

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-53-R-14

Study No.: 487

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

Period Covered: April 1, 1997 to March 31, 1998

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: The third year of stocking steelhead with coded-wire-microtags has begun. Numbers stocked have remained within the range of the numbers proposed in the revised study design in 1996. Study fish are beginning to return to the fishery. Tagged fish are being recovered through volunteer angler returns, Great Lake creel clerks, headhunters hired to look for study fish, and by DNR Personnel conducting assessment work for other studies. In 1996 and 1997 we collected 216 heads from fish marked for our study. Creel surveys were not initiated on study rivers in the fall of 1997. We hired short-term workers to collect information on steelhead caught by anglers in the Muskegon and Manistee Rivers during the spring of 1998. Early results indicate that the upstream plants are performing at least as well as downstream plants. Skamania are returning at a higher rate to the Lake Michigan fishery while Michigan strain fish are returning better in the river fisheries. It is difficult to quantify returns of fish to study river systems without estimates of fishing effort in upstream, mid and mouth sections.

Job 1. Title: Refine design of study.

Findings: At a meeting held on December 17, 1996 we clearly defined the study objectives and established evaluation criteria. All personnel involved in the planning and implementation of the project were involved in this process. In 1997, we amended study 487 to represent changes made to the design and extended the study for one year. In 1997 and 1998 we have continued to follow the amended study design without change. In 1997 and 1998 numerous presentations have been scheduled to communicate the project goals to the angling public. We hope that by promoting the project and informing the public, we will encourage anglers to participate and return data voluntarily. We have designed and produced large numbers of plastic signs detailing the project goals and objectives. The signs are displayed at most public access sites along study rivers and Great Lake ports. We are in the process of producing wallet cards that have a picture of a steelhead on the front cover. The cards will promote the coded-wire tag program in general, and will detail the necessary information to record when anglers are turning heads in.

Job 2. Title: Oversee tag and release of smolts in selected rivers.

Findings: A total of 306,049 steelhead were tagged and released in 1996, and 400,546 were tagged and released in 1997. In 1998 and 1999, a total of 386,000 coded-wire tagged steelhead are to be released each year. Table 1 summarizes the allocation of coded-wire-tagged steelhead at each stocking site for 1996 and 1997, and outlines the proposed stocking schedule for 1998 and 1999.

Job 4. Title: Evaluate performance of upstream and downstream plants.

Findings: After the first two years (1996 and 1997) of the study, it is difficult to fully quantify the differences between upstream and downstream plants. Adult fish are just large enough to begin returning in the creel and are returning for the first time to the river systems to spawn. Qualitative results on the Au Sable River show that upstream plants of Michigan strain steelhead initially are returning to the Lake Huron fishery at a greater rate (Table 2). On the Muskegon River, the mid-river plants are returning at a greater rate than the mouth plants and the upstream plants are producing the greatest returns of all (Table 2). Initial results for the St. Joseph River are less clear. The lowest returns of the Michigan strain fish occurred for the fish stocked at the mouth and at Berrien Springs (Mid-23). Fish stocked at Buchanan (Mid-32) and the upstream site at Merrifield Park (Up-60) produced intermediate returns. While Michigan strain fish stocked in Arden Pond (Mid-17P) showed the highest returns to the open lake fishery (Table 2). The stocking of marked Skamania did not begin in earnest on the St. Joseph River until 1997 (Table 1). The 1997 Skamania plants have not returned in the lake fishery yet. The return rates of Skamania stocked in Arden Pond (Mid-17P) were not different from those stocked at Buchanan (Mid-32) in 1996. Michigan strain fish in the Manistee River produced highest returns to the lake fishery when stocked at the mouth site (Table 2). Fish stocked at the upstream site (Tippy Dam) produced the next highest return rates. The mid-river (High Bridge) site produced the lowest returns of the Michigan strain fish. Skamania stocked in the Manistee River returned best to the lake fishery from the upstream stocking site (Tippy Dam). On the Sturgeon River, Michigan strain fish planted at the mouth site provided the best returns (Table 2). In contrast, Skamania produced the best returns to the lake fishery from the upstream site.

Job 5. Title: Estimate growth and survival of steelhead.

Findings: As of 1997 only Michigan strain fish had returned to the river fisheries (Table 3). Without creel evaluations that would allow us to allocate effort it is difficult to draw conclusions about fisheries on the river systems. It is interesting to note however, that some stocked steelhead did not smolt and over wintered in the Muskegon and St. Joseph Rivers. We were able to determine this through sampling efforts for other fish species. Returns of marked steelhead to the open lake fisheries are presented in Table 4. Stocked rivers are listed in order of their contribution to the lake fisheries. The results provided are preliminary and descriptive in nature.

Job 6. Title: Evaluate performance characteristics of strains.

Findings: Heads from a total of 63 fish were returned by Lake Michigan anglers from fish that were stocked in study river systems (Manistee, St. Joseph, and Sturgeon) with paired plantings of the two strains (Michigan and Skamania). The Michigan strain was represented by 36 (30 when adjusted per 100,000 fish stocked) fish while the Skamania strain was represented by 27 (38 when adjusted per 100,000 fish stocked) fish. When observed independently the Skamania

returned in larger numbers to the Lake Michigan fishery for each of the three study rivers. In contrast, of the 93 fish recovered in river fisheries none were Skamania strain.

Job 9. Title: Define condition of hatchery fish.

Findings: Spring released Skamania from the Bodine Hatchery in Indiana were longer and heavier than Skamania released from Wolf Lake Hatchery. The water content of a fish positively correlates with its fat content. The water content of the Bodine and Wolf Lake groups of Skamania did not differ prior to release in the spring of 1997. Michigan and Skamania strain fish sampled from Wolf Lake prior to stocking were similar in length, weight, and water content. At the same time, both Skamania and Michigan strain fish collected from Arden Pond were smaller, lighter, and had a slightly lower water content than any of the hatchery fish sampled prior to stocking. In the fall of 1997, the Skamania and Michigan strains of steelhead held at Wolf Lake Hatchery were similar in length, weight, and percent water. The Bodine Hatchery Skamania were longer and weighed more, but were significantly lower in water content. We will continue to evaluate parameters relating to the health and condition of hatchery fish, and hope one day to correlate this information with survival and return rates of fish to lake and river fisheries.

Prepared by: Jory Jonas

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Table 1.—Stocking locations and number of marked (coded-wire tag and adipose fin clip) and stocked by steelhead strain into study rivers during 1996 and 1997, and proposed for 1998 and 1999.

River	Stocking Location	1996		1997		1998-99	
		Skamania	Michigan	Skamania	Michigan	Skamania	Michigan
St. Joseph	Pier 33	0	9,961	15,811	15,076	10,000	10,000
	Sportsman's Club-Arden Pond	10,723	10,921	15,440	11,000	10,000	10,000
	Shamrock Park-Berrien Springs	0	9,847	15,666	14,911	10,000	10,000
	Buchanan City Launch-Smittys	10,697	9,801	15,672	14,780	10,000	10,000
	St. Patrick's Park			15,535		15,000	
	Mishawaka-Lincoln Park			31,755	19,819	30,000	20,000
				(31,209)		(30,000)	
	Indiana-Merrifield Park, S. Bend	0	20,931				
Manistee	Manistee		14,795		15,000		16,600
	High Bridge	15,357	15,787	16,494	14,787	16,600	16,600
	Tippy Dam	21,340	15,950	16,000	15,005	16,600	16,600
Manistique	City of Manistique Public Access Site		8,161		8,549		8,000
Muskegon	Muskegon Lake Outlet		10,163		10,056		10,000
	Henning Park		21,489		19,965		20,000
	Pine Street		22,072		20,198		20,000
Sturgeon	Big Bay DeNoc-499 Bridge	5,397	5,430	5,020	5,110	5,000	5,000
	Sturgeon River	6,284	5,345	4,998	4,983	5,000	5,000
Au Sable	Harbor		28,426		24,995		25,000
	Rea Road		27,172		24,712		25,000
Total		69,798	236,251	183,600	238,946	158,200	50,000

Table 2.--Steelhead coded-wire tag returns from lake caught fish in 1996 and 1997.

River	Stocking Location	Class- ification	Michigan Strain			Skamania Strain		
			Number	Number per 10,000 stocked	Age	Number	Number per 10,000 stocked	Age
St. Joseph River	Pier 33	Mouth	2	2.0	2	---		
	Sportsmans Club-Arden Pond	Mid-17P	5	4.6	1&2	5	4.4	1&2
	Shamrock Park-Berrien Springs	Mid-23	2	1.7	1&2	---		
	Buchanan City Launch-Smittys	Mid-32	3	2.7	1&2	4	3.7	2
	Mishawaka-Lincoln Park	Up-55				---		
	Indiana-Merrifield Park S. Bend	Up-60		7	3.3	2	---	
Manistee River	Manistee	Mouth	8	5.4	2			
	High Bridge	Mid	2	1.3	2	2	1.3	2
	Tippy Dam	Up	6	3.8	2	13	6.1	2
Manistique River	City of Manistique	Mouth	3	3.7	2			
Muskegon River	Muskegon Lake Outlet	Mouth	1	1.0	2			
	Henning Park	Mid	12	5.2	2			
	Pine Street	Up	21	9.7	2			
Sturgeon	Big Bay DeNoc-499 Bridge	Mouth	1	1.9	2	1	1.9	2
	Sturgeon River	Up				2	4.0	2
Au Sable	Harbor	Mouth	8	2.8	2			
	Rea Road	Up	15	5.6	2			

¹ No Skamania were stocked in 1996 by the State of Indiana

Table 3.—Steelhead coded-wire tag returns from river caught fish in 1996 and 1997. As of 1997, river anglers had not captured any Skamania strain steelhead.

River	Stocking Location	Classification	Michigan Strain		
			Number	Number per 10,000 stocked	Age
St. Joseph River	Pier 33	Mouth	3	2.7	1&2
	Sportsmans Club-Arden Pond	Mid-17P	4	3.6	1
	Shamrock Park-Berrien Springs	Mid-23	8	6.7	1&2
	Buchanan City Launch-Smittys	Mid-32	12	10.2	1&2
	Mishawaka-Lincoln Park	Up-55	9	4.5	1
	Indiana-Merrifield Park S. Bend	Up-60	9	4.3	1&2
Manistee River	Manistee	Mouth			
	High Bridge	Mid	1	0.6	2
	Tippy Dam	Up	1	0.6	2
Manistique River	City of Manistique	Mouth			
Muskegon River	Muskegon Lake Outlet	Mouth			
	Henning Park	Mid	3	1.5	1
	Pine Street	Up	40	18.6	1&2
Sturgeon	Big Bay DeNoc-499 Bridge	Mouth			
	Sturgeon River	Up			
Au Sable	Harbor	Mouth	1	0.4	3
	Rea Road	Up	2	0.7	2&3

Table 4.—Description of the number of study fish caught in lake fisheries (Michigan and Huron). The number caught indicates the actual number of heads returned in 1996 and 1997. The adjusted number indicates the number caught adjusted to a stocking rate of 100,000 fish per river.

River of origin	Number caught	Number per 100,000 fish stocked
Manistee River	34	75.3
St. Joseph River	28	67.8
Muskegon River	34	64.1
Au Sable River	23	41.6
Sturgeon River	4	35.0
Manistique River	3	3.7

Table 5.—Length, weight, condition factor (K_{TL}), and percent water analysis for hatchery steelhead collected throughout 1996 and 1997. The Skamania strain steelhead are identified by the letters SK and the Michigan strain fish are identified by the letters MI in the strain column. One standard error is in parentheses.

Hatchery	Date	Strain	Sample size	Mean length (mm)	Mean weight (g)	K_{TL}	Percent Water
Arden Pond	Mar-97	MI	26	143.8 (2.95)	30.1 (1.89)	0.00974 (0.00014)	25.66 (0.22)
Arden Pond	Mar-97	SK	80	163.1 (1.89)	41.1 (1.26)	0.00925 (0.00006)	25.54 (0.12)
Bodine	3/27/97	SK	41	198 (3.24)	72 (3.67)	0.00904 (0.00013)	26.25 (0.24)
In-St. Joseph	3/27/97	SK	47	174 (4.02)	50 (3.54)	0.00880 (0.00011)	22.63 (0.36) ¹
Wolf Lake	1/22/97	MI	60	147 (2.53)	33 (1.87)	0.00982 (0.00008)	26.99 (0.16)
Wolf Lake	1/15/97	SK	60	145 (2.23)	28 (1.23)	0.00892 (0.00006)	25.52 (0.16)
Wolf Lake	4/2/97	MI	180	189 (2.36)	71 (2.52)	0.00986 (0.00006)	26.67 (0.18)
Wolf Lake	4/1/97	SK	60	187 (2.84)	64 (2.73)	0.00953 (0.00007)	26.09 (0.20)
Bodine	Sep-97	SK	60	105 (1.97)	11 (0.61)	0.00929 (0.00011)	23.03 (0.33) ²
Wolf Lake	Oct-97	SK	60	97 (1.49)	9 (0.41)	0.00995 (0.00008)	24.90 (0.12)
Wolf Lake	Oct-97	MI	60	96 (1.38)	9 (0.45)	0.00976 (0.00013)	25.39 (0.19)
Arden	Jan-98	??	14	137 (2.89)	22 (1.43)	0.00823 (0.00006)	

¹ Sample Size=27 fish for percent water estimates.

² Sample Size=38 fish for percent water estimates.