

A Progress Report on the Great Lakes Fish Mass Marking Program Activities for 2013

James Webster, Allen Lane and Kevin Pankow



**U.S. Fish and Wildlife Service
Region 3 Fisheries Program**

**Great Lakes Fish Tag and Recovery Laboratory
2661 Scott Tower Drive
New Franken, Wisconsin 54229**

February 2014

Introduction

Fishery managers in the Laurentian Great Lakes, along with the U.S. Fish and Wildlife Service (USFWS), annually stock over 20 million salmonines to diversify sport fisheries, restore native fish populations, and control invasive fishes. However, more needs to be known about how well these fish survive, contribute to fisheries, and levels of natural reproduction by naturalized non-native salmonines. To this end, the Council of Lake Committees (CLC), a basin-wide group of fishery managers that operates under the auspices of the Great Lakes Fishery Commission, agreed in 2005 to develop a basin-wide program to mark all stocked salmonines. This marking effort would provide greater insight into survival of stocked fish, the contribution of stocked adults to restoration of native fishes, the ability to manage harvest away from wild fish, and the opportunity to evaluate and improve hatchery operations.

The CLC requested the USFWS to deliver a mass marking program based on its successful delivery of the basin-wide sea lamprey control (U.S. agent) and lake trout restoration programs. To address this request, the Great Lakes Fish Tag and Recovery Lab was established at the Green Bay Fish and Wildlife Conservation Office in New Franken, WI. Pilot tagging and marking operations and recovery of tagged fish began in 2010.

In 2013, the Great Lakes Fish Tag and Recovery Lab staff consisted of 3 AutoFish trailer operators (two permanent biologists and 1- temporary biologists) and one supervisory biologist. In addition, eleven seasonal technicians were hired to assist with recovery of fish with coded wire tags from sport fisheries on lakes Michigan and Huron. The lab tagging trailer fleet consists of four AutoFish trailers and one manual tagging and marking trailer. In 2013, the lab staff used these trailers to adipose fin clip and coded wire tag 8,649,778 lake trout, Chinook salmon, and Atlantic salmon at state and federal hatcheries. The Great Lakes Restoration Initiative, managed by the U.S. Environmental Protection Agency, provided operational funding through a request made by the USFWS, Region 3.

Summary of 2013 Chinook Tagging Operations

This was the third year that all Chinook salmon stocked into lakes Michigan and Huron (2011-2013 year classes) received a coded wire tag and an adipose fin clip (ADCWT). Only a fraction of the Chinook salmon were tagged in 2010 as part of an oxytetracycline validation study. Using two AutoFish trailers, the lab tagged and clipped about 2.5 million Chinook salmon. Additionally, about 360,000 fish were adipose fin clipped only (AD only) and stocked into Lake Superior. These efforts required coordination and cooperation with seven state administered hatcheries in Michigan, Wisconsin, Indiana, and Illinois.

The number of Chinook salmon stocked in Lake Michigan in 2013 was about 50% of the number stocked in previous years to maintain a target population size that considers natural reproduction. Using information on Chinook salmon catch rates, abundance, natural reproduction, growth, prey abundance, and fish health; state fisheries managers around Lakes Michigan and Huron implemented the reduced Chinook salmon stocking rates for 2013.

Table 1. Total numbers of Chinook salmon tagged and project completion dates by hatchery in 2013 (See Appendix I for project summary data).

Hatchery	Agency	Number tagged	Date completed
Jake Wolf	Illinois Department of Natural Resources	252,839	3/16/2013
Mixsawbah	Indiana Department of Natural Resources	170,016	3/20/2013
Kettle Moraine Springs	Wisconsin Department of Natural Resources	118,295	3/27/2013
Wild Rose	Wisconsin Department of Natural Resources	696,265	4/16/2013
Wolf Lake	Michigan Department of Natural Resources	232,625	3/16/2013
Platte River	Michigan Department of Natural Resources	978,638	4/24/2013
Thompson (ADCWT)	Michigan Department of Natural Resources	47,537	5/8/2013
Thompson (AD only)	Michigan Department of Natural Resources	359,823	5/13/2013
Total Chinook salmon tagged:		2,856,038	

Chinook salmon tagging performance comparison 2010 - 2013

The 2013 Chinook salmon tagging season showed a continued increase in efficiency and throughput that is attributable to increased operator experience, and hardware and software improvements (Table 2, Figure 1). Average throughput has increased to 8,700 fish/hour in 2013 from 6,800 fish/.hours in 2010.

Table 2. Total numbers of Chinook salmon processed and average throughput for 2010 - 2013 tagging projects at all hatcheries combined.

Year	Number of fish processed	Number of machine run hours	Average throughput (fish/hour)
2010	1,104,166	162.0	6,794
2011	4,689,947	667.4	7,241
2012	4,320,884	518.9	8,460
2013	2,856,038	319.0	8,749

Summary of 2013 Lake Trout Tagging Operations

This was the fourth year that all lake trout (2010-2013) were coded wire tagged and adipose fin clipped at USFWS hatcheries in Region 3. In 2013, 4,894,124 fish were processed at the three hatcheries. The Great Lakes Fish Tag and Recovery Lab also tags all lake trout stocked into lakes Erie and Ontario raised by Region 5 of the USFWS. In 2013, using an AutoFish trailer on loan from New York State Department of Environmental Conservation 549,050 fish were tagged and clipped at the Allegheny National Fish Hatchery, Warren, PA. An additional 216,860 lake trout were tagged and clipped at the Michigan DNR Marquette State Fish Hatchery (Table 3).

Table 3. Total numbers of lake trout tagged and project completion dates by hatchery in 2013 (See Appendix I for project summary data).

Hatchery	Agency	Number tagged	Date completed
Marquette State Hatchery	Michigan Department of Natural Resources	216,860	6/12/2013
Jordan River National Fish Hatchery	US Fish and Wildlife Service – Region 3	2,159,149	9/23/2013
Pendill's Creek National Fish Hatchery	US Fish and Wildlife Service – Region 3	1,141,112	8/27/2013
Iron River National Fish Hatchery	US Fish and Wildlife Service – Region 3	1,593,863	10/25/2013
Allegheny National Fish Hatchery	US Fish and Wildlife Service – Region 5	549,050	8/9/2013
Total lake trout:		5,660,034	

The number of fish reared at USFWS lake trout hatcheries in Region 3, is much higher than the average production at a state Chinook salmon facility. For this reason, two AutoFish trailers are commonly used in tandem lake trout hatcheries, except for the smaller projects at Marquette SFH and Allegheny NFH.

Lake Trout Strain Comparison

In 2013, the Region 3 hatcheries raised four different strains of lake trout for restoration stocking into lakes Michigan and Huron: Seneca Lake Wild, Lewis Lake Wild, Superior Klondike Wild, and Huron Parry Sound Wild. Trailer efficiency and throughput differs among strains with the Huron Parry Sound Wild and Seneca Lake Wild strains generally averaging the highest throughputs (Figure 2).

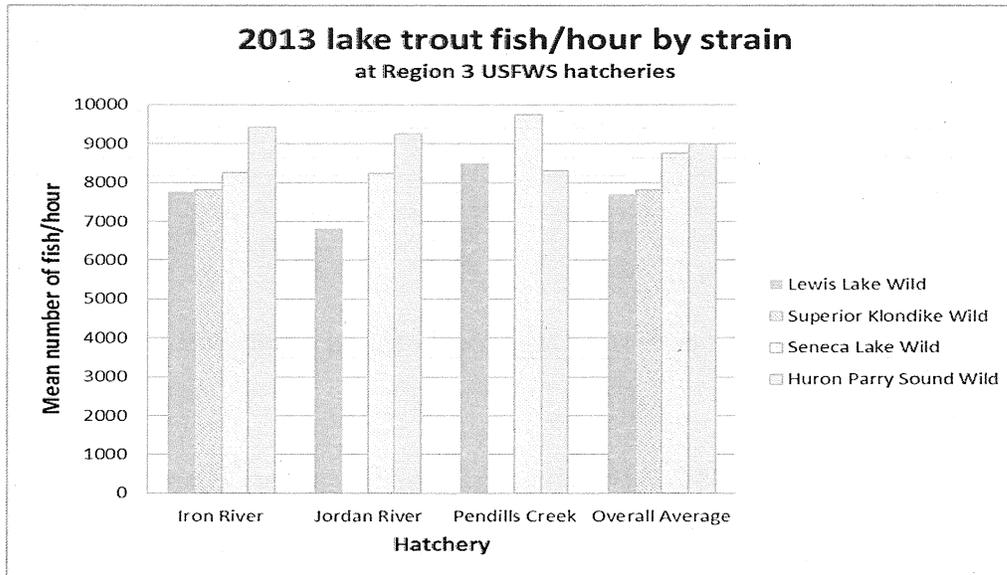


Figure 2. Total average throughput (fish/hour) for the four strains of lake trout tagged and marked at Region 3 USFWS hatcheries in 2013.

Lake trout tagging performance comparison 2010 - 2013

The 2013 lake trout tagging season showed a continued increase in efficiency and throughput at all three hatcheries that is attributable to increased operator experience, and hardware and software improvements (Table 4, Figure 3). Average throughput has increased to 8,100 fish/hour in 2013 from 6,000 fish/.hours in 2010.

Table 4. Total numbers of lake trout processed and throughput for 2010 - 2013 tagging projects for all hatcheries combined.

Year	Number of fish processed	Number of machine run hours	Average throughput (fish/hour)
2010	4,584,509	837.5	5,934
2011	5,077,425	796.6	6,532
2012	6,094,302	856.7	7,296
2013	5,660,034	697.3	8,100

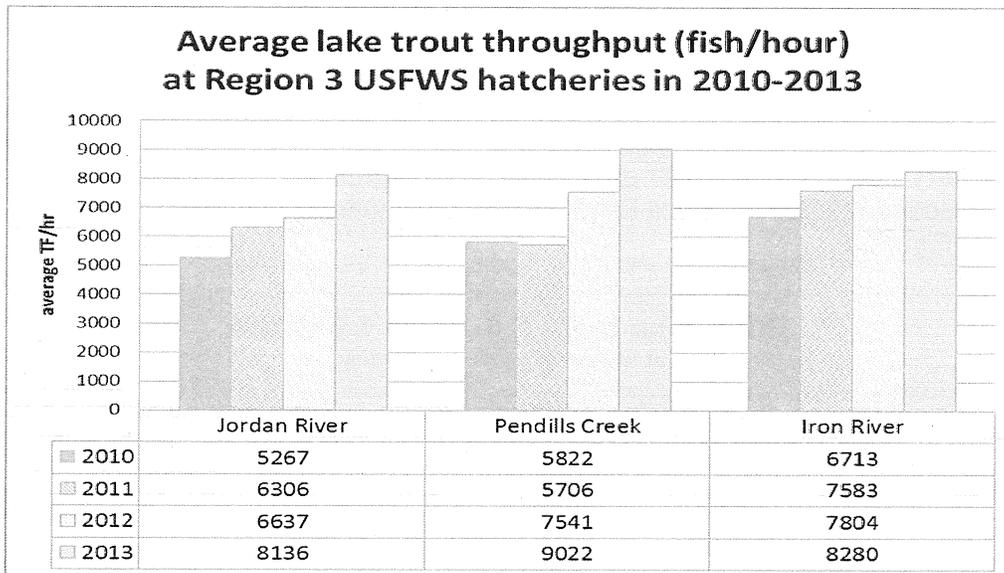


Figure 3. Total average throughput for all lake trout strains combined at USFWS hatcheries for 2010 - 2013.

Summary of 2013 Atlantic salmon tagging operations

In late October, a small Atlantic salmon (ATS) tagging and marking project was conducted at the Michigan Department of Natural Resources Platte River fish hatchery. Over four days and 22.3 machine processing hours, 87,404 ATS were adipose fin clipped and coded wire tagged and 46,302 were adipose fin clipped only (AD only). The average throughput was 5,497 fish/hour for ADCWT and 7,235 fish per hour for AD only, which is lower than that of lake trout and Chinook salmon, but a significant improvement over the throughput attained during the 2012 pilot project (4,175 fish per hour for AD only). Prior to the 2012 pilot project, ATS had never been clipped and tagged using the AutoFish system and it was unknown how they would behave in the system. This project provided insight to the physical and behavioral differences exhibited by ATS and how these differences affect performance of the marking and tagging equipment compared to lake trout and Pacific salmon.

Quality Assurance/Quality Control

Quality assurance/Quality control (QA/QC) of tagging projects is maintained and measured through routine random samples of the tagged population, where tag retention and adipose fin clip success is quantified.

Initial QA/QC samples measure the coded wire tag retention (% with a tag) and adipose fin clip success (% with a clip) for each tag lot at the time of tagging. The trailer operator takes samples every 2 hours of machine run time, directly from the trailer output. Aside from estimating the initial tag retention and fin clip success, these samples are valuable for monitoring tagging equipment performance.

Final QA/QC samples define the expected long-term coded wire tag (CWT) retention and adipose fin clip success rate for each tag lot. Blankenship (1990) determined that there was no significant tag loss after 29 days post tagging for Pacific salmon CWT tag groups; therefore, whenever possible the final QA/QC samples are taken at least 29 days after tagging.

The 2013 initial QA/QC samples for the Chinook salmon and lake trout projects both averaged 99.2% successfully tagged and clipped. The final Chinook salmon QA/QC samples averaged 97.9% successfully tagged and clipped. The final QA/QC samples for the 2013 lake trout projects will be estimated immediately before the fish are stocked in spring of 2014. (See Appendix II for detailed project QA/QC data)

Tag Recovery from fish captured in Lake Michigan and Lake Huron

During April 22 – November 8, 11 U.S. Fish and Wildlife Service technicians worked with state agencies sampling sport caught salmon and trout on lakes Michigan and Huron. Anglers were engaged at various ports and boat landings, with the technicians concentrating their collections at fish cleaning stations and fishing tournaments. Almost 17,000 fish were sampled throughout the season for biological data as well as collecting snouts from over 2,500 that contained coded wire tags (Table 8). Biological data collected included length, weight, fin clips, lamprey wounding, sex, and aging structures. Fish snouts containing coded wire tags were sent to the Great Lakes Fish Tag and Recovery Laboratory for tag extraction and reading.

Table 8. Number of fish by species examined by USFWS staff for CWTs from Lake Michigan and Lake Huron during 2013.

State of Landing	Chinook Salmon	Lake Trout	Steelhead/Rainbow	Coho Salmon	Atlantic Salmon	Brown Trout	Walleye	Total
Wisconsin	3,403	997	1,463	1,907	0	385	0	8,155
Michigan	3,006	950	418	32	4	14	11	4,435
Illinois	838	159	8	21	0	1	0	1,027
Indiana	359	1,072	342	1,488	0	34	0	3,295
Total	7,606	3,178	2,231	3,448	4	434	11	16,912
Percent of total examined	38.1	15.9	11.2	17.3	0.0	2.2	0.1	84.8
Number with CWT	2,207	246	70	34	0	0	0	2,557

Tag Extraction Activities

Since the mid-1990s, the Green Bay FWCO has extracted CWTs for all agencies on Lake Michigan. The Great Lakes Fish Tag and Recovery Laboratory has expanded this service to all agencies throughout the Great Lakes. Tagged fish collected by agencies through assessment surveys, creel surveys, direct angler sampling and voluntary angler returns are sent to the lab for CWT extraction, code reading, and data entry into an electronic format. In 2013 the lab processed 16,308 samples from ten agencies and recovered 15,240 tags (Table 9).

Table 9. Number of snouts processed by Great Lakes Fish Tag and Recovery Laboratory in 2013. Sources were salmon and trout caught by anglers at tournaments, fish cleaning stations or voluntary returns; charter boats; agency assessments; tribal commercial fishery landings; and spawning returns to weirs and hatcheries.

Source agency	Number of heads collected	Number of tags lost during processing	Percent lost tags	Number with no tag found	Percent with no tag found
Grand Traverse Band of Ottawa and Chippewa Indians	49	3	6.1	0	0.0
Indiana Department of Natural Resources	422	4	0.9	30	7.1
Intertribal Fisheries Assessment Program	225	7	3.1	3	0.9
Little River Band of Ottawa Indians	113	1	0.9	8	7.1
Little Traverse Bay Band of Odawa Indians	398	9	2.4	17	4.6
Michigan Department of Natural Resources	5,102	148	2.9	258	5.1
New York Department of Environmental Conservation	4,049	68	1.7	122	3.0
Ontario Ministry of Natural Resources	180	10	5.6	8	4.4
U.S. Fish and Wildlife Service	129	5	3.9	5	3.9
Wisconsin Department of Natural Resources	5,641	118	2.1	244	4.3
TOTALS	16,308	373	2.3	695	4.3

References

Blankenship, H. L. 1990. Effects of time and fish size on coded wire tag loss from Chinook and Coho salmon. American Fisheries Society Symposium 7:237-243.

Appendix I

Details of Mass Marking Projects in 2013

Hatchery	Agency	Species	Total number tagged	Number of tag groups	Number of tag codes	Start date	Complete date	Total machine run hours	Average machine processed fish/hour	Average hand processed fish/hour	Average fish/hour	Mean total length (mm)	Average Coefficient of Variation (CV)	Range of CV
Jake Wolf	Illinois Dept. of Natural Resources	Chinook salmon	252,839	3	3	3/12/2013	3/16/2013	34.5	6,738	631	7,789	98	9.0	8.8-9.1
Mixsawbah	Indiana Dept. of Natural Resources	Chinook salmon	170,016	3	3	3/18/2013	3/20/2013	21.4	7,397	556	7,953	83	13.5	11.2-15.2
Kettle Moraine	Wisconsin Dept. of Natural Resources	Chinook salmon	118,295	3	2	3/25/2013	3/27/2013	12.8	8,267	996	9,262	74	5.6	5.6-5.6
Wild Rose	Wisconsin Dept. of Natural Resources	Chinook salmon	696,265	5	5	4/2/2013	4/16/2013	76.1	8,307	947	9,255	73	7.9	7.1-8.7
Wolf Lake	Michigan Dept. of Natural Resources	Chinook salmon	232,625	11	2	3/13/2013	3/16/2013	26.7	7,954	827	8,781	79	8.2	7.7-8.5
Platte River	Michigan Dept. of Natural Resources	Chinook salmon	978,638	7	5	4/17/2013	4/24/13	104.7	8,739	934	9,673	78	8.3	7.6-9.5
Thompson (ADCWT)	Michigan Dept. of Natural Resources	Chinook salmon	47,537	1	1	5/8/2013	5/8/2013	5.7	7,920	420	8,340	80	8.4	8.4-8.4
Thompson (AD only)	Michigan Dept. of Natural Resources	Chinook salmon	359,823	0	0	5/8/2013	5/13/2013	37.1	8,205	1,494	9,699	82.0	8.4	8.4-8.4
	Chinook salmon totals and means:		2,856,038	33	21	3/12/2013	5/13/2013	319.0	7,941	851	8,792	81	8.7	5.6-15.2
Marquette	Michigan Dept. of Natural Resources	lake trout	216,860	2	1	6/8/2013	6/12/2013	29.7	6,056	1,252	7,308	89	7.9	7.8-7.9
Jordan River	U.S. Fish and Wildlife Service	lake trout	2,159,149	35	27	8/21/2013	9/23/2013	270.4	7,292	844	8,136	96	9.8	8.6-11.4
Pendills Creek	U.S. Fish and Wildlife Service	lake trout	1,141,112	13	12	8/13/2013	8/27/2013	127.5	8,008	1,014	9,022	95	9.5	8.3-12.6
Iron River	U.S. Fish and Wildlife Service	lake trout	1,593,863	25	16	9/18/2013	10/25/2013	191.1	7,392	888	8,280	100	9.7	7.0-13.9
Allegheny	U.S. Fish and Wildlife Service	lake trout	549,050	15	15	7/31/2013	8/9/2013	78.6	6,136	889	7,025	87.8	8.6	7.3-12.4
	lake trout totals and means:		5,660,034	90	71	6/8/2013	10/25/2013	697.3	6,977	977	7,954	93	9.1	7.0-13.9
	Overall totals and means:		8,516,072	123	92	3/12/2013	10/25/2013	1,016.3	7,570	899	8,469	86	8.8	5.6-15.2

Appendix II

Details of QA/QC for Mass Marking Projects in 2013

Hatchery	Agency	Species	Sample time	Date sampled	Number of samples	Number of fish sampled	Number tagged and clipped	Number clipped but not tagged	Number tagged but not clipped	Number not tagged and not clipped	Percent tagged and clipped
Jake Wolf	ILDNR	Chinook salmon	initial	3/16/2013	21	1996	1982	11	1	2	99.3
			final	4/19/2013	3	300	291	5	3	1	97.0
Mixsawbah	INDNR	Chinook salmon	initial	3/20/2013	9	1082	1074	3	5	0	99.3
			final	4/27/2013	3	600	584	11	4	1	97.3
Kettle Moraine	WIDNR	Chinook salmon	initial	3/27/2013	6	831	823	4	3	1	99.0
			final	4/24/2013	3	300	285	6	8	1	95.0
Wild Rose	WIDNR	Chinook salmon	initial	4/16/2013	32	4479	4453	13	8	5	99.4
			final	5/2/2013	5	1660	1649	5	6	0	99.3
Wolf Lake	MIDNR	Chinook salmon	initial	3/16/2013	16	2002	1987	10	2	3	99.3
			final	4/17/2013	11	1117	1110	5	11	1	99.4
Platte River	MIDNR	Chinook salmon	initial	4/24/2013	51	6085	6037	23	12	13	99.2
			final	6/3/2013	6	1345	1310	22	9	4	97.4
Thompson (ADCWT)	MIDNR	Chinook salmon	initial	5/8/2013	3	435	425	1	0	9	97.7
			final	5/9/2013	1	351	327	5	1	18	93.2
Thompson (AD only*)	MIDNR	Chinook salmon	initial	5/13/2013	17	1973	0	1971	0	2	0.0
No final QA/QC samples taken for this group.											
Marquette	MIDNR	Lake trout	initial	6/12/2013	17	1582	1560	2	6	14	98.6
			final		2	201	194	2	4	1	96.5
Jordan River	USFWS	Lake trout	initial	9/23/2013	122	13528	13435	39	18	36	99.3
			final								
Pendills Creek	USFWS	Lake trout	initial	8/27/2013	68	6624	6582	24	4	14	99.4
			final								
Iron River	USFWS	Lake trout	initial	10/25/2013	97	11971	11875	33	42	21	99.2
			final								
Allegheny	USFWS	Lake trout	initial	8/9/2013	33	3726	3686	21	1	18	98.9
			final								