Lessard Sams Outdoor Heritage Council
HRE08
Klondike Clean Water Retention Project – Phase 1
Two Rivers Watershed District

The information below was used by a project team planning committee to develop Natural Resource Enhancement objectives for the project. These were developed specific to fish habitat on the South Branch Two Rivers. This is significant because the removal of the Hallock Dam, previously funded by the LSOHC, will allow fish passage upstream to Lake Bronson. This new project will potentially provide a 59% increase in the 50% lowest flows, which will benefit fish by preventing mortality and providing enough water in the stream during low flow periods for fish survival.

EXCERPTS FROM
Natural Resources Enhancement Objective Development Worksheet
Big Swamp Project Work Team, Two Rivers Watershed District

Project Name: Klondike Clean Water Retention Project (KCWRP)

Evaluation team: NRE Subcommittee (Low-Flow Aug.) **Date:** 1-21-20

Overview (provide a basic overview of the reason that this area is being considered for a project).

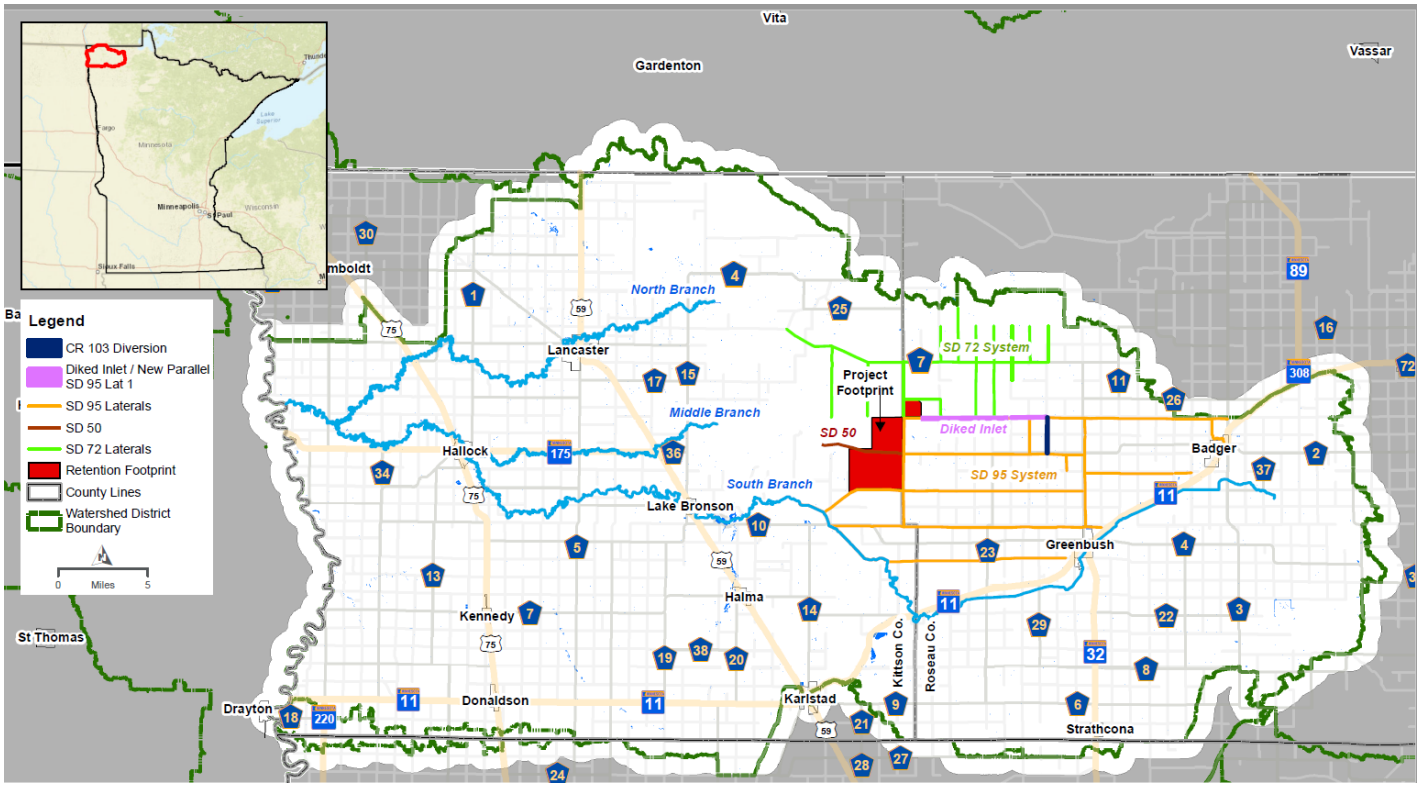
Alterations to the landscape, agricultural drainage, changes to channel morphology, and climate change are some of the factors have resulted in changes to the flow regime of the Two Rivers Watershed. The result of these alterations is a watershed in which an increase in the magnitude and frequency of high flows has occurred, along with prolonged period of no flow in the channels. In short, the entire system has become flashier (Groshens 2003).

The natural flow regime of a lotic system is often considered of "central importance" in determining the fish and macroinvertebrate community structure (Poff et al. 1997). Alterations to the flow regime can cause the resulting fish and macroinvertebrate communities to shift towards a state of impairment which is likely occurring in the Two Rivers Watershed (Sharp 2017). Specifically, flow instability favors species that are short-lived, tolerant, generalist species (Poff and Zimmerman 2010, Aadland et al. 2005). According to the Monitoring and Assessment Report from MPCA, Assessment Unit Identifiers (AUIDs) 502, 503, 505, and 521 are all listed as impaired for aquatic life use based on poor fish and/or macroinvertebrate communities (Dingmann et al. 2016) and are located downstream of the proposed impoundment location. Additionally, 8 AUIDs and Lake Bronson in the Two Rivers Watershed downstream of the proposed KCWRP site are expected to receive water quality benefits from low flow

augmentation. Conventional water quality parameters that are expected to improve are total suspended solids (TSS), dissolved oxygen (DO), and total phosphorus (TP).

Though flow regime is of "central importance" in determining the structure of fish and macroinvertebrate communities, it does not operate in a vacuum. The species present are determined by a suite of variables and interactions (Poff 1997). Other issues in the watershed that also may be of importance in the degradation of fish and macroinvertebrate communities include loss of longitudinal (dams; Topp 2009, Groshens et al. 2003) and lateral connectivity (levees/dikes) to the floodplain, loss of high quality habitat through channelization and dredging, and/or changes to water quality (e.g., total suspended solids, total phosphorus, dissolved oxygen, etc.).

This project has the potential to address some of the flow instability and water quality issues in the South and Middle Branch Two Rivers and move the flow regime to a more natural state. Reducing the hydrologic flashiness and improving the water quality of the South and Middle Branch Two Rivers will also benefit the fish and macroinvertebrate communities with proper operation of a low flow augmentation plan. As such, it should be considered for Natural Resource Enhancement Credit, though it cannot be expected to return either stream to a fully functioning ecosystem without other NRE considerations (such as increased connectivity).



Overview of the Klondike footprint with associated drainage ditches and watercourses

NRE Planning Area Objectives

1. To provide a more natural flow regime to reduce flow instability of Middle and South Branch Two Rivers downstream of KCWRP caused by alterations to landscape, drainage, natural hydrology, river channel morphology, and climate change through:
    a. Reduced magnitude of peak flows and increased base-flows during low water periods in the summer and fall, dependent on water year conditions.
    b. Extend duration of seasonal high flow events
    c. Slowing the hydrologic rate of change (i.e. increased retention time in upstream areas).

   A Hydrological Simulation Program – FORTRAN (HSPF) model was developed with the KCWRP project included and estimates that low flow augmentation from the impoundment can provide a 59% increase in the 50% lowest flows.
2. To improve fish community structure to the modified and general use thresholds so that the MPCA impairment can be removed.
3. To improve macroinvertebrate community to the modified and general use threshold structure so that the MPCA impairment can be removed.
4. Reduce the relative abundance of tolerant fish species at MPCA biological stations (10EM192, 13RD085, 93RD401, 93RD405, 05RD093, 13RD042, 13RD043) and MNDNR fisheries station 10 to the basin average for each station class.
5. Reduce the relative abundance of generalist fish species at MPCA biological stations (10EM192, 13RD085, 93RD401, 13RD085, 05RD093, 13RD042, 13RD043) to the basin average for each station class.
6. Increase the relative abundance of sensitive fish species at MPCA biological stations (10EM192, 93RD401, 93RD405, 05RD093, 13RD042, 13RD043) to the basin average for each station class.
7. Increase catch per unit effort excluding tolerant species at MPCA biological stations (13RD085, 93RD401, 10EM192, 13RD082, 05RD093, 93RD405, 13RD042, 13RD043) to the basin average for each station class.
8. Increase the relative abundance of long lived macroinvertebrates at MPCA biological stations (13RD082, 93RD401, 05RD093, 93RD405, 13RD042, 13RD043) to basin average for each station class.
9. Decrease relative abundance of swimmer taxa (refers to a macroinvertebrate taxon that moves and finds food in their environment by swimming) at MPCA biological stations (05RD093, 93RD405, 13RD042, 13RD043) to basin average for each station class.
10. TSS levels in waterbodies downstream of the impoundment site can be restored to conditions better than what currently exists (with the goal of meeting state standards [65 mg/L] and TMDL reductions). Stagnant conditions cause algal growth and harmful blooms of blue-green algae, which increases TSS in watercourses, but using the impoundment for low flow augmentation will reduce the frequency and duration of stagnant conditions, thereby lowering algal growth and TSS. Decreasing TSS levels also reduces the chances that it will be a stressor to biological communities.
11. Dissolved oxygen levels downstream of the impoundment site can be restored to conditions better than what currently exists (with the goal of meeting state standards [5 mg/L]). A major

cause of low dissolved oxygen in the NRE planning area is lack of flow in watercourses, which can be alleviated by low flow augmentation. To mitigate the possibility that water leaving the impoundment may have low dissolved oxygen due to sitting idle, structures will be placed immediately downstream of the outlets so that as the water is coming out of the impoundment, it's impact with the structures will churn it and increase surface area of the water exposed to air, thereby aerating it (i.e., increasing dissolved oxygen) before traveling further downstream. Increasing DO levels also reduces the chances that it will be a stressor to biological communities.

12. Total phosphorus levels within and downstream of the impoundment site can be restored to conditions better than what currently exists (with the goal of meeting state standards [150 µg/L]). Keeping water in the impoundment for low flow augmentation pool allows more time for plants to take up phosphorus from the water. Decreasing TP levels also reduces the chances that it will be a stressor to biological communities.

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Two Rivers Watershed District

Beaches Lake Area Fen Management Plan

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Two Rivers Watershed District

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Minnesota Department of Natural Resources

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Introduction

The Beaches Lake Fen, also known as the Juneberry Ridge Fen, is an extensive, nearly level, and open wetland on shallow peat. The majority of the fen is located in Kittson County with its eastern border extending into Roseau County (Figure 1). Historically the fen was estimated to be originally 34,000 acres in size. Today the fen is approximated at 18,000 acres (ac) between the large 11,000 ac contiguous block and the surrounding disconnected patches. This fen is unique due to its large size, overall integrity, biodiversity significance, and location, as it is the westernmost, large peatland in Minnesota.

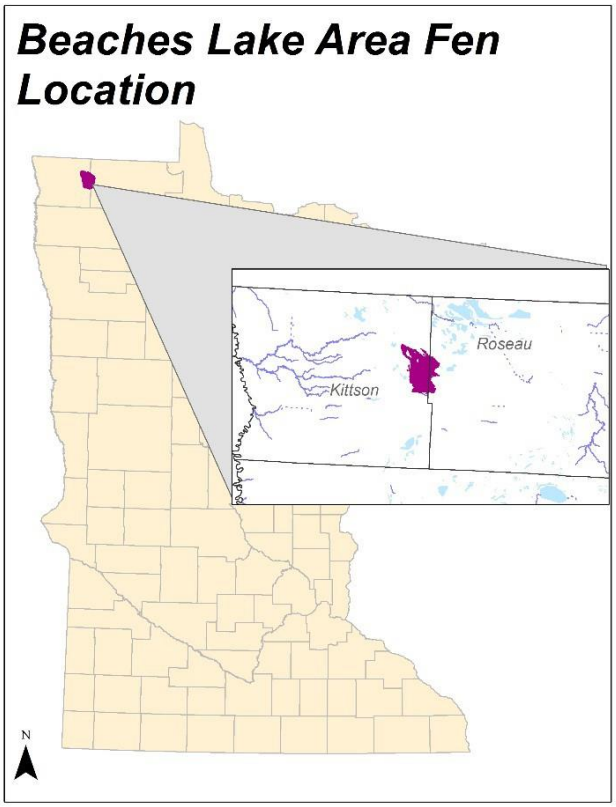


Figure 1. Beaches Lake Area Fen Location

The Beaches Lake Fen is a type of fen called a Prairie Rich Fen. The largest concentration of this type is located in the Red River Basin illustrated in Figure 2. There are three notable complexes of this community, and the Beaches Lake Fen is largest, most intact and stable of these fens. The total pre-European settlement area of this prairie rich fen plant community in Minnesota was probably not more than 55,000 acres, all of it in the Aspen Parkland region in the extreme northwest corner of the state. Other large rich fens in the state have been degraded or altered by ditching, burning, farming, diking, or other disturbance.

A fen is a type of wetland whose primary input of water is ground water. The water table remains at or close to the surface, keeping the peat saturated to the surface most of the time, and flooding from surface inputs (direct precipitation, runoff from uplands) is shallow or of short duration. Lateral flow of the groundwater through the peat is typical, but evident upwelling that typically occurs in calcareous fens is not a feature in this rich fen. The groundwater is rich in minerals dissolved from the calcareous till left by glacial advances from the northwest and has a high pH. The semi-arid climate of the prairie region results in the evaporative concentration of these minerals in the upper part of the peat layer much greater than occurs in fens in the more mesic region to the east. It is this character of the peat that is responsible for the distinctive Prairie Rich Fen plant community.

These fens support a variety of relatively rare plant and animal species. It is dominated by narrow-leaved sedges and grasses, mixed with scattered clumps of low shrubs. Where mosses are present, they are non-sphagnum types. The Beaches Area Lake rich fen is generally located within and adjacent to Beaches Lakes Wildlife Management Area (WMA) in Kittson County

(Figure 3). The WMA is a mixture of wetlands, aspen timber, brush prairie, brush lands and old fields. The original extent of the fen included portions of 40 Sections in four different townships. Some areas of the original fen are degraded while other areas are still contain the intact native plant community characteristics of the prairie rich fen classification.

Protection, restoration, and enhancement of this unique resource depends on future water and land management activities near the fen and within its contributing watershed.

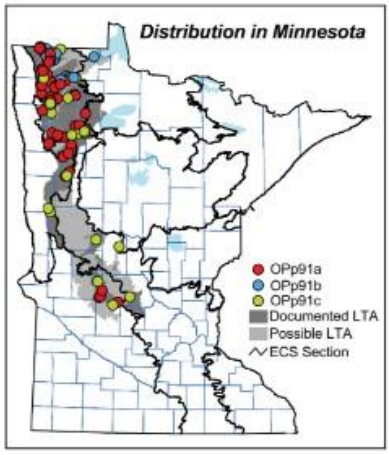


Figure 2. Distribution of Prairie Rich Fens throughout Minnesota

The Two Rivers Watershed District is currently investigating options to construct an impoundment project in Klondike Township, Kittson County, called the Klondike Clean Water Retention Project. This project has the potential for both positive and/or negative effects on the fen in the short and long term. Given the importance of this resource and the need to build flood damage reduction projects in the Red River Basin, the MN legislature enacted legislation (Laws of 2016, Chapter 154, Section 34), which requires the development of a management plan for the fen.

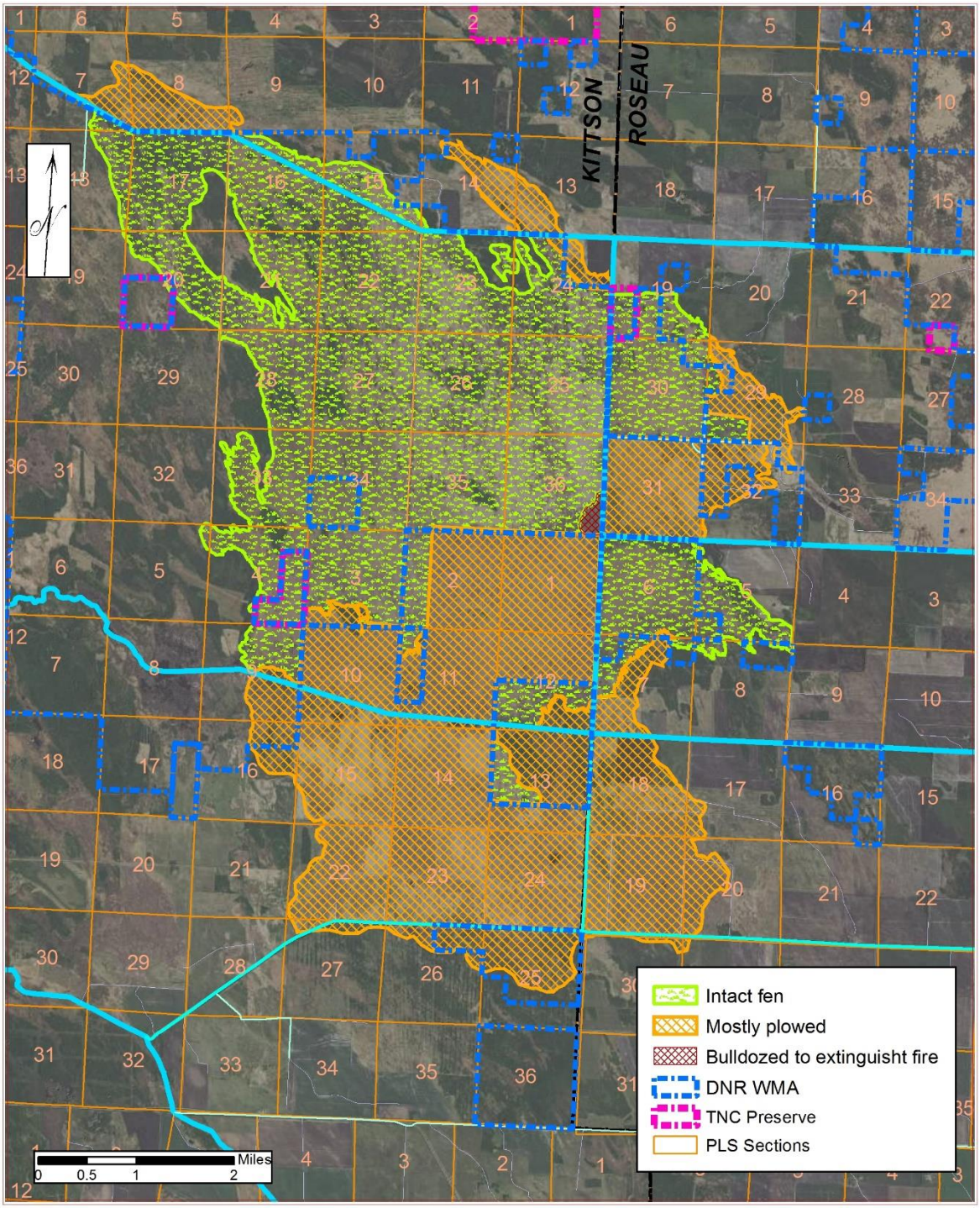
Purpose

The purpose of this Beaches Lake Area fen management plan is to provide management, protection, and enhancement guidance to the Department of Natural Resources, the Two Rivers Watershed District and the Klondike Project planning team. Goals were derived to protect and improve fen conditions as well as increase the resiliency of the fen area to climate and hydrologic changes. They also address potential future stressors on the fen, including the proposed Klondike Flood Damage Reduction project. These goals include:

1. *Protect existing conditions in the highest quality areas of the fen.*
2. *Maintain and/or improve conditions in areas of the fen that are largely intact/functional but have degraded quality.*
3. *Improve conditions in areas of the fen that have been substantially altered.*
4. *Increase awareness of the fen's functions and values and the factors that affect the fen.*

This plan reviews our current understanding of fen conditions, establishes goals and objectives for improving fen conditions, and lists strategies to achieve objectives. It also includes a monitoring plan to establish baseline conditions and an adaptive management plan to evaluate long term conditions within the rich fen area. This fen management plan shall be implemented if funding is made available by MN State Legislature.

Beaches Lake WMA rich fen--original area and intact area



R. Dana, MN DNR 2017