



# manoomin

**We are doing a five year program called Manoomin (Sept. 2009-Sept. 2014). In this program what we are doing is taking core samples from lakes that have wild rice (manoomin) in them to find out what the history of the lakes is. The scientists and the students study the sediment of the cores to figure out the history of the lakes. The cores can look back over history of about ten thousand years. The lakes that we are coring and researching are Perch Lake, Wild Rice Lake, Rice Portage Lake, Deadfish Lake, Jaskari Lake, and Miller Lake.**

**In 2010, while the surface of the lake was still frozen we cored Perch Lake, Deadfish Lake, and Rice Portage Lake.**

**The goals of this project are to learn about the past ecological conditions and to better understand the relationship of manoomin to lake depth, nutrients, sediment, composition, and the presence of other organisms.**

**All of the lakes are shallow, which makes good growing conditions for wild rice.**

**Europeans, in the early 20th century, attempted to make ditches to dry out shallow lakes to make farmland. Their plan had failed and changed the conditions of ecosystems surrounding the lakes.**

**Information about the wild rice's past will help us understand what we can do to keep the wild rice growing healthy on Fond Du Lac Reservation.**

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## So why are phytoliths important to the wild rice history?

Phytoliths are important to studying the history of wild rice because they take ages to break down and they can tell how long the wild rice has been here. They are specialized plant cells formed from silicon dioxide, and are found in all grass forms. Wild rice has five or six diagnostic phytoliths that we look for. For each different type of seed case or "glume" they each produce different assemblages. The method of studying phytoliths is getting a sample which contains 100 phytoliths to make an assemblage. By taking pictures of phytoliths we able identify and measure each sample. After data is collected information is analyzed statistically. There are differences between the wild rice phytoliths here in Fond du Lac and the wild rice phytoliths found from the eastern United States.



## What are macrofossils and why are they important to lake studies?

Macrofossils are preserved organic remains that are big enough to see without a microscope. Macrofossils can be things such as leaves, needles, cones, etc. Macrofossils can be used to identify plants that have previously grown in the area. This is valuable to research because each plant has different climate, depth, and nutrient requirements in order to live, so seeing a change in the macrofossils will show us a change in the climate of the area and a change in depth of the lake. Seeing how the wild rice grew in different climates helps us understand the wild rice better.



## How do Diatoms help show the history of the depth and conditions of the lake?

When the lake is clearer more sunlight comes down and is able to feed the photosynthetic diatoms. Low counts of benthic diatoms indicate turbid (murky) conditions. While low counts of all diatoms show a lack of nutrients in the lake. There are two types of diatoms. Benthic diatoms rest at the bottom of the lake and Planktonic, which float near the top of the water. It also can be show the histories of the lake because of their outer shell that lasts for thousands of years. Such as the higher count of Planktonic diatoms near the bottom of the core for Perch Lake, showing the lake may have been deeper because Planktonic diatoms do not show in the bottom of the lake and float in the water.



## We conclude from our data the following:

Wild rice has been around for 3,500 years.

The temperature around the lake areas has gotten warmer from 10,000 years ago. The water level has been getting shallower because the lake has been filling in with sediment.

The climate has stayed about the same for the past 4,000 years.

The water is clearer now than it was about 4,000 years ago when there was a decrease in planktonic diatoms and an increase in aquatic plant macrofossils. There are probably more nutrients in the lake now than there was about 4,000 years ago



## Why is pollen so important to our community?

We found pollen in lake sediments from 10,000 years ago to the present time. We found a high abundance of spruce pollen at 600 to 700 cm, around the time the lake was first formed after the glaciers melted. This was followed by a high abundance of red-jack pine pollen from 425 to 700 cm. White pine pollen increases about 550 cm, estimated to be about 7000 years ago. Dates are estimated pending radiocarbon dates. There is a decrease of red-jack pine and an increase of white pine during the last ~4000 years. This increase in white pine is usually thought to be caused by a change to cooler or wetter climate. Another interesting change is the increased abundance of grass pollen in the last several thousand years. Wild rice is a grass and this could represent an increase in wild rice abundance in the lake, but its pollen cannot be distinguished from other grasses so it is not clear what type of grass increased. Our data show that the forests of the region have change a lot over thousands of years and raise many questions about the role of climate and native people in these changes.



## What we Know:

1. Pollen is vital for Wild Rice growth because depending on the nutrients needed by other plants species, it could give or take from the process of absorbing nutrients. There for, it could change the germination of the Wild Rice, and change the overall quality of the Wild Rice.
2. Wild rice could need the same nutrients as another plant(s), so the pollen from one plant could go from one plant or the wild rice and fertilize the other. In order for the plant to grow and develop, it has to have pollen either from its own species, or maybe from another plant that needs the same nutrients to grow.

## Why is pollen so important to Wild Rice growth?

Forests have changed a lot over thousands of years. Pollen is found in lake sediments from 10,000 years ago to the present time. Dates are estimated pending radiocarbon dates. Wild Rice is a grass and this could represent an increase in wild rice abundance, but its pollen cannot be distinguished from other grasses so it's not clear what type of grass has increased. Pollen is vital for Wild Rice growth because depending on the nutrients needed by other plant species, it could tell what plants were around at different times. Therefore, it could change the germination of the Wild Rice, and change the overall quality of the Wild Rice. Wild Rice needs nutrients to grow and develop, so the pollen needs to travel from one Wild Rice plant to the other to keep from over germination that would create a greater density and a harsher texture within the rice. And that is why pollen is so important to Wild Rice growth.