of natural wild rice with the exceptions of tribal jurisdictions and regulations, as noted above (MS 84.10, 84.15, 84.027, 84.28). State regulations address the methods and timing of natural wild rice harvest (MS 84.105, 84.111, and 84.152). In addition, several Agency rules also govern the harvest of wild rice in Minnesota (Minnesota Rules 6284.0300 to 6284.0700).

Because State statutes and rules affecting wild rice in Minnesota have been developed and modified over many years, they contain inconsistencies and duplications. These laws could be clarified and made more concise through recodification.

A long-standing tradition of tribal governments and the state of Minnesota involved posting of “closed” signage on selected individual lakes until the wild rice was deemed ripe for harvest. In 1996, after years of criticism from harvesters about particular decisions to open or close wild rice stands, a state law was passed that would open the ricing season on July 15 each year (MS 84.105). The new law also made it illegal to pick wild rice that is not ripe. Wild rice usually ripens in Minnesota between the third week of August and the second week of September, thus the new law was intended to employ a “pick when ripe” philosophy. The opening date was set early enough so that it would always precede the ripening of the rice, and it would also help avoid opening day rushes that can potentially damage rice stands.

One of the rationales behind the new state law was that most other plant products harvested from the wild are picked when the harvester judges them as ready for food, decorative, or medicinal use. Harvesting wild rice before it is ripe produces a product that has no value as a food or cash crop. The new law reduced the need for extensive MNDNR staff time and subjective judgments. It also helps avoid the opening day “stampede” that seems to be associated with all “opening days”, which are often perceived as the best day based on “first-come, first-served”.

Most of the treaties, agreements, and statutes discussed above are concerned with the harvest of the wild rice grain rather than with protection or enhancement of natural wild rice ecosystems. Harvest issues are moot if the wild rice resource is lost due to damage of natural stands. The viability of these stands often depends on active management.

For example, more than 200 wild rice lakes benefit annually from removal of beaver dams. These dams block the outlets of significant wild rice lakes, and their removal allows the outlets to flow freely; reducing the threat of excessive flooding of wild rice stands. The authority to remove beaver, beaver dams, and beaver lodges is found in MS 97A.045 Subd.1; 97A.401 Subd. 5; and 97B.655, Subd. 2. Without these statutes the current management efforts of the DNR and its partners (i.e., Ducks Unlimited) would be significantly restricted.

Wild rice and other aquatic plants are protected from unauthorized removal under the MNDNR Aquatic Plant Management Program (MS 103G.615). Guidelines prohibit the removal of

emergent aquatic plants, including wild rice, without an approved permit. Notable exceptions involve the building of duck hunting blinds and gaining access to open water from shorelines. Removal of aquatic plants is allowed for such access though removal is limited to an area 15 feet or less in width.

Less direct, although important, protection is also provided through shoreland protection laws and regulations (MS 103F.201 through 103F.221). This protection is based on a system of classification for lakes and rivers that applies different zoning regulations depending on classification. Classifications include three for lakes and six for rivers. These regulations are implemented by local units of government within a statewide statutory framework that dictates minimum standards. These standards address issues of shoreland development and uses such as sewage treatment, storm water management, minimum lot size and water frontage, building and septic system setbacks, building heights, subdivisions, and alterations of land and vegetation close to the shore.

The stakeholders group for a pilot project in the five-county north-central lakes area surrounding Brainerd raised concerns about increased shoreline development potentially threatening water quality and the traditional use of individual lakes. One result was the development of alternative shoreland management standards through an advisory committee. The alternative standards provide options for local governments to address specific shoreland issues identified in the five-county area. Subsequently, local governments outside the pilot area began considering elements of these alternative standards for use in their own shoreland ordinances.

In 2005, for example, Beltrami County initiated a review of all of their Natural Environment Lakes in cooperation with the MNDNR and Minnesota Pollution Control Agency (PCA). The MNDNR Section of Wildlife and Division of Ecological Resources procured funding to hire two 2-person crews to conduct site visits to inventory these lakes. Surveys were completed with additional funding from the MNDNR Section of Wildlife in 2006. As a result of this work and the input from a Citizen Advisory Committee, Beltrami County rewrote their shoreland ordinance and reclassified their Natural Environment Lakes. They created one additional lake class, Sensitive Area, with protection criteria intermediate between Natural Environment and the more protective Special Protection. The new Beltrami County Shoreland Ordinance was voted on and approved by the Beltrami County Board in December 2006 (R. Gorham personal communication).

Alternative shoreland management standards may include the promotion of conservation subdivisions over conventional subdivisions (i.e., lot and block); multiple classifications on a single lake (i.e. Natural Environment bay within a General Development lake); districts designated as Sensitive Areas for lakeshore segments so that development standards follow Natural Environment Lake class standards; and a new classification of Special Protection for lakes that have considerable wetland fringe, shallow depth, or unique fish and wildlife habitat.

While these alternative standards can provide protection for natural wild rice habitat, local governments too often lack information on the locations of significant stands of natural wild rice. An updated inventory of wild rice stands in Minnesota would help provide this information.

Further regulation of wild rice occurs through the Minnesota Department of Agriculture (MDA). The MDA has approval authority over the permit-regulated release of genetically modified organisms (GMO), which would include genetically engineered wild rice, under MS Chapter 18. MS Chapter 18 also provides for the issuance of export certificates for the international sale of wild rice. In addition, the MDA inspects and certifies that wild rice seed is free of weed contamination and meets germination standards, and that the labeling of packaged wild rice is truthful and accurate (MS Chapter 21).

The 2006 Minnesota Legislature provided the state Environmental Quality Board (EQB) additional authority over issues related to natural wild rice. The EQB is now required to notify interested parties if a permit to release genetically engineered wild rice is issued anywhere in the United States (MS 116C.92, Subd. 2). The 2006 legislation also requires that 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 (MS 116C.94 Subd.1b).

While two other State statutes further signify the importance of natural wild rice in Minnesota, they do not provide additional protection for the resource. One statute, adopted in 1977, recognizes wild rice as the State Grain of Minnesota (MS 1.148). This law needs to be amended, however, to accommodate revised scientific nomenclature.

Another important State statute is the labeling law for packaged wild rice (MS 30.49). This 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, wild rice 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.

## Threats to Natural Wild Rice in Minnesota

Despite its rich history and abundance in Minnesota, natural wild rice faces many current and potential threats in this region. In general, any factor that can affect water quality, seasonal water levels, lakebed conditions, regional climate, aquatic vegetation, or wild rice's natural genetic makeup could potentially threaten stands of natural wild rice. These threats may work in concert or individually to damage wild rice stands. The order in which the threats are presented in this report is not intended to portray or imply the significance of the threat. Instead these threats are divided into stand level or statewide level categories.

### Stand-Level Threats

#### Hydrologic Changes

Wild rice is by its very nature a shallow water plant and sensitive to changes in water levels. The status of natural wild rice in Minnesota was particularly threatened in the late 1800s and 1900s by installations of dams to increase water levels for navigation, logging, flood control and power production. Although wild rice may persist at depths greater than three feet, these plants typically have poor or no seed production. Over time the plants will decline in numbers and density (Engel 1994). Although some aquatic plants will readily migrate to newly created shallow waters, wild rice apparently does so much less frequently. This may be due to limitations on its rate of seed dispersal.

Even when the normal runout elevation of a lake remains steady, heavy precipitation can cause an abrupt though temporary change in water level that can uproot aquatic plants. Natural wild rice is particularly susceptible to uprooting during its floating-leaf stage, which occurs in early summer. At this stage, any rapid increase in water level can cause damage to natural stands. Changes in lake outlets that reduce flow capacity can also significantly impact wild rice by increasing the frequency and severity of these temporary flood events. For example, permanent dams, beaver dams, culverts, and debris such as mats of vegetation can reduce outlet flow capacity and impact wild rice habitat (Ustipak 1983).

These factors can work in concert to produce cumulative effects. For example, culverts can attract beaver because the culvert is a much more restricted area than the creek or riverbed which channels through it. The roadbed often associated with culverts acts as a ready made dike that further contributes to the ease of blockage. As another example, dams and other outlets can be plugged by vegetation such as floating bogs that break loose in high winds. The effect of the dam in reducing outflows is compounded by the blockage raising water levels and increasing the probability of additional bog breaking off.

Changes in upstream watersheds can also reduce the productivity of natural wild rice stands. Drainage ditches and tiles, pumps, and channelization can increase the quantity and speed of waters moving downstream. The resulting peaks in water levels can produce the same effects as reduced outlet capacity by creating abrupt "bounces" or rapid increases in water depth. Increased sedimentation caused by drainage and channelization can also bury seeds and reduce germination.



Increased sedimentation can also increase the height of runout elevations and reduce outlet capacity. These changes can cause long-term damage to natural wild rice stands. The situation is exacerbated by the installation of artificial dams. Removing the natural flushing action at outlets causes sediment to accumulate more readily.

Dams that maintain stable water levels can have long-term deleterious effects on natural wild rice, as well. Water levels that are held stable year after year can create conditions that favor perennial vegetation and shoreline encroachments that impair wild rice habitat.

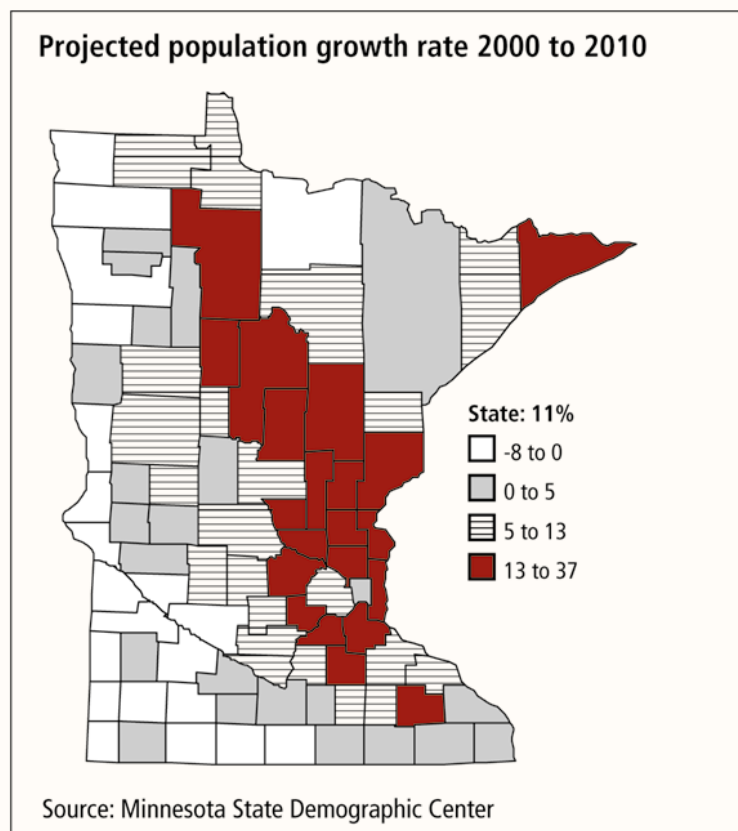
### Recreational Water Use and Shoreland Development

Natural wild rice represents different things to different people. While some consider this native aquatic grass to be a nuisance, others value it greatly as a spiritual entity or as prime habitat for fish and wildlife.

Minnesota is a national leader in numbers of recreational boaters and anglers, with approximately 862,937 registrations for recreational watercraft. Although wild rice provides habitat for spawning fish and their offspring, stands of wild rice can be very frustrating for anglers to fish. Recreational boaters often consider wild rice to be a nuisance because it can be difficult to motor through. The strong stems of erect plants are easily tangled in propellers and may require removal by hand, often by forcibly cutting the tightly wrapped stems.

As a result, wild rice plants are often removed by boaters near docks, in navigational channels, and in other high-use areas. Removal can be direct or incidental due to cutting by propellers or dislodging by excessive wave action (Asplund 2000, Tynan 2000).

As the human population increases, so will the number of boaters. Predictions of demographic changes in Minnesota suggest that the areas of greatest population increases over the next 20



**Figure 2.** Greatest predicted population growth will occur within the primary range of wild rice in Minnesota.

years will include those counties that currently have the highest occurrence of natural wild rice (Figure 2, Minnesota Department of Administration 2007).

The damming of lakes to enhance recreational water use often corresponds with the increased development of shorelands. Shoreland development has increased dramatically in Minnesota, especially in those counties that include the greatest amount of habitat for natural wild rice. This development is often associated with installations of docks, removal of aquatic vegetation, and increases in nutrient-rich runoff.

Seasonal housing across the lake country of the upper Midwest jumped 500% during the past twenty years (United States Forest Service 2007). As lands bordering deeper lakes become more fully developed, prospective lakeshore buyers are increasingly considering lakes that are shallower, often well-vegetated, and more likely to support wild rice habitat.

The changing pattern of forestland ownership in Minnesota is adding to development pressure. Internationally-owned timber corporations are increasingly divesting of their land holdings as part of their fiscal management strategy. These lands have previously been managed somewhat as public lands and have been protected from development. However, as market values increase for shorelands and riparian areas, corporate stockholders are increasingly interested in selling these parcels. About seven million acres of forestland in Minnesota is privately owned, and predictions are that about one million of these acres may be sold for development (Myers 2006).

Such development often accompanies major changes in shorelines and near-shore vegetation (Radomski and Goeman 2001). Natural wild rice is often viewed only as a nuisance to boaters and other lakeshore users. Few shoreland owners consider the cumulative impacts of docks, vegetation removal, dredging, and runoff.

Although known violations of MNDNR Aquatic Plant Management permits do not always indicate which vegetative species were removed, wild rice is a common target where it occurs. A recent permit violation included the removal of 600 feet of natural wild rice from the shoreline of Upper Whitefish Lake in Crow Wing County. The violator was a new landowner who explained that the plants were an “eyesore”.

### Wildlife Activity

Natural stands of wild rice provide excellent habitat for wildlife such as waterfowl and aquatic furbearers. The activities of these animals generally have minimal impact on wild rice stands. Although animals use plant stems for building overwater bird nests and muskrat houses, this activity usually affects only small areas. Moreover, wildlife activity often enhances overall aquatic habitat by creating stand diversity.

An exception to this is when beaver use wild rice stems and other vegetation to plug outlets. The resulting dam increases overall water levels and the probability of damage to natural stands by uprooting wild rice plants.

Birds generally have little impact on natural wild rice. For example, blackbirds, waterfowl and other birds can consume most of the ripening wild rice grain yet still leave more than 200 seeds per square foot (Haramis and Kearns 2004). Canada geese, though, can seriously damage stands of wild rice by grazing on emerging stems. For example, researchers monitored tidal marshes along the Patuxent River in Maryland and documented the loss of existing stands of wild rice due to season-long grazing by the geese (Haramis and Kearns 2004).

Although currently not common in Minnesota, some damage to rice stands has been attributed to Canada geese. High concentrations of geese on small lakes or impoundments have eliminated wild rice crops in some years through overgrazing of the emerging stems (R. Naplin and D. Rhode, personal communication). However, ongoing management of resident populations of Canada geese in Minnesota can limit this type of depredation through increased harvest levels. By contrast, shoreline development that converts communities of native vegetation to managed lawns can result in locally concentrated populations of geese that then may overgraze adjacent wild rice stands.

The effect of trumpeter swans on natural stands of wild rice is less clear. Populations of these native birds are slowly recovering after extirpation in the 1800s from most of their range. Anecdotal reports suggest that swans can damage natural stands of wild rice in particular areas (P. David and R. Naplin, personal communication). Nevertheless, low numbers of trumpeter swans combined with a preference for submergent vegetation suggest that these birds pose a minimal threat to natural wild rice (LaMontagne 2000, Norrgard 2006).

Some non-native species of wildlife do threaten stands of wild rice. These will be discussed below (Non-native Invasive Species section).

### Plant Competition

Natural wild rice must compete for space, light, and nutrients with other aquatic plants, particularly perennial species (Rogosin 1951). Competitive species include submerged pondweeds (primarily *Potamogeton* L. spp.), floating leaved plants such as waterlilies (*Nuphar* J.E. Smith and *Nymphaea* L. spp.), and emergents such as cattail (*Typha* L. spp.) and pickerelweed (*Pontederia cordata* L.). Seasonal water levels play an important role in this competition (Meeker 2000). Natural wild rice may be favored at depths of one to two feet.

Pickerelweed may be an exception in at least three locations in Minnesota where ongoing management to benefit wild rice also found pickerelweed increasing significantly (N. Hansel-Welch, personal communication). Promising management responses have included lowering water levels in winter to freeze and desiccate pickerelweed roots, and cutting competitive species during spring and summer using airboats (McDowell, 2006) or harvesting machines (T. Howes, personal communication). However, maintaining stable water levels over many years may favor other species (D. Vogt, personal communication). Perennial species such as pickerelweed can establish footholds and thus gain the advantage in lakes that are maintained at constant levels.

The seeds of natural wild rice can remain dormant for years until conditions are more favorable for germination. This trait allows rice to maintain long-term viability through years of low

productivity. Natural wild rice is well-adapted to annual fluctuations in water levels, while other species may be less suited to such changes.

Strong competition among native aquatic plants appears to be localized and specific to individual stands. It does not appear to be a significant factor limiting the distribution or abundance of natural wild rice in Minnesota (Meeker 2000, Norrgard 2006).

### Mining and Other Industrial Activity

Mining and industrial activities can potentially adversely affect stands of natural wild rice. For example, this can occur when hydrology is altered in watersheds that support natural wild rice. Alterations can result from the pumping and dewatering of sites. This increases downstream flows (discussed earlier in Hydrologic Changes section) and subsequent depressions in groundwater in surrounding areas. The potential effects of groundwater depression are not well understood. Water levels in basins with higher gradients could be sufficiently lowered to cause shallow areas inhabited by wild rice to dry out.

Other adverse effects can result from the release of chemicals such as sulfate from mine pits and tailings. These chemicals can negatively affect wild rice as well as other plant and animal species in the area. Seepages from tailings can exceed the state established water quality criteria of 10 mg/L for wild rice waters. For example, sulfate has been measured at 1,000 mg/L in these seepages (Udd 2007). State agencies are working with mining companies to decrease sulfate concentrations in discharge waters. Tribal governments express strong concern over the cumulative impacts of the many historic, currently operational, and planned mines in northeastern Minnesota.

### **Statewide Threats**

#### Loss of Natural Genetic Characteristics

The cultural, ecological, and economic value of natural wild rice distinguishes it as a unique natural resource in Minnesota. There is strong agreement among stakeholders that it is critically important to maintain the natural genetic diversity of natural stands of wild rice (Porter et al. 2000, LaDuke and Carlson 2003). This importance reflects an understanding of spiritual and cultural values, biological and ecological principles, and agricultural and economic realities.

Natural population diversity provides wild rice the ability to adapt to changing environmental conditions such as annual variations in temperature and precipitation. Maintaining natural genetic diversity provides the best chance for any species to survive variations related to global warming, for example (BSU-CRI 2007). Ongoing analyses continue to support the position that managing for high biodiversity will best insure the survival of plant and animal communities that have characterized the Great Lakes region for thousands of years.

The flower structure and timing of maturation of wild rice promotes cross-pollination within and among stands. Wind pollination further insures genetic diversity. Genetic variability allows for the natural selection of traits that perform best under different environmental conditions. Studies

in Wisconsin found sufficient genetic diversity between distinct stands of natural wild rice to identify potentially distinct regional populations. The degree of diversity within the stands also varied widely, with larger and denser stands being most diverse (Lu et al. 2005, Waller et al., 2000). The degree of genetic variability within and among natural stands of wild rice in Minnesota is not known. Thus our ability to recognize changes in the genetics of natural wild rice in this region is limited.

Although some studies of wild rice pollen travel have been conducted (Cregan 2004), more research is needed to understand the potential for genetic transfer among natural and cultivated stands. Drift of wild rice pollen may exceed that of other cultivated crops due to the small size of the pollen and its relatively slow settling rate (P. Bloom, personal communication). In addition, a study in Canada has provided evidence that wild geese, and perhaps ducks, can be important transporters of pollen to lake sediments (McAndrews et al. 2007). This raises the possibility that waterfowl may also serve as transporters of viable pollen.

Another means of introducing new genotypes into local populations is the intentional seeding of wild rice to restore historical sites or to develop new stands. Such plantings have a long history in Minnesota. For example, the demand for seeds of wild rice and other native plants helped to establish businesses such as Wildlife Nurseries, Inc. in 1898, in Oshkosh, Wisconsin (Oelke 2007). However, the risks associated with introducing nonlocal genes into local native gene pools are of increasing concern to many scientists (Maki and Galatowitsch 2004).

Plant breeding programs have developed strains of wild rice suitable for commercial production (Oelke 2007). Consistency in plant morphology, control of shattering, and disease resistance have been important objectives of these programs. Because wild rice pollen is airborne, some have expressed concerns about unplanned cross-pollination between cultivated stands and natural stands. At this point in time, however, traditional wild rice breeding programs are not thought to pose a threat to natural stands since the cultivated varieties reflect the selection of genes from within the naturally occurring gene pool (R. Porter, personal communication).

There have been concerns expressed about the potential impact of transgenic engineering. The dramatic increase in use of this technique to alter food crops has been followed by questions concerning its safety, economic losses, potential impact on the natural environment, regulatory framework and compliance, and the ability to mediate unplanned releases. One of the driving forces behind these concerns is evidence that current gene containment practices cannot achieve absolute protection from unwanted pollination (Thai 2005). The unplanned cross-pollination between cultivated crops such as creeping bentgrass and wild relatives has fueled the concerns of both environmentalists and agricultural producers (Haygood et al. 2003, Weiss 2006).

These concerns are evident in the international guidelines for sustainable forest management developed by the Forest Stewardship Council (FSC). The state of Minnesota has actively sought certification of its public forestlands under the Regional Forest Stewardship Standards published by the council. These standards specifically prohibit the use of genetically modified organisms within certified forests (Minnesota Forest Resource Council 2004).

While there are no known research programs in any country to produce transgenic varieties of wild rice (R. Phillips, personal communication), DNA of wild rice has been transferred to white rice (Abedinia et al., 2000). The very possibility of transgenic engineering wild rice generates deep cultural, economic, and ecologic concerns. These include issues surrounding Native American rights, food safety and nutritional value, protection of economic markets, patenting of species, and protection of natural resources that already face significant threats (LaDuke and Carlson 2003).

This controversy ultimately relates to differing worldviews and the valuation of risk and consequences. For some stakeholders, there is no level of acceptable risk. For others, the potential benefits of genetically engineered wild rice may be worth the possible consequences of escaped transgenic traits. A thorough analysis of the cultural, economic, and ecological consequences of genetic contamination of natural wild rice in Minnesota is required to assess potential impacts.

Transgenic alterations of some U.S. crops will likely continue for the foreseeable future. Traditional plant breeding will also continue. A better understanding of the natural genetic variability of wild rice in Minnesota would increase our understanding of the potential impacts of these activities. Efforts to restore native wild rice to its historical range should be encouraged. Studies of the natural variability and ecological requirements of natural wild rice in this region would enhance these efforts.

### Non-native Invasive Species

Non-native invasive species impact every aspect of natural resource management in Minnesota. Protecting and managing natural stands of wild rice is no exception. The movement of watercraft from one wild rice lake to another creates the potential for transfer of invasive animals and plants.

The common carp (*Cyprinus carpio*) leads the way in historical presence and impact. Common carp feed primarily on invertebrates in bottom soils. Their feeding action dislodges plants and suspends fine particles into the water column. The increased turbidity, caused both by disturbed sediments and by algae stimulated by the phosphorus released from disturbed sediments, shades out aquatic plants. Turbidity then increases as non-vegetated lake bottoms are disturbed by wind. The reduction in aquatic vegetation also allows for increased boat traffic and wave action that can further dislodge plants such as wild rice (Pillsbury and Bergey 2000).

Natural stands of wild rice are negatively impacted by turbid conditions during early stages of growth and by disturbances to bottom soils and boat traffic in later stages. The common carp is primarily a problem today in southern Minnesota, where the species occurs in high densities. Carp likely contributed to the loss of natural wild rice from its historic range in this region (Norrgard, 2006). If the predicted changes in climate in northern Minnesota result in warmer waters, carp could achieve higher densities in that region and cause significant damage within the core of prime habitat for natural wild rice.

The non-native rusty crayfish (*Orconectes rusticus*) can directly impact wild rice by cutting stems of the plant. Although the extent of this depredation in Minnesota is not known, significant impacts of native crayfish on cultivated wild rice have been documented (Richards et al. 1995). Native to parts of some states in the Great Lakes region, rusty crayfish have invaded portions of Minnesota, Wisconsin, and Ontario, including areas that are important for wild rice. Rusty crayfish frequently displace the native crayfish, reduce the diversity and abundance of aquatic plants and invertebrates, and reduce some fish populations (MNDNR 2007).

Rusty crayfish were first documented in Minnesota in 1967, at Otter Creek in southern Minnesota. Twenty years later, a statewide survey documented their presence in many areas (Helgen 1990). To date, rusty crayfish have been found in 31 lakes and streams in 11 counties. They prefer areas where rocks, logs, or other debris provide cover. Preferred sediment types include clay, silt, sand, gravel, and rock. The soft organic sediments usually favored by wild rice do not seem to be favored by rusty crayfish and may help minimize their impact.

The non-native mute swan (*Cygnus olor*) can seriously threaten the sustainability of natural wild rice stands (P. Wilson, personal communication). To date, Minnesota has limited the number of these birds to only a few that are held in captivity. With continued efforts to identify free-ranging non-native swans and to respond rapidly with control measures, their impact on natural wild rice in Minnesota could be minimal.

Invasive plants such as purple loosestrife (*Lythrum salicaria* L.), curlyleaf pondweed (*Potamogeton crispus* L.), and Eurasian water milfoil (*Myriophyllum spicatum* L.) occur throughout much of the range of natural wild rice. Although these species may prefer water depths that do not favor wild rice, more research is needed to better understand the potential for competition. It is known that these invasive species can disrupt local aquatic ecosystems and lower habitat quality overall. However, it is also important to monitor the mechanisms of control to insure that these do not have unintended effects on natural wild rice.

Hybrid cattail (*Typha x glauca*), a cross of native and non-native cattail (*Typha latifolia* L. and *Typha angustifolia* L., respectively), competes directly with natural wild rice for shallow-water habitat. These plants aggressively form thick mats of roots that can float as water levels fluctuate. The bog-like mats expand across areas of shallow water and can plug lake outlets when broken off and blown by high winds.

Native sedge bogs often border wild rice lakes in northern regions. These bogs are increasingly being invaded and eventually dominated by hybrid cattails. High infestations of hybrid or non-native cattails near lake outlets can increase rates of sedimentation. This, in turn, can combine with the additional plant material to further decrease outlet capacity.

A relatively new threat to natural stands of wild rice is the non-native flowering rush (*Butomus umbellatus* L.). Found in similar habitats as native bulrush (*Scirpus* L. spp.), which it resembles, flowering rush can persist in either emergent or submergent forms. Though its distribution in Minnesota is limited, its range is expanding. Flowering rush spreads primarily through rootstalks. At a site in Idaho, flowering rush was documented to be out-competing other plants such as willow (*Salix* L. spp.) and cattail (MNDNR 2007).

Another potential threat to natural wild rice in Minnesota is the non-native form of phragmites, or common reed [*Phragmites australis* (Cav.) Trin.]. While phragmites appears in fossil records for North America as early as 40,000 years ago, the non-native form was likely introduced in the late 1700s in ship ballast from Europe. Common reed has since dominated Atlantic coastal marshes and migrated landward, particularly during the 1900s. To date, the non-native form of common reed has invaded natural areas in 18 states including Wisconsin and other Great Lakes states. Although it is still rare in Minnesota, this exotic has been observed in a few disturbed sites in the Minneapolis-St. Paul area and in Duluth harbor (L. Skinner, personal communication).

Although phragmites can spread by seed, the most aggressive growth occurs through rhizomes. Non-native phragmites forms a dense network of roots that can reach several feet in depth. It spreads horizontally by sending out rhizome runners that can grow ten or more feet in a single season if conditions are favorable. Very dense stands are formed, that include live stems as well as standing dead stems from the previous year. The stems of non-native phragmites often reach 15 feet in height along the Atlantic coast.

In a recent study of phragmites in wetlands at Long Point, Lake Erie, researchers found that the occurrence of phragmites increased exponentially in the late 1990s. Of the 31 stands analyzed, 28 (90%) were dominated by the non-native strain (Wilcox et al. 2003). Part of the rapid expansion of the non-native form may be related to its ability to weaken the root structure of adjacent plants through the secretion of gallic acid, which attacks a structural protein (tubulin) in the roots of competing plants (Murray 2007).

### Climate Change

The warming of the earth is now evident from measurements and observations. These include increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising global sea levels. The average surface temperature of Earth has risen by about 1.3° F since 1850. The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC), published in 2007, projects that the average global surface temperature is likely to further increase by 3 to 7° F by the year 2100. This projection assumes a moderate level of action to reduce anthropogenic emissions of greenhouse gases.

According to the IPCC, the lower end of this range (i.e., a further warming of 3° F) represents a threshold for the earth beyond which irreversible and possibly catastrophic changes are likely. If the projections of global warming this century are met, most living things on Earth will likely face severe consequences.

What will predicted changes in climate mean for natural stands of wild rice in Minnesota?

Although climatologists agree that temperatures in this region will increase, predictions of precipitation vary (Figure 3, Kling et al. 2003). Some climate models predict that increasing temperatures will lead to increasing frequency and duration of droughts in the Dakotas and western Minnesota. Hot, dry conditions can negatively impact the pollination of wild rice and thereby reduce its seed production.



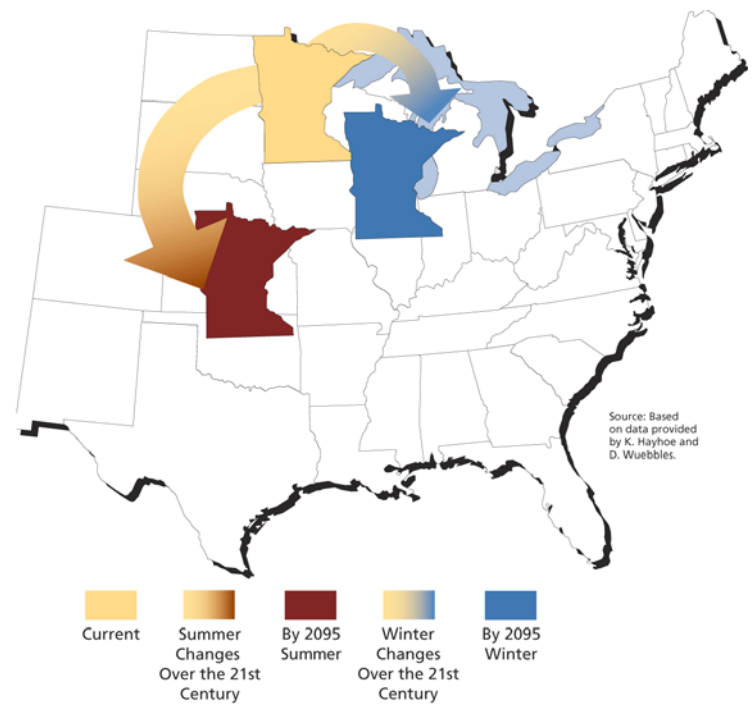
Warmer temperatures will also reduce the severity of winters. The required cold temperature (35° F or less) dormancy of three to four months for wild rice seeds could be reduced, particularly in the southern portions of its range. In addition, warmer conditions often favor non-native species. In particular, warmer waters may increase the survival and spread of carp across Minnesota. Because wild rice lakes, rivers, and wetlands are interconnected, protection of wild rice habitat from carp could become very difficult.

Invasive species such as the non-native phragmites may also benefit from warmer temperatures. Many exotics, such as hydrilla [*Hydrilla verticillata* (L. f.) Royle] and water hyacinth [*Eichhornia crassipes* (Martius) Solms-Laub.] are limited by cold climates (Holm et al. 1977; Langeland 1996). Increased average temperatures may enable these extremely invasive non-native species to migrate and gain footholds in Minnesota. Species such as these could have severe impacts on wild rice waters.

The frequency of dewpoints above 70° F is already trending upward in Minnesota (Seeley 2007a). Warm, humid conditions support diseases of wild rice such as brown spot (*Bipolaris oryzae* Luttrell and *Bipolaris sorokiniana* Luttrell) and other pathogens. For example, high humidity and sustained warm overnight temperatures in early August 2007 promoted the development of brown spot in many natural wild rice stands in Minnesota. Estimated crop losses in some stands were 70 to 90% (R. Ustipak, personal communication).

There is strong agreement that global warming will result in increased severity of individual weather events (Seeley 2006). According to Dr. Mark Seeley, University of Minnesota climatologist, 2007 may be representative of the future conditions in Minnesota. In August 2007, the U.S. Department of Agriculture declared 24 Minnesota counties to be in severe drought and eligible for federal assistance. Also in August 2007, the Federal Emergency Management Agency declared seven counties in southeastern Minnesota to be flood disasters, also eligible for federal assistance (Seeley 2007b).

In nearly two hundred years of weather history, there are no records of such extremes occurring in the same month of the same year in Minnesota. Increasing severity of storm events will cause more flooding and hence more abrupt changes in lake levels during the growing seasons of wild



**Figure 3.** Predicted climate change will effectively alter Minnesota to reflect the climate of states to the south.

rice and other aquatic vegetation. Natural wild rice will be particularly susceptible to damage while in the floating-leaf stage.

The southern edge of the range for natural wild rice may already be receding northward. While many factors have likely contributed to a decline in range of natural wild rice, climate may well be involved.

Lack of Recruitment and Retention of Harvesters

As Minnesotans have fewer positive experiences with natural wild rice through harvesting, hunting, trapping, or wildlife watching, they are less likely to recognize or have concerns about its potential loss. They are also less likely to appreciate the severe impacts that the previously noted threats could have on wild rice, and thus on the historic and culturally rich quality of life in Minnesota. This loss of appreciation, while not a direct threat to rice in itself, nevertheless increases the risks for wild rice because the level of resource protection and management is often based on its perceived value.

The protection and management of natural wild rice relies not only on tribes and agencies, but on the users of the resource, as well. Harvesters support management activities through the purchase of annual licenses. Because they have a personal stake in the future of natural wild rice in Minnesota, they are the ones most likely to report activities that are damaging the resource. Harvesters are also great advocates for natural wild rice. They promote its value within the ricing community and to the state as a whole.

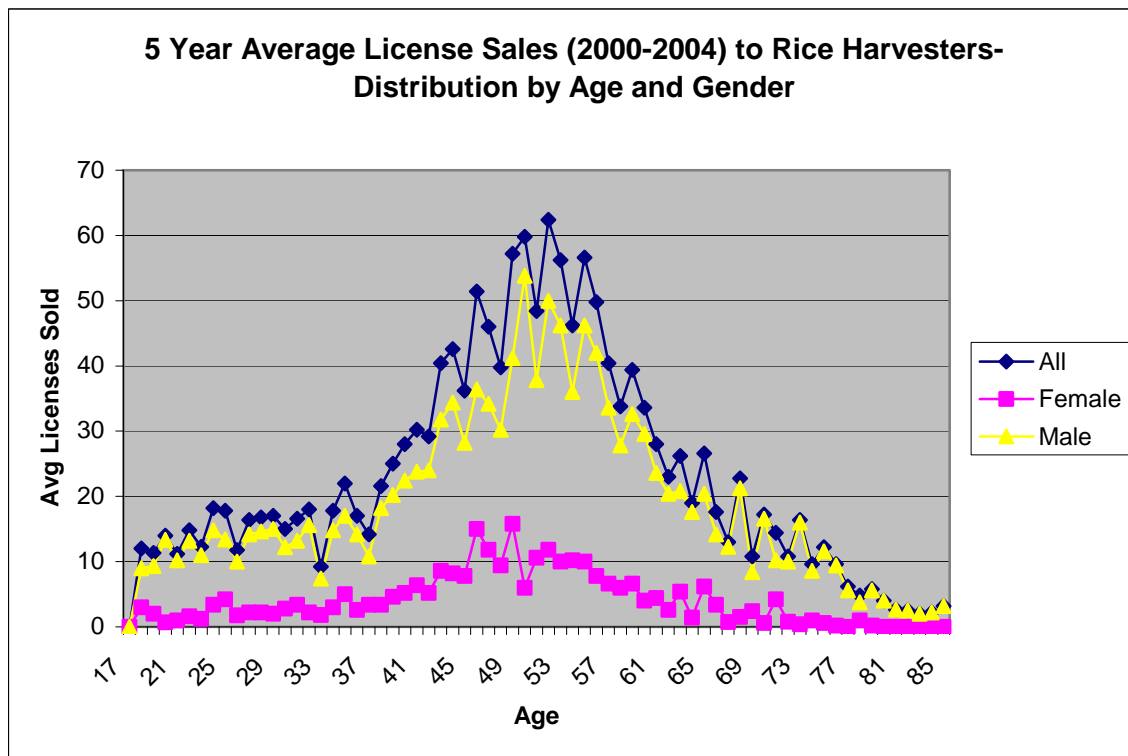


Figure 4. Age distribution of state licensed wild rice harvesters.

Wild rice harvesters are relatively few in numbers, though, and these numbers have declined over the last fifty years. During the 1960s, sales of state licenses in Minnesota averaged over 10,000 per year. Since 2000, these sales have averaged fewer than 1,500 annually. Harvesters under tribal regulations are not required to purchase a state license. Their numbers are estimated to exceed 3000 (R. Norrgard personal communication) and have likely experienced moderate increases in recent years (J. Persell, personal communication).

The MNDNR surveyed wild rice harvesters who purchased licenses from 2004 to 2006 to gather information on harvester characteristics and potential barriers to participation. This survey found that the majority of harvesters were male and at least 40 years old (82% and 81%, respectively). Figure 5 illustrates a similar age distribution from 2000 to 2004. Nearly all of the harvesters who responded had been introduced to wild rice harvesting by a friend or family member (87%).

Although most were satisfied with their harvest experience (82.3%), those surveyed identified several barriers to continuing this tradition. The most important barriers were time, knowing when to harvest, knowing where to harvest, and finding a wild rice processor. Other barriers included finding a ricing partner, physical challenges, financial expenses, finding a buyer, and having proper equipment.

Even for experienced harvesters, the difficulty of finding information on where and when to harvest can limit participation. For those living outside of natural wild rice areas, finding this information can be particularly difficult. For new harvesters, even finding a processor to finish the rice is a significant challenge.

Difficulty in acquiring harvest-related information may influence the distribution of harvesters and harvesting pressure on individual stands. The MNDNR 2006 survey revealed that only 25 lakes accounted for half of all harvesting trips. By contrast, the inventory of wild rice stands compiled for this document indicates that 119 lakes (100+ acres in size) account for more than half of the acreage of natural wild rice in Minnesota.

Addressing the educational or informational needs of Minnesotans interested in natural wild rice has been largely ignored. As with other natural resources in Minnesota, the lack of recruitment and retention of harvesters threatens the sustainability of natural wild rice in the state. Without readily available information and inspiring programs of education, public support of protection and management of the very resources that define Minnesota will likely decline.

## Management Challenges

The future of natural wild rice in Minnesota will depend in large part on its protection and management by state and tribal natural resource agencies. The most important management issues relate to those threats identified in the previous section. The challenges that managers of natural wild rice face are further complicated because of limitations to their authority, inherent variability of wild rice production, and the need for additional information concerning wild rice in Minnesota.

### Multiple Jurisdictions

Minnesota state statutes provide that ownership of wild rice and other aquatic vegetation is vested in the state (MS 84.091). State statutes also establish regulatory control over wild rice removal and harvest (MS 84.10, 84.15, 84.027, 84.28). Exceptions to state harvest regulations apply in geographic locations that are described by treaties and subsequent agreements, statutes, and rules (MS 84.10, MR 6284.0600 and 6284.0700). State and tribal enforcement officers often operate under temporary agreements until formal agreements are finalized.

The enforcement of harvest regulations in Minnesota is mainly stable and without major controversy. One issue still being discussed, however, is the posting of lakes as “closed” to wild rice harvest until it is determined that the grain is ripe. Both state and tribal governments have done this in the past on lakes that are popular with harvesters. In 1996, a new state law was passed that opened the ricing season on July 15 each year and made it illegal to pick rice that is not ripe (MS 84.105). Because wild rice usually ripens in Minnesota between the third week of August and the second week of September, the new law was intended to encourage a “pick when ripe” philosophy.

Most tribal governments have continued to post popular wild rice lakes within their jurisdictions. For many tribes, this practice is part of a long-standing tradition that relies on counsel provided by tribal committees. Tribes have urged the state to work cooperatively to post additional lakes. The position of the state, however, is that posting is unnecessary for the long-term health of the wild rice resource and the MNDNR currently has statutory authority only to post lakes as “closed” to “protect against undue depletion of the crop so as to retard reseeding or restocking of such area or so as to endanger its effective use as a natural food for waterfowl” (MS 84.15). In some cases, productive wild rice lakes are within both tribal and state jurisdictions. For these lakes, the differences in management philosophy have created conflicts between tribal and state agencies and with some harvesters.

Jurisdictional issues also arise over management of lake resources in general. Although the state of Minnesota has the responsibility of ownership of natural wild rice, the state includes many agencies, and each has its own mission and interest groups. No single agency or governmental entity in Minnesota assumes all of the responsibility for protecting natural wild rice. In public waters, the MNDNR takes the lead to regulate harvest and damage or removal of wild rice plants. Counties take the lead, within state statutory guidelines, to regulate shoreline development and most local recreational surface-water use. The Minnesota Pollution Control Agency regulates discharges to waters throughout the state; the Minnesota Department of

Agriculture assumes the lead for issues involving cultivated wild rice; and the state Environmental Quality Board has the lead responsibility to coordinate, notify, and evaluate any potential release of genetically engineered wild rice.

Within the MNDNR, the Division of Waters assumes the lead on shoreline regulations; the Division of Ecological Resources leads on aquatic plant management and invasive species; and the Division of Fish and Wildlife leads on habitat management for fisheries and wildlife values. The MNDNR Division of Enforcement is responsible for enforcement of natural resource regulations including the harvest of natural wild rice except when tribal regulations apply.

A formal, interdisciplinary planning process for Minnesota lakes does not exist. Lake management plans typically reflect the specific goals of the sponsoring entity. The plans often focus on aspects of either fisheries, wildlife, water quality, or vegetation without considering a comprehensive approach that addresses all of these components of a lake ecosystem.

Within Minnesota state statutes, there is no unifying policy of wild rice management that provides integration of these various agencies. By contrast, a unifying policy is clear regarding wetlands. Under public water laws, state statutes declare that it is in the public interest to increase the quantity, quality, and biological diversity of Minnesota's wetlands (MS 103A.201 subd. 2). A similar policy statement would help insure the sustainability of the natural wild rice resource in Minnesota.

### **Annual Crop Variability**

Management by MNDNR and its conservation partners to maintain water levels beneficial to natural wild rice stands has never been greater. Water level monitoring, beaver control, debris removal, and invasive species management has annually taken place on more than 200 lakes and impoundments with significant wild rice stands. This management is based on the combined efforts of the Minnesota Department of Natural Resources, U. S. Fish and Wildlife Service, Ducks Unlimited, Tribal governments, and at least three lake associations. Much of the funding for these management efforts comes from the revenue generated by wild rice license sales.

Nevertheless, the expectations of those who value natural wild rice often exceed the capabilities of those responsible for protecting and managing this resource in Minnesota. A particularly difficult challenge for managers is the critical role that weather plays in wild rice development. Even when growing conditions have been exceptionally favorable, a single storm can reduce or even devastate the local harvest. At best, wild rice managers can “set the table” by maintaining free-flowing outlets or by setting appropriate runout elevations on water control structures. These management actions improve the harvest potential in good years and lessen the impact of poor conditions in less favorable years.

It can be easy for both user groups and managers to overlook the reality that natural wild rice has adapted to changing weather patterns through strategies that promote long-term survival rather than consistent annual abundance. The boom and bust cycle of natural wild rice has been recognized for centuries. This variation in annual productivity may be driven as much by seed dormancy and nutrient cycling as it is by variable weather. Resource managers, wild rice

harvesters, and other stakeholders must remember that productivity of natural wild rice is highly variable, both by stand and by year. Responsible management of this unique resource should strive to maximize its long-term sustainability in the Great Lakes region.

## **Information Needs**

To effectively manage natural wild rice for future generations, resource managers need a better understanding of its natural ecology; its historical losses and patterns of abundance and distribution; threats to its sustainability; and the needs of harvesters.

While much has been learned about the ecology of wild rice over the last several decades, adequate information is still lacking on environmental tolerances and limiting factors such as water and sediment chemistry, seasonal water levels, and disturbance. This information will help create a better understanding of the historical reductions in wild rice distribution and provide much needed guidance for restoration of wild rice habitat.

In addition, a better understanding of ecological relationships in wild rice waters could guide strategies to counter threats such as mining and climate change. Improved ecological understanding would also provide much needed insight into the issues of invasive species. Of particular concern is the potential spread of carp, flowering rush, and exotic phragmites. Better assessments of the damage caused by rusty crayfish are needed as well.

Another concern is that basic information concerning the natural genetic makeup of native stands of wild rice is lacking. An understanding of the natural genetic variability of natural wild rice in the Great Lakes region and genetic drift between stands is critical. This information is needed to guide restoration efforts, particularly in the face of changing climate, and to help detect changes in diversity. We also need to better understand reproduction and its role in population genetics of natural wild rice.

More thorough information is needed on the distribution and overall acreage of natural wild rice in Minnesota. For this study, the MNDNR and the Wild Rice Study Technical Team revised and updated an earlier database of this information (Appendix B). While the recent revision is the most complete and detailed information of its kind for Minnesota, it still represents a gross estimate because information for many lakes, wetlands, rivers, and streams is incomplete or totally lacking. Further refinements and updates to this database are needed. In addition, refined methods are needed to improve the monitoring of annual productivity and the effects of management actions. This information would also help identify new opportunities for harvesters and better distribute harvesting pressure. With improved methods of monitoring and more complete databases, the overall health of the wild rice resource will be better managed.

Managers also need to better understand the harvesters of natural wild rice. What are annual trends? How can agencies and the wild rice community encourage retention of existing harvesters and recruit new people to continue this tradition? Who are the potential harvesters and what do they need in terms of ricing information, education, and support to be successful? The future of the wild rice resource in Minnesota may very well depend on the level of interest in its harvest and traditions.

# Department of Natural Resources Recommendations

## Introduction

This section is in response to the legislative request to include recommendations “on protecting and increasing natural wild rice stands in the state”. The following recommendations were developed with valuable input and discussion from the members of the Wild Rice Study Technical Team and Partnership Team. However, the Minnesota Department of Natural Resources assumes sole responsibility for these recommendations as written and presented here.

MNDNR recognizes the importance of protecting natural wild rice beds from genetic modification and agrees with wild rice stakeholders that this protection is critical to the future of this resource. We strongly support the Environmental Quality Board in adopting rules that require an environmental impact statement for a proposed release of genetically engineered wild rice (MS 116C.94 Subd.1b).

## Recommendation 1

### **Recodify current wild rice harvest statutes and rules to remove duplication and inconsistencies.**

**Rationale:** The state’s wild rice statutes and rules have been developed and modified piecemeal over a long period of time. As a result they contain a number of inconsistencies and duplication. Most of these changes relate to the harvest regulations (MS 84.27 – 84.91) although statutory recognition of wild rice as the state grain (MS 1.148) is also out of date in its nomenclature.

## Recommendation 2

### **Establish statutory policy guidance on wild rice and its management.**

**Rationale:** Within state statutes there is no unifying policy that provides direction to agencies responsible for some aspect of wild rice management. In contrast, the policy of the state is clear when it comes to wetlands. State statutes declare that it is in the public interest to increase the quantity, quality, and biological diversity of Minnesota's wetlands (MS 103A.201 subd. 2). A similar policy statement concerning natural wild rice would be useful guidance for state and local agencies. Suggested language includes “The legislature finds that natural wild rice in Minnesota provides public value by its contributions to fish and wildlife habitat, ecological diversity, environmental quality, recreational opportunities, cultural traditions, human sustenance, and economic well-being, and that it is in the public interest to protect existing natural wild rice stands, including their inherent genetic diversity, and restore wild rice to its historic range and abundance for its ecological, economic, and cultural values.”

### Recommendation 3

**The DNR will convene an interagency workgroup in 2008 to identify desired statutory updates in harvest regulations.**

**Rationale:** Harvest regulations and license fee structure should be reviewed by an interagency work group for suggested changes that would work towards resolution of posting lakes closed to harvest and regulating reservation border lakes, as well as encouraging recruitment and retention of wild rice harvesters. Possible changes include broadening the use of funds deposited in the wild rice account to allow for information and education, removal of the season framework, adding a combination (spouse) license, extending special one-day license, providing special one-day mentored license for resident and nonresident participants in formal education programs, and establishing a special youth day when mentors are not required to have a license.

### Recommendation 4

**The DNR will designate and publish a list of important natural wild rice areas.**

**Rationale:** Recognizing important wild rice areas and publishing the list would call attention to the importance of these areas, indicate management priorities, and provide a formal list that may prove useful for local units of government that are considering zoning and surface use restrictions.

### Recommendation 5

**The DNR will convene a standing interagency wild rice workgroup to share information and develop recommendations for inventory methodology and trend assessments, education and information outreach, lake planning and management, harvester recruitment and retention, and other management issues as they arise.**

**Rationale:** Comprehensive protection and management of wild rice involves multiple agencies. Management needs include better inventory information including consistent methodology for trend analysis, documenting natural genetic diversity, and establishing long-term case studies on identified lakes. This information will encourage sound restoration strategies and help foster the development of interdisciplinary lake management plans. In addition, the workgroup should focus on developing outreach information for harvesters, shoreline owners, realtors, boaters, and outdoor educators.

### Recommendation 6

**Increase intensive natural wild rice lake management efforts and accelerate the restoration of wild rice stands within its historic range.**

**Rationale:** Protecting and managing natural wild rice resources on many lakes requires active annual management activities to maintain free flowing outlets. The MNDNR works cooperatively with other agencies and nonprofit organizations such as Ducks Unlimited to accomplish this management. Tribal agencies also conduct independent management efforts on specific lakes. In recent years these efforts have improved wild



rice habitat on approximately 200 lakes and impoundments annually. Additional funding could expand accomplishments beyond current efforts.

The MNDNR has also been involved to a lesser extent in restoring wild rice to wildlife habitat areas within the historic range of natural wild rice. These efforts should be accelerated as funding, time, and opportunity permit.

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## Appendix A

### Natural Wild Rice Study Development Process

**Scope:** This study provided an information document on natural wild rice developed with conservation partner input, review, and possible endorsement. The document included the current location and estimated acreage and area of natural stands; potential threats to natural stands, including, but not limited to, development pressure, water levels, pollution, invasive species, and genetically engineered strains; and recommendations to the house and senate committees with jurisdiction over natural resources on protecting and increasing natural wild rice stands in the state.

**Format:** The final document was formatted to include an Executive Summary, Introduction, Background, Threats, Management Challenges, Recommendations, and Appendices.

**Process:** A Partnership Team was organized to review, comment, and consider endorsement of the planning process, interim draft of the document, and the final draft to be released for public review. DNR Assistant Commissioner Bob Meier chaired the Partnership Team. Invited members of the Partnership Team included representatives from other agencies and organizations including DNR Tribal Liaison Paul Swenson, the DNR Divisions of Ecological Services, Enforcement and Waters, MN Department of Agriculture, Board of Water and Soil Resources, Minnesota legislature (Representatives Frank Moe and Sondra Erickson), U. S. Bureau of Indian Affairs, U. S. Fish and Wildlife Service, U. S. Natural Resources and Conservation Service, Minnesota Chippewa Tribe, Tribal representatives, Ducks Unlimited, MN Wild Rice Council, Minnesota Waterfowl Association, Save Our Rice Alliance, Minnesota Waters, and the Association of Minnesota Counties. The Partnership Team was offered the opportunity to submit dissenting reports to be included in the appendices.

A Technical Team was organized to propose the document development process, develop the draft document and incorporate revisions as the process proceeded. DNR Wetland Wildlife Program Leader Ray Norrgard chaired the team and assumed the role of lead writer. Invited members of the Technical Team will include DNR wildlife field staff Gary Drotts, Ann Geisen, Shelley Gorham, Beau Liddell, Rob Naplin and Regional Enforcement Supervisor Ken Soring, along with Michelle McDowell (Fish and Wildlife Service), Becky Knowles (Leech Lake Department of Resource Management), Rod Ustipak (Consultant), Jon Schneider (Ducks Unlimited), MN Wild Rice Council (Beth Nelson and Jon Dokter), Rachel Walker (University of Minnesota – St. Paul), Dr. Ron Phillips (University of Minnesota – St. Paul), Dr. Raymie Porter (University of Minnesota- Grand Rapids), Annette Drewes (University of Wisconsin), Thomas Howes (Fond du Lac Reservation), Darren Vogt (1854 Authority), Steve Smith and John Persell (Minnesota Chippewa Tribe), Mike Swan (White Earth Reservation), Andrea Hanks (White Earth Land Recovery Project), and Peter David (Great Lakes Indian Fish and Wildlife Commission).

**Timelines:** The process began with the passage of the 2007 legislative request and will end with a completed report to the legislature by February 15, 2008. The Technical Team met on August 14, 2007 to develop the final draft of the proposed document development process, and a draft outline of the final document. The Technical Team communicated by email and followed up with meetings on November 13, 2007 and January 7, 2008. The draft study document underwent 10 revisions in all. The Partnership Team met on September 19 and December 3, 2007 to review

the Technical Team's proposals. Review of the final working draft of the study document was conducted by mail. The final document will be presented to the legislature by February 15, 2008. Copies of the final document will be posted on the MNDNR website and available upon request through DNR regions and central office.

#### Partnership Team Roster

| Organization                           | Name  | Title                    |
|--|---|--------------------------|
| Association of Minnesota Counties      | Anna Lee Garletz                                      | Policy Analyst           |
| Bois Forte DNR                         | Cory Strong   | Commissioner             |
| Bureau of Indian Affairs               | Bob Jackson   |                          |
| Clearwater County                      | Tom Anderson  | County Commissioner      |
| DNR Commissioner's Office              | Bob Meier   | Asst Commissioner/Policy |
| DNR Division of Ecological Resources   | Lee Pfannmuller (Donna Perleberg)                     | Director                 |
| DNR Division of Enforcement            | Mike, Hamm  | Director                 |
| DNR Division of Waters                 | Kent, Lokkesmoe                                       | Director                 |
| DNR Northwest Region Office            | Paul Swenson  | Tribal Liaison           |
| Ducks Unlimited                        | Ryan Heiniger   | Director, Cons Programs  |
| Fond du Lac Resource Management        | Reginald Defoe (Tom Howes)                            | Director                 |
| Grand Portage Tribal Council           | Norman Deschampe                                      | Chairman                 |
| Leech Lake DRM                         | Rich Robinson   | Director                 |
| Mille Lacs Natural Resources           | Curt Kalk   | Commissioner             |
| Minnesota Chippewa Tribe               | Gary Frazer   | Executive Director       |
| Minnesota Legislature                  | Sondra Erickson                                       | State Representative     |
| Minnesota Legislature                  | Frank Moe   | State Representative     |
| Minnesota Waters                       | Bruce Johnson   | Executive Director       |
| Minnesota Wild Rice Council            | Beth Nelson (Peter Imle, Ken Gunvalson)               | President                |
| MN Board of Water & Soil Resources     | John Jaschke (Greg Larson)                            | Executive Director       |
| MN Department of Agriculture           | Gene, Hugoson (Chuck Dale, Chuck Dryke, Geir Friisoe) | Commissioner             |
| MN Valley National Wildlife Refuge     | Jim Leach (Barb Boyle)                                | Director                 |
| MN Waterfowl Association               | Brad Nylin  | Executive Director       |
| Natural Resources Conservation Service | Bill Hunt   | State Conservationist    |
| Red Lake DNR                           | Al Pemberton  | Director                 |
| Save Our Rice Alliance                 | Richard Draper  |                          |
| White Earth DNR                        | Mike Swan (Doug McArthur)                             | Director                 |
| White Earth Land Recovery Project      | Winona LaDuke   | Founding Director        |

### Technical Team Roster

| First Name        | Title                                | Organization  |
|-------------------|--------------------------------------|---|
| Peter David       | Wildlife Biologist                   | Great Lakes Indian Fish and Wildlife Commission           |
| Jon Dokter        | Associate Director                   | Wild Rice Council   |
| Annette Drewes    | Ph.D Candidate Environmental Studies | University of Wisconsin-Madison<br>Save Our Rice Alliance |
| Gary Drotts       | Area Wildlife Supervisor             | MN Department of Natural Resources                        |
| Ann Geisen        | Wildlife Shallow Lakes Specialist    | MN Department of Natural Resources                        |
| Shelley Gorham    | Area Wildlife Supervisor             | MN Department of Natural Resources                        |
| Andrea Hanks      | Wild Rice Campaign Coordinator       | White Earth Land Recovery Project (WELRP)                 |
| Tom Howes         | Natural resources Manager            | Fond du Lac Department of Resource Management             |
| Becky Knowles     | Plant Ecologist                      | LLBO DRM-Fish, Wildlife, and Plants                       |
| Beau Liddell      | Area Wildlife Supervisor             | MN Department of Natural Resources                        |
| Doug McArthur     | Biologist                            | White Earth Dept. of Natural Resources                    |
| Michelle McDowell | Wildlife Biologist                   | Rice Lake National Wildlife Refuge                        |
| Rob Naplin        | Area Wildlife Supervisor             | MN Department of Natural Resources                        |
| Beth Nelson       | President                            | Wild Rice Council   |
| Ray Norrgard      | Wetland Wildlife Program Leader      | MN Department of Natural Resources                        |
| John Persell      | Biologist                            | LLBO DRM-Fish, Wildlife, and Plants                       |
| Ron Phillips      | Regents Professor                    | University of Minnesota                                   |
| Raymie Porter     | Research                             | University of Minnesota                                   |
| Jon Schneider     | Manager MN Conservation Programs     | Ducks Unlimited   |
| Steve Smith       | Acting Director - Water Quality      | Minnesota Chippewa Tribe                                  |
| Ken Soring        | NE Regional Enforcement Supervisor   | MN Department of Natural Resources                        |
| Mike Swan         | Director                             | White Earth Dept. of Natural Resources                    |
| Rod Ustipak       | Consultant                           |   |
| Darren Vogt       | Wildlife Biologist                   | 1854 Treaty Authority                                     |
| Rachel Walker     | Ph.D Candidate Water Resources       | University of Minnesota                                   |

## **Appendix B**

### **Wild Rice Distribution and Abundance in Minnesota**

#### **EXECUTIVE SUMMARY**

Project Leader

Gary Drotts

Minnesota Department of Natural Resources

Area Wildlife Supervisor - Brainerd

#### **Purpose**

To further the understanding of natural wild rice distribution and abundance in Minnesota, Minnesota Department of Natural Resources (MNDNR) staff and other Technical Team members of the Natural Wild Rice in Minnesota Legislative Study undertook an effort to consolidate and update existing natural wild rice inventory information. The following objectives guided inventory design and development.

1. Consolidate various data/information on the location (i.e. lake, wetland, or river segment) of natural wild rice stands in Minnesota.
2. Determine size and natural wild coverage for each location.
3. Determine type of water level management structure (if present) on each location and primary management authority.
4. Document Tribal, Treaty and/or State authority for each location.
5. Determine natural wild rice harvest potential, harvest pressure, and access for each location.
6. Provide a starting point for a useable data framework/information system for the long-term protection, management and monitoring of natural wild rice in Minnesota.

#### **Methods**

An existing dataset (Microsoft Access) maintained by the MNDNR Shallow Lake Program provided the starting point for this effort. This dataset originated in the late 1980's based on a review and consolidation of the best existing data sources at that time (i.e. MNDNR Enforcement wild rice lists, tribal rice camps, etc.) followed up with field interviews to MNDNR Area Wildlife and Tribal offices in the primary natural wild rice range. This initial assessment found over 700 lakes in 31 counties totaling 1.5 million basin acres contained approximately 61,000 acres of natural wild rice.

Since this initial dataset was formed, various MNDNR, federal, treaty and tribal authorities have accomplished a significant amount of additional inventory work. This information was reviewed, consolidated and added to the initial dataset and sent out for review to MNDNR Area Wildlife and Treaty/Tribal authorities for their comments and input. Return information was entered into a finalized dataset.

Primary information collected consisted of a location (i.e county, basin name), basin area and estimated natural wild rice coverage. For basins having a significant stand of natural wild rice, additional information was requested as to: water level management restrictions (i.e. dam at outlet); general wild rice location within the basin; treaty/tribal authority; and harvest potential, pressure and access.

### **Information sources**

Information sources included the following:

- Minnesota DNR – initial survey data, 2006 Wild Rice Harvesters Survey, Fisheries lake surveys, Wildlife/shallow lake surveys, aquatic plant management permits, and aquatic plant survey data from Ecological Resources.
- Treaty/Tribal - 1854 Treaty Authority, Great Lakes Indian Fish and Wildlife Commission, Fond Du Lac Indian Reservation, Mille Lacs Indian Reservation, Leech Lake Indian Reservation, and, White Earth Indian Reservation.
- U.S. Fish and Wildlife Service, National Wildlife Refuge System

### **Results**

Inventory results note that stands of natural wild rice were present or occurred in recent history on 1,292 lakes or river/stream segments in Minnesota. Of these 1,292 locations, 777 have information on natural wild rice coverage, which totals approximately 64,328 acres. The remaining 515 locations that currently do not have coverage information are primarily small lakes/wetlands on the edge of the current natural wild rice range (southern and western Minnesota) or river/stream segments.

On a county basis, the greatest concentration of natural wild rice locations is in St. Louis (8,939 acres), Itasca (8,448 acres), Cass (8,323 acres), Aitkin (4,859 acres), and Crow Wing (3,751 acres). These five counties contain over 60% of the inventoried natural wild rice acreage in Minnesota.

### **Recommendations**

- This inventory should be considered a work in progress. Further edits and review are needed, especially for small lakes/wetlands on the edge of current natural wild rice range and the numerous river/stream segments that may be missed in this inventory.
- A procedure to review and update this inventory on a regular basis (every 5-10 years) should be undertaken.
- Information gathered on harvest potential, pressure and access to these natural wild rice locations should be listed/posted on appropriate web sites (i.e. MNDNR web site).

| County name | Location Name (i.e. Lake or River)         | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|--|------------|-----------------------|--------------------------------------|
| Aitkin      | Aitkin                                     | 01004000   | 850                   | 298                                  |
| Aitkin      | Anderson                                   | 01003100   | 97                    | 30                                   |
| Aitkin      | Bear                                       | 01006400   | 127                   | 1                                    |
| Aitkin      | Big Sandy                                  | 01006200   | 9,380                 | 94                                   |
| Aitkin      | Birch                                      | 01020600   | 449                   | 5                                    |
| Aitkin      | Blind                                      | 01018800   | 323                   | 39                                   |
| Aitkin      | Brown                                      | 01007800   | 97                    | 34                                   |
| Aitkin      | Camp                                       | 01009800   | 127                   | 30                                   |
| Aitkin      | Clear                                      | 01010600   | 123                   | 20                                   |
| Aitkin      | Cornish Pool                               | 01042700   | 600                   | 30                                   |
| Aitkin      | Davis                                      | 01007101   | 76                    | 30                                   |
| Aitkin      | Deer                                       | 01008600   | 47                    | 3                                    |
| Aitkin      | Elm Island                                 | 01012300   | 656                   | 30                                   |
| Aitkin      | Farm Island                                | 01015900   | 2,025                 | 20                                   |
| Aitkin      | Fleming                                    | 01010500   | 326                   | 1                                    |
| Aitkin      | Flowage                                    | 01006100   | 720                   | 432                                  |
| Aitkin      | Gun  | 01009900   | 735                   | 60                                   |
| Aitkin      | Hammal                                     | 01016100   | 376                   | 1                                    |
| Aitkin      | Hay  | 01005900   | 133                   | 1                                    |
| Aitkin      | Hickory                                    | 01017900   | 183                   | 10                                   |
| Aitkin      | Jenkins                                    | 01010000   | 127                   | 1                                    |
| Aitkin      | Jewett State WMA - Impoundment             | 01038300   | 180                   | 30                                   |
| Aitkin      | Johnson                                    | 01013100   | 27                    | 6                                    |
| Aitkin      | Killroy                                    | 01023800   | 23                    | 4                                    |
| Aitkin      | Kimberly State WMA - Lower Pool            | 01043300   | 300                   | 30                                   |
| Aitkin      | Kimberly State WMA - Upper Pool            | 01041100   | 900                   | 76                                   |
| Aitkin      | Krilwitz                                   | 01IMP002   | 30                    | 6                                    |
| Aitkin      | Lily                                       | 01008800   | 50                    | 2                                    |
| Aitkin      | Little Hill River State WMA - Pool 1       | 01043300   | 135                   | 18                                   |
| Aitkin      | Little McKinney                            | 01019700   | 26                    | 6                                    |
| Aitkin      | Little Pine                                | 01017600   | 126                   | 1                                    |
| Aitkin      | Little Prairie                             | 01001600   | 78                    | 1                                    |
| Aitkin      | Little Red Horse Lake                      | 01005200   | 32                    | 3                                    |
| Aitkin      | Little Willow River State WMA - Upper Pool | W0642001   | 50                    | 20                                   |
| Aitkin      | Little Willow State WMA - Lower Pool       | 01033200   | 140                   | 50                                   |
| Aitkin      | Mallard                                    | 01014900   | 354                   | 320                                  |
| Aitkin      | Mandy                                      | 01006800   | 107                   | 27                                   |
| Aitkin      | Minnewawa                                  | 01003300   | 2,451                 | 130                                  |
| Aitkin      | Monson                                     | 01012600   | 48                    | 25                                   |
| Aitkin      | Moose                                      | 01014000   | 148                   | 117                                  |
| Aitkin      | Moose River                                | 01r4       |                       |                                      |



| County name | Location Name (i.e. Lake or River)   | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|--------------------------------------|------------|-----------------------|--------------------------------------|
| Aitkin      | Moose Willow State WMA - Moose Pool  | 01035800   | 900                   | 89                                   |
| Aitkin      | Moose Willow State WMA - Willow Pool | 01043100   | 300                   | 50                                   |
| Aitkin      | Moulton                              | 01021200   | 282                   | 1                                    |
| Aitkin      | Mud (Grayling Marsh WMA, pool 1)     | 01002900   | 400                   | 1                                    |
| Aitkin      | Mud (Little White Elk)               | 01019400   | 135                   | 68                                   |
| Aitkin      | Nelson                               | 01001000   | 71                    | 1                                    |
| Aitkin      | Newstrom                             | 01009700   | 97                    | 76                                   |
| Aitkin      | Pine                                 | 01000100   | 391                   | 4                                    |
| Aitkin      | Portage                              | 01006900   | 387                   | 5                                    |
| Aitkin      | Prairie River                        | 01r6       |                       |                                      |
| Aitkin      | Rat                                  | 01007700   | 442                   | 45                                   |
| Aitkin      | Rat House                            | 01005300   | 122                   | 100                                  |
| Aitkin      | Red                                  | 01010700   | 97                    | 4                                    |
| Aitkin      | Rice                                 | 01000500   | 83                    | 50                                   |
| Aitkin      | Rice (Big)                           | 01006700   | 3,635                 | 1,700                                |
| Aitkin      | Rice River                           | 01r1       | 190                   | 25                                   |
| Aitkin      | Ripple                               | 01014600   | 676                   | 50                                   |
| Aitkin      | Ripple River                         | 01r3       |                       |                                      |
| Aitkin      | Rock                                 | 01007200   | 366                   | 50                                   |
| Aitkin      | Round                                | 01013700   | 634                   | 1                                    |
| Aitkin      | Salo Marsh State WMA - Pool          | 01041500   | 690                   | 76                                   |
| Aitkin      | Sanders                              | 01007600   | 55                    | 36                                   |
| Aitkin      | Sandy River                          | 01006000   | 368                   | 200                                  |
| Aitkin      | Sandy River                          | 01r2       |                       |                                      |
| Aitkin      | Savanna                              | 01001400   | 86                    | 1                                    |
| Aitkin      | Savanna River                        | 01r5       |                       |                                      |
| Aitkin      | Section Ten                          | 01011500   | 440                   | 52                                   |
| Aitkin      | Section Twelve                       | 01012000   | 167                   | 1                                    |
| Aitkin      | Shovel                               | 01020000   | 230                   | 207                                  |
| Aitkin      | Sissabagamah                         | 01012900   | 386                   | 39                                   |
| Aitkin      | Sitas                                | 01013200   | 59                    | 5                                    |
| Aitkin      | Sixteen                              | 01012400   | 18                    | 1                                    |
| Aitkin      | Sjodin                               | 01031600   | 43                    | 28                                   |
| Aitkin      | Spectacle                            | 01015600   | 107                   | 1                                    |
| Aitkin      | Spirit                               | 01017800   | 523                   | 26                                   |
| Aitkin      | Split Rock                           | 01000200   | 27                    | 1                                    |
| Aitkin      | Spruce                               | 01015100   | 80                    | 80                                   |
| Aitkin      | Steamboat                            | 01007102   | 59                    | 15                                   |
| Aitkin      | Stony                                | 01001700   | 52                    | 5                                    |
| Aitkin      | Sugar                                | 01008400   | 23                    | 1                                    |
| Aitkin      | Sugar                                | 01008700   | 416                   | 1                                    |
| Aitkin      | Swamp                                | 01009200   | 270                   | 1                                    |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Aitkin      | Tamarack River                     | 01r7       |                       |                                      |
| Aitkin      | Twenty                             | 01008500   | 153                   | 119                                  |
| Aitkin      | Unnamed (L. Wolf)                  | 01002000   | 19                    | 1                                    |
| Aitkin      | Unnamed (Rice)                     | 01041900   | 16                    | 1                                    |
| Aitkin      | Unnamed (Round Lake Pothole)       | 01028500   | 15                    | 12                                   |
| Aitkin      | Unnamed (Upper Blind)              | 01033100   | 14                    | 3                                    |
| Aitkin      | Unnamed (W. Washburn)              | 01026200   | 14                    | 1                                    |
| Aitkin      | Washburn                           | 01011100   | 73                    | 4                                    |
| Aitkin      | Waukenabo                          | 01013600   | 819                   | 49                                   |
| Aitkin      | West                               | 01028700   | 51                    | 20                                   |
| Aitkin      | White Elk                          | 01014800   | 780                   | 350                                  |
| Anoka       | Carlos Avery WMA - Pool 1          | W9001001   | 180                   | 15                                   |
| Anoka       | Carlos Avery WMA - Pool 13         | W9001013   | 586                   | 2                                    |
| Anoka       | Carlos Avery WMA - Pool 14         | W9001014   | 749                   | 15                                   |
| Anoka       | Carlos Avery WMA - Pool 15         | W9001015   | 365                   | 1                                    |
| Anoka       | Carlos Avery WMA - Pool 16         | W9001016   | 67                    |                                      |
| Anoka       | Carlos Avery WMA - Pool 17         | W9001017   | 185                   |                                      |
| Anoka       | Carlos Avery WMA - Pool 2          | W9001002   | 683                   | 20                                   |
| Anoka       | Carlos Avery WMA - Pool 22         | W9001022   | 141                   | 10                                   |
| Anoka       | Carlos Avery WMA - Pool 23         | W9001023   | 1,600                 |                                      |
| Anoka       | Carlos Avery WMA - Pool 24         | W9001024   | 35                    | 2                                    |
| Anoka       | Carlos Avery WMA - Pool 26         | W9001026   | 200                   | 5                                    |
| Anoka       | Carlos Avery WMA - Pool 3          | W9001003   | 186                   | 120                                  |
| Anoka       | Carlos Avery WMA - Pool 5          | W9001005   | 52                    | 25                                   |
| Anoka       | Carlos Avery WMA - Pool 6          | W9001006   | 200                   | 1                                    |
| Anoka       | Carlos Avery WMA - Pool 7          | W9001007   | 240                   | 3                                    |
| Anoka       | Carlos Avery WMA - Pool 9          | W9001009   | 269                   | 120                                  |
| Anoka       | Carlos Avery WMA - Pool 9(2)       | W9001011   | 71                    | 30                                   |
| Anoka       | East Twin                          | 02002000   | 171                   | 1                                    |
| Anoka       | Grass                              | 02011300   |                       |                                      |
| Anoka       | Grass                              | 02009200   |                       |                                      |
| Anoka       | Hickey                             | 02009600   | 41                    |                                      |
| Anoka       | Little Coon                        | 02003200   | 486                   | 10                                   |
| Anoka       | Pickerel                           | 02013000   | 303                   | 25                                   |
| Anoka       | Rice                               | 02000800   |                       |                                      |
| Anoka       | Rice                               | 02004300   |                       |                                      |
| Anoka       | Rice Creek                         | 02r1       |                       |                                      |
| Anoka       | Rondeau                            | 02001500   | 552                   |                                      |
| Anoka       | Rum River                          | 02r2       |                       |                                      |
| Anoka       | Swan                               | 02009800   | 273                   | 33                                   |
| Anoka       | West Twin                          | 02003300   | 18                    |                                      |
| Becker      | Abners                             | 03003900   | 100                   | 80                                   |

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|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Becker      | Albertson                          | 03026600   | 73                    |                                      |
| Becker      | Aspinwall                          | 03010400   | 178                   | 18                                   |
| Becker      | Axberg                             | 03066000   | 47                    |                                      |
| Becker      | Balsam                             | 03029200   | 148                   | 10                                   |
| Becker      | Bass                               | 03048000   | 28                    |                                      |
| Becker      | Bass                               | 03008800   | 208                   | 10                                   |
| Becker      | Bean                               | 03041100   | 19                    |                                      |
| Becker      | Big Basswood                       | 03009600   | 586                   | 304                                  |
| Becker      | Big Rat                            | 03024600   | 1,102                 | 110                                  |
| Becker      | Big Rush                           | 03010300   | 1,128                 | 20                                   |
| Becker      | Blackbird                          | 03019700   | 284                   | 42                                   |
| Becker      | Blueberry                          | 03000700   | 160                   | 2                                    |
| Becker      | Booth                              | 03019800   | 48                    | 43                                   |
| Becker      | Buffalo                            | 03035000   | 444                   | 89                                   |
| Becker      | Bullhead                           | 03031200   | 39                    | 6                                    |
| Becker      | Bush                               | 03021200   | 110                   | 40                                   |
| Becker      | Cabin                              | 03034600   | 38                    |                                      |
| Becker      | Camp Seven                         | 03015100   | 78                    | 8                                    |
| Becker      | Carman                             | 03020900   | 217                   | 30                                   |
| Becker      | Chippewa                           | 03019600   | 960                   | 288                                  |
| Becker      | Dahlberg                           | 03057700   | 77                    |                                      |
| Becker      | Dead                               | 03016000   | 296                   |                                      |
| Becker      | Dinner                             | 03004400   | 53                    | 11                                   |
| Becker      | Eagen                              | 03031800   | 85                    |                                      |
| Becker      | Equay                              | 03021900   | 73                    | 7                                    |
| Becker      | Flat                               | 03024200   | 1,970                 | 197                                  |
| Becker      | Gull Creek                         | 03r2       |                       |                                      |
| Becker      | Gyles                              | 03006600   | 42                    | 16                                   |
| Becker      | Halverson                          | 03041200   | 18                    |                                      |
| Becker      | Height of Land                     | 03019500   | 3,943                 | 197                                  |
| Becker      | Hubbel Pond                        | 03024000   | 561                   | 168                                  |
| Becker      | Indian Creek Imp.                  | 03r4       |                       |                                      |
| Becker      | Johnson                            | 03019900   | 181                   | 40                                   |
| Becker      | Kneebone                           | 03009000   | 149                   | 15                                   |
| Becker      | Little Basswood                    | 03009200   | 105                   | 31                                   |
| Becker      | Little Dinner                      | 03004500   | 12                    | 5                                    |
| Becker      | Little Flat                        | 03021700   | 235                   | 211                                  |
| Becker      | Little Mud                         | 03002200   | 25                    | 6                                    |
| Becker      | Little Rice                        | 03023900   | 110                   | 21                                   |
| Becker      | Little Round                       | 03030200   | 565                   |                                      |
| Becker      | Lower Egg                          | 03021000   | 171                   | 75                                   |
| Becker      | Lyman WPA                          | 03IMP003   |                       |                                      |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Becker      | Manomin Creek                      | 03r5       |                       |                                      |
| Becker      | Mary Yellowhead                    | 03024300   | 68                    | 7                                    |
| Becker      | Mud                                | 03012000   | 170                   |                                      |
| Becker      | Mud                                | 03002300   | 85                    | 42                                   |
| Becker      | Mud                                | 03006700   | 88                    | 83                                   |
| Becker      | Mud                                | 03001600   | 86                    |                                      |
| Becker      | Ottertail River                    | 03r1       |                       |                                      |
| Becker      | Pearl                              | 03048600   | 268                   |                                      |
| Becker      | Rice                               | 03028500   | 51                    |                                      |
| Becker      | Rice                               | 03017300   | 37                    |                                      |
| Becker      | Rice                               | 03029100   | 245                   | 196                                  |
| Becker      | Rice                               | 03020100   | 245                   | 245                                  |
| Becker      | Rock                               | 03029300   | 1,198                 | 240                                  |
| Becker      | Round                              | 03015500   | 1,094                 |                                      |
| Becker      | Schultz                            | 03027800   | 103                   | 82                                   |
| Becker      | Shell                              | 03010200   | 3,147                 | 169                                  |
| Becker      | Shipman                            | 03000500   | 71                    | 1                                    |
| Becker      | Spindler                           | 03021400   | 185                   | 125                                  |
| Becker      | Tamarack                           | 03024100   | 2,227                 | 245                                  |
| Becker      | Tamarack NWR - Ogemash Pool        | 03IMP002   | 71                    | 20                                   |
| Becker      | Tea Cracker                        | 03015700   | 122                   | 30                                   |
| Becker      | Town                               | 03026400   | 117                   | 35                                   |
| Becker      | Trieglaff                          | 03026300   | 111                   | 56                                   |
| Becker      | Twin Island                        | 03003300   | 71                    | 5                                    |
| Becker      | Two Inlets                         | 03001700   | 643                   | 40                                   |
| Becker      | Unnamed                            | 03008700   | 23                    |                                      |
| Becker      | Unnamed                            | 03060000   | 59                    |                                      |
| Becker      | Unnamed                            | 03059800   | 36                    |                                      |
| Becker      | Unnamed                            | 03059900   | 34                    |                                      |
| Becker      | Unnamed                            | 03014000   | 43                    |                                      |
| Becker      | Unnamed                            | 03109300   | 72                    | 7                                    |
| Becker      | Unnamed                            | 03077600   | 20                    | 10                                   |
| Becker      | Unnamed                            | 03071600   | 25                    | 12                                   |
| Becker      | Unnamed                            | 03043400   | 21                    | 17                                   |
| Becker      | Upper Egg                          | 03020600   | 493                   | 24                                   |
| Becker      | Wild Rice River                    | 03r3       |                       |                                      |
| Becker      | Winter                             | 03021600   | 117                   | 43                                   |
| Becker      | Wolf                               | 03010100   | 1,453                 | 10                                   |
| Beltrami    | Big                                | 04004900   | 3,565                 | 250                                  |
| Beltrami    | Big Rice                           | 04003100   | 642                   | 96                                   |
| Beltrami    | Bootleg                            | 04021100   | 308                   | 185                                  |
| Beltrami    | Burns                              | 04000100   | 131                   | 105                                  |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Beltrami    | Campbell                           | 04019600   | 462                   | 23                                   |
| Beltrami    | Carr                               | 04014100   | 51                    | 8                                    |
| Beltrami    | Cass                               | 04003000   | 15,958                | 10                                   |
| Beltrami    | Clearwater                         | 04034300   | 1,039                 |                                      |
| Beltrami    | Cranberry                          | 04012300   | 77                    | 46                                   |
| Beltrami    | Dutchman                           | 04006700   | 171                   |                                      |
| Beltrami    | Erickson                           | 04006800   | 111                   | 50                                   |
| Beltrami    | George                             | 04017500   | 89                    | 18                                   |
| Beltrami    | Grant Creek                        | 04r1       |                       |                                      |
| Beltrami    | Grass                              | 04021600   | 233                   |                                      |
| Beltrami    | Gull                               | 04006400   | 170                   | 34                                   |
| Beltrami    | Heart                              | 04027100   | 10                    |                                      |
| Beltrami    | Irving                             | 04014000   | 644                   | 97                                   |
| Beltrami    | Kitchi                             | 04000700   | 1,850                 | 185                                  |
| Beltrami    | Little Puposky                     | 04019700   | 158                   | 95                                   |
| Beltrami    | Little Rice                        | 04017000   | 72                    |                                      |
| Beltrami    | Little Rice                        | 04001500   | 123                   | 60                                   |
| Beltrami    | Little Rice Pond                   | 04002300   |                       |                                      |
| Beltrami    | Little Turtle                      | 04015500   | 464                   | 23                                   |
| Beltrami    | Manomin                            | 04028600   | 288                   | 144                                  |
| Beltrami    | Marquette                          | 04014200   | 578                   |                                      |
| Beltrami    | Medicine                           | 04012200   | 458                   | 69                                   |
| Beltrami    | Mississippi                        | 04r2       |                       |                                      |
| Beltrami    | Moose                              | 04001100   | 617                   | 96                                   |
| Beltrami    | Moose                              | 04034200   | 133                   |                                      |
| Beltrami    | Norman                             | 04002900   | 61                    | 8                                    |
| Beltrami    | Pimushe                            | 04003200   | 1,350                 | 135                                  |
| Beltrami    | Puposky                            | 04019800   | 2,120                 | 236                                  |
| Beltrami    | Rabideau                           | 04003400   | 723                   | 217                                  |
| Beltrami    | Rice                               | 04017400   | 55                    |                                      |
| Beltrami    | Rice                               | 04012100   | 36                    |                                      |
| Beltrami    | Rice                               | 04025000   | 124                   |                                      |
| Beltrami    | Rice Pond                          | 04005900   | 247                   | 123                                  |
| Beltrami    | Three Island                       | 04013400   | 836                   | 125                                  |
| Beltrami    | Turtle River                       | 04011100   | 1,664                 |                                      |
| Beltrami    | Upper Red                          | 04003501   | 119,271               |                                      |
| Beltrami    | Whitefish                          | 04030900   | 126                   |                                      |
| Blue Earth  | Rice                               | 07005900   |                       |                                      |
| Blue Earth  | Rice Creek                         | 07r1       |                       |                                      |
| Brown       | Altematt                           | 08005400   |                       |                                      |
| Brown       | Rice Lake                          | 08003500   |                       |                                      |
| Carlton     | Bang                               | 09004600   | 58                    | 1                                    |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Carlton     | Bob                                | 09002600   | 78                    | 1                                    |
| Carlton     | Cedar                              | 09003100   | 62                    | 10                                   |
| Carlton     | Cross                              | 09006200   | 110                   | 6                                    |
| Carlton     | Dead Fish                          | 09005100   | 153                   | 115                                  |
| Carlton     | Flower                             | 09006400   | 14                    | 10                                   |
| Carlton     | Hardwood                           | 09003000   | 100                   | 25                                   |
| Carlton     | Hay                                | 09001000   | 103                   | 1                                    |
| Carlton     | Island                             | 09006000   | 456                   | 46                                   |
| Carlton     | Jaskari                            | 09005000   | 74                    | 74                                   |
| Carlton     | Kettle                             | 09004900   | 611                   | 415                                  |
| Carlton     | Long                               | 09006600   | 17                    | 4                                    |
| Carlton     | Miller                             | 09005300   | 156                   | 156                                  |
| Carlton     | Moose                              | 09004300   |                       |                                      |
| Carlton     | Moosehead                          | 09004100   |                       |                                      |
| Carlton     | Perch                              | 09003600   | 796                   | 597                                  |
| Carlton     | Rice Portage                       | 09003700   | 832                   | 120                                  |
| Carlton     | Sterle Pool                        | W0854002   | 29                    | 2                                    |
| Carlton     | Tamarack                           | 09006700   | 228                   | 11                                   |
| Carlton     | Tamarack River                     | 09r1       |                       |                                      |
| Carlton     | Wild Rice                          | 09002300   | 54                    | 36                                   |
| Carlton     | Woodbury                           | 09006300   | 59                    | 10                                   |
| Cass        | Baby                               | 11028300   | 736                   | 7                                    |
| Cass        | Bergkeller                         | 11044700   | 120                   | 5                                    |
| Cass        | Beuber                             | 11035300   | 135                   | 15                                   |
| Cass        | Big Birch                          | 11001700   | 255                   | 45                                   |
| Cass        | Big Portage                        | 11030800   | 956                   | 30                                   |
| Cass        | Big Rice (Remer)                   | 11007300   | 2,717                 | 1,411                                |
| Cass        | Big Sand                           | 11007700   | 752                   | 10                                   |
| Cass        | Birch                              | 11041200   | 1,262                 | 1                                    |
| Cass        | Bluebill                           | 11039700   | 51                    | 1                                    |
| Cass        | Bowen                              | 11035000   | 182                   |                                      |
| Cass        | Boy (& Boy River)                  | 11014300   | 5,544                 | 340                                  |
| Cass        | Brockway                           | 11036600   | 182                   | 55                                   |
| Cass        | Bullhead                           | 11018400   | 88                    |                                      |
| Cass        | Cat                                | 11050900   | 108                   | 5                                    |
| Cass        | Cedar                              | 11048100   | 34                    | 3                                    |
| Cass        | Cedar                              | 11044400   | 17                    | 4                                    |
| Cass        | Child                              | 11026300   | 295                   | 12                                   |
| Cass        | Chub                               | 11051700   | 57                    | 51                                   |
| Cass        | Ding Pot                           | 11056500   | 29                    | 29                                   |
| Cass        | Donkey                             | 11028000   | 54                    |                                      |
| Cass        | Drumbeater                         | 11014500   | 376                   | 5                                    |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Cass        | East Twin                          | 11012300   | 297                   | 50                                   |
| Cass        | Esterday                           | 11051100   | 43                    | 3                                    |
| Cass        | Farnham                            | 11051300   | 142                   | 71                                   |
| Cass        | Five Point                         | 11035100   | 265                   | 13                                   |
| Cass        | George                             | 11010100   | 720                   | 262                                  |
| Cass        | Gijik                              | 11018500   | 118                   | 1                                    |
| Cass        | Goose                              | 11009600   | 844                   | 844                                  |
| Cass        | Grass                              | 11031500   | 113                   |                                      |
| Cass        | Grass                              | 11009000   |                       |                                      |
| Cass        | Gull                               | 11030500   | 9,541                 | 15                                   |
| Cass        | Gull River                         | 11r1       | 219                   | 110                                  |
| Cass        | Hand (Lower)                       | 11025100   | 122                   | 50                                   |
| Cass        | Hand (Upper)                       | 11024200   | 316                   | 20                                   |
| Cass        | Hardy                              | 11033200   | 89                    | 2                                    |
| Cass        | Hattie                             | 11023200   | 592                   | 40                                   |
| Cass        | Hay                                | 11019900   | 364                   | 36                                   |
| Cass        | Hole-In-Bog                        | 11019700   | 76                    |                                      |
| Cass        | Hunter                             | 11017000   | 189                   | 2                                    |
| Cass        | Inguadona                          | 11012000   | 935                   | 19                                   |
| Cass        | Island                             | 11010200   | 390                   | 10                                   |
| Cass        | Island                             | 11036000   | 117                   | 30                                   |
| Cass        | Kelly                              | 11042800   | 50                    | 10                                   |
| Cass        | Kerr                               | 11026800   | 81                    | 1                                    |
| Cass        | Kid                                | 11026200   | 167                   | 3                                    |
| Cass        | Laura                              | 11010400   | 1,424                 | 854                                  |
| Cass        | Leech                              | 11020300   | 109,415               | 4,000                                |
| Cass        | Lind                               | 11036700   | 462                   | 95                                   |
| Cass        | Little Birch                       | 11001800   | 25                    | 25                                   |
| Cass        | Little Boy                         | 11036900   | 71                    | 1                                    |
| Cass        | Little Boy                         | 11016700   | 1,396                 | 10                                   |
| Cass        | Little Swift                       | 11013100   | 62                    | 16                                   |
| Cass        | Little Vermillion                  | 11003000   | 138                   | 15                                   |
| Cass        | Little Woman                       | 11026500   | 50                    | 8                                    |
| Cass        | Lizotte                            | 11023100   | 75                    | 50                                   |
| Cass        | Lomish                             | 11013600   | 282                   | 197                                  |
| Cass        | Lower Milton                       | 11008000   | 80                    | 5                                    |
| Cass        | Lower Trelipe                      | 11012900   | 618                   | 20                                   |
| Cass        | Mad Dog                            | 11019300   | 27                    |                                      |
| Cass        | Margaret                           | 11022200   | 230                   | 3                                    |
| Cass        | McCarthy                           | 11016800   | 194                   | 78                                   |
| Cass        | McKeown                            | 11026100   | 171                   | 3                                    |
| Cass        | Moon                               | 11007800   | 58                    | 5                                    |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Cass        | Moose                              | 11042400   | 92                    | 1                                    |
| Cass        | Mud                                | 11030900   | 18                    | 18                                   |
| Cass        | Mud                                | 11010000   | 1,440                 | 1,300                                |
| Cass        | Norway                             | 11030700   | 498                   | 10                                   |
| Cass        | Nushka                             | 11013700   | 78                    |                                      |
| Cass        | Ododikossi                         | 11007400   | 20                    | 10                                   |
| Cass        | Oxbow                              | 11007500   | 172                   | 4                                    |
| Cass        | Peterson                           | 11015400   | 139                   | 3                                    |
| Cass        | Pick                               | 11026700   | 36                    | 1                                    |
| Cass        | Pickerel                           | 11035200   | 66                    |                                      |
| Cass        | Pillager                           | 11032000   | 213                   | 10                                   |
| Cass        | Pine Mountain                      | 11041100   | 1,657                 | 40                                   |
| Cass        | Portage                            | 11047600   | 277                   |                                      |
| Cass        | Potshot                            | 11014900   | 28                    | 14                                   |
| Cass        | Rat                                | 11028500   | 104                   |                                      |
| Cass        | Ray                                | 11022000   | 183                   | 37                                   |
| Cass        | Rice                               | 11040200   | 188                   | 5                                    |
| Cass        | Rice                               | 11016200   | 342                   | 137                                  |
| Cass        | Rice                               | 11013800   | 55                    | 1                                    |
| Cass        | Rice (Carrol's)                    | 11022700   | 46                    | 46                                   |
| Cass        | Rice (Pillager)                    | 11032100   | 232                   | 100                                  |
| Cass        | Rice Pad                           | 11072000   | 14                    | 4                                    |
| Cass        | Rock                               | 11032400   | 249                   | 10                                   |
| Cass        | Sailor                             | 11001900   | 42                    | 10                                   |
| Cass        | Schafer                            | 11000400   | 44                    | 2                                    |
| Cass        | Scribner                           | 11044100   | 93                    | 5                                    |
| Cass        | Six Mile                           | 11014600   | 1,288                 | 70                                   |
| Cass        | Skunk                              | 11002700   | 145                   | 30                                   |
| Cass        | Spring                             | 11002200   | 86                    | 12                                   |
| Cass        | Stephens                           | 11021300   | 104                   | 1                                    |
| Cass        | Swift                              | 11013300   | 359                   | 51                                   |
| Cass        | Tamarack                           | 11034700   | 46                    | 4                                    |
| Cass        | Tamarack                           | 11018900   | 63                    | 6                                    |
| Cass        | Thiebault                          | 11002000   | 37                    | 5                                    |
| Cass        | Third Guide                        | 11000100   | 44                    | 14                                   |
| Cass        | Thirty-Six                         | 11017300   | 49                    | 1                                    |
| Cass        | Thunder                            | 11006200   | 1,316                 | 2                                    |
| Cass        | Twin                               | 11048400   | 168                   |                                      |
| Cass        | Unnamed                            | 11077700   | 40                    |                                      |
| Cass        | Unnamed                            | 11078000   | 10                    | 4                                    |
| Cass        | Unnamed (Pistol Lake Rice Bed)     | 11073800   | 22                    | 20                                   |
| Cass        | Unnamed (Rice Swamp)               | 11069800   | 11                    |                                      |



| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Cass        | Unnamed (Rice)                     | 11061500   | 11                    |                                      |
| Cass        | Upper Gull                         | 11021800   | 345                   | 2                                    |
| Cass        | Upper Loon                         | 11022500   | 114                   |                                      |
| Cass        | Wabedo                             | 11017100   | 1,272                 | 5                                    |
| Cass        | Wabegon                            | 11040300   | 42                    | 4                                    |
| Cass        | Washburn                           | 11005900   | 1,768                 | 60                                   |
| Cass        | Wax                                | 11012400   | 95                    | 10                                   |
| Cass        | West Twin                          | 11012500   | 200                   | 11                                   |
| Cass        | White Oak                          | 11001600   | 68                    | 1                                    |
| Cass        | Widow                              | 11027300   | 197                   |                                      |
| Cass        | Winnibigoshish                     | 11014700   | 69,821                | 1,000                                |
| Cass        | Woman                              | 11020100   | 5,360                 | 54                                   |
| Chippewa    | Chippewa River                     | 12r1       |                       |                                      |
| Chisago     | Goose                              | 13008300   | 710                   |                                      |
| Chisago     | Rush                               | 13006900   | 3,170                 |                                      |
| Clay        | Cromwell                           | 14010300   | 27                    |                                      |
| Clearwater  | Anderson                           | 15007400   | 53                    | 3                                    |
| Clearwater  | Bagley                             | 15004000   | 106                   |                                      |
| Clearwater  | Berg                               | 15002500   | 50                    |                                      |
| Clearwater  | Clearwater River                   | 15r1       |                       |                                      |
| Clearwater  | Duncan                             | 15002400   | 18                    |                                      |
| Clearwater  | Elk                                | 15001000   | 305                   |                                      |
| Clearwater  | First                              | 15013900   | 60                    | 3                                    |
| Clearwater  | Gill                               | 15001900   | 380                   | 38                                   |
| Clearwater  | Itasca                             | 15001600   | 1,065                 |                                      |
| Clearwater  | Lomond                             | 15008100   | 108                   | 5                                    |
| Clearwater  | Lower Red                          | 15020200   |                       |                                      |
| Clearwater  | Lower Rice                         | 15013000   | 2,375                 | 1,568                                |
| Clearwater  | Mallard                            | 15001800   | 123                   | 25                                   |
| Clearwater  | Minerva                            | 15007900   | 239                   | 36                                   |
| Clearwater  | Mississippi                        | 15r3       |                       |                                      |
| Clearwater  | Mud                                | 15006100   | 294                   | 103                                  |
| Clearwater  | Pine                               | 15014900   | 1,465                 | 220                                  |
| Clearwater  | Second                             | 15014000   | 68                    | 7                                    |
| Clearwater  | Sucker                             | 15002000   | 90                    | 14                                   |
| Clearwater  | Tamarack                           | 15005600   | 21                    |                                      |
| Clearwater  | Tamarack                           | 15013600   | 115                   |                                      |
| Clearwater  | Third                              | 15014100   | 38                    | 2                                    |
| Clearwater  | Unnamed (Rice Bed)                 | 15002100   | 150                   | 45                                   |
| Clearwater  | Upper Rice                         | 15005900   | 1,860                 | 1,116                                |
| Clearwater  | Wild Rice River                    | 15r2       |                       |                                      |
| Cook        | Bigsby                             | 16034400   | 89                    | 1                                    |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Cook        | Caribou                            | 16036000   | 714                   | 7                                    |
| Cook        | Christine                          | 16037300   | 192                   | 19                                   |
| Cook        | Elbow                              | 16009600   | 415                   | 124                                  |
| Cook        | Fente                              | 16074100   | 35                    |                                      |
| Cook        | Four Mile                          | 16063900   | 593                   | 42                                   |
| Cook        | Grassy                             | 16039000   | 22                    |                                      |
| Cook        | Gust                               | 16038000   | 159                   | 1                                    |
| Cook        | Iron                               | 16032800   | 125                   |                                      |
| Cook        | Jack                               | 16052100   | 127                   | 12                                   |
| Cook        | Kelly                              | 16047600   | 188                   | 56                                   |
| Cook        | Luffs                              | 16000600   |                       |                                      |
| Cook        | Mark                               | 16025000   | 126                   |                                      |
| Cook        | Marsh                              | 16048800   | 62                    | 31                                   |
| Cook        | Moore                              | 16048900   | 64                    | 48                                   |
| Cook        | Mt. Maud                           | 16wtld2    |                       |                                      |
| Cook        | North Fowl                         | 16003600   | 297                   |                                      |
| Cook        | Northern Light                     | 16008900   | 443                   | 133                                  |
| Cook        | Peterson                           | 16047800   | 104                   | 1                                    |
| Cook        | Phoebe                             | 16080800   | 758                   | 1                                    |
| Cook        | Prout                              | 16001300   | 18                    |                                      |
| Cook        | Rib                                | 16054400   | 89                    |                                      |
| Cook        | Rice                               | 16045300   | 230                   | 92                                   |
| Cook        | Richey                             | 16064300   | 114                   |                                      |
| Cook        | Royal River                        | 16r1       |                       |                                      |
| Cook        | South Fowl                         | 16003400   | 508                   |                                      |
| Cook        | Swamp                              | 16000900   |                       |                                      |
| Cook        | Swamp River                        | 16r2       |                       |                                      |
| Cook        | Swamp River Reservoir              | 16090100   | 165                   | 153                                  |
| Cook        | Teal                               | 16000300   | 73                    | 1                                    |
| Cook        | Temperance River                   | 16r3       |                       |                                      |
| Cook        | Toohey                             | 16064500   | 369                   |                                      |
| Cook        | Turtle                             | 16025100   | 61                    |                                      |
| Cook        | Unnamed                            | 16wtld1    |                       |                                      |
| Cook        | Unnamed                            | 16041600   | 14                    | 14                                   |
| Cook        | White Pine                         | 16036900   | 374                   |                                      |
| Crow Wing   | Arrowhead                          | 18036600   | 285                   | 40                                   |
| Crow Wing   | Bass                               | 18001100   | 65                    | 13                                   |
| Crow Wing   | Bass                               | 18022900   | 114                   | 1                                    |
| Crow Wing   | Bay                                | 18003400   | 2,435                 | 1                                    |
| Crow Wing   | Big Bird                           | 18028500   | 205                   | 10                                   |
| Crow Wing   | Birchdale                          | 18017500   | 80                    | 40                                   |
| Crow Wing   | Borden                             | 18002000   | 1,038                 | 31                                   |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Crow Wing   | Buffalo                            | 18015200   | 36                    | 18                                   |
| Crow Wing   | Bulldog                            | 18001400   | 151                   | 5                                    |
| Crow Wing   | Butterfield                        | 18023100   | 225                   | 1                                    |
| Crow Wing   | Camp                               | 18001800   | 537                   | 22                                   |
| Crow Wing   | Caraway                            | 18017900   | 40                    | 32                                   |
| Crow Wing   | Carlson                            | 18039500   | 45                    | 1                                    |
| Crow Wing   | Clark                              | 18037400   | 309                   | 3                                    |
| Crow Wing   | Cole                               | 18012700   | 114                   | 1                                    |
| Crow Wing   | Crow Wing                          | 18015500   | 378                   |                                      |
| Crow Wing   | Dahler                             | 18020400   | 277                   | 28                                   |
| Crow Wing   | Deadman's                          | 18018800   | 28                    | 5                                    |
| Crow Wing   | Deer                               | 18018200   | 78                    | 30                                   |
| Crow Wing   | Dog                                | 18010700   | 71                    | 71                                   |
| Crow Wing   | Duck                               | 18017800   | 310                   | 175                                  |
| Crow Wing   | Duck                               | 18031400   | 160                   | 3                                    |
| Crow Wing   | Eagle                              | 18029600   | 356                   | 1                                    |
| Crow Wing   | Emily                              | 18020300   | 675                   | 2                                    |
| Crow Wing   | Erskine                            | 18000900   | 186                   | 7                                    |
| Crow Wing   | Faupel                             | 18023700   | 42                    | 25                                   |
| Crow Wing   | Flanders                           | 18024700   | 181                   | 20                                   |
| Crow Wing   | Garden                             | 18032900   | 262                   | 100                                  |
| Crow Wing   | Gilbert                            | 18032000   | 391                   | 7                                    |
| Crow Wing   | Goggle                             | 18022300   | 107                   | 11                                   |
| Crow Wing   | Goodrich                           | 18022600   | 382                   | 5                                    |
| Crow Wing   | Grass                              | 18036200   | 45                    | 1                                    |
| Crow Wing   | Grass                              | 18023000   | 78                    | 4                                    |
| Crow Wing   | Green                              | 18023300   | 14                    | 1                                    |
| Crow Wing   | Greer                              | 18028700   | 384                   | 20                                   |
| Crow Wing   | Half Moon                          | 18023800   | 70                    | 14                                   |
| Crow Wing   | Happy                              | 18010100   | 51                    | 36                                   |
| Crow Wing   | Hay                                | 18044400   | 46                    | 29                                   |
| Crow Wing   | Hole-in-the-Day                    | 18040100   | 217                   | 90                                   |
| Crow Wing   | Holt                               | 18002900   | 164                   | 10                                   |
| Crow Wing   | Horseshoe                          | 18031700   | 33                    | 13                                   |
| Crow Wing   | Island                             | 18005200   | 37                    | 18                                   |
| Crow Wing   | Island                             | 18038300   | 85                    | 2                                    |
| Crow Wing   | Jail                               | 18041500   | 190                   | 2                                    |
| Crow Wing   | Johnson                            | 18032800   | 129                   | 25                                   |
| Crow Wing   | Lily Pad                           | 18027500   | 47                    | 30                                   |
| Crow Wing   | Little Pine                        | 18026600   | 384                   | 20                                   |
| Crow Wing   | Little Pine                        | 18017600   | 135                   | 30                                   |
| Crow Wing   | Lizzie                             | 18041600   | 384                   | 100                                  |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Crow Wing   | Long                               | 18003100   | 80                    | 4                                    |
| Crow Wing   | Love                               | 18038800   | 88                    | 18                                   |
| Crow Wing   | Lower Dean                         | 18018100   | 372                   | 360                                  |
| Crow Wing   | Lower Mission                      | 18024300   | 739                   | 50                                   |
| Crow Wing   | Lows                               | 18018000   | 320                   | 45                                   |
| Crow Wing   | Mahnomen                           | 18012600   | 238                   | 1                                    |
| Crow Wing   | Mallard                            | 18033400   | 73                    | 4                                    |
| Crow Wing   | Maple                              | 18004500   | 68                    | 20                                   |
| Crow Wing   | Middle Cullen                      | 18037700   | 405                   | 2                                    |
| Crow Wing   | Mississippi River                  | 18r1       |                       | 1                                    |
| Crow Wing   | Mitchell                           | 18029400   | 460                   | 3                                    |
| Crow Wing   | Mollie                             | 18033500   | 421                   | 17                                   |
| Crow Wing   | Mud                                | 18009400   | 78                    | 6                                    |
| Crow Wing   | Mud                                | 18013700   | 132                   | 40                                   |
| Crow Wing   | Mud                                | 18032600   | 82                    | 60                                   |
| Crow Wing   | Mud                                | 18019800   | 103                   | 10                                   |
| Crow Wing   | Nelson                             | 18016400   | 323                   | 100                                  |
| Crow Wing   | Nisswa                             | 18039900   | 213                   | 25                                   |
| Crow Wing   | North Long                         | 18037200   | 6,178                 | 10                                   |
| Crow Wing   | Olson                              | 18017100   | 28                    | 3                                    |
| Crow Wing   | Ossawinnamakee                     | 18035200   | 739                   | 1                                    |
| Crow Wing   | Perch                              | 18030400   | 181                   | 8                                    |
| Crow Wing   | Pine                               | 18026100   | 391                   | 60                                   |
| Crow Wing   | Platte                             | 18008800   | 1,768                 | 350                                  |
| Crow Wing   | Pointon                            | 18010500   | 193                   | 14                                   |
| Crow Wing   | Rat                                | 18041000   | 100                   | 2                                    |
| Crow Wing   | Red Sand                           | 18038600   | 569                   | 28                                   |
| Crow Wing   | Rice (Blomberg's)                  | 18012100   | 78                    | 60                                   |
| Crow Wing   | Rice (Clark Lake rice bed)         | 18032700   | 181                   | 124                                  |
| Crow Wing   | Rice (Deerwood)                    | 18006800   | 185                   | 170                                  |
| Crow Wing   | Rice (Hesitation State WMA)        | 18005300   | 168                   | 138                                  |
| Crow Wing   | Rice (Lowell State WMA)            | 18040500   | 85                    | 33                                   |
| Crow Wing   | Rice (Pratt's)                     | 18031600   | 100                   | 90                                   |
| Crow Wing   | Rice Bed                           | 18018700   | 50                    | 47                                   |
| Crow Wing   | Rock                               | 18001600   | 210                   | 10                                   |
| Crow Wing   | Rogers                             | 18018400   | 249                   | 4                                    |
| Crow Wing   | Round                              | 18014700   | 144                   | 5                                    |
| Crow Wing   | Round (Round-Rice Bed State WMA)   | 18003200   | 82                    | 5                                    |
| Crow Wing   | Roy                                | 18039800   | 310                   | 5                                    |
| Crow Wing   | Sebie                              | 18016100   | 180                   | 2                                    |
| Crow Wing   | Sewells Pond                       | 18044600   | 20                    | 16                                   |
| Crow Wing   | Sibley                             | 18040400   | 412                   | 10                                   |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Crow Wing   | Smith                              | 18002800   | 486                   | 49                                   |
| Crow Wing   | South Long                         | 18013600   | 1,380                 | 4                                    |
| Crow Wing   | Stewart                            | 18036700   | 254                   | 5                                    |
| Crow Wing   | Tamarack                           | 18031800   | 34                    | 30                                   |
| Crow Wing   | Terry                              | 18016200   | 102                   | 55                                   |
| Crow Wing   | Twenty Two                         | 18000800   | 169                   | 42                                   |
| Crow Wing   | Twin Island                        | 18010600   | 85                    | 42                                   |
| Crow Wing   | Unnamed                            | 18020100   | 16                    | 1                                    |
| Crow Wing   | Unnamed                            | 18041300   | 103                   | 27                                   |
| Crow Wing   | Unnamed                            | 18055000   | 30                    | 30                                   |
| Crow Wing   | Unnamed                            | 18005500   | 70                    | 1                                    |
| Crow Wing   | Unnamed (Blackies Slough)          | 18054400   | 33                    | 20                                   |
| Crow Wing   | Unnamed (Lost Rice)                | 18022800   | 157                   | 80                                   |
| Crow Wing   | Unnamed (Nokasippi R. Rice Bed)    | 18048500   | 166                   | 40                                   |
| Crow Wing   | Unnamed (Total's Pothole)          | 18054300   | 28                    | 16                                   |
| Crow Wing   | Upper Cullen                       | 18037600   | 459                   | 23                                   |
| Crow Wing   | Upper Dean                         | 18017000   | 263                   | 10                                   |
| Crow Wing   | Upper Hay                          | 18041200   | 640                   | 2                                    |
| Crow Wing   | Upper Mission                      | 18024200   | 895                   | 5                                    |
| Crow Wing   | Upper Whitefish                    | 18031000   | 7,969                 | 50                                   |
| Crow Wing   | Velvet                             | 18028400   | 167                   | 2                                    |
| Crow Wing   | Whipple                            | 18038700   | 345                   | 40                                   |
| Crow Wing   | Whitefish                          | 18000100   | 709                   | 30                                   |
| Crow Wing   | Williams                           | 18002400   | 47                    | 3                                    |
| Crow Wing   | Wilson                             | 18004900   | 63                    | 4                                    |
| Crow Wing   | Wolf                               | 18011200   | 218                   | 25                                   |
| Dakota      | Blackhawk                          | 19005900   |                       |                                      |
| Dakota      | Chub                               | 19002000   | 301                   | 1                                    |
| Douglas     | Mud                                | 21023600   | 50                    |                                      |
| Faribault   | Minnesota                          | 22003300   | 1,915                 |                                      |
| Faribault   | Rice                               | 22000700   |                       |                                      |
| Faribault   | Rice                               | 22007500   |                       |                                      |
| Fillmore    | Rice Creek                         | 23r1       |                       |                                      |
| Freeborn    | Bear                               | 24002800   | 1,560                 |                                      |
| Freeborn    | Geneva                             | 24001500   | 1,875                 | 18                                   |
| Freeborn    | Spicer                             | 24004500   | 125                   | 100                                  |
| Freeborn    | Trenton                            | 24004900   | 184                   | 18                                   |
| Goodhue     | Cannon River                       | 25r2       |                       |                                      |
| Goodhue     | Rice Bottoms                       | 25r1       |                       |                                      |
| Goodhue     | Sturgeon                           | 25001701   |                       |                                      |
| Hennepin    | Grass                              | 27008000   | 326                   |                                      |
| Hennepin    | Rice                               | 27013200   | 294                   |                                      |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Hennepin    | Rice                               | 27011600   |                       |                                      |
| Houston     | Blue                               | 28000503   | 362                   |                                      |
| Houston     | Lawrence                           | 28000501   | 142                   |                                      |
| Houston     | Target                             | 28000502   | 424                   |                                      |
| Hubbard     | Alice                              | 29028600   | 150                   | 15                                   |
| Hubbard     | Birch Creek                        | 29r1       |                       |                                      |
| Hubbard     | Clausens                           | 29009700   | 222                   |                                      |
| Hubbard     | Crow Wing                          | 29011600   |                       |                                      |
| Hubbard     | Crow Wing River                    | 29river    |                       |                                      |
| Hubbard     | Deer                               | 29009000   | 193                   |                                      |
| Hubbard     | Eagle                              | 29025600   | 440                   | 4                                    |
| Hubbard     | Eighth Crow Wing                   | 29007200   | 493                   | 1                                    |
| Hubbard     | Eleventh Crow Wing                 | 29003600   | 752                   | 1                                    |
| Hubbard     | Fifth Crow Wing                    | 29009200   | 406                   | 10                                   |
| Hubbard     | First Crow Wing                    | 29008600   | 564                   | 50                                   |
| Hubbard     | Fishhook River                     | 29r4       |                       |                                      |
| Hubbard     | Fourth Crow Wing                   | 29007800   | 523                   | 130                                  |
| Hubbard     | Garfield                           | 29006100   | 984                   | 90                                   |
| Hubbard     | George                             | 29021600   | 882                   | 18                                   |
| Hubbard     | Hart                               | 29006300   | 236                   | 118                                  |
| Hubbard     | Hattie                             | 29030000   | 359                   |                                      |
| Hubbard     | Holland-Lucy                       | 29009500   | 44                    |                                      |
| Hubbard     | Horseshoe                          | 29005900   | 264                   |                                      |
| Hubbard     | Island                             | 29025400   | 522                   | 60                                   |
| Hubbard     | Kabekona River                     | 29r6       |                       |                                      |
| Hubbard     | Kabekona River                     | 290075T2   |                       |                                      |
| Hubbard     | Kabenkona                          | 29007500   |                       |                                      |
| Hubbard     | Little Rice                        | 29018300   | 27                    | 1                                    |
| Hubbard     | Little Stony                       | 29008000   | 55                    |                                      |
| Hubbard     | Loon                               | 29002000   | 112                   |                                      |
| Hubbard     | Lower Bottle                       | 29018000   | 712                   | 10                                   |
| Hubbard     | Lower Mud                          | 29026700   | 30                    | 30                                   |
| Hubbard     | Mantrap                            | 29015100   | 1,770                 | 200                                  |
| Hubbard     | Mud                                | 29011900   | 146                   | 30                                   |
| Hubbard     | Mud Creek                          | 29r3       |                       |                                      |
| Hubbard     | Necktie River                      | 29r2       |                       |                                      |
| Hubbard     | Ninth Crow Wing                    | 29002500   | 235                   |                                      |
| Hubbard     | Oak                                | 29006000   | 58                    | 1                                    |
| Hubbard     | Oelschlager Slough                 | 29000600   | 328                   |                                      |
| Hubbard     | Paine                              | 29021700   | 258                   |                                      |
| Hubbard     | Plantagenet                        | 29015600   | 2,620                 |                                      |
| Hubbard     | Portage                            | 29025000   | 429                   |                                      |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Hubbard     | Potato                             | 29024300   | 2,239                 | 30                                   |
| Hubbard     | Rice                               | 29017700   | 230                   | 58                                   |
| Hubbard     | Schoolcraft                        | 29021500   | 176                   | 35                                   |
| Hubbard     | Second Crow Wing                   | 29008500   | 228                   | 5                                    |
| Hubbard     | Seventh Crow Wing                  | 29009100   | 251                   | 10                                   |
| Hubbard     | Shallow                            | 29008900   | 295                   | 9                                    |
| Hubbard     | Shell River                        | 29r5       |                       |                                      |
| Hubbard     | Sixth Crow Wing                    | 29009300   | 358                   | 5                                    |
| Hubbard     | Spider                             | 29011700   | 593                   |                                      |
| Hubbard     | Spring                             | 29005400   | 43                    |                                      |
| Hubbard     | Sunday                             | 29014400   | 62                    |                                      |
| Hubbard     | Tamarack                           | 29009400   | 36                    |                                      |
| Hubbard     | Tenth Crow Wing                    | 29004500   | 185                   | 9                                    |
| Hubbard     | Third Crow Wing                    | 29007700   | 636                   | 40                                   |
| Hubbard     | Tripp                              | 29000500   | 155                   | 1                                    |
| Hubbard     | Twin                               | 29029300   |                       |                                      |
| Hubbard     | Unnamed                            | 29011500   | 16                    |                                      |
| Hubbard     | Unnamed                            | 29011800   | 21                    |                                      |
| Hubbard     | Unnamed                            | 29011400   | 24                    |                                      |
| Hubbard     | Unnamed                            | 29008400   | 87                    |                                      |
| Hubbard     | Unnamed                            | 29007900   | 38                    |                                      |
| Hubbard     | Unnamed                            | 29017900   | 16                    |                                      |
| Hubbard     | Unnamed                            | 29009900   | 26                    |                                      |
| Hubbard     | Unnamed                            | 29015800   | 60                    |                                      |
| Hubbard     | Unnamed                            | 29002100   |                       |                                      |
| Hubbard     | Unnamed                            | 29026300   | 20                    |                                      |
| Hubbard     | Unnamed                            | 29001900   | 15                    |                                      |
| Hubbard     | Unnamed (Boudora)                  | 29008200   | 48                    | 1                                    |
| Hubbard     | Unnamed (Hay Creek)                | 29055400   | 38                    | 20                                   |
| Hubbard     | Upper Bass                         | 29003400   | 30                    |                                      |
| Hubbard     | Upper Bottle                       | 29014800   | 505                   | 30                                   |
| Hubbard     | Upper Mud                          | 29028400   | 50                    | 50                                   |
| Hubbard     | Upper Twin                         | 29015700   | 212                   | 1                                    |
| Isanti      | Elizabeth                          | 30008300   | 323                   |                                      |
| Isanti      | German                             | 30010000   | 340                   |                                      |
| Isanti      | Grass                              | 30014200   | 33                    |                                      |
| Isanti      | Krone                              | 30014000   | 142                   |                                      |
| Isanti      | Lindgren                           | 30014400   | 75                    |                                      |
| Isanti      | Little Stanchfield                 | 30004400   | 155                   |                                      |
| Isanti      | Mud                                | 30006500   | 300                   |                                      |
| Isanti      | Mud                                | 30010600   | 81                    |                                      |
| Isanti      | Mud                                | 30011700   |                       |                                      |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Isanti      | North Stanchfield                  | 30014300   | 153                   |                                      |
| Isanti      | Rice                               | 30001800   |                       |                                      |
| Isanti      | Section                            | 30006000   | 130                   |                                      |
| Isanti      | South Stanchfield                  | 30013800   | 433                   |                                      |
| Isanti      | Typo                               | 30000900   | 273                   |                                      |
| Isanti      | Upper Rice                         | 30005700   | 208                   | 208                                  |
| Itasca      | Ann                                | 31030500   | 94                    | 5                                    |
| Itasca      | Aspen                              | 31069000   | 86                    | 5                                    |
| Itasca      | Bass                               | 31057600   | 2,844                 | 427                                  |
| Itasca      | Big Fork River                     | 31r3       |                       |                                      |
| Itasca      | Birdseye                           | 31083400   | 73                    | 11                                   |
| Itasca      | Blackberry                         | 31021000   | 240                   | 50                                   |
| Itasca      | Blackwater                         | 31056100   | 674                   | 300                                  |
| Itasca      | Bluebill                           | 31026500   | 144                   | 14                                   |
| Itasca      | Bosley                             | 31040300   | 41                    | 10                                   |
| Itasca      | Bowstring (& Bowstring River)      | 31081300   | 8,900                 | 1,335                                |
| Itasca      | Bowstring River                    | 31r4       |                       |                                      |
| Itasca      | Buckman                            | 31027200   | 222                   | 33                                   |
| Itasca      | Clearwater                         | 31040200   | 67                    | 10                                   |
| Itasca      | Clubhouse                          | 3105400    |                       |                                      |
| Itasca      | Coddington                         | 31088300   | 70                    | 18                                   |
| Itasca      | Copenhagen                         | 31053900   |                       |                                      |
| Itasca      | Crescent                           | 31029400   | 42                    | 2                                    |
| Itasca      | Crooked                            | 31020300   | 80                    | 12                                   |
| Itasca      | Cut Foot Sioux                     | 31085700   | 3,222                 | 322                                  |
| Itasca      | Damon                              | 31094400   | 53                    | 20                                   |
| Itasca      | Decker                             | 31093400   | 292                   | 58                                   |
| Itasca      | Deer                               | 31034400   | 1,854                 |                                      |
| Itasca      | Dishpan                            | 31099200   | 15                    | 15                                   |
| Itasca      | Dixon                              | 31092100   | 666                   | 67                                   |
| Itasca      | Dora                               | 31088200   | 477                   | 89                                   |
| Itasca      | Egg                                | 31081700   | 118                   | 11                                   |
| Itasca      | Farley                             | 31090200   | 33                    | 5                                    |
| Itasca      | First River                        | 31081800   | 228                   | 160                                  |
| Itasca      | Grass                              | 31072700   |                       |                                      |
| Itasca      | Grass                              | 31052700   |                       |                                      |
| Itasca      | Gunny Sack                         | 31026700   | 81                    | 8                                    |
| Itasca      | Hamrey                             | 31091100   | 61                    | 15                                   |
| Itasca      | Harrigan                           | 31017400   | 27                    | 3                                    |
| Itasca      | Hay                                | 31003700   |                       |                                      |
| Itasca      | Helen                              | 31084000   | 109                   | 76                                   |
| Itasca      | Hunters                            | 31045000   | 162                   | 16                                   |



| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Itasca      | Ima                                | 31063400   |                       |                                      |
| Itasca      | Irene                              | 31087800   | 10                    | 1                                    |
| Itasca      | Island                             | 31075400   | 291                   | 10                                   |
| Itasca      | Kelly                              | 31029100   | 31                    | 19                                   |
| Itasca      | Lawrence                           | 31023100   | 382                   | 19                                   |
| Itasca      | Leighton                           | 31003200   | 242                   | 12                                   |
| Itasca      | Lillian                            | 31075000   | 90                    | 14                                   |
| Itasca      | Little Ball Club                   | 31082200   | 181                   | 10                                   |
| Itasca      | Little Cut Foot                    | 31085200   | 1,357                 | 136                                  |
| Itasca      | Little Drum                        | 31074100   | 89                    | 22                                   |
| Itasca      | Little Island                      | 31017900   | 26                    | 3                                    |
| Itasca      | Little Moose                       | 31061000   | 234                   | 12                                   |
| Itasca      | Little Rice                        | 31071600   |                       |                                      |
| Itasca      | Little Spring                      | 31079700   | 121                   | 3                                    |
| Itasca      | Little White Oak                   | 31074000   | 493                   | 25                                   |
| Itasca      | Lost                               | 31028900   |                       |                                      |
| Itasca      | Lost                               | 31090000   | 26                    | 5                                    |
| Itasca      | Lower Pigeon                       | 31089300   | 53                    | 20                                   |
| Itasca      | Marble                             | 31027100   | 155                   | 20                                   |
| Itasca      | Marie                              | 31093700   | 45                    | 10                                   |
| Itasca      | Middle Pigeon                      | 31089200   | 182                   | 15                                   |
| Itasca      | Mississippi River                  | 31r6       |                       |                                      |
| Itasca      | Morph                              | 31092900   | 67                    | 3                                    |
| Itasca      | Mosomo                             | 31086100   | 47                    | 5                                    |
| Itasca      | Mud                                | 31020600   | 271                   | 203                                  |
| Itasca      | Munzer                             | 31036000   | 108                   | 3                                    |
| Itasca      | Nagel                              | 31037700   | 90                    | 50                                   |
| Itasca      | Natures                            | 31087700   | 2,885                 | 2,499                                |
| Itasca      | O'Donnell                          | 31030300   | 47                    | 10                                   |
| Itasca      | Otter                              | 31030100   |                       |                                      |
| Itasca      | Pigeon Dam                         | 31089400   | 511                   | 500                                  |
| Itasca      | Pokegama                           | 31053200   | 15,600                | 100                                  |
| Itasca      | Pothole                            | 31099100   |                       |                                      |
| Itasca      | Prairie                            | 31038400   | 1,167                 | 45                                   |
| Itasca      | Prairie (& Prairie River)          | 31005300   | 29                    | 1                                    |
| Itasca      | Rabbits                            | 31092300   | 209                   | 157                                  |
| Itasca      | Raven                              | 31092500   | 97                    | 70                                   |
| Itasca      | Rice                               | 31031500   | 37                    | 15                                   |
| Itasca      | Rice                               | 31071700   |                       |                                      |
| Itasca      | Rice                               | 31077700   |                       |                                      |
| Itasca      | Rice                               | 31087600   | 911                   | 729                                  |
| Itasca      | Rice                               | 31020100   | 115                   | 6                                    |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Itasca      | Rice                               | 31070700   |                       |                                      |
| Itasca      | Rice                               | 31094200   | 39                    |                                      |
| Itasca      | Rice Creek                         | 31r5       |                       |                                      |
| Itasca      | Rice Creek                         | 31r1       |                       |                                      |
| Itasca      | Rice River                         | 31r2       |                       |                                      |
| Itasca      | Ruby                               | 31042200   | 243                   | 5                                    |
| Itasca      | Sand                               | 31082600   | 3,391                 | 50                                   |
| Itasca      | Shallow Pond                       | 31091000   | 281                   | 11                                   |
| Itasca      | Simpson                            | 31086700   | 35                    | 5                                    |
| Itasca      | Sioux                              | 31090700   | 69                    | 27                                   |
| Itasca      | Skimmerhorn                        | 31093900   | 30                    | 6                                    |
| Itasca      | Soneman                            | 31027600   | 40                    | 16                                   |
| Itasca      | Spruce                             | 31034700   | 58                    | 58                                   |
| Itasca      | Stevens                            | 31071800   | 224                   | 11                                   |
| Itasca      | Stone Axe                          | 31082800   | 37                    | 4                                    |
| Itasca      | Swan                               | 31006700   | 2,472                 | 50                                   |
| Itasca      | Tuttle                             | 31082100   | 56                    | 16                                   |
| Itasca      | Unnamed                            | 31081500   | 109                   | 5                                    |
| Itasca      | Unnamed                            | 31096100   | 10                    | 2                                    |
| Itasca      | Unnamed                            | 31020400   | 28                    | 3                                    |
| Itasca      | Unnamed                            | 31032200   | 28                    | 2                                    |
| Itasca      | Unnamed                            | 31006600   | 23                    | 3                                    |
| Itasca      | Unnamed                            | 31086000   | 24                    | 5                                    |
| Itasca      | Upper Pigeon                       | 31090800   | 86                    | 10                                   |
| Itasca      | Walters                            | 31029800   | 120                   | 18                                   |
| Itasca      | Wart                               | 31085900   | 14                    | 5                                    |
| Itasca      | White Fish                         | 31014200   | 31                    | 2                                    |
| Itasca      | White Oak                          | 31077600   | 905                   | 271                                  |
| Itasca      | Whitefish                          | 31084300   | 493                   | 10                                   |
| Itasca      | Wilderness                         | 31090100   | 26                    | 4                                    |
| Kanabec     | Ann                                | 33004000   | 363                   | 18                                   |
| Kanabec     | Grass                              | 33001300   |                       |                                      |
| Kanabec     | Kent                               | 33003500   | 34                    |                                      |
| Kanabec     | Knife                              | 33002800   |                       |                                      |
| Kanabec     | Mud                                | 33001500   |                       |                                      |
| Kanabec     | Pomroy                             | 33000900   | 267                   |                                      |
| Kanabec     | Rice                               | 33001100   | 172                   |                                      |
| Kanabec     | Rice                               | 33003100   |                       |                                      |
| Kanabec     | Sells                              | 33001800   | 64                    |                                      |
| Kanabec     | Twin or East                       | 33001900   | 27                    |                                      |
| Kanabec     | Unnamed                            | 33002900   | 21                    |                                      |
| Kanabec     | Unnamed                            | 33011100   | 33                    | 27                                   |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Kanabec     | Unnamed                            | 33001400   | 30                    |                                      |
| Kanabec     | Unnamed                            | 33007200   | 31                    | 1                                    |
| Kanabec     | Unnamed                            | 33001200   | 11                    |                                      |
| Kandiyohi   | Bear                               | 34014800   | 128                   |                                      |
| Kandiyohi   | Blaamyhre                          | 34034500   | 121                   |                                      |
| Kandiyohi   | Eight                              | 34014600   | 89                    |                                      |
| Kandiyohi   | Glesne                             | 34035200   | 205                   |                                      |
| Kandiyohi   | Monongalia                         | 34IMP001   | 1,500                 |                                      |
| Kandiyohi   | Mud                                | 34015800   | 2,516                 |                                      |
| Kandiyohi   | Ole                                | 34034200   | 66                    |                                      |
| Kandiyohi   | Unnamed                            | 34023600   | 117                   |                                      |
| Koochiching | Nett                               | 36000100   | 7,369                 |                                      |
| Koochiching | Rainy Lake                         | 36000100   | 7,301                 | 2,000                                |
| Koochiching | Rat Root                           | 36000600   | 734                   |                                      |
| Koochiching | Tilson Creek                       | 36r1       |                       |                                      |
| Lake        | Bald Eagle                         | 38063700   | 1,243                 |                                      |
| Lake        | Basswood                           | 38064500   | 14,610                | 485                                  |
| Lake        | Bluebill                           | 38026100   | 44                    | 11                                   |
| Lake        | Bonga                              | 38076200   | 138                   | 138                                  |
| Lake        | Cabin                              | 38026000   | 71                    | 55                                   |
| Lake        | Campers                            | 38067900   | 56                    | 56                                   |
| Lake        | Charity                            | 38005500   | 26                    |                                      |
| Lake        | Christianson                       | 38075000   | 158                   |                                      |
| Lake        | Clark                              | 38067400   |                       |                                      |
| Lake        | Clark                              | 38064700   | 49                    |                                      |
| Lake        | Cloquet                            | 38053900   | 176                   |                                      |
| Lake        | Cloquet River                      | 38r1       |                       |                                      |
| Lake        | Comfort                            | 38029000   | 42                    |                                      |
| Lake        | Cougar                             | 38076700   | 71                    | 1                                    |
| Lake        | Cramer                             | 38001400   | 69                    | 55                                   |
| Lake        | Crooked                            | 38002400   |                       |                                      |
| Lake        | Crooked                            | 38081700   |                       |                                      |
| Lake        | Crown                              | 38041900   | 69                    |                                      |
| Lake        | Driller                            | 38065200   | 24                    |                                      |
| Lake        | Dumbbell                           | 38039300   | 476                   | 48                                   |
| Lake        | Ella Hall                          | 38072700   | 372                   | 1                                    |
| Lake        | Fall                               | 38081100   | 2,322                 | 23                                   |
| Lake        | Farm                               | 38077900   | 1,292                 |                                      |
| Lake        | Flat Horn                          | 38056800   | 52                    |                                      |
| Lake        | Fools                              | 38076100   | 14                    | 14                                   |
| Lake        | Gabbro                             | 38070100   | 927                   |                                      |
| Lake        | Garden                             | 38078200   | 4,236                 | 212                                  |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Lake        | Gegoka                             | 38057300   | 174                   | 14                                   |
| Lake        | Greenwood                          | 38065600   | 1,469                 | 15                                   |
| Lake        | Harris                             | 38073600   | 121                   | 18                                   |
| Lake        | Hjalmer                            | 38075800   | 109                   | 2                                    |
| Lake        | Hoist                              | 38025100   | 117                   |                                      |
| Lake        | Horse River                        | 38r5       |                       |                                      |
| Lake        | Hula                               | 38072800   | 121                   | 121                                  |
| Lake        | Isabella                           | 38039600   | 1,318                 |                                      |
| Lake        | Isabella River                     | 38r4       |                       |                                      |
| Lake        | Island River                       | 38084200   | 49                    | 49                                   |
| Lake        | Kawishiwi                          | 38008000   | 468                   |                                      |
| Lake        | Kawishiwi River                    | 38r2       |                       |                                      |
| Lake        | Little Gabbro                      | 38070300   | 151                   |                                      |
| Lake        | Little Wampus                      | 38068400   |                       |                                      |
| Lake        | Lobo                               | 38076600   | 132                   | 99                                   |
| Lake        | Manomin                            | 38061600   | 455                   | 23                                   |
| Lake        | Middle McDougal                    | 38065800   | 104                   |                                      |
| Lake        | Moose                              | 38003600   | 201                   |                                      |
| Lake        | Mud                                | 38074200   | 164                   |                                      |
| Lake        | Muskeg                             | 38078800   | 178                   | 71                                   |
| Lake        | Newton                             | 38078400   |                       |                                      |
| Lake        | Nine A.M.                          | 38044500   | 27                    | 14                                   |
| Lake        | North McDougal                     | 38068600   | 273                   |                                      |
| Lake        | Papoose                            | 38081800   | 54                    | 3                                    |
| Lake        | Phantom                            | 38065300   | 70                    |                                      |
| Lake        | Railroad                           | 38065500   | 11                    | 1                                    |
| Lake        | Rice                               | 38046500   | 206                   | 206                                  |
| Lake        | Roe                                | 38013900   | 76                    |                                      |
| Lake        | Round Island                       | 38041700   | 58                    | 58                                   |
| Lake        | Sand                               | 38073500   | 506                   | 51                                   |
| Lake        | Sand River                         | 38r3       |                       |                                      |
| Lake        | Scott                              | 38027100   | 52                    |                                      |
| Lake        | Silver Island                      | 38021900   | 1,239                 |                                      |
| Lake        | Slate                              | 38066600   | 293                   |                                      |
| Lake        | Snowbank                           | 38052900   | 4,819                 | 50                                   |
| Lake        | Source                             | 38065400   | 35                    | 1                                    |
| Lake        | Sourdough                          | 38070800   | 17                    | 17                                   |
| Lake        | South McDougal                     | 38065900   | 277                   | 3                                    |
| Lake        | Stony                              | 38066000   | 409                   | 245                                  |
| Lake        | Stony River                        | 38r6       |                       |                                      |
| Lake        | Upland                             | 38075600   | 74                    | 1                                    |
| Lake        | Vera                               | 38049100   | 262                   |                                      |

| County name       | Location Name (i.e. Lake or River)   | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------------|--------------------------------------|------------|-----------------------|--------------------------------------|
| Lake              | Wampus                               | 38068500   | 146                   |                                      |
| Lake              | Wind                                 | 38064200   | 952                   | 10                                   |
| Lake              | Wood                                 | 38072900   | 587                   | 125                                  |
| Lake of the Woods | Baudette River                       | 39r2       |                       |                                      |
| Lake of the Woods | Bostick Creek                        | 39r1       |                       |                                      |
| Lake of the Woods | Lake of the Woods                    | 39000200   | 950,400               | 225                                  |
| Lake of the Woods | Rainy River                          | 39r5       |                       |                                      |
| Lake of the Woods | Roseau Flowage                       | 39IMP001   | 200                   | 100                                  |
| Lake of the Woods | Silver Creek                         | 39r3       |                       |                                      |
| Lake of the Woods | Winter Road River                    | 39r4       |                       |                                      |
| Le Sueur          | Rice                                 | 40wtld1    |                       |                                      |
| Le Sueur          | Rice                                 | 40011400   |                       |                                      |
| Le Sueur          | Rice                                 | 40003700   |                       |                                      |
| Le Sueur          | Rice                                 | 40001600   |                       |                                      |
| Mahnomen          | Grass                                | 44004700   | 22                    |                                      |
| Mahnomen          | Long                                 | 44000200   | 117                   |                                      |
| Mahnomen          | Peabody                              | 44-wetld   |                       |                                      |
| Mahnomen          | Rice                                 | 44002400   | 120                   |                                      |
| Mahnomen          | Roy                                  | 44000100   | 689                   |                                      |
| Mahnomen          | Sargent (Little Rice)                | 44010800   | 174                   |                                      |
| McLeod            | Grass                                | 43001300   |                       |                                      |
| McLeod            | Rice                                 | 43004200   |                       |                                      |
| McLeod            | Schaefer Prairie                     | 43r1       |                       |                                      |
| Mille Lacs        | Dewitt Marsh                         | 48002000   | 110                   | 131                                  |
| Mille Lacs        | Dewitt Pool                          | 48IMP004   | 146                   | 131                                  |
| Mille Lacs        | Ernst Pool                           | 48003600   | 300                   | 200                                  |
| Mille Lacs        | Korsness Pool 1                      | 48003500   | 130                   | 90                                   |
| Mille Lacs        | Mille Lacs WMA - Headquarters 2 Pool | W9004009   | 500                   | 13                                   |
| Mille Lacs        | Mille Lacs WMA - Jones 1 Dk Pool     | W9004008   | 520                   | 3                                    |
| Mille Lacs        | Mille Lacs WMA - Korsness Pool 2     | W9004002   | 33                    | 30                                   |
| Mille Lacs        | Mille Lacs WMA - Korsness Pool 3     | W9004003   | 18                    | 5                                    |
| Mille Lacs        | Mille Lacs WMA - Olson Pool          | W9004007   | 85                    | 2                                    |
| Mille Lacs        | Mille Lacs WMA - Townhall Pool       | W9004010   | 110                   | 3                                    |
| Mille Lacs        | Ogechie                              | 48001400   | 732                   |                                      |
| Mille Lacs        | Onamia                               | 48000900   | 2,250                 | 1,350                                |
| Mille Lacs        | Rice                                 | 48001000   | 512                   |                                      |
| Mille Lacs        | Shakopee                             | 48001200   | 771                   |                                      |
| Mille Lacs        | Unnamed                              | 48004300   | 60                    | 10                                   |
| Mille Lacs        | Unnamed                              | 48004400   | 500                   |                                      |
| Mille Lacs        | Unnamed                              | 48005400   | 32                    | 25                                   |
| Mille Lacs        | W. brnch Groundhouse Riv             | 48IMP002   | 50                    | 1                                    |
| Morrison          | Bernhart                             | 49013500   | 39                    |                                      |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Morrison    | Coon                               | 49002000   | 75                    | 75                                   |
| Morrison    | Crookneck                          | 49013300   | 200                   |                                      |
| Morrison    | Hannah                             | 49001400   | 109                   | 27                                   |
| Morrison    | Long                               | 49001500   | 128                   | 32                                   |
| Morrison    | Longs                              | 49010400   | 60                    |                                      |
| Morrison    | Madaline                           | 49010100   | 50                    |                                      |
| Morrison    | Miller                             | 49005100   | 39                    | 9                                    |
| Morrison    | Mud                                | 49009500   | 105                   |                                      |
| Morrison    | Mud                                | 49007200   | 83                    | 5                                    |
| Morrison    | Mud                                | 49002700   | 23                    | 9                                    |
| Morrison    | Mud                                | 49001800   |                       |                                      |
| Morrison    | Peavy                              | 49000500   | 140                   |                                      |
| Morrison    | Pelkey                             | 49003000   | 113                   | 10                                   |
| Morrison    | Placid                             | 49008000   | 537                   |                                      |
| Morrison    | Platte River                       | 49r2       |                       |                                      |
| Morrison    | Popple                             | 49003300   | 153                   |                                      |
| Morrison    | Rice                               | 49002500   | 323                   | 250                                  |
| Morrison    | Rice Creek                         | 49r1       |                       |                                      |
| Morrison    | Round                              | 49001900   | 134                   | 14                                   |
| Morrison    | Skunk                              | 49002600   | 320                   | 256                                  |
| Morrison    | Skunk                              | 49000700   |                       |                                      |
| Morrison    | Sullivan                           | 49001600   | 1,199                 | 20                                   |
| Morrison    | Twelve                             | 49000600   | 159                   | 80                                   |
| Nicollet    | Rice                               | 52003300   |                       |                                      |
| Otter Tail  | Armor                              | 56038100   |                       |                                      |
| Otter Tail  | Beauty Shore                       | 56019500   | 233                   |                                      |
| Otter Tail  | Berger                             | 56114900   | 190                   |                                      |
| Otter Tail  | Davies                             | 56031100   | 69                    |                                      |
| Otter Tail  | Dead                               | 56038300   | 7,827                 |                                      |
| Otter Tail  | Duck                               | 56092500   | 41                    |                                      |
| Otter Tail  | East Red River                     | 56057300   | 292                   |                                      |
| Otter Tail  | Emma                               | 56019400   | 473                   |                                      |
| Otter Tail  | Gourd                              | 56013900   |                       |                                      |
| Otter Tail  | Grass                              | 56011500   |                       |                                      |
| Otter Tail  | Grass                              | 56072300   |                       |                                      |
| Otter Tail  | Grass                              | 56071700   |                       |                                      |
| Otter Tail  | Head                               | 56021300   | 499                   |                                      |
| Otter Tail  | Little McDonald                    | 56032800   | 1,506                 |                                      |
| Otter Tail  | Long                               | 56021000   |                       |                                      |
| Otter Tail  | Mud                                | 56021500   | 138                   |                                      |
| Otter Tail  | Mud                                | 56022200   | 437                   |                                      |
| Otter Tail  | Mud                                | 56013200   | 155                   |                                      |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Otter Tail  | Mud                                | 56114800   | 134                   |                                      |
| Otter Tail  | North Maple                        | 56001300   | 161                   |                                      |
| Otter Tail  | North Rice                         | 56034900   | 103                   |                                      |
| Otter Tail  | Otter Tail River                   | 56r1       |                       |                                      |
| Otter Tail  | Peterson                           | 56047100   | 141                   |                                      |
| Otter Tail  | Rankle                             | 56093500   | 57                    |                                      |
| Otter Tail  | Reed                               | 56087600   | 155                   |                                      |
| Otter Tail  | Rice                               | 56000600   |                       |                                      |
| Otter Tail  | Rice                               | 56035200   |                       |                                      |
| Otter Tail  | Rice                               | 56070200   |                       |                                      |
| Otter Tail  | Rice                               | 56021100   | 263                   |                                      |
| Otter Tail  | Rice                               | 56036300   | 350                   |                                      |
| Otter Tail  | Rush                               | 56014100   | 5,340                 |                                      |
| Otter Tail  | Sharp                              | 56048200   | 160                   |                                      |
| Otter Tail  | Sixteen                            | 56010000   | 107                   |                                      |
| Otter Tail  | South Maple                        | 56000400   | 160                   |                                      |
| Otter Tail  | Star                               | 56038500   | 4,809                 |                                      |
| Otter Tail  | Tamarack                           | 56019200   | 440                   |                                      |
| Otter Tail  | Tamarack                           | 56043300   | 470                   |                                      |
| Otter Tail  | Unnamed                            | 56127300   | 126                   |                                      |
| Otter Tail  | Unnamed                            | 56151700   | 23                    |                                      |
| Otter Tail  | Unnamed                            | 56155000   | 14                    |                                      |
| Otter Tail  | Unnamed                            | 56157800   | 29                    |                                      |
| Otter Tail  | Unnamed                            | 56019800   | 69                    |                                      |
| Otter Tail  | Unnamed                            | 56028400   | 83                    |                                      |
| Otter Tail  | Unnamed                            | 56108300   | 198                   |                                      |
| Otter Tail  | Unnamed                            | 56092700   | 35                    |                                      |
| Otter Tail  | Unnamed                            | 56125900   | 12                    |                                      |
| Otter Tail  | West Battle                        | 56023900   |                       |                                      |
| Otter Tail  | West Lost                          | 56048100   | 915                   |                                      |
| Otter Tail  | Wing River                         | 56004300   | 138                   |                                      |
| Pine        | Big Pine                           | 58013800   |                       |                                      |
| Pine        | Cedar                              | 58008900   | 71                    |                                      |
| Pine        | Crooked                            | 58002600   | 94                    | 85                                   |
| Pine        | Fox                                | 58010200   |                       |                                      |
| Pine        | Grass                              | 58012500   |                       |                                      |
| Pine        | Hay Creek Flowage                  | 58000500   | 66                    | 40                                   |
| Pine        | Kettle River                       | 58r2       |                       |                                      |
| Pine        | Little North Sturgeon              | 58006600   | 20                    |                                      |
| Pine        | McCormick                          | 58005800   |                       |                                      |
| Pine        | Passenger                          | 58007600   | 75                    |                                      |
| Pine        | Pokegama (& River)                 | 58014200   | 1,621                 | 16                                   |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Pine        | Rush                               | 58007800   | 88                    |                                      |
| Pine        | Stanton                            | 58011100   | 84                    | 34                                   |
| Pine        | Willow River                       | 58r1       |                       |                                      |
| Polk        | Unnamed (Round)                    | 60072100   | 9                     | 2                                    |
| Pope        | Rice                               | 61006900   |                       |                                      |
| Ramsey      | Grass                              | 62007400   |                       |                                      |
| Redwood     | Rice Creek                         | 64r1       |                       |                                      |
| Rice        | Cedar                              | 66005200   | 927                   | 93                                   |
| Rice        | Dudley                             | 66001400   | 83                    |                                      |
| Rice        | Hatch                              | 66006300   | 102                   | 10                                   |
| Rice        | Hunt                               | 66004700   | 190                   | 19                                   |
| Rice        | Kelly                              | 66001500   | 62                    |                                      |
| Rice        | Mud                                | 66005400   | 269                   | 54                                   |
| Rice        | Pooles                             | 66004600   | 182                   |                                      |
| Rice        | Rice                               | 66004800   |                       |                                      |
| Rice        | Unnamed                            | 66010300   | 26                    |                                      |
| Rice        | Weinberger                         | 66004100   | 53                    | 8                                    |
| Rice        | Willing                            | 66005100   | 53                    | 5                                    |
| Roseau      | Bednar Impoundment                 | 68IMP002   | 240                   | 40                                   |
| Scott       | Artic                              | 70008500   |                       |                                      |
| Scott       | Blue                               | 70008800   | 316                   | 120                                  |
| Scott       | Fisher                             | 70008700   | 396                   | 190                                  |
| Scott       | Rice                               | 70006000   |                       |                                      |
| Scott       | Rice                               | 70002500   | 328                   | 160                                  |
| Scott       | Rice                               | 70000100   |                       |                                      |
| Sherburne   | Big Mud                            | 71008500   | 263                   | 100                                  |
| Sherburne   | Buck Lake                          | 71IMP007   | 30                    | 26                                   |
| Sherburne   | Clitty                             | 71011600   | 56                    |                                      |
| Sherburne   | Fremont                            | 71001600   | 466                   |                                      |
| Sherburne   | Jim                                | 71011100   | 20                    | 20                                   |
| Sherburne   | Johnson Slough                     | 71IMP004   | 65                    | 10                                   |
| Sherburne   | Johnson Slought                    | 71008400   |                       |                                      |
| Sherburne   | Josephine                          | 71006800   | 132                   |                                      |
| Sherburne   | Josephine Pool                     | 71IMP008   | 143                   | 72                                   |
| Sherburne   | Kliever Marsh                      | 71000300   | 37                    |                                      |
| Sherburne   | Long Pond                          | 71003600   | 82                    |                                      |
| Sherburne   | Lower Roadside                     | 71IMP006   | 8                     | 7                                    |
| Sherburne   | Lundberg Slough                    | 71010900   | 50                    |                                      |
| Sherburne   | Muskrat Pool                       | 71IMP003   | 299                   | 15                                   |
| Sherburne   | Orrock Lake                        | 71IMP010   | 215                   | 162                                  |
| Sherburne   | Rice                               | 71001500   | 11                    |                                      |
| Sherburne   | Rice                               | 71007800   | 505                   |                                      |



| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Sherburne   | Rice                               | 71014200   | 187                   | 2                                    |
| Sherburne   | Schoolhouse Pool                   | 71IMP009   | 225                   | 90                                   |
| Sherburne   | Sherburne NWR - Pool 1             | 71IMP001   | 2                     | 2                                    |
| Sherburne   | Sherburne NWR - Pool 2             | 71IMP002   | 30                    | 15                                   |
| Sherburne   | Sherburne NWR - Pool 31            | 71IMP011   |                       |                                      |
| Sherburne   | Unnamed                            | 71002500   | 31                    |                                      |
| Sherburne   | Upper Roadside                     | 71IMP005   |                       |                                      |
| Sibley      | Titlow                             | 72004200   | 924                   |                                      |
| St. Louis   | ???                                | 69IMP002   |                       | 15                                   |
| St. Louis   | Alden                              | 69013100   | 190                   |                                      |
| St. Louis   | Anchor                             | 69064100   | 316                   | 32                                   |
| St. Louis   | Angell Pool                        | W0889001   | 500                   | 80                                   |
| St. Louis   | Artichoke                          | 69062300   | 306                   |                                      |
| St. Louis   | Balkan                             | 69086000   | 36                    | 2                                    |
| St. Louis   | Bear                               | 69011200   | 125                   | 125                                  |
| St. Louis   | Bear Island River                  | 69r8       |                       |                                      |
| St. Louis   | Bear Trap                          | 69008900   | 131                   |                                      |
| St. Louis   | Big                                | 69019000   | 2,049                 | 20                                   |
| St. Louis   | Big Rice                           | 69017800   | 416                   | 416                                  |
| St. Louis   | Big Rice                           | 69066900   | 2,072                 | 1,700                                |
| St. Louis   | Birch                              | 69000300   | 7,628                 | 381                                  |
| St. Louis   | Black                              | 69074000   | 118                   |                                      |
| St. Louis   | Blueberry                          | 69005400   | 130                   | 13                                   |
| St. Louis   | Bootleg                            | 69045200   | 352                   |                                      |
| St. Louis   | Breda                              | 69003700   | 137                   | 135                                  |
| St. Louis   | Burntside                          | 69011800   | 7,314                 |                                      |
| St. Louis   | Canary                             | 69005500   | 22                    | 1                                    |
| St. Louis   | Caribou                            | 69048900   | 569                   | 3                                    |
| St. Louis   | Cloquet River                      | 69r5       |                       |                                      |
| St. Louis   | Comet                              | 69026700   | 28                    |                                      |
| St. Louis   | Cranberry                          | 69014700   | 69                    |                                      |
| St. Louis   | Crane                              | 69061600   | 3,396                 | 600                                  |
| St. Louis   | Deadmans                           | 69IMP001   | 5                     |                                      |
| St. Louis   | Dollar                             | 69053400   | 51                    | 51                                   |
| St. Louis   | Duck                               | 69019100   | 126                   |                                      |
| St. Louis   | Eagles Nest #3                     | 69028500   | 1,028                 |                                      |
| St. Louis   | East Stone                         | 69063800   | 92                    | 24                                   |
| St. Louis   | East Twin                          | 69016300   |                       |                                      |
| St. Louis   | Echo                               | 69061500   |                       |                                      |
| St. Louis   | Ed Shave                           | 69019900   | 90                    |                                      |
| St. Louis   | Elliot                             | 69064200   | 393                   | 20                                   |
| St. Louis   | Embarrass River                    | 69r3       |                       |                                      |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| St. Louis   | Five Mile                          | 69028800   | 106                   | 10                                   |
| St. Louis   | Four Mile                          | 69028100   | 86                    | 1                                    |
| St. Louis   | Gafvert                            | 69028000   | 33                    | 1                                    |
| St. Louis   | George                             | 69004000   | 42                    |                                      |
| St. Louis   | Gill                               | 69066700   | 18                    |                                      |
| St. Louis   | Grand                              | 69051100   | 1,742                 | 10                                   |
| St. Louis   | Grass                              | 69077600   | 49                    | 1                                    |
| St. Louis   | Grassey                            | 69091300   |                       |                                      |
| St. Louis   | Grassy                             | 69008200   |                       |                                      |
| St. Louis   | Grassy                             | 69021600   |                       |                                      |
| St. Louis   | Gull                               | 69009200   | 196                   | 20                                   |
| St. Louis   | Hay                                | 69044100   | 47                    |                                      |
| St. Louis   | Hay                                | 69043500   | 78                    | 78                                   |
| St. Louis   | Hay                                | 69015000   | 32                    | 1                                    |
| St. Louis   | Hay                                | 69057900   | 114                   | 114                                  |
| St. Louis   | Hay                                | 69043900   | 42                    | 1                                    |
| St. Louis   | Hay                                | 69041700   | 82                    | 45                                   |
| St. Louis   | Hockey                             | 69084900   | 139                   | 70                                   |
| St. Louis   | Hoodoo                             | 69080200   | 252                   | 252                                  |
| St. Louis   | Horseshoe                          | 69025500   | 39                    | 10                                   |
| St. Louis   | Indian                             | 69002300   | 57                    |                                      |
| St. Louis   | Jeanette                           | 69045600   |                       |                                      |
| St. Louis   | Johnson                            | 69011700   | 473                   | 24                                   |
| St. Louis   | Joker                              | 69001500   | 46                    | 5                                    |
| St. Louis   | King                               | 69000800   | 320                   | 39                                   |
| St. Louis   | Kylen                              | 69003400   | 16                    | 2                                    |
| St. Louis   | La Pond                            | 69017700   | 176                   | 176                                  |
| St. Louis   | Leeman                             | 69087500   | 284                   | 90                                   |
| St. Louis   | Lieung                             | 69012300   | 476                   | 10                                   |
| St. Louis   | Little Birch                       | 69027100   | 58                    |                                      |
| St. Louis   | Little Cloquet River               | 69r6       |                       |                                      |
| St. Louis   | Little Indian Sioux River          | 69r7       |                       |                                      |
| St. Louis   | Little Mesaba                      | 69043600   |                       |                                      |
| St. Louis   | Little Rice                        | 69061200   | 266                   | 266                                  |
| St. Louis   | Little Sandy                       | 69072900   | 89                    | 89                                   |
| St. Louis   | Little Stone                       | 69002800   | 163                   |                                      |
| St. Louis   | Little Vermillion                  | 69060800   | 558                   |                                      |
| St. Louis   | Long (Butterball)                  | 69004400   | 442                   | 400                                  |
| St. Louis   | Low                                | 69007000   | 353                   | 71                                   |
| St. Louis   | Lower Pauness                      | 69046400   | 162                   | 1                                    |
| St. Louis   | Martin                             | 69076800   | 71                    |                                      |
| St. Louis   | Moose                              | 69079800   | 82                    | 62                                   |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| St. Louis   | Mud                                | 69015100   | 51                    |                                      |
| St. Louis   | Mud                                | 69080000   | 71                    | 18                                   |
| St. Louis   | Mud                                | 69004700   |                       |                                      |
| St. Louis   | Mud Hen                            | 69049400   | 165                   |                                      |
| St. Louis   | Myrtle                             | 69074900   | 876                   |                                      |
| St. Louis   | Nels                               | 69008000   | 200                   | 2                                    |
| St. Louis   | Nichols                            | 69062700   | 444                   | 22                                   |
| St. Louis   | One Pine                           | 69006100   | 369                   | 37                                   |
| St. Louis   | Oriniack                           | 69058700   | 748                   |                                      |
| St. Louis   | Papoose                            | 69002400   | 16                    | 16                                   |
| St. Louis   | Pelican (& River)                  | 69084100   | 11,944                | 119                                  |
| St. Louis   | Perch                              | 69068800   | 79                    | 32                                   |
| St. Louis   | Petrel Creek                       | 69r4       |                       |                                      |
| St. Louis   | Picket                             | 69007900   | 78                    | 7                                    |
| St. Louis   | Pike River                         | 69r1       |                       |                                      |
| St. Louis   | Prairie                            | 69084800   | 807                   | 16                                   |
| St. Louis   | Rainy                              | 69069400   | 220,800               |                                      |
| St. Louis   | Rainy (Grassy Narrows)             | 69064000   |                       |                                      |
| St. Louis   | Rat                                | 69092200   |                       |                                      |
| St. Louis   | Rat                                | 69073700   |                       |                                      |
| St. Louis   | Rice                               | 69057800   | 41                    | 41                                   |
| St. Louis   | Rice                               | 69080300   |                       |                                      |
| St. Louis   | Round                              | 69004800   | 336                   |                                      |
| St. Louis   | Ruth                               | 69001400   | 47                    | 9                                    |
| St. Louis   | Sandpoint                          | 69061700   |                       |                                      |
| St. Louis   | Sandy                              | 69073000   | 121                   | 121                                  |
| St. Louis   | Seven Beaver                       | 69000200   | 1,508                 | 1,282                                |
| St. Louis   | Shannon (& River)                  | 69092500   | 135                   | 108                                  |
| St. Louis   | Side                               | 69069900   | 25                    | 15                                   |
| St. Louis   | Simian Lake                        | 69061900   | 81                    | 5                                    |
| St. Louis   | Sioux River                        | 69r9       |                       |                                      |
| St. Louis   | Six Mile                           | 69028300   | 103                   | 1                                    |
| St. Louis   | St. Louis River                    | 69r2       |                       |                                      |
| St. Louis   | Stone                              | 69004600   | 230                   | 173                                  |
| St. Louis   | Stone                              | 69068600   | 160                   | 24                                   |
| St. Louis   | Sturgeon                           | 69093900   | 2,050                 | 243                                  |
| St. Louis   | Sunset                             | 69076400   | 309                   | 6                                    |
| St. Louis   | Susan                              | 69074100   | 305                   |                                      |
| St. Louis   | Tommila                            | 69003500   | 87                    | 85                                   |
| St. Louis   | Trettel Pool                       | W0889002   | 30                    | 3                                    |
| St. Louis   | Turpela                            | 69042700   | 76                    | 61                                   |
| St. Louis   | Twin                               | 69050400   | 18                    | 1                                    |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| St. Louis   | Twin                               | 69069500   |                       |                                      |
| St. Louis   | Unnamed                            | 69063400   | 101                   | 20                                   |
| St. Louis   | Unnamed (Camp 97)                  | 69059400   | 25                    |                                      |
| St. Louis   | Upper Bug                          | 69040600   | 23                    |                                      |
| St. Louis   | Upper Pauness                      | 69046500   | 215                   | 1                                    |
| St. Louis   | Vang                               | 69087600   | 126                   | 3                                    |
| St. Louis   | Vermilion                          | 69037800   | 49,110                | 250                                  |
| St. Louis   | Vermilion River                    | 69061300   | 1,125                 | 562                                  |
| St. Louis   | Wabuse                             | 69040800   | 64                    | 51                                   |
| St. Louis   | Washusk #1                         | 69040900   | 51                    | 40                                   |
| St. Louis   | Watercress                         | 69079700   | 43                    | 43                                   |
| St. Louis   | Watercress (Mud)                   | 69079700   | 30                    |                                      |
| St. Louis   | Wheel                              | 69073500   | 11                    | 6                                    |
| St. Louis   | Whitchel                           | 69053100   | 71                    | 53                                   |
| St. Louis   | White Iron                         | 69000400   |                       |                                      |
| St. Louis   | Wild Rice                          | 69037100   | 2,133                 | 1                                    |
| St. Louis   | Wolf                               | 69014300   | 456                   |                                      |
| Stearns     | Anna                               | 73012600   | 133                   |                                      |
| Stearns     | Big Rice                           | 73016800   | 282                   |                                      |
| Stearns     | Cedar                              | 73022600   | 152                   |                                      |
| Stearns     | Crow                               | 73027900   | 461                   |                                      |
| Stearns     | Fifth                              | 73018000   | 76                    |                                      |
| Stearns     | Fish                               | 73028100   | 204                   |                                      |
| Stearns     | Grass                              | 73029400   | 157                   |                                      |
| Stearns     | Gravel                             | 73020400   | 55                    |                                      |
| Stearns     | Henry                              | 73016000   | 62                    |                                      |
| Stearns     | Henry                              | 73023700   | 191                   |                                      |
| Stearns     | Linneman                           | 73012700   | 108                   |                                      |
| Stearns     | Little Rice                        | 73016700   | 56                    |                                      |
| Stearns     | Lower Spunk                        | 73012300   | 269                   |                                      |
| Stearns     | McCormic                           | 73027300   | 211                   |                                      |
| Stearns     | Middle Spunk                       | 73012800   | 242                   |                                      |
| Stearns     | Mud                                | 73016100   | 55                    |                                      |
| Stearns     | Raymond                            | 73028500   | 126                   |                                      |
| Stearns     | Rice                               | 73019600   | 1,568                 |                                      |
| Stearns     | Sagatagan                          | 73009200   | 170                   |                                      |
| Stearns     | Schultz Slough                     | 73020100   | 29                    |                                      |
| Stearns     | Tamarack                           | 73027800   | 470                   | 235                                  |
| Steele      | Oak Glen                           | 74000400   | 350                   | 4                                    |
| Steele      | Rice                               | 74000100   | 697                   | 467                                  |
| Todd        | Beck                               | 77005600   | 57                    | 25                                   |
| Todd        | Cass County                        | 77000400   | 25                    | 18                                   |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Todd        | Hayden                             | 77008000   | 253                   | 1                                    |
| Todd        | Jacobson                           | 77014300   | 40                    |                                      |
| Todd        | Jaeger                             | 77007500   | 46                    | 28                                   |
| Todd        | Lawrence                           | 77008300   | 172                   |                                      |
| Todd        | Little Fishtrap                    | 77007400   |                       |                                      |
| Todd        | Little Pine                        | 77013400   |                       |                                      |
| Todd        | Long                               | 77006900   | 356                   | 338                                  |
| Todd        | Mud                                | 77008700   | 398                   | 318                                  |
| Todd        | Pine Island                        | 77007700   | 156                   |                                      |
| Todd        | Rice                               | 77006100   | 675                   | 60                                   |
| Todd        | Robbinson Pond                     | 77IMP001   | 60                    | 30                                   |
| Todd        | Rogers                             | 77007300   | 185                   | 130                                  |
| Todd        | Sheets                             | 77012200   | 100                   |                                      |
| Todd        | Stones                             | 77008100   | 63                    |                                      |
| Todd        | Thunder                            | 77006600   |                       |                                      |
| Todd        | Tucker                             | 77013900   | 43                    |                                      |
| Todd        | Twin                               | 77002100   | 317                   | 159                                  |
| Todd        | Unnamed                            | 77020200   | 70                    |                                      |
| Todd        | Unnamed                            | 77017600   | 40                    | 2                                    |
| Todd        | Unnamed                            | 77019700   | 53                    |                                      |
| Todd        | Unnamed                            | 77017800   | 42                    | 23                                   |
| Todd        | Unnamed                            | 77014000   | 61                    |                                      |
| Todd        | West Nelson                        | 77000500   | 84                    | 70                                   |
| Wabasha     | Pool 5                             | 79IMP001   | 600                   | 35                                   |
| Wabasha     | Unnamed                            | W0580001   | 160                   | 25                                   |
| Wadena      | Blueberry                          | 80003400   | 555                   | 30                                   |
| Wadena      | Burgen                             | 80001800   | 92                    | 86                                   |
| Wadena      | Finn                               | 80002800   | 148                   | 30                                   |
| Wadena      | Granning                           | 80001200   | 50                    | 50                                   |
| Wadena      | Jim Cook                           | 80002700   | 238                   |                                      |
| Wadena      | Lower Twin                         | 80003000   | 267                   | 5                                    |
| Wadena      | Rice                               | 80002400   | 8                     | 1                                    |
| Wadena      | Round                              | 80001900   | 58                    | 58                                   |
| Wadena      | Strike                             | 80001300   | 76                    | 76                                   |
| Wadena      | Unnamed                            | 80000700   | 16                    | 16                                   |
| Wadena      | Yaeger                             | 80002200   | 384                   | 346                                  |
| Wright      | Albion                             | 86021200   | 238                   |                                      |
| Wright      | Beaver Dam                         | 86029600   | 253                   |                                      |
| Wright      | Butler                             | 86019800   | 131                   |                                      |
| Wright      | Butternut                          | 86025300   | 203                   |                                      |
| Wright      | Carrigan                           | 86009700   | 162                   |                                      |
| Wright      | Cedar                              | 86003400   | 191                   |                                      |

| County name | Location Name (i.e. Lake or River) | MN Lake ID | Location size (acres) | Estimated wild rice coverage (acres) |
|-------------|------------------------------------|------------|-----------------------|--------------------------------------|
| Wright      | Gilchrist                          | 86006400   | 388                   |                                      |
| Wright      | Gonz                               | 86001900   | 152                   |                                      |
| Wright      | Henshaw                            | 86021300   | 277                   |                                      |
| Wright      | Long                               | 86019400   | 255                   |                                      |
| Wright      | Louisa                             | 86028200   | 183                   |                                      |
| Wright      | Malardi                            | 86011200   | 149                   |                                      |
| Wright      | Mallard Pass                       | 86018500   | 51                    |                                      |
| Wright      | Maple                              | 86019700   | 82                    |                                      |
| Wright      | Maple Unit                         | 86015700   | 177                   |                                      |
| Wright      | Mary                               | 86004900   | 331                   |                                      |
| Wright      | Millstone                          | 86015200   | 221                   |                                      |
| Wright      | Mink                               | 86022900   | 304                   |                                      |
| Wright      | Mud                                | 86002600   | 128                   |                                      |
| Wright      | Mud                                | 86021900   | 66                    |                                      |
| Wright      | Pelican                            | 86003100   | 2,793                 |                                      |
| Wright      | Pooles                             | 86010200   | 166                   |                                      |
| Wright      | Rice                               | 86003200   | 246                   |                                      |
| Wright      | Rice                               | 86000200   | 57                    |                                      |
| Wright      | Sandy                              | 86022400   | 118                   | 150                                  |
| Wright      | School                             | 86002500   | 76                    |                                      |
| Wright      | School Section                     | 86018000   | 266                   |                                      |
| Wright      | Shakopee                           | 86025500   | 206                   |                                      |
| Wright      | Smith                              | 86025000   | 330                   |                                      |
| Wright      | Spring                             | 86020000   | 63                    |                                      |
| Wright      | Taylor                             | 86020400   | 78                    |                                      |
| Wright      | White                              | 86021400   | 145                   |                                      |
| Wright      | Willima                            | 86020900   | 246                   |                                      |

1,286 total locations

For the 777 locations that have coverage data

1,569,889

64,328

## **Appendix C**

### **Wild Rice Harvest Survey**

The full report will be posted on the MNDNR website [www.dnr.state.mn.us](http://www.dnr.state.mn.us) prior to March 1, 2008

### **Executive Summary**

#### **Introduction**

The following objectives guided the study design, survey instrument and final report for this effort.

- To determine the characteristics of wild rice harvesters in Minnesota.
- To assess current harvest levels and harvester satisfaction.
- To assess current natural wild rice harvest use of Minnesota lakes and rivers.
- To obtain wild rice harvester opinions of current state regulations and proposed revisions.
- To determine factors that limit wild rice harvesting.
- Identify information needs of wild rice harvesters, and the best means to deliver information to harvesters.
- To determine support for natural wild rice management priorities.

In November of 2006 the Minnesota Department of Natural Resources initiated a self-administered, mail questionnaire of all 2006 wild rice license holders (n=1,625) to gather information on the objectives listed above, and all 2004 and 2005 license holders who did not purchase a license in 2006 (n=945) to gather information on why they did not harvest wild rice in 2006. Completed questionnaires were returned by 53 percent (n=1,365) of the 2,574-license holder sample.

#### **Characteristics**

The 2004 to 2006 wild rice license holder respondents were predominately male (82%), Minnesota residents (98%), and averaged 51 years of age. A large majority (81%) are 40 years of age or older. A majority harvested wild rice under only a state license (86%). The average age that harvesters began gathering wild rice was 31. Friends and parents were the primary means of introduction to the activity, and 69 percent of harvesters reported introducing others to gathering wild rice. The average harvester has 13 seasons of experience.

#### **Harvest Levels**

Based on responses, an estimated average of 430 pounds of unprocessed natural wild rice was gathered per harvester in 2006. Based on state issued license sales of 1,625 in 2006, this creates a total harvest estimate of approximately 700,000 pounds of natural wild rice. Approximately two percent of 2006 respondents harvested more than 2,000 pounds of rice, while 79 percent harvested less than 500 pounds. When comparing these groups (those harvesting > 500 lbs and those harvesting < 500 lbs) there is a difference in both the average age they began harvesting (20 and 33 years old, respectively) and the average number of seasons participated (25 and 12 years, respectively). A large majority (85%) of harvesters harvest for personal use.

#### **Harvester Satisfaction**

A large majority (82%) of 2006 harvesters were satisfied with their overall wild rice harvesting experience, with only one in ten expressing dissatisfaction. Harvesters were neutral on the existing wild rice season opening date (July 15<sup>th</sup>) and slightly in favor of the current wild rice season hours (9 a.m. to 3 p.m.). Other comment topics included: high licensing fees, less than ideal water levels, lack of processor information, lack of enforcement, weather, shoreline degradation, motor boats in wild rice stands, beaver control, and a need for more regulation of genetically modified wild rice.

### **Use of Minnesota Lake and Rivers to Harvest Wild Rice**

A total of 3,151 trips were reported by 845 harvesters, resulting in an average of 4 trips per person to gather wild rice. Sixty percent (60%) of 2006 harvesters took three or fewer trips, while 12 harvesters (1%) managed 20 or more trips. One half (50%) of the respondents reported harvesting on only one lake, indicating that multiple trips were made to the same lakes. An additional 28 percent reported harvesting on two lakes. The average number of lakes visited for harvesting wild rice was 1.8 across all harvesters. The maximum number of lakes visited was six.

During 2006, over two-thirds (70%) of all wild rice harvesting trips were in Aitkin, St. Louis, Itasca, Crow Wing or Cass counties. The next five counties with the highest number of trips were Becker, Clearwater, Beltrami, Lake and Hubbard counties. The above ten counties had 91 percent of all wild rice harvesting trips. A total of 28 counties were identified as being visited for wild rice gathering.

While 407 locations were identified from the survey results to at least the county level, only 313 noted a specific name (i.e. lake name or river segment). Of these 313 locations, the top ten harvest locations based on harvest pressure (number of trips) account for 27.4 percent of the statewide total. Further review notes that 50 percent of total trips are represented by the top 32 locations and that the top 68 locations represent 66.6 percent of total trips.

### **State Regulations**

About half (53%) of the respondents supported a change in harvesting hours from 9 a.m. - 3 p.m. to 10 a.m. - sunset, and three-fourths (77%) supported changing the wild rice season opening from July 15 to August 14. More than half (62% and 66% respectively) of the respondents opposed use of watercraft up to 38 inches wide or establishing a 7-day nonresident license.

### **Participation, Information Needs**

The most important factors identified by respondents that limit participation in harvesting were personal time, and knowing when and where to harvest wild rice. For respondents that did not harvest in 2006, finding a rice processor ranked highest after personal time. Where and when to harvest are again ranked high for information helpful to 2006 ricers. In order of preference, the preferred method for delivery of information is through web sites, pamphlets or as a section of the DNR Hunting Regulation Handbook. Other limiting factors identified in comments include the cost of the license, fuel and transportation costs, and access (to private and reservation lakes).

### **Management Priorities**

A large majority of respondents ranked water level management as the highest management priority, followed by availability of information. Seeding ranked third, while enforcement of regulations, access site improvement, and wild rice research were ranked fourth, fifth and sixth,



respectively. Other comments included protection from genetically modified rice, increased habitat protection, and excessive license fees. Specific habitat protection comments included more restrictions on shoreline development, protection from motorized watercraft, prevention of the removal of wild rice through aquatic plant management permits, and more management of specific lakes that are historical wild rice lakes.

## **Appendix D**

### **The Life History of Natural Wild Rice**

#### **Growth and Development**

The following description of the growth of wild rice plants is adapted primarily from the work of Dr. Ervin Oelke and others at the University of Minnesota unless noted otherwise (Oelke et al. 2000, Oelke 2007).

As an annual plant, wild rice develops each spring from seeds that fell into the water and settled into sediment the previous fall or before. Germination requires three to four months of cold, nearly freezing water (35° F or colder). Seeds exposed to drying die. Seed dormancy is regulated through hormonal growth promoters and inhibitors and by an impermeable, tough, wax-covered pericarp. Low oxygen levels can also inhibit germination.

Seed germination typically occurs when the substrate and surrounding water temperatures reach about 40° F. Depending on water depth, latitude, and the progression of spring weather, wild rice germinates in Minnesota sometime in April, well ahead of most but not all perennial plants. Within three weeks, rooted wild rice seedlings develop three submerged leaves. These leaves usually remain submerged and decay as the plant matures. Adventitious roots arise at the first leaf node and occasionally at the second and third nodes. Most, but not all, roots are shallow, often rust-tinged due to iron deposits, and may spread 8 to 12 inches. Natural mortality can be relatively high during the submerged leaf stage (Meeker 2000).

The emergent stage begins with the development of one or two floating leaves and continues with the development of several aerial leaves two to three weeks later. The floating leaves are apparent in late May to mid June in Minnesota, again dependent on water depth, latitude, and weather. It is at this stage of growth that wild rice is most susceptible to uprooting by rapidly changing water levels due to the natural buoyancy of the plant. Rising water levels can significantly stress the plant even if it remains rooted.

The upper portion of the wild rice stem is hollow, with thin evenly spaced partitions. The number of tillers, or additional flowering stems, can vary with plant density and water depth. In deep water there may only be one stem per plant while in shallow water the number can exceed 30. Tillers typically mature 7 to 14 days later than the main stem (Meeker 2000).

Wild rice begins to flower in mid to late July in Minnesota. Flowering times are dependent on both day length and temperature. Short day lengths trigger earlier flowering but a reduction in kernel number. Longer day lengths delay flowering while increasing kernel number. Warmer temperatures will accelerate development, and cooler temperatures will slow growth. Wild rice flowers are produced in a branching panicle with female flowers (pistillate or seed-producing) at the top of the panicle on appressed branches. Female florets typically number about 130 per plant. Male flowers (staminate or pollen-producing) are produced on nearly horizontal branches on the lower portion of the panicle. Natural wild rice is primarily pollinated by wind. High temperatures and low humidity can negatively affect fertilization rates.

There are several variations of the typical wild rice panicle. One is the bottlebrush variant, often associated with male sterility, in which the male flowering branches remain appressed and give the panicle a compact bottlebrush appearance. Another variant is the crowsfoot panicle, in which the female flowering branches spread in the same manner as the male branches. In another variant, the male florets are replaced by female florets, resulting in a gynoeocious or entirely female panicle.

Cross-pollination is typical for natural wild rice because the female flowers develop, become receptive, and are pollinated before the male flowers on the same plant shed pollen. The female florets are receptive over a period of about ten days (Moyle 1944b). Cross-pollination is enhanced by plant-to-plant variation for flowering within the same stand due to the effects of water depth, non-synchronous tillering, and genetic differences among plants (Moyle 1944b, Meeker 2000).

Cross-pollination within and among wild rice populations helps maintain genetic variability and the biologic potential for wild rice to adapt to changing conditions. Some changes may be seasonal or annual in nature; others, such as changing climate in the Great Lakes region, will likely be long term. The variability in natural wild rice genetics that exists today may be a critical determinant of whether natural wild rice can adapt to changes in regional weather. Studies in northern Wisconsin found sufficient genetic diversity among geographically distinct stands of natural wild rice to identify four regional populations. The degree of diversity within stands varied widely, however, with larger and denser stands having higher levels (Waller et al. 2000).

When viable pollen grains land on the female stigma, they germinate within one hour and reach the embryo sac within two. Seeds are visible two weeks after fertilization, and they mature in four to five weeks. Immature seeds have a green outer layer that turns purplish black as the seed reaches physiologic maturity.

Seeds ripen over several days on an individual stem, starting at the top. Primary stems ripen earlier than secondary tillers, plants in rivers ripen earlier than those in lakes, plants in shallow water earlier than those in deeper water, and plants in northern Minnesota earlier than those in more southerly stands.

This staggered maturation process means that ripe seeds may be available within individual stands for several weeks, and across the entire range of natural wild rice in Minnesota for a month or longer. This extended period of “shattering”, or dropping of ripened seed, is an important mechanism that insures at least some seeds will survive to perpetuate the natural wild rice stand. The entire process, from germination of a new plant to the dropping of mature seeds, takes about 110 to 130 days (or about 2600 growing-degree days) depending on temperature and other environmental factors.

Not all wild rice seed germinates the following year. Under some conditions, natural wild rice seeds can remain dormant in the bottom sediment for many years to several decades if conditions are not suitable for germination. This allows wild rice to survive years when high water levels or

storms reduce or eliminate productivity. Wild rice can germinate and colonize habitats after other plants have been removed by environmental disturbance if a seed bank is present (Meeker, 1999).

Even under ideal growing conditions, wild rice populations follow approximately three to five year cycles (Jenks 1900, Moyle 1944b, Pastor and Durkee Walker 2006, Walker et al. 2006). Highly productive years are followed by unproductive ones followed by a gradual recovery (Moyle 1944b, Grava and Raisanen 1978, Atkins 1986, Lee 1986, Archibold et al. 1989). Recent study suggests that oscillations in wild rice may be caused by delays in nutrient recycling to plant uptake. Wild rice litter accumulation may inhibit plant growth and production (Pastor and Durkee Walker 2006, Walker et al. 2006). In particular, the amount of wild rice straw, stage of decay, and tissue chemistry (root litter) may affect available nutrients, influence production, and result in population cycling (Walker, Ph.D. thesis 2008).

### **Habitat Requirements**

While the historical range of wild rice illustrates its broad distribution, its specific occurrence and abundance is in large part dependent on local environmental conditions. The following descriptions are a capsulation of the historical and current literature (Moyle 1944a, Rogosin 1951, Lee 2000, Meeker 2000, Oelke 2007). For more detailed information be sure to check the original sources.

#### Hydrology

Wild rice generally requires some moving water, with rivers, flowages, and lakes with inlets and outlets being optimal areas. Water basins with intermittent or seasonal flow may sustain beds, but annual production will fluctuate more widely. Seasonal water depth is critical. Wild rice grows well in about 0.5 - 3 feet of water, although plants may be found deeper. Shallower sites support strong competition from perennial emergent plants and deeper water stresses the plant to the point that seed production is limited or nonexistent. At Rice Lake National Wildlife Refuge from 2002 to 2005, production and growth parameters were highest at water depths of 1- 30 inches (McDowell, personal communication).

Water levels that are relatively stable or decline gradually during the growing season are preferred. Abrupt water level increases during the growing season can uproot plants. Wild rice is particularly sensitive to this disturbance during the floating leaf stage. However, some observers feel that water levels kept stable over the long term (multiple years) tend to favor perennial aquatic vegetation over wild rice (David and Vogt, personal communication).

#### Water characteristics

Clear to moderately stained water is preferred, as darkly stained water may limit sunlight penetration and hinder early plant development.

Wild rice grows over a wide range of alkalinity, pH, iron, and salinity. It does best in water that has a pH range of 6.0 - 8.0 and alkalinity greater than 40 ppm. Some of the measured chemistry

parameters are alkalinity (5-250 ppm), pH (6.4-10.1 SU), Iron (0.1-3.0 ppm) and True Color (50-300 Pt-Co) (Andryk 1986, Persell and Swan 1986).

The state of Minnesota instituted a water quality criterion for sulfate in wild rice waters of 10 mg/liter. The level was established based on observations by Moyle (1944a), however, other field observations and research show that wild rice can grow in waters with significantly higher sulfate concentrations (Grava 1981, Lee and Stewart 1983, Peden 1982). This research also indicates that factors such as oxygen levels and potential sediment anoxia are involved in the wild rice-sulfate connection.

While researchers have observed that natural wild rice ecosystems are relatively nutrient rich, excess levels of nutrients, especially phosphorus, can have significant adverse effects on natural wild rice productivity (Persell and Swan 1986).

### Sediment

Although wild rice may be found growing in a variety of bottom types, the most consistently productive are lakes with soft, organic sediments (Lee 1986). The high organic matter content with a rather low carbon/nitrogen ratio is necessary to meet the rather high nitrogen needs of wild rice (Carson 2002). Nitrogen and phosphorus are major limiting nutrients for wild rice (Carson 2002). Flocculent sediments with nitrogen and phosphorus concentrations less than one gram per square meter are typically incapable of supporting sustained production (Lee 1986).

### Competing Vegetation

As an annual plant sprouting each year from seed, wild rice can have difficulty competing with aggressive perennial vegetation, particularly where natural hydrologic variation has been reduced. Cattail (*Typha* spp.), particularly hybrid cattail (*Typha x glauca*), yellow water lily (*Nuphar variegata*), and pickerelweed (*Pontederia cordata*) are examples of plants that have been cited as competing with wild rice (Norrsgard, David, and Vogt, personal communication).

## Appendix E

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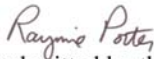
**Appendix F**  
**Stakeholder Comments**

## UNIVERSITY OF MINNESOTA

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North Central Research and Outreach Center  
College of Food, Agricultural and  
Natural Resource Sciences

1861 East Highway 169  
Grand Rapids, MN 55744  
218-327-4490  
Fax: 218-327-4126  
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Date: February 10, 2008  
To: Legislators of the State of Minnesota  
From: Dr. Raymie Porter, University of Minnesota   
Re: The report "Natural Wild Rice in Minnesota" submitted by the DNR

*In this statement I do not speak on behalf of the University of Minnesota, but rather as a scientist who has been engaged in research on cultivated wildrice breeding at the University of Minnesota for almost 20 years.*

I would like to commend the Technical Team convened by the DNR to pull together the information that contributed to this report. Although the participants represent diverse interests when it comes to wildrice, our meetings have been characterized by a vigorous interchange of ideas with mutual respect, while focusing on what is actually known about wildrice. I hope that future efforts to deal with the issues identified by this report will be as positive and fruitful as what I have experienced in the meetings of the Technical Team. I would like to add the following comments to the report for emphasis.

The loss of genetic diversity should be viewed *not* as a primary *cause*, but rather as an *effect* resulting from other causes. Granted, addressing the loss of genetic diversity is crucial for the species to flourish in state waters. Loss of genetic diversity means loss of the alleles (or variant forms) of genes across the many natural populations of wildrice, which also means that there are fewer genotypes (genetic types) for a given trait within a given population. Having fewer genotypes may limit a population's ability to respond to seasonal, yearly, or long-term changes in the local environment of that population. This is especially true if the genotypes lost are ones needed for adaptation to conditions that prevail at that site. But, since loss of genetic diversity is usually caused by factors that reduce the number of individuals in populations to low numbers, alleviating the problems that reduce wildrice stands will help maintain the genetic diversity of wildrice. The report does a good job of characterizing the primary threats that limit wildrice stands and that could therefore reduce genetic diversity.

But how will we know whether or how genetic diversity is being affected? Only through knowledge about the genetics of wildrice. Sound scientific knowledge about the genetic make-up of natural stands, coupled with knowledge about how different genes respond to various environmental factors, should prove useful in guiding restoration efforts. If seeds need to be brought in from other natural stands in order to restore a site, knowing the genetics of the potential donor stands could help identify those that might be most similar to the population that remains at, or that once existed at, the site.

What about cultivated wildrice? Is the breeding of wildrice really a threat to natural stands from a genetic perspective? The consensus of the Technical Team is that it is not. I agree with this perspective. In fact, I believe that cultivated wildrice should not be made a scapegoat for problems in natural stands. I have heard speculations that cultivated wildrice causes this or that problem observed in a natural stand—speculations without evidence. What I know about population genetics leads me to the conclusion that such speculations will never find evidence to support them. Some basic facts about population genetics and wildrice should shed light on this.

Cultivated varieties (cultivars) of wildrice in Minnesota are not genetically uniform—they are heterogeneous, or made up of many different genotypes. The wildrice breeding project at the University of Minnesota has endeavored to maintain as much genetic diversity as possible in the cultivars released. Also, since all the genes in cultivars ultimately originated in the natural wildrice gene pool, they are a subset of the total genetic variability of wildrice. No new alleles or genes have been artificially added (i.e., no genetic engineering has been done, nor is it being pursued). Therefore, it seems reasonable to assume that cultivated wildrice has less total genetic diversity than natural wildrice. But this is the norm for any cultivated crop species, since breeders would tend to select only those alleles (variant forms) of genes that make the crop better adapted under the narrower range of cultivated conditions. Conversely, breeding a crop for adaptation to cultivated conditions tends to make it less fit for survival in the wild.

But even if a wildrice cultivar were genetically uniform, that uniformity should not impact the vast diversity of natural wildrice. There are many more acres of natural stands than cultivated stands, and they are rarely in close proximity to each other. That wildrice pollen travels over long distances has *not* been established. But even if pollen should travel between cultivars and natural stands, it could just as easily travel from one natural stand to another. And pollen moving from one natural stand to another natural stand nearby would likely be so few in number compared to the pollen produced locally that it would be diluted to insignificant amounts. Also, the viability of that pollen once it arrives is in doubt, given the short life of wildrice pollen.

"Migration" is the term used by population geneticists to describe gene movement between populations. But what would happen in those cases of successful migration of alleles of genes into a population? If the allele of that gene is *already* present in the population, the migration doesn't add anything new. If the allele is *not* already present, it would *add* to the genetic diversity of the population where it has found its home. This new allele, along with all the other alleles already present in the population, are then subjected to the forces of natural selection. If the allele increases the fitness of the plant to survive under the conditions of that population, natural selection favors it, and it will increase in its frequency in the population according to how much fitness it adds. If it decreases the fitness of the plant, natural selection will not favor it, and other plants with more favorable alleles will out-compete it. In this manner, natural selection will determine the genetic make-up of the population.

The heterogeneous nature of wild populations is the response of those populations to ever-changing local conditions. Any given year, some genotypes will do well, others will do poorly. In a different season, other different genotypes may prevail. In short, those plants with alleles that enable the plant to grow well and produce more seed under the local environmental conditions will contribute those genes to the next generation. Natural selection will enable the best plants to survive. This will be the case as long as there is enough genetic variability to allow adaptation to that environment.

Therefore, those factors that are known to adversely impact natural stands should be the focus of efforts to protect and enhance natural wildrice. This would accomplish the most to prevent loss of genetic diversity. It has been stated in the report that the threat of transgenic wildrice doesn't exist—no one knows of anyone who is pursuing it, and it seems unlikely that they would. Traditional (or conventional) breeding of wildrice is not a threat, by consensus of the Technical Team, for the reasons that I have just given. Other threats have been identified as important. Those threats should be addressed.





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February 11, 2008

Ray Norrgard  
Wetland Wildlife Program Leader  
MN DNR  
500 Lafayette Rd.  
St. Paul, MN 55155-4020

Dear Mr. Norrgard:

As President of the Minnesota Cultivated Wild Rice Council (MCWRC), I appreciate the opportunity to comment on the Natural Wild Rice in Minnesota Study you were required to complete and are submitting to the Minnesota Legislature. The protection of natural stands of wild rice is an extremely important issue and is supported strongly by the MCWRC.

As I'm sure you know, cultivated wild rice plays an important role in Minnesota's rural economy. It is grown on marginal crop lands, providing income to some of the poorest counties in Minnesota. As forestry, mining, and other industries have lost jobs in the region, alternative opportunities for employment have become more important to the region. The cultivated wild rice industry has provided much-needed economic activity in these northern Minnesota counties. More than 500 people derive full or part-time employment directly from the cultivated wild rice industry in Minnesota, many of them on farms that have been in the family for four generations. On a full-time equivalent basis, these jobs equal more than 200 positions.

Additionally, the wild rice industry generates about \$3.1 million in employee compensation annually. It also contributes a total of \$8.7 million in total employee payroll and over \$21 million in revenues to Minnesota's economy. Other industries share in about \$20 million in revenues directly related to the wild rice industry. So you can see how important the cultivated wild rice industry is to northern Minnesota. *(The economic information cited herein is taken from a 1992 study of the economic impact of wild rice in Minnesota. Therefore, these figures understate the contributions of wild rice to Minnesota's economy in today's dollars.)*

With regard to the legislation passed in 2007 which requires an environmental impact statement for any proposed release of genetically modified wild rice and a study of potential threats to natural stands of wild rice, the MCWRC remained neutral. However, we feel it is very important to address a couple of specific issues as they relate to cultivated wild rice in Minnesota.

First, we would like to bring attention to the fact that, as noted in the wild rice study, traditional wild rice breeding programs do not pose a threat to natural stands. Wild rice grown in paddies is the same genus and species as that found in natural stands. Evidence to support this fact can be found by analyzing the 2007 harvest.

In 2007, hand harvesters enjoyed their most productive harvest in more than 40 years - at the same time cultivated wild rice producers recorded their highest production ever, a virtual impossibility if cultivated wild rice truly had a negative impact on natural stands. An article by Rod Ustipak, coordinator of a wild rice management program in Minnesota for Ducks Unlimited (DU) and the Minnesota Department of Natural Resources (DNR), which appeared in the September 16, 2007 edition of the St. Paul Pioneer Press (an article still available online at <http://www.ducks.org/news/1359/DroughtimprovesMinne.html>), explains how drought conditions over the past few years have actually conspired to create an environment in which natural stands thrived and produced a bumper harvest, conditions completely unrelated to cultivated wild rice production.

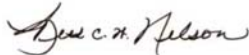
Secondly, although it is mentioned in the Natural Wild Rice In Minnesota Study as a concern, we feel it is extremely important to explicitly state the following: **genetically engineered wild rice does not exist.**

There is a widely held belief, though completely inaccurate, that wild rice is somehow, somewhere being genetically modified or engineered. It is not. The MCWRC is neither developing, nor does it have plans to develop genetically engineered wild rice. We are not aware of any entity that is developing GE wild rice. The federal and state regulatory processes currently in place, coupled with the enormous investment (in the millions of dollars) necessary to develop GE wild rice, renders any effort to do so cost prohibitive. These facts, coupled with the recently passed legislation which requires an environmental impact study prior to the release of any genetically modified varieties of wild rice provide ample safeguards to the environment to ensure food safety and environmental integrity.

Since natural wild rice stands gave birth to the cultivated wild rice industry in Minnesota growers are keenly aware of the importance of protecting them. In fact, the MCWRC board of directors went on record with its support of protecting natural stands when it passed the following resolution at its July 27, 2005, board meeting, *"The MCWRC fully supports the protection of native stands of wild rice in Minnesota. There is no genetic engineering of wild rice occurring. The biosafety requirements in place through the coordinated framework of the USDA, EPA, FDA, the State of Minnesota, and the University of Minnesota are working well to assure a safe environment and food supply."*

Many threats may exist to natural stands of wild rice – shoreline development, climate change, wildlife activity, and recreational water use just to name a few. If we are to be successful in maintaining the vigor and existence of natural stands it is imperative that we analyze and focus our efforts on current threats - those that exist now - rather than perceived threats which are likely never to exist.

Sincerely,



Beth Nelson,  
President



**Tribal Statement Regarding MNDNR Wild Rice Study  
Submitted To the State Legislature February 15, 2008**

We appreciate the opportunity to provide input into the development of this *Natural Wild Rice in Minnesota* report. Manoomin (wild rice) is a remarkable and valuable component of the Minnesota landscape, and it is commendable that the State is concerned with its future. We concur with most of the wild rice history, ecology and proposed management recommendations contained therein and offer our statements below as points for emphasis and clarity to the Legislature and State DNR.

Manoomin is an inherent part of being Ojibwe. Our lifestyles and cultural identity are intimately bound to manoomin, spiritually, physically and economically. The importance of manoomin to the Ojibwe people cannot be overstated as it holds a central position in the lives and rich history of the Ojibwe people. It is more than just another grain or crop; it is a cultural resource of indescribable importance. It is a sacred gift from the creator to our people and is used for sustenance, ceremonial and commercial purposes.

The right of the Ojibwe to harvest and use manoomin was reserved and guaranteed in treaties signed between the Chippewa Bands of the region and the federal government that predate Minnesota statehood. Recent Supreme Court rulings have upheld the existence of these treaty reserved rights along with the federal trust responsibility to uphold these rights, and resources they are built upon.<sup>1</sup> Today, Tribal members continue to harvest manoomin, as they have for many years, in numbers greater than the rest of the state population. The very existence of the Ojibwe people depends on the vitality of their environment, their resource use and their culture which is intricately connected to natural wild rice.

Science and technology in the world is rapidly changing and challenging the environment of our daily lives. Threats to the existence and integrity of natural stands of wild rice are of immense concern to the Ojibwe. Today, the thought of genetic modification of wild rice poses an alarming threat into the possibility of irreversible genetic contamination of our natural stands of wild rice. This would have a profound negative impact on the Ojibwe people. The connection between Ojibwe culture and wild rice is not a static concept and should not be viewed as such. Rather, our relationship to wild rice should be acknowledged as a respectful, living force that guides the growth and development of our Ojibwe communities, as it has for centuries.

We feel strongly that manoomin must be protected from genetic engineering. From the beginning of the genetic engineering debate in Minnesota, the tribes have wanted GE wild rice banned. For the Ojibwe, no level of contamination is acceptable. Once genetic contamination occurs, there is likely no way to reverse it. There are published documents and reports demonstrating that genetically engineered plants can escape test plots and intermingle with native populations at distances greater than was previously thought. These same studies have shown that the range of impacts on native populations is significantly greater than currently recognized.<sup>2</sup> Thus, if GE wild rice were to be grown in Minnesota, it is not a question of whether contamination will occur rather, it is a question of how quickly and to what extent contamination will occur.

We recognize and appreciate that the current statute requiring an Environmental Impact Statement prior to any proposed release of GE wild rice represents progress. However, we desire complete and permanent protection for manoomin. There are currently no proven safe guards that could effectively isolate GE strains of wild rice from natural stands. The only way to prevent genetic contamination is to ensure that no GE wild rice is released into the environment. A ban on genetically engineered rice in Minnesota would be the best way to achieve this.

We recommend that the State Legislature require the Environmental Quality Board to specifically include Tribal cultural impacts as part of any GE wild rice Environmental Impact Statement process. Statements should include effects on the cultural practices of the Tribal community and State and address effects on Ojibwe culture, and traditional and customary rights.

We can not afford to hesitate when it comes to protecting natural stands of wild rice. We must conserve the biodiversity of natural wild rice stands. The rapid development of new technology and science combined with corporate exploitation of resources adds to the urgency. We must not allow Minnesota manoomin to be genetically contaminated by genetically engineered varieties that may be developed. This resource is far too precious, far too significant ecologically, economically and culturally, and far too sacred to allow this to occur. The protection and preservation of natural bed wild rice needs to be the concern of all Minnesotans. We desire to work with the State of Minnesota to ensure that wild rice is protected fully and permanently.

Bois Forte Band of Chippewa  
Fond du Lac Band of Lake Superior Chippewa  
Grand Portage Band of Chippewa  
Leech Lake Band of Ojibwe  
Mille Lacs Band of Ojibwe  
White Earth Band of Ojibwe  
The Minnesota Chippewa Tribe  
1854 Treaty Authority  
Great Lakes Indian Fish and Wildlife Commission  
White Earth Land Recovery Project

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<sup>1</sup> None of the material in this report can be construed to abrogate, abridge, affect, modify, supersede or alter any treaty-reserved right or other sovereign rights of the regions Chippewa Bands' as recognized by any means, including but not limited to, agreements with the United States, Executive Orders, statutes, judicial decrees, or Federal law.

<sup>2</sup> The following references represent a small sample of the research on the uncertainty of the impact and fate of genetically engineered organisms on natural ecosystems: Schoen, DJ, Reichman JR, and Ellstrand, NC 2008. Transgene Escape Monitoring, Population Genetics, and the Law. *Bioscience* Vol. 58 No. 1: 71-77; Ponti, Luigi, 2005. Transgenic Crops and Sustainable Agriculture in the European Context, *Bulletin of Science Technology & Society* Vol. 25, No. 4: 289-305; Lundmark, C, 2007, Genetically Modified Maize, *Bioscience* Vol. 57, No. 11: 996.



**Ryan P. Heiniger**

*Director of Conservation Programs – MN/IA*

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February 12, 2008

Commissioner Mark Holsten  
Department of Natural Resources  
500 Lafayette Road  
Saint Paul, Minnesota 55155

RE: Wild Rice Study Report

Dear Commissioner Holsten:

I am writing to express Ducks Unlimited's support for the recently completed wild rice report. Thanks to you and your staff for developing such a thorough document and set of recommendations. In particular, we are especially pleased with recommendations in the report that call for increased management, inventory, and stewardship of Minnesota's wild rice lakes and wetlands. Ducks Unlimited looks forward to helping your staff and other partners implement those recommendations in the coming years through our Living Lakes Initiative.

As with many of Minnesota's natural resources, wild rice habitat for waterfowl and other wildlife has been impacted and degraded due to changes to our land and waters. Due to the biological, cultural and economical values of wild rice, it is incumbent upon the state of Minnesota in collaboration with local stakeholders to invest new financial resources to protect and enhance the precious wild rice habitat that remains. Wild rice is one of the most important aquatic plants to migratory waterfowl and it is also critically important to other game and non-game wildlife species.

Since 2001, Ducks Unlimited has worked in partnership with the Minnesota Department of Natural Resources to assess, enhance, manage, and protect over 100 wild rice lakes annually throughout northern Minnesota. Grants from the Minnesota Environment & Natural Resource Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources have also provided important funding to both improve wild rice lakes and protect their shoreline through conservation easements.

DU was pleased provide input during the development of the wild rice study and we support the final report the DNR developed for the legislature. Please advise us of any opportunities to provide further support regarding this important wetland and shallow lake conservation issue.

Sincerely,

Ryan Heiniger  
Director of Conservation Programs – MN/IA

Cc: Dave Schad, Dennis Simon, Ray Norrgard, & Nicole Hansel-Welch  
Jon Schneider & Rod Ustipak



# United States Department of the Interior



## FISH AND WILDLIFE SERVICE

Tamarac National Wildlife Refuge  
35704 County Highway 26  
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Phone: 218/847-2641 Fax: 218/847-9141

TMC-08-003

February 15, 2008

Ray Norrgard  
Wetland Wildlife Program Leader  
Minnesota Department of Natural Resources  
500 Lafayette Rd.  
St. Paul, MN 55155-4020

Subject: **Wild Rice Study document "Natural Wild Rice in Minnesota."**

Dear Mr Norrgard:

This is a letter of endorsement for the above mentioned document and for the document development process. The U.S. Fish and Wildlife Service (Service) has long recognized the ecological importance of natural wild rice stands and associated wetlands. The establishment of National Wildlife Refuges, such as Tamarac and Rice Lake, for the purpose of managing these wetland habitats for the benefit of migrating and resident wildlife is evidence of this appreciation. This study, which provides exceptional background information on the importance of natural wild rice as well as identifies potential threats and management challenges, will be extremely useful in the continued management of this critical resource. Additionally, the process fostered a close working relationship between State, Tribal and Federal governments, university researchers, non-government organizations and well as interested citizens. This collaborative effort is essential to insuring the abundance of natural wild rice for future generations.

Thank you for the opportunity to participate in this process and provide comments.

Sincerely,

Barbara Boyle  
Refuge Manager