

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-80-R-3

Study No.: 487

Title: Performance, survival and production of steelhead strains in tributaries of Lake Michigan and Lake Huron.

Period Covered: October 1, 2001 to September 30, 2002

Study Objectives: To evaluate strain performance of winter (Michigan) and summer (Skamania) strains of steelhead. To evaluate the performance of steelhead in six rivers, Lake Michigan and Lake Huron. To evaluate returns of steelhead from upstream and downstream plants in rivers. To describe year-to-year variation in growth and survival of steelhead populations in Michigan. To define the quality, condition, and health of different strains and batches of hatchery-produced fish.

Summary: We completed the stocking of steelhead with coded-wire tags (CWTs) for this study in 1999 (Table 1). Study fish are recruiting to the fishery and are being recovered through volunteer angler returns, Great Lakes and river creel clerks, headhunters hired to look for study fish, and by Department of Natural Resources (DNR) personnel conducting assessment work for other studies. CWTs were collected from the river fisheries by part-time personnel in 1998. Full river creel surveys have been conducted from 1999 until the present on the Muskegon, Manistee and St. Joseph rivers. A full creel survey was also conducted on the Au Sable River in 1999 and 2000. From 1997 to 1998 the number of tags collected had increased from 57 to 1,600 marked fish recovered. The number of tags collected from fish in 1999 and 2000 increased even more dramatically at nearly twice the 1998 returns equaling approximately 3,000 tags per year. In 2001, the return rates of tagged fish were slightly lower with 2,106 steelhead returned with tags. We are still collecting and analyzing heads returned from the 2002 fishery. In general, early results indicate that the furthest upstream plants are returning at equal or better rates when compared to downstream plants. Both strains are returning at similar rates to the Lake Michigan fishery and compare similarly when evaluated for potential to stray to non-stocked river systems. In river fisheries, Michigan-strain steelhead are returning at higher rates than Skamania-strain steelhead.

Findings: Jobs 4, 5, 6, and 8 were scheduled for 2001-02, and progress is reported below.

Job 4. Title: Evaluate performance of upstream and downstream plants.—To date, return rate data have been collected for stocked fish aged 1 to 4 fish in Great Lakes and river fisheries. However, evaluations of differences between upstream, midstream, and mouth plants will not be complete until data from 5- and 6-year old fish are fully included in the analysis (Table 2). In general, both strains of fish stocked in the St. Joseph River returned at similar rates to Lake Michigan fisheries whether planted at the mouth (Pier 33 location) or 55 miles upstream at the Mishawaka-Lincoln Park location (Tables 2 and 3). Fish stocked in Arden Pond, an extensive rearing facility intended to enhance survival by supplying a predator free environment until fish are ready to passively smolt into the river system, provided the highest return rates of Michigan-strain steelhead to Great Lake fisheries (Tables 2 and 3) and lowest return rates in river fisheries (Table 4). In four other rivers evaluated, upstream plants returned to Great Lake fisheries at higher rates than downstream plants. For example, 50 to 100 % higher return rates were observed for Michigan-strain fish stocked upstream in the Manistee, Muskegon, Sturgeon, and Au Sable rivers compared to mouth and midstream plants (Table 3). Upstream plants also returned at

relatively high rates in river fisheries (Table 4) and for both Michigan and Skamania strains of steelhead in Great Lakes and river fisheries (Tables 3 and 4).

Results from comparisons of fish identified as straying into other river systems indicate that steelhead stocked into the Manistee and Au Sable rivers had a higher relative propensity for straying (Table 5). Results from the Au Sable and Manistee rivers further indicate that upstream-stocked fish were more likely to stray than downstream fish (Table 5). It is also possible that upstream fish survived better to spawning and were thus more prevalent in all areas including non-study streams. Results from the Muskegon and St. Joseph rivers indicate that midstream-stocked fish were also more likely to stray than mouth or upstream planted fish (Table 5). Michigan-strain fish were more likely to appear in non-study rivers than Skamania-strain fish (Table 5). No straying was observed from fish stocked in the Sturgeon River however, overall abundances of fish returning to fisheries from this river were also extremely low (Table 5). The five most common sites for steelhead to stray to (not including streams tributary to study rivers) include the Thunder Bay, Pere Marquette, Platte, Betsie, and White rivers listed in order of importance (returns rates equal 238, 173, 118, 111, 101 fish per 100,000 fish stocked / site / river / year).

We continue to collect and compile data from 2002 collection efforts.

Job 5. Title: Estimate growth and survival of marked steelhead to lake and river fisheries.

Marked Skamania-strain steelhead first returned to river fisheries in 1998, and only limited data were collected from river systems in that year. From 1999 through 2001, creel surveys were conducted, allowing for optimal collection of data to evaluate catch rates, effort allocations, and movements within river systems; these data were entered into standard database files. Examination of 786 heads returned from Lake Michigan river creel surveys in 1999 indicated that 698 (89%) had tags. In 2000, 1,942 heads were returned from river creel surveys and 1,712 (88%) had tags. In 2001, 470 heads were returned from river creel surveys and 376 (80%) had tags. It is still too early to interpret return rates of strains or stocking locations in the river fisheries. Three years of data are currently available for analysis (1999, 2000, and 2001) and 2002 data are being collected and compiled. Data have been collected, but we have not yet evaluated the growth of steelhead in lake and river systems. The relative return rates of marked steelhead in the open-lake fisheries of lakes Huron and Michigan are the primary measure of survival. However, the return rates of steelhead in river fisheries can be compared to open-lake estimates to help determine relative survival. For example, as observed in open lake fishery, fish planted upstream also returned better to river fisheries. The Manistee and Muskegon rivers had significant returns of fish from upstream plants to river fisheries, and the Au Sable River fish displayed a similar but less pronounced pattern (Table 4). Returns of Michigan-strain fish to St. Joseph River fisheries were more similar across all stocking sites. However, the return rates from the upriver sites were higher for both Skamania and Michigan strains (Table 4). River returns have not yet been adjusted for differences in effort among sections within a river. River creel surveys on the Muskegon, Manistee, and Au Sable rivers initiated in 1999 have greatly increased the available data, enhancing our ability to evaluate systems other than Lake Michigan and the St. Joseph River. Only 2 years of data are available from the Au Sable River as creel surveys were discontinued in 2001.

To evaluate the contribution of steelhead planted in a given river system to the Lake Michigan sport fishery, we summarized the returns of marked steelhead by river of origin (Table 6). The Muskegon River seems to be providing the best input of winter-run Michigan-strain steelhead to the Lake Michigan and Lake Huron fisheries, followed by the St. Joseph, and Au Sable rivers. The largest returns to river fisheries occurred in the St. Joseph River, followed by the Muskegon and Manistee rivers (Table 6).

Job 6. Title: Evaluate performance characteristics of steelhead strains.—Michigan-strain steelhead stocked for Study 487 have been returning to spawn in river systems since 1997, while Skamania-strain fish returned for the first time to study river systems in 1998. The Michigan- and Skamania-strain steelhead appear to be contributing at similar rates to the Lake Michigan fishery when evaluated for systems with paired plantings (Table 2). The fourth year of river creel is being conducted and early results indicate that Michigan strain fish contribute higher numbers to river fisheries than do Skamania when evaluating only systems and stocking sites that have received both strains (Table 4). The seasonal components of the fisheries remain to be evaluated and it is important to note that though stocked at the same age, Skamania return to river fisheries one year later than the Michigan strain and may yet be underrepresented in the fisheries. Winter-run Michigan-strain steelhead appeared to be more likely to stray to other river systems than summer-run Skamania-strain fish (Table 5).

Job 8. Title: Analyze data and write reports.—Data collection for this project is closely coordinated with study 427. This progress report was prepared as scheduled. Presentations to angling groups and interested parties have been prepared as requested.

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Table 1.—Stocking locations and number of marked (coded-wire tag and adipose fin clip) steelhead, by strain (Skamania, Michigan), stocked into study rivers during 1996-1999. Numbers in parentheses represent fish marked by the State of Indiana for additional study comparing size-at-stocking and rearing strategies.

River stocked	Stocking Location	1996		1997		1998		1999	
		Skamania	Michigan	Skamania	Michigan	Skamania	Michigan	Skamania	Michigan
St. Joseph	Pier 33		9,961	15,811	15,076	10,608	9,982	11,054	15,030
	Sportsman's Club-Arden	10,723	10,921	15,440	11,652	11,615	11,697	10,265	10,577
	Shamrock Park-Berrien		9,847	15,666	14,923	10,667	10,173	11,108	10,049
	Buchanan City Launch	10,697	9,801	15,672	14,780	10,556	10,107	10,823	9,987
	St. Patrick's Park		15,535			16,135		15,989	
	Mishawaka-Lincoln Park			31,755	19,819	32,013	20,317	31,726	20,054
				(31,209)		(32,237)		(32,009)	
	Indiana-Merrifield Park S. Bend		20,931						
Manistee	Manistee		14,795		15,102		16,727		15,080
	High Bridge	15,357	15,787	16,494	14,787	17,071	15,044	12,555	15,444
	Tippy Dam	21,340	15,950	16,000	15,005	17,105	15,110	12,961	15,010
Manistique	Manistique Public Access Site		8,161		8,549		8,134		8,008
Muskegon	Muskegon Lake outlet		10,163		10,056		10,180		10,095
	Henning Park		21,489		19,965		20,218		20,022
	Pine Street		22,072		20,198		20,180		20,058
Sturgeon	Big Bay DeNoc-499 Bridge	5,397	5,430	5,021	5,116	3,682	5,128	5,216	5,145
	Sturgeon River	6,284	5,345	4,998	4,983	5,103	5,222		
Au Sable	Harbor		28,426		21,095		22,134		25,050
	Rea Road		27,172		24,812		25,027		25,426
Total		69,798	236,251	183,601	235,918	166,792	225,380	148,490	230,451

Table 2.—Comparison of age-specific return rates averaged across stocking years for summer steelhead (Skamania strain) and winter steelhead (Michigan strain). Returns are from 1997 through 2001 collection efforts in Great Lake fisheries. The number of fish is adjusted to 100,000 fish stocked/site/river/year. Sites from left to right are ordered from down to upstream. The sites for the St. Joseph River begin at the mouth while Manistee River sites begin with the midstream site.

Strain	Plant years	Ages	St. Joseph River				Manistee River	
			Pier 33	Arden Pond	Shamrock Park	Buchanan	Mishawaka	High Bridge
Michigan								
1996-1999	^a 1	5	7	12	4	10	4	5
	^a 2	89	74	60	61	106	26	45
	^a 3	130	166	109	112	140	87	144
	4	29	35	29	45	19	15	31
	5	3	21	2	8	13	2	3
	6	3	0	3	0	0	2	2
	Total	260	303	215	230	289	135	231
Skamania								
1996-1999	^a 1	6	0	0	0	7	2	7
	^a 2	48	33	49	22	69	26	31
	^a 3	108	164	148	117	201	66	97
	4	24	118	78	36	54	21	31
	5	10	24	7	3	7	26	7
	6	0	0	0	0	0	2	4
	Total	197	338	283	179	338	142	176

^a Indicates that all stocked year classes have attained this age in the fishery (years of stocking 1996-1999). Ages 4 through 6 are not yet available for some stocked year classes.

Table 3.—Average annual coded-wire tag returns from lake-caught (lakes Michigan and Huron) steelhead stocked from 1996 through 1999. Summarized returns are for years 1997 through 2001. Numbers are adjusted to a stocking rate of 100,000 fish/site/river/year. The site classification defines whether the stocking site was at the mouth, a midstream location or an upstream location.

River stocked	Stocking location	Site classification	Avg. number per 100,000 stocked	
			Michigan strain	Skamania strain
St. Joseph	Pier 33	Mouth	260	197
	Sportsmans Club-Arden Pond	Mid-17	303	338
	Shamrock Park-Berrien Springs	Mid-23	215	283
	Buchanan City Launch-Smittys	Mid-32	230	179
	Mishawaka-Lincoln Park	Up-55	289	338
	Indiana-Merrifield Park S. Bend	Up-60	227	— ^a
Big Manistee	Manistee	Mouth	129	—
	High Bridge	Mid	135	142
	Tippy Dam	Up	231	176
Manistique	City of Manistique	Mouth	83	—
Muskegon	Muskegon Lake outlet	Mouth	252	—
	Henning Park	Mid	271	—
	Pine Street	Up	315	—
Sturgeon	Big Bay DeNoc-499 Bridge	Mouth	20	23
	Sturgeon River	Up	46	34
Au Sable	Harbor	Mouth	185	—
	Rea Road	Up	232	—

^a No Skamania were stocked in 1996 by the State of Indiana.

Table 4.—Average number of Michigan- and Skamania-strain steelhead returned to river fisheries for fish stocked from 1996 through 1999 and collected from 1997 to spring 2002 (numbers of fish adjusted to 100,000 fish stocked/site/river/year). Numbers are adjusted for stocking rate but not fishing effort. The site classification defines whether the stocking site was at the mouth, a mid-stream location or an upstream location.

River stocked	Stocking location	Site classification	Avg. number per 100,000 stocked	
			Michigan strain	Skamania strain
St. Joseph	Pier 33	Mouth	799	89
	Sportsmans Club-Arden Pond	Mid-17	741	301
	Shamrock Park-Berrien Springs	Mid-23	911	210
	Buchanan City Launch-Smittys	Mid-32	992	213
	Mishawaka-Lincoln Park	Up-55	1,471	842
	Indiana-Merrifield Park S. Bend	Up-60	1,238	—
Big Manistee	Manistee	Mouth	251	—
	High Bridge	Mid	852	316
	Tippy Dam	Up	1,258	362
Manistique	Mouth	Mouth	44	—
Muskegon	Muskegon Lake Outlet	Mouth	296	—
	Henning Park	Mid	1,019	—
	Pine Street	Up	1,340	—
Sturgeon	499 Bridge	Mouth	27	0
	River	Up	45	35
Au Sable	Harbor	Mouth	136	—
	Rea Road	Up	190	—

Table 5.—Summary of fish straying from stocked rivers presented as total number of strays per river and summarized numbers referring to stocking location and strain (fish straying to tributaries of study rivers have been eliminated from this analysis). Returns are from 1997 through 2001 collection efforts. Numbers of fish are adjusted to 100,000 fish stocked/site/river/year.

River stocked	Total	Stocking location			Strain	
		Mouth	Midstream	Upstream	Michigan	Skamania
Au Sable	302	109	—	193	—	—
Manistee	432	32	158	242	277	155
Manistique	106	106	—	—	—	—
Muskegon	198	42	101	55	—	—
St. Joseph	239	17	177	45	177	62
Sturgeon	0	0	—	0	0	0

Table 6.—Average number of marked Michigan- and Skamania-strain steelhead caught in the Great Lakes (Michigan and Huron) and in river fisheries, 1997-2002. Numbers are adjusted to a stocking rate of 100,000 fish/site/river/year.

River stocked	Great Lakes		River	
	Michigan	Skamania	Michigan	Skamania
Au Sable	209	—	163	—
Manistee	165	160	788	337
Manistique	83	—	44	—
Muskegon River	287	—	967	—
St. Joseph River	255	257	1,027	373
Sturgeon River	40	29	36	18