

## STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-80-R-8

Study No.: 230519

Title: Colonization of a brook trout stream by introduced brown trout.

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

**Study Objectives:** To establish a stable, naturally reproducing population of brown trout in the headwaters of Hunt Creek to use as an experimental population for future management experiments and evaluations. A long term goal is to build a brown trout population that can be used to study interactions with potamodromous salmonid species found in the Great Lakes. To monitor population dynamics of all trout species as brown trout colonize reaches of Hunt Creek presently occupied primarily by brook trout.

**Summary:** A total of 90 adult brown trout *Salmo trutta* obtained from naturalized stocks were stocked into a headwater reach of Hunt Creek over a 4-year period (2001–04). Brook trout *Salvelinus fontinalis* in this reach were previously the only salmonid species present in significant numbers. Brown trout reproduced successfully each year from 2002–07 and progeny of the stocked adults are surviving to older ages. In 2007 density of yearling-and-older (YAO) brown trout in reaches 1 through 3 was higher than density of YAO brook trout for the first time since the study began. Progeny of the brown trout stocked as adults are now the dominant salmonid species, comprising about 70% of total trout biomass in the three reaches with free access to spawning and rearing habitat. Barriers to upstream movement by spawning trout were partially removed and large woody material was added to provide additional habitat complexity and cover.

**Findings:** Jobs 1 through 6 were scheduled for 2006-07, and progress is reported below.

**Job 1. Title: Estimate trout populations.**—A total of 90 adult brown trout were transferred into Hunt Creek upstream of a low-head barrier between 2001 and 2004 to provide a spawning stock. Thirty adults were collected during late summer in 2001, 2003, and 2004 from unstocked Michigan trout streams containing naturalized brown trout populations. Before the present study, brown trout captured during electrofishing surveys were removed from the study area so that virtually all the salmonids in the 3.4-km study reach of Hunt Creek were brook trout prior to fall 2001. I monitored colonization of the study reach by brown trout by making mark-and-recapture estimates of brown and brook trout populations during May and August from 2002–06 in a 3.4 km reach of Hunt Creek. In 2007 populations were estimated only in August. Estimates were computed using the Chapman variation of the Petersen formulas (Ricker 1975). Separate population estimates were calculated for four contiguous sections of the 3.4 km study reach (Table 1). Young-of-year (YOY) were differentiated from yearling-and-older (YAO) fish based on total length frequency histograms. Only August population data are presented in this performance report.

Mean density of brown trout YOY in reaches 1–3 combined increased steadily from 257/ha in 2002 up to 1,168/ha in 2007 (Table 1). Density of YOY brook trout has declined in these reaches over the same time period. In 2007 brown trout YOY comprised nearly 40% of total YOY in reaches 1–3. Density of YAO brown trout increased steadily from 2002 to 2007 as progeny of the stocked adults survived to older ages. The percentage of the total salmonid standing stock

composed of brown trout in reaches 1–3 combined increased from 20% in 2002 to 70% in 2007. Total standing stocks of trout, brown trout and brook trout combined, increased over time in all reaches where brown trout populations have become well established.

**Job 2. Title: Estimate growth and survival.**—Scale samples were collected from a large subsample of fish collected during the August surveys. Data on growth and survival rates will be presented in future progress reports after scale samples are read.

**Job 3. Title: Monitor temperature and discharge.**—I recorded water temperatures hourly at four locations in the study reach using StowAway® XTI (Onset Computer Corporation) electronic thermometers. Temperature data were archived for use in future analyses. Stream stage was recorded hourly at the downstream end of the study reach by a Sutron 8400 digital data recorder (Sutron Corporation). Stream stage was converted to stream discharge based on the regression relation between stage height and estimated stream discharge. Discharge data were archived for use in future analyses.

**Job 4. Title: Remove barriers.**—Most of the stop logs that inhibit upstream movement into reach 4 have been removed from the low-head bulkhead. A sediment basin excavated to capture sand that had accumulated upstream of the low-head barrier filled rapidly with sand so removal of the final stop logs has been deferred until the basin can be emptied. Brown trout redd counts conducted in fall 2006 and low abundance of YOY brown trout in reach 4 in August 2007 indicate that few adult brown trout moved upstream of the barrier.

**Job 5. Title: Add LWD.**—Large woody material, primarily whole trees with branches trimmed to a shorter length, was added throughout reach 2 during June and July 2006. Additional LWD was added to the upstream half of reach 1 during June and July 2007. Woody material was added primarily in areas where water depths were deeper than average but where woody cover was lacking. Channel morphology (width, depth, substrate, and lateral channel position) was characterized at fixed transects spaced at 30.5 m intervals throughout the treated reaches before woody material was added. Pebble counts were also conducted at all transects. These data will be compared to similar data collected in the future to determine if LWD additions significantly altered channel morphology or substrate composition.

**Job 6. Title: Write annual performance report.**—This performance report was completed as scheduled.

#### **Literature Cited:**

Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Fisheries Research Board of Canada, Bulletin 191.

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**Date:** September 30, 2007

Table 1.—August density of young-of-year (YOY) and yearling-and-older (YAO) brook trout and brown trout in four contiguous reaches of Hunt Creek, MI, 2002–07. Stream reaches are numbered consecutively from downstream to upstream. Most brown trout have been excluded from reach 4 by a low-head barrier that is being gradually removed.

Year	YOY (fish/ha)		YAO (fish/ha)		Kg/ha	
	Brook	Brown	Brook	Brown	Brook	Brown
<b>Reach 1</b>						
2002	2,259	86	813	48	46	19
2003	1,925	143	510	69	34	30
2004	1,117	217	823	196	49	19
2005	1,706	350	601	334	34	39
2006	1,519	435	530	385	31	55
2007	1,123	598	359	387	24	60
<b>Reach 2</b>						
2002	2,582	297	971	45	50	11
2003	2,902	717	719	70	46	25
2004	2,438	472	1,133	260	63	43
2005	2,058	1,272	808	277	44	47
2006	2,032	546	623	570	43	78
2007	2,574	1,553	589	507	40	73
<b>Reach 3</b>						
2002	1,809	389	1,112	59	39	5
2003	1,850	997	769	332	31	33
2004	1,574	1,271	997	538	37	26
2005	1,889	1,140	918	634	36	43
2006	1,520	816	530	755	24	58
2007	1,995	1,354	368	558	19	59
<b>Reach 4</b>						
2002	3,025	0	1,401	0	62	0
2003	3,189	0	1,050	0	55	0
2004	2,718	0	1,461	0	61	0
2005	3,056	83	1,628	23	64	2
2006	2,687	2	1,131	48	52	5
2007	2,598	194	1,291	58	65	11