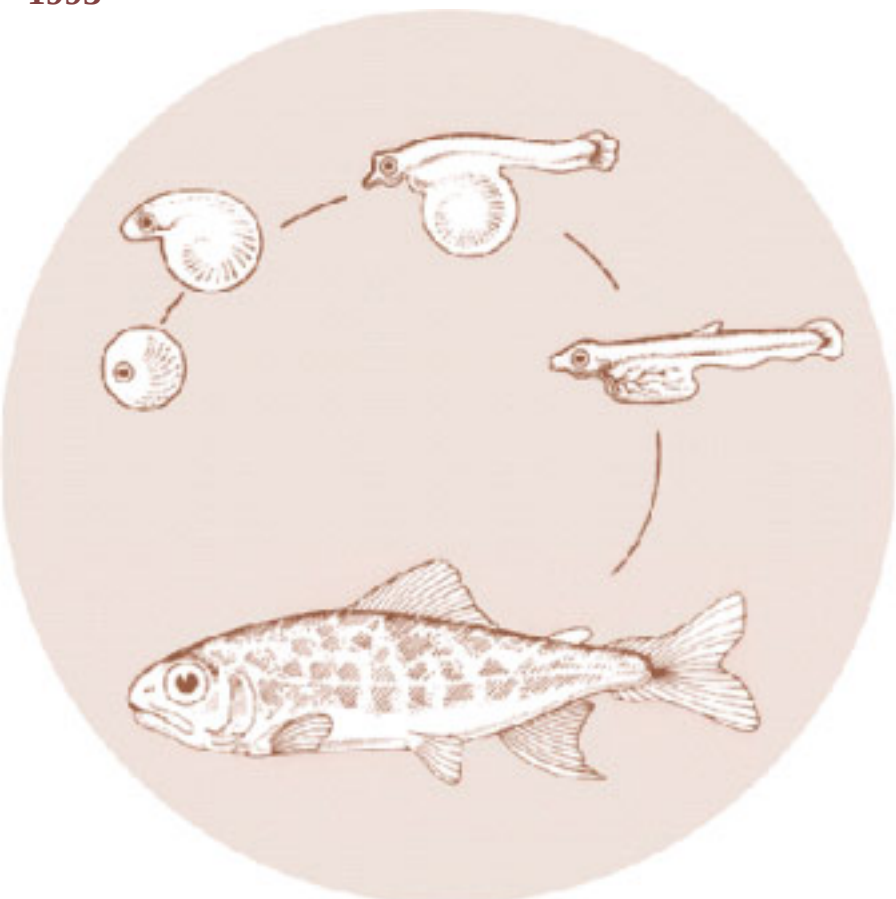
Salmon Supplementation Studies in Idaho Rivers

Idaho Supplementation Studies

Annual Report
1993



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Bonneville Power Administration
P.O. Box 3621
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SALMON SUPPLEMENTATION STUDIES IN IDAHO RIVERS

Annual Report 1993

Prepared by

Jay A. Hesse, Fisheries Biologist
and
Billy D. Arnsberg, Fisheries Biologist

Nez Perce Tribe
Department of Fisheries Resources Management

Prepared for:

Thomas S. Vogel, Project Officer
U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, Oregon 97208-3621

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ABSTRACT

The Idaho Salmon Supplementation Study is a cooperative effort between state, federal, and tribal agencies to assess what strategies, both brood stock and release stage, are best for supplementating natural or depleted spring and summer chinook salmon populations and what effect supplementation has on these populations. Evaluation of treatment and control streams focuses on parr densities, juvenile yield and survival, adults returns to weirs, and redd counts.

This report represents the Nez Perce Tribe's 1993 research efforts, including: parr density estimates from snorkeling observations, trapping and PIT tagging data examining fall emigration and smolt outmigration characteristics, and spawning ground surveys to determine adult escapement. Estimates of parr densities for individual habitat types were highest for pools in Lolo Creek, while no chinook parr were observed in Yoosa, Eldorado, and Squaw Creeks. Low parr densities limited PIT Tagging and examination of emigration and smolt outmigration primarily to Lolo Creek. Screw trap efficiencies varied, ranging from 23 percent to 54 percent. A high of 123 redds were observed in Johnson Creek and no redd were observed in Squaw Creek. Needed modifications to the ISS study design are discussed.

ACKNOWLEDGEMENTS

The Nez Perce Tribal Executive Committee authorized this research, with funding provided by the Bonneville Power Administration (BPA), U.S. Department of Energy. Contributions to this project have and continue to come from many individuals associated with the Nez Perce Tribe and with state and federal agencies. In order to assure proper and complete acknowledgment of those individuals we will postpone individual acknowledgement until the final report. Until that time we thank all contributing individuals for their assistance in this cooperative research project.

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INTRODUCTION

This is the results of the second year of Salmon Supplementation Studies in Idaho Rivers conducted by the Nez Perce Tribe Department of Fisheries Management. The Nez Perce Tribe (NPT) has coordinated chinook salmon supplementation research activities with the Bonneville Power Administration (BPA), Idaho Department of Fish and Game (IDFG), U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), U.S. Forest Service (USFS), and the Shoshone Bannock Tribes (SBT). The project is a cooperative effort involving members of the Idaho Supplementation Technical Advisory Committee (ISTAC). This project has also been extensively coordinated with the Supplementation Technical Work Group (STWG) which identified specific research needs and integrated and coordinated supplementation research activities through development of a five year work plan.

In this study we are assessing what strategies, both brood stock and release stage, are best for supplementing natural or depleted spring and summer chinook populations and what effect supplementation has on these populations. This research should identify which supplementation strategies employed are beneficial in terms of increasing adult returns and the ability of these returns to sustain themselves. Biological evaluation points will be parr density, survival to Lower Granite Dam, adult return to weirs, redd counts and presmolt and smolt yield from both treatment and control streams. Genetic monitoring of certain treatment and control populations will also occur (Bowles and Leitzinger 1991).

The project objectives taken from the experimental design (Bowles and Leitzinger 1991) are:

1) Monitor and evaluate the effects of supplementation on presmolt and smolt numbers and spawning escapements of naturally produced chinook salmon.

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

3) Determine which supplementation strategies (brood stock and release stage) provide the quickest and highest response in natural production without adverse effects on productivity.

4) Develop supplementation recommendations.

DESCRIPTION OF STUDY AREAS

The Salmon Supplementation Studies includes a number of streams throughout the Salmon and Clearwater River drainages. We monitored Squaw, Papoose, Yoosa, Eldorado, Lolo, and Newsome Creeks in the Clearwater River drainage (Figure 1), and Slate and Lake Creeks and the Secesh River in the Salmon River drainage (Figure 2). We also conducted spawning ground surveys in Johnson Creek (Figure 2). Of these streams, all are supplementation streams in the Clearwater River drainage and all are control streams in the Salmon River drainage except Slate Creek which is a supplementation stream.

Areas surveyed for parr abundance within each study stream are listed in Table 1 which describes the locations of the lowest and uppermost transects snorkeled. Table 2 describes the area surveyed during spawning ground counts within each study stream.

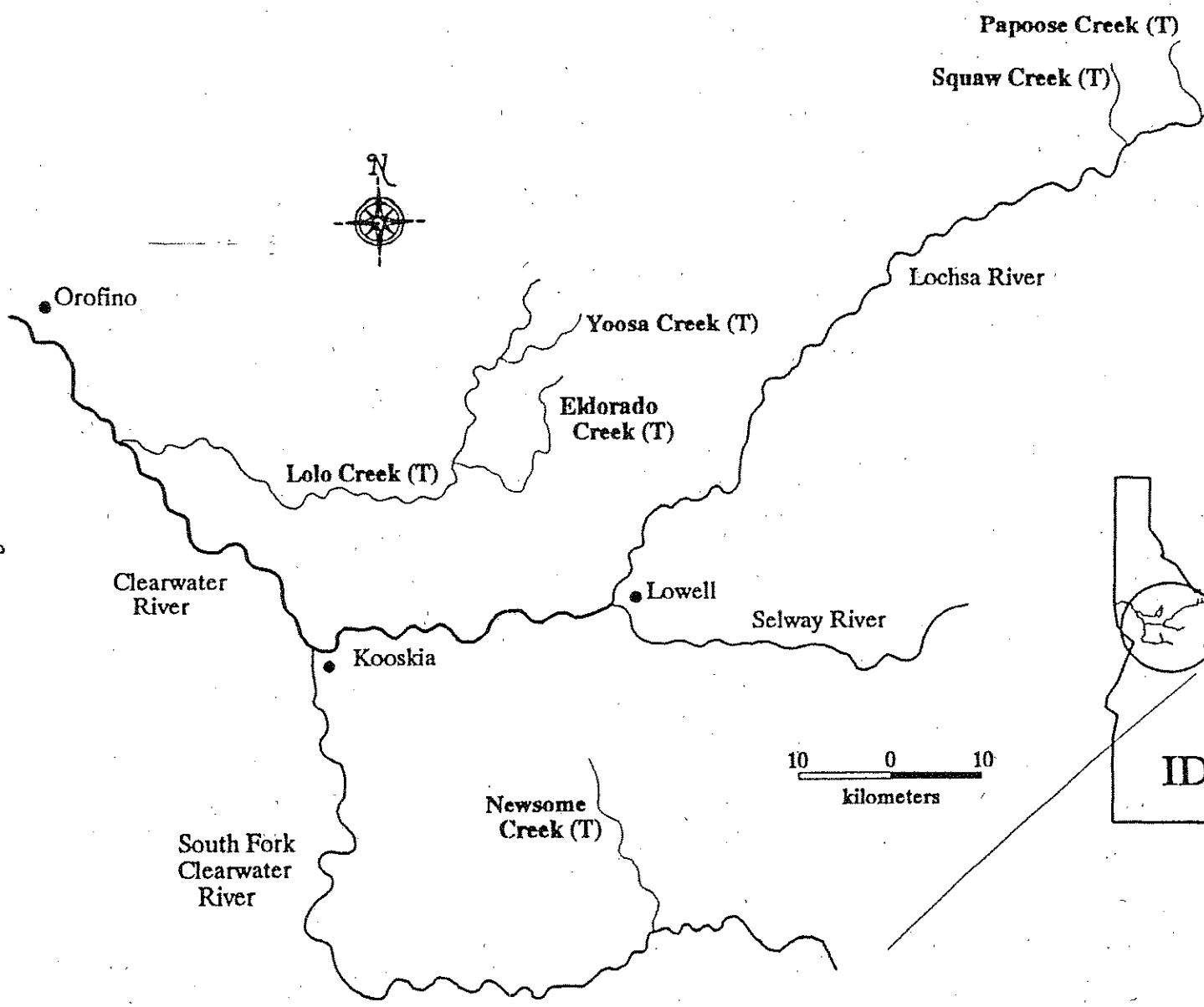

Figure 1. Treatment (T) streams (bold) in the Clearwater River drainage associated with Idaho Supplementation S
by the Nez Perce Tribe.

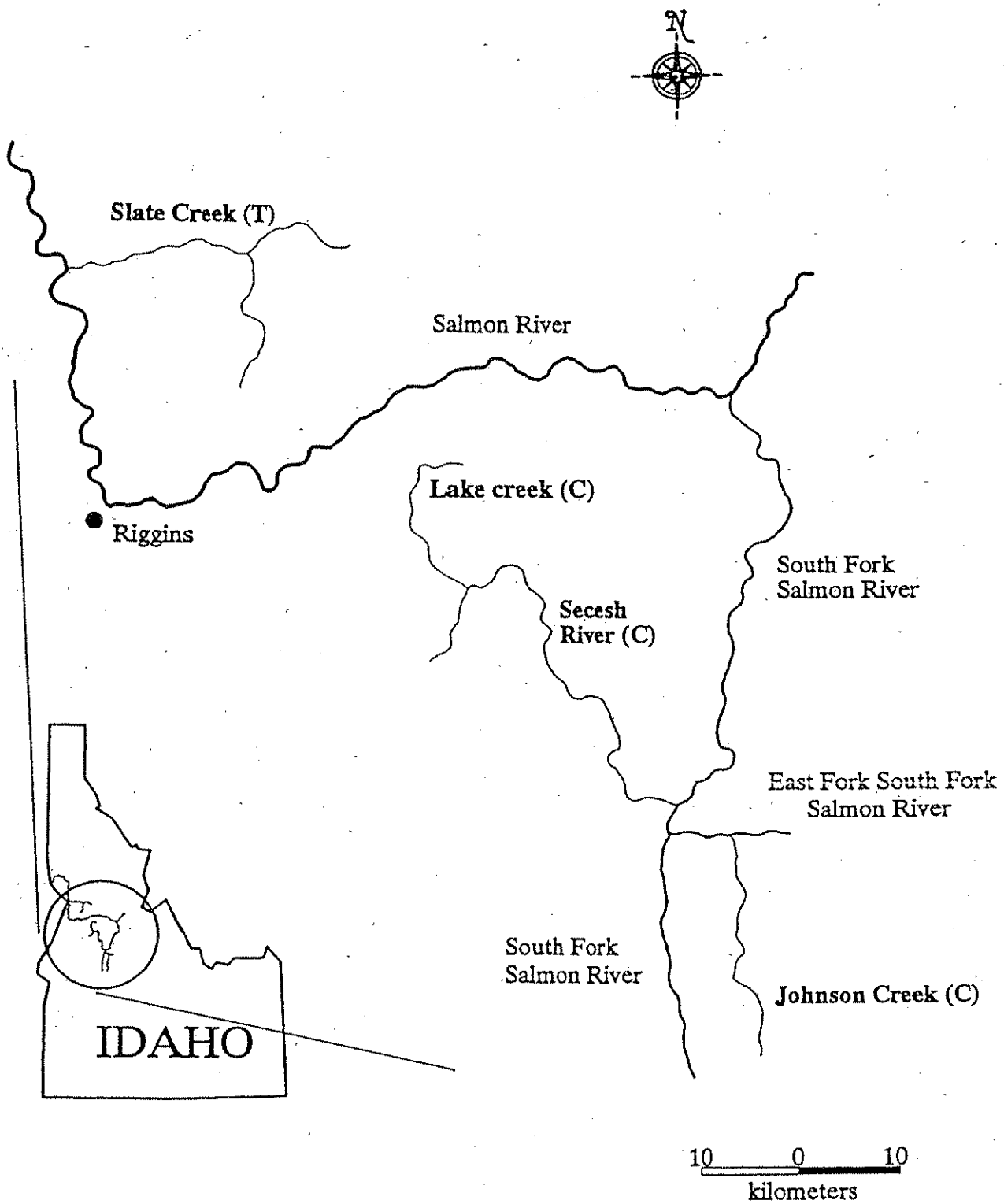

Figure 2. Treatment (T) and control (C) streams (bold) in the Salmon River drainage associated with Idaho Supplementation Studies and monitored by the Nez Perce Tribe.

Table 1. Location of the lowest and uppermost parr abundance transects in Idaho Supplementation Study streams monitored by the Nez Perce Tribe.

Stream	Lowest and Uppermost Transects
Lake Creek	Mouth to bridge at forest route 318.
Secesh River	Chinook Campground to mouth of Lake Creek.
Slate Creek	Mile marker number 3 to foot bridge 0.7 km up Little Slate Creek.
Lolo Creek	Campground upstream of North Fork of Mud Creek to mouth of Yoosa Creek.
Eldorado Creek	Mouth to Dollar Creek Bridge.
Yoosa Creek	Mouth to Camp Creek (campground).
Newsome Creek	Mouth to 1.9 km above the town of Newsome.
Papoose Creek	Mouth to mouth of East and West Forks of Papoose Creek.
Squaw Creek	Mouth to mouth of East and West Forks of Squaw Creek.

Table 2. Location of areas surveyed for spawning activity and carcass recovery in Idaho Supplementation Studies and monitored by the Nez Perce Tribe.

Stream	Survey Location	Length
Johnson Creek	"Index Area" from Moose Creek to Deadhorse Creek.	4.8 km
Lake Creek	Mouth to Willow Creek.	13.8 km
Secesh River	Alex Creek to Grouse Mountian Bridge.	12.2 km
Slate Creek	Willow Creek to foot bridge 0.7 km up Little Slate Creek.	5.5 km
Lolo Creek	Bradford Bridge to mouth of Yoosa Creek.	16.7 km
Yoosa Creek	Mouth to Camp Creek (campground).	4.4 km
Eldorado Creek	Snow Creek to Fan Creek.	3.5 km
Newsome Creek	Mouth to Mule Creek (2.2 km above town of Newsome).	15.1 km
	Town to transect #11(new '94).	1.0 km
	Town to transect #12(new '94).	1.9 km
	Town to Haysford Creek.	3.1 km
	Town to beginning of 2nd area of minning tailings.	5.7 km
Squaw Creek	Mouth to mouth of East and West Forks of Squaw Creek.	6.0 km
Papoose Creek	Mouth to mouth of East and West Forks of Papoose Creek.	3.0 km

METHODS

All methods for the 1992 field season were followed as described in Bowles and Leitzinger (1991).

Parr Abundance

Estimates of mid-summer parr abundance followed a standardized snorkeling technique described in the ISS study design (Bowles and Leitzinger 1991). We snorkeled upstream with the number of snorkelers dependent upon stream width and water clarity. Transects snorkeled followed those sampled in 1992, representing a random selection of existing habitat types. The numbers of young of year (YOY) and yearling chinook salmon observed were recorded. Other species were recorded by number and size (nearest inch). Stream visibilities were determined prior to snorkeling.

Physical Habitat

Physical habitat characteristics were determined for each transect sampled. Predominate habitat types (pool, run, pocket water, and riffle) were assigned to each transect based on stream gradient, water velocity and depth, and channel structure/substrate (Rosgen 1985). Stream width was recorded at the top and bottom of each transect and at habitat type changes within each transect. Length of each habitat type and total transect length were recorded. Stream gradient was determined with a hand held level and stadia rod as the amount of vertical drop from the top to the bottom of each transect. Substrate (percent sand, gravel, rubble, boulder, and bedrock) and depth measurements were recorded at 1/4, 1/2, and 3/4 widths for 1-3 locations within each habitat type.

Water Temperature

Water temperatures were taken at each parr abundance transect and conductivity recorded for each stream. Thermograph data providing continuous water temperatures for each study stream are available through NPT fisheries research projects or the USFS.

PIT Tagging

We PIT tagged chinook salmon parr and smolts in accordance with the protocols outlined by the PIT Tag Steering committee (1992). Collection of fish prior to tagging was accomplished with minnow traps, screw traps, and electrofishing. Marking (fin clipping/PIT tagging) of hatchery/treatment fish was done prior to stocking. We PIT tagged by hand only when water temperatures were less than 16 degrees celsius and targeted chinook salmon greater than 60 mm (fork length) with none smaller than 55 mm (fork length) tagged. A minimum sample size of 500 chinook salmon per stream was desired in order to obtain sufficient detections at downstream interrogation facilities.

Fall Emigrant and Smolt Outmigration

Two screw traps were operated on Lolo Creek (one at river km 41 and one at river km 1) during the fall of 1992 and one screw trap was operated on Lolo Creek (river km 1) during the spring of 1993. These screw traps aided in the examination of fall emigration to lower Lolo Creek and the Clearwater River, spring outmigration to the Clearwater River, and also assisted in the collection of samples for PIT tagging. Screw traps were generally run only during the week, being raised during the weekends. Traps were checked at least once in the morning with the species and size (mm) of all captured fish, water temperature, and stream gauge reading recorded. All chinook salmon and steelhead were interrogated for the presence of PIT tags. Screw trap efficiencies were determined periodically by releasing ($n > 50$) PIT tagged chinook salmon approximately 200 meters above trap after dusk.

Spawning Escapement

We conducted spawning ground surveys/redd counts by walking to determine spawning escapement in all study streams. We recorded each redd location, number of redds, live adults, and carcasses found during surveys. Redds were flagged and redd number recorded during each survey. Salmon carcasses were examined and length (fork and hypural), sex, and percentage spawned recorded. We also took scale samples for later analysis. The caudal fin was removed to negate repetitive sampling.

RESULTS

Parr Abundance

A total of 97 transects (15 in Eldorado Creek, 6 in Lake Creek, 21 in Lolo Creek, 13 in Newsome Creek, 8 in Papoose Creek, 8 in Secesh River, 7 in Slate Creek, 11 in Squaw Creek, and 8 in Yoosa Creek) were snorkeled across all study streams during 1993. Fish densities (number/100m^2) by habitat type for each transect are presented in Table 3. The average chinook salmon density was highest for pool habitat in Lolo Creek (10.24/100m^2), while no chinook salmon parr were observed in Yoosa, Eldorado, and Squaw Creeks (Table 4). Estimates of parr density per stream were obtained from a weighted average density across all habitat types and are reported as "all transects combined" in Table 4. Estimates of total parr production for each study stream will be calculated using parr density estimates per habitat type and estimates of the total available habitat. This analysis is still on going. Also shown in Table 4 are the densities of chinook salmon yearlings observed per habitat type.

Physical Habitat and Temperatures

Compilation and analysis of physical habitat data and water temperature data is ongoing.

PIT Tagging

All marked fish (both natural and treatment/hatchery) captured and/or released in study streams are tabulated in Table 5. PIT tagging of chinook salmon occurred in the summer/fall of 1992 and spring of 1993 on Lolo Creek. A total of 947 chinook salmon were PIT tagged during the summer/fall and an additional 122 chinook salmon were PIT tagged in the spring. Numbers PIT tagged for each trapping location were tabulated (Table 5).

Fall Emigrant and Smolt Outmigration

A total of 352 and 231 chinook salmon parr were captured and PIT tagged in the upper Lolo Creek screw trap between October 23 and November 10, and in the lower Lolo creek screw trap between November 12 and November 24, 1992 respectively. A total of 1,212 chinook salmon were captured, with 853 receiving PIT tags, in upper/lower Lolo creek screw traps during the fall of 1993. Further analysis of the fall 1993 trapping will be included in the 1994 report as recapture information becomes available.

Screw trap efficiencies for chinook salmon were estimated on five occasions and once for steelhead during the fall of 1992 and spring of 1993. Trap efficiencies for chinook salmon in the upper trap were 26.7% and 32.2%, while efficiencies for the lower trap ranged from 23.25% to 54%.

Table 3. Fish densities (number/100m^2) in streams associated with Idaho Supplementation and monitored by the Nez Perce Tribe, 1993.

Stream	Habitat Type	Area (m^2)	Chinook Age 0+	Chinook Age 1+	Chinook Adults	Steelhead Wild	Steelhead Hatchery	Cutthroat Trout	Brook Trout	Bull Trout	Whitefish	Other[x]
Lake Creek												
	run	679.66	4.56	0.15	0.15	0.44	0.00	0.00	0.29	0.29	0.15	0
	run	846.45	20.44	0.59	0.00	6.38	0.00	0.12	0.12	0.35	1.18	0
	riffle	196.41	0.00	0.00	0.00	10.69	0.00	0.00	0.00	0.00	0.00	0
	run	561.12	0.89	0.53	0.18	2.14	0.00	0.00	0.89	0.71	0.18	0
	run	282.10	0.35	0.00	0.71	0.71	0.00	0.00	0.00	0.00	3.19	Sc
	run	184.01	1.09	0.00	0.00	1.63	0.00	0.00	0.00	0.00	0.00	0
	riffle	131.10	0.76	0.00	0.00	5.34	0.00	0.00	0.00	0.76	0.00	0
	pool	422.14	0.24	0.00	0.00	1.18	0.00	0.00	1.18	1.42	0.00	0
Sesech River												
	run	763.61	3.27	0.00	0.00	0.39	0.00	0.00	0.13	0.00	0.00	Dace
	run	726.22	13.36	0.14	0.69	2.75	0.00	0.14	0.00	0.00	0.69	0
	pool	471.84	7.84	0.21	0.00	10.38	0.00	0.85	0.21	0.42	0.42	0
	run	275.75	8.70	0.00	0.00	5.08	0.00	0.73	0.36	0.00	0.00	0
	run	568.33	0.18	0.18	0.18	2.29	0.00	0.00	0.00	0.00	0.53	0
	run	1196.59	2.34	0.00	0.00	2.51	0.00	0.17	0.08	0.08	0.33	0
	riffle	151.05	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0
	pocket water	714.85	0.98	0.00	0.00	1.82	0.00	0.14	0.00	0.14	0.42	0
	pocket water	675.00	1.04	0.00	0.00	0.30	0.00	0.00	0.15	0.15	0.00	0
	run	377.26	0.80	0.53	0.00	0.80	0.00	0.27	0.27	0.00	0.00	0
Slate Creek												
	run	527.76	0.19	0.38	0.19	11.18	0.00	0.38	0.19	0.00	0.38	0
	pocket water	784.50	0.76	0.00	0.00	6.88	0.00	0.00	0.00	0.00	0.00	0
	pocket water	694.98	0.43	0.00	0.00	4.89	0.00	0.14	0.14	0.00	0.00	0
	run	210.56	0.00	0.00	0.00	9.50	0.00	1.90	0.00	0.00	0.00	Sc
	pocket water	531.75	4.70	0.00	0.00	4.33	0.00	0.19	0.00	0.00	0.19	Sc,TF
	pocket water	619.73	1.13	0.00	0.16	6.45	0.00	0.00	0.00	0.00	0.00	0
	pocket water	240.19	0.83	0.00	0.00	7.49	0.00	0.00	0.00	0.00	0.00	0
Yoosa Creek												
	run	372.90	0.00	0.00	0.00	2.41	0.00	0.00	0.00	0.00	0.00	0
	run	301.72	0.00	0.00	0.00	3.31	0.00	0.00	0.00	0.00	0.00	0
	run	370.44	0.00	0.00	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0
	run	397.44	0.00	0.00	0.00	2.52	0.00	0.00	0.00	0.00	0.00	0
	run	501.84	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0
	run	238.08	0.00	0.00	0.00	2.52	0.00	0.00	0.00	0.00	0.00	0
	riffle	335.72	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0
	run	543.86	0.00	0.00	0.00	1.84	0.00	0.00	0.00	0.00	0.00	0
	run	174.00	0.00	0.00	0.00	4.02	0.00	0.00	0.57	0.00	0.00	0
	riffle	59.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Eldorado Creek												
	run	454.48	0.00	0.00	0.00	1.10	0.00	0.00	0.00	0.00	0.00	0
	run	199.40	0.00	0.00	0.00	15.55	0.00	0.00	0.50	0.00	0.00	0
	riffle	205.81	0.00	0.00	0.00	4.37	0.00	0.00	0.00	0.00	0.00	0
	pool	65.01	0.00	0.00	0.00	7.69	0.00	0.00	0.00	0.00	0.00	0
	pocket water	589.18	0.00	0.00	0.00	0.34	0.00	0.00	0.00	0.00	0.00	Sc
	run	306.67	0.00	0.00	0.33	1.30	0.00	0.00	0.00	0.00	0.00	0
	riffle	98.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
	run	394.44	0.00	0.00	0.00	0.51	0.00	0.00	0.00	0.00	0.00	0
	run	747.72	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0
	run	590.55	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	Dace,Sc,
	run	401.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Sc
	run	408.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
	run	484.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
	run	928.35	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.11	Dace,Sc
	run	152.96	0.00	0.00	0.00	1.31	0.00	0.00	0.00	0.00	0.00	0
	pool	426.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Sc
	pool	595.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Sc
	pool	262.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0

Table 3. Continued.

Stream	Habitat Type	Area (m^2)	Chinook Age 0+	Chinook Age 1+	Chinook Adults	Steelhead Wild	Steelhead Hatchery	Cutthroat Trout	Brook Trout	Bull Trout	Whitefish	Other[a]
Lolo Creek												
	run	726.43	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.14	0
	riffle	816.61	0.00	0.00	0.00	1.10	0.00	0.00	0.00	0.00	0.49	0
	run	1299.60	0.00	0.00	0.00	0.85	0.00	0.00	0.00	0.00	0.31	0
	riffle	283.20	0.00	0.00	0.00	2.12	0.00	0.00	0.00	0.00	0.00	0
	riffle	277.02	0.72	0.00	0.36	8.30	0.00	0.00	0.00	0.36	2.17	0
	pool	1683.66	1.43	0.00	0.00	0.36	0.00	0.00	0.00	0.00	0.06	0
	run	315.84	2.53	0.00	0.00	6.65	0.00	0.00	0.00	0.00	0.00	0
	run	574.05	17.59	0.00	0.17	2.44	0.00	0.00	0.00	0.00	0.17	0
	run	427.68	9.12	0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	0
	riffle	390.72	1.02	0.00	0.00	0.51	0.00	0.00	0.00	0.00	0.00	0
	pool	229.76	29.16	0.00	0.44	1.31	0.00	0.00	0.00	0.00	0.00	0
	riffle	565.97	0.88	0.00	0.00	1.77	0.00	0.00	0.00	0.00	0.00	0
	pool	702.00	0.14	0.14	0.00	1.14	0.00	0.00	0.00	0.00	0.00	0
	riffle	335.40	0.00	0.00	0.00	0.89	0.00	0.00	0.00	0.00	0.00	0
	run	707.97	0.00	0.00	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0
	riffle	109.50	8.22	0.00	0.00	2.74	0.00	0.00	0.00	0.00	0.91	0
	pocket water	652.68	0.00	0.00	0.00	1.07	0.00	0.00	0.00	0.00	0.00	0
	run	1170.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
	run	931.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0
	run	800.08	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0
	run	470.82	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
	riffle	161.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
	run	417.05	1.20	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0
	run	675.69	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0
	run	594.50	0.17	0.00	0.17	0.34	0.00	0.00	0.00	0.00	0.00	0
	run	984.43	3.56	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0
	run	543.24	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.00	0
	pocket water	487.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
	run	517.70	0.00	0.00	0.00	2.90	0.00	0.00	0.00	0.00	0.00	0
Newsome Creek												
	riffle	170.82	0.00	0.00	0.00	12.88	0.00	0.00	0.00	0.00	0.00	0
	run	590.40	1.86	0.17	0.00	24.39	0.00	0.00	0.00	0.00	0.85	0
	riffle	156.51	0.00	0.00	0.00	57.50	0.00	0.64	0.00	0.00	1.28	0
	run	368.00	0.00	0.00	0.00	17.93	0.00	0.54	0.00	0.00	0.54	Sc
	run	1031.94	2.33	0.00	0.19	7.36	0.00	0.19	0.00	0.10	2.62	Dace,Tf
	run	237.25	0.00	0.00	0.00	20.23	0.00	0.42	0.00	0.00	1.69	0
	pocket water	217.53	0.00	0.00	0.00	27.12	0.00	0.00	0.00	0.00	1.38	S
	riffle	217.65	0.00	0.00	0.00	8.27	0.00	0.00	0.00	0.00	1.38	0
	run	352.81	0.85	0.00	0.00	15.87	0.00	0.28	0.00	0.28	4.25	Dace,S
	riffle	174.40	1.72	0.00	0.00	6.88	0.00	0.00	0.00	0.00	2.29	Dace
	run	143.78	3.48	0.00	0.00	4.87	0.00	0.70	0.00	0.70	4.87	Sc
	riffle	234.08	2.56	0.00	0.00	34.18	0.00	0.00	0.00	0.00	2.99	Sc,Tf
	pool	78.80	1.27	0.00	0.00	20.30	0.00	1.27	0.00	0.00	6.35	0
	run	468.45	4.91	0.00	0.00	15.16	0.00	0.00	0.00	0.00	5.12	0
	run	99.16	2.02	0.00	0.00	18.15	0.00	0.00	0.00	0.00	17.14	0
	riffle	116.73	1.71	0.00	0.00	21.42	0.00	0.00	0.00	0.00	2.57	0
	pool	88.92	13.50	0.00	0.00	32.61	0.00	0.00	0.00	0.00	0.00	0
	run	226.22	0.00	0.00	0.00	18.57	0.00	0.00	0.00	0.00	4.42	0
	pool	105.84	0.00	0.00	3.78	15.12	0.00	0.94	0.00	0.94	6.61	Sc
	run	321.12	0.00	0.00	0.00	16.82	0.00	0.31	0.00	0.00	4.98	Dace
Squaw Creek												
	pool	54.23	0.00	0.00	0.00	3.69	0.00	1.84	0.00	0.00	0.00	0
	run	654.00	0.00	0.00	0.00	3.06	0.00	0.76	0.00	0.00	0.00	0
	run	292.22	0.00	0.00	0.00	16.08	0.00	4.11	0.00	0.68	0.00	0
	riffle	181.65	0.00	0.00	0.00	24.22	0.00	1.10	0.00	0.00	0.00	0
	pocket water	143.93	0.00	0.00	0.00	6.95	0.00	0.00	0.00	0.69	0.00	0
	run	158.97	0.00	0.00	0.00	7.55	0.00	1.26	0.00	0.00	0.00	0
	run	312.24	0.00	0.00	0.00	8.65	0.00	0.64	0.00	0.00	0.00	0
	riffle	183.73	0.00	0.00	0.00	5.99	0.00	0.00	0.00	0.00	0.00	0

Table 3. Continued.

Stream	Habitat Type	Area (m^2)	Chinook Age 0+	Chinook Age 1+	Chinook Adults	Steelhead Wild	Steelhead Hatchery	Cutthroat Trout	Brook Trout	Bull Trout	Whitefish	Other[a]
Squaw Creek												
Cont.	pool	86.35	0.00	0.00	0.00	6.95	0.00	0.00	0.00	1.16	0.00	0
	run	82.94	0.00	0.00	0.00	89.22	0.00	0.00	0.00	1.21	0.00	0
	riffle	245.96	0.00	0.00	0.00	6.91	0.00	0.00	0.00	0.00	0.00	0
	riffle	180.48	0.00	0.00	0.00	3.88	0.00	0.55	0.00	0.00	0.00	0
	pool	38.57	0.00	0.00	0.00	20.74	0.00	2.59	0.00	0.00	0.00	0
	run	208.03	0.00	0.00	0.00	1.44	0.00	0.00	0.00	0.00	0.00	0
	riffle	116.77	0.00	0.00	0.00	2.57	0.00	0.00	0.00	0.00	0.00	0
	run	78.30	0.00	0.00	0.00	5.11	0.00	0.00	0.00	0.00	0.00	0
	pocket water	132.93	0.00	0.00	0.00	8.28	0.00	0.00	0.00	0.00	0.00	0
	pocket water	309.15	0.00	0.00	0.00	4.85	0.00	0.00	0.00	0.32	0.00	0
	riffle	156.94	0.00	0.00	0.00	1.27	0.00	0.00	0.00	0.64	0.00	0
	pocket water	98.48	0.00	0.00	0.00	10.15	0.00	1.02	0.00	0.00	0.00	0
	run	109.01	0.00	0.00	0.00	3.67	0.00	0.00	0.00	0.00	0.00	0
	pocket water	135.00	0.00	0.00	0.00	1.48	0.00	0.74	0.00	0.00	0.00	0
Papoose Creek												
	run	239.99	17.50	0.00	0.00	15.00	0.00	3.33	0.00	0.00	0.00	0
	riffle	207.76	12.03	0.00	0.00	12.51	0.00	0.00	0.00	0.00	0.00	0
	riffle	145.92	5.48	0.00	0.00	8.22	0.00	0.00	0.00	0.00	0.00	0
	run	189.00	46.56	0.00	0.53	16.40	0.00	3.70	0.00	0.00	0.00	0
	riffle	127.68	5.48	0.00	0.00	3.13	0.00	0.00	0.00	0.00	0.00	0
	run	195.11	18.45	0.00	1.03	13.33	0.00	2.56	0.00	0.00	0.00	0
	run	219.55	44.18	0.00	0.00	14.58	0.00	4.10	0.00	0.46	0.00	0
	riffle	106.05	10.37	0.00	0.00	3.77	0.00	0.00	0.00	0.00	0.00	0
	run	408.48	14.93	0.00	0.00	16.65	0.00	1.71	0.00	0.00	0.00	Tf
	riffle	147.55	2.71	0.00	0.00	10.84	0.00	0.00	0.00	0.00	0.00	0
	run	187.68	0.53	0.00	0.00	10.12	0.00	7.99	0.00	0.00	0.00	0
	riffle	28.25	0.00	0.00	0.00	31.86	0.00	17.70	0.00	0.00	0.00	0
	run	142.97	2.80	0.00	1.40	21.68	0.00	2.80	0.00	0.00	0.00	0
	riffle	186.55	0.00	0.00	0.00	13.40	0.00	5.90	0.00	0.00	0.00	0
	run	181.84	0.00	0.00	1.10	6.60	0.00	6.60	0.00	0.00	0.00	0

[a] Cf = crawfish, S = sucker, Sc = sculpin, Tf = tailed frog

Table 4. Average density of chinook salmon parr and yearlings per habitat type and stream for Nez Perce Tribe ISS study streams, 1993.

Stream	Habitat Type	# of Transects	Total Area	# of Fish (Parr)	Average Density (#/100^2)	# of Fish (Yearlings)	Average Density (#/100^2)
Lake Creek							
	Pool	1	422.14	1	0.24	0	0
	Run	5	2553.34	212	5.47	9	0.25
	Pocket Water	0	--	--	--	--	--
	Riffle	2	327.51	1	0.38	0	0
	All Transects Combined		3302.99	132.88	3.54	5.63	0.16
Secesh River							
	Pool	1	471.84	37	7.84	1	0.21
	Run	6	3907.76	178	4.77	4	0.14
	Pocket Water	2	1389.85	14	1.01	0	0
	Riffle	1	151.05	0	0	0	0
	All Transects Combined		5920.50	113.30	3.85	2.50	0.11
Slate Creek							
	Pool	0	--	--	--	--	--
	Run	2	738.32	1	0.09	2	0.19
	Pocket Water	5	2871.15	43	1.57	0	0
	Riffle	0	--	--	--	--	--
	All Transects Combined		3609.47	31.00	1.15	0.57	0.05
Lolo Creek							
	Pool	3	2615.42	92	10.24	1	0.05
	Run	16	11157.3	190	2.15	0	0
	Pocket Water	2	1140	0	0	0	0
	Riffle	8	2939.7	20	1.36	0	0
	All Transects Combined		17852.42	119.86	2.62	0.10	0.01
Yoosa Creek							
	Pool	0	--	--	--	--	--
	Run	8	2900.28	0	0	0	0
	Pocket Water	0	--	--	--	--	--
	Riffle	2	395.2	0	0	0	0
	All Transects Combined		3295.48	0.00	0.00	0.00	0.00
Eldorado Creek							
	Pool	4	1349.27	0	0	0	0
	Run	11	5069.31	0	0	0	0
	Pocket Water	1	589.18	0	0	0	0
	Riffle	2	304.5	0	0	0	0
	All Transects Combined		7312.26	0.00	0.00	0.00	0.00
Newsome Creek							
	Pool	3	273.56	13	4.92	0	0
	Run	10	3839.13	68	1.54	1	0.02
	Pocket Water	1	217.53	0	0	0	0
	Riffle	6	1070.19	11	1	0	0
	All Transects Combined		5400.41	39.25	1.81	0.50	0.01
Squaw Creek							
	Pool	3	179.15	0	0	0	0
	Run	8	1895.71	0	0	0	0
	Pocket Water	5	819.49	0	0	0	0
	Riffle	6	1065.53	0	0	0	0
	All Transects Combined		3959.88	0.00	0.00	0.00	0.00
Papoose Creek							
	Pool	0	--	--	--	--	--
	Run	8	1764.62	329	18.12	0	0
	Pocket Water	0	--	--	--	--	--
	Riffle	7	949.76	55	5.15	0	0
	All Transects Combined		2714.38	201.13	12.07	0.00	0.00

Table 5. Summary of marked chinook salmon captured and/or released in Nez Perce Tribe ISS study streams, 1993.

Stream	Date Released	Life Stage	Mark Type	Stock Source	Number Marked	Number Captured	Capture Method
Lake Creek	7/93 – 8/93	Parr	PIT tag[a]	Wild	252	265	Electrofishing
Lolo Creek upper (km 41)	10/23/92 – 11/10/92	Parr	PIT Tag	Natural	352	352	Screw Trap
Lolo Creek lower (km 1)	11/12/92 – 11/24/92	Parr	PIT Tag	Natural	231	231	Screw Trap
Lolo Creek lower (km 1)	3/9/93 – 6/8/93	Smolt	PIT tag	Natural	122	253	Screw Trap
Lolo Creek upper (km 54)	8/25/93 – 9/21/93	Parr	PIT tag	Natural	606	673	Minnow trap
Lolo Creek upper (km 41)	10/15/93 – 11/10/93	Parr	PIT tag	Natural	663	949	Screw Trap
Lolo Creek lower (km 1)	8/28/93 – 11/23/93	Parr	PIT tag	Natural	190	263	Screw Trap
Newsome Creek	8/9/93	Adults	--	Rapid River	125 pairs		Stocked
	9/28/93 – 10/6/93	Parr	PIT tag	Natural	60	60	Minnow Trap
Secesh River	7/93 – 8/93	Parr	PIT tag[a]	Wild	422	463	Electrofishing
Squaw Creek	8/5/93	Parr	LV Clip	Clearwater	11000		Stocked
			LV, PIT tag	Hatchery	1000		

[a] Captured and PIT tagged by the National Marine Fisheries Service

Dam Detections

Of the 1069 chinook salmon parr (1992 cohort) PIT tagged in Lolo Creek, 323 (30.2%) of those fish were detected in interrogation facilities at downstream dams. The total group of PIT tagged chinook salmon can be broken down into four tagging groups (late summer minnow trap, fall upper Lolo Creek screw trap, fall lower Lolo Creek screw trap, and spring lower Lolo screw trap) and respective downstream detection percentages. The minnow trapped group had the lowest detection rate of 15.8% and the spring screw trap group the highest detection rate at 69.7%. Both groups exhibited detection rates that were significantly different from that of the fall upper/lower trap groups of 30.8% and 29.6 %, respectively.

Spawning Escapement

We made three redd counts from the ground approximately 1.5 to 2 weeks apart for most study streams (Table 6). Johnson Creek had the highest number of observed redds with 126 (26.2 redds/km observed) and Squaw Creek the lowest with no redds observed. There was not a consistent trend in the number of redds observed between study streams in 1992 and 1993 (Figure 3).

Table 6. Number of new redds, live adult chinook salmon, carcasses, and redds per kilometer of stream stream observed for Johnson Creek, Secesh River, Lake Creek, Slate Creek, Lolo Creek (including Yoosa and Eldorado Creeks), Newsome Creek, Squaw Creek, and Papoose Creek during 1993[a].

Stream	Date	No. of New Redds	No. of Live Fish	No. of Carcasses	Redds/ Kilometer
Johnson Creek	08/10/93	20	56	2	
(4.8 km)	08/23/93	73	108	17	
	09/02/93	NC	13	62	
	09/09/93	33	4	60	
	09/16/93	0	0	10	
	Total	126		151	26.2
Lake Creek	08/17/93	27	16	10	
(13.6 km)	08/30/93	17	1	3	
	Total	44		13	3.2
Secesh River	08/19/93	62	34	22	
(12.2 km)	08/30/93	5	0	8	
	09/14/93	24	0	8	
	Total	91		40[c]	8.8
Slate Creek	08/25/93	1	0	0	
(5.5 km)	09/13/93	0	0	0	
	Total	1		0	0.2
Lolo Creek	08/18/93	6	5	2	
(16.7 km)	08/25/93	15	15	4	
	09/07/93	2	0	4	
	Total	23		10	1.4
Yoosa Creek[b]	08/23/93	1	0	0	
(4.4 km)	Total	1		0	0.2
Eldorado Creek	08/23/93	0	0	0	
(3.5 km)	Total	0		0	0.0
Newsome Creek	08/18/93	10	36	2	
(15.1 km)	08/30/93	32	13	22	
	09/09/93	6	0	10	
	09/14/93	4	0	5	
	09/29/93	3	0	0	
	Total	55		39	3.6
Squaw Creek	08/17/93	0	0	0	
(6.0 km)	08/26/93	0	0	0	
	Total	0		0	0.0
Papoose Creek	08/16/93	15	4	2	
(3.0 km)	08/26/93	0	0	1	
	09/08/93	0	0	0	
	Total	15		3	5.0

[a] See Table 2 for description of surveyed areas.

[b] Yoosa Creek was surveyed by Pat Murphy (USFS), date of survey unknown.

[c] Includes 2 carcasses found at times other than redd surveys.

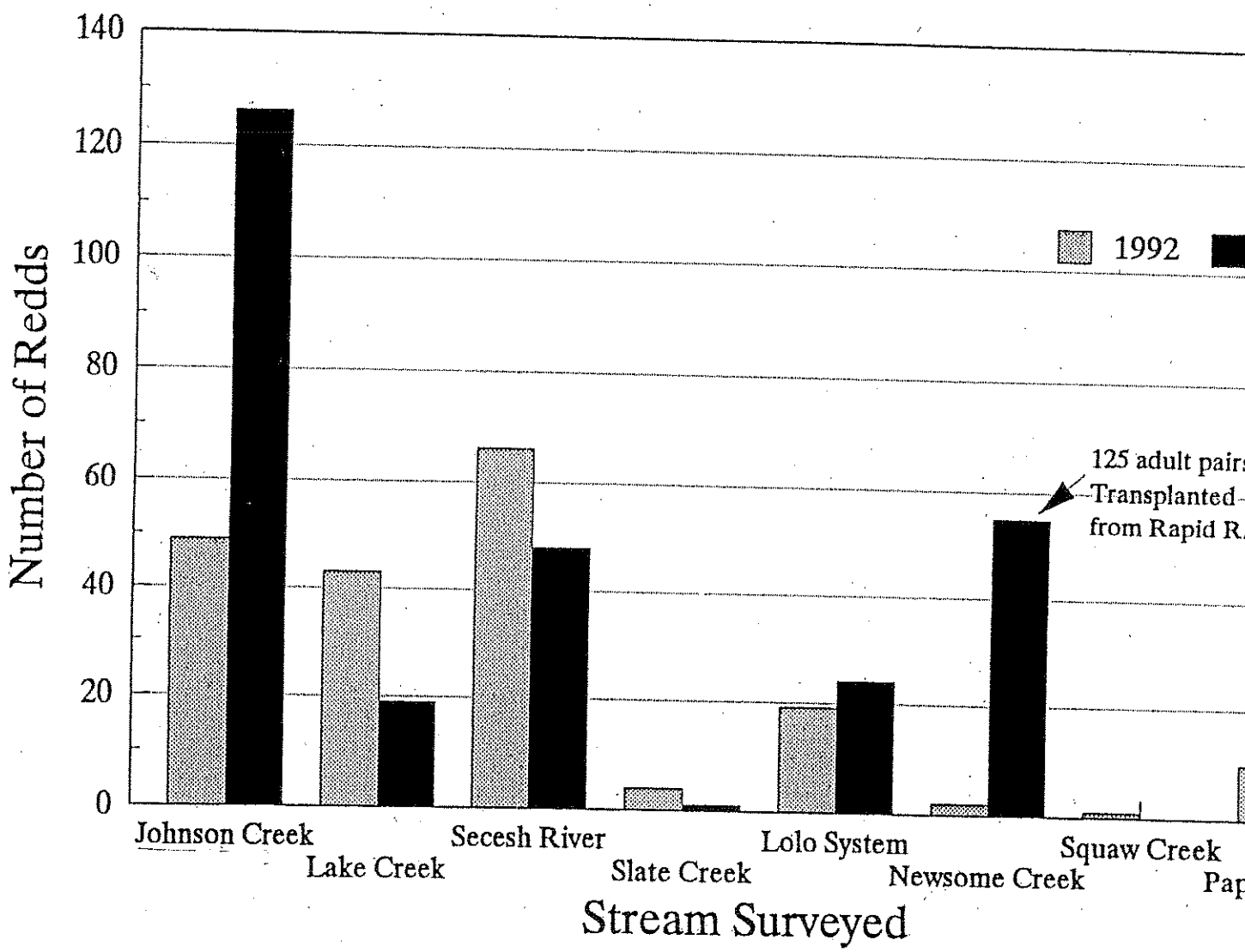

Figure 3. Number of chinook salmon redds observed in streams associated with Idaho Supplementation S
monitored by the Nez Perce Tribe, 1992 and 1993.

DISCUSSION

This report represents a summary of the 1993 data for the NPT as part of the Idaho Salmon Supplementation Study. As this data represents only the second year of this study, the following discussion will focus mainly on major findings as they may affect the future direction of thought and effort in this study.

Parr Abundance

Stream visibilities were adequate to snorkel all study streams, therefore electrofishing was not used. The snorkeling techniques used to obtain parr density estimates appear to be adequate. However, preliminary statistical analysis has shown a need for an increased number of transects for each habitat type per stream. Additional transects should be added to future parr density assessments to include at least five transects per habitat type per stream. All transects should cover a cross-section of habitat types that represents the relative abundance of each habitat type.

Physical Habitat

With the use of the same snorkeling/physical habitat transects being use from year to year it may seem inefficient/repetitive to collect physical habitat data annually. However, yearly differences in water flows and temporal changes in stream channels necessitates the annual collection of physical habitat characteristics.

PIT Tagging

Due to low parr densities and the inability to PIT tag the desired 500 fish per stream, only Lolo Creek, Lake Creek and the Secesh River were targeted for PIT tagging activities. Late summer parr densities were sufficient in Lolo Creek to allow effective use of minnow traps and screw traps to collect/tag sufficient numbers of chinook salmon at different locations within the river and at parr and smolt life stages. Electrofishing was used by the NMFS to collect an adequate sample size in the Secesh River and Lake Creek. Due to the increased adult escapement in 1993 and the resulting increase in parr densities, additional streams should be targeted for PIT Tagging in 1994.

Fall Emigrant and Smolt Outmigration

Screw trap efficiencies tend to vary with fluctuating stream discharges. Increased testing of trap efficiencies at various water levels would prove beneficial. However, there is a limited number of trapping days where a large enough sample size ($n > 50$) is obtained to conduct efficiency tests. The number of efficiency test covering various stream discharges can be increased by combining several daily catches.

Dam Detections

The availability of downstream PIT tag interrogation data from the 1992 cohort opens the door for several aspects of chinook salmon outmigration, including minimum survival rates and travel times, to be examined. The difference in the percentage of downstream detections of PIT tags between chinook tagged in the summer, fall, and spring can most likely be attributed to over-winter survival. The possibility does exists that some of the summer/fall tagged fish outmigrated past detection facilities during the winter months when detection facilities are not operated. With the assumption that fish were tagged in proportion to the number present at both fall and spring tagging periods and using the 30.3% detection average, a minimum estimate of survival/outmigrating numbers can be established. However, we need to get good estimates of tag detection efficiencies for each facility under different flow regimes in order to produce useful estimates of survival.

Spawning Escapement

With the numbers of returning chinook salmon adults and number of redds being used as an evaluation point, it should be noted that the high numbers of adults and redds observed in Newsome Creek in 1993 was the result of transplanting 125 Rapid River adult pairs and not as a result of juvenile stockings or natural production. Parr abundance in 1994 and subsequent adult returns will be used to evaluate the supplementation of adult spawners in Newsome Creek during 1993.

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