

## STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-80-R-7

Study No.: 230692

Title: Influence of total length and condition at stocking on Chinook salmon survival and time at large.

Period Covered: October 1, 2005 to September 30, 2006

**Study Objectives:** There are six main objectives identified for this project. 1) To evaluate the influence of the total length of stocked Chinook salmon on post-stocking survival. 2) To evaluate the influence of total length of Chinook salmon at stocking on the age and size of fish returning to spawn. 3) To evaluate the cost per return of small versus large stocked Chinook salmon. 4) To evaluate the influence of condition on survival of Chinook salmon stocked at the same size. 5) To evaluate the influences of high and low condition on the return size and age of Chinook salmon stocked at similar sizes. 6) To determine the cost per return of Chinook salmon at two condition levels.

**Summary:** Fish for this study have been stocked for six years, beginning in 2001. The portion of the study evaluating the condition of Chinook salmon at stocking has not been initiated due to delays in hatchery renovations at the Thompson hatchery and the need to work out appropriate rearing techniques to complete this objective. Returns of tagged fish from the size at stocking evaluation are increasing; four year-classes have fully entered the fishery. At the time of completion of this report, 3,242 study fish have been returned and analyzed from the recreational fishery for all years and sites and 3,763 study fish have been recovered from harvest weirs.

**Findings:** Jobs 1 through 4 were scheduled for 2005-06, and progress is reported below.

**Job 1. Title: Stock fish.**—Study fish have been stocked into Lake Michigan and Lake Huron tributaries for six years (2001-06; Table 1). Fish quality assessments have been conducted on each treatment prior to stocking, and data are being compiled for evaluation.

**Job 2. Title: Recover tags.**—A total of 3,242 tagged study fish have been recovered from recreational fisheries. From 2002 through 2003, the return in recreational fisheries of Wolf Lake fish was 25-50 percent higher than return of Platte River fish. In 2004 the pattern changed and more similar percent returns were obtained from each hatchery (<1 percent different). The pattern appears to be reversing in 2005 and 2006, as 10 percent fewer Wolf Lake fish have been recovered, relative to Platte River fish (Table 2). Overall, the return of Wolf Lake fish was 7% greater than returns of fish from the Platte River hatchery. The majority of the fish returned were stocked at Medusa Creek (N=1,578) and the greatest number of salmon heads were returned from the Manistee, Charlevoix, Grand Haven, Ludington, and South Haven fisheries in Lake Michigan (N=383, 371, 345, 244, and 211).

A total of 3,763 tagged study fish have been recovered at harvest weirs and 19 percent more Wolf Lake hatchery fish were recovered relative to Platte River Hatchery fish. Like recreational returns, differences among hatcheries have declined from 44 percent higher returns of Wolf Lake fish in 2002 to only a 4 percent difference in 2005 (Table 3).

**Job 3. Title: Analyze data on length.**—The lengths of 40-60 randomly sampled fish were obtained within 7 d prior to stocking in each year (2001-06) and for each stocking location. Data from 2006 are in the process of being entered and evaluated. Lengths were to be obtained from each hatchery at each stocking location, but, samples were not collected at all facilities and sites (Table 4). Fish from Wolf Lake were longer than fish from the Platte River Hatchery, as called for in the study design. Pen-reared fish were longer than direct-plant fish, independent of hatchery.

**Job 4. Title: Analyze data on condition.**—Dry weights were obtained from a random sample of 40-60 fish collected within 7 d prior to stocking from each hatchery at each stocking location. Fish from 2006 are in the process of being dried. Percent water provides an indication of the fat content and therefore condition of fish; the higher the water content, the lower the condition. The water content of fish from the two facilities was more similar than total length (Table 5). When differences did occur, larger fish from Wolf Lake and those raised in net pens had lower water content and therefore were in better condition (Table 5).

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Table 1.—Number of Chinook salmon stocked (recoverable tags) per stocking location and hatchery (treatment), 2001 to 2006.

Stocking year	Stocking site/hatchery							
	Swan River		Medusa Creek (net pen)		Little Manistee River		St. Joseph River (net pen)	
	Wolf Lake	Platte	Wolf Lake	Platte	Wolf Lake	Platte	Wolf Lake	Platte
2001	102,749	84,703	94,462	75,348	98,978	79,719	71,029	67,085
2002	84,027	95,473	96,524	100,424	96,424	91,137	73,562	68,496
2003	100,698	94,038	98,471	98,768	98,057	94,284	70,943	71,201
2004	86,606	88,705	84,849	97,326	86,790	93,879	68,513	74,009
2005	89,314	95,703	88,414	97,420	80,814	97,330	64,231	73,118
2006	99,040	101,107	99,822	102,661	100,296	100,579	60,178	61,467

Table 2.—Number of Chinook salmon heads returned and tags recovered annually, (2001 to 2006) from recreational fisheries in Lakes Michigan and Huron.

Recovery year	Total heads returned	Number of heads with tags	Number and hatchery origin of tags from study 230692	
			Platte	Wolf Lake
2001	416	306	0	2
2002	893	670	46	142
2003	1,792	1,432	324	551
2004	1,876	1,522	589	582
2005	1,113	896	474	381
2006 <sup>a</sup>	214	151	83	68
Total	6,304	4,977	1,516	1,726

<sup>a</sup> Current year and therefore incomplete data summary.

Table 3.—Number of Chinook salmon heads returned and tags recovered annually, (2001 to 2005) from harvest weirs (Swan River, Medusa Creek, Little Manistee River, Boardman River, and Upper and Lower Platte River).

Recovery year	Total heads returned	Number of heads with tags	Number and hatchery origin of tags from study 230692	
			Platte	Wolf Lake
2001	342	249	0	0
2002	868	695	117	302
2003	1,583	1,260	319	642
2004	1,795	1,452	583	740
2005	1,326	1,091	507	553
Total	5,914	4,747	1,526	2,237

Table 4.—Average length (mm ± standard deviation) of Chinook salmon stocked annually, 2001-05. ND indicates no data collected.

Recovery year	Stock site/hatchery							
	Swan River		Medusa Creek (net pen)		Little Manistee River		St. Joseph River (net pen)	
	Wolf Lake	Platte	Wolf Lake	Platte	Wolf Lake	Platte	Wolf Lake	Platte
2001	96 ± 9	78 ± 5	111 ± 10	105 ± 8	96 ± 9	74 ± 6	ND	78 ± 6
2002	ND	ND	ND	ND	ND	ND	ND	ND
2003	84 ± 6	ND	108 ± 10	102 ± 7	92 ± 8	ND	111 ± 9	98 ± 7
2004	90 ± 9	79 ± 4	ND	ND	92 ± 9	77 ± 4	93 ± 8	73 ± 4
2005	91 ± 8	78 ± 5	110 ± 12	100 ± 7	92 ± 7	78 ± 5	112 ± 7	84 ± 5
Average	90 ± 9	78 ± 5	109 ± 11	102 ± 7	93 ± 8	76 ± 5	106 ± 11	84 ± 11

Table 5.—Average percent water ( $\pm$  standard deviation) of Chinook salmon stocked annually, 2001 to 2005. ND indicates no data collected.

Recovery year	Stock site/hatchery							
	Swan River		Medusa Creek (net pen)		Little Manistee River		St. Joseph River (net pen)	
	Wolf Lake	Platte	Wolf Lake	Platte	Wolf Lake	Platte	Wolf Lake	Platte
2001	77.0 $\pm$ 1.6	77.1 $\pm$ 2.6	77.6 $\pm$ 3.3	76.5 $\pm$ 1.2	76.6 $\pm$ 1.8	80.3 $\pm$ 2.8	ND	79.6 $\pm$ 2.1
2002	ND	ND	ND	ND	ND	ND	ND	ND
2003	79.6 $\pm$ 4.9	ND	76.0 $\pm$ 3.6	77.1 $\pm$ 3.8	76.9 $\pm$ 4.4	ND	74.5 $\pm$ 1.6	74.6 $\pm$ 3.2
2004	77.9 $\pm$ 1.4	79.4 $\pm$ 5.4	ND	ND	79.8 $\pm$ 8.1	79.6 $\pm$ 4.7	76.5 $\pm$ 9.5	78.6 $\pm$ 9.5
2005	77.6 $\pm$ 2.5	78.4 $\pm$ 2.7	77.6 $\pm$ 1.7	79.1 $\pm$ 1.4	77.4 $\pm$ 1.4	78.2 $\pm$ 2.2	77.0 $\pm$ 6.8	80.1 $\pm$ 1.9
Average	78.1 $\pm$ 3.1	78.3 $\pm$ 3.9	76.8 $\pm$ 3.0	77.8 $\pm$ 2.9	77.6 $\pm$ 4.7	79.4 $\pm$ 3.5	75.6 $\pm$ 6.9	77.8 $\pm$ 5.5