HYBRID CATTAIL REMOVAL AND WATER FLOW ENHANCEMENT PROJECT

Project Partners:

Rainy Lake Property Owners Association, Koochiching County, Koochiching SWCD, Int'l Falls Fire Dept / Rural Fire Protection Assn

Collaborative Support:

Voyageurs National Park, MN Dept. of Natural Resources, and local area residents

This project is funded by the Clean Water, Land, and Legacy Amendment and local contributions

Presentation Outline

- **PROJECT HISTORY & OVERVIEW: HOW DID WE GET HERE?**
  - Jeff Hardwig, RLPOA
- **PROJECT ADMINISTRATION: PLANS, TIMELINE & BUDGET**
  - Pam Tomevi, Koochiching SWCD
- **CR 134 ROAD PROJECT: WHAT TO EXPECT**
  - Trent Nicholson, Koochiching Highway Dept
- **QUESTION & ANSWERS: QUESTIONS FROM THE PUBLIC**
  - Project Partners (RLPOA / SWCD Koochiching Highway)
  - Collaborative Support (DNR / VNP)

NORTHERNAIRE FLOATING LODGES
CIRCA 1960


SunTracker
ON2528410


grassy portage 2014
Legend
Moosehorn Lake
Google Earth
Image © 2020 Maxar Technologies
N
2000 ft

FLOATING CATTAIL MATS

- **THE HYBRID CATTAILS THAT MAKE UP THESE MATS HAVE FAR GREATER NEGATIVE IMPACTS ON THE ENVIRONMENT BEYOND THEIR EFFECT ON HUMAN NAVIGATION AND RECREATION.**

PROJECT HISTORY & OVERVIEW:
HOW DID WE GET HERE?

FROM THE SCIENCE ON CATTAILS:

"OVER RECENT DECADES, THE DISTRIBUTION AND ABUNDANCE OF CATTAIL IN NORTH AMERICA HAS INCREASED AS A RESULT OF HUMAN DISTURBANCES TO NATURAL WATER CYCLES AND NUTRIENT LOADS"

USGS FACT SHEET 2019

1. **HUMAN DISTURBANCE (ROADS)**

- **Roads functioned like dams by:**
  - **TRAPPING NUTRIENTS from inadequate sewer systems**
  - **SHELTERING ENCLOSED WATERS from wave action, current, and boat traffic**
  - **CREATING EXTENSIVE ARTIFICIAL SHORELINE for Hybrid cattails to take root**
- **County Roads 134 (CIRCA 1947) and 135 (CIRCA 1960) connecting islands in Rainy Lake did not include bridges or adequate openings for waterflow**

*** CHANGES IN HYDROLOGY AND NUTRIENTS ARE THE MAIN HUMAN CAUSES OF ACCELERATED HYBRID CATTAIL GROWTH**

2. **AGGRESSIVE NATURE OF HYBRID CATTAILS**

- **Hybrid cattails are a cross between Native and Invasive European cattails.**

- **The European Cattail and Hybrid Cross arrived on the east coast in the mid 1800s, spread up the Great Lakes and arrived in our area by the 1980s**

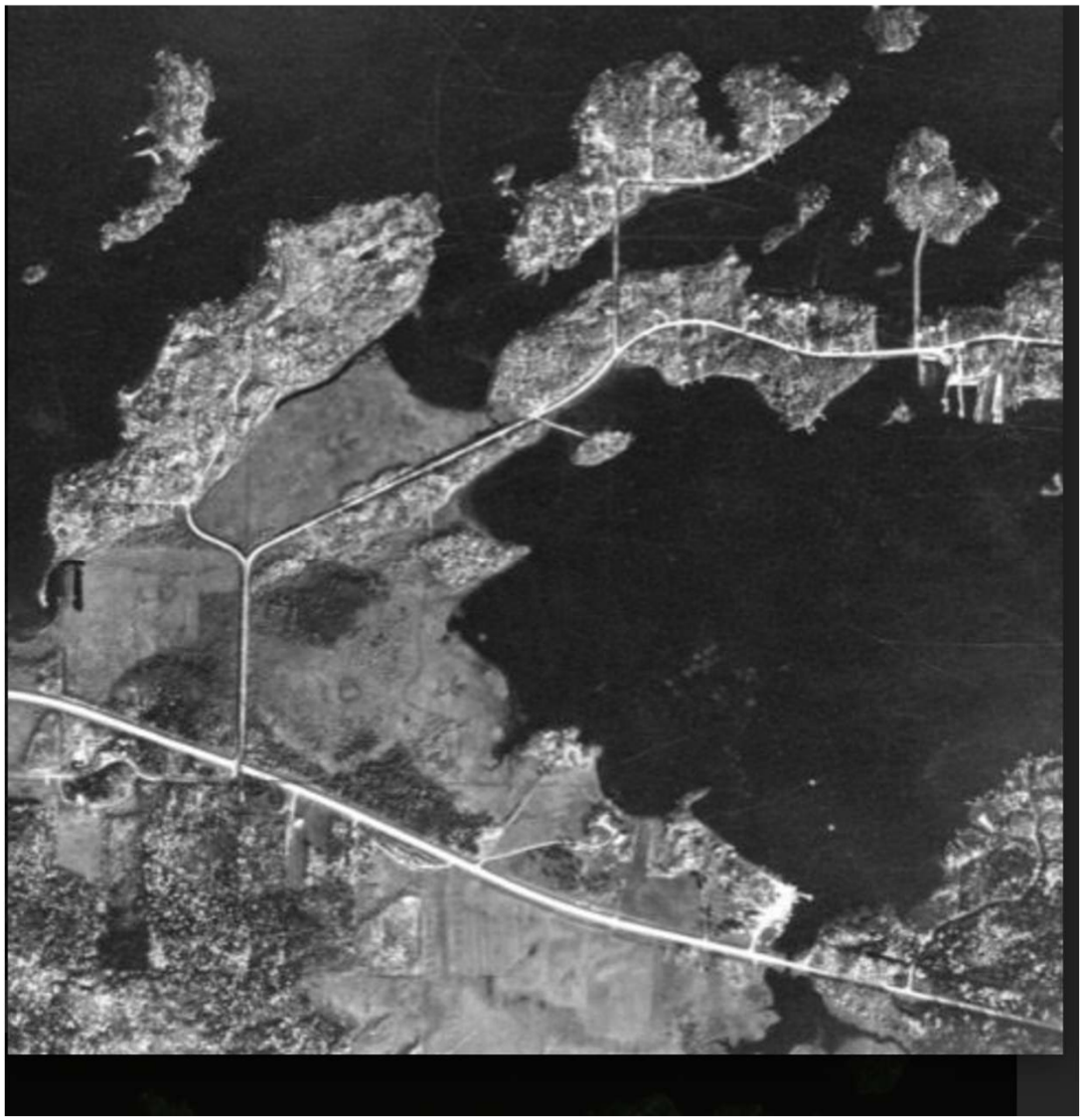
- **Genetic marker testing of sites in Cranberry Bay on Rainy Lake and sites in Kabetogama confirm 98-99% mainly Hybrid Cattails**

HYBRID CATTAILS HAVE HYBRID VIGOR

- **Outcompete both their native and invasive parents and displace other native vegetation such as wild rice, sedges, bullrush, and lilly pads.**
- **Can grow in deeper water up to 1 ½ meters**
- **Grow taller**
- **Grow more densely**
- **Grow extremely fast mainly by spreading out from roots**
- **Create large amount of litter which inhibits other plants**
- **Resulting in pure stands of hybrid cattails**

NEGATIVE EFFECTS OF HYBRID CATTAILS

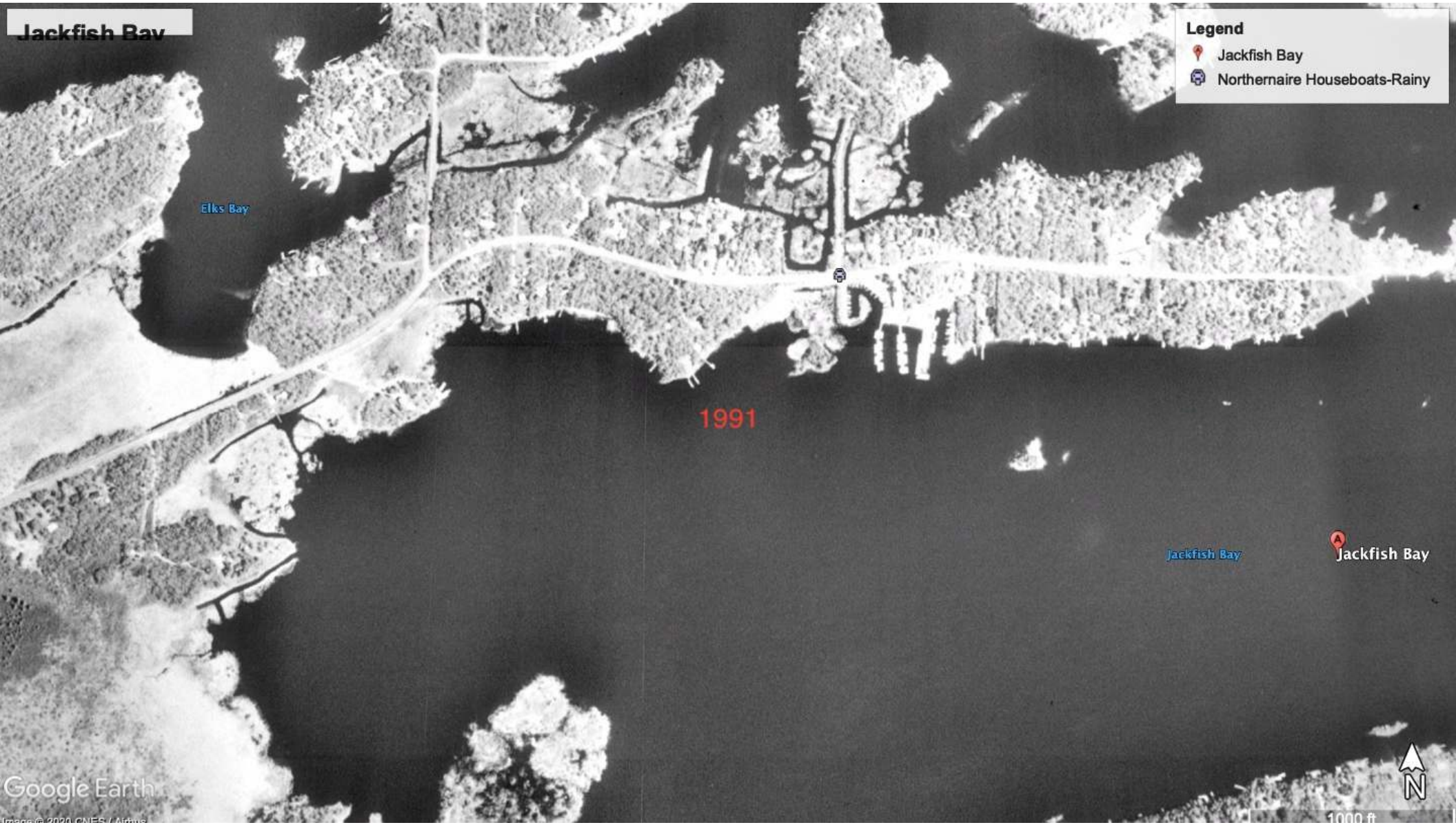
- **POOR FISH SPAWNING/FISH NURSERY (lower oxygen and temps)**
- **POOR PREDATOR FISH HABITAT (too dense to hunt in and low oxygen)**
- **POOR WATERFOWL HABITAT (although Redwing Blackbirds roost in cattails)**
- **DISPLACES NATIVE PLANTS - Native plants provide superior habitat for fish and wildlife or are commercially valuable such as wild rice**
- **POOR FOOD FOR WATERBIRDS**



AERIAL PHOTO FROM 1971

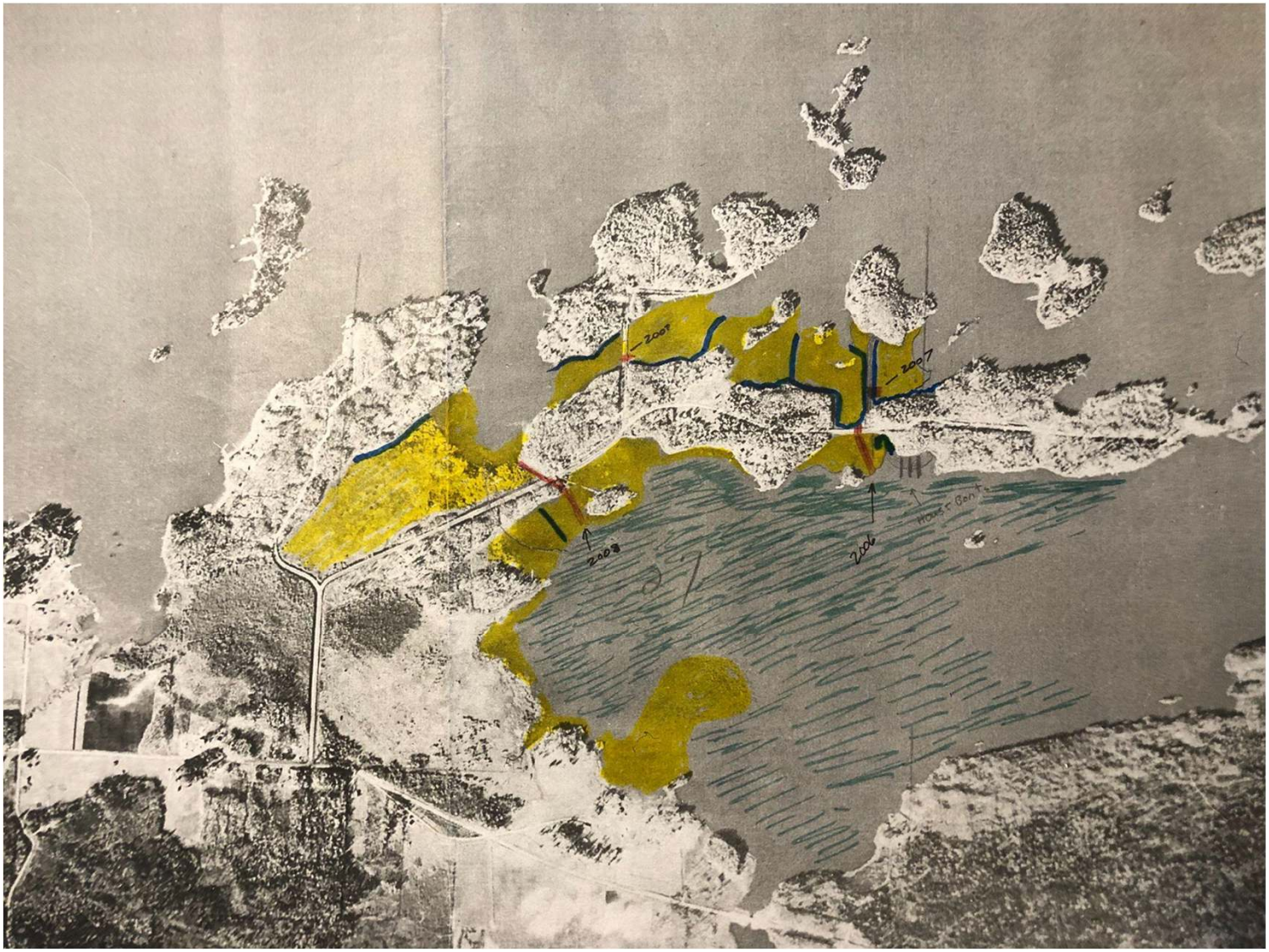
(NOTE OPEN WATER)

CR 134, CR 135,
LORDS ISLAND, and
NORTHERNAIRE FLOATING
LODGES


Jackfish Bay
Legend
Jackfish Bay
Northernaire Houseboats-Rainy
Elks Bay
1991
Jackfish Bay
Jackfish Bay
Google Earth
N

First Effort To Restore Waterflow Interrupted By Roads Connecting Islands

2007




Untitled Map
Write a description for your map.
Legend
Northernaire Houseboats-Rainy
Google Earth
N
1000 ft


Jackfish Bay
Legend
Jackfish Bay
Northernaire Houseboats-Rainy
Elks Bay
2007
Jackfish Bay
Jackfish Bay
Google Earth
N


NEW PIPE


2008
Box Culvert
and
Dredging
Project


2013


2015


2019
135
94

WHAT WE LEARNED:

- **The 2007 CR 94 box culvert installation resulted in GOOD FLOW through the culvert and REGRESSION OF CATTAILS on either side of the culvert, especially along the dredged channel to culvert (however, numerous FLOATING MATS broke off)**
- **Habitat improvement is best achieved through WATER FLOW RESTORATION paired with CATTAIL REMOVAL**

CURRENT PROJECT:

- **Continuation of the original vision of Tom Karsnia and other local residents in the early 2000s to restore water flow to CR 134 and 135 lost through road construction**
- **Project Modeled from success of the 12’ Box Culvert Placement on CR 94 in 2007**
- **Objective: Water flow enhancement paired with cattail removal to increase the potential for successful habitat improvement with native vegetation restoration**


UT-273
County Rd 134
9
T71 R23
County Rd 94
2023 PROJECT AREA

PROJECT ADMINISTRATION:

- **Koochiching SWCD serving as Fiscal Agent and Technical Support**

- **Funded through Conservation Partners Legacy (CPL) Grant Program with Local Match Support**

PHASE 1 – CATTAIL REMOVAL

- **PURPOSE:**
  - Remove trapped nutrients which favor hybrid cattail growth
  - Prevent floating cattail mats
  - Clear the way for restoration of native habitat
- **Timeline / Tasks**
  - April/May 2023
    - If conditions allow, perform above ice non-native hybrid cattail burn to reduce biomass, reducing removal and trucking costs
  - July – September 2023
    - Mechanically remove 9 acres of non-native hybrid cattails; haul debris to pre-approved upland site

PHASE 2 – CULVERT REPLACEMENT & RAISE ROAD

- **PURPOSE: Culvert Replacement / Raise Road**
  - Remove trapped nutrients which favor hybrid cattail growth
  - Restore waterflow
  - Promote regression of non-native hybrid cattails
  - Accommodate new box culvert
  - Provide Flood Mitigation

- **Timeline / Tasks**
  - Fall 2023 or Summer 2024
    - Replace existing 48”culvert culvert with 10’ X 16’ box culvert
    - Raise elevation of CR134 by approximately 4 ½ feet
    - Construct bypass for continued access during construction

PHASE 3 – RESTORE NATIVE VEGETATION

- **PURPOSE:**
  - **Replace non-native cattails with wild rice and native wetland seed mix**
  - **Improve habitat for fish and wildlife**
- **Timeline / Tasks**
  - **Fall 2023/2024**
    - **Introduce wild rice seed**
  - **Spring 2024/2025**
    - **Introduce native wetland seed mix**
  - **Fall 2025**
    - **Seed additional wild rice seed if previous plantings were effective**
  - **2025 and forward**
    - **Monitor project effectiveness related to goals**

CPL Grant Funds Budgeted:

- Cattail Removal $202,000
- Culvert & Road $195,000+
- Native Seed Mix $2,500

- **Total Grant $399,500**

Local Match Support:

- Wild Rice Seed $2,500 (RLPOA)
- Prescribed Burn $1,600 (RFPA)
- Add'l Road Cost $44,000 Minimum (Koochching County)
- Staff Support $16,300 (SWCD)

- **Total Match $65,500+**

TOTAL Project Cost: $465,000+

COUNTY ROAD 134 – ROAD PROJECT

Koochiching County Highway Department

- Trent Nicholson – County Engineer
- 218-283-1187 or 1186
- Trent.Nicholson@co.koochiching.mn.us
- Koochiching County Highway Department – Road authority for all County and Unorganized Township Roads.
- County Road 134 - 1947

CR 134 – Why?

- County Road 134 has been considered for an improvement in this area for some time.
  - Road condition – Base and surface condition
  - Lack of water transfer between bays
  - Road surface elevation

- County Road 134 – May 18, 2022

Project Details

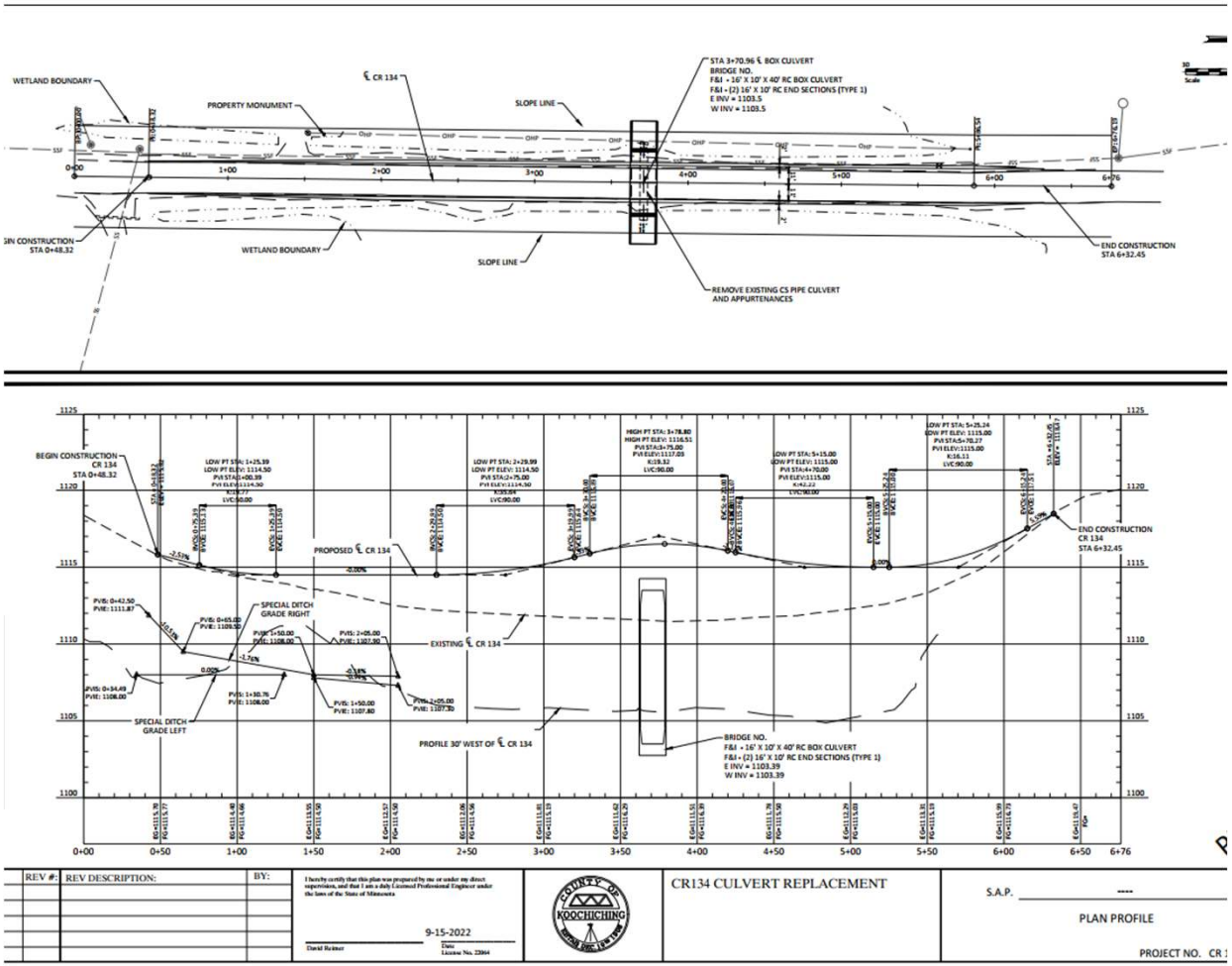
- Preliminary plans
  - Installation of a 10’x16’ box culvert
    - Increased water transfer.
    - Allows for small watercraft travel.
  - Improving road surface
    - Resurface, 11’ Lanes, 3’ Aggregate Shoulder, 9’ Clear Zone
  - Raising the roadway elevation out of flood risk.
    - Lowest point on this portion of road would be 1114.50’
    - Peak elevation of Rainy lake – 1113.225’
    - Elevations are 1912 datum, which is the datum used for reporting Rainy Lake Levels.
- Funding
  - CPL Grant
  - Local Option Sales Tax (LOST)
  - Project cost - $500K range
- County Road 134 – June 14, 2022

Project Timing

- Easements
- Final Design Approval via MNDOT State Bridge Office
- Permitting – MNDNR
- Box Culvert Supply Chain
- Utilities – Overhead and Underground

Best case - September 2023

Worst Case – Summer 2024



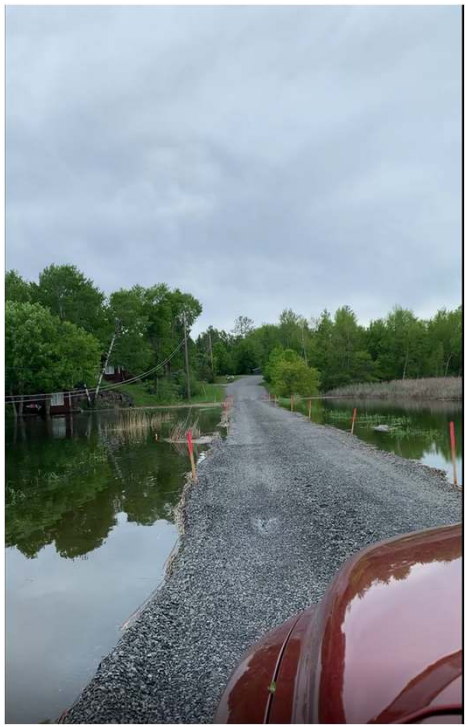
Accessibility During Construction

- Construction duration – 3 weeks
  - Single lane traffic?
    - Slows construction
    - Full closures could be expected at times
  - Temporary bypass?
    - Adds cost ($100K)
    - Permitting
    - Full closures could still be expected at times

Nearly 7’ in elevation change.

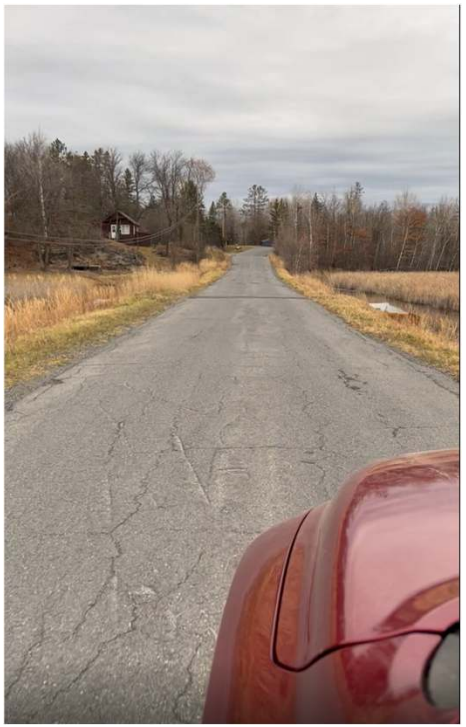
June 15, 2022

Elevation 1113.225 (Approx)



November 8, 2022

Elevation 1106.25’ (Approx)



THANK YOU FOR COMING!

QUESTIONS?

United States Department of the Interior

NATIONAL PARK SERVICE
Voyageurs National Park
360 Highway 11 East
International Falls, MN 56649

File Code:
7.C (3 yrs)

September 15, 2021

Conservation Partners Legacy Grant Program
MN DNR
500 Lafayette Road
Box #20
St. Paul, MN 55155

Dear MN Department of Natural Resources:

This letter is provided by Voyageurs National Park in support of the Koochiching County Soil and Water Conservation District (KSWCD) and Rainy Lake Property Owners Association's (RLPOA) project, "Hybrid Cattail Removal and Waterflow Enhancement."

Voyageurs National Park initiated a similar project in 2016 investigating non-chemical approaches to treating and controlling invasive hybrid cattail (*T.* x *glauca*) and restoration of invaded wetlands. Our project has successfully shown that mechanical treatment of cattail is an effective means of restoring lacustrine wetlands infested with invasive hybrid cattails back to diverse native wetland habitats. We feel that by using our tested restoration techniques as a foundation, this project will be able achieve its stated project objectives; positively benefiting fish and wildlife habitat on Rainy Lake. Voyageurs National Park remains committed to providing wetland restoration technical support in the form of staff consultation/expertise to aid the KSWCD and RLPOA in meeting their specified goals and objectives.

Voyageurs National Park fully supports the wetland restoration work of KSWCD and RLPOA on Rainy Lake and their effort to seek external funding through the Conservation Legacy Grant Program. We feel their project directly aligns with the CPL goals and priorities and will positively benefit the "Outstanding Water Resources" of Rainy Lake.

Sincerely,

Bob DeGross
Superintendent

UNIVERSITY OF MINNESOTA

Minnesota Sea Grant College Program
Chester Park Rm. 132
31 W. College Street
Duluth, MN 55812
Phone: 218-726-8175
Fax: 218-726-6556

September 14, 2021

Eric Olson
Resource Conservationist
Koochiching Soil and Water Conservation District
501 3rd St. Ste. 201
International Falls, MN 56649
Re: MNDNR Conservation Partners Legacy proposal **"Hybrid cattail removal and water flow enhancement"**

Dear Mr. Olson,

Please accept this letter as indication of my support for your MNDNR Conservation Partners Legacy proposal, "**Hybrid cattail removal and water flow enhancement**." I am a Fisheries and Aquaculture Extension Educator at Minnesota Sea Grant and have participated in research on the effects of hybrid cattail on fish communities and nearshore lake ecosystems in the Great Lakes region for the past six years. The work outlined in this proposal will benefit the fisheries, native plant communities, and coastal ecosystem health of Rainy Lake and the results have the potential to guide restoration of nearshore lake ecosystems in the region.

The proposed project will provide much needed restoration of the site near CR 134 and Elks Bay in Rainy Lake. Rather than simply removing hybrid cattail, the proposal has a comprehensive restoration approach by restoring water flow via culvert construction, removing hybrid cattail in a two stage process to prevent the formation of floating mats and excess nutrient pollution, and reseeding with native plant mix. There is a strong scientific basis for the methods described and because the process is clearly outlined, the project may be useful as a case study to guide other communities on best practices for restoration of nearshore ecosystems invaded by hybrid cattail.

The proposal has a strong list of collaborators to ensure local support for the project and buy-in from stakeholders. The proximity and collaboration with Voyageurs National Park (VNP) is particularly helpful as park biologists have been working on hybrid cattail removal in a variety of situations and have strong expertise. I am currently the principal investigator of a project funded by the Minnesota Aquatic Invasive Species Center at the University of Minnesota to examine the effects of hybrid cattail removal on nearshore fish communities and we also have hybrid cattail removal sites located in Rainy Lake in collaboration with VNP. The timing of this proposal is fortunate as I would be eager to see the current project described in this proposal move forward concurrently with both VNP's and our ongoing work to compare results over time.

I strongly support this proposal. The methods have a solid foundation in the scientific literature and the project has an excellent chance for success. The results of this project would be immediately and directly beneficial to fisheries and nearshore ecosystem health in the region and could be a model for other restoration efforts. The timing of this project is also important since there is other similar work occurring in the region providing opportunity for collaboration and comparison of results. I encourage the review committee to fund this proposal.

Sincerely,

Amy Schrank, Ph.D.
University of Minnesota Sea Grant
Fisheries and Aquaculture Extension Educator

Rob Ecklund
State Representative

District 3A
Koochiching, Lake, Cook,
and St. Louis Counties

Minnesota House of Representatives

August 5, 2021

Conservation Partners Legacy Grant Program
Minnesota DNR
ATTN: Kathy Varble
500 Lafayette Road
Box #20
St. Paul, MN 55155
LSCPLGrants.DNR@state.mn.us

Dear Ms. Varble:

I write in strong support of the grant request from the Rainy Lake Property Owners Association (RLPOA), in partnership with the Koochiching Soil and Water Conservation District (KSWCD), and Koochiching County. They seek funding to enhance water flow through County Road 134, which connects an island in Rainy Lake to the mainland; and to remove nine acres of non-native hybrid cattails that have taken over the existing waterway since the road was built.

Over time the dense cattail mats have rapidly taken over many bay areas of Rainy Lake, choking off the diversity of both terrestrial and aquatic habitat. The grant request seeks to restore these areas to their historical state. By removing the cattail mats, restoring surface water movement through the addition of culverts to the roadway, and re-establishing native vegetation, the project area can successfully restore habitat and provide more ecological benefits than the current hybrid cattail stands provide to Rainy Lake.

This is an excellent proposal that is deserving of funds through the Conservation Partners Legacy Grant Program, and I recommend it highly. Thank you for your consideration.

Sincerely,

Rob Ecklund
State Representative

Cc: Eric Olson
3048 County Rd 125
International Falls, MN 56649

409 State Office Building, 100 Rev. Dr. Martin Luther King Jr. Blvd. St. Paul, Minnesota 55155 (651) 296-2190
FAX (651) 296-6605 Email: rep.rob.ecklund@house.mn

RAINY LAKE SPORTFISHING CLUB

August 10, 2021

MN Conservation Partners Legacy
500 Lafayette Road
Box #20
St Paul, Minnesota 55155

Council Members:

The Rainy Lake Sportfishing Club supports the effort to remove non-native hybridized cattail in the Elks Bay area on Rainy Lake, reestablishment of native vegetation, and restoration of surface water movement across County Road 134 proposed by Koochiching Soil and Water Conservation District.

Throughout time, dense cattail mats have rapidly taken over many bay areas of Rainy Lake reducing the overall diversity of both terrestrial and aquatic habitat. Historical evidence suggests that prior to hybrid cattail establishment, native grasses, sedges and forbs flourished under normal water conditions and it is the goal to restore the area to its historical state. Currently, these plant communities are outcompeting many of the native species, limiting the space and nutrients that they need in order to provide the diverse habitat needed to support a healthy ecosystem and fishery which Rainy Lake is known for.

Removing the cattail mats and restoring surface water movement through the addition of culverts to the roadway and reestablishing native vegetation the project area can successfully restore habitat and provide more ecological benefits than the current hybrid cattail stands provide to Rainy Lake.

By following successful similar projects and guidelines set forth by Voyageurs National Park, this project can successfully contribute to the overall health and diversity of Rainy Lake.

Sincerely,

Rainy Lake Sportfishing Club
President Jason Ellman
P O Box 888
International Falls, MN 56649

CPL Application "Hybrid Cattail Removal and Water Flow Enhancement"

Annotated Bibliography
(alphabetical by lead author)

1. Bansal, Sheel, Shane C. Lishawa, Sue Newman, Brian A. Tangen, Douglas Wilcox, Dennis Albert, Michael J. Anteau, , Michael J. Chimney, Ryann L. Cressey, Edward DeKeyser, Kenneth J. Elgersma, Sarah A. Finkelstein, Joanna Freeland, Richard Grosshans, Page E. Klug, Daniel J. Larkin, Beth A. Lawrence, George Linz, Joy Marburger, Gregory Noe, Clint Otto, Nicholas Reo, Jennifer Richards, Curtis Richardson, LeRoy Rodgers, Amy J. Schrank, Dan Svedarsky, Steven Travis, Nancy Tuchman & Lisamarie Windham-Myers, "Typha (Cattail) invasion in North American wetlands: Biology, regional problems, impacts, ecosystem services, and management." *Wetlands* 39, no. 4 (2019): 645-684.

   Link: https://rdcu.be/cx3me

   Summary: A highly cited review of Typha (Cattail) invasion in North America prepared by leading research groups throughout the United States and Canada. This comprehensive and authoritative review describes hybridization and biological characteristics that have led to large increases in Typha in wetland ecosystems in North America as substantial cost to native biodiversity. Three regional case studies including the Laurentian Great Lakes region. The article discusses the physical, chemical, and hydrological controls necessary to manage invasive Typha.

   Relevance: This is the most recent, authoritative, and relevant review article available in the scientific literature, and specifically includes a case study in the region. The article's summary of physical, chemical, and hydrological controls needed to manage invasive Typha form the foundation for the three elements of the proposed project.

2. Lishawa, Shane C., Eric M. Dunton, Douglas R. Pearsall, Andrew M. Monks, Kurtis B. Himmler, Brendan D. Carson, Brian Loges, and Dennis A. Albert. "Wetland waterbird food resources increased by harvesting invasive cattails." The Journal of Wildlife Management 84, no. 7 (2020): 1326-1337.

   Link: https://iwmmprogram.org/documents/Cattail1.pdf

   Summary: This recent paper describes results of a controlled experiment at the Shiawassee National Wildlife Refuge in Michigan in which three different mitigation techniques were tested in a site dominated by invasive cattails. The experiments show that three years of harvesting cattails and flooding significantly increased plant species diversity, increased the abundance of waterbird seed and tuber producing plants by five times, increased day use by waterbirds, and produced a plant community composition and structure beneficial to waterbirds.

   Relevance: The proposed project will result in harvesting of all cattails in the project site, and reseeding with a diverse seed mix of native plants. This paper suggests this will lead to improvements in the plant community and structure supporting the waterbird population at this location on Rainy Lake.

3. Newman, S., James B. Grace, and J. W. Koebel. "Effects of nutrients and hydroperiod on Typha, Cladium, and Eleocharis: implications for Everglades restoration." Ecological Applications 6, no. 3 (1996): 774-783.

   Link: https://www.jstor.org/stable/2269482

   Summary: This highly cited article demonstrated the rapid growth of hybrid cattails relative native species in the Florida Everglades. Additional nutrients accelerated the relative rates of growth. The paper also showed that reducing nutrients and hydrological instability allowed native species to compete against the invasive hybrid cattail. The relevant conclusion was "results from this study suggest that attempts to limit the growth of Typha [hybrid cattail] should consider hydrological restoration as well as reduction in surface water nutrients".

   Relevance: Though located in the Everglades, the main conclusion of this paper supports the main activities of this project: hydrological restoration and a reduction in surface water nutrients through enhanced waterflow. See the notes regarding the later work of Woo and Zedler (2002) in the Great Lakes region for further discussion.

4. Schrank, Amy J., and Shane C. Lishawa. "Invasive cattail reduces fish diversity and abundance in the emergent marsh of a Great Lakes coastal wetland." Journal of Great Lakes Research 45, no. 6 (2019): 1251-1259.

   Link: https://www.sciencedirect.com/science/article/pii/S0380133019301741

   Summary: This paper examined six zones in the St. Ignace marsh located in Michigan, three that were primarily native species and three comparable zones infested with hybrid cattails. They measured environmental variables, plants, and fish in each zone over two summers. They found fish abundance and species richness were significantly lower in the infested zones, and were dominated by small species tolerant of the hypoxic, low-oxygen environment. Other important fish for the food web were absent in the infested zones.

   Relevance: This paper shows how the proposed project will contribute to improving the fishery at the project location. Removing the hybrid cattail and the successful introduction of native species should increase oxygen levels and improve fish abundances and species richness, including those fish important to food web within the lake.

5. Strayer, David L., Valerie T. Eviner, Jonathan M. Jeschke, and Michael L. Pace. "Understanding the long-term effects of species invasions." Trends in ecology & evolution 21, no. 11 (2006): 645-651.

   Link: https://www.caryinstitute.org

   Summary: This is among the most highly cited papers on the topic of invasive species (over 1000 citations). The paper demonstrates the impact of invasive species correlates with time since invasion through evolution, shifts in species composition, accumulation of materials, and abiotic variables. The cumulative effect grows and can substantially alter wetlands over the years and decades since invasion.

Relevance: The project location has been invaded by cattails for several decades. The period of infestation is not perfectly known, but there is photographic evidence for open water in the location in the early 1980's. This paper suggests the location will continue to evolve in adverse ways absent effective intervention.

6. Travis, Steven E., Joy E. Marburger, Steve Windels, and Barbora Kubátová. "Hybridization dynamics of invasive cattail (Typhaceae) stands in the Western Great Lakes Region of North America: a molecular analysis." Journal of Ecology 98, no. 1 (2010): 7-16.

   Link: https://www.jstor.org/stable/27754344

   Summary: This highly cited paper demonstrated the hybridization of cattails between native and introduced species using molecular markers. In work directly relevant to the proposed project, they found an extremely high prevalence of hybrid cattails in multiple locations in Western Great Lakes region. They observe typically larger sizes for the hybrids and show the hybrids are capable of outcompeting native species, thus demonstrating hybridization having an influential role in the cattail invasion in North America.

   Relevance: This paper demonstrates the ecological mechanism by which hybrid cattails invade native stands. This work shows that if hybrid cattails are not eliminated and removed, the hybrid cattails will reinvade and continue to dominate the project site. This observation is the foundation for the methods being developed and tested within Voyageurs National Park for the restoration of native wetland species.

7. Witkowski, E. T. F., and M. Wilson. "Changes in density, biomass, seed production and soil seed banks of the non-native invasive plant, Chromolaena odorata, along a 15 year chronosequence." Plant Ecology 152, no. 1 (2001): 13-27.

   Link: https://idp.springer.com

   Summary: This is an early paper demonstrating the long-term evolution of sites infested with invasive species. This work predates the work of Strayer (2006) describing more specific mechanisms for the evolution of a site.

   Relevance: Like Strayer (2006), the paper shows that without intervention, sites like that in the scope of this project will continue to evolve in ways that will change the nature of the local ecology.

8. Woo, Isa, and Joy B. Zedler. "Can nutrients alone shift a sedge meadow towards dominance by the invasive Typha× glauca." Wetlands 22, no. 3 (2002): 509-521.

   Link: https://rdcu.be/cx3pw

   Summary: This highly cited article demonstrated the role of phosphorus and nitrogen nutrient inputs in promoting the growth of invasive hybridized Typha in sedge meadow. Using controlled greenhouse experiments, the investigators found additional nutrients accelerated the growth of Typha relative to the sedge meadow grasses. The investigators conclude that wetland managers should focus on reducing nutrient inflows to urban wetlands.

   Relevance: The project location where CR 134 crosses Elks is a site blockage of water flow by road placement, and a legacy of inadequate septic systems, led to the a high concentration of nutrients. This study shows that this would have certainly contributed to the current overwhelming invitations of hybrid cattails at this site. The establishment of the East Koochiching County Sanitary District resulted in the removal of all septic systems in the area. This project, consistent with the recommendations of this paper, will add culverts beneath CR 134 to increase water flow and further reduce nutrient concentrations.