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IDAHO SUPPLEMENTATION STUDIES

Joint Project Progress Report
2002 Interim Report
January 1, 2002 — July 31, 2002

Prepared by:

David A. Venditti, Senior Fisheries Research Biologist
Andre Kohler, Fisheries Research Biologist
Kimberly A. Apperson, Regional Fisheries Biologist
Bruce Barnett, Senior Fisheries Technician
Arnold Brimmer, Regional Fisheries Biologist
Nathan Brindza, Regional Fisheries Biologist

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By

David A. Venditti[1]
Andre Kohler[2]
Kimberly A. Apperson[1]
Bruce Barnett[1]
Arnold Brimmer[1]
Nathan Brindza[1]

Idaho Department of Fish and Game[1]
600 South Walnut Street
P.O. Box 25
Boise, ID 83707

Shoshone-Bannock Tribes[2]
P.O. Box 306
Fort Hall, ID 83201

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U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, OR 97283-3621

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ABSTRACT

The Idaho Supplementation Studies (ISS) project was initiated in 1992 to evaluate the benefits and risks of using hatchery supplementation to increase natural production of spring/summer Chinook salmon *Oncorhynchus tshawytscha* in Idaho streams. This report documents ISS research tasks completed by the Idaho Department of Fish and Game (IDFG) and the Shoshone-Bannock Tribes (SBT) between January 1 and July 31, 2002. This report is necessary to fill a gap in reporting caused by the change from the calendar year reports these agencies have produced in the past to the joint brood year format adopted by all four agencies involved with the ISS (IDFG, SBT, the Nez Perce Tribe, and the U.S. Fish and Wildlife Service) beginning with brood year 2002 activities. Data from the ISS study including hatchery Chinook salmon releases; naturally produced juvenile Chinook salmon trapping, tagging, and population estimation; and passive integrated transponder (PIT) tag detections of migrating juveniles at mainstem dams are provided for this time period. Releases of brood year 2002 juveniles took place in 2003 (presmolts) and 2004 (smolts) and were generally consistent with levels prescribed in the project's study design. Juvenile screw traps were operated in 12 streams managed by the IDFG and SBT to estimate juvenile production in these streams. Production varied substantially both between streams and between juvenile life stages. Supplementation and naturally produced juveniles were PIT tagged to estimate survival to and passage timing at Lower Granite Dam. Supplementation juveniles were tagged at the hatcheries prior to release, while naturally produced fish were tagged at the screw traps. Minimum survival was estimated from PIT tag detections at mainstem dams. Future estimates of survival should be made using a more quantitatively powerful method than the estimate used here and in the past. We recommend using the SURPH2 model for future survival estimates.

Authors:

David A. Venditti
Senior Fisheries Research Biologist
Idaho Department of Fish and Game

Andre Kohler
Fisheries Research Biologist
Shoshone-Bannock Tribes

Kimberly A. Apperson
Regional Fisheries Biologist
Idaho Department of Fish and Game

Bruce Barnett
Senior Fisheries Technician
Idaho Department of Fish and Game

Arnold Brimmer
Regional Fisheries Biologist
Idaho Department of Fish and Game

Nathan Brindza
Regional Fisheries Biologist
Idaho Department of Fish and Game

INTRODUCTION

The Idaho Supplementation Studies (ISS) project is a collaborative study between the Idaho Department of Fish and Game (IDFG), the Nez Perce Tribe (NPT), the Shoshone-Bannock Tribes (SBT), and the U.S. Fish and Wildlife Service (USFWS). The project was developed to evaluate the benefits and risks associated with hatchery supplementation of Chinook salmon *Oncorhynchus tshawytscha* in the Snake River basin. Because the scope of study is broad, streams were distributed among the cooperating agencies, which operate under an umbrella agreement to maintain consistency for all research activities.

The ISS study design was implemented in 1992 (Bowles and Leitzinger 1991) with the following goals in mind: 1) evaluate the efficacy of using hatchery fish to restore or augment production in natural populations of spring and summer Chinook salmon in the Salmon River and Clearwater River subbasins of Idaho, 2) evaluate the long-term impacts of supplementation with hatchery origin Chinook salmon on the survival and fitness of natural populations, and 3) evaluate hatchery releases at different life stages with respect to these same measures of production and productivity. To achieve these goals, an experiment was designed to compare production and productivity measures between a group of experimentally supplemented (treatment) streams and a group of untreated (control) streams where natural production has experienced little or no hatchery influence. The following objectives were established for the ISS study:

1. Monitor and evaluate the effects of supplementation on the abundance of naturally produced juveniles and subsequent adult returns,

2. Monitor and evaluate changes in natural productivity and genetic composition of target and adjacent populations following supplementation,

3. Determine which supplementation strategies (e.g., smolt versus parr release) provide the highest response in natural production without adverse affects on productivity, and

4. Develop supplementation recommendations.

The objectives and tasks of the ISS study are split into two main categories: supplementation-augmentation of existing Chinook salmon populations and supplementation-restoration of extirpated populations. Augmentation is being tested in the Salmon River subbasin, where streams are supplemented using locally derived broodstocks. Restoration efforts are being tested in the Clearwater River subbasin to evaluate the attempts at rebuilding populations by out-planting various life stages of juvenile Chinook salmon of hatchery origin.

In this report we document ISS research tasks completed by IDFG and SBT researchers during the gap in time created as the program transitions between the calendar year reporting (see Kohler et al. 2001; Lutch et al. 2003) and the current brood-year report format beginning with brood year 2002 (Venditti et al. 2005). Data collected for the corresponding time period by the NPT are reported in Lockhart and Kinzer (2006) and Lockhart et al. (2006). Data collected by the USFWS for this time period is in Bretz and Olson (2003). As the lead coordinating agency, the IDFG is responsible for approximately half (N = 14) of the total ISS study streams and the SBT monitors an additional five streams (Table 1). Data on ISS related hatchery Chinook salmon releases; naturally produced juvenile Chinook salmon trapping, tagging, and population estimation; and passive integrated transponder (PIT) tag detections of migrating

juveniles at lower Snake and Columbia river dams are provided for the period from January 1, 2002 through July 31, 2002.

Table 1. Idaho Supplementation Study streams monitored by the Idaho Department of Fish and Game (IDFG) cooperating regions and the Shoshone-Bannock Tribes (SBT) in 2002.

Subbasin	Agency	Study Stream	Classification
Salmon	IDFG Nampa Research	Marsh Creek	Control
		Pahsimeroi River	Treatment
		Upper Salmon River	Treatment
	IDFG McCall Region	South Fork Salmon River	Treatment
	IDFG Salmon Region	Lemhi River	Control[a]
		North Fork Salmon River	Control
	SBT	Bear Valley Creek	Control
		Herd Creek	Control
		Valley Creek	Control
		West Fork Yankee Fork Salmon River	Treatment
		Upper East Fork Salmon R.	Treatment
Clearwater	IDFG Nampa Research	Big Flat Creek	Treatment
		Colt Killed Creek	Treatment
		Crooked Fork Creek	Control[a]
		Brushy Fork Creek	Control
	IDFG Lewiston Region	American River	Control[a]
		Crooked River	Treatment
		Red River	Treatment
		White Cap Creek	Control

[a] Reclassified from a treatment to a control study stream.

METHODS

Juvenile Treatments

To create juvenile supplementation groups released in 2002, ISS broodstock management hatcheries utilized hatchery origin and naturally produced adults from spawn years 2000 and 2001 in supplementation broodstocks. As prescribed in Bowles and Leitzinger (1991), hatchery adults returning from F_1 and F_2 supplementation releases have been spawned with naturally produced fish since 1995. Supplementation broodstocks were developed at six locations for IDFG managed streams including:

Salmon Subbasin Satellite Facilities

- McCall Fish Hatchery—South Fork Salmon River
- Pahsimeroi Fish Hatchery—Pahsimeroi River

- Sawtooth Fish Hatchery—Upper Salmon River

Clearwater Subbasin Hatchery Facilities

- Crooked River
- Red River
- Powell—Colt Killed Creek

Hatchery methods used for capturing and spawning adult Chinook salmon and rearing juveniles for the ISS study followed accepted standard practices (for an overview of standard methods, see Leitritz and Lewis 1976; Piper et al. 1982; Erdahl 1994; Bromage and Roberts 1995; McDaniel et al. 1994; Pennell and Barton 1996).

Juvenile Marking and Release

Fish in each juvenile release group may have received up to two marks prior to release. Ventral fin clips or coded-wire tags (CWT) were used to mark all supplementation juveniles to distinguish them from other hatchery origin and naturally produced Chinook salmon. A small percentage of these individuals (≈ 500) received PIT tags, whose later detections were used to estimate survival and travel rates between release and Lower Granite Dam. Juveniles for supplementation releases in 2002 were reared, marked, and PIT tagged at the McCall Fish Hatchery, Pahsimeroi Fish Hatchery, Sawtooth Fish Hatchery, and Clearwater Fish Hatchery.

Juveniles produced by the locally derived broodstocks described above were released into ISS treatment streams at different life stages at prescribed numeric levels. For this report, we define three biologically distinct life stages for juvenile treatment: 1) summer parr released in July and August as age-0, 2) presmolts released during September and October as age-0, and 3) smolts released the following spring (March through April) as age-1. This report contains information on juveniles from brood years 2000 and 2001 and releases in 2001 and 2002.

Juvenile Migration and PIT Tag Detections

Juvenile migration is reported in two ways. First, we report specific trap operations during 2002, which includes the calendar dates that define the trapping period and the number of days traps were operated. Second, production for brood years 2000 and 2001 is estimated from the number of juvenile Chinook salmon trapped, marked, and recaptured during migration years 2001 and 2002.

We used a combination of rotary-screw and motorized inclined scoop traps on 12 study streams to collect emigrating juvenile Chinook salmon of natural origin (Table 2). Fish ≥60 mm fork length (FL) were marked with PIT tags to estimate abundance of both spring and fall emigrants and to provide minimum survival rates to Lower Granite Dam. Trapping data also provided additional life history information, such as length structure and emigration timing. Traps were installed in March and were operated daily through the ice-free season. Traps were positioned in the thalweg of each stream when possible. During periods of high water, traps were inspected several times during daylight hours and removed from the thalweg during extremely high flows. During low water periods, flow was directed towards the center of the traps using temporary rock fykes.

Table 2. Location of Idaho Supplementation Studies juvenile Chinook salmon traps in streams monitored by the Idaho Department of Fish and Game (IDFG) and the Shoshone-Bannock Tribes (SBT) in 2002.

Study Stream	Trap Type	Trap Location	Agency
Clearwater River basin			
Crooked Fork Cr.	Rotary screw	3.2 km upstream from mouth	IDFG
Colt Killed Cr.	Rotary screw	0.2 km upstream from mouth	IDFG
American R.	Rotary screw	1.9 km upstream from mouth	IDFG
Crooked R.	Scoop trap/Rotary screw	0.9 km upstream from mouth	IDFG
Red R.	Rotary screw	5.4 km upstream from mouth	IDFG
Salmon River basin			
South Fork Salmon R.	Rotary screw	Knox Bridge	IDFG
Marsh Cr.	Rotary screw	0.25 km upstream from confluence with Capehorn Cr.	IDFG
Lemhi R.	Rotary screw	0.2 km upstream of Hayden Cr.	IDFG
Pahsimeroi R.	Rotary screw	Directly below weir at Pahsimeroi Hatchery	IDFG
Upper Salmon R.	Rotary screw and Scoop trap	Sawtooth Hatchery intake	IDFG
W. Fk. Yankee Fk. Salmon R.	Rotary Screw	10 m upstream of confluence with the Yankee Fork	SBT
E. Fk. Salmon R.	Rotary Screw	200 m downstream of the Sawtooth satellite weir	SBT

Juvenile Chinook salmon were captured daily unless mechanical failures, high flows, debris, or ice prevented trap operation. Each morning, fish were removed from the traps and anesthetized in buffered Finquel® (MS-222), interrogated for PIT tags, weighed to the nearest 0.1 g, and measured to the nearest 1 mm FL. A subsample (typically 30 fish/day) of Chinook salmon ≥60 mm FL was marked with PIT tags according to procedures described by Kiefer and Forster (1991) and the PIT Tag Steering Committee (1992). Fish showing obvious signs of stress (e.g., descaling, poor equilibrium) were not tagged but released downstream of the trap. After tagging, juveniles were either released immediately after recovery or held in live boxes approximately 0.1-1.0 km upstream from the trap and released at dusk to facilitate trap efficiency estimates. A goal of tagging 700 summer, 500 fall, and 300 spring wild/natural emigrants per stream was targeted (Bowles and Leitzinger 1991). Data (species, length, weight) were also collected on nontarget species to assist other projects. Physical data, such as weather condition, staff gauge height, and stream temperature were also recorded daily.

For analysis, life stages used in production estimates were based on age, biological development, and arbitrary seasonal trapping dates. Spring/summer Chinook salmon “fry” were newly emerged young-of-the-year (YOY) captured prior to July 1 (spring trapping season). Fry became “parr” as they entered their first summer and included age-0 fish collected between July 1 and August 31 (summer trapping season) as they migrated from natal streams. Presmolts were juvenile fish that were collected moving downstream between September 1 and trap removal at ice-up (fall trapping season). Although juveniles in the act of migration before September 1 were defined as parr in this report, they also may be considered presmolts. Migrating presmolts did not show typical smolt characteristics (e.g., silvery color and the tendency to lose their scales easily). Smolts were age-1 migrants captured between the start of trapping and June 30.

Trap efficiencies and abundance of juvenile Chinook salmon migrating past the traps were estimated using the Gauss software package (Steinhorst et al. 2004). This program uses the Lincoln-Petersen estimator and modifications (e.g., Bailey’s estimator) for calculating abundance and the profile and bootstrap methods for calculating confidence intervals. For this report, we apply the Bailey estimator and compute 95% confidence intervals with the bootstrap

method (Steinhorst et al. 2004). The daily number of captured, marked, and recaptured (previously PIT tagged) fish were used to estimate efficiency, with the assumption that marked fish were released far enough upstream to permit random mixing with unmarked juveniles. Gauss uses an iterative solution to calculate the abundance estimate, and when enough iterations are run (typically 1,000), the estimates stabilize and a maximum likelihood estimate is obtained.

For brood year abundance estimates, we first stratified our juvenile data and calculated estimates by life stage using the Bailey's estimator. These point estimates, by life stage, were then summed to determine the number of brood year specific juveniles that migrated from each stream. In most cases, smolts and presmolts were easily discernable using length distribution data and PIT tag interrogations. We then determined 95% confidence intervals for brood year estimates based on the percentiles of the bootstrap distribution (Steinhorst et al. 2004). We present all of the estimates regardless of the number of recaptures, although at least three to four recaptures are needed to decrease the chance of statistical bias in the estimate (Ricker 1975). However, neither precocial male Chinook salmon nor Chinook salmon fry caught during the spring trapping season were included in the population or trap efficiency estimates, since both of these groups likely had a very different capture probability than actively migrating individuals.

We obtained PIT tag interrogation data from the Columbia River basin PIT Tag Information System (PTAGIS) database to document detections of supplementation and naturally produced juvenile Chinook salmon PIT tagged in the ISS program. We first queried the PTAGIS database for each study stream by migratory year for information on detection numbers at mainstem dams. Data were sorted to determine the first unique detection at each dam site. Unique detections from interrogation sites below Lower Granite Dam (LGR) were summed with those at LGR to obtain the total number of detected fish that reached LGR. Because it is likely that at least some PIT tagged fish go undetected at all four dams, cumulative detections are considered minimum for this report. Passage timing of 10%, 50%, and 90% of each release group was calculated from frequency distributions of detection dates at LGR.

RESULTS AND DISCUSSION

Juvenile Treatments

Juvenile supplementation release groups were created from adult Chinook salmon returning to the following locations: Crooked River, Red River, Colt Killed Creek, Pahsimeroi River, South Fork Salmon River, and the upper Salmon River (Table 3). Adults collected in 2000 and 2001 were spawned and the resulting juveniles were reared at various hatcheries to create the last ISS juvenile treatment groups. Parr and presmolt treatments (brood year 2001) were made between mid-July and late September 2002, and smolt treatments (brood year 2000) were made in March and April 2002 (Table 3).

The types of life-stages released in treatment streams were generally consistent with the original experimental design (Bowles and Leitzinger 1991) except in the South Fork Salmon River, which received a portion of its treatment juveniles as parr (smolts are prescribed in Bowles and Leitzinger 1991). The parr treatments were released from Stolle Ponds and were allowed to enter the river volitionally. This expanded treatment was prescribed to expand the current range of the spawning aggregate in the South Fork Salmon River by rearing and

releasing juveniles upstream of and within suspected historic spawning habitats (Sankovich and Hassemer 1999).

Table 3. Idaho Supplementation Studies juvenile Chinook salmon treatment releases in streams monitored by the Idaho Department of Fish and Game and the Shoshone-Bannock Tribes in 2002.

Treatment Stream	Release Date	Number Released	Life Stage	Brood Year	Number PIT tagged	Mark[a]	Broodstock Source[b]	Rearing Facility[c]
Clearwater Subbasin								
Colt Killed Creek	8/25/2002	299,690	Parr	2001	702	RV	POW	CAFH
Crooked River	9/27/2002	169,768	Presmolt	2001	490	RV	SFC	CAFH
Red River	9/27/2002	85,064	Presmolt	2001	492	LV	SFC	CAFH
Salmon Subbasin								
SF Salmon River	3/25/2002	41,700	Smolt	2000	600	RV	SFS	MFH
Stolle Pond	7/16/2002	61,800	Parr	2001	600	CWT	SFS	MFH/ST
Pahsimeroi River	4/09/2002	87,225	Smolt	2000	498	CWT	PAH	PFH
Upper Salmon River	4/19/2002	120,119	Smolt	2000	989	CWT	SAL	SFH

[a] Mark: RV = right pelvic fin clip, LV = left pelvic fin clip, CWT= coded-wire tag.

[b] Broodstock sources: POW = Powell, SFS = South Fork Salmon River, PAH = Pahsimeroi River (summer run), SAL = Salmon River, SFC= South Fork Clearwater.

[c] Rearing Facilities: CAFH = Clearwater Anadromous Fish Hatchery, MFH = McCall Fish Hatchery, MFH/ST = McCall Fish Hatchery and Stolle Pond, PFH = Pahsimeroi Fish Hatchery, SFH = Sawtooth Fish Hatchery.

Juvenile Trapping

In 2002, juvenile traps were operated in 12 streams managed by the IDFG and SBT. Most of these traps were installed soon after ice-out in the spring and generally operated through late October or until freezing conditions prevented daily operation (Table 4). However, adult Chinook salmon were trapped in the East Fork Salmon River and the West Fork Yankee Fork Salmon River screw traps, and the traps were removed in late August to comply with ESA requirements. The screw trap on the East Fork Salmon River was not installed until June 29 because of personnel issues.

Juvenile Abundance Estimates

We estimated the number of naturally produced juvenile Chinook salmon migrating from ISS study streams in 2002 (Table 5). Production varied substantially both between streams, juvenile life-stage groups, and brood years. In general, Crooked Fork Creek had the highest production estimates in the Clearwater River subbasin, and the South Fork Salmon River had the highest juvenile production estimates in the Salmon River subbasin.

Table 4. Trapping operations for juvenile Chinook salmon in streams managed by the Idaho Department of Fish and Game and Shoshone-Bannock Tribes in 2002.

Stream	Calendar Year	Trapping Period		
		Start Date	End Date	Total Days Trapped
Clearwater Subbasin				
American River	2002	4/12/02	10/31/02	210
Colt Killed Creek	2002	4/4/02	10/31/02	166
Crooked Fork Creek	2002	3/27/02	11/3/02	175
Crooked River	2002	4/4/02	10/31/02	214
Red River	2002	4/10/02	10/31/02	213
Salmon Subbasin				
Lemhi River	2002	3/12/02	12/9/02	268
Marsh Creek	2002	3/13/02	11/14/02	237
Pahsimeroi River	2002	2/27/02	12/2/02	278
South Fork Salmon River	2002	3/19/02	10/14/02	177
Upper Salmon River	2002	3/13/02	11/14/02	241
W Fk Yankee Fork Salmon River[a,b]	2002	3/26/02	8/21/02	100
East Fork Salmon River[b]	2002	6/29/02	8/18/02	54

[a] The WFYF screw trap was not fished from 5/09/02 to 5/14/02 and 5/20/02 to 6/24/02 due to high flows.
[b] The screw traps were pulled due to section 10 requirements when adult Chinook salmon were caught in the traps.

Table 5. Brood year production estimates and 95% confidence intervals (CI) from the recapture of PIT-tagged juvenile Chinook salmon migrants in Idaho Supplementation Study streams with screw traps operated by the Idaho Department of Fish and Game and Shoshone-Bannock Tribes during 2001—2003.

Stream	Brood Year and Life Stage	Abundance Estimate	95% CI	
			Lower	Upper
Clearwater subbasin				
American River	00 parr	2,669	2,081	3,388
	00 presmolts	4,804	3,240	7,241
	00 smolts	5,608	3,906	8,269
	01 parr/presmolts	10,214	7,402	15,096
	01 smolts	14,750	11,269	19,737
Colt Killed Creek	00 parr/presmolts	15,852	13,164	19,466
	00 combined	17,598	14,547	22,110
	01 parr/presmolts	5,308	4,309	7,228
	01 smolts	2,394	1,219	5,141
	01 combined	7,702	6,175	10,084
Crooked Fork Creek	00 parr/presmolts	39,115	35,290	44,073
	00 smolts	1,705	1,019	2,928
	00 combined	40,820	36,826	46,300
	01 parr/presmolts	28,152	25,978	30,486
	01 smolts	5,457	4,472	6,602
	01 combined	33,609	30,817	37,347
Crooked River	00 parr	4,250	3,449	5,202
	00 presmolts	4,536	3,793	5,582
	00 smolts	5,313	4,506	6,249

Table 5. Continued.

Stream	Brood Year and Life Stage	Abundance Estimate	95% CI Lower	95% CI Upper
Clearwater subbasin				
	01 parr/presmolts	1,238	545	2,097
	01 smolts	3,839	1,551	5,751
Red River	00 parr	2,527	1,761	3,901
	00 presmolts	677	569	810
	00 smolts	5,377	3,708	8,630
	00 parr/presmolts	82,277	67,108	102,651
	00 smolts	8,639	6,976	11,318
Salmon subbasin				
Lemhi River	00 presmolts	10,836	9,488	12,633
	00 smolts	1,489	1,034	2,222
	01 presmolts	40,429	35,625	45,418
	01 smolts	2,898	2,202	3,813
Marsh Creek	00 parr/presmolts	24,164	19,603	30,605
	00 smolts	461	372	556
	00 combined	24,625	19,858	30,895
	01 parr/presmolts	105,616	100,314	110,792
	01 smolts	1,706	1,576	1,857
	01 combined	107,322	102,501	112,268
Pahsimeroi River	00 parr/presmolts	12,649	10,344	16,531
	00 smolts	4,922	3,405	7,559
	00 combined	17,571	13,767	24,131
	01 parr/presmolts	56,378	51,091	62,682
	01 smolts	6,189	5,550	6,991
	01 combined	62,567	57,263	68,790
South Fork Salmon River	00 parr/presmolts	134,213	101,202	192,553
	00 smolts	3,927	3,293	4,717
	00 combined	138,140	101,098	203,435
	01 parr/presmolts	698,448	539,185	952,567
	01 smolts	2,270	1,938	2,672
	01 combined	700,718	533,361	927,236
Upper Salmon River	00 parr/presmolts	73,923	66,631	81,972
	00 smolts	24,410	14,756	43,887
	00 combined	98,333	87,078	111,372
	01 parr/presmolts	304,312	232,020	411,568
	01 smolts	28,182	25,053	32,277
	01 combined	332,494	264,906	430,892
West Fork Yankee Fork Salmon River	00 smolts[a]	NA	NA	NA
	01 parr/presmolts	1,966	1,207	4,001
	01 smolts	1,335	751	3,423
East Fork Salmon River	00 parr/presmolts	5,906	3,344	10,795
	01 parr/presmolts	1,768	857	3,813
	01 smolts	4,210	2,718	6,670

[a] The West Fork Yankee Fork Salmon River screw trap was not operated in 2001. In 2002, no BY00 smolts were recaptured, which precludes population estimates.

Interrogations

Supplementation and naturally produced juveniles were PIT tagged to estimate survival to and passage timing at LGR. Supplementation juveniles were tagged at the hatcheries prior to release, while naturally produced fish were tagged at the screw traps. The number of naturally produced and ISS supplementation juveniles from brood years 2000-2001 PIT tagged and detected at the lower Snake River dams are presented below (Table 6). Naturally produced parr from the Pahsimeroi River differed substantially in their passage timing from other study streams. The vast majority of parr tagged in both 2001 and 2002 were detected in the hydrosystem in the same calendar year as tagging. A total of 689 brood year 2000 parr were tagged in 2001 (Table 6). Of these 79 were detected in 2001 and 10 were detected in 2002. Passage timing of brood year 2001 parr was similar, with 2,182 parr tagged in 2002 and 656 later detected (Table 6). A total of 606 were detected in 2002 and 50 fish were detected in 2003.

Minimum survival estimates to Lower Granite Dam can be computed by dividing the number detected by the number tagged (Table 6), but this method has a serious limitation. Computing survival by this method precludes meaningful statistical comparisons between groups or over time. We will compute future estimates of survival using the more quantitatively powerful SURPH2 model. We also recommend that all cooperators use this model with historic ISS PIT tag detection data to compute adjusted survival estimates and facilitate future analyses.

Table 6. Detections of juvenile (brood year 2000-2001) Chinook salmon PIT tagged by the Idaho Supplementation Study in streams managed by the Idaho Department of Fish and Game and Shoshone-Bannock Tribes. Number detected is the total number of unique detections from one of the four Snake and Columbia river hydropower detection sites (Lower Granite [LGR], Little Goose, Lower Monumental, and McNary dams). Juvenile treatment releases are identified by (ISS). The remainder were naturally produced juveniles tagged and released at juvenile traps.

Stream	Brood Year	Life Stage	Number PIT Tagged	Total Number Detected	First Detection	Number Detected at LGR	10% Passage at LGR	50% Passage at LGR	90% Passage at LGR
Clearwater Subbasin									
American River	2000	Parr	6	0					
	2000	Presmolt	283	26	4/15/02	3			
	2000	Smolt	327	172	5/17/02	80	6/2/02	6/23/02	7/5/02
	2001	Presmolt	305	5	5/26/04	1			
	2001	Smolt	1,559	655	4/24/03	444	6/3/03	6/21/03	7/7/03
Colt Killed Creek	2000	Parr	702	6	5/3/03	0			
	2001	Parr	701	10	5/3/03	5	5/6/03	5/18/03	5/25/03
Crooked River	2000	Presmolt	207	27	4/3/02	11	4/15/02	4/26/02	6/21/02
	2000	Smolt	917	284	5/9/2002	130	5/31/02	6/24/02	7/7/02
	2001	Parr	1	0					
	2001	Smolt	472	119	5/18/03	70	5/28/03	6/23/03	7/10/03
	2000	Presmolt (ISS)	500	25	4/15/02	4			
	2001	Presmolt (ISS)	491	13	4/13/03	2			
Red River	2000	Parr	5	1	5/23/02	1			
	2000	Presmolt	400	41	4/10/02	22	4/14/02	5/11/02	6/23/02
	2000	Smolt	589	246	5/11/02	121	6/1/02	6/24/02	7/5/02
	2001	Presmolt	726	25	4/23/03	17	4/24/03	5/18/03	6/22/03
	2001	Smolt	769	218	4/25/03	148	5/28/03	6/18/03	7/8/03
	2000	Presmolt (ISS)	500	16	4/25/02	5			
	2001	Presmolt (ISS)	489	17	4/2/03	7			

Table 6. Continued.

Stream	Brood Year	Life Stage	Number PIT Tagged	Total Number Detected	First Detection	Number Detected at LGR	10% Passage at LGR	50% Passage at LGR	90% Passage at LGR
Salmon Subbasin									
South Fork Salmon River	2000	Parr (ISS)	600	25	5/2/02	9	5/8/02	6/1/02	6/3/02
	2000	Smolt (ISS)	600	224	4/18/02	55	5/4/02	5/9/02	5/20/02
	2001	Parr (ISS)	600	24	4/24/03	11	4/25/03	5/18/03	5/30/03
	2001	Presmolt	405	22	4/23/03	9	4/23/03	5/15/03	5/26/03
	2001	Smolt	219	77	4/24/03	38	5/25/03	5/31/03	6/15/03
Pahsimeroi River	2000	Parr	689	89	6/7/01	74	6/13/01	7/4/01	7/24/01
	2000	Presmolt	300	56	4/16/02	15	4/17/02	4/27/02	5/6/02
	2000	Smolt	127	66	4/13/02	20	4/15/02	4/23/02	5/12/02
	2001	Parr	2,182	656	5/30/02	313	6/14/02	6/27/02	7/19/02
	2001	Presmolt	2,206	340	4/3/03	184	4/13/03	4/23/03	5/6/03
	2001	Smolt	1,443	600	3/28/03	305	4/18/03	4/28/03	5/20/03
	2000	Smolt (ISS)	498	261	4/24/02	67	5/3/02	5/10/02	5/20/02
	2001	Smolt (ISS)	498	204	4/16/03	106	4/19/03	4/26/03	5/7/03
Lemhi River	2000	Parr	160	9	4/17/02	4			
	2000	Presmolt	1,199	375	4/14/02	91	4/16/02	4/20/02	5/4/02
	2000	Smolt	200	95	4/19/02	25	4/20/02	5/8/02	5/19/02
	2001	Parr	1,095	12	4/1/03	5			
	2001	Presmolt	1,822	314	3/28/03	159	4/12/03	4/23/03	5/3/03
	2001	Smolt	374	144	4/3/03	78	4/22/03	4/29/03	5/21/03
Upper Salmon River	2000	Smolt (ISS)	989	309	5/4/02	96	5/11/02	5/17/02	5/20/02
	2001	Smolt (ISS)	491	191	4/30/03	83	5/4/03	5/9/03	5/17/03
	2000	Parr	1,519	143	4/16/02	36	4/19/02	5/5/02	5/23/02
	2000	Presmolt	1,038	221	4/15/02	72	4/23/02	5/10/02	5/24/02
	2000	Smolt	695	356	4/20/02	104	5/5/02	5/21/02	6/1/02
	2001	Parr	1,494	93	4/3/03	55	4/19/03	4/3/03	5/25/03
	2001	Presmolt	2,093	281	4/7/03	156	4/18/03	5/3/03	5/25/03
	2001	Smolt	2,649	1,183	4/17/03	541	5/6/03	5/25/03	6/4/03
Marsh Creek	2000	Parr	519	123	4/13/02	35	4/16/02	4/26/02	5/21/02
	2000	Presmolt	1,048	296	4/15/02	86	4/23/02	5/21/02	5/28/02
	2000	Smolt	119	60	5/4/02	19	5/21/02	5/31/02	6/21/02
	2001	Parr	1,785	218	4/2/03	118	4/13/03	4/23/03	5/17/03
	2001	Presmolt	1,342	218	4/12/03	111	4/22/03	5/8/03	5/27/03
	2001	Smolt	650	257	4/30/03	126	5/16/03	5/30/03	7/1/03
East Fork Salmon River	2000	Parr	21	0					
	2000	Presmolt	271	24	4/10/02	7	4/10/02	5/14/02	5/26/02
	2000	Smolt	0						
	2001	Parr	23	0					
	2001	Presmolt	0						
	2001	Smolt	303	29	5/2/03	7	5/2/03	5/26/03	6/22/03
West Fork Yankee Fork Salmon River	2000	Parr	0						
	2000	Presmolt	0						
	2000	Smolt	20	2	5/15/02	1			
	2001	Parr	77	0					
	2001	Presmolt	0						
	2001	Smolt	110	51	5/25/03	22	5/30/03	6/11/03	6/27/03

LITERATURE CITED

Bowles, E. C., and E. J. Leitzinger. 1991. Salmon supplementation studies in Idaho rivers. U.S. Department of Energy, Bonneville Power Administration Contract No. DE-B179-89BPO1466. Portland, Oregon.

Bretz, C., and J. M. Olson. 2003. Salmon Supplementation Studies in Idaho Rivers, Field Activities Conducted on Clear and Pete King Creeks in 2002. Annual program progress report to the Bonneville Power Administration, Project Number 198909801, Portland, Oregon.

Bromage, N. R., and R. J. Roberts. 1995. Broodstock Management and Egg and Larval Quality. Blackwell Science Ltd. Cambridge, Massachusetts.

Erdahl, D. A. 1994. Inland Salmonid Broodstock Management Handbook. U.S. Department of the Interior, Fish and Wildlife Service. 712 FW 1.

Kiefer, R. B., and K. Forster. 1991. Intensive evaluation monitoring of Chinook salmon and steelhead trout production, Crooked River and upper Salmon River sites, Idaho. Idaho Department of Fish and Game, Annual Report to Bonneville Power Administration, Contract DE-AI79-84BP13381, Project 83-7. Boise, Idaho.

Kohler, A., D. Taki, A. Teton. 2001. Salmon Supplementation Studies in Idaho Rivers. Shoshone-Bannock Tribes, Annual Program Progress Report 1992-2000 to the Bonneville Power Administration, Contract Number 00004012, Project Number 198909803. Portland, Oregon.

Leitritz, E., and R. C. Lewis. 1976. Trout and salmon culture (hatchery methods). California Department of Fish and Game Fish Bulletin 164.

Lockhart, J., and R. Kinzer. 2006. Salmon Supplementation Studies in Idaho Rivers, Brood Year 2000. Annual program progress report to the Bonneville Power Administration, Project Number 198909802, Portland, Oregon.

Lockhart, J., R. Kinzer, and T. Covel. 2006. Salmon Supplementation Studies in Idaho Rivers, Brood Year 2001. Annual program progress report to the Bonneville Power Administration, Project Number 198909802, Portland, Oregon.

Lutch, J., B. Leth, K. A. Apperson, A. Brimmer, and N. Brindza. 2003. Idaho supplementation studies. Project Progress Report to the Bonneville Power Administration, Contract Number DE-BI79-89BP01466. Portland, Oregon.

McDaniel, T. R., K. M. Prett, T. R. Meyers, T. D. Ellison, J. E. Follett, and J. A. Burke. 1994. Alaska Sockeye Salmon Culture Manual. Special Fisheries Report No. 6. Alaska Department of Fish and Game, Juneau, Alaska.

Pennell, W., and B. A. Barton. 1996. Principles of Salmonid Aquaculture. Elsevier Science B. V. Amsterdam, The Netherlands.

Piper, G. R., I. B. McElwain, L. E. Orme, J. P. McCraren, L. G. Gowler, and J. R. Leonard. 1982. Fish Hatchery Management. U.S. Fish and Wildlife Service. Washington, D.C.

PIT Tagging Steering Committee. 1992. PIT tag specification document, Columbia River Basin PIT tag information system, data source input specifications. 33 pp.

Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin of the Fisheries Research Board of Canada 191. 382 pp.

Sankovich, P., and P. Hassemer. 1999. Spawning distribution of outplanted adult summer Chinook salmon in the South Fork Salmon River, 1992-1994. Idaho Department of Fish and Game. Project Progress Report #99-04. Boise, Idaho.

Steinhorst, K., Y. Wu, B. Dennis, and P. Kline. 2004. Confidence intervals for fish out-migration estimates using stratified trap efficiency methods. Journal of Agricultural, Biological, and Environmental Statistics 9:284-299.

Venditti, D. A., K. A. Apperson, A. Brimmer, N. Brindza, C. Gass, A. Kohler, and J. Lockhart. 2005. Idaho supplementation studies brood year 2002 cooperative report. Annual Program Progress Report to the Bonneville Power Administration, Contract Numbers 00006630, 00004998, 00016291, 00004127, 00004012; Project Numbers 198909800, 198909801, 198909802, 198909803. Portland, Oregon.

Prepared by:

David A. Venditti
Senior Research Fisheries Biologist
Idaho Department of Fish and Game

Andy Kohler
Research Biologist
Shoshone-Bannock Tribes

Kimberly A. Apperson
Regional Fisheries Biologist
Idaho Department of Fish and Game

Bruce Barnett
Senior Fisheries Technician
Idaho Department of Fish and Game

Arnold Brimmer
Regional Fisheries Biologist
Idaho Department of Fish and Game

Nathan Brindza
Regional Fisheries Biologist
Idaho Department of Fish and Game

Approved by:

Steve Yundt, Chief
Bureau of Fisheries
Idaho Department of Fish and Game

Daniel J. Schill
Fisheries Research Manager
Idaho Department of Fish and Game

Chad Colter
Fish and Wildlife Coordinator
Shoshone-Bannock Tribes