2024 DRAFT Rice Hull Protocol

Background

The wild rice hull mulch research will measure the impact of this traditional resource on ecosystem health that has the potential to alleviate environmental degradation, provide climate crisis mitigation, and preserve the natural resources of NE Minnesota.
Over the last two years, participants in the PTP have begun using manoomin hulls as mulch in their fields. New research on the use of wild rice hull mulch will contribute to ecosystem thinking that is the keystone of Gitigaaning.

Purpose and Research Questions

The purpose of this study to evaluate the effectiveness of manoomin hulls as mulch. Specifically, this study seeks to address the following research questions:

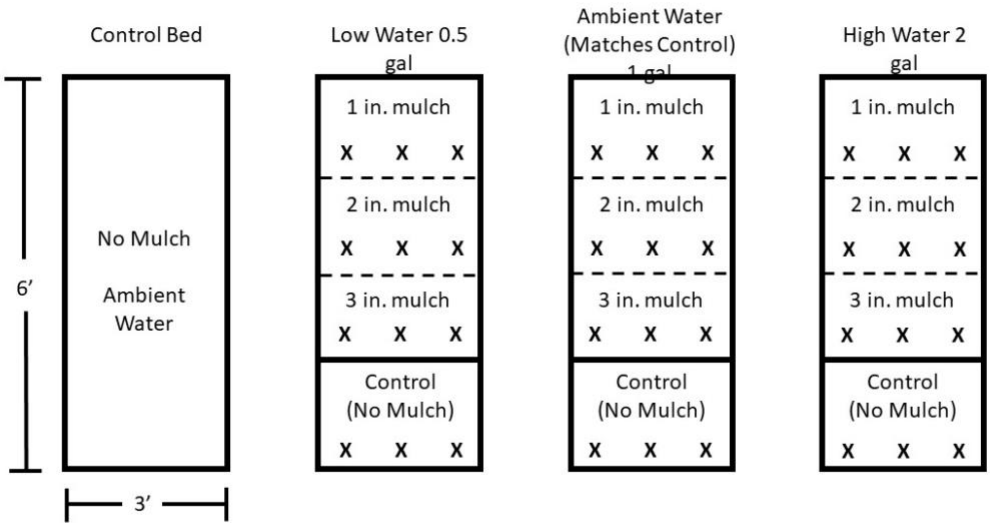
- Is wild rice mulch an effective method of retaining soil moisture?
- Is there a relationship between the use of wild rice mulch and soil health?
- How does wild rice mulch contribute to weed suppression?

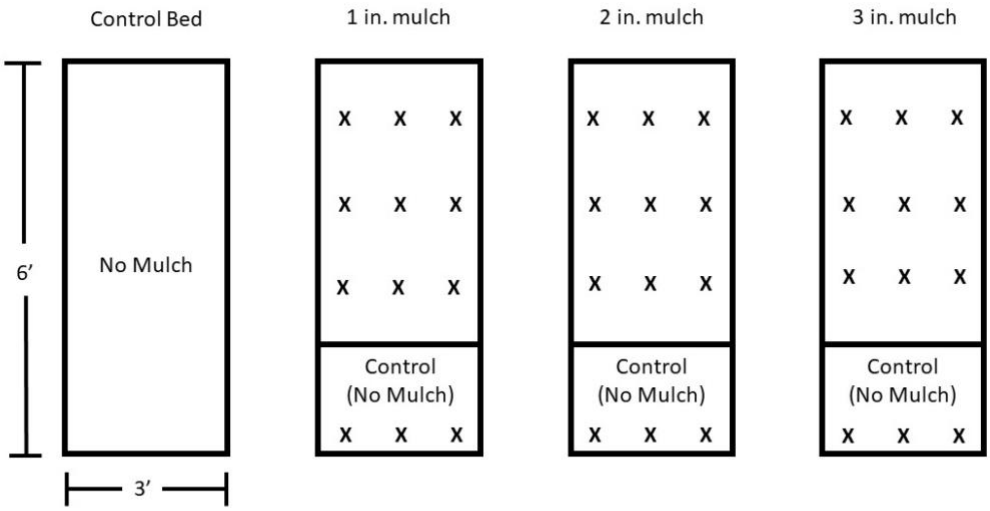
Experimental Design at FDLTCC High Tunnel

To answer the research questions, the research will occur on two scales. The first will be in raised garden beds in the FDLTCC high tunnel at 14th and Stevens Rd. Following the implementation of these protocols in the high tunnel, FDLTCC students and staff will continue to work with PTP participants to implement these protocols at a scaled level for their plots at Gitigaaning.

Within the high tunnel, four raised garden beds will be dedicated to the wild rice hull research. One bed will serve as a control that will not contain any mulch. In the remaining three beds, the amount of mulch will serve as the experimental variables to determine the effectiveness of the rice hulls as mulch. The figure below illustrates the differences between each of the raised beds.

A total of 12 plants will be planted in each of the garden beds (indicated by “X” in figure) and will be evenly distributed in each bed. To minimize the amount of variability in the beds, only one species will be used in the high tunnel beds.





Considerations for experimental design

- Do we need to replace the soil in each bed prior to starting experiment?
- Does soil need to be replaced between years?
- Does initial soil need to be similar to what is at Gitigaaning?

Watering protocols

To assess the effectiveness of wild rice hulls on the soil moisture retention, soil moisture meters will be installed in each of the garden beds. These meters will continuously monitor the soil moisture in each bed. The frequency and volume of water used in each bed will be determined by the soil moisture meters. There currently is no pressurized system for watering the plants, so each garden bed will be watered by hand to get the most accurate volume of water used on each bed.

The watering data to be recorded each day will include:

- Soil moisture measurement from meters
- Volume of water used in each bed
- Date and time of watering (should be completed before noon each day)

Weeding protocols

Each of the raised beds will be weeded on a weekly basis.
Prior to weeding, take a photograph of each bed for a visual reference of the density of weeds in each bed.

Weed counts

- Count and record the number of individual weeds in each bed.
    - This can be done using a quadrat when scaled up to the farm

Weed biomass

- Using the weeds counted previously, cut the plant where the stem meets the root system. Be careful not to get soil in the sample.
- Sort and identify weeds by species.
- Place samples into bags and store in cooler until ready to weigh samples (okay to refrigerate for a few days).
- Weigh plants and record on datasheet.
- Dry the biomass at 140F for a few days, until it's completely crispy, then weigh it again.

Weed Suppression

- Weekly photos of each bed
- Weed Weekly
    - Weight wet mass
    - Weight dry mass

Potential Next Steps

Soil health protocols

Soil health will be assessed at several times during the growing season, including:

- Once prior to planting
- 2x per month during the growing season
- Once at the end of the growing season

Soil samples will be collected from each raised bed and will be analyzed for the following nutrients:

- Phosphate
- Nitrogen / Nitrates/ Ammonium
- Potassium
- Magnesium
- Boron
- Calcium

Other parameters that can be measured:

- Bulk density – accounts for changes in C
- C:N ratio
- Decomposition rate of mulch – put some hulls in a tea bag and place on top of the soil
- Infiltration