Rainbow Trout Management Summary

for the Minnesota Waters of Lake Superior and its Tributaries 2014

Introduction

This document is a summary of activities related to the management of Rainbow Trout in the Minnesota waters of Lake Superior and its tributaries. The framework for Rainbow Trout management is in the Rainbow Trout chapter of the 2006 *Fisheries Management Plan for the Minnesota Waters of Lake Superior* (LSMP) available on the Minnesota Department of Natural Resources (MN DNR)-Lake Superior Area Fisheries website. Creel surveys, trap reports, and weekly angling reports are available at this location: **http://www.dnr.state.mn.us/areas/fisheries/lakesuperior/management.html** Other publications cited in this summary can be obtained by contacting Lake Superior Area Fisheries (see page 24).

Knife River Trap Repair Update

The June 2012 flood caused extensive damage to the Knife River trap and it was not operational for the fall of 2012 or at all during 2013. Northland Constructors of Duluth was awarded the rebuild project (i.e. low bidder) with a bid of $407,738. The cost to rebuild the trap qualified for 75% reimbursement from the U.S. Federal Emergency Management Agency (FEMA) and the remaining 25% was covered by state bonding funds dedicated to flood recovery efforts. The “dirt work” component of the project was completed in the fall of 2013 and consisted of removal of all flood debris and broken trap components, reconstruction of the road, and refilling voids around the trap with rock. The “hardware” component of the project was the fabrication of new water control gates, walkway grating, and other parts used to operate the trap. Despite extremely difficult working conditions during the winter of 2013/14, Northland Constructors of Duluth finished the hardware reconstruction prior to the spring thaw, and trap was operational for the spring run of 2014.

The Knife River fish trap after the June 2012 flood.

The Knife River fish trap near completion in March 2014.

Lake Superior Management Plan Revision

The 2006 *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 plan is revised every 10 years, and the next plan is scheduled to be completed in 2015. Revision of the plan started in December of 2014 with a kick-off conference open to the Lake Superior Advisory Group and any interested citizens. Through the winter and spring of 2015, MN DNR staff will meet on a monthly basis with the Lake Superior Advisory Group. The Advisory Group is comprised of individuals representing a wide variety of user groups. Proposed revisions to the Lake Superior Management Plan will be developed at these meetings, which are also open to the public. A draft of the new plan should be available for public comment by the end of 2015. Refer to the Lake Superior Area website at http://www.dnr.state.mn.us/areas/fisheries/lakesuperior/index.html for more information on the Lake Superior Management Plan process.

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 1974-75 and is in need of significant repairs and upgrades if it is to continue to operate effectively. The MN DNR hired an engineering and consulting firm, HDR, Inc., to fully evaluate the FRCWH. The product of their assessment is the French River Rehabilitation Study, which details the repairs and upgrades necessary for efficient operation of the facility. The projected cost of renovation is $7.6 million and would extend the life of the facility by 25 years. The French River Rehabilitation Study is available in its entirety on the Lake Superior Area website. Decisions regarding the feasibility of repairs and upgrades to the FRCWH will be made after the LSMP revision process is complete.

Environmental factors

Environmental conditions were generally favorable for juvenile trout entering the winter of 2013/14. Despite less than average precipitation in the fall months, only portions of the North Shore were classified as being abnormally dry, while the rest of the North Shore was free from drought status. Air temperatures were bitterly cold throughout much of the winter however. Air temperatures were significantly below average from December 2013 through April of 2014. Nearly all of Lake Superior was covered in ice by February.

An aerial view of ice coverage on Lake Superior, February 2014.

Snowfall totals were high for the second consecutive winter. The National Oceanic and Atmospheric Administration (NOAA) snowfall total for Duluth was 130.2 inches, making it the third snowiest winter on record. (The previous winter was fourth at 129.4 inches.) Adequate snowfall during the winter months can help insulate streams from excessive ice formation that can decrease overwintering habitat for juvenile trout, and help recharge wetlands and other sources of water for streams.

Similar to 2013, spring was slow to arrive in 2014. Streams along the lower half of the North Shore remained choked with ice until mid-April

and some streams farther up the North Shore remained ice-covered until nearly May. Once rivers did thaw, snowmelt, combined with rain events, kept rivers at high flow conditions for most of the spring (Figure 1).

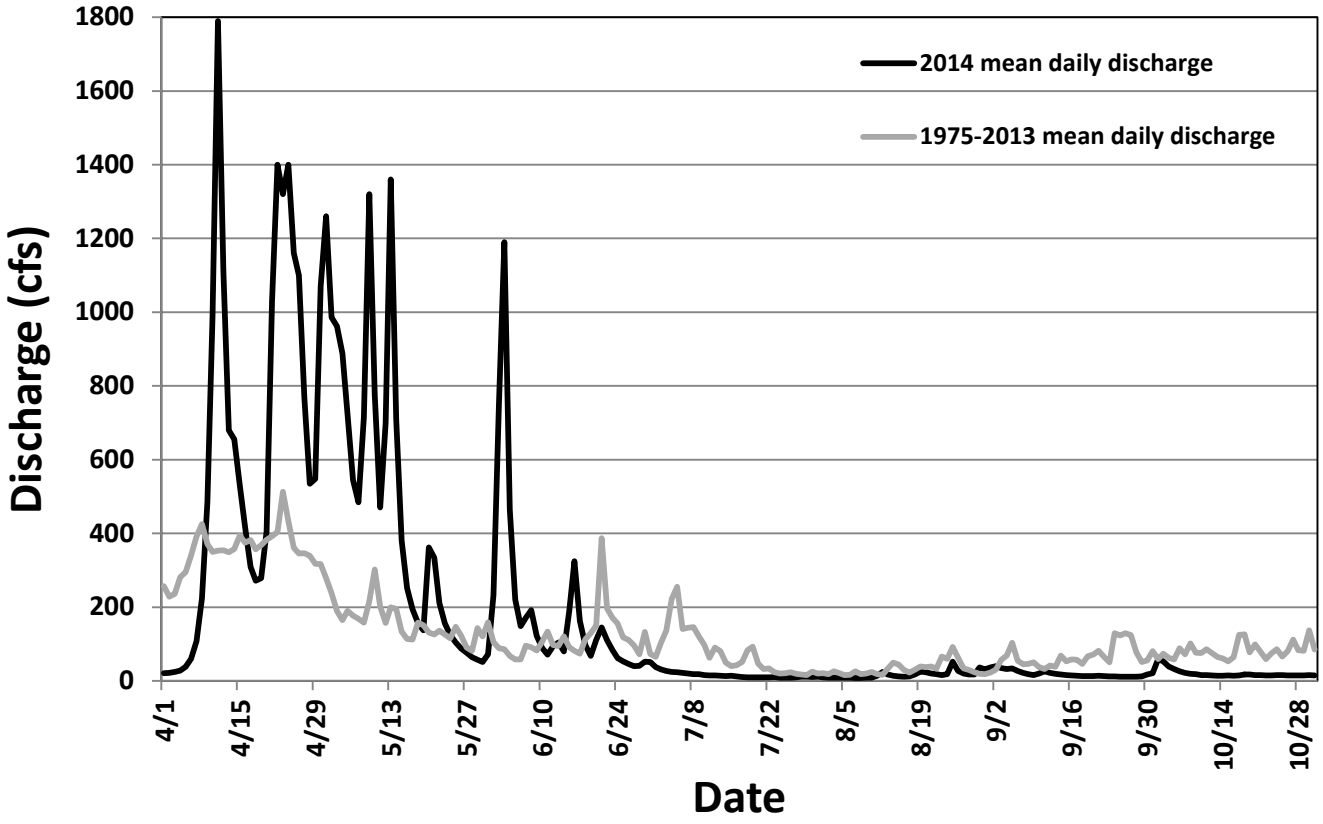

Figure 1. Knife River mean daily discharge (ft^3/sec) from April through October 2014, and the 1975-2013 average.

Conditions for juvenile trout were generally favorable during the summer months. Air temperatures were very similar to long-term means from June through August, and precipitation totals were near or above average during these months. The fall months were drier and warmer than average, but despite this, the North Shore remained out of drought status the entire year until mid-November, when some areas of the North Shore entered abnormally dry conditions. Adequate flows and cool water temperatures continue to be key elements in retaining juvenile Steelhead upstream for two years until they are large enough to undergo smoltification.

Juvenile Steelhead assessments

Duluth, Finland, and Grand Marais Area offices continued annual juvenile Steelhead electrofishing assessments at their respective index stations. Sampling these stations demonstrates if Steelhead successfully reproduced during the spring spawning season. Juvenile abundances can also be compared to long-term averages to assess trends over time across the North Shore.

In 2014, Duluth Area sampled 9 stations across 7 rivers including the Blackhoof, French, Knife, Little West Branch Knife, West Branch Knife, Stewart, and Sucker rivers. Finland Area sampled one station on both the Split Rock and Baptism rivers. Grand Marais Area sampled stations on 6 rivers including the Cascade, Onion, Devil Track, Kimball, Kadunce, and Flute Reed rivers. Shorewide in 2014, age-0 Steelhead abundance was below average at 11 stations, average at 5 stations, and above average at 1 station (Table 1). Age-1+ Steelhead abundance was below average at 4 stations, average at 12 stations, and above average at 1 station.

		2014	
		Age-0 STT	Age-1+ STT
Duluth Area	Below average	4	3
	Average	4	5
	Above average	1	1
Finland Area	Below average	2	0
	Average	0	2
	Above average	0	0
Grand Marais Area	Below average	5	1
	Average	1	5
	Above average	0	0
Shore-wide	Below average	11	4
	Average	5	12
	Above average	1	1

Table 1. The number of index stations above, below, or near the long-term average of juvenile Steelhead abundance in 2014.

Creel surveys

Lake Superior Area has continued its annual spring and summer creel surveys. 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 web page.

In 2014, the spring creel survey was conducted from April 22nd – June 4th. Anglers spent an estimated 18,607 hours fishing for Rainbow Trout during this time, which was the lowest pressure estimate since the creel survey began in 1992. One of the reasons pressure was low was the late spring and high water conditions. Ice cover and unwadeable stream conditions prevented anglers from fishing Lake Superior tributaries most of April, which is often considered the prime month for Rainbow Trout fishing. With such a late start, anglers may have opted to forego fishing for Rainbow Trout and instead focused on walleyes and other gamefish during May.

Another factor contributing to the low angling pressure may have been reports of relatively poor angling success. Many anglers reported poor fishing, and catch rates in the creel survey for both Steelhead and Kamloops were relatively low. The estimated shorewide catch rate for Steelhead was 0.077 fish/angler-hour (a-hr) (13.0 hours/fish), which was the lowest since 2005 (Figure 2). It marks only the second year out of the past nine where the catch rate has been below 0.10 fish/a-hr. The estimated shorewide catch rate of Kamloops was 0.039 fish/a-hr (25.6 hours/fish) and was the lowest since the inception of the spring creel survey. The prolonged winter and cold spring may have negatively influenced the Rainbow Trout fishing this year.

The poor catch rates combined with light angling pressure resulted in low catches of Rainbow Trout. The estimated shorewide catch of 1,435 Steelhead was approximately 1,200 fish below the average and the

estimated shorewide catch of 734 Kamloops was approximately 1,900 fish below the average. In many years there is considerable shore fishing pressure prior to ice-out, which is not captured in the spring creel survey. A one month creel survey targeting shore anglers fishing for Kamloops was planned for March, but frequently changing conditions near river mouths made for very sporadic angler presence so the additional creel survey was not conducted.

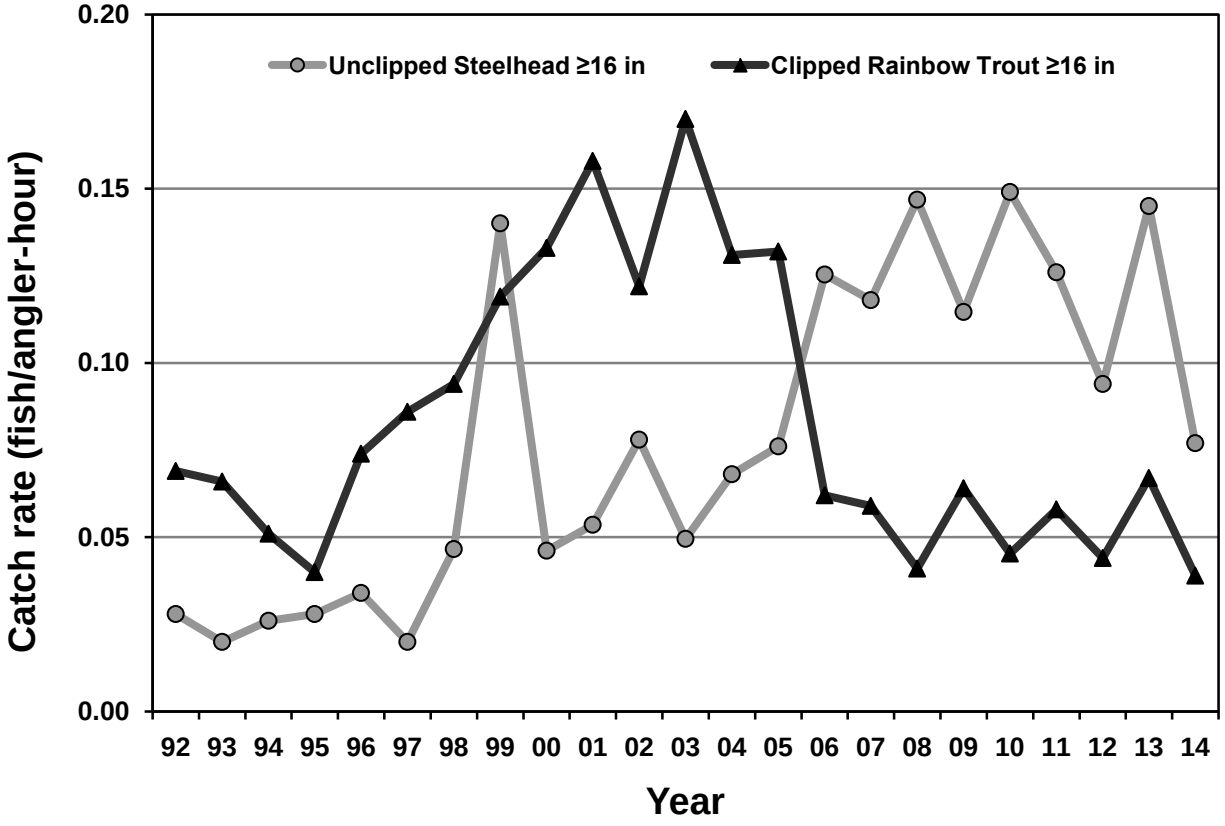

Figure 2. Shorewide catch rate (fish/angler-hour) for unclipped Steelhead and clipped Rainbow Trout ≥16" from the spring creel survey, 1992-2014.

The summer creel primarily targets boat anglers fishing Lake Superior and was conducted from May 31st – October 5th. A total of 282 Steelhead were caught in the summer creel, which was substantially fewer than in recent years. A total of 197 Kamloops were also caught, but low Kamloops catches are typical in the summer creel. In general, all catches of Rainbow Trout were low in 2014.

Anadromous Fish Traps

Trap numbers reported for 2014 are preliminary, and final numbers will be included in trap reports available on the Lake Superior Area website by June 2014. As previously mentioned, the Knife River fish trap reconstruction was completed in time to sample the spring run in 2014. Spring operations at the French River, including both the trap and seining, were delayed until May due to the extremely high flows in the river.

French River adult trap

In spring 2014, a total of 24 unclipped Steelhead and 437 Kamloops were sampled at the French River (Table 2). The number of unclipped Steelhead captured was below the interquartile range (25th to 75th percentiles) and the lowest during the past 20 years. The French River adult trap has not been operated in the fall since 2009.

	Unclipped Steelhead 2014	Long-term average	Kamloops 2014	Long-term average	Clipped Steelhead 2014
French River	24	90	437	884	0

Table 2. The number of Steelhead and Kamloops captured at the French River trap in the spring of 2014 compared to the long-term averages.

Fewer Steelhead than average are expected to return in the next few years because of reduced Steelhead stocking in the French River during the fryling stocking study. Refer to the research section later in this publication for information on the experimental use of Steelhead frylings in the French River.

The number of Kamloops captured in 2014 was considerably less than the three previous years and slightly below the 25th percentile (Figure 3). Concerned anglers have presumed this is due to the smaller size at stocking for Kamloops produced at the Spire Valley Hatchery (SVH), but until multiple year-classes from SVH fully recruit to the fishery, effects of the production shift will not be fully realized.

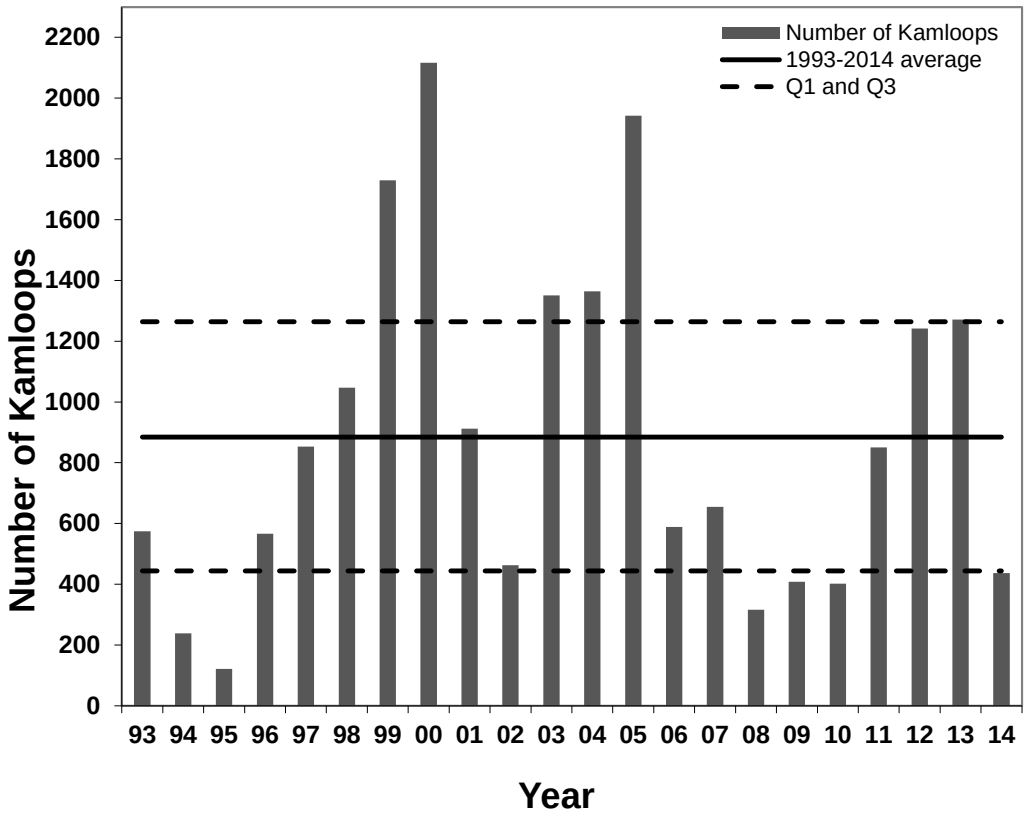

Figure 3. The yearly returns of Kamloops to the French River trap, 1993-2014. The mean, 25th percentile (Q1), and 75th percentile (Q3) are also shown.

MN DNR staff collects Kamloops with a seine at the mouth of the French River. The eggs will be used to produce the next year-class of Kamloops.

French River juvenile trap

The number of juvenile Steelhead emigrants sampled at the French River juvenile trap in 2014 was 1,795. This was about 1,000 more than in 2013 but about half the long-term average. Steelhead frylings were stocked from 2009-2013 as part of a research project to evaluate stocking fish at this life stage. The number stocked per year has been approximately half the number compared to fry, so a lower number of juvenile Steelhead emigrants is not alarming. Refer to the research section of this report for more information and preliminary results on the fryling study.

Knife River adult trap

Trap totals for the spring were 483 unclipped Steelhead, 21 hatchery-reared (clipped) Steelhead, and 29 Kamloops (Table 3). Fall totals included 9 unclipped Steelhead, 7 Brown Trout, and 1 Chinook Salmon.

	Unclipped Steelhead 2014	Long-term average	Kamloops 2014	Long-term average	Clipped Steelhead 2014
Knife R. spring	483	350	29	52	21
Knife R. fall	9	30	0	3	0

Table 3. The number of Steelhead and Kamloops captured at the Knife River trap in the spring and fall of 2014 compared to the long-term averages.

The 483 unclipped Steelhead captured in the spring of 2014 represents the second highest return of unclipped Steelhead since the trap was opened in 1996 (Figure 4). Only 21 clipped Steelhead (from hatchery yearlings) were captured. Stocking of hatchery-reared yearling Steelhead was discontinued in 2007 so the continued decline in their numbers was expected. The spring run was late due to the cold spring conditions. The first Steelhead wasn't captured until April 30th, while the last upstream migrant was captured on June 30th. Reports were received of spawning Steelhead in some North Shore streams in July, and the Knife River trap data corroborates these observations. Fall

returns were minimal, mainly due to a lack of precipitation events to draw fish into the river.

Knife River juvenile trap

Final numbers of juvenile Steelhead were not yet available at the time of this writing. The estimated number of juveniles is calculated based on the number captured in the trap and the efficiency of the trap, which takes into account flow conditions. A total of 4,658 juveniles were captured, but this number will increase once efficiency of the trap is determined. Refer to the Knife River trap report on the Lake Superior website for final trap numbers.

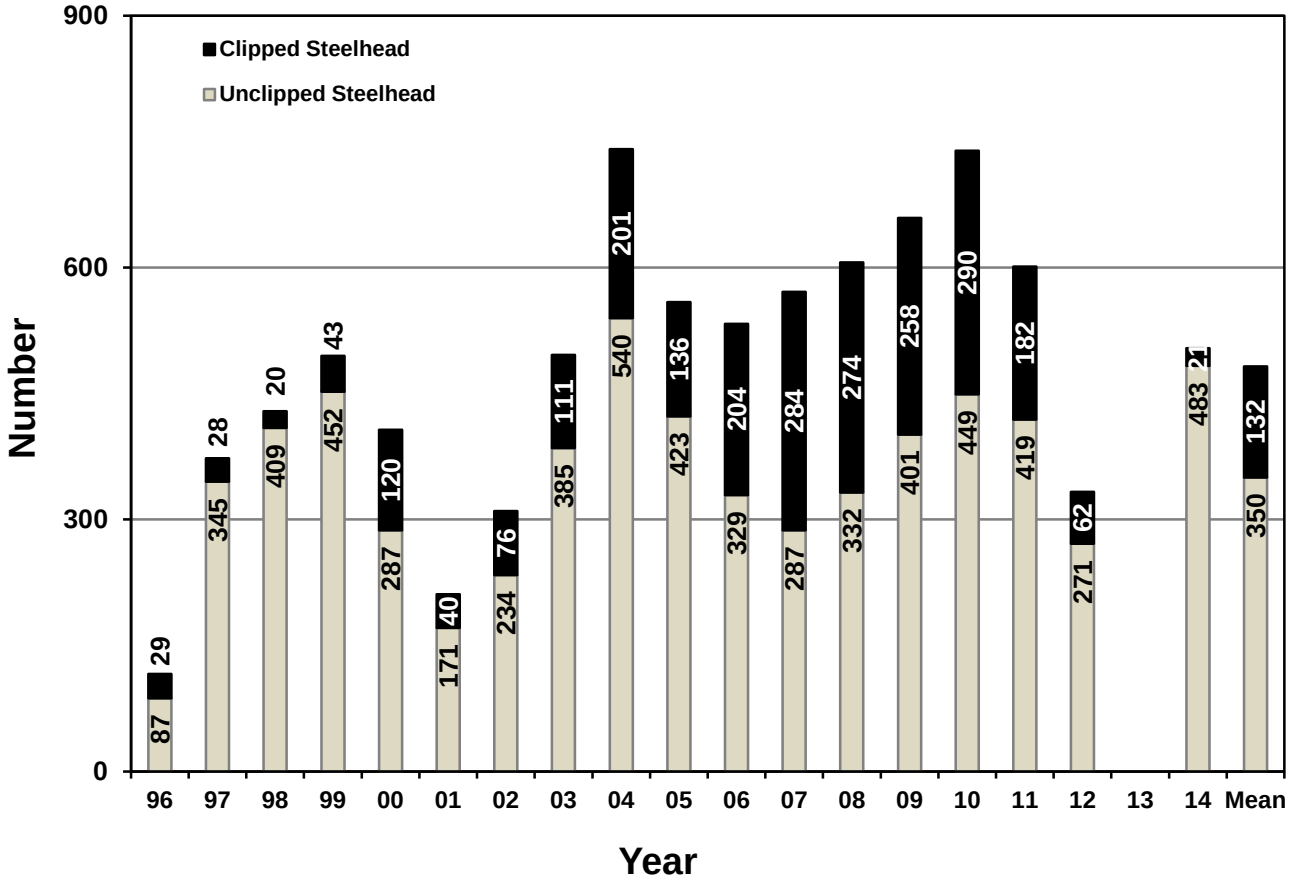

Figure 4. The estimated number of unclipped and clipped (hatchery) Steelhead captured at the Knife River fish trap, 1996-2014.

Stocking

Steelhead Fry and Frylings

A total of 233,989 Steelhead fry were stocked in 2013 (Table 4). Stocked fish originated from either the Knife River captive broodstock or returning French River unclipped feral broodstock. 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 where they are stocked above the barriers. The experimental fryling stocking in the French River ended in 2013 and fry stocking resumed in 2014. Experimental use of frylings is discussed in the research section of this summary.

Area	River	fry
Duluth Area	Amity Creek	12,138
	French River	39,856
	Stewart River	52,758
Finland Area	East Beaver River	32,137
Grand Marais Area	Temperance River	47,100
	Cascade River	50,000
	Total	**233,989**

Table 4. The number of Steelhead fry stocked in 2014.

The Steelhead fry quota is set at a target of 500,000 fry per year. Unfortunately, extended periods of very warm Lake Superior water caused considerable mortality of Steelhead broodstock in the FRCWH in 2012. This, combined with very low returns of feral broodstock to the French River trap, greatly reduced fry production in 2014. With the exception of the Cascade River, all other rivers stocked in 2014 received reduced quotas, and one river (Cross River) was dropped from this year's stocking schedule. Efforts are being made to replenish the captive broodstock, but this will take several years.

Kamloops Yearlings

In 2014, a total of 94,100 Kamloops yearlings were stocked in the French River (36,396), Lester River (32,707), and McQuade Harbor (24,997), which slightly exceeded the annual quota of 92,500 yearlings. About 73% of the Kamloops quota is reared at SVH for 10 months before being returned to the FRCWH where they are reared for approximately three months, then stocked into Lake Superior. The remaining Kamloops are reared entirely at the FRCWH prior to stocking in Lake Superior.

Habitat Work

Beaver management update

Blackhoof River

The Blackhoof River is assessed for beaver activity by canoe. After the completion of the 2013 beaver dam survey, 10 beaver and 6 dams were removed from the anadromous portion of the Blackhoof River during the fall/winter months of 2013/14. In the fall of 2014, 4 beaver and no dams were removed.

Knife River Watershed

Duluth Area staff annually conducts a fall aerial survey of beaver activity within the Knife River watershed. The 2014 flight of the Knife River watershed was conducted on November 3rd. Fifteen dam sites were located and prioritized for removal prior to spring. This will allow Steelhead to ascend farther upstream in search of ideal spawning habitat, and will allow Brook Trout to migrate throughout the system.

Only 5 beaver and 6 dams were removed from the Knife River system in the winter of 2013/14 and spring 2014, which was much less than the previous year (43 beaver and 15 dams). Tributaries of the Knife River with removals included Captain Jacobson Creek and McCarthy Creek.

Habitat Projects

West Branch Knife River

In 2012 the Lake Superior Steelhead Association (LSSA) secured a $380,000 grant from the Lessard-Sams Outdoor Heritage Council (LSOHC) to restore trout habitat on the West Branch of the Knife River that was degraded by historic clear cutting and decades of beaver activity. In 2014, LSSA augmented their tree planting efforts by contracting with the Conservation Corps Minnesota. Over 800 potted trees were planted in beaver meadows where there is a lack of trees providing shade to the stream. A mix of coniferous and deciduous trees were planted to promote a diverse riparian zone. In October the club conducted maintenance at the planting sites by removing grasses around the trees to improve their growth and survival.

Members of the Conservation Corps Minnesota hard at work planting trees along the West Branch Knife River.

In addition, LSSA continued their water temperature assessment by placing 22 temperature monitors throughout the watershed, and also mapped important features including beaver dams, springs, and ash

stands. Moving forward in 2015, the club anticipates expanding their planting and assessment work into other parts of the Knife River watershed. Assessment is critical in helping direct the location of future projects.

Stewart River

Minnesota Trout Unlimited (TU) has begun its Stewart River Watershed Project with approximately $250,000 in combined funding from grants from LSOHC, Sustain Our Great Lakes, and Lake County Soil and Water Conservation District (SWCD). The main goals of the multi-year project are to improve hydrology by slowing runoff to the river, increase baseflow in low-flow periods, and provide better habitat for juvenile Steelhead. In 2014, TU volunteers, landowners, and partners planted over 8,000 trees in the riparian corridor, with more to be planted in 2015. Additionally, survey data were collected in preparation of a 2,000 foot channel restoration project scheduled for 2015. The goal of the channel restoration project is to restore stream stability and provide more pool habitat for fish.

Knife River

In 2013, the Lake County SWCD was able to determine the amount of sediment contributed to the Knife River from specific banks in a seven mile stretch of the river. In 2014, with Great Lakes Commission funding, the Lake County SWCD designed and implemented a bank stabilization project upstream of Hawk Hill Road. The purpose of the project was to reduce the sediment load to the stream by reducing shear stress on the bank, and reconnecting the river to its floodplain by providing a floodplain bench that will dissipate energy during high flows. Over 300 feet of bank was stabilized and habitat was improved by using Natural Channel Design (NCD) techniques. NCD addresses the dimension, pattern, and profile of a stream to improve habitat and restore functionality and stability of the stream. This project will

The eroding bank upstream of Hawk Hill Road prior to stabilization.

By providing a floodplain bench, the energy of flood events will be dissipated. The floodplain bench was also planted with willow stakes which will further reduce the energy during periods of high flow. Depth in the pool and woody debris along the bank will provide cover for fish.

An aerial view of the completed project in the fall of 2014. By next year vegetation will be growing on this site, and eventually it will blend in with the surrounding landscape.

decrease the amount of sediment to the river by approximately 140 tons per year, and provide quality fish habitat that will not require maintenance through time.

French River

With $147,000 in flood recovery funding from the Minnesota Board of Water and Soil Resources (BWSR), the Southern St. Louis County SWCD restored over 500 feet of the French River in 2014. The site was damaged by the flood of 2012 and had degraded fish habitat and severely eroding banks, one of which was threatening a home. Techniques of NCD were primarily used, including toewood floodplain benches and cross vanes, to address the dimension, pattern, and profile of the stream which will increase channel stability and provide fish habitat.

Amity Creek

The Southern St. Louis County SWCD completed a bank restoration project on Amity Creek in the summer of 2014 with $160,000 from a Great Lakes Restoration Initiative Grant administered by the MN Pollution Control Agency. Amity Creek is impaired for turbidity, and the

approximately 30 foot tall, 120 foot long bluff was contributing considerable sediment to the stream. As with the French River project, the Southern St. Louis County SWCD used Natural Channel Design to address the dimension, pattern, and profile of the stream, which will in turn reduce sediment load and provide habitat for fish.

Left: Survey staff collect data to be used in the design of the Amity Creek bank restoration. To correctly implement a NCD project, extensive field data are required. The elevation of floodplain benches, cross vanes, and other features must be correct for the project to function properly.

Right: The bank on Amity Creek in the fall of 2014, after completion of the project. During low flows, the stream is confined to a narrow channel. During high flows, the stream can exceed its banks but will not cause erosion of the steep bluff. A rock cross vane structure is also visible in the center of the photo.

Flute Reed River

The Cook County SWCD has completed the MPCA Flute Reed River Restoration Initiatives project, which was started in 2011 with $398,929 in funding from the Great Lakes Restoration Initiative. Working collaboratively with the Minnesota Pollution Control Agency and the Flute Reed River Partnership, five bank stabilization projects utilizing Natural Channel Design have been completed. In addition to the bank stabilization projects, three undersized culverts were replaced with properly sized culverts. Properly sized and installed culverts can reduce erosion, increase fish passage, and allow streambed materials to move naturally during high flows.

Two undersized culverts (left) were replaced with one properly sized and installed culvert (right) to reduce erosion and improve connectivity.

Riparian Easement Acquisition

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. The MN DNR purchases easement rights in the riparian corridors of trout streams in the Lake Superior watershed from private landowners. Trout stream easements ensure the protection of the riparian corridor from detrimental activities, enhance water quality, authorize MN DNR personnel 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.

The project was completed on July 1st of 2014. Land ownership was mapped on 60 Lake Superior tributaries spanning 764 miles of stream along the North Shore. Of the 764 river miles, 246 are under private ownership. The program has agreements with 31 landowners to purchase 12.04 river miles that will protect 232 riparian acres and adds 21 new angler access points at an estimated cost of $812,004.85. The easements will also connect over 95 miles of currently unconnected public river miles.

Research Projects

No new Rainbow Trout research projects were started during the past year. Currently there is only one ongoing Rainbow Trout research project, although more may be developed depending upon the needs of management to have specific questions addressed.

Survival, Growth, and Emigration Behavior of Steelhead Frylings

A study to evaluate the use of frylings as suggested by anglers during the development of the 2006 LSMP began in 2008. Frylings are stocked about a month later than fry and therefore have an initial size advantage when stocked. About 55,000 frylings were stocked into the French River in 2009 and 2011-2013 when no fry were stocked into the river. 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.

Thus far, fryling-stocked Steelhead have maintained their size advantage over fry-stocked Steelhead. Although it takes two years for most naturally-spawned Steelhead to achieve smolt size, many of the stocked frylings achieve smolt size by age-1. However, survival of frylings to emigration as age-1 or age-2 juveniles does not appear to have increased compared to survival of fry to emigrating juveniles. The

spring of 2014 was the first year adults from fryling stocking were expected to return, but none were captured.

Monitoring of the stocked frylings will continue through 2016, when all year-classes will have completely emigrated. Survival and growth rates will be compared to data collected on fish stocked as fry in previous years. Adults produced from frylings will be monitored at the French River adult trap. The percent of adult returns from fryling stocking will be compared to the return rate of adults from fry stocking to determine if the fryling program yields better returns than traditional fry stocking.

CONTACTS AND INFORMATION

Duluth Area (218) 525-0853
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- Lester River to Gooseberry River
- Stream survey, population assessment, and temperature reports
- French River adult and juvenile trap reports 1994-2014

Finland Area (218) 353-7591
Dean Paron-Area Supervisor

- Split Rock River to Cross River
- Stream survey, population assessment, and temperature reports

Grand Marais Area (218) 387-3056
Steve Persons-Area Supervisor

- Temperance River to Grand Portage Reservation
- Stream survey, population assessment, and temperature reports

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Listed plans, summaries, surveys, and reports are available at:
http://www.dnr.state.mn.us/areas/fisheries/lakesuperior/management.html

- Lake Superior Fisheries Management Plan 2006
- Spring and Summer Lake Superior Creel Surveys 2009-14
- Rainbow Trout Management Summaries 2006-14
- Rainbow Trout Management Plan for the MN waters of Lake Superior 2003
- Knife River adult and juvenile trap reports 2009-14
- French River adult and juvenile trap reports 2009-14
- Weekly North Shore fishing updates April-October

French River Cold Water Hatchery (218) 525-0867
Mark Gottwald-Hatchery Supervisor

- Production of juvenile Steelhead and Kamloops

Duluth Area Research (218) 525-0853
Bethany Bethke-Research Biologist ext-223

Other Recent 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).

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