MEMORANDUM
Comfort Lake-Forest Lake Watershed District

To: Board of Managers
From: Mike Kinney
Subject: Bone Lake Legacy Loading Investigation Scope of Work

Date: September 16, 2019

Background/Discussion
The 2019 budget contains $50,000 for item 5-222-F (Bone) Diagnostic Study Implementation in order to implement the Bone Lake Rural Subwatershed Analysis and complete the next generation of targeted monitoring within this subwatershed. This one drainage area in the northeast corner of Bone Lake is of particular interest for further analysis given the historical photos of immediately adjacent farming activities and the additional recent monitoring data results.

Recommended Action
Proposed Motion: Manager __________ moves to authorize the administrator, on advice of counsel, to enter into an agreement with Emmons & Olivier Resources in accordance with the September 17, 2019 scope of work and in an amount not to exceed $5,111. Seconded by Manager __________.

Attached: EOR Scope of Work – Bone Lake Legacy Loading Investigation
The purpose of this scope of work is to conduct a small field investigation of a small wetland on the northeast shore of Bone Lake (Figure 1) to determine if there are legacy phosphorus loads resulting from historical livestock access to the wetland. A large farm is present adjacent to the small wetland on the northeast shore of Bone Lake in 1964 (Figure 2), but is not present in 1938 (Figure 3) or currently (Figure 1). Recall that the eastern portion of Moody Wetland A was historically used as a water source for cattle. Over time, a nutrient rich layer of sediment accumulated within the eastern portion of Wetland A. This history of direct livestock access to the wetlands allowed nutrient rich runoff to flow directly into the wetlands and downstream to Moody Lake.

A grab sample was collected and analyzed for total and ortho-phosphorus from the wetland discharge following a rain event on July 15, 2019. Total phosphorus concentration in the water quality sample was 0.58 mg/L, of which 0.55 mg/L was ortho-phosphorus. The objective of this scope of work is to determine if a legacy load is present in the wetland, and if so, the general extent of the accumulated, nutrient rich sediment in the wetland.

Up to 15 soil cores will be collected along transects through the wetland to determine the areal extent and depth of accumulated, phosphorus-rich sediment. These cores will be assessed and measured to determine the presence and depth of accumulated sediment based on visual changes in soil horizons. Soil samples will be collected at several depths from each sediment core and analyzed for total phosphorus and percent organic matter. TP concentrations reported for undisturbed wetland soils (550 mg TP/kg of sediment; Mukherjee et. al., 2009). For comparison, observed soil TP concentrations in the eastern portion of wetland A that was excavated as part of the Moody Wetland Rehabilitation project had elevated nutrient concentrations in the top (1250 mg TP/kg of sediment) and bottom (1210 mg TP/kg of sediment) of the soil core, indicating a thick layer of nutrient rich sediment.

**Deliverables**

- TP concentration data for up to 15 soil cores at 3 depths per core
- Visual observations of soil horizons

**Schedule**

October – November 2019

**Estimated Hours and Cost**

32 hours = $3,568; Mileage, equipment and lab expenses = $1,543; Total cost = $5,111

**References**

Figure 1. Proposed wetland location for legacy load field investigation on the northeast shore of Bone Lake

Figure 2. 1964 aerial image showing presence of the historic feedlot
Figure 3. 1938 aerial image showing absence of the historic feedlot