



Rice Lake, Google

Rice Lake Pond Water Quality Improvement Project Using Barley Straw

Prepared for:
**Rice Lake Area Association and
City of Maple Grove, Minnesota**

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Rice Lake, Maple Grove, Minnesota

Lake ID: 27-0116

Size: 314 acres (source: MnDNR)

Littoral area: 314 acres (source: MnDNR)

Maximum depth: 11.5 ft (source: MnDNR)

Introduction and Methods

Lowering phosphorus concentrations in stormwater ponds lowers the amount of phosphorus that is discharged into a lake. This is a way to improve lake water quality. Previous research (McComas, unpublished) has documented that installing barley straw into stormwater ponds can lower phosphorus concentrations. It appears the organic carbon in barley serves as a carbon source for carbon-limited microbes already present in a pond and stimulates microbial growth. As a microbe population increases they have requirements for macro and micro-nutrients. Because barley straw is low in phosphorus, microbes need to get phosphorus from the water column to grow. This can reduce the phosphorus levels in a pond. Thus, the use of barley straw can lower phosphorus concentrations in stormwater ponds.

In 2008, barley straw was installed in two stormwater ponds in the Rice Lake watershed, within the City of Maple Grove. The pond sizes and barley amounts added are shown in Table 1.

Table 1. Pond sizes and amount of barley straw added to the ponds.

	86th Pond	89th Pond
Pond size	0.42 ac	0.26 ac
(maximum depth)	4.5 ft	4.0 ft
Barley added (7.31.08)	420 pounds	200 pounds
Barley (pounds/ac)	1,000 pounds/ac	770 pounds/ac

Twenty pounds of pelletized barley were contained in mesh bags which were tied together and staked into the nearshore areas of the ponds (Figure 1). Barley straw was installed in the ponds on July 31, 2008. Pond locations are shown in Figure 2.



Figure 1. Barley straw installation.



Figure 2. 89th Pond (0.26 ac) is located west of Rice Lake Road and 89th Avenue North (referred to as Tristan Bay South). 86th Pond (0.42 ac) is located west of Rice Lake Road and 86th Avenue North (referred to as Maple Grove EF Church).

Results

Barley straw was installed in the ponds on July 31, 2008. Pond water quality was monitored for phosphorus on July 31 and then on August 20 and September 29 (Table 2). It takes about 30 days for barley to start noticeably reducing phosphorus in a pond. The first sample date after installation was on August 20, 20 days after barley was installed. Phosphorus levels in both ponds were higher than on the day of installation. On the second sampling date after installation, phosphorus was less than the first sample date for both ponds. For the September sample, phosphorus was less than the July concentration for the 86th Pond, but not for the 89th Pond. However, one interesting result was that the duckweed was gone in the 89th Pond on the September date (Figure 3).

Barley results for these two ponds are not conclusive. Although phosphorus levels declined from August to September, it is not clear if this was caused by barley or if it would have happened naturally. Likewise, the decline in duckweed in the 89th Pond could have been from barley or other natural causes. However, the results were positive.

These two stormwater ponds do not represent major sources of phosphorus loading to Rice Lake. Future barley installations will not have much impact on reducing phosphorus in Rice Lake although barley helps improve water quality in the stormwater ponds.

Table 2. Total phosphorus concentrations in the two stormwater ponds in 2008.

	86th Pond	89th Pond	Notes
July 31, 2008	118 ppb	252 ppb	Prior to barley installation.
August 20, 2008	133 ppb	381 ppb	20 days after installation, major reductions are not expected.
September 29, 2008	91 ppb	277 ppb	Duckweed disappeared in 89 th pond.

86th Avenue Pond



July 31, 2008

89th Avenue Pond



July 31, 2008



August 20, 2008



August 20, 2008



September 29, 2008



September 29, 2008

Figure 3. Stormwater pond conditions from July through September, 2008 for the two ponds with barley straw.