STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-80-R-8

Study No.: 230743 **Title:** Evaluation of Eagle Lake and Lake Michigan steelhead-strain rainbow trout stocked into inland lakes in Michigan

Period Covered: October 1, 2006 to September 30, 2007

Study Objective: To determine the relative survival, growth, and return to creel of steelhead and Eagle Lake-strain rainbow trout stocked into inland lakes.

Summary: Eagle Lake (EL) and Michigan steelhead (STT) strain rainbow trout were given distinctive fin clips and stocked into seven experimental lakes in 2004–07. Relative abundance and growth of the strains was evaluated from samples collected by on-site angler census, gill netting, electrofishing, and by volunteer anglers. Steelhead comprised 75% of the 507 rainbow trout captured with survey gear or observed by census clerks, to date. Sixty-seven percent of rainbow trout caught by volunteer anglers fishing in small stocked lakes were STT. Mean total lengths of both rainbow trout strains were similar within each lake. In small lakes incremental growth in total length between stocking in April and capture in survey gear in October was approximately 1 inch greater for the EL strain compared to STT. However, because the EL strain was smaller at planting, mean lengths of both strains were similar by fall.

Findings: Jobs 1–7 were scheduled for 2006-07, and progress is reported below.

Job 1. Title: Fin clip rainbow trout strains.–EL- and STT-strain rainbow trout planted in 2004–07 were fin clipped at the Thompson State Fish Hatchery. The left pectoral fin was clipped from the EL-strain and STT were given a right pectoral fin clip.

Job 2. Title: Perform fish quality assessment and rate fin clip quality.–Hatchery personnel performed detailed assessments of fish health quality before fish were planted. They examined a random sample of 60 fish of each strain to determine if eyes, gills, pseudobranchia, thymus, and opercles were normal. A subsample of 20 fish of each strain was examined to determine fat levels on pyloric caeca or in the body cavity, condition of the spleen, hind gut, kidney, and liver, and bile color. Fins were examined for erosion and fin clip quality was rated for a sample of 100 fish of each strain.

Overall health quality ratings were very good for both strains immediately before they were stocked each year from 2004 to 2007. Visceral fat levels and Fulton condition factors (K_{TL}) were also similar between strains each year. Fin clip quality was also excellent during all years.

Job 3. Title: Stock fish into test lakes.–Yearling rainbow trout were stocked annually into seven experimental lakes in 2004–07 (Table 1). On average, STT were 0.9 inches longer than EL stocked in 2004, 1.2 inches longer in 2005, 0.7 inches longer in 2006, and 0.9 inches longer in 2007.

Job 4. Title: Conduct creel census and collect biological data.–In 2007, an on-site angler census of Walloon began on 28 April and is scheduled to continue through October. Additional angler census on Walloon Lake is planned for the 2008 ice fishing period. Eight of ten rainbow trout

observed by the census clerk as of 12 September 2007 were STT. These data have not yet been expanded to estimate total harvest of rainbow trout. Mean lengths of harvested rainbow trout from Walloon Lake were similar, 18.0 inches for EL and 17.7 inches for STT (ANOVA $P > 0.05$). In Maceday Lake estimated angler catch of rainbow trout from April through October 2005 was 370 fish with 172 of these being harvested. Nearly 73% of the rainbow trout harvested from Maceday Lake were STT.

No rainbow trout of either strain were observed by the census clerk during fall and winter angler surveys on the three largest lakes in the study. An on-site angler census was conducted on Elk, Big Glen, and Walloon lakes during October 2005 and on Elk and Walloon lakes in February and March 2006.

Volunteer anglers caught significantly more STT than EL from three of the smaller lakes under study (Binomial test $P < 0.001$). Sixty-seven percent of 382 marked rainbow trout reported caught by volunteer anglers from 2005 through 2006 were STT. Most volunteer angler reports were for catches from Heart, Big Chub, and Maceday lakes. Mean length of STT measured by volunteer anglers was significantly higher than that of EL in Big Chub Lake (ANOVA $P \leq 0.05$), but was similar in Heart and Maceday lakes.

Job 5. Title: Conduct netting surveys.–Biological and relative strain abundance data were collected in five lakes by electrofishing or with experimental gill nets in 2007. Data collected during these surveys are presented under Job 6.

Job 6. Title: Analyze data.–Michigan steelhead were caught 3 times more frequently than EL in the pooled samples of rainbow trout collected from seven study lakes (Table 2). With the exception of Maceday Lake most trout samples were collected by electrofishing or gill nets. Recreational anglers also caught about 3 times more STT than EL from lakes where on-site angler census was conducted, i.e. Maceday Lake and Walloon Lake. Glen Lake was the only large lake where I was able to catch a large sample of STT and EL with survey gear. In our spring 2007 gill net survey I caught 69 marked rainbow trout, 84% of which were STT. A similar amount of netting effort in Walloon Lake in spring 2006 (1,000 feet of gill nets fished for 4 nights) yielded only 8 STT and 8 EL rainbow trout. Only one wild rainbow trout was caught by this level of netting effort in Elk Lake during spring 2006. Two electrofishing surveys of Elk Lake conducted in fall 2005 captured a total of 18 rainbow trout but all appeared to be of wild origin because none had fin clips.

I used analysis of variance to test for differences in mean total lengths between strains for each lake and survey period. Binomial tests were used to determine if the proportion of each strain within a sample was different from 0.5. Differences were judged to be significantly different for $P \leq 0.05$. Mean total lengths were similar between strains within each lake (Table 2). The largest individual rainbow trout in most samples were usually STT because they more frequently survive to older ages (Table 2). The EL strain grew significantly faster than STT during the first summer after planting into Shupac, Big Chub, and Maceday lakes. However, because the EL strain fish were smaller at planting there were no significant differences between the mean total lengths of the two strains by the end of summer.

Michigan steelhead were significantly more abundant than EL in the pooled samples of rainbow trout from all lakes that are shown in Table 2, a sample of 507 rainbow trout. Michigan steelhead were also significantly more abundant than EL in 6 of 7 study lakes when samples collected on multiple dates were pooled. Proportions of each strain were not significantly different from 0.5 only in Walloon Lake.

Job 7. Title: Write annual performance report.–This performance report was completed as scheduled.

Prepared by: Andrew J. Nuhfer
Date: September 30, 2007

Table 1.–Eagle Lake (EL) and Michigan Steelhead (STT) plantings into experimental lakes. Mean total lengths are reported in inches.

Lake name (acres)	Year	Number stocked		Mean length	
		STT	EL	STT	EL
Elk Lake (7,730)	2004	21,480	21,500	7.8	6.8
	2005	21,500	21,500	8.0	6.9
	2006	16,797	16,797	8.0	7.3
	2007	18,700	18,700	8.0	7.1
Big Glen Lake (4,865)	2004	10,000	10,000	7.8	6.8
	2005	13,279	13,116	7.8	6.8
	2006	12,000	12,000	7.8	7.4
	2007	10,000	10,000	8.0	7.2
Walloon Lake (5,487)	2004	14,000	14,000	7.9	6.9
	2005	14,000	14,000	8.0	6.8
	2006	15,000	15,000	8.0	7.2
	2007	14,000	14,000	8.1	7.2
Maceday Lake (419)	2004	6,000	6,000	7.8	6.9
	2005	6,000	6,000	8.0	6.8
	2006	8,000	8,000	8.1	7.3
	2007	6,000	6,000	8.0	7.2
Shupac Lake (107)	2004	2,700	2,700	7.6	6.9
	2005	2,700	2,700	8.0	7.1
	2006	2,700	2,700	8.0	7.2
	2007	2,700	2,700	8.1	7.2
Big Chub Lake (75)	2004	2,500	2,500	7.6	6.9
	2005	2,500	2,500	8.0	6.6
	2006	2,500	2,500	7.8	7.4
	2007	2,500	2,500	8.0	7.0
Heart Lake (65)	2004	2,000	2,000	7.6	6.9
	2005	2,000	2,000	8.0	6.6
	2006	2,000	2,000	7.8	7.4
	2007	2,000	2,000	8.0	7.0

Table 2.–Mean total length (in) of Michigan steelhead (STT) and Eagle Lake (EL) rainbow trout collected from experimental lakes with survey gear. Range in total length in samples is shown in parentheses. "–" = not surveyed.

Lake	Trout strain	Fall surveys			Spring surveys		
		2004	2005	2006	2005	2006	2007
Shupac	EL	12.1 (11.3–13.0)	11.8 (11.3–12.7)	12.2 (12.1–12.3)	12.8 (12.5–13.5)	12.5 (11.5–13.1)	13.2 (12.8–14.3)
	STT	12.0 (11.8–12.1)	12.2 (10.9–14.5)	11.7 (11.3–12.0)	12.1 (11.5–12.5)	13.3 (11.8–20.5)	14.6 (12.4–17.3)
Big Chub	EL	13.8 (11.5–16.0)	13.3 (13.0–13.5)	13.4 (11.7–19.1)	15.6 (15.5–15.6)	16.2 (14.0–19.7)	15.1 (13.0–20.7)
	STT	13.7 (12.5–17.0)	14.8 (12.1–19.1)	13.9 (11.5–18.7)	15.4 (14.1–16.5)	15.8 (12.8–20.5)	15.7 (12.7–21.9)
Maceday	EL	–	10.3[a] (9.1–11.4)	–	–	–	–
	STT	–	10.4[a] (8.7–11.9)	–	–	–	–
Heart	EL	–	12.3 (12.2–12.5)	14.1 (14.1–14.1)	–	12.9 (12.0–13.7)	12.1 (10.9–12.9)
	STT	–	12.4 (10.8–14.3)	14.2 (13.6–14.9)	–	12.3 (10.9–13.3)	13.1 (11.2–15.5)
Walloon	EL	–	–	–	–	22.1 (18.4–23.2)	None caught
	STT	–	–	–	–	22.4 (19.5–24.4)	None caught
Elk	EL	–	None caught	–	–	None caught	–
	STT	–	None caught	–	–	None caught	–
Glen	EL	–	–	None caught	–	–	17.4 (14.3–24.3)
	STT	–	–	15.5	–	–	16.7 (12.3–26.5)

[a] Lengths collected from angler creel census from April through October.