

**Rainbow Trout Management Summary
for the
Minnesota Waters of
Lake Superior
2015**



**Nick Peterson
Cory Goldsworthy**

**Lake Superior Area Fisheries
Minnesota Department of Natural Resources
Duluth, Minnesota**



Introduction

This document is a summary of activities related to the management of Rainbow Trout in the Minnesota waters of Lake Superior. The framework for Rainbow Trout management is in the Rainbow Trout chapter of the 2016 *Fisheries Management Plan for the Minnesota Waters of Lake Superior* (LSMP; *in prep*). Creel surveys, trap reports and weekly angling reports are on the Lake Superior Area Fisheries website (<http://www.dnr.state.mn.us/areas/fisheries/lakesuperior/management.html>). Publications cited in this summary can also be obtained by contacting the Lake Superior Area Fisheries Office.

Lake Superior Fisheries Management Plan Revisions

The *Fisheries Management Plan for the Minnesota Waters of Lake Superior* (LSMP) is the guiding document for fisheries management in the Minnesota waters of Lake Superior, and includes a chapter for Rainbow Trout management. The LSMP is reviewed and revised every 10 years by the MNDNR North Shore Management Group (NSMG) and the Lake Superior Advisory Group (LSAG), comprised of individuals representing a wide variety of user groups. A kick-off conference was held on Saturday, December 6th, 2014 at the University of Minnesota-Cloquet Forestry Center near Cloquet, Minnesota that allowed interested citizens to discuss and identify important issues to address in the 2016 LSMP. The LSAG then met monthly throughout 2015 to address specific issues important to Lake Superior. The final LSAG meeting was held in Duluth on December 7, 2015, where proposed revisions to the 2006 LSMP were finalized. The 2016 LSMP review process helped to revise and/or expand on objectives and management goals for Rainbow Trout. The 2016 LSMP will soon be made available for public comment, and three public input meetings will be held near Grand Marais, Duluth and St. Paul in January/February 2016. More information on the review process can be found on the Lake Superior Area Fisheries website (<http://www.dnr.state.mn.us/areas/fisheries/lakesuperior/index.html>).

French River Coldwater Hatchery Update

The French River Coldwater Hatchery (FRCWH) has been the facility primarily responsible for the rearing of steelhead fry and Kamloops yearlings stocked into Lake Superior tributaries. The FRCWH was built in 1974-1975 and is in need of significant repairs and upgrades if it is to continue to operate effectively. In 2013, the MNDNR hired an engineering and consulting firm, HDR, Inc., to evaluate the current condition of this facility and to determine renovation options to ensure that the system can be fully operational for the next 25 years and can continue to meet the statewide fish production goals. The French River Cold Water Hatchery Rehabilitation Analysis Report projected costs of renovation was \$7.6 million to extend the life of the facility by 25 years. The French River Rehabilitation Study is available in its entirety on the Lake Superior Area Fisheries website (<http://files.dnr.state.mn.us/areas/fisheries/lakesuperior/HDR-Report.pdf#view=fit&page=9>). The 2016 LSMP revision process did not address the future of the French River Coldwater Hatchery. Hatchery needs identified will be evaluated as a separate process within the context of the statewide coldwater hatchery system. A strategic assessment of the entire coldwater hatchery production program in the State of Minnesota will be pursued in 2016. Angler groups with a stake in the hatchery products will be appropriately involved during that process.

Environmental Conditions

Environmental conditions and habitat (i.e., adequate water levels and cool water temperatures) are two primary factors that dictate whether steelhead will remain in tributaries for at least two years and reach an age/size that is needed to survive in Lake Superior. Ample precipitation in the fall and snowfall during the winter months helps to maintain overwintering habitat for fish by recharging water sources (e.g., wetlands) and insulating stream temperatures from excessive ice formation.

Environmental conditions were not ideal for juvenile trout entering the winter of 2014/15. Below average precipitation in the fall left many North Shore streams in abnormally- or moderately-dry drought conditions throughout the winter of 2014/15. However, the snowfall total for Duluth in 2014 (111.2 inches) was above average. Spring arrived on schedule in 2015 after two consecutive years of late-ice and cold spring conditions in 2013 and 2014. Ice started to clear in streams near Duluth in early-April, and all rivers shore wide were free of ice by late-April. Above average snowfall in winter 2014/15 helped to counteract fall drought conditions and resulted in only slightly below-average spring discharge in many rivers for most of the spring season, such as the Knife River (Figure 1).

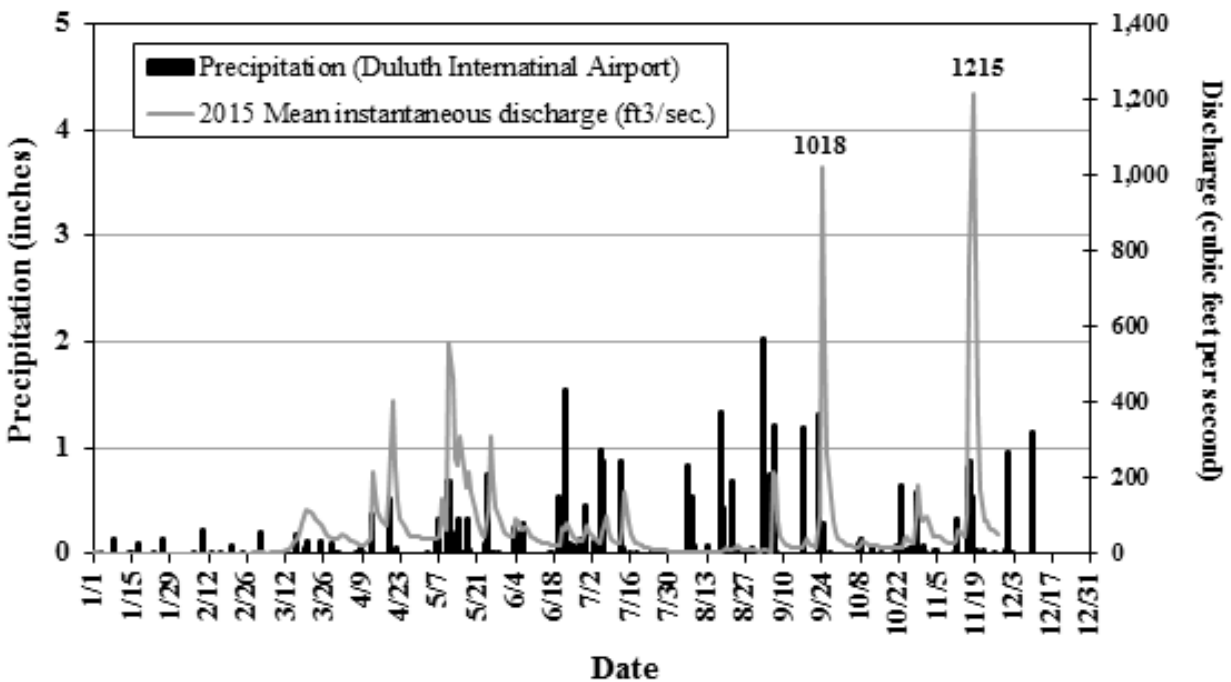


Figure 1. Daily precipitation (inches) at the National Climate Data Center in Duluth, Minnesota (black bars), and the 2015 mean daily discharge (cubic feet per second) at the Knife River USGS Geological Survey station near Knife River, Minnesota (grey line). Stream flow data was provided by the United States Geological Survey (online: <http://waterdata.usgs.gov/mn/nwis/rt>).

Stream conditions were favorable for juvenile trout during the summer and fall of 2015. Air temperatures and precipitation totals were similar to the historic averages throughout the summer (<http://cdo.ncdc.noaa.gov/qclcd/QCLCD>). Abnormally-dry or moderate drought conditions reappeared in August. Frequent rain events provided average or above-average discharge in the fall. Two significant runoff events occurred in September and November at the Knife River that were the highest mean daily discharge observed in those months since 2000 (Figure 2). The North Shore was free of drought conditions from October through December.

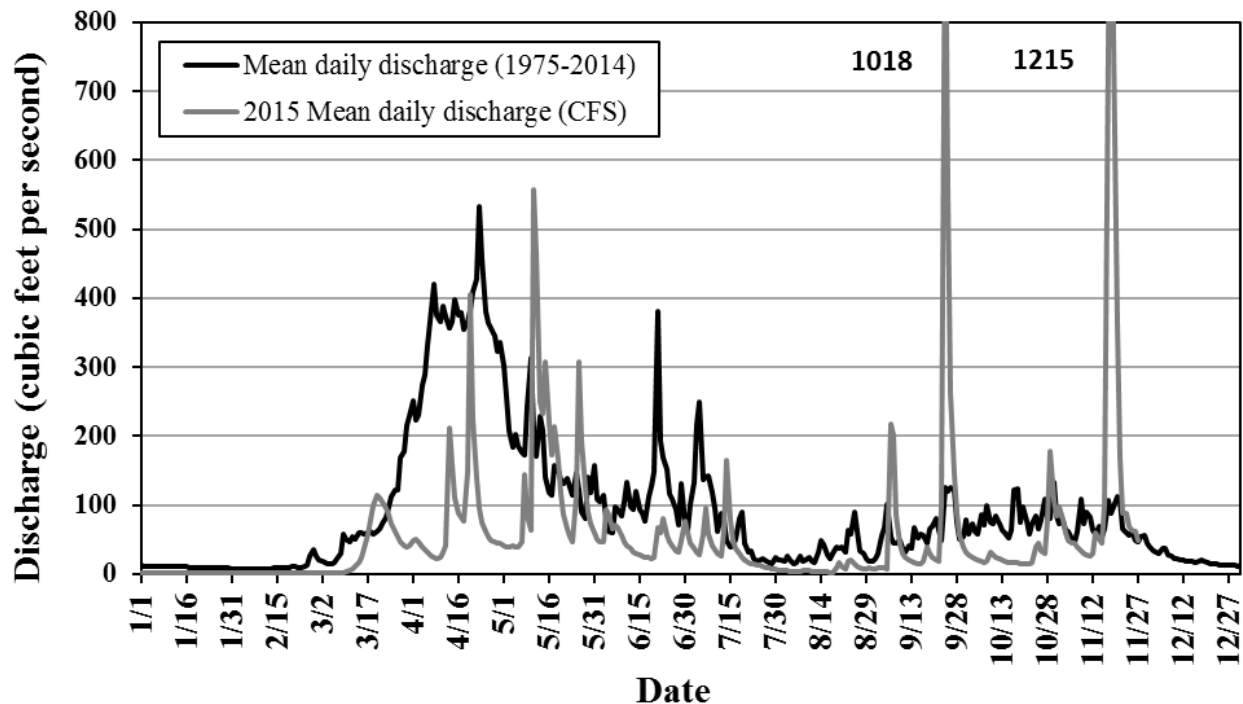


Figure 2. Historic mean daily discharge (cubic feet per second; black line) and the 2015 mean daily discharge (grey line) at the Knife River USGS Geological Survey station near Knife River, Minnesota (online: <http://waterdata.usgs.gov/mn/nwis/rt>).

MNDNR Lake Superior Creel Surveys

Lake Superior Area Fisheries has continued its annual spring and summer creel surveys on the North Shore. The spring creel begins at ice-out and targets anglers fishing rivers and near river mouths on 18 Lake Superior tributaries and McQuade Harbor, whereas the summer creel focuses on those angling primarily by boat on Lake Superior. Annual completion reports for both creel surveys are available on the Lake Superior Area Fisheries website.

Spring Creel Survey

The annual MNDNR Lake Superior spring creel survey was conducted from April 14 through May 20, 2015. Anglers spent an estimated 21,120 hours fishing in spring of 2015, which was lower than the historic average (1992-2014 average = 31,112 angler-hours). The shorewide catch rate of steelhead was 0.170 fish per angler-hour (5.8 angler hours per fish caught), which was the highest catch rate observed since the start of the spring creel survey in 1992 (Figure 3). The estimated shorewide catch of 3,588 steelhead was higher than the historic average (1992-2014 average = 2,568; Figure 4).

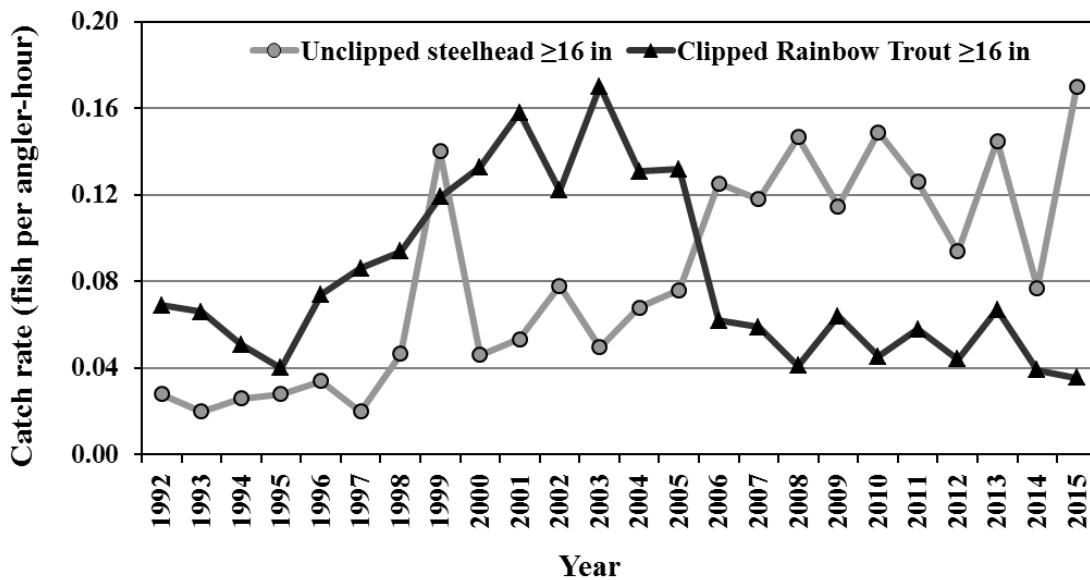


Figure 3. Shorewide catch rate (fish per angler-hour) for unclipped steelhead and clipped Rainbow Trout ≥ 16 " from the MNDNR Lake Superior spring creel survey by year.

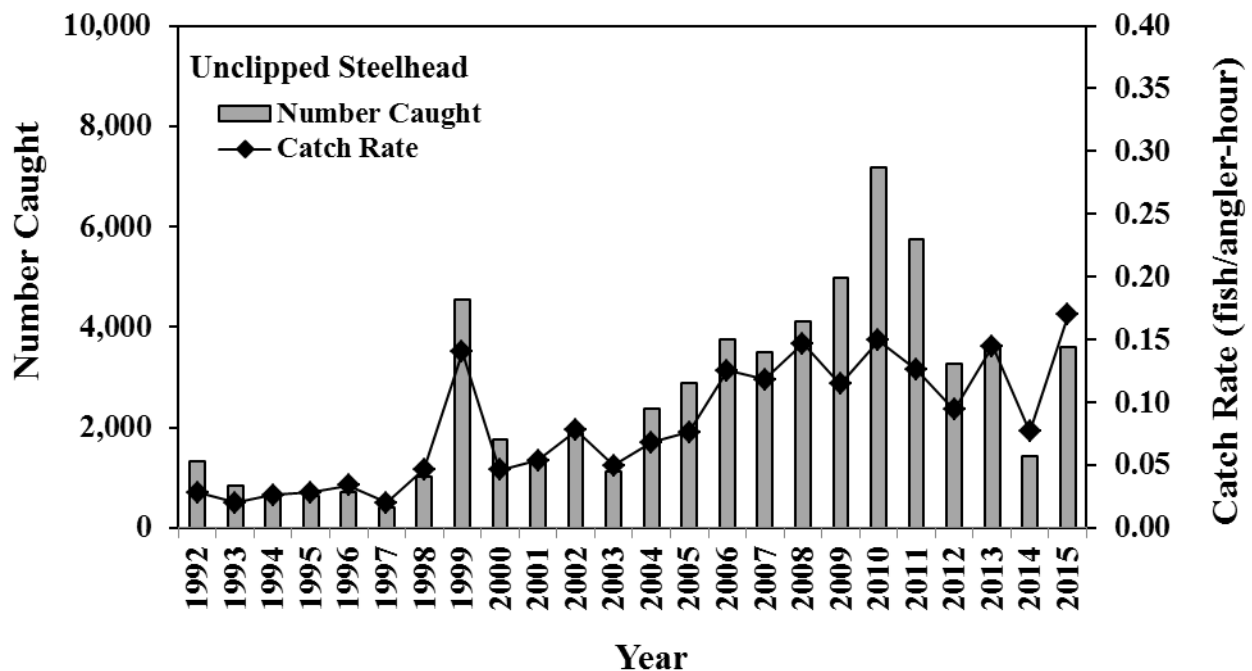


Figure 4. Number caught and catch rate (fish per angler-hour) of steelhead Rainbow Trout greater than 16 inches reported by year in the MNDNR Lake Superior spring creel survey.

The shorewide catch rate of Kamloops was 0.035 fish per angler-hour (28.6 angler-hours per fish caught), and was the lowest since 1992 (Figure 3). The estimated shorewide catch of 749 Kamloops was below the historic average (1992-2014 average = 2,485; Figure 5).

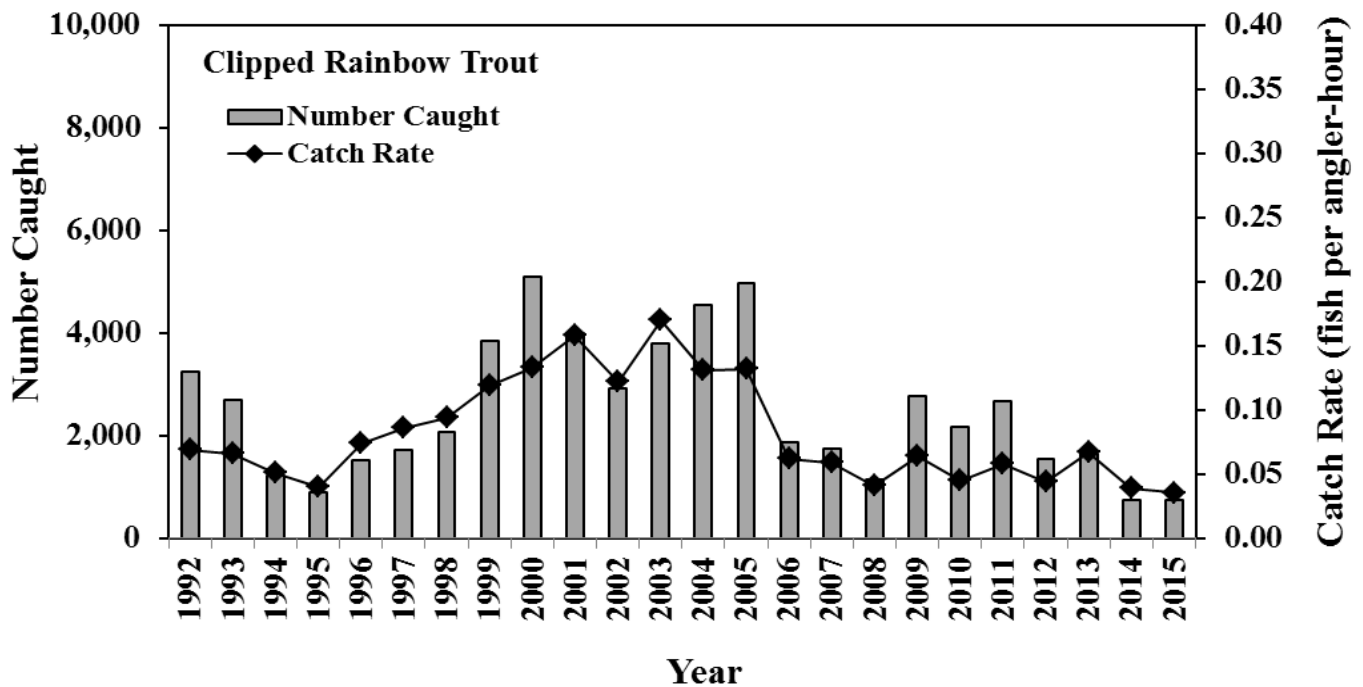


Figure 5. Number caught and catch rate (fish per angler-hour) of clipped Rainbow Trout (Kamloops and/or clipped steelhead) greater than 16 inches reported by year in the MNDNR Lake Superior spring creel survey.

Summer Creel Survey

The annual MNDNR summer creel survey was conducted from May 23 through October 4, 2015. This survey targets boat anglers fishing in Lake Superior. Most boat anglers fishing Lake Superior in the summer are targeting other species and not actively targeting Rainbow Trout; however, Rainbow Trout are caught and reported in the summer creel survey. Steelhead catch rates were lower than in recent years and similar to 2014. A total of 347 steelhead were reported, of which 340 were released and seven were illegally harvested. Thirty-four Kamloops were reported as caught and harvested in 2015, which was the lowest catch reported since 1995. Very few Kamloops are typically targeted and caught by boat anglers in Lake Superior in the summer months.

MNDNR Long-term Trout Monitoring Stations

MNDNR Fisheries offices in Duluth, Finland, and Grand Marais continued annual juvenile steelhead electrofishing assessments at long-term monitoring (index) stations. Index stations are sampled each year to track annual juvenile trout abundance in North Shore streams over time, and determine if steelhead and other trout successfully reproduced during the spring spawning season. In 2015, Duluth Area sampled nine stations at seven streams (Blackhoof, French, Knife, Little West Branch Knife, West Branch Knife, Stewart, and Sucker rivers), Finland Area sampled two stations at two streams (Split Rock and Baptism rivers), and Grand Marais Area sampled five stations at five streams (Onion, Devil Track, Kimball, Kadunce, and Flute Reed rivers). Among all locations sampled shorewide in 2015, age-0 steelhead abundance was similar-to or above average at 13 stations, and below average at 3 stations. Age-1 and older steelhead abundance was similar-to or above average at 8 stations, and below average at 8 stations. Steelhead abundance trends were variable among lower shore rivers (Duluth, Lake Superior, and Finland Areas), but were average or above in all upper shore rivers (Grand Marais Area) in 2015 (Table 1).

Table 1. Age-0 and age-1 and older steelhead abundance observed at MNDNR long-term index stations in 2015 by MNDNR management area and stream. Categorical values represent the abundance observed in 2015 compared to the long-term average of steelhead abundance at each location.

MNDNR Management Area	Stream	Station location		
		(miles from mouth)	Age-0	Age-1+
Duluth Area	Blackhoof River	12.7	Above	Below
	French River	4.6	Below	Below
	Knife River	15.1	Above	Average
	Knife River, Little West Branch	4.2	Below	Below
	Stewart River	0.2	Above	Average
	Sucker River	1.0	Below	Below
Lake Superior Area	Knife River	1.9	Average	Below
	Knife River	17.6	Average	Average
	Knife River, West Branch	3.7	Above	Below
Finland Area	Baptism River	0.7	Average	Below
	Split Rock River	0.5	Average	Below
Grand Marias Area	Devil Track River	0.1	Average	Average
	Flute Reed River	0.0	Average	Average
	Kadunce Creek	0.0	Average	Average
	Kimball Creek	0.1	Average	Average
	Onion River	0.1	Above	Above

MNDNR Fish Traps

Trap numbers reported for 2015 are preliminary. Final numbers will be included in trap reports available on the Lake Superior Area Fisheries website by July 2016.

Knife River Adult Trap

It was a historic year for adult steelhead returns to the Knife River fish trap. Spring and fall steelhead returns in 2015 were the highest observed since the trap became operational in 1996 (Table 2; Figure 6). Wild (unclipped) steelhead made up 96% of the total spring return (Table 2; Figure 6). Steelhead returns in the fall were 5 times higher than the historic average (Table 2).

Table 2. The number of steelhead returning to the Knife River adult trap in 2015 spring and fall trap seasons, including the long-term average by season.

Species	Spring ¹		Fall ²	
	2015	Average (1996 - 2015)	2015	Average (1996 - 2015)
All Steelhead	963	423	160	38
Clipped Steelhead	41	93	5	5
Unclipped Steelhead	922	330	155	29

¹Spring totals are mark-recapture population estimates

²Fall totals are the total number of steelhead that returned.

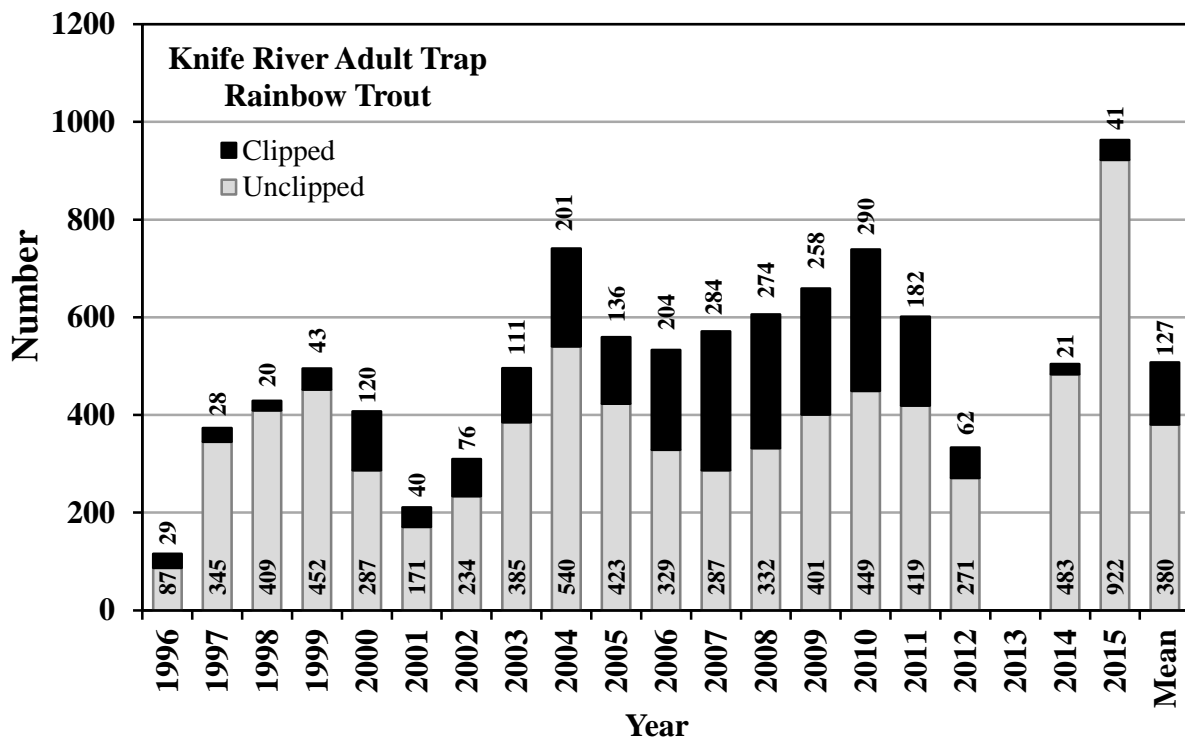


Figure 6. The estimated number of clipped (hatchery) and unclipped (wild) steelhead returns in the spring to the Knife River adult trap by year.

Although adult steelhead returns were well above average in 2015, low adult returns are possible in coming years. MNDNR stream assessments in the Knife River and its tributaries found few juvenile steelhead from the 2011 and 2012 year-classes. Since most adult steelhead return to spawn at 5 or 6 years old, very few steelhead from these year-classes were expected to return to the Knife River in 2015. The influence of these weak year-classes on adult returns should start to be realized with adult returns in 2016. It will be interesting to see if the masses of steelhead caught in 2015 will return again in coming years and buffer the weak 2011 and 2012 year-classes.

Knife River Juvenile Trap

A total of 4,529 juvenile steelhead were captured emigrating from the Knife River in 2015. A complete synthesis of juvenile data is not yet available. The annual total of emigrating juvenile steelhead is calculated based on the number captured in the trap and trap efficiency, which also takes into account flow conditions. The total number of juvenile steelhead provided in this report will increase after adjusting for trap efficiency. A complete Knife River Trap Report will be available on the Lake Superior Area Fisheries website by July 2016.

French River Adult Trap

Kamloops returns to the French River in 2015 was almost identical to the historic average (Table 3; Figure 7).

Table 3. The number of steelhead and Kamloops Rainbow Trout captured at the French River trap in the spring of 2015, including the long-term averages.

	Kamloops 2015	Historic Average (1993 - 2015)	Unclipped Steelhead 2015	Historic Average (1993 - 2015)	Clipped Steelhead 2015
French River Adult Trap	888	884	121	91	4 (RM)

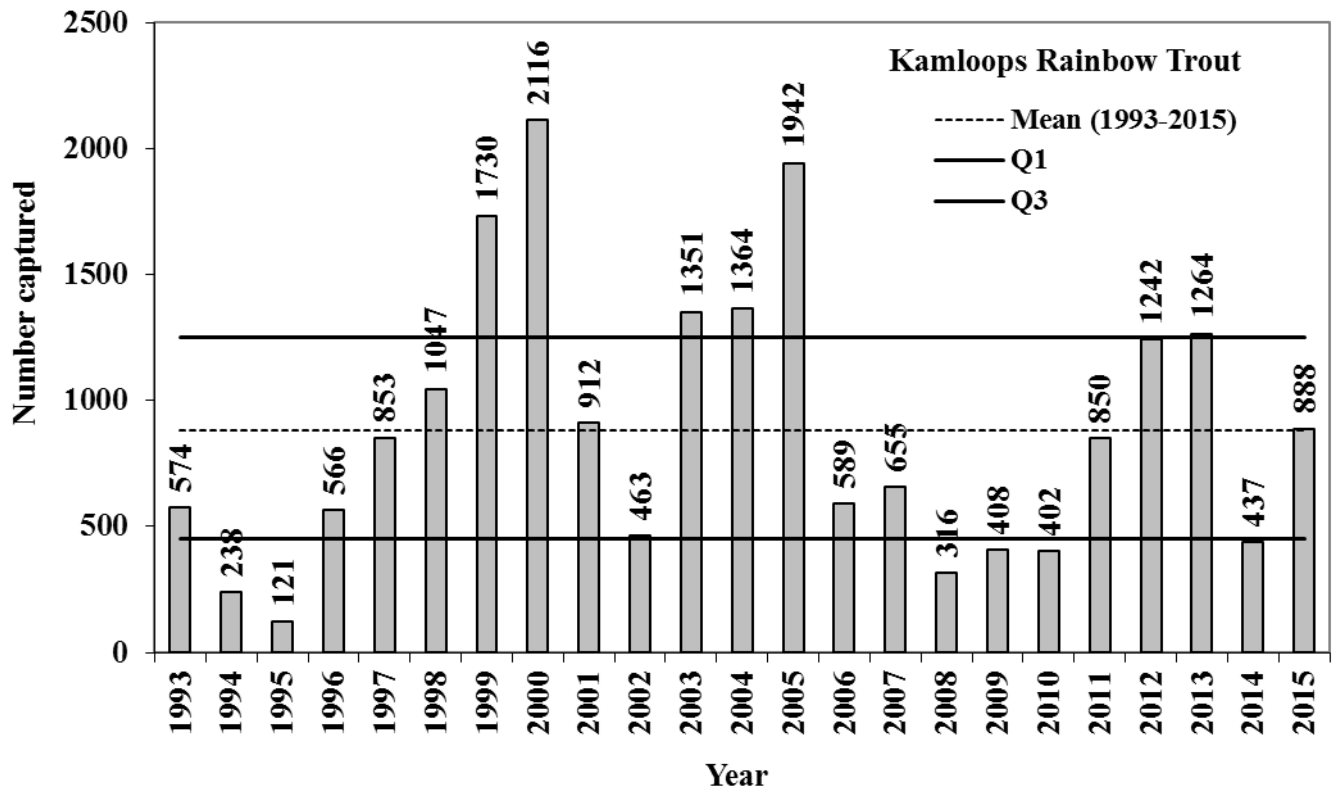


Figure 7. The yearly returns of Kamloops to the French River trap by year. The historic average return (Mean), 25th percentile (Q1), and 75th percentile (Q3) are also shown.

One hundred and twenty-three unclipped steelhead were captured at the French River in 2015, which was above the long-term average (Table 3; Figure 8). Four clipped steelhead were found and all had a right maxillary clip that indicated they were Knife River captive broodstock used at French River Coldwater Hatchery and released in recent years.

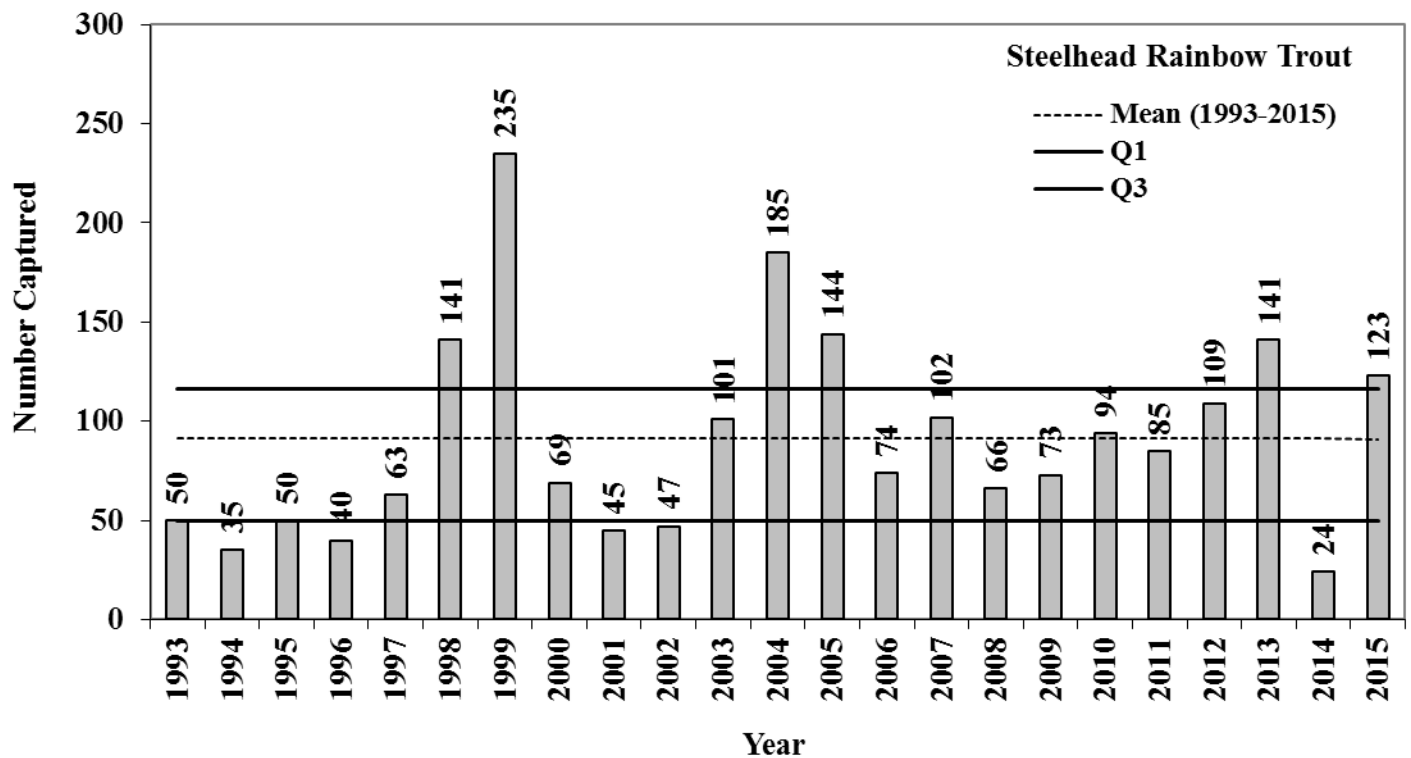


Figure 8. The yearly returns of steelhead to the French River trap by year. The historic average (Mean), 25th percentile (Q1), and 75th percentile (Q3) are also shown.

French River Juvenile Trap

The French River juvenile trap was operated from April 15 – November 11, 2015 (204 days). A total of 1,359 juvenile Steelhead emigrants were sampled at the French River juvenile trap in 2015, which was less than in 2014 (1,795) and lower than the long-term average (1994-2014 average = 3,414). Steelhead frylings were stocked from 2009-2013 as part of a research project to evaluate stocking fish at this life stage and intermediate size. The below average number of juvenile steelhead emigrants was expected because approximately half the number of frylings were stocked in recent years. Refer to the research section of this report for more information and preliminary results on the fryling study.

Stocking

Steelhead

A total of 356,390 steelhead fry were stocked in 2015 (Table 4). Stocked fish were offspring produced from Knife River captive broodstock and/or wild adult steelhead captured at the mouth of the French River. Steelhead fry continue to be reared for short lengths of time at the Spire Valley Hatchery (SVH) to prevent the potential introduction of VHS above the natural barriers. The fry are then transported in well water to North Shore tributaries and stocked upstream of natural barriers. Extended periods of very warm Lake Superior water in 2012 caused considerable mortality of steelhead broodstock in the FRCWH, which reduced fry availability in recent years. The steelhead stocking quota was modified with revisions to the 2016 Lake Superior Management Plan. The annual quota will be reduced or eliminated at some rivers in future years to more accurately reflect the annual fry availability over the past decade. Progress has been made to replace the losses of captive steelhead broodstock at the FRCWH, but it will take several more years before it is completely replenished.

Table 4. Steelhead fry stocking quota and number stocked in 2015 by MNDNR management area and stream.

MNDNR Management Area	Stream	Quota	Number Stocked
Duluth Area	French River	150,000	99,908
	Gooseberry River	50,000	37,282
	Lester River	100,000	71,743
	Silver Creek	50,000	23,617
Finland Area	Split Rock River	150,000	66,151
	Baptism River	150,000	57,689
Total		650,000	356,390

Kamloops

A total of 102,649 Kamloops yearlings were stocked in the French River (45,446), Lester River (19,730), and McQuade Harbor (37,473) in 2015, which exceeded the annual quota of 92,500. About 73% of the Kamloops quota is partially reared at SVH before being returned to the FRCWH each year. Spire Valley Kamloops are reared for approximately three months at FRCWH prior to being stocked into Lake Superior. The remaining Kamloops are reared entirely at the FRCWH prior to stocking in Lake Superior.

Habitat Projects

Stewart River

Stream Bank Stabilization

Lake County SWCD, Technical Service Area III, Trout Unlimited and MNDNR restored over 4,000 feet of degraded and unstable stream channel at the Stewart River upstream of Big Rock Road between July 8 and September 15, 2015. The main goal of the project was to restore the stream to correct form so it is stable and provides better quality habitat for fish and other aquatic organisms. The objectives were based on the five components of stream function:

1. Connectivity- restore appropriate connectivity to floodplain and improve vertical connectivity of stream to groundwater. Restore riparian zone, where necessary.
2. Geomorphology- restore the appropriate channel form (dimension, pattern and profile) so the channel is stable (neither aggrading nor degrading, while maintaining this form), and provide a diversity of habitat and cover.
3. Water quality- dramatically reduce sediment by minimizing stream bank erosion, and improve temperatures for trout through shading and improved baseflow and/or narrowing of stream channel.
4. Biology- increase the amount and quality of habitat and cover for all life-stages of trout and other aquatic organisms, and improve water temperature and water quality for trout.
5. Hydrology- at a minimum, maintain current hydrology (duration, magnitude and timing of flows), but attempt to improve baseflow conditions for trout.

The project was designed by Dave and Brandon Rosgen (Wildland Hydrology) and Mike Geenen (Watershed Restoration, LLC). The construction contractor was North State Environmental (Two Harbors, Minnesota). This project has drawn interest from other districts as a demonstration site for this type of approach to river restoration. The project was funded by grants from Sustain Our Great Lakes, Lessard-Sams Outdoor Heritage Council, Clean Water funds, Board of Water and Soil Resources Flood Relief funds, and a MNDNR debris and sediment removal grant.



Photos (above): A section of the 2015 stream habitat project on the Stewart River at Big Rock Road before (left) and after (right) completion. The after (right) photo shows a toe wood structure that was built to dissipate flows and create pool habitat that will provide rearing and overwintering habitat for juvenile steelhead and other fish species. *Photo credit: MNDNR.*

Knife River

Stream Bank Stabilization

Lake County SWCD identified five banks on the Knife River and prioritized them for stabilization. In 2012, the SWCD received a Clean Water Fund (CWF) grant (\$221,000) to stabilize the largest bank located west of Copperhead Road. Thanks to the CWF grant, the SWCD was able to gain more federal funding from the Great Lakes Commission (an additional \$293,000) to work on additional streambank and channel stabilization projects along the Knife River. The Copperhead Road project stabilized a slumping bank that was 1,200 feet long and 80 feet high. The SWCD estimated that this project alone will reduce sediment loading to the river by 21%, saving 750 tons of sediment (equal to 30 dump truck loads) from entering the stream per year. The channel was completely realigned away from the actively sloughing bank and reconnected to its floodplain. This project has drawn interest from other districts as a demonstration site for the utility and benefits of a natural channel design approach to stream restoration.



Photos (above): The 2015 Lake County SWCD bank stabilization project on the Knife River at Copperhead Road before (left) and after (right) completion. The after (right) photo shows how the stream was rebuilt away from a very large sloughing bank to reduce excess sediment from entering the stream. Fixing this bank should save 750 tons of sediment (approximately 30 dump truck loads) from entering the Knife River per year. A toe wood structure that was built to dissipate flows and create pool habitat that will provide rearing and overwintering habitat for juvenile steelhead and other fish species. *Photo credit: MNDNR.*

Geomorphic Assessment

The Lake Superior Steelhead Association (LSSA) contracted Mike Geenen (Watershed Restoration, LLC) to conduct a preliminary geomorphic assessment of the Upper Knife River from upstream of Lake County Road 11-Valley Road to the headwaters. Members of the LSSA and Watershed Restoration, LLC staff walked approximately 12 miles of river and identified 12 degraded reaches that need baseline data for future restoration. A geomorphic assessment of the 12 reaches identified is currently underway. One reach will be considered for stream bank stabilization in 2016.

West Branch Knife River

Tree Planting

In May of 2014, the LSSA contracted with the Conservation Corps of Minnesota to plant hundreds of deciduous trees in a lengthy stretch of the Main West Branch of the Knife River, located off the Fox Farm Road about a half-mile below the State Trail Bridge on the Main West Branch. After inspecting the planting in the spring of 2015, it was evident that there were losses to the young trees due to vole/mouse predation over the winter. The CCM placed stakes and tree guards around all surviving young trees, and planted several hundred more deciduous trees to replace those lost. This project was funded through the LSSA's Lessard-Sams Outdoor Heritage Council grant.



Photo (above): Members of the Lake Superior Steelhead Association planting trees at the West Branch of the Knife River. *Photo credit: LSSA.*

Geomorphic Assessment

The LSSA hired the South St. Louis County SWCD to perform a geomorphic assessment on 6.25 miles of the West Branch of the Knife River to provide baseline data for future stream restorations. This stretch of river starts below MNDNR tributary number S-017-004-005 (referred to as Udesen Creek by the LSSA) downstream to where private property begins. These geomorphic assessments were funded through the LSSA's Lessard-Sams Outdoor Heritage Council grant.

East Amity Creek

Stream Bank Stabilization

South St. Louis SWCD completed a bank stabilization project on East Amity Creek, upstream of Jean Duluth Road. One private landowner was involved in the project. The objectives were based on the five components of stream function:

1. Connectivity- reestablish floodplain connection and maintain connection to groundwater.
2. Geomorphology- construct a stable stream reach that maintains its dimension, pattern, and profile without aggrading or degrading.
3. Water quality- dramatically reduce sediment by minimizing stream bank erosion and lower water temperatures by deepening pools, improving stream shading, and restoring a stable width/depth ratio of the stream channel.
4. Biology- increase quality and amount of undercut pool habitat, reduce spawning gravel embeddedness, increase spawning habitat for fish, improve riffle complexity and habitat, and reestablish riparian vegetation and enhance the riparian corridor for wildlife.
5. Hydrology- construct a channel and floodplain that will handle a wide range of flows.

Other considerations for this project were to make the restoration appear natural and improve aesthetics, educate landowners about natural channel design, reduce land loss to erosion, and protect residential structures by protecting the toe of a slumping stream bank. This project was funded by the Minnesota Board of Water and Soil Resources (BWSR) Flood Relief Grant.



Photos: The 2015 South St. Louis SWCD bank stabilization project on East Amity Creek, upstream of Jean Duluth Road, before (left) and after (right) completion. *Photo credit: South St. Louis SWCD.*

Culvert Enhancement

The Jean Duluth Road culvert on East Amity Creek was installed in 2004 and buried two feet into the stream bed with fish passage boulders every 10 feet. This structure had not filled with other streambed sediment as expected due to the relatively large size (cobble) of natural bed material in this stream. Without other bed material around them to hold them in place, the fish passage boulders were moved by the flood flows in 2012. This left the majority of the length of this culvert impassable to fish. MNDNR Duluth Area Fisheries staff and the MNDNR Fisheries construction crew placed natural bed material in the buried culvert to provide roughness and velocity breaks for fish passage.

Stanley Creek

Tree Planting

The LSSA had a volunteer tree-planting project on June 6, 2015 on a stretch of Stanley Creek, a tributary to the Knife River. Eighteen LSSA volunteers planted 50 white spruce, 50 tamarack, 15 silver maple (approximately eight feet tall) and green ash (approximately six feet tall) in an abandoned beaver meadow. The silver maples were caged and covered with trunk guards. The trees were purchased through the LSSA's general fund.

Geomorphic Assessment

The LSSA contracted the South St. Louis SWCD to perform a geomorphic assessment on 5.25 miles of Stanley Creek to provide baseline data for future stream restorations. The assessed reach covered downstream of Homestead Road to the confluence with the Knife River. This geomorphic assessment was funded through the LSSA's Lessard-Sams Outdoor Heritage Council grant.

Miscellaneous Watershed Work

Identification of Steelhead Spawning Sites in the Knife River Watershed

In 2015, the LSSA walked miles of the Main Knife River, the Main West Branch of the Knife and Stanley Creek to identify steelhead spawning sites. Spawning redds were counted and locations were recorded with a GPS. Data obtained from these walks will help to characterize spawning sites selected by steelhead in the Knife River, and provided data to support future habitat work in the Knife River watershed.

Water Temperature Monitoring

The LSSA continued water temperature monitoring in the Knife River watershed. Twenty-seven temperature loggers were placed in the upper Knife River and the West Branch of the Knife River prior to June 1 and extracted after September 30. Water temperature data will be shared with other local resource agencies.

Lester River and French River Headwaters Aquatic Management Areas

The MNDNR used Lessard-Sams Outdoor Heritage Council funds to restore two abandoned gravel pits found within the French River Headwaters Aquatic Management Area (AMA) and the Lester River AMA north of Duluth. The gravel pits have a history of excessive illegal ATV activity and are known local "party spots." As a result, both sites have not been able to naturally reforest themselves and the disturbance has invited invasive species to take root. In the spring of 2015, the MNDNR contracted with the Conservation Corps of Minnesota to plant 3,000 trees at the two sites. A mix of native coniferous and deciduous trees and shrubs were planted using a cluster design to create a more natural planting. Soil type and climate change were both considered when determining which species to plant. The MNDNR will follow up with bud capping and invasive control annually at the sites to increase survival rates. In addition, the ATVs created multiple erosion gullies and trails at the Lester River AMA of which were stabilized with brush bundles to trap sediment and fill in over time. The MNDNR has also taken multiple measures to prevent future disturbance at these sites and is hopeful of a complete restoration.



Beaver Management Update

The MNDNR Duluth Area Fisheries office conducts an annual aerial survey within the Knife River watershed to monitor beaver activity and locate dams that could significantly impede migration of steelhead and Brook Trout. The 2015 flight was conducted on October 20. Fifty-six dam sites were located and prioritized for removal prior to the spring run. As of November 15, 2015, 19 beaver and 16 dams had been removed. Only 15 beaver and 10 dams were removed from the Knife River system in the winter of 2014/15 and spring 2015, which was more than the previous year (5 beaver and 6 dams). Tributaries of the Knife River with removals included the Main Knife River, Little East Branch, West Branch and Stanley Creek. Beaver activity was also monitored in the Blackhoof River Watershed. Six beaver and four dams were removed in the fall of 2015, and one more dam will be removed in spring 2016.

Riparian Easement Acquisition

Trout stream easements ensure the protection of the riparian corridor from detrimental activities, enhance water quality, authorize MNDNR personnel, other government entities, and non-government affiliates to conduct habitat improvement projects within the easement boundaries, and provide angler access. These are perpetual easements, meaning they never expire. Acquiring and preserving riparian easements helps ensure that future generations of anglers have access to North Shore streams.

A riparian easement acquisition program was initiated in 2011 with a \$200,000 grant obtained by MN DNR from the National Fish Habitat Initiative-Great Lakes Partnership and approximately one million dollars from the LSOHF. This program was completed in June 2014. However, several easements were still in process and completed in the summer of 2015. This program allowed the MNDNR to purchase easement rights in the riparian corridors of trout streams in the Lake Superior watershed from private landowners. Land ownership was mapped on 60 Lake Superior tributaries spanning 764 miles of stream along the North Shore. Of the 764 river miles, 246 were under private ownership. The program produced agreements with 29 landowners to purchase 12.04 river miles that protects 232 riparian acres and adds 21 new angler access points at an estimated cost of \$812,184. The easements also connect over 95 miles of currently unconnected public river miles.

Currently, the MNDNR is working to purchase two conservation easements in the Lake Superior watershed. One easement is on the Stewart River and includes 3,400 feet of stream and 15.1 acres. The other is on the Baptism River and includes 712 feet of stream and is 1.4 acres. They are also working with the City of Silver Bay to acquire a conservation easement on the East Branch of the Beaver River. This easement is a collaborative effort between the MNDNR, Lake County Soil and Water Conservation District, and the City of Silver Bay, and includes 2,733 feet of stream and 12.0 acres of riparian habitat. If this acquisition is successful, Lake County SWCD will then be able to use approximately \$400,000 in funding to restore a section of stream that was severely damaged by previous flooding. As a result of 2015 legislation, Duluth Area Fisheries received approximately \$200,000 in funding for acquisition work on the Blackhoof River system in Carlton County. Candidate parcels will be identified and offer letters mailed to landowners sometime this winter.

Research Projects

Two MNDNR Rainbow Trout research projects are currently underway; two have been ongoing prior to this year and one was initiated in 2015.

1) Survival, Growth, and Emigration Behavior of Steelhead Frylings (2009-2020)

The goal of this study is to determine if the fryling program yields better adult returns than traditional fry stocking. About 55,000 frylings were stocked into the French River in 2009 and 2011-2013; no fry or frylings were stocked in the French River in 2010 because of VHS concerns. Emigrating juveniles have been monitored each year at the French River juvenile trap.

Fryling-stocked steelhead were larger in size at emigration compared to fry-stocked steelhead. Typically, most naturally-produced steelhead achieve smolt size at age-2; however, many of the stocked frylings achieved smolt size by age-1. Preliminary results indicate that survival of steelhead stocked as frylings to age-1 and age-2 is similar to survival of steelhead stocked as fry to these ages. Survival and growth rates of frylings will be compared to fish stocked as fry after age data is evaluated for juvenile steelhead emigrants collected in the 2015 trap season. Returns of fry- and fryling-stocked adult steelhead will continue to be monitored at the French River adult trap until stocked year-classes have completely returned to the French River.

2) Pilot Study: Age-1 Steelhead Smolt Relocation Project (2014-2018)

A juvenile steelhead relocation program was initiated by the LSSA with assistance from the MNDNR in July 2014. The goal of the pilot program is to determine if age-1 juveniles that have emigrated down the Knife River will remain upstream another year if placed in headwater areas that are deemed to be suitable for their survival. If age-1 steelhead emigrants remain in the river an extra year, their chance of survival to adulthood increases over thirtyfold. Relocation sites include (or may include) the headwaters of the Knife River, the upper and lower sections of the West Branch, Knife River, and Stanley Creek. These areas were selected based on 1) availability of cold water, 2) limited or no significant populations of Brook Trout and steelhead present according to MNDNR fish surveys, and 3) stream accessibility. This program should provide a better understanding of the life-history dynamics of juvenile steelhead in the Knife River watershed and the influence of habitat availability for this life-history form.

In 2014, the MNDNR collected 712 age-1 juvenile steelhead (size range: 100-140 mm total length) from the Knife River juvenile trap and transported them to the French River office. All fish received a fin clip, were held overnight, and then transported by LSSA members in aerated coolers and stocked into the headwaters of the West Branch Knife River. None of these relocated fish were observed in the Knife River juvenile trap in 2014. Only 18 were found migrating downstream as age-2 emigrants in spring 2015.

In June 2015, the MNDNR collected 1248 age-1 juvenile steelhead (size range: 100-140 mm total length) from the Knife River juvenile trap and transported them to the French River office. All fish received a fin clip (different from the clip applied in 2014), and held overnight. The next day, all fish were transported by LSSA members in aerated coolers and stocked in Stanley Creek immediately upstream of the Homestead Road crossing. One-hundred twenty-three were collected later in the summer at the Knife River juvenile trap located downstream of Highway 61. Three were also found in early-September during an annual MNDNR stream survey in the lower Knife River, upstream of Shilhon Road.

Recent Rainbow Trout Publications

- Miller, L.M., M.C. Ward, and D.R. Schreiner. 2014. Reduced reproductive success of hatchery fish from a supplementation program for naturalized Steelhead in a Minnesota tributary to Lake Superior. *Journal of Great Lakes Research* 40(994-1001).
- Negus, M.T., and J.C. Hoffman. 2013. Habitat and diet differentiation by two strains of Rainbow Trout in Lake Superior based on archival tags, stable isotopes, and bioenergetics. *Journal of Great Lakes Research* 39(578-590).
- Ward, M.C., D.R. Schreiner, and D.F. Staples. 2013. An evaluation of age-1 Steelhead stocking locations on a Minnesota tributary to Lake Superior. *North American Journal of Fisheries Management* 33(1063-1070).
- Negus, M.T., D.R. Schreiner, M.C. Ward, J.E. Blankenheim, D.F. Staples. 2012. Steelhead return rates and relative costs: a synthesis of three long-term stocking programs in two Minnesota tributaries of Lake Superior. *Journal of Great Lakes Research* 38(653-666).
- LSMP. 2016. Lake Superior Management Plan for The Minnesota Waters of Lake Superior (*in prep.*). [Available on Lake Superior Area website in 2016].

CONTACTS AND INFORMATION

Duluth Area Fisheries (218) 302-3272

Deserae Hendrickson - Area Supervisor

- Lester River to Knife River Watersheds
- Stream surveys, stream assessments and temperature reports
- French River adult and juvenile trap reports

Finland Area Fisheries (218) 353-7591

Dean Paron - Area Supervisor

- Stewart River (Two Harbors) to Cross River Watersheds
- Stream surveys, population assessments and temperature reports

Grand Marais Area Fisheries (218) 387-3056

Steve Persons - Area Supervisor

- Temperance River Watershed to Grand Portage Reservation
- Stream surveys, population assessments and temperature reports

Lake Superior Area Fisheries (218) 302-3272

Cory Goldsworthy - Area Supervisor (218) 302-3268

Keith Reeves – Assistant Area Supervisor (218) 302-3277

Josh Blankenheim - Large Lake Specialist (218) 302-3273

Nick Peterson – Migratory Fish Specialist (218) 302-3272

- 2016 Lake Superior Fisheries Management Plan (*in prep*)
- 2006 Lake Superior Fisheries Management Plan
- 2003 Rainbow Trout Management Plan for the MN waters of Lake Superior
- Spring and Summer Lake Superior Creel Survey Reports
- Rainbow Trout Management Summaries
- Knife River adult and juvenile trap reports
- French River adult and juvenile trap reports
- Weekly North Shore fishing updates (April-October)

All plans, summaries, surveys and reports completed by Lake Superior Area Fisheries are available at: <http://www.dnr.state.mn.us/areas/fisheries/lakesuperior/management.html>

French River Cold Water Hatchery (218) 302-3272

Mark Gottwald - Hatchery Supervisor (218) 302-3288

- Steelhead and Kamloops production

Duluth Area Fisheries Research (218) 302-3272

Bethany Bethke - Research Biologist (218) 302-3271

Patrick Schmaltz – Research Biologist (218) 302-3270