

## **Leesard Outdoor Heritage Council Proposal 2009**

**Project Information:** Knife River Habitat Rehabilitation

**Sponsoring Organization:** Lake Superior Steelhead Association

Project Managers: Craig Wilson, LSSA President, Technical Manager  
Kevin Bovee, LSSA Secretary, Technical and Fiscal Manager  
Telephone Number: Craig Wilson (218) 722-6013, Kevin Bovee (218) 525-5960  
Email: [cwilson@etsmn.com](mailto:cwilson@etsmn.com), [outriderduluth@msn.com](mailto:outriderduluth@msn.com)

### **Project Budget:**

#### **History of the Knife River**

The Knife River once held one of the largest populations of natural reproducing steelhead in the Great Lakes (Attachment 1 Site Location Map). This stream once provided spawning habitat in its upper watershed to thousands of steelhead each spring. Since the late 1970's, the Knife River steelhead population has seen a dramatic population downturn. Where thousands of steelhead once traveled upstream to spawn now only five hundred make this same journey. One of the primary reasons for the decrease in the steelhead population is the degradation of the upper Knife River Watershed habitat from uncontrolled beaver activity. This beaver activity is the result of logging along the stream banks, which replaced the old growth coniferous forest to an aspen monocultural. The beaver colonized this area, because of this new aspen growth provided a food source that was not present prior to logging.

#### **Facts about the Knife River Watershed**

The Knife River watershed consists of approximately 54,000 acres, of which 29,000 acres is owned by the State of Minnesota, St. Louis County and Lake County. Approximately 25,000 acres are privately owned, of this privately owned property 6,200 acres or approximately 25% are enrolled in stewardship plans (Attachment 2 Knife River Watershed Map). The main Knife River and its tributaries consist of approximately seventy miles of stream. The Knife River consists of approximately fifty percent (50%) of the steelhead habitat on Minnesota's Northshore and is the best spawning habitat on Minnesota's Northshore.

#### **Beaver Colonization and Habitat Degradation of the Knife River Watershed**

After extensive logging of the coniferous trees throughout the watershed, aspen regenerated along the upper stream banks. This aspen regeneration became a primary food source for beaver. Once beaver colonized areas in the watershed, dams blocked the stream flow and flooded the stream bank killing the riparian tree cover. The beaver also increased erosion as they went inland through their runs to collect the aspen for dam material and as a food source.

Recognizing this habitat degradation the DNR started to remove beaver and beaver dams from the watershed, however the DNR did not have the resources to restore the habitat destruction caused by the beaver dams. The results today are numerous barren beaver meadows where beaver dams once existed (Attachment 3 Beaver Meadow Photo prior to Tree Planting).

The major habitat concerns to the Knife River Watershed are increase in water temperatures due to a lack of a tree canopy, reduced stream flows due to increased evaporation from a lack of a tree canopy, and decreased water quality due to erosion. The Knife River water quality has been impaired to the point that this watershed was listed in 2006 the Minnesota Pollution Control Agency (MPCA) Total Maximum Daily Load (TMDL) list of impaired waters for turbidity (Attachment 4). This watershed also saw further impacts in 2007 where the DNR Fisheries personnel stated the Little Knife River a branch to the main Knife River went dry due to increase evaporation.

According to a DNR fisheries study, the impact to the trout fishery due to these impaired water quality factors (increased temperature, decreased flow and turbidity) result in juvenile steelhead prematurely migrating to Lake Superior where predation is extremely high. This early migration of smolts to Lake Superior is the limiting factor to the steelhead population recovery according to a DNR study.

### **History of the Lake Superior Steelhead Association**

The Lake Superior Steelhead Association was formed in 1970 due to the growing concern by area steelhead fishermen that the coldwater steelhead fishery was in decline. The first newsletter was published in 1971 and the club was incorporated in 1973, gaining IRS 501.c.3 status in 1973. Per Article II of the Bylaws of the Lake Superior Steelhead Association, “the Association’s primary purpose is to promote the propagation of trout and other cold water fishes through such methods as hatchery development and the improvement and protection of the coldwater environment that supports these game fish.” For over thirty-five years, we have strived to uphold these noble objectives.

### **LSSA Steelhead and Habitat Project Experience**

In 1971, the LSSA began its first steelhead conservation effort “Make it a Million” program. This program was intended to raise \$100,000 to purchase one million juvenile fish to be planted in Lake Superior. It was an energetic goal but beyond the grasp of our fledgling club at that time.

In 1972, the LSSA recognized the need for a coldwater hatchery to conduct annual stocking of trout in Lake Superior, its tributaries and the surrounding designated trout lakes. This recognition resulted in the LSSA to begin lobbying for a state or federal hatchery to be built in the Duluth area. The result is the existing French River Hatchery we have today.

Even with the new French River Hatchery, steelhead decline still persists especially on the Knife River. As stated above, the importance of the Knife River has always been recognized by the LSSA as the most critical steelhead river on the Minnesota’s Northshore. This led the club to reduce the legal take of steelhead in the Knife River. However in the 1980’s, the DNR did not have steelhead population data just “anecdotal evidence from fishermen” to support the club’s concerns. To obtain hard fish population data on the Knife River, the LSSA and DNR teamed up to conduct at that time was their Spring Creel Census. LSA members volunteered to collect population data to present to the DNR. This census concluded the Knife River steelhead were in decline and needed additional protection so the DNR reduced the bag limit to one fish on the Knife River in 1983. The LSSA then funded an intensive Spring Creel Census in 1987 to

determine the populations in the other Northshore Rivers. The LSSA donated \$ **3,304** to fund this census in 1987. Then in 1988 and 1989, the club again funded two more years of Spring Creel Census in the amount of \$ **4,119** and \$ **3,774** respectively. Our funding of the creel census' concluded steelhead populations were in decline along the entire Northshore and hence the bag limit was changed to 100% catch and release for steelhead on the entire Northshore.

As our understanding of DNR policies evolved, knowledge of both the fishery and the habitat became the utmost focus of the LSSA in the 1980's and 90's. The LSSA donated \$ **875** to the DNR so that a thermograph could be installed on the Little Knife Weir, enabling the department to gather more critical information on the parameters of the steelhead run in the Knife River watershed. In 1988, the club donated \$ **2,200** for a fisherman parking lot on the river, which alleviated uncontrolled vehicle parking and associated habitat degradation from erosion. The LSSA donated funds to have the fishermen trails leading to the river covered with wood chips, which also reduced erosion/sediment runoff into the rivers.

In the late 1980's, the DNR had no steelhead rearing/stocking plans so the LSSA worked with the department to try various projects on our own. The LSSA spent \$ **6,500** and countless volunteer hours in 1988 to raise steelhead in a private spring pond in the Lester River watershed. Then in 1989, the LSSA donated \$ **8,400** to the DNR for their first serious attempt at raising wild steelhead in a hatchery.

Obtaining fish for any propagation program was almost impossible for the MN DNR, so the LSSA organized and funded "Catch and Donate" weekends where anglers would donate their fair hooked steelhead to DNR personnel so that they could be taken back to the hatchery, spawned and then released back to the river. LSSA assisted the DNR with netting the upper and lower falls on the Knife River to get an additional egg source so the DNR could raise additional fish. The result of this egg collection not only provided fish for stocking, but an unique opportunity to conduct various steelhead studies on the Knife River.

The desire to learn more about the fishery resulted in the decision by the DNR to construct a weir on the Knife River. This weir provided an opportunity to study the adult fish migrating upstream and for the a smolt (juvenile trout) trap would be constructed to evaluate the emigrating juvenile steelhead. The LSSA felt that the data obtained through a smolt trap addition would be invaluable so in 1995, the LSSA donated \$ **50,000** so the DNR could construct a weir that incorporate a smolt trap into the design. The LSSA also donated \$ **5,000** to the DNR for a video viewing window that could be incorporated in the fish passageway to record migrating fish. This single item of construction has allowed the DNR to obtain almost all of their information pertaining to the steelhead run on the Knife River.

The LSSA also realizes that the health of the entire watershed plays a vital role in the health of the coldwater fishery. From the late 1990's into the 2003, the LSSA donated in excess of \$ **14,000** for the Knife River Watershed Program. This program funded a forester to develop land management plans to encourage the health of the watershed through private landowners. Many plans were drawn up and implemented in the watershed, which continue to be beneficial to the overall health of the system today.

Beaver dams and beaver deforestation have been a problem in the watershed during the last 25 years. The LSSA has donated over \$ **15,000** for various beaver related programs in the watershed. In 2001 the club donated \$ **13,000** to the NCRS for a two-year, riparian zone tree-planting project throughout the watershed. LSSA volunteers have also donated many hundreds of hours of labor to improve the watershed in multiple tree planting projects, beaver dam removal efforts and bank stabilization projects.

The LSSA's largest block of donations occurred from 1997 through 2006 for the Knife River Smolt Project. During this period, the LSSA donated over \$ **305,000** to offset some of the cost so the French River Coldwater Hatchery could raise smolt steelhead.

The LSSA's efforts continue today. The total funded over the past 35+ years to the benefit of the coldwater fishery in the western end of Lake Superior has approached \$ **650,000**. Our goal is to improve the coldwater fishery in the Knife River watershed. To do achieve this goal it is paramount that we restore the upper watershed to restore the pleasure and the prominence that this great fishery once provided to the people of Minnesota.

### **Description of the Proposed Project**

The DNR has flown the upper Knife River since the mid 1990's to locate beaver dams. Each year the DNR has trapped the beaver and performed limited beaver dam removal, but not rehabilitated the habitat damage the beaver dam have caused to the streambed and adjacent riparian cover. The damage these beaver dams have left behind is the loss of overhead tree canopy, siltation of the stream's spawning gravel, debris in the water and stream bank erosion.

The LSSA proposes to use the DNR's existing aerial data and beaver dam location maps to access the beaver impacts to the upper Knife River (Attachment 5). The DNR and LSSA will discuss and rank the locations for rehabilitation. The area of focus will start with the primary spawning tributary in the Knife River watershed, which is the West Branch of the Main Knife River. A field reconnaissance will be conducted to determine the stream section's condition and to design the rehabilitation project. Design parameters will include the following categories of rehabilitation based on the stream section's impacts:

- Tree planting.
- Sediment removal, bank stabilization and tree planting.
- Bank stabilization/reconstruction and tree planting.

The project design/scope of work (project plans) will be submitted for review to the stakeholders and conservation partners in "Draft Form" so we can receive their input and approval. The LSSA will modify the project plans as recommended by the stakeholders and conservation partners and then submit the plan to the DNR for approval. Once we receive DNR Fisheries approval we will submit the plans to the Board of Water and Soil Resources (BWSR), South St. Louis County and Lake County Soil and Water Conservation District (SWCD) and Army Corp of Engineers for construction permit approval.

### **Land Access and Conservation Easements**

The LSSA will require all landowners to sign an access agreement prior to the start of work. The access agreement will require the property owner to provide access to the property to perform the work and to conduct project monitoring and maintenance. Landowners will also be required to sign a conservation easement to protect the area on their property where the work has been performed. This will safeguard the trees that were planted so they cannot be logged and protect the habitat that was created. Project monitoring will insure the property's habitat is maintained after the completion of the project.

### **Project's Compatibility with Existing Management Plans**

This project has been designed and is consistent with the DNR's Lake Superior Management Plan and the DNR's Rainbow Trout Plan. Both of these DNR management plans, place a high priority in habitat conservation and rehabilitation.

### **Habitat Rehabilitation Result 1-Tree Planting Only**

The LSSA and DNR have identified many stream sections where the beaver dams have flooded the riparian cover killing the trees, but there is no noticeable debris, sediment or erosion present. To rehabilitate these stream sections, the LSSA is proposing to plant trees to restore the riparian cover. The tree planting project will consist of planting potted White Spruce tree that are approximately 2-3 feet in height. Larger potted trees have been selected to more quickly reestablish this coniferous stream corridor and to outcompete existing vegetation. White Spruce trees were specifically selected, because whitetail deer dislike the bitter taste of the trees needles, rabbits and beaver dislike the trees bark and the tree grow best in a wet regimes. Each area where a tree is planted will be prepared by removing the underbrush and grasses in a 2 x 2 foot area. This 2'x 2 'mat will reduce the competition from the surrounding grasses, alder brush and aspen trees. The trees will be planted and staked so survival can be monitored. We estimate that there are approximately 50 areas where we will be performing tree only planting. We anticipate planting 200 trees per area, which equates to an estimated 10,000 trees in total.

The tree planting will provide a long-term benefit to the Knife River watershed that includes:

- Reestablishing the overhead tree canopy to maintain summertime water temperatures.
- Reestablishing the overhead tree canopy to decrease the rate, which water will is lost through evaporation.
- Reestablish large woody debris into the watershed that provides rearing habitat for juvenal trout.
- Create a corridor or buffer of coniferous trees to protect the stream from future beaver activity and discontinue future habitat loss by beavers.
- Re turn the watershed's riparian cover back to its original old growth "piney woods", as it existed prior to logging.

### **Estimated Cost of Result 1**

### **Habitat Rehabilitation Results 2 - Debris/Sediment Removal and Tree Planting**

Due to the large number of beaver dams that have been located in the Knife River watershed, the DNR could not blast every dam. In many cases, the DNR notched the dams to allow for fish passage. While this achieved the goal of allowing fish to migrate upstream, the river's current

could not completely remove all the silt and beaver dam debris from the larger dams. This silt and beaver dam debris remains in the stream and continues to limit rearing habitat and smother spawning gravel. Our approach to rehabilitate these areas, is to remove the remaining dam remnants (debris and sediment) and reestablish the overhead tree canopy. The debris and sediments will be removed using innovative equipment and a unique approach. This approach will utilize a small scale floating hydraulic dredge to vacuum the sediment from the spawning and juvenile fish rearing habitat. This equipment is the size of a small one-person raft and can be floated into small stream sections. This equipment is also sized to only remove lighter silt/sand material, while leaving the gravel and rock substrate behind. By removing the silts and small woody debris, deeper rearing pools will be restored and spawning gravel will be exposed. The LSSA anticipate that there will be 15 areas that will require debris and sediment removal and tree planting. These 15 areas will require approximately 3,000 trees.

## **Estimated Cost of Result 2**

### **Habitat Rehabilitation Result 3 – Bank Stabilization, Debris/Sediment Removal and Tree Planting**

The largest beaver dams on the Knife River typically have significant erosions area associated with them, because these large dams were typically in place for many years and beaver cut numerous runs (traveling corridors) into the banks (Attachment 6 Photo of Eroding Banks along a Beaver Run). These cuts into the bank quickly erode during high water events and discharge silt into the stream eventually causing a section of stream bank to collapse.

The LSSA will rehabilitate these areas by using the same hydraulic dredge to dredge the bank material out of the stream and place the discharged material in the old beaver runs. The discharged material will be stabilized with fabric and rock to prevent future bank erosion. The removal of this silt will re-expose existing spawning gravel allowing the stream section to support increased steelhead spawning activity. Rearing area rehabilitation will concentrate on deepening pools and creating overhead cover. Large in-stream woody debris will also be placed to provide overhead cover and to construct undercut banks. The LSSA anticipate that there will be 15 areas that will require bank stabilization, debris and sediment removal, and tree planting. These 15 areas will require approximately 3,000 trees.

### **Habitat Rehabilitation Result 4 - Project Inspection/Maintenance**

The project areas will be inspected and maintained four times over a ten-year period. The inspection /maintenance period will be at the following frequencies:

- Year 1- Measuring tree mortality will be the primary inspection task.
- Years 3, 6 and 10- Measuring tree growth, tree mortality and plant specie competition will be the primary inspection task. The primary maintenance task will be to remove competing or exotic species from around the trees.

## **Estimated Cost -**

### **Measuring the Projects Success**

Project's success will be measured by evaluating the major project objectives. These objectives are:

- High survival of planted trees.
- Reestablish the coniferous tree stream canopy.
- Decrease in the summertime water temperature.
- Increase in summertime stream flows.
- Decrease in early smolt emigration.
- Increase in adult steelhead population.

**Total Cost**

The total cost of the proposed project is \*\*\*\*

**Proposed Project Partners**

Knife River Township – This partner will provide the project in-kind support, assistance with access agreements and a building for stakeholder meetings.

Minnesota Department of Natural Resource Fisheries– This partner will provide data of existing dam and stream conditions, technical support to review plans and process permits for the project.

Minnesota Department of Natural Resource Coastal Management Program – This partner will provide assistance to apply and obtain matching funds.

Minnesota Pollution Control Agency – This partner will provide technical support and review of existing plans.

Laurentian RC & D – This partner will provide assistance to obtain matching funds.

Arrowhead Fly Fisherman – This partner will provide in-kind labor.

Trout Unlimited – This partner will provide in-kind labor.

Soil and Water Conservation District – This partner will provide technical information from the Knife River total maximum daily load (TMDL) study.

**APPENDIX 1**  
**ATTACHMENTS**



## **APPENDIX 2**

### **PROJECT MANAGER RESUMES**

