

PINE RIVER & NORWAY LAKE DAM REMOVAL AND RESTORATION

Pine River, MN

General Design

This project removes an existing dam and replaces it with rock riffles and enhanced riverbanks to improve public safety and river access, reduce flood risk, and reestablish aquatic organism connectivity. The team worked with the City of Pine River, MNDOT, State Historic Preservation Office (SHPO), and regulatory agencies from feasibility studies starting in 2013 to project completion in 2022. The riffle pools and channels enhanced recreational opportunities for wading, fishing, and other water-based fun. This work reconnected 134 lakes and 80 miles of river and stream corridors benefitting fish, mussels, and many game and non-game animal species.

ROLES + RESPONSIBILITIES

The landscape architect worked with an multi-disciplinary team provide a project vision that was aspirational and implementable. The landscape architect was responsible for:

- Leading site design for integrating the streambank design into existing context
- Integrating WPA historic relics into the site design
- Creating a design for ADA accessible fishing piers
- Ecologically responsible planting design
- Coordination with regulatory and community stakeholders
- Collaborating with engineers to seamlessly integrate the streambank design with the in-stream grading and rock riffles for ecological function and access for people
- Creating visuals for meetings, jurisdictional, and regulatory approvals
- Creating final drawings and specifications for construction

DESIGN SOLUTIONS

The landscape architect was instrumental in creating design solutions that would achieve the goals of the client (City of Pine River), MnDOT, and requirements from regulatory agencies. The key design solutions were:

- Creating a design that kept Norway Lake levels the same as if the dam was still in place
- Creating a site design and restored stream design that was integrated through careful grading
- The rock riffles had to be a certain vertical and horizontal distance from the new bridge to be constructable and maintainable
- Habitat designed for aquatic, terrestrial, and avian species to thrive
- Creating a site that is easy for people to access
- Use historic relics to inform site design geometries and form
- Meet 500 year flood requirements

PROJECT SCOPE

From 2013 to 2017 the design team and consultants prepared feasibility studies for the dam removal and stream restoration. In 2018 the design team helped the City of Pine River write a grant and get funding through the Lessard-Sams Outdoor Heritage Council. The funding of \$2.3m allowed the team to proceed through final design and construction. The key scope items were:

- Removal of existing dam and roadway
- Coordinating with MNDOT on new bridge/roadway
- Restore stream function by using rock riffles
- Create an ADA accessible fishing pier
- Integrate WPA historic relics into the design
- Site engineering and design that creates a cohesive functionality of streambanks and in-stream geometries and materials
- Use locally sourced materials
- Manage coordination and permitting with regulatory agencies

IMPORTANCE OF PROJECT

The importance of the project is about protecting and enhancing the ecology of the Pine River watershed while providing a place that people love. This project does the following:

- Restores natural function to the connection point between the Pine River watershed and the Whitefish Chain of Lakes
- Provides access for critical aquatic species to move upriver that were not able to due to the dam
- Provides a safer place for people to interact with and explore nature
- Protects and maintains WPA historic structures
- Provides habitat for terrestrial and avian species
- Reduces flood risks by meeting 500 year flood requirements

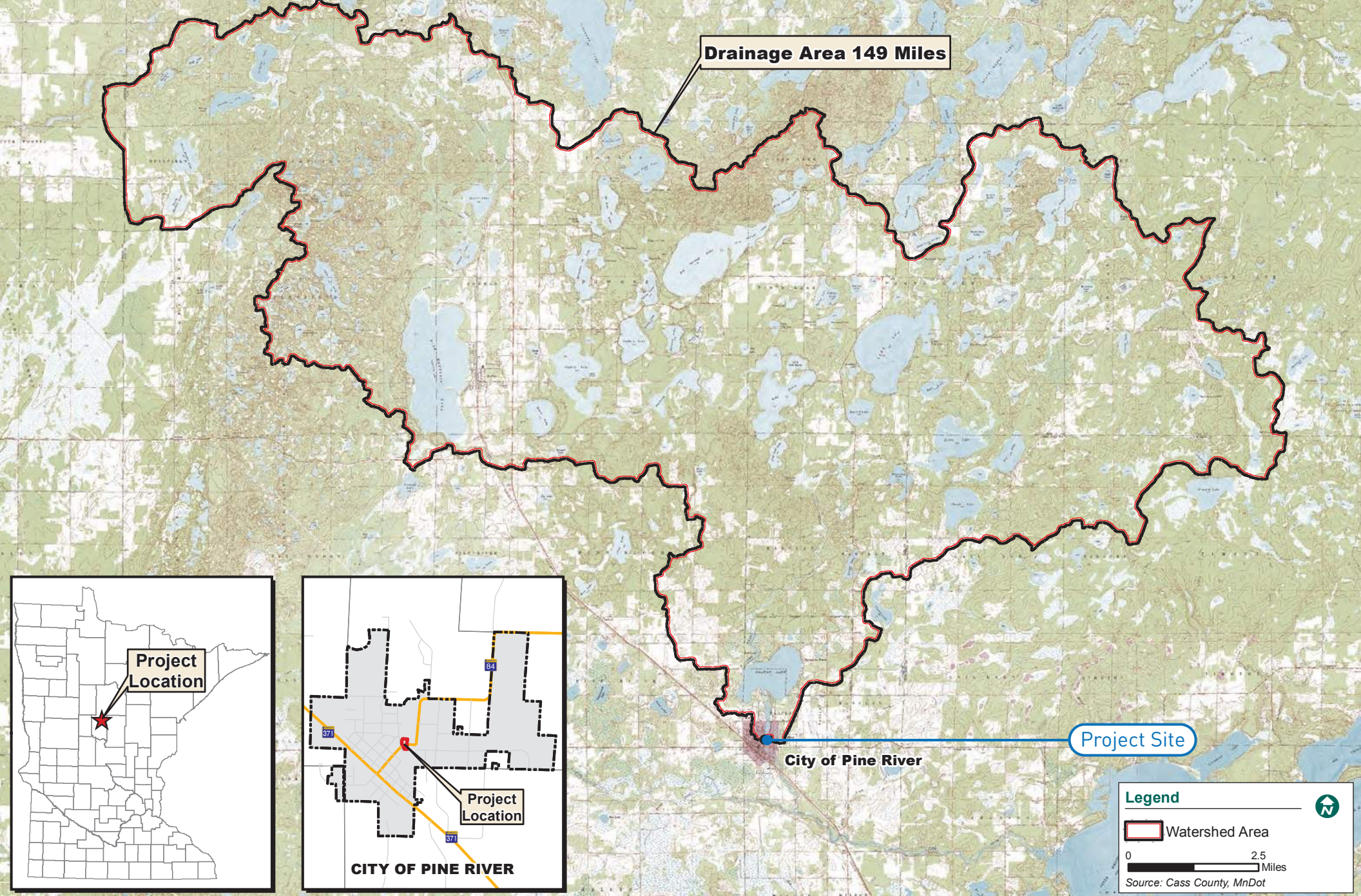
WHY AWARD THIS PROJECT?

This project is truly larger than the sum of it's parts. The design team created both a high-functioning ecosystem and a beautiful place that is site specific. The design's impact will forever enhance the ecological sustainability of Pine River watershed and Whitefish Chain of Lakes.

SITE CONTEXT



The project site is the confluence of the 149 square mile Pine River watershed with the Whitefish Chain of Lakes. The project reconnects 134 lakes and 80 miles of river and stream corridors benefitting fish, mussels, and many game and non-game animal species.



Drainage Area 149 Miles

Project Site

City of Pine River

Project Location

Project Location

CITY OF PINE RIVER

Legend

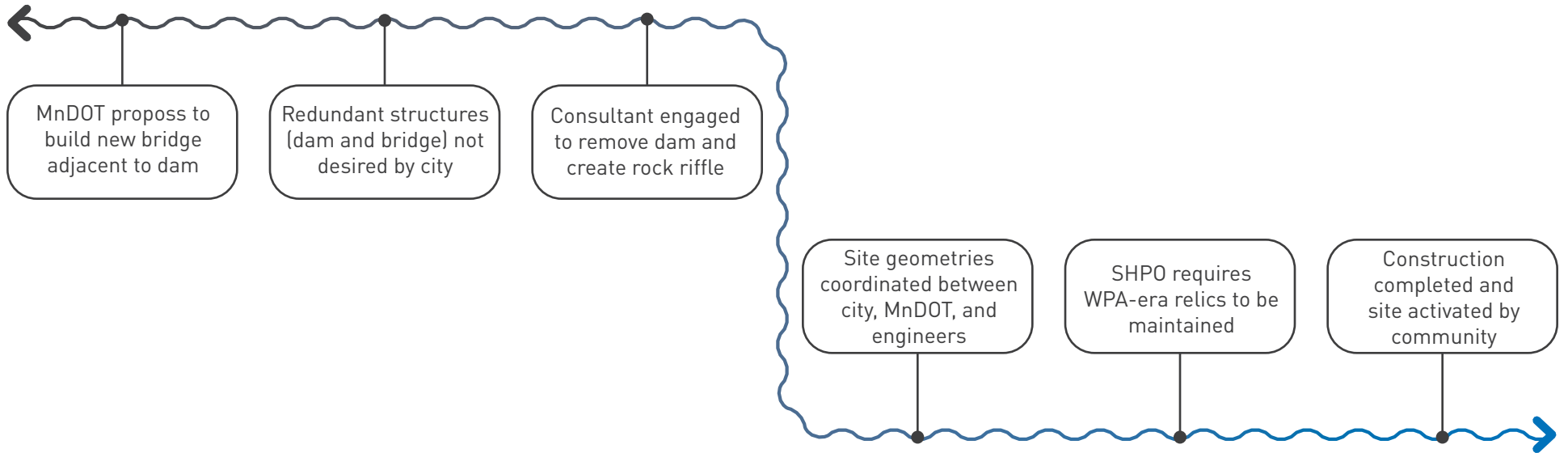
Watershed Area

0 2.5 Miles

Source: Cass County, MnDot



SEQUENCE OF KEY EVENTS



2016



2021

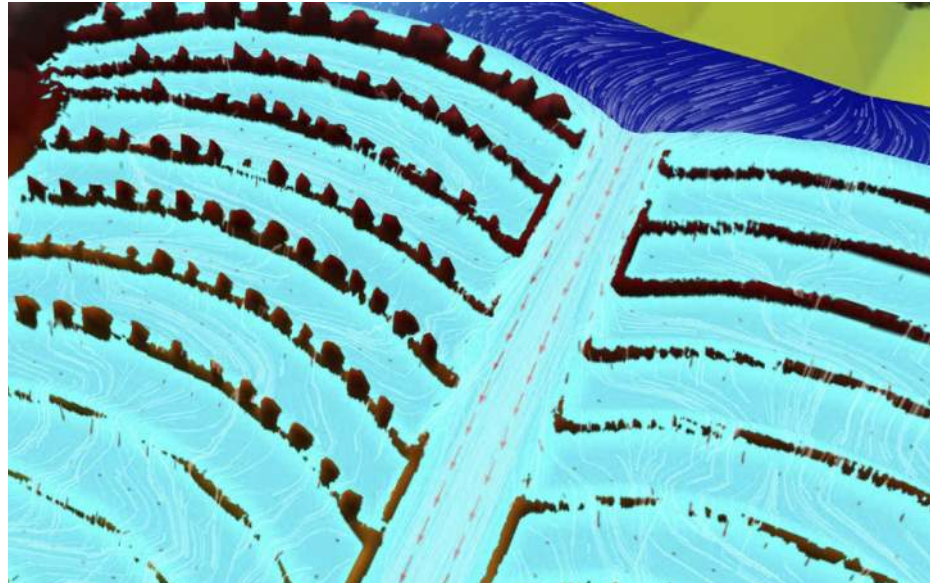
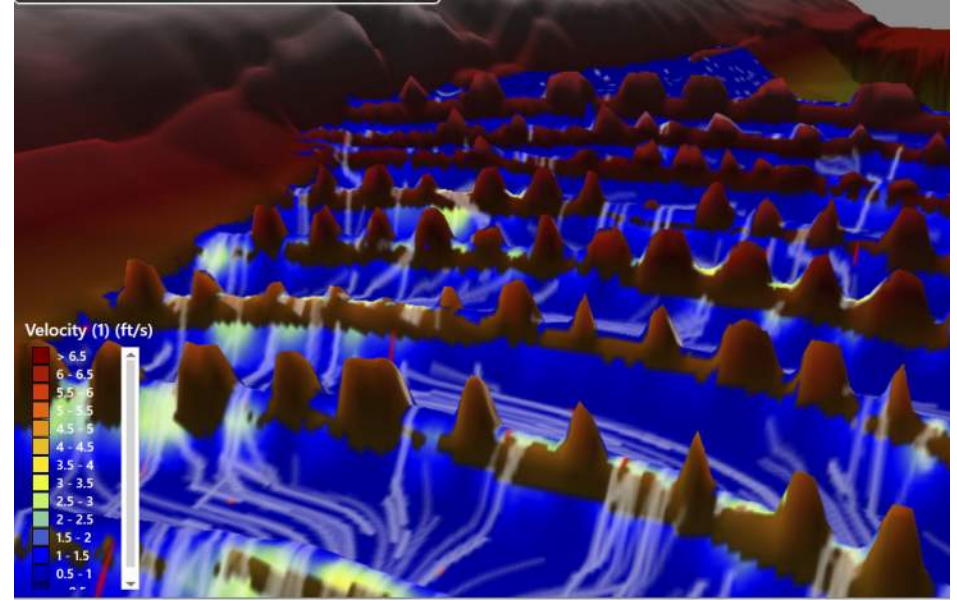
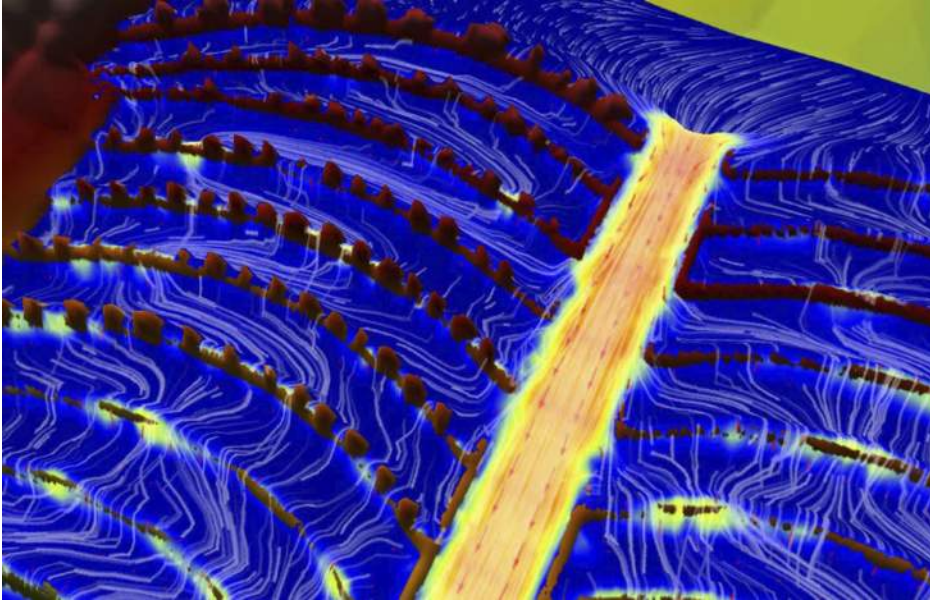


2022



ANALYZING DESIGNED WATER FLOWS

The water flows through rock riffles are critical to aquatic habitat. It was determined that a straight channel would result in water moving too fast for the fish. The landscape architect had the idea to create an s-curve channel, which solved the problem.

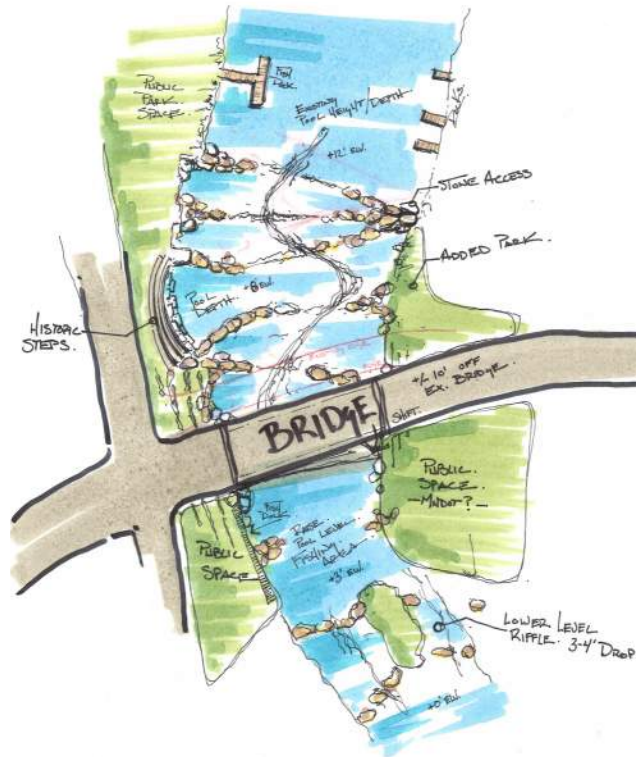


CONCEPT ITERATIONS

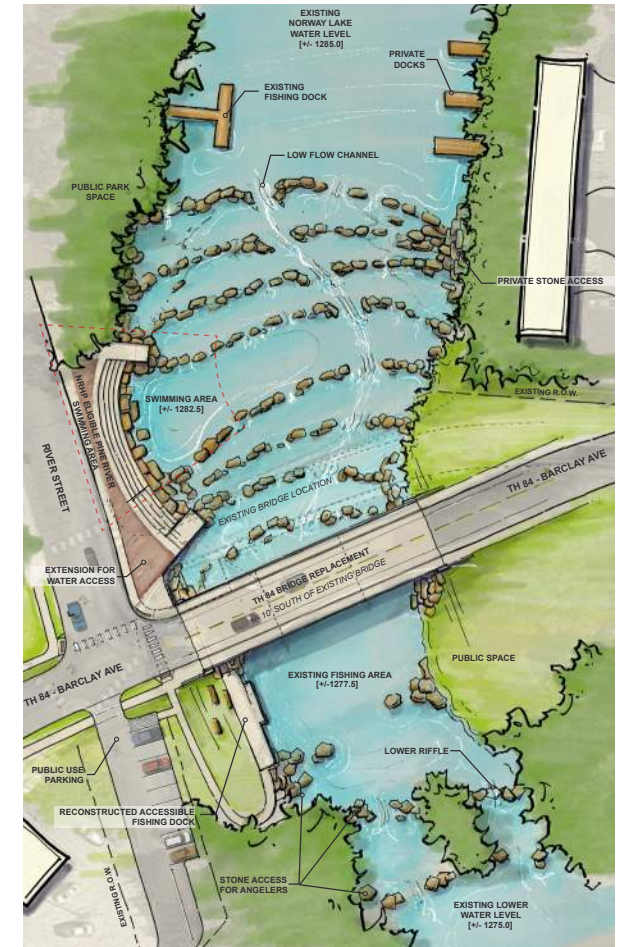
Concept Sketches



Early sketch of relationship of bridge to rock riffles.



Initial sketch from charrette with landscape architect, engineers, and MNDOT that got everyone in agreement on the path forward.



Refined plan for meetings with key stakeholders and agencies.

DAM REMOVAL TO ROCK RIFFLE VISUALIZATION

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Removal of the dam, building of a bridge, and stream restoration with rock riffles provides new recreational opportunities, improved habitat, and a stronger physical and visual connection between Pine River and Norway Lake.



INTEGRATING HISTORIC RELICS

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The 1937 WPA relics were to integrate into the site design, both required by SHPO and preferred by the community. The desire to still play in the water was also a community desire. The formal swimming beach is north of the site, so swimming in this location wasn't a requirement.



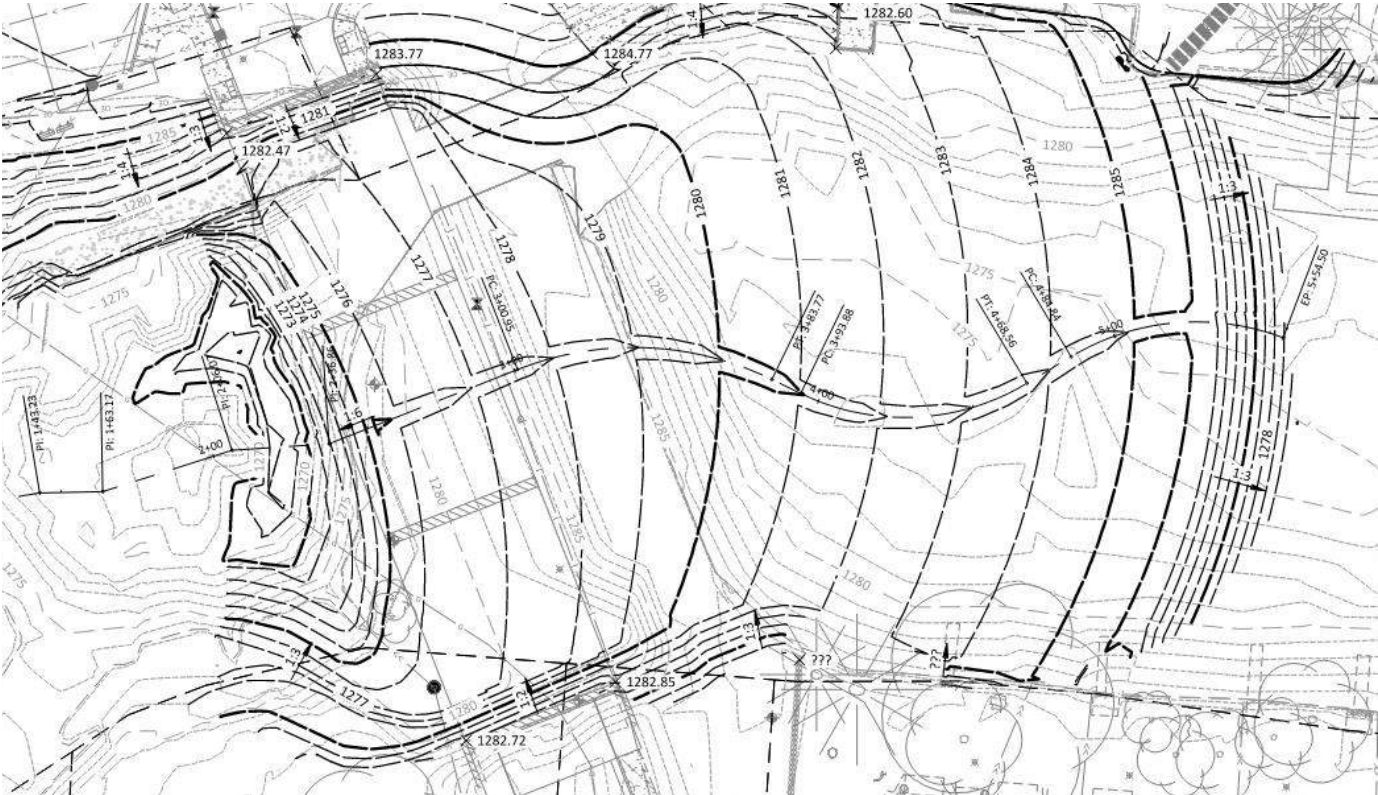
EXISTING



PROPOSED

TECHNICAL DRAWINGS OF ROCK RIFFLE & STREAMBANK DESIGN

Grading was key to integrating the streambank design with the rock riffles. Rock riffles and water flow have to be designed specific to aquatic species needs, hence the s-curve to get the right amount of drop within the constrained length of the rock riffles between Norway Lake and Pine River.



UNHEALTHY PRE-EXISTING CONDITIONS

A dam that no longer was producing electricity, a roadway that no longer met the needs of the community, and caused issues for ecological health of Pine River & Norway Lake was a barrier to the future sustainability - both socially and ecologically.



Norway Lake

Pine River Beach

Existing Fishing Dock

WPA-Era Historic Relics

Spillway

Dam

TH 84 - Barclay Ave

Stairs to Fishing Areas

Existing Fishing Area, Not accessible

Pine River

River Street

RESTORING NATURAL STREAM FUNCTION

⋮ The site design spans from the land and into the water to create a site of restored natural functions, critical aquatic habitat, maintains Norway Lake levels, and gives people the ability to enjoy and explore as they wish.



River Street

WPA-Era Historic Relics

Beach Area w/ River Gravel

Rock Riffle with S-Curve Low Flow Channel

Native Plantings

TH 84 Replacement
Bridge, by MNDOT

TH 84 - Barclay Ave

Reconstructed Accessible
Fishing Area

IMPROVING CONNECTIONS TO THE WATER

Fishing is a well-loved past time for many in the community. The landscape architects created ADA accessible spaces for fishing and further enjoyment of the site.



BEFORE



AFTER

FROM HARD INFRASTRUCTURE TO NATURAL SYSTEMS

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The dam infrastructure bifurcated and kept natural systems from performing as they should. The installed rock riffles, native plantings, and now established aquatic plant species create a sustainable and ecologically rich natural system.



HISTORIC CONCRETE STEPS AND PLATFORM MAINTAINED

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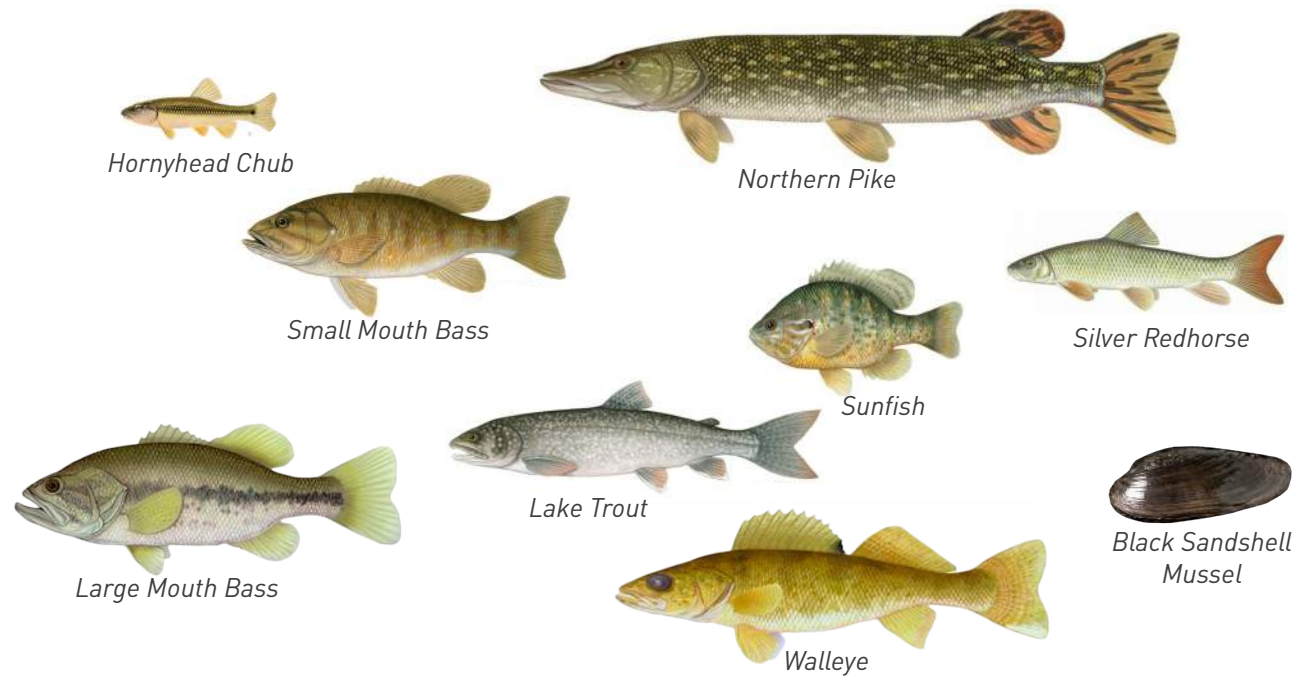
The seating and platform built by Work Progress Administration (WPA) in 1937 are iconic relics to the site. The team worked with SHPO and the community to keep and integrate them into the project.



ENHANCING HABITAT FOR AQUATIC SPECIES

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The removal of the dam and creation of rock riffles will allow aquatic species to migrate and spawn as some species had not been able to migrate north of the dam previously.



all fish illustrations by MN DNR, C. Iverson



DESIGN THAT ENCOURAGES EXPLORATION

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The hardened infrastructure of the dam was dangerous and not welcoming. The enhanced streambank and rock riffles allow for fun and healthy explorations with the natural systems of Pine River.

BEFORE



AFTER



SEASONAL CHANGE

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Minnesota's seasons are distinct and each play an important role in natural processes. Each season brings with it inherent beauty that Minnesotans embrace.

