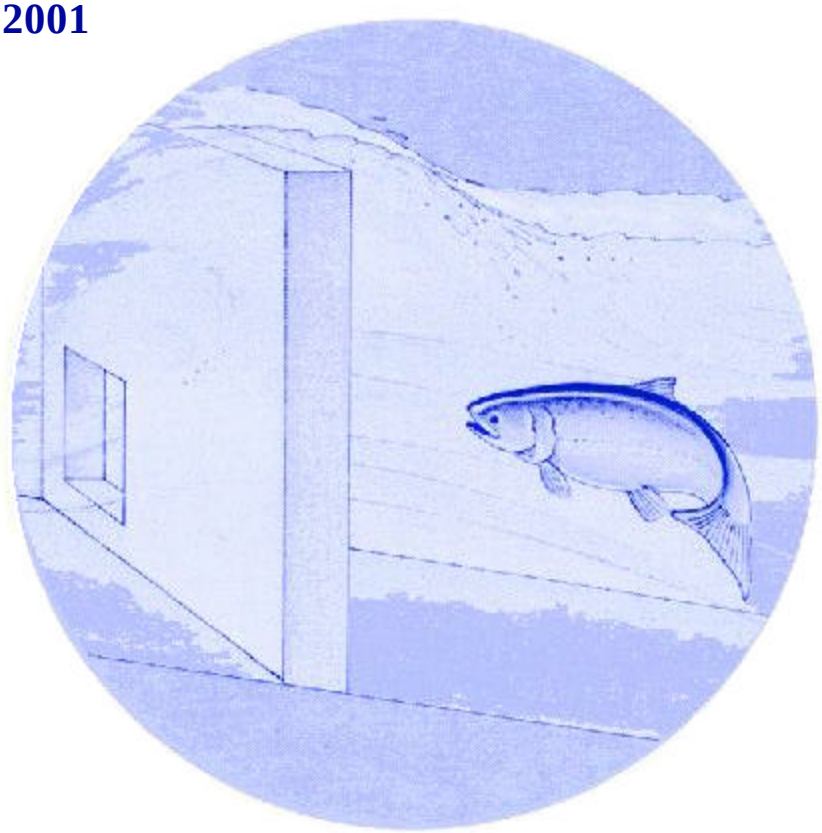
Spawning Success of Hatchery Spring Chinook Salmon Outplanted as Adults in the Clearwater River Basin, Idaho

Technical Report
2001



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SPAWNING SUCCESS OF HATCHERY SPRING CHINOOK SALMON OUTPLANTED AS ADULTS IN THE CLEARWATER RIVER BASIN, IDAHO, 2001

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EXECUTIVE SUMMARY

We completed stream-side surveys of spring chinook salmon spawning in selected streams of the Clearwater River Basin, Idaho, during 2001 to evaluate spawning success and direct effects on naturally-arriving chinook salmon spawning that resulted from outplanting hatchery adults into chinook salmon-producing streams. Survey areas included 1) the upper Selway River where 4,155 adult chinook salmon were released from returns to Rapid River and Dworshak National Fish hatcheries, 2) Meadow and O'Hara creeks in the lower Selway River where 579 adult chinook salmon were outplanted, 3) Mill and Meadow creeks of the South Fork Clearwater River where 164 adult chinook salmon were outplanted and 4) Colt Killed Creek in the Lochsa River Subbasin where another 219 adult chinook salmon were released from Dworshak National Fish Hatchery, Kooskia National Fish Hatchery, and Clearwater Anadromous Fish Hatcheries. Survey data were divided into these four components to accommodate mathematical analysis. We surveyed 235km of streams with repeat surveys areas on three successive weeks from August 23 to September 13 in key reaches where spawners were common.

Spawning surveys were planned independently of those who planned and implemented outplanting activities. The outplanting was not designed as a scientific experiment, and monitoring of spawning was commissioned just as spawning commenced. Combinations of these factors confounded our spawning survey design and caused constraints in the ability to fully evaluate the impacts of outplanting on natural spawning. Natural spawners included both unmarked hatchery fish and naturally-produced fish, so we refer to these indistinguishable groups collectively as naturally-arriving fish.

Both outplanted spawners and naturally-arriving spawners were well distributed throughout the study areas and were found in all four of the survey basins. Outplanted fish spawned several miles downstream and upstream from release locations, and the direction of movement varied between streams. We found ad-clipped chinook salmon over 32km from any outplant location.

We accounted for only a minor portion of the outplanted fish in the areas we surveyed. There was difficulty distinguishing outplanted adults from ad-clipped returns of juvenile outplants because carcasses were often scavenged or too badly decomposed to distinguish secondary marks applied to adult outplants. Even if all ad-clipped fish were assumed to be outplanted fish, our expanded estimate of hatchery spawners represented 24% of outplanted spawners in the upper Selway and in 24% in Colt Killed Creek, and 44-60% of outplanted spawners in Mill and Meadow creeks of the South Fork Clearwater, and O'Hara Creek in the lower Selway. However, these estimates are based on an assumed

ratio of three spawners (male and female) per redd. Deviations in the true ratio from this assumption would strongly influence the estimates of survival.

Prespawning mortality was high among outplanted fish and may account for most of the unaccounted fish although some migration out of our survey areas was also indicated. Delayed outplanting mortality was found in Meadow Creek (South Fork Clearwater) where we surveyed 3 days after fish were outplanted. Within 250 m of the release site, we found nine ad-clipped carcasses (all unspawned males and females) plus 23 carcasses in condition too poor to distinguish fin clips. These dead fish probably resulted from a group of 73 fish released 3 days earlier, and represent a minimum 44% mortality. Most delayed outplanting mortality and mortality during summer holding (fish were outplanted into the upper Selway during June and July) would not have been detectable from our surveys, because 90% of marked carcasses disappeared within one week.

We found that 41% of outplanted females recovered as carcasses in the upper Selway were unspawned. This was significantly greater (Π^2 test, P= 0.057) than the 14% of naturally-arriving female carcasses that were unspawned. When combined with our estimate that only 24% of outplanted fish were accounted for, this indicates that only 14% of the outplanted females spawned within the areas surveyed in the upper Selway Subbasin. Spawning of outplanted adults was similarly low in all areas surveyed. However, estimates of egg deposition in the upper Selway Subbasin indicate the presence of adult outplants doubled the egg deposition that would have occurred if only naturally-arriving fish had been present.

We found important difference in distribution of redds between groups outplanted in June-July compared to August. Where fish were outplanted shortly before spawning, there was little correlation (r= 0.37) between where naturally-arriving and adult outplants chose to spawn. In the upper Selway River Basin where fish were outplanted 1-3 months before spawning, fish spread throughout the upper basin, and there was a high correlation (r= 0.99) between where adult outplants and naturally-arriving fish chose to spawn. Only two redds were observed in the 14.2 kilometers of Selway River immediately downstream of the Little Clearwater River where average daily temperature of the mainstem remained consistently above 60ºF through the first week of September.

In the Selway River reach upstream of the Little Clearwater River to the Elk City bridge we observed some outplanted salmon spawning on top of existing redds, and others spawning in marginal quality habitat. This reach had the highest concentration of spawners (51 redds/km) for both adult outplants (61%) and naturally-arriving fish (39%). We also observed superimposition of redds in Meadow Creek of the lower Selway River, but most fish there were returns from a release of 300,000 ad-clipped smolts of the 1997 brood.

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This work was funded by Bonneville Power Administration under the direction of Ken Kirkman. Dave Johnson, Nez Perce Tribe, was instrumental in developing overall project goals and objectives. The project was assisted by the efforts of the United States Forest Service staff Dick Reed, Cary Hiatt and Lewis Levins. Use of Forest Service facilities greatly aided our work. Data were provided by Evan Brown, Rene'e Hedrick, Brian Leth and Brad Dredge of the Idaho Department of Fish and Game, Howard Burge of the U.S. Fish and Wildlife Service, and Bruce McLeod and Sherman Sprague of the Nez Perce Tribe. Jay Hesse, Becky Ashe, and Nancy Hoefs of the Nez Perce Tribe, and Jody Brostrom of the Idaho Department of Fish and Game provided useful insights through critical review of this report. Peoples Market in Darby, Montana generously provided cold storage for fish head samples that we collected from ad-clipped fish.

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INTRODUCTION

The study described in this report evaluated spawning distribution, overlap with naturally-arriving spawners, and pre-spawning mortality of spring chinook salmon, Oncorhynchus tshawytscha, outplanted as adults in the Clearwater River Subbasin in 2001. Returns of spring chinook salmon to Snake River Basin hatcheries and acclimation facilities in 2001 exceeded needs for hatchery production goals in Idaho. Consequently, management agencies including the U.S. Fish and Wildlife Service (FWS), Idaho Department of Fish and Game (IDFG) and Nez Perce Tribe (NPT) agreed to outplant chinook salmon adults as an adaptive management strategy for using hatchery adults. Adult outplants were made in streams or stream sections that have been typically underseeded with spawners. This strategy anticipated that outplanted hatchery chinook salmon would spawn successfully near the areas where they were planted, and would increase natural production.

Outplanting of adult spring chinook salmon from hatcheries is likely to be proposed in years when run sizes are similar to those of the 2001 run. Careful monitoring of results from this year's outplanting can be used to guide decisions and methods for future adult outplanting.

Numbers of spring chinook salmon outplanted was based on hatchery run size, hatchery needs, and available spawning habitat. Hatcheries involved in outplanting in the Clearwater Basin included Dworshak National Fish Hatchery, Kooskia National Fish Hatchery, Clearwater Anadromous Fish Hatchery, and Rapid River Fish Hatchery. The NPT, IDFG, FWS, and the National Marine Fisheries Service (NMFS) agreed upon outplant locations and a range of numbers of spring chinook salmon to be outplanted (Table 1). Outplanting occurred mainly in the Selway River Subbasin, but additional outplants were made in tributaries to the South Fork Clearwater River and the Lochsa River (Table 1). Actual outplanting activities were carried out primarily by the NPT with supplemental outplanting done in the Lochsa basin by IDFG. Fish were trucked from the hatcheries to outplant sites.

Table 1. Locations and numbers for outplanting during 2001, as agreed by the NPT, IDFG, FWS, and NMFS in the Clearwater Basin, Idaho.

Area	Outplant Number
Lower Mainstem Clearwater	
Lolo Cr.	500-900
Selway Basin	
Lower Selway	0-2,000
O'Hara Cr.	200
Upper Selway-McGruder corridor	800-10,000
Meadow Cr.	500-2,000
Lochsa R.	
Colt Killed Cr. (White Sands Cr.)	500-2,500
S.Fk. Clearwater	
Newsome Cr.	400-600
Mill Cr.	150
Meadow Cr.	150-300
S. Fk (Downstream of Red and Crooked R.)	0-600
Subtotal	3,200 - 19,250

The actual number of adult spring chinook salmon outplanted to these areas through September 13 was 5,721 (Table 2). An additional 624 chinook salmon were outplanted in the lower Selway Subbasin after spawning surveys were completed (Table 2). Only 88 transportation mortalities of 6,345 (1.3%) chinook salmon outplanted were noted by the outplant crews at the time the fish were released (Table 2).

Table 2. Data for each group of adult spring chinook salmon outplanted by the NPT and IDFG to the Clearwater River Basin during 2001. Only streams surveyed for the project are listed.

River	Date	Hatchery	Release Site Location	Mark	# of Fish	Mortality	% Ad Clipped	Jack
Upper Selway	06/05/01	Rapid River	Magruder Ranger Station	1	400	2	100	NA
	06/07/01	Rapid River	2.9 Miles below Elk City/Paradise junction	1	450	6	100	NA
	06/12/01	Rapid River	2.9 Miles below Elk City/Paradise junction	0	410	2	100	NA
	06/14/01	Rapid River	1.6 Miles above Elk City/Paradise junction	1	450	0	100	NA
	06/19/01	Rapid River	2.9 Miles below Elk City/Paradise junction	1	445	8	100	NA
	06/21/01	Rapid River	6.3 Miles below Elk City/Paradise junction	1	400	40	100	NA
	06/26/01	Rapid River	Magruder Ranger Station	1	400	4	100	NA
	07/03/01	Rapid River	1.6 Miles above Elk City/Paradise junction	1	400	18	100	NA
	07/24/01	Dworshak	6.3 Miles below Elk City/Paradise junction	2	400	5	92.7	0
	08/02/01	Dworshak	Magruder Ranger Station	2	400	1	92.7	7
					4,155	***86***	***98.6***	
Lower Selway	08/23/01	Dworshak	Just above Selway falls	2	200	0	92.7	0
	08/27/01	Dworshak	Just above Selway falls	2	404	0	92.7	3
	09/13/01	Dworshak	Just above Selway falls	2	339	0	92.7	2
	09/18/01	Dworshak	Just above Selway falls	2	285	2	92.7	4
					1,228	***2***	***92.7***	***9***
Meadow (Selway)	07/16/01	Kooskia	Slims Campground	3	200	0	92.7	4
					200	***0***	***92.7***	***4***
O'Hara Cr	08/23/01	Dworshak	Mouth	2	269	0	92.7	1
	08/27/01	Dworshak	Mouth	2	110	0	92.7	1
					379	***0***	***92.7***	***2***
Mill Cr.	08/13/01	Red River	Road crossing 2.3mi upstream	4	41	0	100	NA
					41	***0***	***100***	**NA**
Meadow (S.Fk.)	08/13/01	Crooked River	Camp 58, Bridge at lower end of meadow	4	50	0	100	NA
	08/24/01	Red River	Camp 58, Bridge at lower end of meadow	4	36	0	100	NA
	08/24/01	Crooked River	Camp 58, Bridge at lower end of meadow	4	37	0	100	NA
					123	***0***	***100***	***NA***
Colt Killed	Season	Powell	No site location given	5	*219*	*NA*	*99.6*	NA
Total					***6,345***	***88***	***97***	**NA**

Mark Code

0 No marks given
1 dorsal punch
2 Left opercle v-notch
3 Right opercle v-notch, 2 rt opercle v-notches and upper caudal clip, or rt. Opercle v-notch and upper caudal clip
4 Right Opercle punch, 2 rt. Opercal punches

5 Left opercle punch

The surveys conducted under this project were designed to evaluate spawning of outplanted hatchery adults in areas that were not surveyed on the ground by other projects. A large share of spring chinook salmon spawning in the Clearwater River Subbasin is surveyed by aerial counts which do not permit distinction of hatchery or natural fish nor of spent condition of carcasses. Two programs currently underway using ground surveys to monitor spring chinook salmon spawning in the Clearwater Basin include: (a) Nez Perce Tribal Hatchery Monitoring Program and (b) Idaho Supplementation Studies. A complete list of stream reaches to be surveyed by IDFG, U.S. Forest Service (USFS) or the NPT in the Clearwater Basin is presented in Appendix A.

The intention of the surveys was to answer the following questions:

- To what extent did outplanted fish disperse from the outplant location?
- Did early outplants disperse greater distances than later outplants?
- How did outplant numbers relate to redd densities?
- Did outplants alter spawning distribution of naturally-arriving spawners?
- Did naturally-arriving spawners and outplanted adult spawners intermix on the spawning grounds, or was some spatial or temporal separation of spawning maintained?
- What proportion of outplanted fish survived to spawn, and how was survival related to transport date and distance?

Spawning surveys were planned independently of those who planned and implemented outplanting activities. The outplanting was not designed as a scientific experiment, and monitoring of spawning wasn't commissioned until spawning was underway. Combinations of these factors confounded our spawning survey design and caused constraints in our ability to fully evaluate the impacts of outplanting on natural spawning. In addition, outplanting effects realized through nutrient enhancement through carcass additions were not evaluated.

In the remainder of this report the term "outplanted fish" refers to adult spring chinook salmon that arrived at hatcheries and were then outplanted by the NPT or IDFG to supplement natural spawning (fish hauled downstream to recycle through sport fisheries are excluded). The term "naturally-arriving spawners" refers to any fish of hatchery or natural origin returning to natural spawning areas in streams. Not all naturally spawning fish are natural. There was significant outplanting of unclipped hatchery juveniles of the 1997 brood that would have returned as age 4 adults in the 2001 run (see Table 5). Also, not all ad-clipped fish were adult outplants. Outplanting of ad-clipped 1997 brood juveniles in

Meadow Creek (Selway) and Mill Creek (S.Fk. Clearwater) resulted in the return of ad-clipped adults in the 2001 run.

SURVEY LOCATIONS

Surveys were located in areas where fish were outplanted. These areas included the lower Selway Subbasin, upper Selway, South Fork Clearwater and Lochsa (Figures 1 and 2, Table 3). Each stream was surveyed at least once, and when possible, up to three times. Surveys were completed on foot by two crews; one that operated out of Kooskia at the confluence of the South Fork and Middle Fork Clearwater rivers and one crew that camped at Paradise Campground on the upper Selway River near the mouth of Whitecap Creek. The upper Selway Subbasin is a remote wilderness area with only a single road in; the crew there traveled on horseback to most of their survey sites. A total of 235km of stream was surveyed throughout the project.

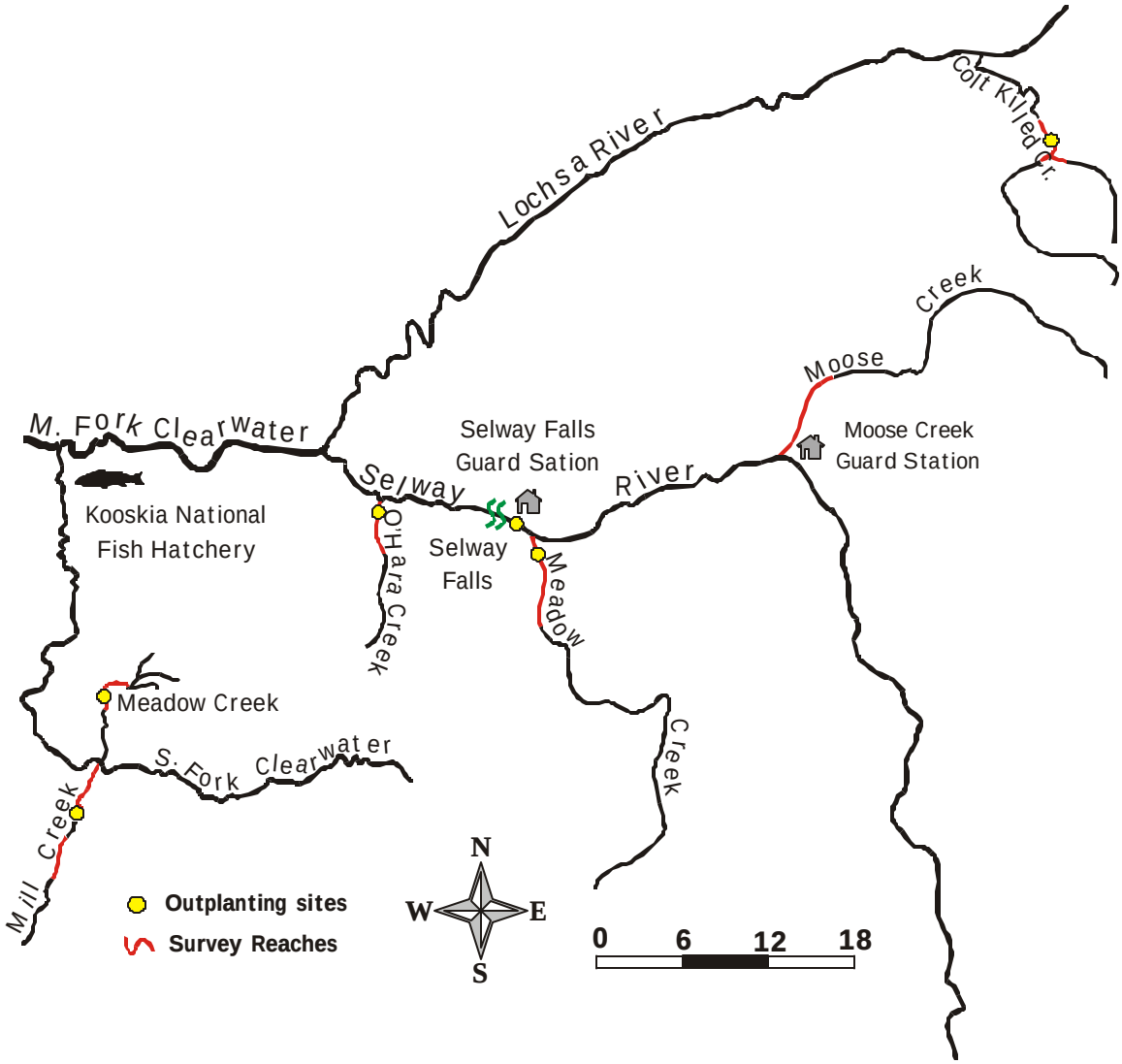

Figure 1. Map of the Lower Selway, South Fork Clearwater and Lochsa subbasins showing survey reaches and spring chinook salmon outplant locations.

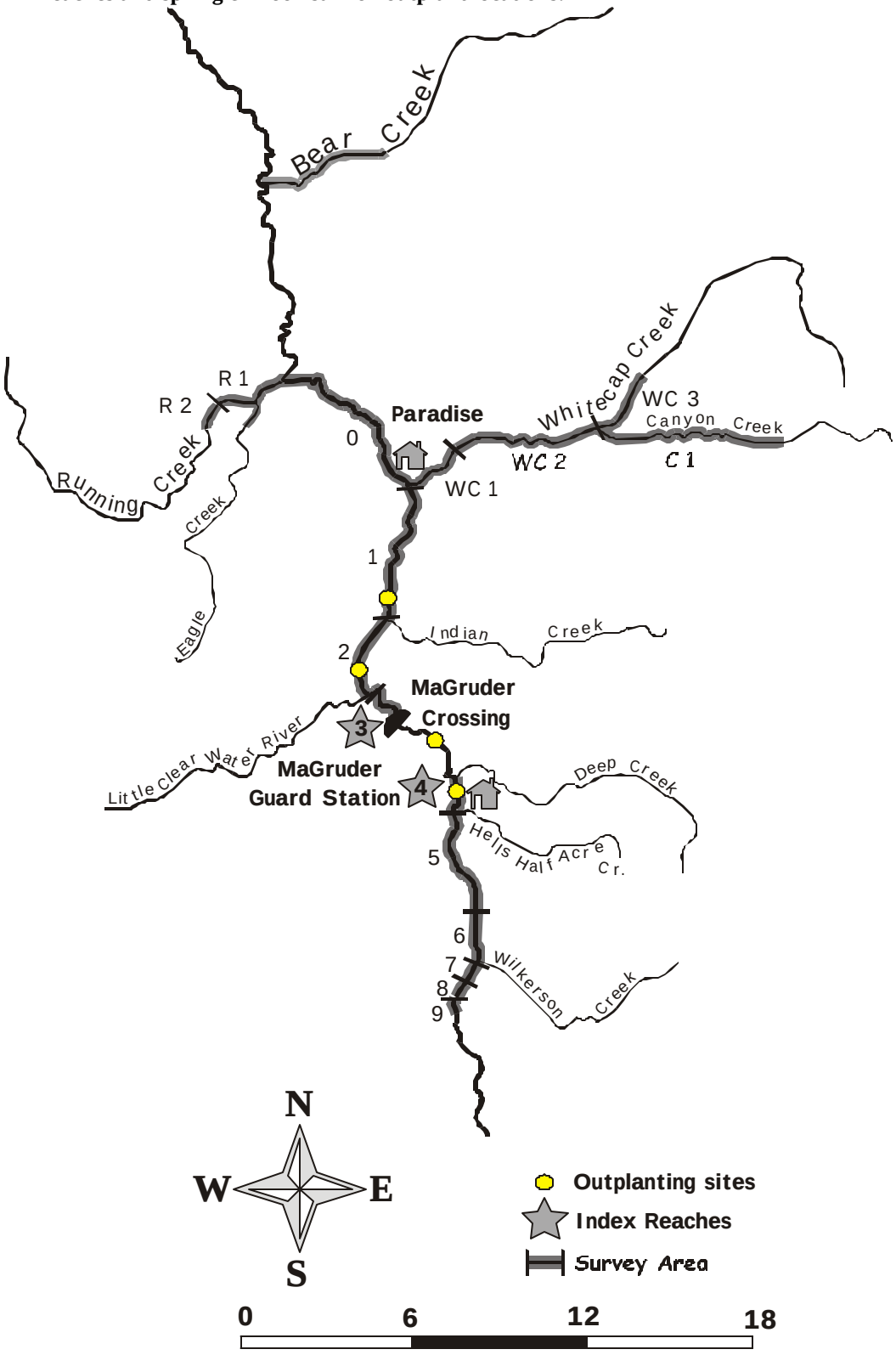

Figure 2. Map of the Upper Selway subbasin showing survey reaches and spring chinook salmon outplant locations.

Table 3. Stream reaches surveyed for this study in the Clearwater Basin.

Basin	Stream	Reach	Location	Survey Repetitions	Approximate Length of Survey (mi.)
Lower Selway	O'Hara Cr.	1	Mouth to Hamby Fork	3	7.6
	Meadow Cr.	1	Mouth to 10.5km upstream	3	10.5
Upper Selway	Selway	0	Running Cr. to Whitecap Cr.	1	10.8
		1	Whitecap Cr. to Indian Cr.	1	8.3
		2	Indian Cr. to Little Clearwater	1	5.9
		3	Little Clearwater to Magruder Crossing	3	2.9
		4	Magruder Guard Station to Hell's Half Acre Creek	3	1.9
		5	Hell's Half Acre Creek to Jct. Trails 4 & 12.	2	5.6
		6	Jct. of Trails 4 & 12 to Wilkerson Creek	2	3.7
		7	Wilkerson Cr. to Thompson Flat	1	1.0
		8	Thompson flat to unidentified ephemeral stream	1	1.0
		9	Ephemeral stream to 2.3km upstream of Swet Cr.	1	2.6
		Aerial	Mouth to Thompson Flat	1	123.9
	Whitecap	1	Mouth to between Cedar Cr. and Barefoot Cr.	2	7.8
		2	Between Cedar Cr. and Barefoot Cr. to Cooper Flat	2	3.4
		3	Cooper Flat to Elk Creek	1	4.7
	Canyon Cr.	1	Mouth to 5.6km upstream	1	5.6
	Running Cr.	1	Mouth to Grouse Cr.	1	11.6
		2	Grouse Cr. to 2.4km upstream	1	2.0
	Eagle Cr.	1	Mouth to 2.4km upstream	1	2.4
	Bear Cr.	1	Mouth to 9.0km upstream	1	9.0
	Moose Cr.	1	Mouth to just below Double Cr.	1	11.9
S. Fk. Clearwater	Lower Mill Cr.	1	Mouth to 750m upstream of Hays Cr.	3	5.0
	Upper Mill Cr.	1	GPS Coordinates	2	4.8
	Meadow Cr.	1	5.6km through McComas Meadow	3	6.0
Lochsa	White Sands Cr.	1	1500m below trail bridge to Colt Cabin to 750m above Big Sands Cr.	1	5.5

Streams in the survey areas differed in their size and capacity to support spring chinook salmon. Size of stream ranged in width from 2.4m (Eagle Creek) to 20.7m (mainstem of upper Selway) (Table 4). The best quality habitat surveyed was predominantly in the upper Selway Subbasin.

Table 4. Total length and average width of spring chinook bearing study streams as assigned by the Smolt Density Model (SDM), for streams we surveyed. Data from www.streamnet.com (Streamnet 2002).

Stream	Length (km)	Avg. Width (m)
Upper Selway		
Upper Selway R	58.1	21
Moose Cr	13.3	16
Bear Cr	98.8	15
Running Cr	16.4	10
Eagle Cr	19.3	2
Whitecap Cr	19.0	15
Lower Selway		
O'Hara Cr	10.8	8
Meadow Cr	18.5	16
Lower Selway - Unsurveyed	97.2	60
S. Fk. Clearwater		
Meadow Cr.	21.7	6
Mill Cr.		
Lochsa		
Colt Killed Cr.	7.6	20

SURVEY METHODS

FIELD METHODS

Survey Frequency and Data Recorded

We originally intended to survey all study reaches in each of three weeks. However, once in the field we limited the number of areas where surveys were repeated so that additional effort could be extended to determine upstream limits of spawning in streams where fish were observed. Those areas where we repeated surveys each week are referred to as "index areas", and were used to evaluate the temporal distribution of spawning.

Several areas in the upper Selway Basin were surveyed to assess the upper limit of salmon spawning. These streams included the Selway River, Whitecap Creek, and Running Creek. We recorded the same information as in other streams. If we did not observe salmon or redds for ½ mile, we concluded that most, if not all, salmon were spawning below that point. In some cases, we surveyed more than ½ mile above known salmon and redds to be sure we had accurately assessed the upper limit of distribution.

Index areas where surveys were repeated weekly included 1.9km of the mainstem Selway River from Hell's Half Acre Creek downstream to Deep Creek, 2.9km of the mainstem Selway River from Magruder Bridge (also called Elk City bridge) crossing to the mouth of the Little Clearwater River, the entire surveyed sections of Meadow and O'Hara Creeks in the lower Selway Basin, and the entire surveyed sections of lower Mill and Meadow Creeks in the South Fork Clearwater Basin (Figure 1and Figure 2).

Salmon Counts

Surveyors walked upstream or downstream on opposite stream banks, and counted all live and dead salmon. Surveys were conducted by one person on the smallest streams, two people on moderate sized streams, and three people on the mainstem Selway. Whenever live salmon were seen, the surveyor approached cautiously and attempted to determine if the salmon had an adipose fin. We recorded whether the adipose was present, absent, or not observable. Carcasses were retrieved and carefully examined for the presence of an adipose fin and marks indicating hatchery of origin. Unique secondary marks (in addition to an adipose clip) were given to outplanted fish by each hatchery including a "V" notch in the left operculum, opercular punches, a clip of the upper caudal fin, or a hole punch in the dorsal fin (Table 2). One group of fish outplanted to the upper Selway Subbasin from Rapid River Hatchery did not receive secondary marks on 400 of 410 fish planted (Table 2). In many instances it was difficult to distinguish the presence or absence of an adipose fin or secondary hatchery marks because the carcass was too decomposed or too badly scavenged. For these carcasses we noted the presence of the carcass as unknown origin; but no attempt at sex identification was made, and no measurements, snouts, or scales were taken.

Ad-clipped fish may have been implanted with Coded Wire Tags (CWT), so we collected snouts from all ad-clipped carcasses. We later transported

snouts to the IDFG office in Lewiston. As of publication of this report, snouts had not been processed, and no data on CWT codes recovered was available. At the time of our surveys, we were unaware of releases of unclipped juveniles implanted with CWT's, so we did not scan carcasses for the presence of tags.

The sex of each carcass was recorded, and females were slit open to determine if the fish had died before or after spawning. The length of each salmon was measured from the middle of the eye to the posterior most scale at the anterior edge of the tail (MEPS measurement). Scales were collected from above the lateral line and below the dorsal fin on both sides of each ad-clipped carcass and every third unclipped carcass.

All carcasses were subsequently returned to the location from which they were taken. Ad-clipped carcasses previously counted would have been distinguishable by their cut-off snout. Unclipped carcasses were tagged on either the lower jaw or operculum. Thus, all sampled carcasses counted in previous surveys could be identified on subsequent surveys.

REDD SURVEYS

Redds were distinguished as single excavated depressions in the streambed believed to be dug by a single female salmon. Whether streambed depressions were created by excavation was evident from the gravel pile at the tail end of the redd and differences in the color of the gravel substrate. Gravel from a redd appeared lighter in color than undisturbed gravel. In some cases it was difficult to distinguish individual redds because of high redd density. In these cases, we attempted to count each depression. In some cases it was necessary to use professional judgement to estimate the number of redds in areas where excavations overlapped.

In areas where multiple surveys were conducted, such as index areas, the location of redds was marked by tying a ribbon to a limb on the stream bank. We recorded on these ribbons the number of fish, occupied redds and unoccupied redds in the immediate area. Ribbons were removed during the final index count.

In several surveyed streams, we recorded separate counts and data for each 500m of stream. These streams included: O'Hara, Meadow (Selway), Mill (lower section), Meadow (S. Fk. Clearwater), and Colt Killed Cr. These distinct stream segments provided more detailed measurements of how spawning was distributed in the immediate vicinity of outplant locations.

TEMPERATURE MONITORING

We monitored temperatures at several locations so we could later examine its relationship to spawn timing. Stoway temperature monitors were placed in the Selway River at the Magruder Guard Station (RKm 289.0), Magruder bridge crossing (RKm 282.2), mouth of Whitecap Creek (RKm 264.4) and in Whitecap Creek at the Paradise Campground (RKm 0.40). The recorders were deployed at the beginning of surveys and removed at the end of surveys. A

temperature profile of Meadow Creek (Selway) during the study period was obtained from the NPT. In the lower Selway, South Fork Clearwater, and Lochsa Basins temperatures were taken with a hand held thermometer at the beginning and end of each survey day.

DATA ANALYSIS METHODS

Spawner Estimate

Spawner abundance estimates were derived from redd counts. An estimate of the total number of spawners in the study area was calculated by multiplying the estimated number of redds for each reach by a 3 spawners (male and female)/redd expansion factor. Rich Carmichael (Oregon Department of Fish and Wildlife, personal communications, October, 2001) provided data from the Imnaha basin in Oregon showing there was an average of three spring chinook salmon spawners for every redd built when spawners were released above a weir several weeks prior to spawning. The 3 spawners/redd ratio was based off of data from 1990 to 2000 where values ranging from 1.64 to 3.72 spawners per redd were observed.

We found that live fish were still present in our survey areas on the last date of our surveys, so we presume they built redds after our surveys concluded. We assumed one additional redd was built for each three live fish observed on our last survey. The key assumptions in this calculation were 1) live fish counted on the last survey date had not started construction of redds, 2) all live fish present were observed, and 3) no new fish entered the stream following the last survey. We believe these assumptions were reasonably accurate. These "post survey" redds were added to the cumulative number of redds observed in the three weekly surveys to give the total number of redds constructed in the season for each index area. Spawners observed in the final survey of index areas accounted for 15% of all spawners observed in the index areas, and the estimated number of redds contributed by these spawners accounted for 11% of the total redd counts in index areas.

The total number of redds constructed for the season in areas surveyed only once or twice were estimated based on the proportion of the season's redds that were constructed each week in index reaches. The percentage of spawning complete by week i was calculated with data from the index areas by dividing the number of redds observed in week i by the total number of redds estimated in that reach for the season. That is:

$$SPAWNING_i = REDDS_{1...i}/REDDS_{total}$$

Where: $SPAWNING_i$ = The percentage of spawning complete in weeks 1 through i.

REDDS = Redds counted in week i in that index reach.

$REDDS_{total}$ = The total number of redds estimated for that index reach for the season.

These proportions of fish spawning by week i were calculated for data aggregated to the basin level to determine the spawn timing for each of the basins including upper Selway, lower Selway, and the South Fork Clearwater.

In areas surveyed only once or twice we estimated the season total for number of redds built by multiplying the cumulative number of redds observed after a given week by the cumulative percentage of spawning complete in that basin through the same week. For example, after week two, 88 redds had been observed in Selway reach 5. By dividing 88 by 0.7 (70% of spawning complete in upper Selway after week 2), we estimated a total of 126 redds. That is:

$$REDDS_{total} = REDDS_{1..i}/SPAWNING_i$$

The total number of spawners was derived by multiplying the total number of redds constructed by the expansion factor of three fish/redd.

$$SPAWNERS = REDDS_{total} * 3$$

Tables of calculations to estimate total redds and spawners are in Appendix B.

Outplant and Naturally-Arriving Spawner Abundance Estimates

We used the combined data from observations of carcasses and live fish to estimate the proportions of outplants and naturally-arriving spawners in each reach surveyed. If the number of live fish and carcasses observed in a particular area were too small ($\leq$15) to reliably calculate proportions, the proportions for that entire basin were used as surrogates. Fish that could not be positively identified as ad-clipped or unclipped were excluded from calculations.

Not all outplanted fish were ad-clipped. Specifically, 7.3% of age 4 fish returning to Dworshak National Fish Hatchery had regenerated adipose fins (personal communication, Howard Burge, USFWS, 11/01). Unclipped rates of hatchery outplants ranged from 0-7.3% depending on the hatchery of origin (Table 8). When fish from more than one hatchery were outplanted in a reach, we calculated the weighted proportion of outplanted fish without ad-clips for all releases. We used these proportions of unmarked fish to expand the number of ad-clips observed such that unclipped outplants were included. We then subtracted the number of unclipped outplants fish from the number of naturally-arriving spawners observed. That is:

$$OUTPLANT_{no\ clip} = OUTPLANT_{clip} * (\%NO\ CLIP/100-\%NO\ CLIP)$$
$$NATURAL_{raw} = NATURAL_{obs} - OUTPLANT_{no\ clip}$$
$$OUTPLANT_{tot} = OUTPLANT_{clip} + OUTPLANT_{no\ clip}$$

Where: OUTPLANT = number of adult outplants observed
NATURAL = number of naturally-arriving spawners observed
% NO CLIP = percentage of outplants without an adipose clip
tot = estimated total number of fish
clip = fish that had an adipose clip
no clip = fish that were not adipose clipped
raw = counts of fish, before any adjustments were made

Finally, we used these adjusted numbers of adult outplants and naturally-arriving fish in our counts of fish to estimate the percentage of adult outplants and naturally-arriving fish in our observations. We then multiplied these percentages by the estimated number of spawners to determine the number of adult outplants and naturally-arriving fish estimated to have spawned in the survey area. That is:

1) $OUTPLANT_{est} = OUTPLANTS_{tot}/(OUTPLANTS_{tot} + NATURAL_{tot})*SPAWNERS_{tot}$

2) $NATURAL_{est}$ $NATURAL_{tot}/(OUTPLANTS_{tot}+NATURAL_{tot})*SPAWNERS_{tot}$

Where: $OUTPLANT_{est}$ = Abundance estimate of Outplanted fish
$NATURAL_{est}$ = Abundance estimate of naturally-arriving fish

Refer to tables 8 and 9 for calculations of Outplanted and naturally-arriving fish abundances for each area.

RESULTS

DISTINCTION OF OUTPLANTED FISH

Observations of the unique secondary mark applied by each hatchery were low among carcasses recovered in our surveys. Secondary marks applied to differentiate between outplants and other ad-clipped fish included a unique dorsal fin punch or various opercular punches (see Table 2). However, observations of these marks were extremely low. Of 169 ad-clipped carcasses sampled, secondary hatchery marks were only observed on 40. Meadow Creek (Selway) is not included in this calculation, because of the potential for returning ad-clipped smolt outplants from 1999. It is likely that many of the 129 ad-clipped carcasses without secondary marks were adult outplants. Secondary hatchery marks were often difficult to distinguish because many carcasses were decomposing and fins were eroded. Although some of the sampled hatchery carcasses were likely strays or returns from juvenile outplantings, it is unlikely they accounted for 76% (129 of 169) of sampled carcasses. The release method used with the 1999 smolt outplants in Meadow Creek likely resulted in weak imprinting as juveniles followed by substantial dispersion as adults. We found no quantitative documentation of straying rates in the Clearwater Basin that would allow us to estimate the proportion of recovered ad-clipped fish that would be strays from elsewhere in the Snake River Basin. Throughout the analysis and discussion presented in this report, we made the assumption that ad-clipped fish represented outplanted fish. Except in Meadow Creek (Selway) and nearby O'Hara Creek, errors in this assumption are likely to be small.

Many of the ad-clipped fish in Meadow Creek (Selway) were probably not from the adult outplants. Age 4 fish from the 1999 release of 300,000 smolts returned with this year's run (2001)(Table 5). The presence of these fish is reflected in that only 3 of 48 ad-clipped carcasses in Meadow Creek had a secondary mark (Table 6). It is also possible a portion of these ad-clipped fish released as smolts strayed into nearby O'Hara Creek where secondary marks were found on only 1 of 32 sampled ad-clipped carcasses (Table 6).

Table 5. Hatchery spring chinook salmon released in the Clearwater Basin as juveniles, and that would have returned as age 4 spawners in 2001. The mouth of Walton Creek is less than a half mile downstream of the mouth of Colt Killed Creek. Streams in bold are streams in the spawning survey study area.

Basin	Stream	Life Stage	Brood Year	Release Year	Release Dates	# Fish	Adclip (Y/N)
Selway River	Whitecap Creek	Parr	1997	1998	7/30	124,140	N
Selway River	Mainstem Selway	Parr	1997	1998	7/21	78,950	N
Selway River	Running Creek	Parr	1997	1998	7/21	49,000	N
Selway River	Moose Creek	Parr	1997	1998	7/28	90,815	N
Selway River	Bear Creek	Parr	1997	1998	7/30-8/13	137,680	N
Selway River	Meadow Creek	Eyed Eggs	1997	1997	10/30, 10/31, 11/5	280,000	--
Selway River	Meadow Creek	Smolt	1997	1999	3/22-26 & 3/30-3/31	300,021	Y
Selway River	Deep Creek	Parr	1997	1998	9/29	5,712	N
S.Fk. Clearwater	Mill Creek	Smolt	1997	1999	3/19	40,000	N
Lochsa	Walton Creek	Smolt	1997	1999	April	334,482	Y
Clearwater	Lolo Cr.	Smolt	1997	1998	3/30	150,000	N
Lochsa	Boulder Cr.	Parr	1997	1998	7/8	84,860	N
Lochsa	Boulder Cr.	Smolt	1997	1999	4/6-4/7	104,280	N
Lochsa	Warm Springs Cr.	Parr	1997	1998	7/9	22,650	N
S.Fk. Clearwater	Newsome Cr.	Smolt	1997	1998	3/19	74,638	N

Recovery of secondary marks was significantly different ($P<0.01$) between the upper Selway (53.4%) and the other three subbasins (2.9%) (lower Selway, South Fork, and Lochsa) (Table 6). The percentage of observed secondary marks among ad-clipped fish was, as expected, low in Meadow Creek (Selway) due to influence from returns of ad-clipped smolt releases. Also, it could be expected that ad-clipped returns from smolt releases would stray into nearby O'Hara Creek. Recovery of 20 ad-clipped fish without secondary marks in Colt Killed Creek likely resulted from the presence of stray hatchery fish from the Powell Hatchery facility downstream of the survey area. Also, many carcasses were badly decomposed or picked apart by scavengers (secondary marks were difficult to distinguish). Of 35 ad-clipped carcasses observed in the South Fork Clearwater, no secondary marks were observed (Table 6). In comparison to the number of fish estimated to have spawned in the study area, the number of outplants and naturally-arriving fish carcasses recovered was low. We attribute this primarily to high rates of scavenging.

Table 6. Recovery of secondary hatchery marks in each reach of the study area. Secondary marks included dorsal punches and various opercle punches. Eleven ad-clipped carcasses from first survey of Meadow Creek (S.Fk.) and 8 ad-clipped carcasses from first survey of Meadow Creek (Selway) where the presence of secondary marks was not carefully inspected are not included.

Basin	Stream	Total Ad-Clips	Ad-Clips & Secondary	% Secondary
Lower Selway	Meadow	48	3	6.3%
	O'Hara	32	1	3.1%
	Sub-total	**80**	**4**	**5.0%**
Upper Selway	Selway 0	0	0	--
	Selway 1	1	0	--
	Selway 2	1	1	--
	Selway 3	40	21	52.5%
	Selway 4	13	7	53.8%
	Selway 5	3	3	100.0%
	Selway 6	3	1	--
	Selway 7	--	--	--
	Selway 8	1	0	--
	Selway 9	3	3	100.0%
	Moose	--	--	--
	Bear	4	0	--
	Whitecap 1	2	2	--
	Whitecap 2	--	--	--
	Whitecap 3	2	1	--
	Canyon	--	--	--
	Eagle	--	--	--
	Running	--	--	--
	Sub-total	**73**	**39**	**53.4%**
S.Fk. Clearwater	Mill, Lower	8	0	0.0%
	Mill, Upper	--	--	--
	Meadow	27	0	0.0%
	Sub-total	**35**	**0**	**0.0%**
Lochsa	Colt Killed	20	0	0.0%

We surveyed Meadow Creek (S. Fk.) only three days after outplanting and found 32 carcasses within 250m of the outplant site. Nine of these were ad-clipped, and marks could not be distinguished on 23. We expect that most of these 32 carcasses were outplants, but due to miscommunication regarding sampling protocol, the crew there did not carefully inspect carcasses for the presence of a secondary hatchery mark. This occurred on the first survey of Meadow Creek (S.Fk.) and on the first survey of Meadow Creek (Selway).

SPAWNER DISTRIBUTION

Overall Density Distribution

Both adult outplants and naturally-arriving spawners were well distributed throughout the study areas and were found in all four of the major subbasins (upper Selway, lower Selway, South Fork Clearwater, and Lochsa). We found that spawning was concentrated in areas of high quality habitat. The highest redd and spawner abundance estimates were in the upper Selway and in Meadow Creek in the lower Selway (Table 7, Figure 3). Redd estimates in the upper Selway were concentrated in 10.5km of the mainstem from Little Clearwater River to Magruder Crossing (Selway Reach 3), and from Magruder Guard Station to the Junction of Trails 4 and 12 (Selway Reach 4 and Reach 5) (Table 7, Figure 3). These three reaches contained 57% of redds built in the upper Selway study area. The highest redd densities (redds per kilometer) among the study areas were in the mainstem Selway reaches 3,4,5 and 8 (Table 7, Figure 4). Outside of the upper Selway, the highest observed redd densities occurred in Meadow (17.0 redds/km) and O'Hara (8.7 redds/km) Creeks in the lower Selway.

Our estimates of both redd and spawner densities and abundances are sensitive to our ratio of 3 spawners/redd derived from data on the Imnaha River. The three spawners (male and female) per redd was derived by conducting multiple redd counts above a wier on the Imnaha River and comparing those to spawner population estimates from a mark-recapture study of fish passing over the weir. In 2000 the Nez Perce observed 4 females per redd above their weir in Newsome Creek. If the true ratio of spawners/redd is more than three, then we have overestimated the number of redds, and underestimated the number of spawners, both outplanted and naturally-arriving (see p 12-15).

Table 7. Redd counts, extrapolated redd estimates, redd densities and spawner abundance estimates of spring chinook salmon in the study area. Spawner abundance is based upon a redd counts multiplied by 3 fish/redd.

Basin	Stream	Redd Counts	Extrapolated Redds	Redds per km.	Estimated Spawners
Lower Selway	Meadow	140	178	17.0	533
	O'Hara	65	66	8.7	198
	Sub-Total	**205**	**244**	**13.5**	**731**
Upper Selway	Selway 0	2	3	0.2	9
	Selway 1	0	0	0.0	0
	Selway 2	0	0	0.0	0
	Selway 3	136	149	51.4	447
	Selway 4	59	61	31.4	182
	Selway 5	88	126	22.3	377
	Selway 6	12	44	12.0	133
	Selway 7	4	6	5.1	17
	Selway 8	16	23	20.3	69
	Selway 9	25	36	13.9	107
	Moose	14	20	1.7	60
	Bear	18	26	2.9	77
	Whitecap 1	9	13	1.6	39
	Whitecap 2	20	29	8.5	86
	Whitecap 3	9	13	2.8	39
	Canyon	0	0	0.0	0
	Eagle	0	0	0.0	0
	Running 1	9	33	2.9	100
	Running 2	4	6	3.0	17
	Sub-Total	**425**	**586**	**5.7**	**1,758**
S.Fk. Clearwater	Mill, Lower	26	26	5.3	79
	Mill, Upper	0	0	0.0	0
	Meadow	36	42	7.1	126
	Sub-Total	**62**	**68**	**4.3**	**205**
Lochsa	Colt Killed	21	23	4.1	68
	Total	**713**	**921**	**6.5**	**2,762**

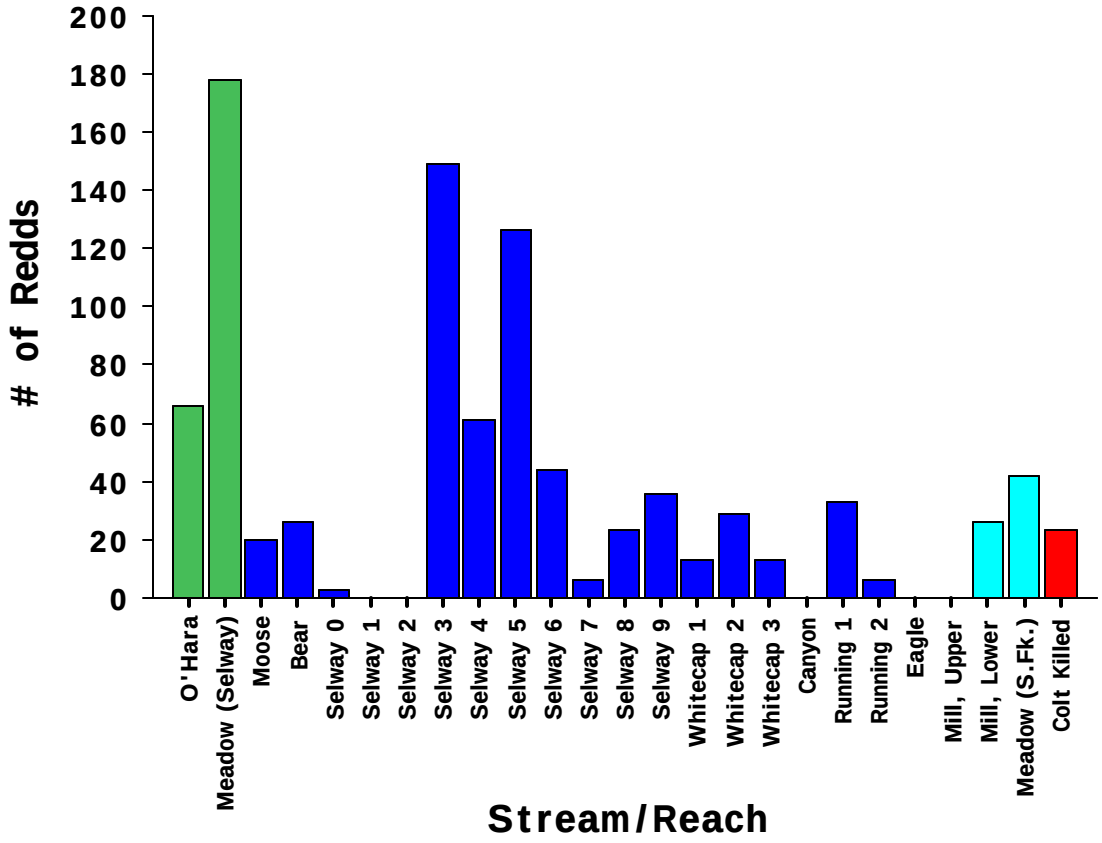

Figure 3. Estimated number of redds in each survey area in the Clearwater River Basin. Estimates include extrapolation for weeks not surveyed and for live fish remaining on last survey.

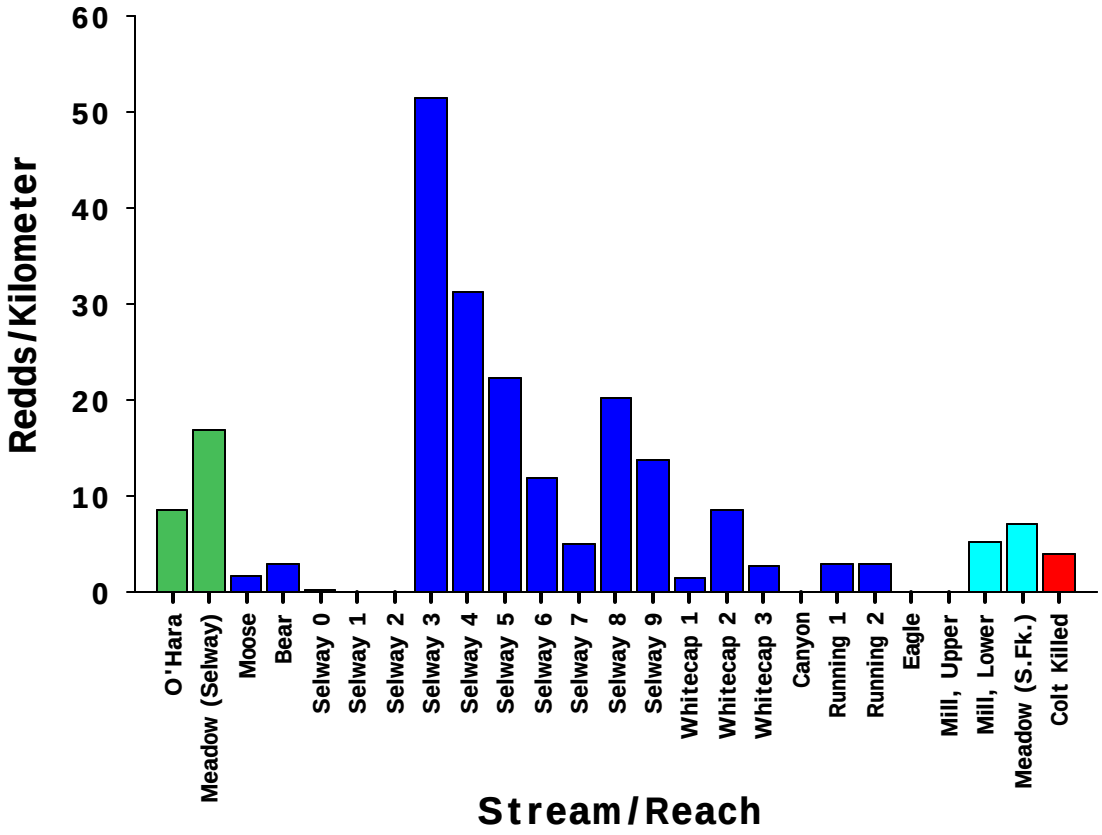

Figure 4. Spring chinook salmon redd densities in each of the stream reaches surveyed, 2001. Densities based on total redd estimates from Table 6.

Densities of naturally-arriving and outplanted spawners combined were highest in the upper Selway in reaches 3 (154/km), 4 (94/km), and 5 (67/km)(Table 8). Among the lower Selway, South Fork Clearwater and Lochsa basins, spawner densities were highest in Meadow Creek (Selway) (51/km) and O'Hara Creek (26/km).

Limits of Spawner Distribution

Although spawners were well distributed throughout the study area, there were some areas, particularly where field observations indicated habitat quality was poor, where no signs of spawning were found. We conducted spawning ground surveys in the Little Clearwater River, Canyon Creek and Eagle Creek to determine if outplanted spring chinook salmon may have strayed into streams not commonly used by spring chinook salmon for spawning. We did not observe any outplants or naturally-arriving chinook salmon in these streams. The Little Clearwater River and Canyon Creek are fairly large streams with steep stream gradient. Eagle Creek has lower stream gradient with some spawning gravel, but the stream may be too small to support spawning spring chinook salmon.

Table 8. Estimated abundance of outplants and naturally-arriving spawners in each reach surveyed. Separation into outplants and naturally-arriving spawners was based on estimated percentages from Table 11. Some ad-clipped fish in Meadow Creek (Selway) and O'Hara Creek were likely returns from juvenile ad-clipped outplants.

Stream	Outplanted Spawners	Naturally-Arriving Spawners	Est. Spawners Per Mile
Meadow (Selway)	496	37	51
O'Hara	167	31	26
Upper Selway	950	808	19
Mill, Lower	23	56	16
Mill, Upper	0	0	0
Meadow (S.Fk.)	74	52	21
Colt Killed	53	15	12
Upper Selway Breakdown			
Selway 0	5	4	1
Selway 1	0	0	0
Selway 2	0	0	0
Selway 3	240	207	154
Selway 4	94	88	94
Selway 5	179	198	67
Selway 6	72	61	36
Selway 7	9	8	15
Selway 8	37	31	61
Selway 9	58	49	42
Moose	36	24	5
Bear	46	35	9
Whitecap 1	21	18	5
Whitecap 2	47	39	25
Whitecap 3	21	18	8
Canyon	0	0	0
Eagle	0	0	0
Running 1	54	46	9
Running 2	9	8	9

Several areas in the upper Selway Basin were surveyed to assess the upper limit of distribution of salmon spawning. The end of distribution was assigned when no spawners, carcasses, or redds were observed for a half mile of survey. The upstream distribution limit in the Selway River was near Swet Creek (RKm 302.0). In Whitecap Creek, the end of distribution was near Elk Creek (RKm 15.1), and in Running Creek was just above Grouse Creek (RKm 12.7) (Table 9). Our designations of spawning limits were supported by observations of unused quality spawning areas, and lack of habitat quality. In the mainstem Selway, observations indicated flow was becoming a constraining issue on spawning distribution. However, the gradient and substrate appeared suitable for spawning. Near the end of distribution, significant amounts of

suitable spawning area were observed, but no fish or redds were present in these areas. In Whitecap and Running creeks where distribution was ended observations of habitat indicated that the gradient and substrate size were increasing, decreasing the amount of suitable spawning habitat.

Table 9. Upstream limits of spawner distribution in streams where distribution limits were assessed. Selway River stream kilometers are assigned with stream kilometer 0 being the mouth of the Clearwater River.

Stream	Last Survey Date	Survey Length (kilometers)	End of Distribution (stream km.)
Selway River	11-Sep	43.7	302.0
Whitecap Creek	7-Sep	15.9	15.1
Canyon Creek	5-Sep	5.6	0
Running Creek	8-Sep	13.5	12.7
Eagle Creek	8-Sep	2.4	0

Outplanted spawners likely distributed themselves outside the study area. In the upper Selway Subbasin, ad-clipped chinook salmon were observed above Thompson Flat in the mainstem Selway, above Canyon Creek in Whitecap Creek, and the upper most chinook salmon observed in Running Creek was ad-clipped. The presence of ad-clipped chinook salmon in Moose and Bear Creek indicate distribution outside the survey area, since outplanted chinook salmon would need to migrate through large sections of the mainstem Selway to reach these creeks. Eleven ad-clipped fish observed in Moose Creek traveled either approximately 42km upstream or 58km downstream from the nearest outplant locations. In addition, results from our aerial survey conducted on August 29 (week 1) showed the presence of 114 live fish, and 59 redds in the mainstem Selway (Table 10). However, 58 of the live fish and 22 of the redds were observed in reaches that were not surveyed by ground (Selway mouth to Bear Creek). The aerial survey revealed that significant spawning took place between Meadow Creek and O'Hara Creek in the lower Selway River, a reach that we did not survey on the ground.

Table 10. Redds and fish counted during an aerial survey on August 29, on the Selway River from Thompson Flat to the mouth.

Begin	End	Alive	Dead	Redds
Thompson Flat	Magruder RS	7	0	8
Magruder RS	Magruder Crossing	2	0	5
Magruder crossing	Little Clearwater River	41	2	22
Little Clearwater River	White Cap Creek	0	0	0
White Cap Creek	Bear Creek	6	0	0
Bear Creek	Moose Creek	0	0	1
Moose Creek	Meadow Creek	5	0	0
Meadow Creek	O'Hara Creek	53	7	20
O'Hara Creek	Mouth	0	0	1
Selway Total		**114**	**9**	**57**
Bear Creek Mouth	meadow	67	0	4

Survey Total	**181**	**9**	**61**

Relationship of Outplant and Naturally-Arriving Spawner Distribution

We estimated abundance of adult outplants and naturally-arriving spawners by multiplying their combined proportions observed among carcasses and live fish times the total spawner estimates. The percentage of spawners that were ad-clipped ranged from 28.6% in lower Mill Creek to 92.8% in Meadow Creek on the Selway. In the upper Selway, percent hatchery fish ranged from 47% to 60% in reaches with more than 15 fish observed (Table 11). It is likely that in Meadow (Selway) and O'Hara creeks there is significant influence from returns of ad-clipped smolts released in Meadow Creek (Selway) in 1999. Appendices C and D display the observations of both ad-clipped and naturally-arriving live fish and carcasses for each reach surveyed.

Table 11. Calculation of outplant to naturally-arriving spawner ratios for each reach we surveyed in the Clearwater Basin, 2001. This table shows adjustments that were made to account for the small percentage of outplanted fish that were unclipped. Percentages of hatchery and natural were only calculated for individual reaches with at least 15 fish observed.

	Observed Live + Carcass		% Outplanted fish	Adj. Ad-Clipped	Adj. Naturally Arriving	Percent	Percent Naturally
Stream	**Ad Clipped**	**Unclipped**	**Unclipped**	**Spawners**	**Spawners**	**Ad-Clipped**	**Arriving**
Meadow (Selway)	201	32	7.3%	217	16	93.1%	6.9%
O'Hara	39	11	7.3%	42	8	84.1%	15.9%
Upper Selway	177	143	2.8%	182	138	56.9%	43.1%
Mill, Lower	8	20	0.0%	8	20	28.6%	71.4%
Mill, Upper	0	0	0.0%	0	0	--	--
Meadow (S.Fk.)	52	36	0.0%	52	36	59.1%	40.9%
Colt Killed	42	12	0.4%	42	12	78.1%	21.9%
Upper Selway Breakdown							
Selway 0	0	0	2.8%	0	0	--	--
Selway 1	1	0	2.8%	1	0	--	--
Selway 2	1	0	2.8%	1	0	--	--
Selway 3	74	51	2.8%	76	49	60.9%	39.1%
Selway 4	17	17	2.8%	17	17	51.4%	48.6%
Selway 5	12	14	2.8%	12	14	47.5%	52.5%
Selway 6	5	0	2.8%	5	0	--	--
Selway 7	2	0	2.8%	2	0	--	--
Selway 8	3	2	2.8%	3	2	--	--
Selway 9	6	9	2.8%	6	9	41.2%	58.8%
Moose	11	8	2.8%	11	8	59.6%	40.4%
Bear	18	13	2.8%	19	12	59.7%	40.3%
Whitecap 1	10	5	2.8%	10	5	68.6%	31.4%
Whitecap 2	9	6	2.8%	9	6	61.7%	38.3%
Whitecap 3	6	3	2.8%	6	3	--	--
Canyon	0	0	2.8%	0	0	--	--
Eagle	0	0	2.8%	0	0	--	--
Running 1	1	13	2.8%	1	13	7.3%	92.7%
Running 2	1	2	2.8%	1	2	--	–

Little spatial separation of spawning by outplanted fish and naturally-arriving fish was apparent in the lower Selway, the South Fork Clearwater, or the Lochsa. We compared the number of outplanted versus naturally-arriving fish (carcasses and live fish combined) in 500m segments in Meadow Creek (South Fork Clearwater), lower Mill Creek, and Colt Killed Creek, and found a significant, but weak correlation between the two ($r = 0.37$, $P = 0.03$) (Figure 5). In segments where outplant abundances were greater, there was little correlation to naturally-arriving abundances being high or low. Correspondingly, in segments where outplant abundance were less, there was again little correlation to low or high naturally-arriving abundances. Data from Meadow Creek in the Selway and O'Hara Creek was not used because it was clear many of the hatchery fish were returns of ad-clipped smolts released in 1999. This conclusion was based on 1) the high percentage of ad-clipped fish and 2) the low number of secondary marks that distinguished outplanted fish.

In contrast, we found a high correlation of spawning densities between outplanted and naturally-arriving chinook salmon in the upper Selway ($r = 0.99$, $P < 0.0001$) (Figure 5). Densities were calculated as the number of fish per mile in each reach. The high correlation in the upper Selway (Figure 5) was strongly influenced by the data points for reaches 3 and 4 where densities were high for both outplants and naturally-arriving fish. Densities were sufficiently high in reach 3 (Little Clearwater River to Magruder Crossing) where we observed fish spawning in marginal habitat and superimposition of redds. This was the only reach in the upper Selway in which such observations were made. We found that even if Selway reaches 3 and 4 are removed from Figure 5, the significant correlation still held true ($r = 0.67$ and $P = 0.004$). Thus, outplanted and naturally-arriving fish consistently preferred the same spawning areas in the upper Selway.

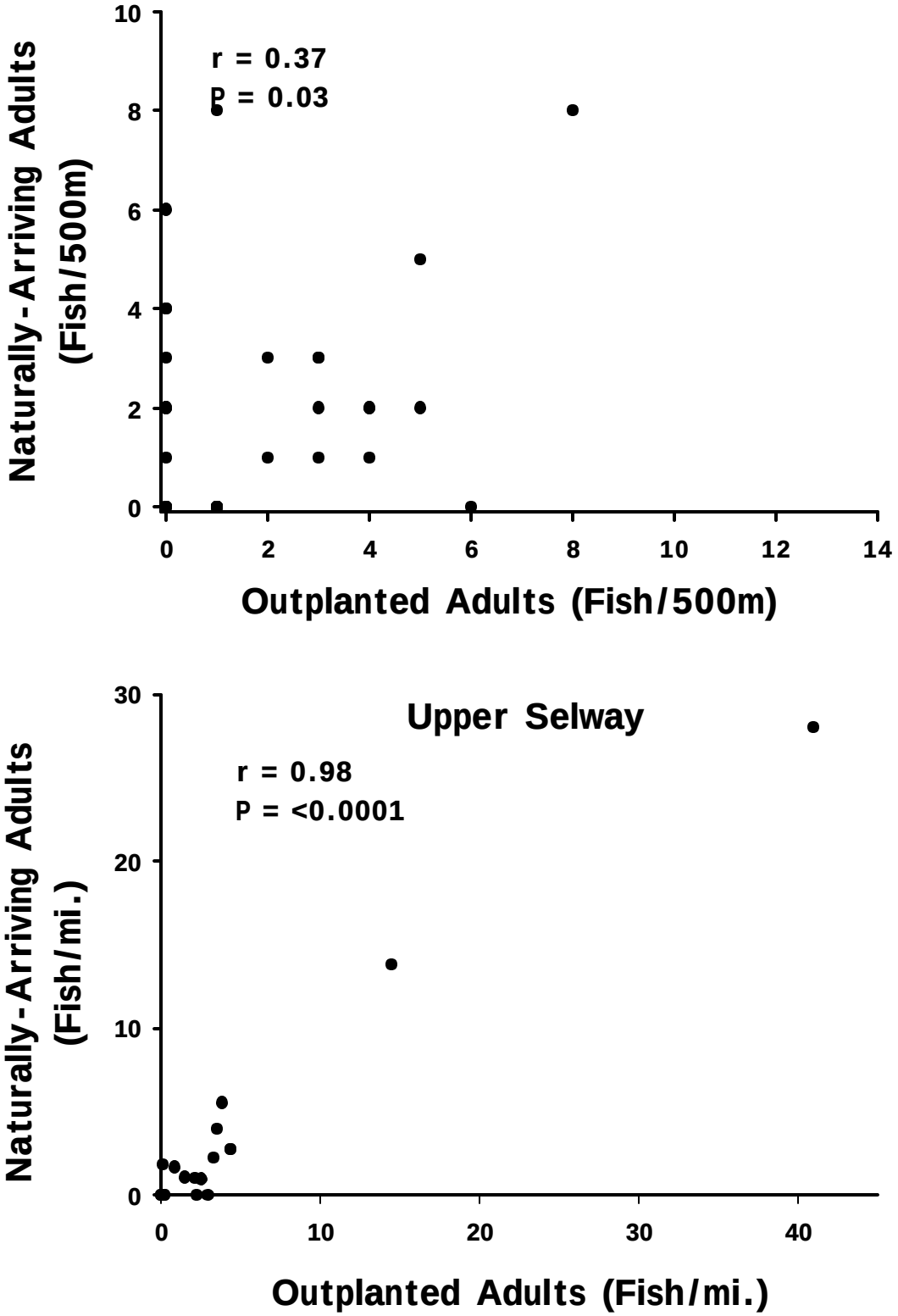

Figure 5. Relationship between spawning densities of outplanted and naturally-arriving chinook salmon in each reach, based on counts of carcasses and live fish (Table 11). Points in top graph represent 500m stream segments in Mill, Meadow (S.Fk.) and Colt Killed creeks. Points in bottom graph represent reaches in the upper Selway basin.

Spawning of adult outplants fish was broadly distributed from the point of outplanting. In all five streams broken into 500m segments (Mill, Meadow (S.Fk.), O'Hara, Meadow (Selway), and Colt Killed creeks) redds were widely distributed from the outplant site. Redds were observed anywhere from 3,000m downstream to 9,000m upstream of outplant locations (Figure 6). In some streams, such as Meadow Creek (S. Fk.), most redds were upstream of the outplant locations. In other streams, such as Mill Creek, redds were mostly downstream from the outplant location.

Carcasses and live fish were also distributed well upstream and downstream from outplant locations. In Mill Creek, 7 of 8 hatchery carcasses observed were found within 1,000m up and downstream of the outplant site while the other carcass was 2,000m downstream of the site. (Figure 7). In Meadow Creek (South Fork), only 5 of 14 live outplanted fish were observed within 1,500m of the outplant site, and one fish was observed as far as 4,000m upstream. However, 24 of 38 outplanted carcasses were found less than 500m from the outplant site, and 31 of 38 were found within 1,500m of the release site (Figure 8). The high frequency of observations near the outplant site is probably related to the fact that an outplanting was made just 3 days prior to the first survey. In O'Hara Creek, no ad-clipped live fish were observed within 1,000m of the outplant site, and eight observations were made between 1,500m and 7,000m upstream of the outplant site. Ad-clipped carcasses were found in each 500m segment from the outplant site to 3,000m upstream, and some as far as 7,000m upstream, while carcasses of naturally-arriving fish were only found 3,500 - 5,500m upstream of the outplant site (Figure 9). In Colt Killed Creek, ad-clipped carcases and live fish were spread throughout the survey segments from 1,500m downstream to 2,500m upstream of the outplant site (Figure 10). In Meadow Creek of the Selway Basin, ad-clipped fish were predominant in all segments from 500m below the outplant site to 9,000m upstream (Figure 11). Most of the ad-clipped fish in Meadow Creek were probably returns from the release of 300,000 smolts (1997 brood), rather than outplanted adults. Only 3 of 48 carcasses observed in Meadow Creek had secondary hatchery marks. Throughout the surveys, there was difficulty distinguishing secondary marks due to decomposition and scavenging.

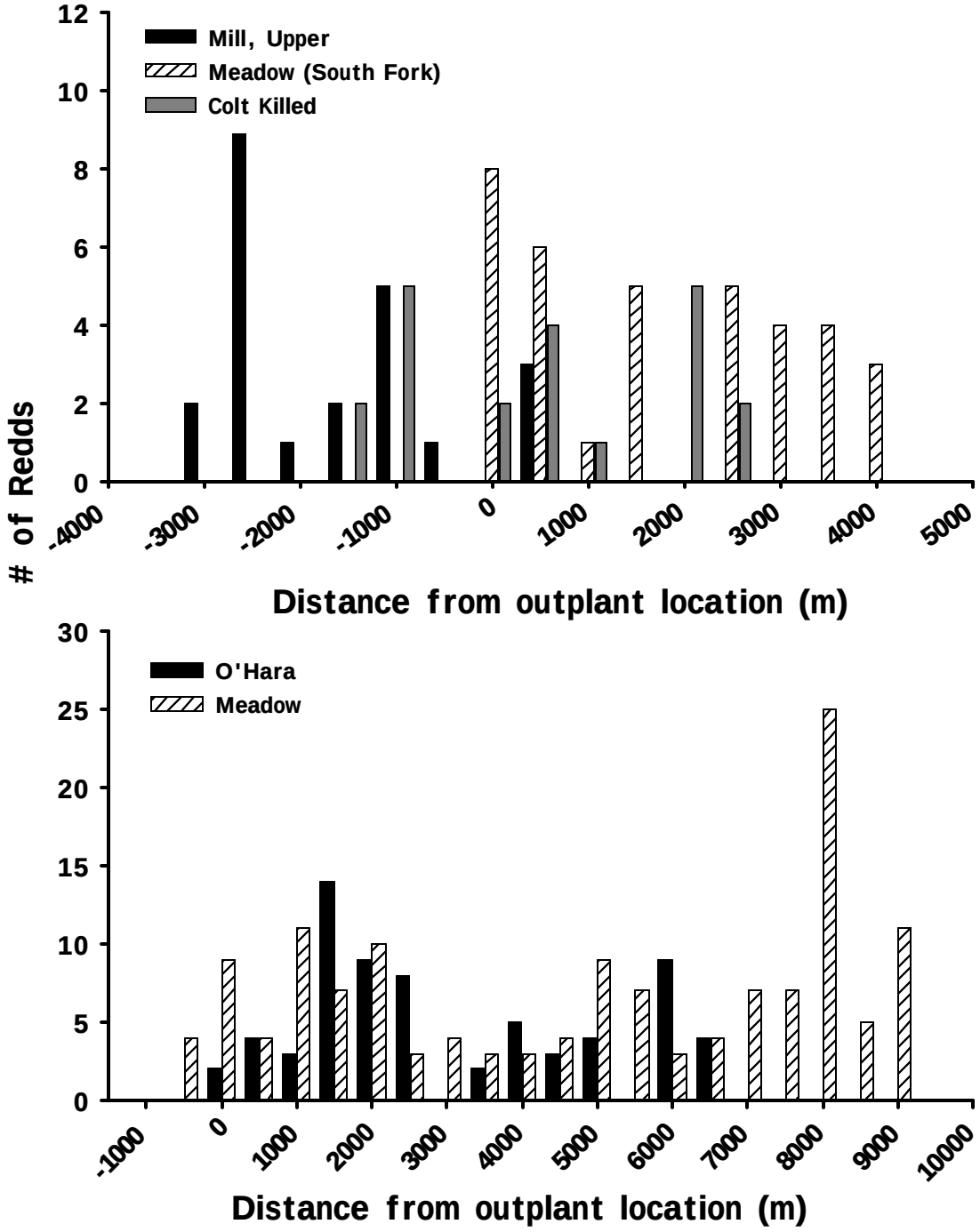

Figure 6. Distribution of observed redds expressed as distance from the outplant location, in study streams broken into 500m segments.

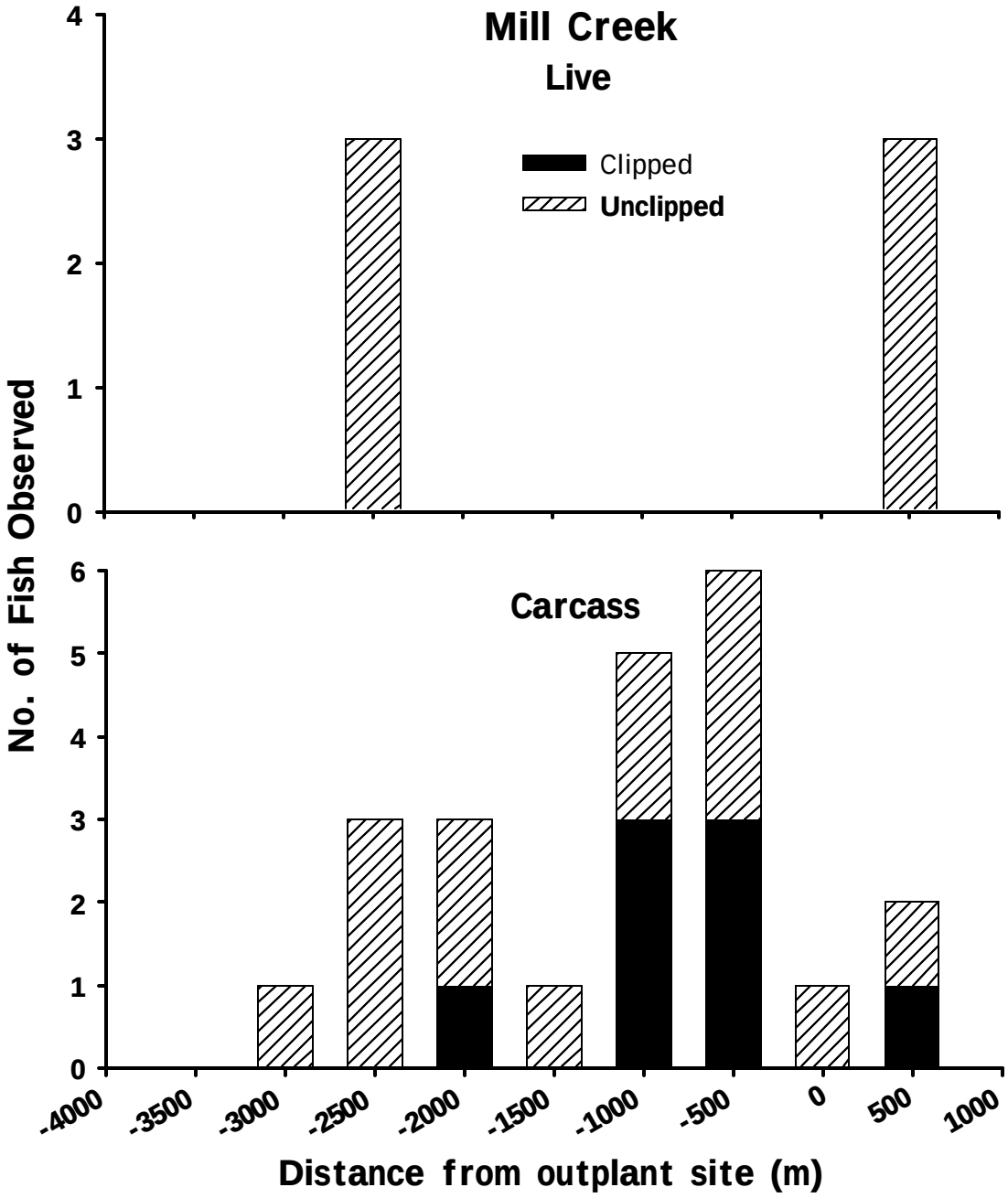

Figure 7. Distribution in lower Mill Creek of outplanted and naturally-arriving chinook salmon among 500m stream segments, expressed as distance from the outplant location.

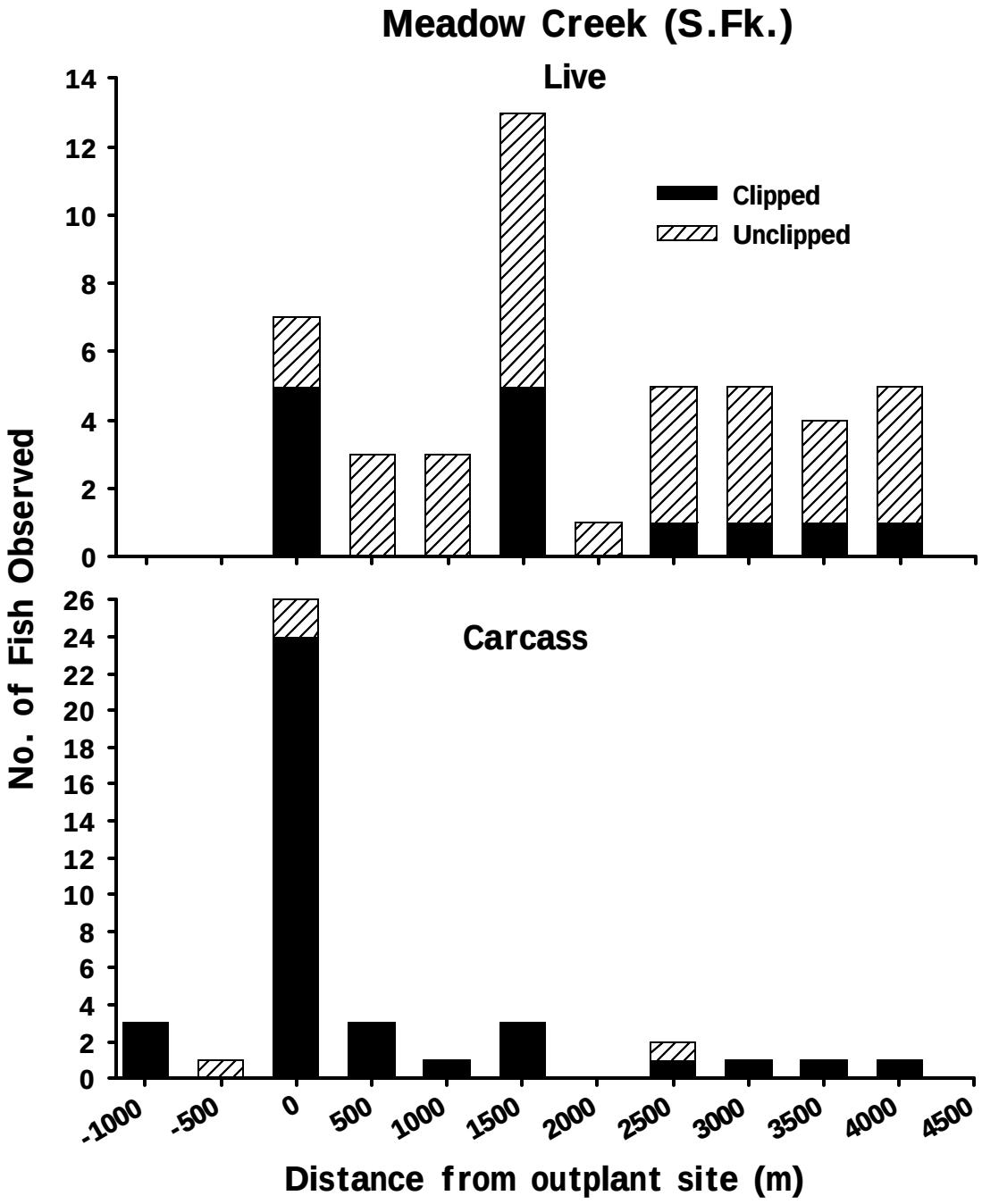

Figure 8. Distribution in Meadow Creek (South Fork Clearwater) of outplanted and naturally-arriving chinook salmon among 500m stream segments expressed as distance from the outplant location.

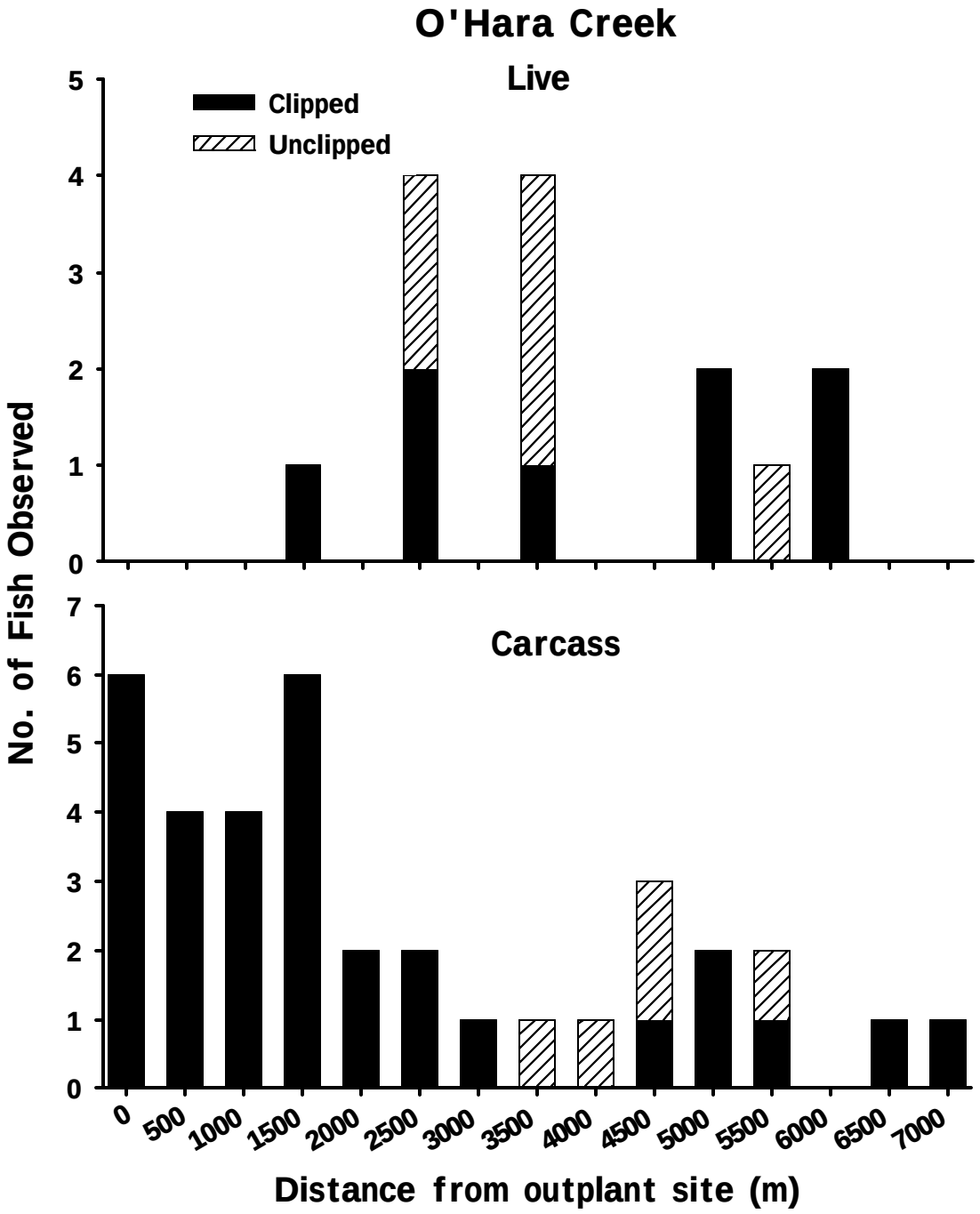

Figure 9. Distribution in O'Hara Creek of outplanted and naturally-arriving chinook salmon among 500m stream segments expressed as the distance from the outplant location.

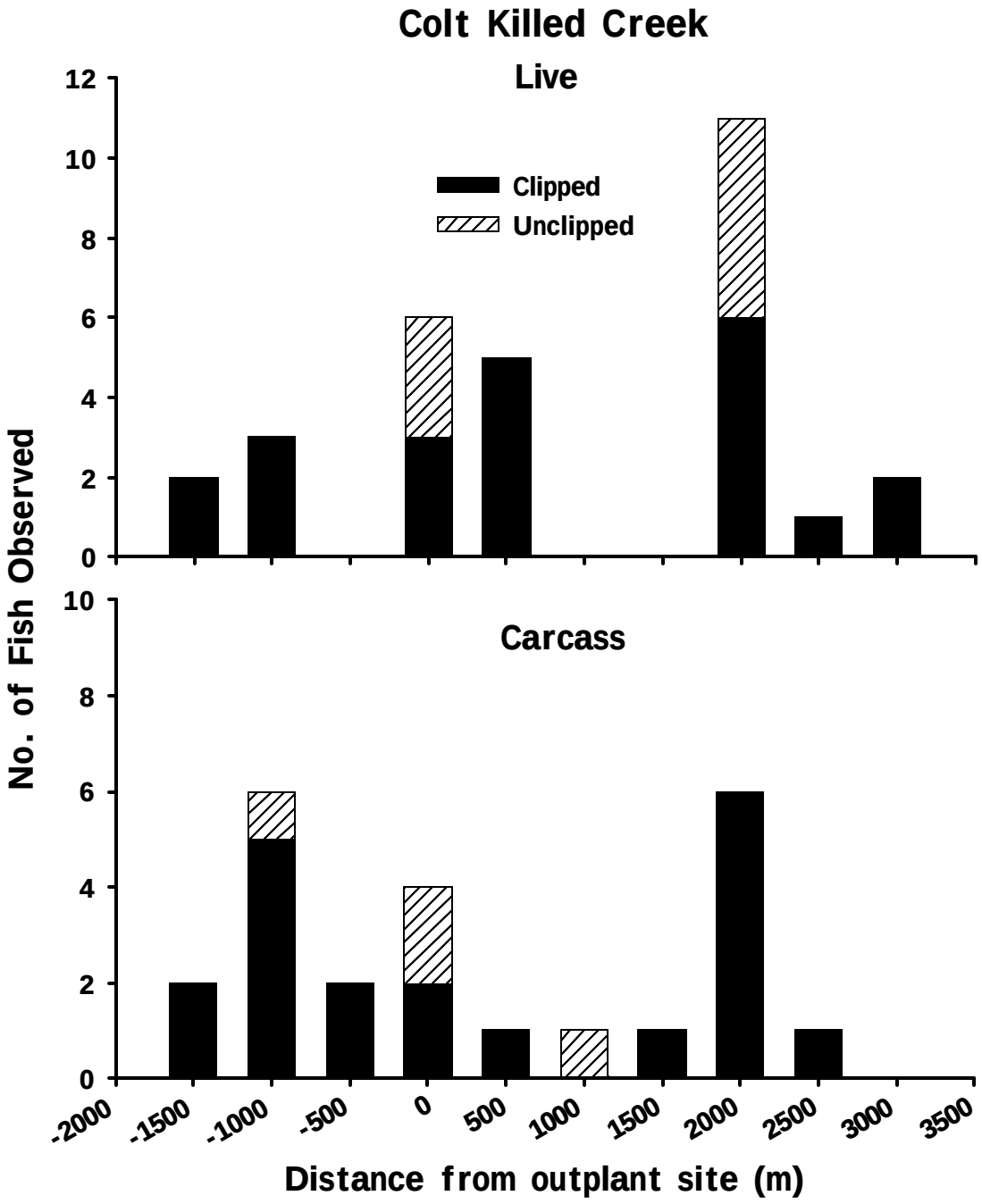

Figure 10. Distribution in Colt Killed Creek of outplanted and naturally-arriving chinook salmon among 500m stream segments expressed as distance from outplant location.

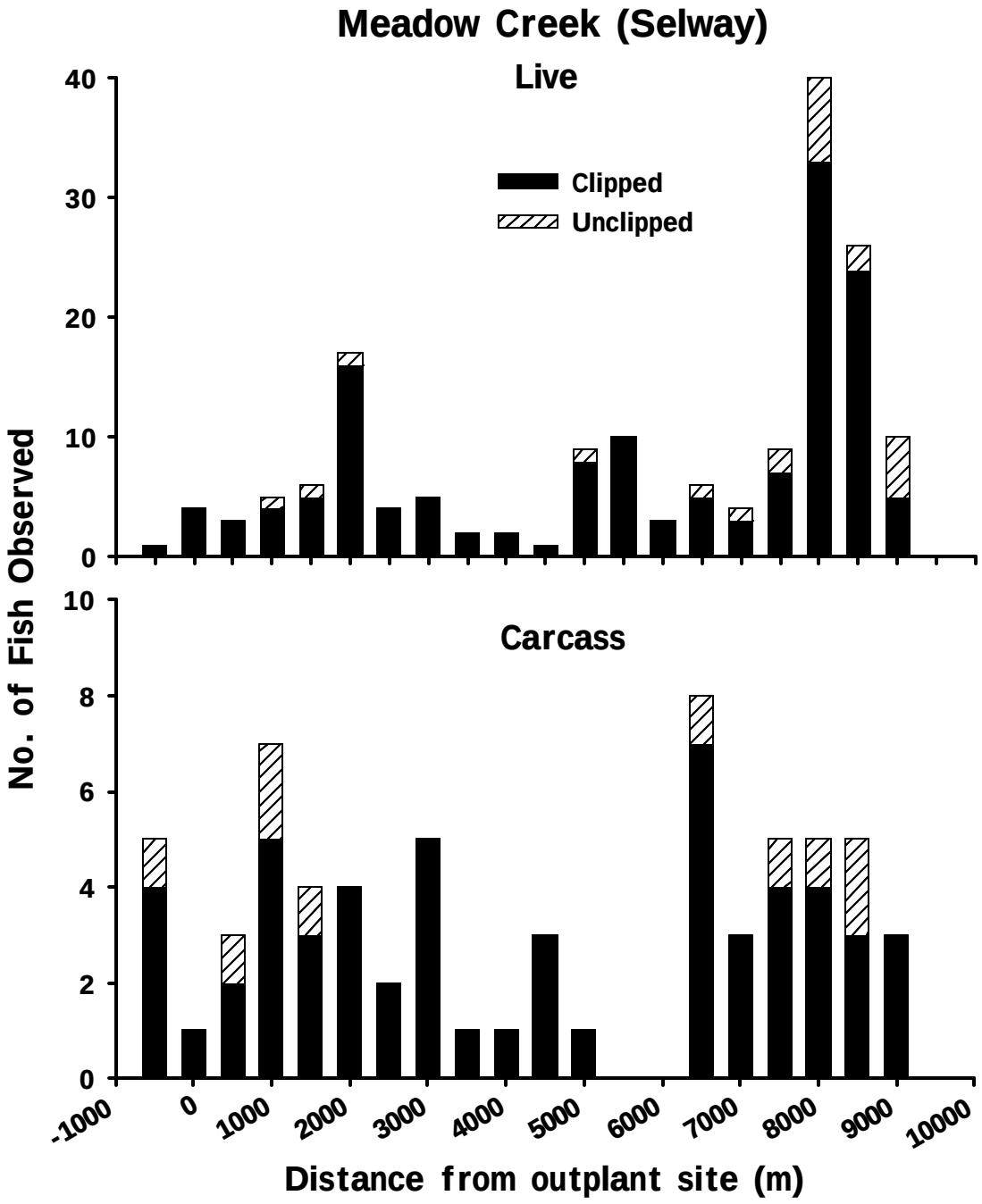

Figure 11. Distribution in Meadow Creek (Selway) of ad-clipped and unclipped chinook salmon among 500m stream segments expressed as distance from outplant location.

Pre-spawn Mortality

Pre-spawn mortality rates, as determined from egg retention in female carcasses, were higher among outplanted fish than naturally-arriving fish (Table 12). In the upper Selway, 41.3% of outplanted females recovered as carcasses still had their eggs in them while this was true for only 14.3% of naturally-arriving female carcasses (Table 12). A chi square test showed this difference to be significant at P = 0.057. In streams of the South Fork Clearwater Basin, there was indication of a difference in prespawning mortality rate of outplanted (100%) and naturally-arriving (60%) females, but the sample size of female carcasses was too small (13 fish) to be statistically significant (Fisher Test P = 0.128). Sample sizes of naturally-arriving females were too small in the lower Selway and Colt Killed Creek to compare prespawning mortality. Estimates of prespawning mortality only apply to fish that survived to within about a week of our initial surveys because carcasses rarely lasted longer than a week.

Total Egg Deposition

We estimate 600 ad-clipped and 404 unclipped chinook salmon females successfully spawned in the areas we surveyed. Disregarding Meadow Creek (Selway) and O'Hara Creek due to influence from ad-clipped returns of juvenile outplantings, 381 outplants and 389 naturally-arriving females successfully spawned suggesting a 98% increase over natural production resulting from outplanted adult fish. This was calculated by multiplying the percent of females for each reach (Table 13) by the estimated spawner abundance. In reaches where sample sizes for sex were small, (<15) we used the percent of females calculated for entire basin the reach was located in. Many females died before spawning, so we calculated the number of successful females by multiplying the total female spawners by proportion of females that spawned successfully in that basin (Table 13). If the average number of eggs per female is 4,000, approximately 1.5 million adult outplant and 1.5 million naturally-arriving female eggs were deposited in survey areas (without Meadow Creek Selway and O'Hara Creek)(Table 13). In the upper Selway, Outplanted adults roughly doubled the egg deposition that would have occurred if only naturally-arriving fish had spawned (Table 13).

Table 12. Pre-spawn mortality rates estimated from female carcasses of ad-clipped and unclipped spring chinook salmon. Unspawned carcasses were counted as prespawn mortality.

	Ad-Clipped		Unclipped	
Basin	**Spawned**	**Unspawned**	**Spawned**	**Unspawned**
Lower Selway				
O'Hara Cr.	4	1	1	0
Meadow Cr.	10	3	1	0
Sub-Total	**77.8%**	**22.2%**	**100.0%**	**0.0%**
Upper Selway				
Moose Cr.	0	0	0	1
Bear Cr.	0	2	0	0
Selway 3	19	9	13	0
Selway 4	2	6	4	1
Selway 5	2	0	1	0
Selway 6	1	0	0	0
Selway 8	1	0	0	0
Selway 9	2	0	0	0
Whitecap 1	0	2	0	1
Sub-Total	**58.7%**	**41.3%**	**85.7%**	**14.3%**
S.Fk. Clearwater				
Mill, Lower	0	1	2	3
Meadow Cr.	0	7	0	0
Sub-Total	**0.0%**	**100.0%**	**40.0%**	**60.0%**
Lochsa				
Colt Killed Cr.	2	1	1	0
Sub-Total	**66.7%**	**33.3%**	**100.0%**	**0.0%**

Table 13. Egg deposition, adult outplants and naturally-arriving spawners by stream in the Clearwater Basin study area. Spawner abundances based on 3 fish/redd extrapolation from redd counts. Estimate based on 4,000 eggs per female. Sex ratios were determined from carcass data. See page 38 for methods used to calculate female spawners and successful females. Some ad-clipped fish in Meadow Creek (Selway) and O'Hara Creek were likely returns from juvenile ad-clipped outplants.

		Spawners		% Females		Female Spawners		Successful Females		Egg Deposition	
Basin	**Stream**	**Ad-Clip**	**Unclip**	**Ad-Clip**	**Unclip**	**Ad-Clip**	**Unclip**	**Ad-Clip**	**Unclip**	**Ad-Clip**	**Unclip**
Lower	Meadow	496	37	59.6%	36.0%	296	13	230	13	919,957	53,280
Selway	O'Hara	167	31	65.0%	36.0%	109	11	84	11	337,808	44,640
	Sub-total	**663**	**68**	**65.0%**	**36.0%**	**404**	**24**	**314**	**24**	**1,257,765**	**97,920**
Upper	Selway 0	5	4	64.0%	51.0%	3	2	2	2	7,514	6,993
Selway	Selway 1	0	0	64.0%	51.0%	0	0	0	0	0	0
	Selway 2	0	0	64.0%	51.0%	0	0	0	0	0	0
	Selway 3	272	175	70.0%	56.0%	190	98	112	84	447,059	335,944
	Selway 4	94	88	64.0%	51.0%	60	45	35	39	140,687	154,511
	Selway 5	179	198	64.0%	51.0%	115	101	67	87	269,107	346,269
	Selway 6	72	61	64.0%	51.0%	46	31	27	27	108,196	106,645
	Selway 7	9	8	64.0%	51.0%	6	4	3	3	13,524	13,986
	Selway 8	37	31	64.0%	51.0%	24	16	14	14	55,601	54,197
	Selway 9	58	49	64.0%	51.0%	37	25	22	21	87,158	85,666
	Moose	36	24	64.0%	51.0%	23	12	13	11	53,703	42,418
	Bear	46	35	64.0%	51.0%	29	18	17	15	69,250	61,190
	Whitecap 1	21	18	64.0%	51.0%	13	9	8	8	31,557	31,469
	Whitecap 2	47	39	64.0%	51.0%	30	20	18	17	70,628	68,183
	Whitecap 3	21	18	64.0%	51.0%	13	9	8	8	31,557	31,469
	Canyon	0	0	64.0%	51.0%	0	0	0	0	0	0
	Eagle	0	0	64.0%	51.0%	0	0	0	0	0	0
	Running 1	54	46	64.0%	51.0%	35	23	20	20	81,147	80,421
	Running 2	9	8	64.0%	51.0%	6	4	3	3	13,524	13,986
	Sub-total	**1000**	**758**	**64.0%**	**51.0%**	**627**	**387**	**370**	**358**	**1,480,212**	**1,433,346**
S.Fk.	Mill, Lower	23	56	33.0%	46.0%	7	26	0	16	0	62,297
Clrwtr	Mill, Upper	0	0	0.0%	0.0%	0	0	0	0	0	0
	Meadow	74	52	35.0%	46.0%	26	24	0	14	0	57,408
	Sub-total	**97**	**108**	**35.0%**	**46.0%**	**33**	**50**	**0**	**30**	**0**	**119,705**
Lochsa	Colt Killed	53	15	60.0%	48.0%	32	7	11	0	42,439	0
	Total	**1813**	**949**	**60.0%**	**48.0%**	**1088**	**456**	**695**	**413**	**2,780,415**	**1,650,971**

Note: Dworshak National Fish Hatchery egg take averaged approximately 4,150 eggs per female in 2001. Rapid River Hatchery predicts 3,700 -4,000 eggs per female.

SPAWN TIMING

We counted a total of 713 new redds in the study areas, with 391 of these observed in the second week, suggesting peak spawning occurred between August 31 and September 8 (Table 14). However, in O'Hara Creek in the lower Selway, spawning peaked in the first week of surveys (Aug. 23-Aug. 30) (Table 8). Spawn timing between the subbasins appears to be fairly consistent throughout the study with the exception of lower Selway which had spawn timing earlier than other subbasins (Table 15). Although spawning started earlier in the lower Selway , it was also the last subbasin to have completed spawning with the lowest percentage of spawning complete after the third week (Table 15).

Table 14. Number of new redds counted each week in each stream reach surveyed. Reaches surveyed all three weeks are in bold italics. Dashes indicate no survey.

Basin	Stream	Week 1	Week 2	Week 3	Total
S.Fk. Clwtr.	Mill, Upper	0	0	--	0
S.Fk. Clwtr.	***Mill, Lower***	***1***	***23***	***2***	***26***
S.Fk. Clwtr.	***Meadow***	***7***	***20***	***9***	***36***
S.Fk. Clwtr.	**Subtotal**	**8**	**43**	**11**	**62**
Lower Selway	***O'Hara***	***52***	***9***	***4***	***65***
Lower Selway	***Meadow***	***58***	***63***	***19***	***140***
Lower Selway	**Subtotal**	**110**	**72**	**23**	**205**
Upper Selway	Selway 0	--	2	--	2
Upper Selway	Selway 1	0	--	--	0
Upper Selway	Selway 2	0	--	--	0
Upper Selway	***Selway 3***	***27***	***64***	***45***	***136***
Upper Selway	***Selway 4***	***30***	***26***	***3***	***59***
Upper Selway	Selway 5	27	61	--	88
Upper Selway	Selway 6	3	9	--	12
Upper Selway	Selway 7	--	4	--	4
Upper Selway	Selway 8	--	16	--	16
Upper Selway	Selway 9	--	25	--	25
Upper Selway	Moose	--	14	--	14
Upper Selway	Bear	--	18	--	18
Upper Selway	Whitecap 1	4	5	--	9
Upper Selway	Whitecap 2	1	19	--	20
Upper Selway	Whitecap 3	--	9	--	9
Upper Selway	Eagle	--	0	--	0
Upper Selway	Running 1	9	--	--	9
Upper Selway	Running 2	--	4	--	4
Upper Selway	**Subtotal**	**101**	**276**	**48**	**425**
Lochsa	Colt Killed	–	–	21	21
Clearwater	**Total**	**219**	**391**	**103**	**713**

Table 15.Cumulative number of redds constructed, and percent of spawning complete as of each week of surveys.

Basin	Week 1 8/23 - 8/31	Week 2 9/1 - 9/8	Week 3 9/9 - 9/13	Post Survey Post 9/13
	# Redds Cumulative			
S. Fk. Clearwater	8	51	62	68
Lower Selway	110	184	207	244
Upper Selway	57	147	195	210
	% Spawning Complete			
S. Fk. Clearwater	12%	75%	91%	100%
Lower Selway	45%	75%	85%	100%
Upper Selway	27%	70%	93%	100%

Spawn time appeared similar between outplanted and naturally-arriving fish. In streams surveyed during each of the three weeks, there was no trend between weeks for any change in the proportion of carcasses that were ad-clipped or unclipped (Figure 12).

SPAWNER CHARACTERISTICS

Sex Comparison

We determined the sex of 161 ad-clipped and 73 unclipped carcasses. There were indications, although not statistically significant (P=0.19) that females composed a greater percentage of outplanted fish (65%) than of naturally-arriving fish (51%) in the upper Selway Subbasin (Table 16). There was a significant (P=0.007) difference in the percentage that females composed of outplanted fish (65%) in the upper Selway Subbasin compared to that in the South Fork Clearwater Basin (33%). The hatchery sources and outplanting of these two basins differed (see Table 2).

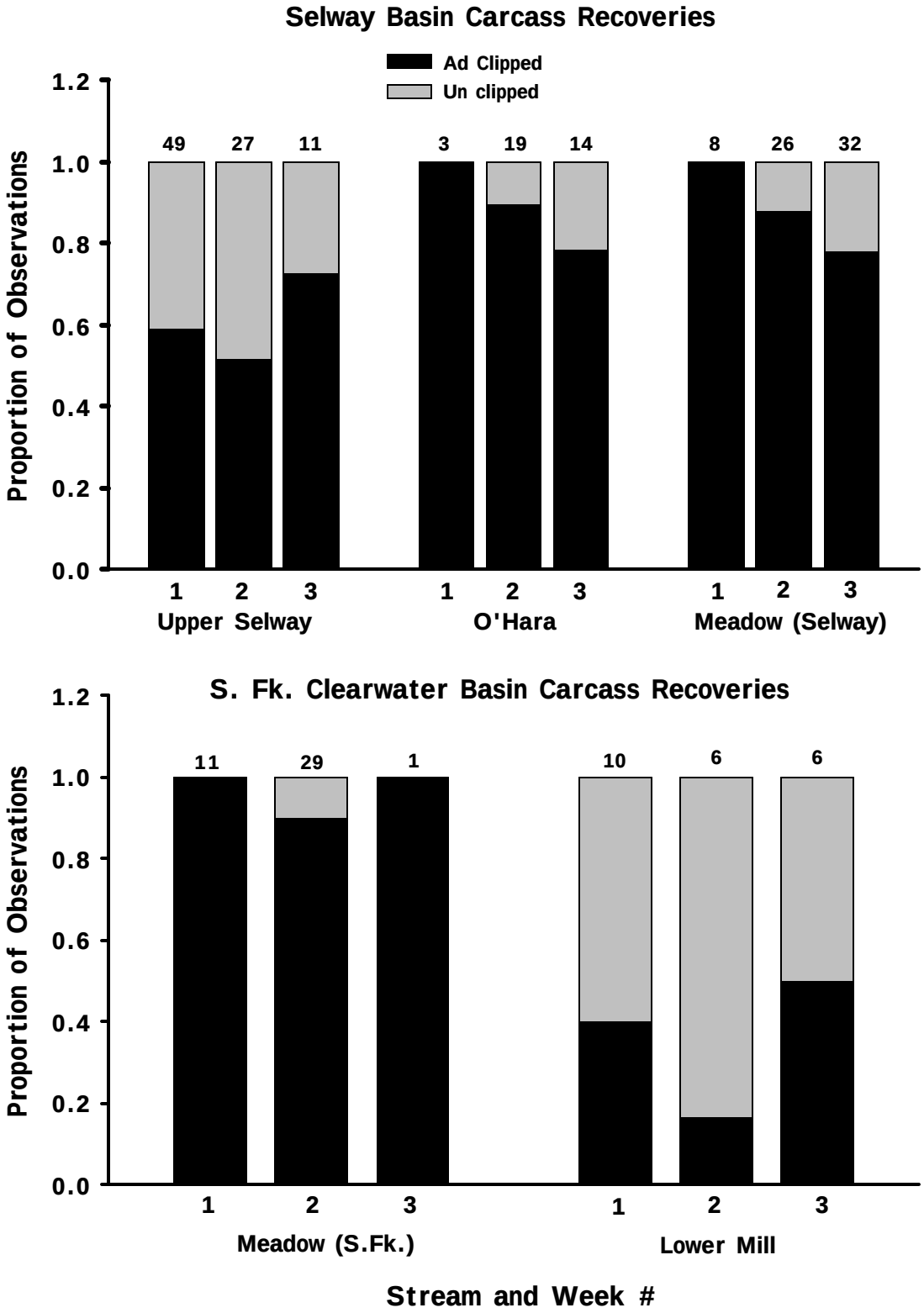

Figure 12. Proportion of unclipped and ad-clipped carcass recoveries by stream and week in five index areas. Numbers above bars are numbers of carcasses examined. Some ad-clipped fish in Meadow Creek (Selway) and O'Hara Creek were likely returns from juvenile ad-clipped outplants.

Table 16. Sex composition of adult outplants and naturally-arriving chinook salmon in the Clearwater Subbasin, 2001. % Females is only calculated for reaches where at least five observations were made. Some ad-clipped fish in Meadow Creek (Selway) and O'Hara Creek were likely returns from juvenile ad-clipped outplants.

		Outplants			Naturally-Arriving		
Basin	**Stream**	**Male**	**Female**	**% Females**	**Male**	**Female**	**% Females**
Lower Selway	Meadow	21	31	59.6%	6	3	33.3%
	O'Hara	1	8	88.9%	1	1	--
	Sub-total	**22**	**39**	**63.9%**	**7**	**4**	**36.4%**
Upper Selway	Selway 0	0	0	--	0	0	--
	Selway 1	1	0	--	0	0	--
	Selway 2	1	0	--	0	0	--
	Selway 3	12	28	70.0%	12	15	55.6%
	Selway 4	3	8	72.7%	3	6	66.7%
	Selway 5	1	2	--	2	2	--
	Selway 6	2	1	--	0	0	--
	Selway 7	0	0	--	0	0	--
	Selway 8	0	1	--	0	0	--
	Selway 9	1	2	--	3	0	--
	Moose	0	0	--	0	1	--
	Bear	3	1	--	2	0	--
	Whitecap 1	0	2	--	2	1	--
	Whitecap 2	0	0	--	0	0	--
	Whitecap 3	1	1	--	0	0	--
	Canyon	0	0	--	0	0	--
	Eagle	0	0	--	0	0	--
	Running	0	0	--	0	0	--
	Sub-total	**25**	**46**	**64.8%**	**24**	**25**	**51.0%**
S.Fk. Clearwater	Mill, Lower	3	1	--	5	5	50.0%
	Mill, Upper	0	0	--	0	0	--
	Meadow	17	9	34.6%	2	1	--
	Sub-total	**20**	**10**	**33.3%**	**7**	**6**	**46.2%**
Lochsa	Colt Killed Cr.	1	3	--	1	0	--

Length at Maturity

Mean MEPS lengths of outplanted fish and naturally-arriving spring chinook salmon in our survey sections was identical; 630 mm (Table 17). We did not observe carcasses of either outplants or naturally-arriving age 2 jacks. Outplanted males tended to be longer than outplanted females while naturally-arriving males tended to be smaller than naturally-arriving females.

Age Composition

Analysis of scales sampled from spawned carcasses indicated that 93% of ad-clipped chinook salmon were age-4 while only 7% were age-5. Similarly, 88.8% of unclipped chinook salmon were age-4, but 11% were age-3 jacks. Appendix C presents a summary of marks and scale samples taken from carcasses.

Table 17. Average length (MEPS) of spring chinook salmon carcasses by stream in the, Clearwater basin, 2001.

	Outplants				Naturally-arriving			
Stream	**Male**	**n=**	**Female**	**n=**	**Male**	**n=**	**Female**	**n=**
Meadow	623	11	608	17	NA	0	610	1
O'Hara	NA	0	628	5	NA	0	660	1
Sub-total	**623**	**11**	**613**	**22**	**NA**	**0**	**635**	**2**
Selway 1	500	1	NA	0	NA	0	NA	0
Selway 2	630	1	NA	0	NA	0	NA	0
Selway 3	656	12	633	25	602	5	683	3
Selway 4	660	3	624	6	740	1	650	1
Selway 5	660	1	675	2	NA	0	600	1
Selway 6	615	2	650	1	NA	0	NA	0
Selway 7	NA	0	NA	0	NA	0	NA	0
Selway 8	NA	0	620	1	NA	0	NA	0
Selway 9	710	1	567	2	670	1	NA	0
Moose	NA	0	NA	0	NA	0	630	1
Bear	628	2	645	1	650	1	NA	0
Whitecap 1	NA	0	600	2	NA	0	NA	0
Whitecap 2	NA	0	NA	0	NA	0	NA	0
Whitecap 3	740	1	800	1	NA	0	NA	0
Canyon	NA	0	NA	0	NA	0	NA	0
Eagle	NA	0	NA	0	NA	0	NA	0
Running	NA	0	NA	0	NA	0	NA	0
Sub-total	**649**	**24**	**627**	**41**	**634**	**8**	**655**	**6**
Lower Mill	622	3	680	1	598	5	638	3
Upper Meadow	627	12	635	7	575	1	NA	0
Sub-total	**626**	**15**	**641**	**8**	**594**	**6**	**638**	**3**
Colt Killed Cr.	600	1	628	3	615	1	NA	0
Total	**636**	**51**	**624**	**74**	**617**	**15**	**647**	**11**

STREAM TEMPERATURE

Mean water temperatures in the Upper Selway ranged from 46 to 64º F with a steady decrease in mean temperatures throughout the study period (Figure 13). Diurnal fluctuations in temperature were 10ºF in the mainstem Selway during late August. Mean temperatures in the Selway at Whitecap Creek (lower end of Selway Reach 1) remained near 60ºF until the second week of September (Figure 13), while those upstream were at or below 57ºF during the last week of August. In Meadow Creek (Selway) average temperatures remained near 61º F until mid-way through the second week when average temperatures dropped to near 55º F in week three (Figure 14). In other locations temperature data was recorded using handheld thermometers during surveys. A single temperature reading of 63º F was recorded in lower Bear Creek in the afternoon of September 5. On the same date, temperatures of 55-63º F were recorded in lower Moose Creek. Temperatures in O'Hara Creek ranged from 55-62º F in the first week to 55º F in the final week. In the South Fork Clearwater streams, temperatures were recorded as high as 57º F in week two and as low as 45º F in week three. Temperatures in Colt Killed Creek ranged from 48-55º F during the single survey September 11th and 12th.

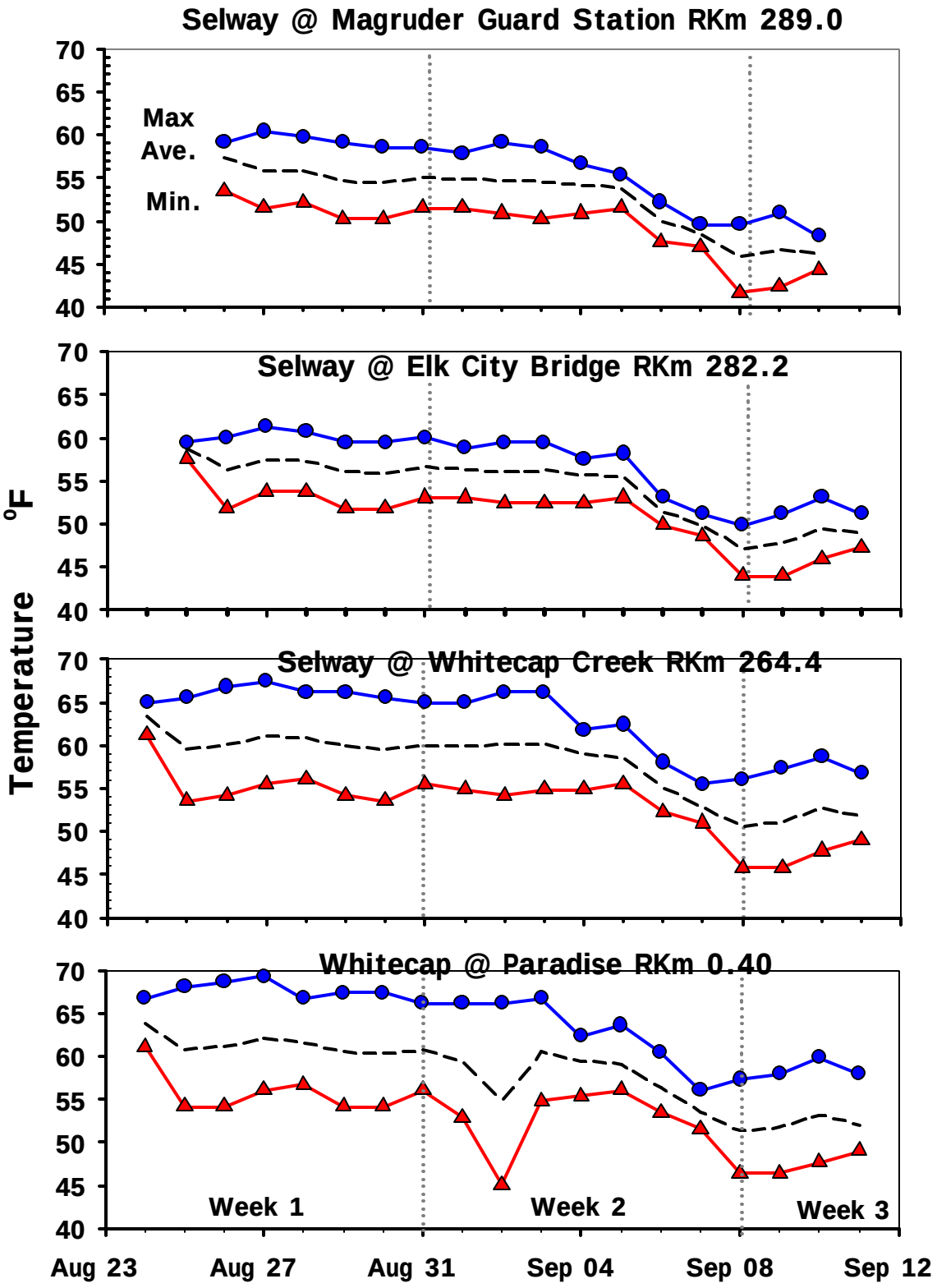

Figure 13. Temperature profiles of several locations in the Upper Selway as taken by Stowaway temperature monitors. River kilometers of Selway are given as distance from confluence of Clearwater and Snake Rivers.

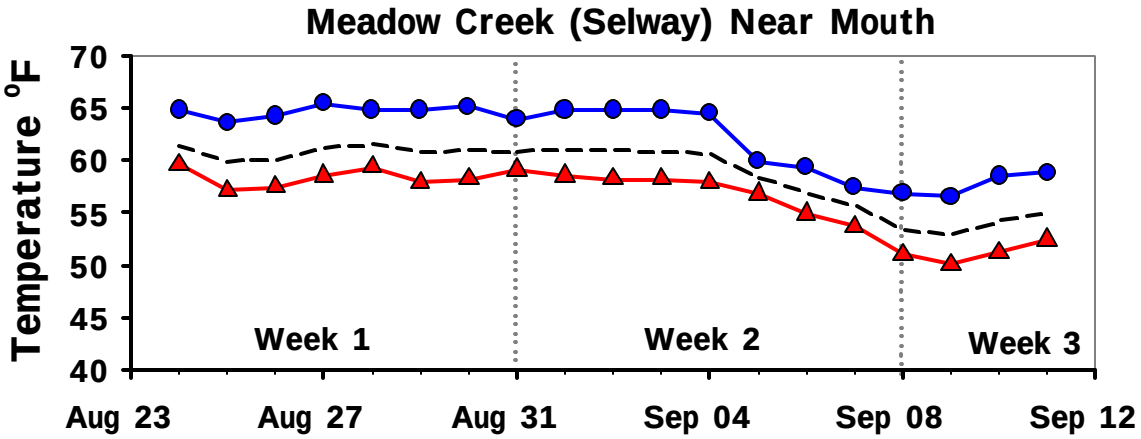

Figure 14. Temperature profile of Meadow Creek (Selway). Data taken near the mouth of Meadow Creek. Data obtained from the Nez Perce Tribe.

DISCUSSION

CONTRIBUTION OF OUTPLANTS TO NATURAL SPAWNING

Accounting of Outplants

We accounted for only a minor portion of outplanted fish in areas we surveyed. Even if all marked fish were assumed to be outplanted fish, our expanded estimate of hatchery spawners represented 24% of outplanted adults in the upper Selway and Colt Killed Creek, and 44-60% of outplanted adults in Mill and Meadow creeks of the South Fork Clearwater and O'Hara Creek of the lower Selway (Table 18). The higher percentage of fish recovered in Mill, Meadow, and O'Hara creeks is to be expected because salmon were outplanted only 3 days to 2 weeks before surveys began. We suspect many returns in O'Hara creek originated from ad-clipped smolts released in nearby Meadow Creek (Selway). Only 1 of 32 carcasses examined in O'Hara Creek had a secondary hatchery mark. Conversely, outplants released at the mouth of O'Hara Creek could easily enter the Selway mainstem lowering the percentage of outplants recovered in O'Hara Creek.

Although the upper Selway is a larger stream (20.7m wide at low flow) than Mill and Meadow creeks of the South Fork Clearwater, we do not believe size of stream affected recovery of carcasses or observations of redds. Visibility in the upper Selway was excellent and there were no areas obscured from our vision. Accordingly, we interpret the lower recovery rate of outplanted fish in the upper Selway to indicate either more fish died or dispersed further during the extended time they were free (7-11 weeks).

We believe the low recovery rate of outplanted fish in Colt Killed Creek may have been related to outplants leaving the study area, prespawning mortality, and a high rate of scavenging. We believe outplanted fish in Colt Killed Creek distributed themselves outside our study area as they did in the upper

Selway. Our surveys were conducted 1.6km downstream and 3.9km upstream of the outplant site, and live ad-clipped fish were seen at both the lower and upper extent of the survey. Surveys conducted by the IDFG on Colt Killed Creek between September 4th and 6th indicated significant presence of both ad-clipped and unclipped fish above and below our survey reach (IDFG unpublished data).

Carcasses recovered on Colt Killed Creek were frequently found out-of-water on gravel bars and partially eaten. Salmon predation by bears appeared move evident on Colt Killed Creek than in other streams we surveyed. Observations indicated bears took salmon at a higher rate on Colt Killed Creek than other streams we surveyed. However, the influence from hatchery strays from the Powell Hatchery facility downstream of the survey area may have raised our percentage of outplants recovered. The evidence for prespawning mortality is described in the next report section.

Table 18. Number and percentage of outplanted chinook salmon that could be accounted for in each area surveyed.

Survey Area	Number of Fish Outplanted	Estimated Outplanted Spawners	Percentage of Outplants Accounted For
Upper Selway	4,155	1000	24%
O'Hara Creek	379	167	44%*
Mill Creek	41	23	56%
Meadow Crk (S. Fk.)	123	74	60%
Colt Killed Creek	219	53	24%

** Likely includes returns from 1999 smolt release in Meadow Creek (Selway).*

Our accounting for outplanted fish is also influenced by our assumed ratio of three spawners/redd used to estimate the number of spawners in the study area. This ratio is based on data from 1990-2000 of spring chinook spawning in the Imnaha River in northeastern Oregon. For the 10 yrs. of data from which we derived our estimate, values ranged from 1.62 to 3.74 spawners/redd with an average of 2.76. This estimate accounts for both male and female spawners, and does not correct for pre-spawning mortality. The estimate comes from a section of river above a weir where they conduct mark-recapture estimates of fish passing over the weir to estimate spawning populations, and conduct multiple redd surveys to estimate the number of redds. If the true ratio in the streams we surveyed was higher, then our spawner estimates and percent of outplants accounted for would have been higher since they were based on redd counts. Observations as high as 4 females/redd in areas where outplanting occurred have been made in Newsome Creek in the Clearwater Basin (Personal communication, Jay Hesse, Nez Perce Tribal Fisheries, Lapwai, ID).

Post Release and Prespawning Mortality

Prespawning mortality was high among outplanted fish and may account for most of the unaccounted fish, although migration out of our survey areas was also likely a contributing factor. We found evidence that some fish died within a few days after outplanting, while others survived until the spawning season, but still died unspawned. The clearest example of delayed outplanting mortality was found in Meadow Creek (South Fork Clearwater) where we surveyed 3 days after fish were outplanted. Within 250 m of the release site, we found 9 ad-clipped carcasses (all unspawned males and females) plus 23 carcasses in condition too poor to distinguish fin clips. Carcasses found in this 500m segment represented over half of all carcasses found in 3.7 miles of stream surveyed. The fish that did survive the delayed morality had dispersed substantially, because we observed live ad-clipped fish in most sections of Meadow Creek up to 4000 m upstream of the release site (Figure 8). It is likely that delayed mortality occurred at other locations, but we were not present soon enough to find the carcass. Above average temperatures and low flows during the spawning season contributed to the rapid rate of carcass decomposition and removal from the stream.

Carcasses were removed quickly by scavengers. We observed many bear (*Ursus americanus*) tracks, and other bear signs, and we observed one bear removing a salmon from the upper Selway River. We suspect the outplanting program, plus the large escapement of natural salmon, attracted bears to the rivers. Of 120 carcasses we jaw tagged or chopped, only 12 were recovered on subsequent surveys. Although we estimated from redd counts that there were 2,753 spawners in our study areas, we only found 385 carcasses.

We have no means to directly estimate delayed mortality, but within several days of outplanting in Meadow Creek (South Fork), we found 32 mortalities near the release site that probably resulted from a group of 73 fish released 3 days earlier. Some of the dead fish may already have been removed from the site, so the observed carcasses would represent a minimum 44% mortality. Because Meadow Creek is a small stream with limited holding areas for adult chinook salmon, stress to the fish and prespawning mortality may have been higher than in other areas of outplanting. However, the limited number of outplanted fish accounted for as spawners in each of the areas we surveyed is consistent with the theory that prespawning mortality was substantial.

In addition to observed delayed mortality after outplanting, the only prespawning mortality we could have detected was that which occurred within a week of spawning. About 90% of the carcasses we marked and left in the stream were not present the following week. Therefore, we know that most carcasses we observed were fish that died within the last week. Even with this limitation for detecting prespawning mortality, 41% of outplanted female carcasses we examined in the upper Selway were unspawned. This was significantly greater (Π^2 test, P= 0.057) than the 14% of naturally-arriving female carcasses that were unspawned. When combined with our estimate that only 24% of outplanted fish were accounted, the finding that only 59% of those fish

spawned successfully, indicates only 14% of outplanted females spawned successfully within the areas surveyed in the upper Selway Subbasin. This calculation assumes all ad-clipped fish in the area resulted from outplants although only 56% of ad-clipped fish had distinguishable secondary marks.

Sample sizes for estimating prespawning morality were 7 or less fish in other streams surveyed so we cannot confidently estimate the magnitude of prespawning mortality in those areas. We can, however, confirm that marked female carcasses with eggs retrained were found in all streams surveyed. In Meadow Creek (South Fork) all seven marked female carcasses still had their eggs. Meadow Creek (South Fork) is the one stream in which we recovered the highest percentage of fish released (62%), but none of them were found to have spawned successfully. These limited observations indicate that only a small fraction of outplanted adult spring chinook salmon spawned successfully in 2001.

DISPERSION OF SPAWNING BY OUTPLANTS

The distribution and spawning success of outplanted fish in the study areas was apparently influenced by at least two major factors; date of the outplanting, and temperature. First, we discuss effects related to timing of outplanting.

Effects of Outplanting Date

One of the key questions in evaluating a spawning supplementation project is: How does the timing of outplanting affect the distribution and success of outplanted fish? An opportunity to answer this question was afforded by large differences in outplanting dates between the upper Selway and other areas we surveyed. In the upper Selway, 2,900 of the 4,155 fish outplanted were planted in June, and the last 1,200 were planted during July 3 to August 2. Thus, most fish were planted in the upper Selway at least 7-11 weeks prior to spawning. Conversely, outplanting in other streams (except one group of 200 fish in Meadow Creek (Selway) on July 16) did not begin until August 13, and concluded as late as August 27 (see Table 2). Fish in those streams would have spawned within a few days to a few weeks after being outplanted.

Our data show a important difference in distribution of outplanted spawners between these contrasting groups of early and late outplants. In the small streams (Mill, Meadow (S.Fk.) and Colt Killed creeks) where outplanting was shortly before spawning, spawners spread more than a mile up and downstream, but there was little (r= 0.37) correlation between where naturally-arriving spawners and outplanted fish chose to spawn (see Figure 5). In the upper Selway where fish were out planted 1-3 months before spawning, fish spread throughout the subbasin and there was a high correlation (r= 0.99) between where outplants and naturally-arriving fish chose to spawn (see Figure 5). Alternatively, this relationship could be explained by physical differences in the streams, and the locations of available spawning habitat.

Adults outplanted earlier in the season were not yet ready to spawn. They had time to acclimate to their new environment and to search for desirable

spawning habitat. It appears early outplants exercised the same preferences for spawning habitat as natural spawners. On the other hand, outplants released later in the season were nearly ripe and ready to spawn after release. They were afforded less time and, consequently, less discretion in seeking out spawning habitat.

Timing of outplanting may have also had an effect on survival of outplanted fish to spawning, although we had little data to evaluate this relationship. In the upper Selway, there were groups of fish outplanted at different times with different secondary marks, so we could compare their recovery rates. A group of 3,355 fish from the Rapid River Hatchery with dorsal fin punches were released prior to July 3. Subsequently,800 fish from Dworshak National Fish Hatchery with opercle notches were released on July 24, and August 2. Hatchery. A larger percentage (3.3%) of the late release fish from Dworshak National Fish Hatchery were recovered than early releases from Rapid River Hatchery (0.4%, Table 19). We cannot be certain that this difference reflected greater survival of the later fish from Dworshak National Fish Hatchery because the dorsal punch (used earlier on fish from Rapid River Hatchery) could not be distinguished on many carcasses. The dorsal fin was one of the first parts of carcasses to decompose. Also, early released fish had more time to leave the upper Selway and spawn in areas not surveyed.

Table 19. Summary of number of fish released and recovered with unique hatchery marks in the upper Selway Subbasin

Mark	# Released	Last Release Date	# Recovered
Dorsal Punch	2,945	7/3/2002	12
Opercular Punch	800	8/3/2002	26

Effects of Temperature

High temperatures in the upper Selway Subbasin may have influenced the distribution of outplanted fish. The temperature preference range for chinook salmon migration is 38-57ºF and for spawning is 42-57ºF (Bjornn and Reiser 1991). However, average daily temperatures near Whitecap Creek in the upper Selway in the first week of surveys were consistently above 60ºF, and likely warmer in prior weeks (Figure 13). Consistent with this undesirable temperature for spawning, we never found any redds in the next 14.2km of Selway River mainstem (reaches 1 and 2) below Whitecap Creek (see Figure 2 and 3). High temperatures likely caused outplanted fish to seek cooler waters farther upstream or in tributaries. We did observe spawning in the Selway River downstream of Whitecap Creek when temperatures cooled.

POTENTIAL FOR IMPACT ON NATURAL SPAWNING

Outplanting and Spawner Densities

There was evidence in one of the reaches we surveyed that spawning exceeded the capacity of the area for spawning. Only in the Selway River reach between the Little Clearwater River and the Elk City bridge did we observe some salmon spawning on top of existing redds and spawning in marginal quality habitat. This reach had the highest concentration of spawners (see Table 2). Aerial surveys by IDFG indicate this reach had the highest spawning densities in the upper Selway from 1996-1999 (IDFG, unpublished data 2001). However, in those years redd densities were only 1.2 to 2.8 redds per kilometer. Aerial and ground counts of redds are not directly comparable, but it is clear from our estimate of 51 redds/km spawner densities in 2001 far exceeded escapement of recent years. We also noted superimposition of redds in Meadow Creek (lower Selway), but we believe the high escapement in Meadow Creek was caused by returns from a hatchery release of 300,000 ad-clipped smolts two years earlier. In all other areas, spawning density seemed to be within the capacity of available spawning habitat.

Relationship of Outplant Abundance Estimates to Outplant Activities

Our expanded estimate of outplanted spawners in the upper Selway Subbasin is only 24% of the number of fish outplanted. Some 4,155 adult chinook salmon were outplanted into the upper Selway Subbasin prior to completion of our surveys (see Table 2), but we estimated that only 950 outplanted chinook salmon successfully spawned (see Table 8).

High prespawning mortality probably accounts for a large share of the missing fish, but it is also possible that a large share of outplanted fish spawned outside of our survey area. As discussed earlier, an aerial survey in the first week of surveys showed that 50% of redds in the Selway main stem were outside of the study area (see Table 5). It is probable hatchery fish moved downstream from the upper release site and spawned in the middle or lower Selway or in unsurveyed tributaries. In fact, the majority of adult chinook salmon observed in Bear and Moose creeks were ad-clipped where no fish were outplanted. Bear and Moose creeks were surveyed when most of the salmon were still alive so we could not confirm from secondary marks whether those fish were from outplants. Logistical constraints prevented us from returning to these streams when spawning was completed.

It is also possible outplanted fish left the Selway Subbasin and spawned elsewhere or returned to their hatcheries of origin. However, hatchery personnel could not determine if outplanted fish returned to the hatchery because hatcheries had used the same secondary marks on adults trucked downstream for recycling through the sport fisheries (personal communication, Rene'e Hedrick, IDFG, Clearwater Anadromous Fish Hatchery). Nicole Johnson (IDFG) reported that none of the outplanted adult salmon returned to Rapid River Hatchery.

In contrast to our other survey areas, the outplant spawner abundance estimate in Meadow Creek (Selway), was slightly larger than the number of fish outplanted. We estimated 217 outplant (ad-clipped) spawners in Meadow Creek while only 200 were released. Again, there were obvious explanations for this over-estimation. First, ad-clipped adults were returning to Meadow Creek from a release of 300,000 adipose-clipped smolt released in 1999 (age 4 in 2001). Secondly, 1,228 adults were outplanted upstream of Selway Falls which is a short distance below the mouth of Meadow Creek. Since Meadow Creek is the first tributary with chinook salmon spawning above the outplant site, some outplants may have entered Meadow Creek.

RECOMMENDATIONS

If outplanting of excess hatchery adults is to continue, we offer the following recommendations for improving both the effectiveness of spawning and the determination of impacts on natural spawning.

1. The outplanting of adult hatchery fish doubled the egg deposition in the upper Selway. However, it should be recognized only a small percentage of outplanted fish, perhaps 10-20%, will spawn successfully. It is uncertain if survival will improve in years of better environmental conditions. The fall of 2001 was marked by unusually high temperatures, and low flows contributing to stress on outplanted fish. In addition, our estimate of spawning success may be artificially low if outplanted fish migrated outside the study area.
2. Time of outplanting affects survival, dispersal, and selected spawning areas. Adult salmon outplanted in June dispersed to spawning areas in direct proportion to natural fish while adult salmon released in August spawned relatively close to their release site. Further, adult salmon released in June appeared to produce more successful spawners than salmon released in August. Early releases appear superior if the management objective is to maximize benefits of outplanting. Late releases appear superior if the objective is to seed specific reaches of stream or minimize potential interaction with natural fish.
3. Superimposition of redds indicated the number of outplants stocked in the upper Selway exceeded available spawning habitat in the reach from the Magruder Bridge to the Little Clearwater River. If this same outcome is repeated in the future the number of outplants should be reduced in that reach.
4. New types of secondary marks should be used on outplanted fish. Marks should be chosen for their longevity through spawning and the initial decaying process. Marks on the dorsal fin were particularly hard to distinguish among carcasses.
5. Outplanting locations should be surveyed 3-5 days after outplanting to detect delayed mortality. We only observed delayed stocking mortality at one site where our surveys followed 3 days after the fish were outplanted. There is little chance of recovering a carcass one week after death of a fish.
6. The number of carcasses recovered and data gathered could be significantly increased in reaches of interest by increasing the survey frequency to twice weekly. Confident interpretation of findings in this study is limited by the low number of carcasses recovered and indistinction of secondary marks.
7. All carcasses should be scanned with a CWT detector. Use of a CWT detector in the field would aid in distinguishing unclipped natural fish from unclipped hatchery fish.

8. Evaluation of the contribution from outplanting to natural production in the Clearwater Basin could be enhanced by monitoring juvenile densities and subsequent adult returns in areas where outplanting occurred. For such monitoring to be useful, comparisons to control streams would be needed.

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Data category = Smolt Density Model Data, Species = Chinook Salmon, Run = Spring, Columbia Subbasin = Selway, S Fk, Lochsa.

APPENDIX

APPENDIX A. A list of stream reaches surveyed by IDFG, USFS, NPT and SPCA in the Clearwater Basin in 2001.

Agency	HydroName	Lower Bound	Upper Bound
		Ground Surveys	
IDFG	American River	Mouth	Box Sing Creek
IDFG	American River	Box Sing Creek	Corrals (US of dredge tailings where FS 443 leaves river)
IDFG	American River	Corrals (US of dredge tailings where FS 443 leaves river)	Limber Luke Creek
IDFG & USFS	Big Sand Creek	Mouth	Hidden Creek
IDFG & USFS	Brushy Fork	About 1 mile DS of Elk Meadows Bridge (FS 373)	Elk Meadows Road bridge (FS373)
IDFG & USFS	Crooked Fork Lochsa River	Rock Creek	Cliff Hole
IDFG	Crooked River	Mouth	Headwaters / East & West Fork Crooked River / Umatilla Creek
IDFG	Crooked River	Relief Creek	Orogrande Airstrip (upper end)
IDFG & USFS	Eldorado Creek	Mouth	Eldorado Creek Weir
IDFG & USFS	Eldorado Creek	Eldorado Creek Weir	Six-bit Creek
IDFG	Meadow Creek	McComas Meadows (bottom)	McComas Meadows (top)
IDFG	Meadow Creek	Mouth	Pea Creek
IDFG & USFS	Musselshell Creek	Mouth	Bridge US of Musselshell Work Center
IDFG	Red River	Mouth	Gold Point
IDFG	Red River	Gold Point	Dawson Creek
IDFG	Red River	Dawson Creek	Little Moose Creek
IDFG	Red River	Little Moose Creek	Red River Weir
IDFG	Red River	Red River Weir	Red River Campground
IDFG	Red River	Red River Campground	Shissler Bridge
IDFG & USFS	Selway River	Little Clearwater River	Magruder Crossing (FS 468)
IDFG	South Fork Clearwater River	Cottonwood Creek	Sears Creek
IDFG	South Fork Red River	Mouth	Schooner Creek
IDFG & USFS	Storm Creek	Mouth	Headwaters / North & South Fork Storm Creek
IDFG & USFS	Colt Killed Creek	Mouth	Big Flat Creek
IDFG & USFS	Yoosa Creek	Mouth	Camp Creek
IDFG & USFS	Yoosa Creek	Mouth	Headwaters
SPCA	Selway River	Running Creek	White Cap Cr.
SPCA	Selway River	White Cap Cr.	Indian Cr.
SPCA	Selway River	Indian Cr.	Little Clearwater River
SPCA	Selway River	Little Clearwater River	Magruder Crossing
SPCA	Selway River	Deep Cr.	Hells Half Acre Cr.
SPCA	Selway River	Hell's Half Acre Cr.	Junction of Trails 4 and 12
SPCA	Selway River	Junction of Trails 4 and 12	Wilkerson Cr.
	Selway River	Wilkerson Cr.	Thompson Flat
	Selway River	Thompson Flat	1.4mi upstream of Swet Cr.
SPCA	Whitecap Cr.	Mouth	9mi. Upstream
SPCA	Canyon Cr. (Whitecap Trib.)	Mouth	3.5 mi.
SPCA	Running Cr.	Mouth	Grouse Cr.
SPCA	Eagle Cr. (Running Trib.)	Mouth	1.5 mi.
SPCA	Bear Cr.	Mouth	5.6 mi upstream
SPCA	Moose Cr.	Mouth	About 7 mi. upstream
SPCA	Meadow Cr.	Mouth	6.5 mi upstream
SPCA	O'Hara Cr.	Mouth	Hamby Fork ?
SPCA	Mill Cr	Mouth	3.1 mi upstream
SPCA	Meadow Cr. (S.Fk.)	Just Below Rock Cr.	3.7mi.
SPCA	Colt Killed Cr.	1500m below Colt Cabin Bridge	About 600m upstream of Big Sands Creek.
SPCA	Big Sands Cr.	Mouth	500m upstream

NPT	Baldy Creek (Newsome)	Mouth	1500 meters upstream
NPT	Bear Creek (Newsome)	Mouth	1500 meters upstream
NPT	Beaver Creek (Newsome)	Mouth	1500 meters upstream
NPT	Brown's Creek	Mouth	Weaver Creek
NPT	Camp Creek	Mouth	1.5 miles upstream
NPT	Eldorado Cr.	Mouth	Weir site
NPT	Eldorado Cr.	Dollar Cr. Bridge	Weir site
NPT	Lolo Cr.	Slide	Pheasant Camp Sign
NPT	Lolo Cr.	Mouth of Yoosa Cr.	Pheasant Camp Sign
NPT	Lolo Cr.	Slide	Mouth of Yoosa Cr.
NPT	Lolo Cr.	Pheasant Camp	Mouth of Crane Cr.
NPT	Lolo Cr.	Cottonwood Flats	Pheasant Camp Sign
NPT	Meadow Creek	Mouth	Five Mile Creek
NPT	Musselshell Creek	Mouth	Greer Gulch
NPT	Newsome Cr.	Mouth	Glory Hole
NPT	Pilot Creek (Newsome)	Mouth	1500 meters upstream
NPT	Radcliff Creek (Newsome)	Mouth	Glory Hole
NPT	West Fork Creek (Newsome)	Mouth	1500 meters upstream
NPT	Yoosa Cr.	Mouth	1.5 miles upstream
		Aerial Surveys	
IDFG & USFS	Bear Creek	Mouth	Cub Creek
IDFG & USFS	Eagle Creek	Mouth	1 mile upstream of mouth
IDFG & USFS	Lolo Creek	Cottonwood Flats (bottom)	Pheasant Camp Sign
IDFG & USFS	Meadow Creek	Mouth	Fourmile Creek
IDFG & USFS	Moose Creek Trend Transect (WC-3)	Mouth	Cedar Creek (on E Fk Moose Cr)
IDFG & USFS	Running Creek	Mouth	2 miles upstream of Eagle Creek
IDFG & USFS	Selway River	Bear Creek	Thompson Flat G. S.
IDFG & USFS	Selway River	Mouth	Meadow Creek
IDFG & USFS	White Cap Creek	Mouth	Headwaters
SPCA	Selway River	Mouth	Thompson Flat

APPENDIX B. Information used to calculate spawner abundance.

Table B- 1: Redd counts and estimate of total redds in index areas.

Total Redd and Spawner Estimate

		Cumulative Redd Count Week			Post Survey				% Spawning Complete Week		
Subbasin	Location	1	2	3	Spawners	Post Survey Redds	Total Redds	Total Spawners	1	2	3
S.Fk. Clearwater	Lower Mill	1	24	26	1	0	26	79	3.8%	91.1%	98.7%
	Upper Meadow	7	27	36	18	6	42	126	16.7%	64.3%	85.7%
Lower Selway	Meadow	58	121	140	113	38	178	533	32.6%	68.1%	78.8%
	O'Hara	52	61	65	3	1	66	198	78.8%	92.4%	98.5%
Upper Selway	Selway 3	27	91	136	39	13	149	447	18.1%	61.1%	91.3%
	Selway 4	30	56	59	5	2	61	182	49.5%	92.3%	97.3%

Note: *Post Survey Spawners: Spawners noted on final index survey.*
Post Survey Redds: Post survey spawners divided by 3 spawners per redd to determine number of redds constructed after final survey.
*Total Spawners: Total Redds*3.*

Table B- 2: Calculation of spawning timing based upon redd counts in index areas.

Subbasin	Week 1 8/23 - 8/31	Week 2 9/1 - 9/8	Week 3 9/9 - 9/13	Post Survey Post 9/13
# Redds Cumulative				
S. Fk. Clearwater	8	51	62	68
Lower Selway	110	184	207	244
Upper Selway	57	147	195	210
% Spawning Complete				
S. Fk. Clearwater	12%	75%	91%	100%
Lower Selway	45%	75%	85%	100%
Upper Selway	27%	70%	93%	100%

Table B- 3: Estimated total redd counts in non-index areas based upon spawning timing calculated from index areas.

Subbasin	Stream	Reach	Date	Week	Redd Count	Estimated Redd Total
Upper Selway	Selway	1	25-Aug	1	0	0
Upper Selway	Selway	2	25-Aug	1	0	0
Upper Selway	Running	1	29-Aug	1	9	32
Upper Selway	Selway	6	30-Aug	1	9	32
Upper Selway	Selway	7	31-Aug	2	4	6
Upper Selway	Selway	8	31-Aug	2	16	22
Upper Selway	Selway	9	1-Sep	2	25	35
Upper Selway	Selway	5	2-Sep	2	88	123
Upper Selway	Bear Cr.	1	5-Sep	2	18	25
Upper Selway	Canyon Cr	1	5-Sep	2	0	0
Upper Selway	White Cap	3	5-Sep	2	9	13
Upper Selway	Moose Cr.	1	5+6-Sep	2	14	20
Upper Selway	White Cap	1	7-Sep	2	9	13
Upper Selway	White Cap	2	7-Sep	2	20	28
Upper Selway	Eagle Cr	1	8-Sep	2	0	0
Upper Selway	Running	2	8-Sep	2	4	6
Lochsa	Colt Killed	1	12-Sep	3	21	22

Table B- 4: Total number of redds and spawners in study area.

Subbasin	Stream	# Redds	# Spawners
Lower Selway	Meadow	178	533
	O'Hara	66	198
	Sub-Total	**244**	**731**
Upper Selway	Selway 1	0	0
	Selway 2	0	0
	Selway 3	149	447
	Selway 4	61	182
	Selway 5	126	377
	Selway 6	44	133
	Selway 7	6	17
	Selway 8	23	69
	Selway 9	36	107
	Moose	20	60
	Bear	26	77
	Whitecap 1	13	39
	Whitecap 2	29	86
	Whitecap 3	13	39
	Canyon	0	0
	Eagle	0	0
	Running 1	33	100
	Running 2	6	17
	Sub-Total	**585**	**1,749**
S.Fk. Clearwater	Lower Mill	26	79
	Upper Meadow	42	126
	Sub-Total	**68**	**205**
Lochsa	Colt Killed	23	68
	Total	**920**	**2,753**

APPENDIX C. Mark and scale samples collected from carcasses.

Area	Sex	Marks						Scales
		Adipose only	Unclipped	Unknown	Dorsal	L. Opercle	R. Opercle	Taken
Bear Creek	M	3	2	0	0	0	0	3
	F	1	0	0	0	0	0	1
	U	0	0	0	0	0	0	0
Moose Creek	M	0	0	0	0	0	0	0
	F	0	1	0	0	0	0	1
	U	0	0	3	0	0	0	0
Meadow Creek	M	19	6	0	0	2	0	11
(Selway)	F	30	3	0	0	1	0	18
	U	4	1	26	0	0	0	0
O'Hara Creek	M	1	1	0	0	0	0	0
	F	8	1	0	0	0	0	6
	U	22	3	2	0	1	0	0
Meadow Creek	M	17	2	0	0	0	0	13
(S. Fk.)	F	9	1	0	0	0	0	9
	U	12	0	27	0	0	0	0
Mill, Lower	M	3	5	0	0	0	0	8
	F	1	5	0	0	0	0	3
	U	4	4	4	0	0	0	0
Mill, Upper				NO CARCASSES OBSERVED				
Colt Killed	M	1	1	0	0	0	0	2
	F	3	0	0	0	0	0	3
	U	16	3	0	0	0	0	0
Sub-Total		**154**	**39**	**62**	**0**	**4**	**0**	**78**
Selway 0				NO CARCASSES OBSERVED				
Selway 1	M	1	0	0	0	0	0	1
Selway 2	M	0	0	0	0	1	0	1
Selway 3	F	12	15	0	8	8	0	18
	M	7	12	0	1	4	0	12
	U	0	0	5	0	0	0	0
Selway 4	F	3	6	0	1	4	0	3
	M	1	3	0	0	2	0	4
	U	0	0	2	0	0	0	0
Selway 5	F	0	2	0	1	1	0	3
	M	0	2	0	0	1	0	1
	U	0	1	0	0	0	0	0
Selway 6	F	1	0	0	0	0	0	1
	M	1	0	0	0	1	0	2
Selway 7				NO CARCASSES OBSERVED				
Selway 8	F	1	0	0	0	0	0	1
Selway 9	F	0	0	0	1	1	0	2
	M	0	3	0	0	1	0	2
Whitecap 1	F	0	1	0	0	2	0	2
	M	0	2	0	0	0	0	0
				NO CARCASSES OBSERVED				
Whitecap 3	F	1	0	0	0	0	0	0
	M	0	0	0	0	1	0	1
Running Creek				NO CARCASSES OBSERVED				
Eagle Creek				NO CARCASSES OBSERVED				
Canyon Creek				NO CARCASSES OBSERVED				
Sub-Total		**28**	**47**	**7**	**12**	**27**	**0**	**54**
Total		**182**	**86**	**69**	**12**	**31**	**0**	**132**

APPENDIX D. Summary of observation of live salmon observed in spawning surveys in our study area.

Jacks were defined as having a MEPS length less than 500mm.

					Fish	Comments			Live Adults					Dead			
Date	Subbasin	Stream	Reach	Segment	Activity	1	2	Redds	Unclip	Ad-Clip	Unknown	Jacks	Male	Female	Jacks	Unknown
8/25/2001	Selway	Selway	1	NA	16	53	NONE	0	0	0	1	1	1	0	0	0
8/25/2001	Selway	Selway	2	NA	16	NONE	NONE	0	0	0	3	0	1	0	0	0
8/25/2001	Selway	Selway	3	NA	16	NONE	NONE	27	0	0	59	1	5	7	0	0
8/26/2001	Selway	Selway	4	1	16	50	NONE	20	0	0	25	1	2	7	0	0
8/26/2001	Selway	Selway	4	2	16	NONE	NONE	10	0	0	3	0	1	0	0	0
8/27/2001	Selway	Selway	5	NA	16	NONE	NONE	27	4	1	14	0	0	0	0	0
8/27/2001	Selway	Selway	6	NA	16	NONE	NONE	3	0	0	3	0	0	1	0	0
8/27/2001	Selway	Whitecap	1	NA	16	50	NONE	4	0	5	5	0	1	1	0	0
8/27/2001	Selway	Whitecap	2	NA	16	50	NONE	1	0	0	5	0	0	1	0	0
8/29/2001	Selway	Running	1	NA	14	50	NONE	9	13	1	1	0	0	0	0	2
8/30/2001	Selway	Selway	6	NA	13	51	NONE	9	0	2	3	0	2	1	0	0
8/31/2001	Selway	Selway	7	NA	16	50	NONE	4	0	2	1	0	0	0	0	1
8/31/2001	Selway	Selway	8	NA	13	50	NONE	16	2	2	1	0	0	1	0	0
9/1/2001	Selway	Selw ay	9	NA	13	52	NONE	25	6	3	2	0	4	2	0	0
9/2/2001	Selway	Selway	5	NA	13	50	NONE	61	5	8	7	1	3	4	0	0
9/3/2001	Selway	Selway	3	NA	13	51	NONE	64	14	25	12	1	14	29	0	0
9/4/2001	Selway	Selway	4	1	13	51	NONE	22	3	1	2	0	0	5	0	0
9/4/2001	Selway	Selway	4	2	13	51	NONE	4	2	3	1	0	2	0	0	2
9/5/2001	Selway	Canyon	1	NA	NA	NONE	NONE	0	0	0	0	0	0	0	0	0
9/5/2001	Selway	Whitecap	3	NA	13	51	NONE	9	3	4	0	1	1	1	0	0
9/7/2001	Selway	Whitecap	1	NA	NA	NONE	NONE	5	2	3	1	0	0	1	0	0
9/7/2001	Selway	Whitecap	2	NA	16	50	NONE	19	6	9	1	1	1	1	0	0
9/8/2001	Selway	Eagle	1	NA	NA	NONE	NONE	0	0	0	0	0	0	0	0	0
9/8/2001	Selway	Running	2	NA	16	50	NONE	4	2	1	0	0	0	0	0	0
9/8/2001	Selway	Selway	M	1	13	NONE	NONE	2	0	0	5	0	0	0	0	0
9/10/2001	Selway	Selway	4	2	13	51	NONE	0	0	0	0	0	1	1	0	0
9/10/2001	Selway	Selway	4	1	13	51	53	3	3	2	0	0	0	1	0	0
9/11/2001	Selway	Selway	3	13	13	NONE	NONE	45	10	9	3	1	2	5	0	0
9/12/2001	Lochsa	Big Sands Cr.	NA	1	NA	NONE	NONE	0	0	0	0	0	0	0	0	0
9/12/2001	Lochsa	Colt Killed Cr.	NA	1	13	50	51	2	0	2	1	0	0	1	0	1
9/12/2001	Lochsa	Colt Killed Cr.	NA	2	13	50	41	5	0	3	4	0	0	0	0	6
9/12/2001	Lochsa	Colt Killed Cr.	NA	3	13	50	51	0	0	0	0	0	0	1	0	1
9/12/2001	Lochsa	Colt Killed Cr.	NA	4	13	50	NONE	2	3	3	5	0	0	0	0	4
9/12/2001	Lochsa	Colt Killed Cr.	NA	5	13	50	51	4	0	5	3	0	0	1	0	0
9/12/2001	Lochsa	Colt Killed Cr.	NA	6	13	NONE	NONE	1	0	0	2	0	1	0	0	0
9/12/2001	Lochsa	Colt Killed Cr.	NA	7	13	NONE	NONE	0	0	0	0	0	0	0	0	1
9/12/2001	Lochsa	Colt Killed Cr.	NA	8	13	50	51	5	5	6	4	0	1	0	0	5
9/12/2001	Lochsa	Colt Killed Cr.	NA	9	15	50	NONE	2	0	1	1	0	0	0	0	1

					Fish	Comments			Live Adults					Dead			
Date	**Subbasin**	**Stream**	**Reach**	**Segment**	**Activity**	**1**	**2**	**Redds**	**Unclip**	**Ad-Clip**	**Unknown**	**Jacks**	**Male**	**Female**	**Jacks**	**Unknown**
9/12/2001	Lochsa	Colt Killed Cr.	NA	10	15	50	41	0	0	2	0	0	0	0	0	0
9/12/2001	Lochsa	Colt Killed Cr.	NA	11	15	41	NONE	0	0	0	0	0	0	0	0	0
8/23/2001	S. Fk. Clearwater	Lower Mill Creek	NA	1	14	NONE	NONE	0	0	0	0	0	0	0	0	0
8/23/2001	S. Fk. Clearwater	Lower Mill Creek	NA	2	14	NONE	NONE	0	0	0	5	0	0	0	0	1
8/23/2001	S. Fk. Clearwater	Lower Mill Creek	NA	3	14	NONE	NONE	0	0	0	2	0	0	0	0	0
8/24/2001	S. Fk. Clearwater	Lower Mill Creek	NA	4	14	NONE	NONE	1	0	0	4	0	1	0	0	0
8/24/2001	S. Fk. Clearwater	Low er Mill Creek	NA	5	14	NONE	NONE	0	0	0	1	0	1	1	0	0
8/24/2001	S. Fk. Clearwater	Lower Mill Creek	NA	6	14	NONE	NONE	0	0	0	1	0	1	1	0	0
8/25/2001	S. Fk. Clearwater	Lower Mill Creek	NA	7	14	NONE	NONE	0	0	0	8	0	1	0	0	9
8/25/2001	S. Fk. Clearwater	Lower Mill Creek	NA	8	14	NONE	NONE	0	0	0	4	0	3	0	0	1
8/25/2001	S. Fk. Clearwater	Lower Mill Creek	NA	9	14	NONE	NONE	0	0	0	3	0	2	0	0	0
8/25/2001	S. Fk. Clearwater	Lower Mill Creek	NA	10	14	NONE	NONE	0	0	0	3	0	0	0	0	0
9/3/2001	S. Fk. Clearwater	Lower Mill Creek	NA	1	16	NONE	NONE	2	0	0	3	0	0	0	0	0
9/3/2001	S. Fk. Clearwater	Lower Mill Creek	NA	2	16	NONE	NONE	0	0	0	0	0	0	0	0	0
9/3/2001	S. Fk. Clearwater	Lower Mill Creek	NA	3	16	NONE	NONE	2	0	0	0	0	0	1	0	0
9/3/2001	S. Fk. Clearwater	Lower Mill Creek	NA	4	16	NONE	NONE	9	3	0	1	0	0	1	0	0
9/3/2001	S. Fk. Clearwater	Lower Mill Creek	NA	5	16	NONE	NONE	1	0	0	0	0	0	0	0	1
9/3/2001	S. Fk. Clearwater	Lower Mill Creek	NA	6	16	NONE	NONE	1	0	0	0	0	0	0	0	0
9/3/2001	S. Fk. Clearwater	Lower Mill Creek	NA	7	16	53	NONE	5	0	0	0	0	0	1	0	1
9/3/2001	S. Fk. Clearwater	Lower Mill Creek	NA	8	16	NONE	NONE	0	0	0	0	0	0	1	0	1
9/3/2001	S. Fk. Clearwater	Lower Mill Creek	NA	9	16	NONE	NONE	0	0	0	0	0	0	0	0	1
9/3/2001	S. Fk. Clearwater	Lower Mill Creek	NA	10	16	NONE	NONE	3	3	0	1	0	0	0	0	2
9/10/2001	S. Fk. Clearwater	Lower Mill Creek	NA	1	NA	NONE	NONE	0	0	0	0	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Lower Mill Creek	NA	2	NA	NONE	NONE	0	0	0	0	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Lower Mill Creek	NA	3	NA	NONE	NONE	0	0	0	0	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Lower Mill Creek	NA	4	NA	NONE	NONE	0	0	0	0	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Lower Mill Creek	NA	5	NA	NONE	NONE	0	0	0	0	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Lower Mill Creek	NA	6	NA	NONE	NONE	1	0	0	0	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Lower Mill Creek	NA	7	13	53	NONE	0	0	0	1	0	0	0	0	2
9/10/2001	S. Fk. Clearwater	Lower Mill Creek	NA	8	NA	NONE	NONE	1	0	0	0	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Lower Mill Creek	NA	9	13	54	NONE	0	0	0	0	0	0	0	0	1
9/10/2001	S. Fk. Clearwater	Lower Mill Creek	NA	10	13	NONE	NONE	0	0	0	0	0	0	0	0	2
8/27/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	1	14	NONE	NONE	0	0	0	1	0	1	0	0	0
8/27/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	2	14	NONE	NONE	0	0	0	3	0	0	0	0	0
8/27/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	3	14	NONE	NONE	4	0	0	21	0	5	1	0	23
8/27/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	4	14	NONE	NONE	3	0	0	12	0	1	0	0	0
8/27/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	5	14	NONE	NONE	0	0	0	6	0	0	0	0	0
8/27/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	6	14	NONE	NONE	0	0	0	7	0	0	0	0	0
8/27/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	7	14	NONE	NONE	0	0	0	0	0	0	0	0	0
8/27/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	8	14	NONE	NONE	0	0	0	3	0	0	0	0	0
8/27/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	9	14	NONE	NONE	0	0	0	7	0	0	0	0	0
8/27/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	10	14	NONE	NONE	0	0	0	2	0	0	0	0	0
8/27/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	11	14	NONE	NONE	0	0	0	2	0	0	0	0	0
8/27/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	12	14	NONE	NONE	0	0	0	0	0	0	0	0	0

					Fish	Comments			Live Adults					Dead			
Date	**Subbasin**	**Stream**	**Reach**	**Segment**	**Activity**	**1**	**2**	**Redds**	**Unclip**	**Ad-Clip**	**Unknown**	**Jacks**	**Male**	**Female**	**Jacks**	**Unknown**
9/3/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	1	14	NONE	NONE	0	0	0	1	0	2	0	0	0
9/3/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	2	14	NONE	NONE	0	0	0	0	0	1	0	0	0
9/3/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	3	14	50	NONE	3	0	4	3	0	3	3	0	11
9/3/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	4	14	NONE	NONE	3	3	0	0	0	1	1	0	0
9/3/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	5	14	NONE	NONE	0	2	0	0	0	1	0	0	0
9/3/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	6	14	50	NONE	3	4	5	0	0	3	0	0	4
9/3/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	7	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/3/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	8	14	50	NONE	2	0	1	2	0	0	0	0	0
9/3/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	9	14	50	NONE	3	3	1	0	0	1	0	0	0
9/3/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	10	14	50	NONE	4	3	1	0	0	0	0	0	1
9/3/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	11	14	50	NONE	2	3	3	0	0	1	0	0	0
9/10/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	1	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	2	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	3	14	50	NONE	1	2	1	0	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	4	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	5	14	NONE	NONE	1	1	0	1	0	0	0	0	1
9/10/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	6	14	NONE	NONE	2	4	0	0	0	0	0	0	1
9/10/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	7	14	NONE	NONE	0	1	0	1	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	8	14	NONE	NONE	3	4	0	0	0	0	1	0	0
9/10/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	9	14	NONE	NONE	1	1	0	0	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	10	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	11	14	NONE	NONE	1	1	0	1	0	0	0	0	0
9/10/2001	S. Fk. Clearwater	Upper Meadow Cr.	NA	12	14	NONE	NONE	0	0	0	0	0	0	0	0	0
8/24/2001	S. Fk. Clearwater	Upper Mill Creek	NA	1	14	NONE	NONE	0	0	0	0	0	0	0	0	0
8/24/2001	S. Fk. Clearwater	Upper Mill Creek	NA	2	14	NONE	NONE	0	0	0	0	0	0	0	0	0
8/24/2001	S. Fk. Clearwater	Upper Mill Creek	NA	3	14	NONE	NONE	0	0	0	0	0	0	0	0	0
8/25/2001	S. Fk. Clearwater	Upper Mill Creek	NA	4	14	NONE	NONE	0	0	0	0	0	0	0	0	0
8/25/2001	S. Fk. Clearwater	Upper Mill Creek	NA	5	14	NONE	NONE	0	0	0	0	0	0	0	0	0
8/25/2001	S. Fk. Clearwater	Upper Mill Creek	NA	6	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/4/2001	S. Fk. Clearwater	Upper Mill Creek	NA	1	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/4/2001	S. Fk. Clearwater	Upper Mill Creek	NA	2	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/4/2001	S. Fk. Clearwater	Upper Mill Creek	NA	3	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/4/2001	S. Fk. Clearwater	Upper Mill Creek	NA	4	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/4/2001	S. Fk. Clearwater	Upper Mill Creek	NA	5	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/4/2001	S. Fk. Clearwater	Upper Mill Creek	NA	6	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	1	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	2	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	3	14	50	NONE	0	0	1	0	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	4	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	5	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	6	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	7	14	NONE	NONE	0	0	0	2	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	8	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	9	14	NONE	NONE	0	1	0	0	0	0	0	0	0

					Fish	Comments			Live Adults					Dead			
Date	**Subbasin**	**Stream**	**Reach**	**Segment**	**Activity**	**1**	**2**	**Redds**	**Unclip**	**Ad-Clip**	**Unknown**	**Jacks**	**Male**	**Female**	**Jacks**	**Unknown**
9/5/2001	Selway	Bear Creek	NA	10	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	11	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	12	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	13	14	NONE	NONE	5	2	0	7	1	4	0	0	0
9/5/2001	Selway	Bear Creek	NA	14	14	50	NONE	6	5	6	7	1	1	0	0	0
9/5/2001	Selway	Bear Creek	NA	15	14	NONE	NONE	0	0	0	2	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	16	14	NONE	NONE	2	0	0	5	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	17	14	50	NONE	5	3	7	11	0	0	0	0	0
9/5/2001	Selway	Bear Creek	NA	18	14	NONE	NONE	0	0	0	0	0	0	0	0	0
8/28/2001	Selway	Meadow Creek	NA	1	14	NONE	NONE	0	0	0	7	0	0	0	0	0
8/28/2001	Selway	Meadow Creek	NA	2	14	NONE	NONE	4	0	0	15	0	0	1	0	0
8/28/2001	Selway	Meadow Creek	NA	3	14	NONE	NONE	7	0	0	8	0	0	0	0	0
8/28/2001	Selway	Meadow Creek	NA	4	14	NONE	NONE	0	0	0	3	0	0	0	0	1
8/28/2001	Selway	Meadow Creek	NA	5	14	NONE	NONE	2	0	0	34	0	0	2	0	1
8/28/2001	Selway	Meadow Creek	NA	6	14	NONE	NONE	5	0	0	18	0	1	1	0	0
8/28/2001	Selway	Meadow Creek	NA	7	14	NONE	NONE	6	0	0	17	0	0	1	0	0
8/28/2001	Selway	Meadow Creek	NA	8	14	NONE	NONE	1	0	0	23	0	0	0	0	0
8/28/2001	Selway	Meadow Creek	NA	9	14	NONE	NONE	1	0	0	19	0	0	0	0	0
8/28/2001	Selway	Meadow Creek	NA	10	14	NONE	NONE	1	0	0	11	0	0	1	0	1
8/28/2001	Selway	Meadow Creek	NA	11	14	NONE	NONE	3	0	0	8	0	0	0	0	0
8/28/2001	Selway	Meadow Creek	NA	12	14	NONE	NONE	1	0	0	2	0	1	0	0	0
8/28/2001	Selway	Meadow Creek	NA	13	14	NONE	NONE	3	0	0	6	0	0	0	0	0
8/28/2001	Selway	Meadow Creek	NA	14	14	NONE	NONE	3	0	0	12	0	0	0	0	0
8/28/2001	Selway	Meadow Creek	NA	15	14	NONE	NONE	0	0	0	2	0	0	0	0	0
8/28/2001	Selway	Meadow Creek	NA	16	14	NONE	NONE	3	0	0	16	0	0	0	0	0
8/28/2001	Selway	Meadow Creek	NA	17	14	NONE	NONE	2	0	0	1	0	0	0	0	0
8/28/2001	Selway	Meadow Creek	NA	18	14	NONE	NONE	3	0	0	9	0	0	0	0	0
8/28/2001	Selway	Meadow Creek	NA	19	14	NONE	NONE	7	0	0	20	0	0	0	0	0
8/28/2001	Selway	Meadow Creek	NA	20	14	NONE	NONE	2	0	0	12	0	0	0	0	1
8/28/2001	Selway	Meadow Creek	NA	21	14	NONE	NONE	4	0	0	13	0	0	0	0	0
9/7/2001	Selway	Meadow Creek	NA	1	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/7/2001	Selway	Meadow Creek	NA	2	14	NONE	NONE	0	0	0	0	0	1	2	0	1
9/7/2001	Selway	Meadow Creek	NA	3	14	50	NONE	2	0	4	0	0	1	0	0	0
9/7/2001	Selway	Meadow Creek	NA	4	14	50	NONE	4	0	1	0	0	0	0	0	2
9/7/2001	Selway	Meadow Creek	NA	5	14	50	NONE	8	0	2	10	0	1	2	0	1
9/7/2001	Selway	Meadow Creek	NA	6	14	50	NONE	1	0	2	1	0	0	0	0	0
9/7/2001	Selway	Meadow Creek	NA	7	14	50	NONE	1	1	7	3	0	1	2	0	0
9/7/2001	Selway	Meadow Creek	NA	8	14	50	NONE	1	0	1	1	0	0	0	0	1
9/7/2001	Selway	Meadow Creek	NA	9	14	50	NONE	2	0	3	2	0	1	0	0	2
9/7/2001	Selway	Meadow Creek	NA	10	14	50	NONE	2	0	1	2	0	0	0	0	0
9/7/2001	Selway	Meadow Creek	NA	11	14	50	NONE	0	0	1	1	0	0	1	0	1
9/7/2001	Selway	Meadow Creek	NA	12	14	50	NONE	3	0	1	0	0	0	1	0	0
9/7/2001	Selway	Meadow Creek	NA	13	14	50	NONE	3	0	1	4	0	0	0	0	0
9/7/2001	Selway	Meadow Creek	NA	14	14	50	NONE	4	0	10	2	0	0	0	0	0

					Fish	Comments			Live Adults					Dead			
Date	**Subbasin**	**Stream**	**Reach**	**Segment**	**Activity**	**1**	**2**	**Redds**	**Unclip**	**Ad-Clip**	**Unknown**	**Jacks**	**Male**	**Female**	**Jacks**	**Unknown**
9/7/2001	Selway	Meadow Creek	NA	15	14	NONE	NONE	1	0	0	4	0	0	0	0	3
9/7/2001	Selway	Meadow Creek	NA	16	14	50	NONE	0	1	5	2	0	0	3	0	0
9/7/2001	Selway	Meadow Creek	NA	17	14	50	NONE	2	1	1	5	0	1	0	0	0
9/7/2001	Selway	Meadow Creek	NA	18	14	50	NONE	4	2	4	3	0	1	0	0	1
9/7/2001	Selway	Meadow Creek	NA	19	14	50	NONE	17	7	31	15	0	0	2	0	0
9/7/2001	Selway	Meadow Creek	NA	20	14	50	NONE	2	1	2	1	0	0	0	0	0
9/7/2001	Selway	Meadow Creek	NA	21	14	50	NONE	6	3	4	8	0	0	0	0	0
9/13/2001	Selway	Meadow Creek	NA	1	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/13/2001	Selway	Meadow Creek	NA	2	14	50	NONE	0	0	1	0	0	1	0	0	2
9/13/2001	Selway	Meadow Creek	NA	3	14	NONE	NONE	0	0	0	2	0	0	0	0	0
9/13/2001	Selway	Meadow Creek	NA	4	14	50	NONE	0	0	2	0	0	1	0	0	2
9/13/2001	Selway	Meadow Creek	NA	5	14	50	NONE	1	1	2	1	0	0	1	0	1
9/13/2001	Selway	Meadow Creek	NA	6	14	50	NONE	1	1	3	4	0	1	0	0	1
9/13/2001	Selway	Meadow Creek	NA	7	14	50	NONE	3	0	9	7	0	0	0	0	0
9/13/2001	Selway	Meadow Creek	NA	8	14	50	NONE	1	0	3	1	0	1	1	0	0
9/13/2001	Selway	Meadow Creek	NA	9	14	50	NONE	1	0	2	0	0	1	1	0	1
9/13/2001	Selway	Meadow Creek	NA	10	14	50	NONE	0	0	1	0	0	0	0	0	3
9/13/2001	Selway	Meadow Creek	NA	11	14	50	NONE	0	0	1	0	0	0	0	0	0
9/13/2001	Selway	Meadow Creek	NA	12	14	NONE	NONE	0	0	0	0	0	0	0	0	0
9/13/2001	Selway	Meadow Creek	NA	13	14	50	NONE	3	1	7	7	0	1	0	0	2
9/13/2001	Selway	Meadow Creek	NA	14	14	NONE	NONE	0	0	0	0	0	0	0	0	1
9/13/2001	Selway	Meadow Creek	NA	15	14	50	NONE	2	0	3	1	0	0	0	0	0
9/13/2001	Selway	Meadow Creek	NA	16	14	NONE	NONE	1	0	0	2	0	1	2	0	0
9/13/2001	Selway	Meadow Creek	NA	17	14	50	NONE	3	0	2	1	0	1	0	0	1
9/13/2001	Selway	Meadow Creek	NA	18	14	50	NONE	0	0	3	0	0	1	2	0	0
9/13/2001	Selway	Meadow Creek	NA	19	14	50	NONE	1	0	2	3	0	2	0	0	0
9/13/2001	Selway	Meadow Creek	NA	20	14	50	NONE	1	1	22	12	0	3	2	0	3
9/13/2001	Selway	Meadow Creek	NA	21	14	50	NONE	1	2	1	2	0	1	2	0	0
9/5/2001	Selway	Moose Creek	NA	1	15	10	NONE	0	0	0	0	0	0	0	0	1
9/5/2001	Selway	Moose Creek	NA	2	15	50	10	1	0	1	1	0	0	0	0	0
9/5/2001	Selway	Moose Creek	NA	3	15	50	10	1	0	1	1	0	0	1	0	0
9/5/2001	Selway	Moose Creek	NA	4	15	10	NONE	1	0	0	2	0	0	0	0	0
9/5/2001	Selway	Moose Creek	NA	5	16	50	22	9	6	6	12	0	0	1	0	2
9/5/2001	Selway	Moose Creek	NA	6	16	50	22	2	1	3	3	0	0	0	0	0
8/30/2001	Selway	O'Hara Creek	NA	1	16	50	51	1	0	0	3	0	0	1	0	1
8/30/2001	Selway	O'Hara Creek	NA	2	16	50	44	4	0	0	2	0	1	0	0	0
8/30/2001	Selway	O'Hara Creek	NA	3	16	44	NONE	3	0	0	1	0	0	0	0	1
8/30/2001	Selway	O'Hara Creek	NA	4	16	50	NONE	9	0	0	7	1	0	0	0	0
8/30/2001	Selway	O'Hara Creek	NA	5	16	50	NONE	7	0	0	6	0	0	0	0	0
8/30/2001	Selway	O'Hara Creek	NA	6	16	50	NONE	7	0	0	7	0	0	0	0	0
8/30/2001	Selway	O'Hara Creek	NA	7	16	NONE	NONE	0	0	0	0	0	0	0	0	0
8/30/2001	Selway	O'Hara Creek	NA	8	16	NONE	NONE	2	0	0	4	0	0	0	0	0
8/30/2001	Selway	O'Hara Creek	NA	9	16	50	NONE	2	0	0	4	0	0	0	0	0
8/30/2001	Selway	O'Hara Creek	NA	10	16	50	NONE	3	0	0	3	0	0	0	0	0

					Fish	Comments			Live Adults					Dead		
Date	Subbasin	Stream	Reach	Segment	Activity	1	2	Redds	Unclip	Ad-Clip	Unknown	Jacks	Male	Female	Jacks	Unknown
8/30/2001	Selway	O'Hara Creek	NA	11	16	50	NONE	2	0	1	1	0	0	0	0	0
8/30/2001	Selway	O'Hara Creek	NA	12	16	50	NONE	0	0	0	0	0	0	0	0	0
8/30/2001	Selway	O'Hara Creek	NA	13	16	50	NONE	8	0	2	8	0	0	1	0	0
8/30/2001	Selway	O'Hara Creek	NA	14	16	50	51	4	0	0	3	0	0	0	0	0
8/30/2001	Selway	O'Hara Creek	NA	15	16	50	NONE	0	0	0	1	0	0	0	0	0
9/8/2001	Selway	O'Hara Creek	NA	1	13	44	NONE	0	0	0	0	0	0	0	0	3
9/8/2001	Selway	O'Hara Creek	NA	2	13	44	NONE	0	0	0	0	0	0	0	0	2
9/8/2001	Selway	O'Hara Creek	NA	3	13	44	NONE	0	0	0	0	0	0	0	0	3
9/8/2001	Selway	O'Hara Creek	NA	4	13	50	44	4	0	1	1	0	0	0	0	1
9/8/2001	Selway	O'Hara Creek	NA	5	13	NONE	NONE	2	0	0	2	0	0	1	0	1
9/8/2001	Selway	O'Hara Creek	NA	6	13	50	NONE	1	1	2	0	0	0	0	0	2
9/8/2001	Selway	O'Hara Creek	NA	7	13	NONE	NONE	0	0	0	0	0	0	0	0	1
9/8/2001	Selway	O'Hara Creek	NA	8	13	50	NONE	0	1	1	0	0	0	0	0	0
9/8/2001	Selway	O'Hara Creek	NA	9	13	NONE	NONE	1	0	0	1	0	0	0	0	0
9/8/2001	Selway	O'Hara Creek	NA	10	13	NONE	NONE	0	0	0	0	0	0	1	0	0
9/8/2001	Selway	O'Hara Creek	NA	11	13	50	NONE	2	0	1	2	0	0	0	0	2
9/8/2001	Selway	O'Hara Creek	NA	12	13	NONE	NONE	0	1	0	1	0	0	0	0	0
9/8/2001	Selway	O'Hara Creek	NA	13	13	NONE	NONE	1	0	0	0	0	0	0	0	0
9/8/2001	Selway	O'Hara Creek	NA	14	13	NONE	NONE	0	0	0	0	0	0	0	0	0
9/8/2001	Selway	O'Hara Creek	NA	15	13	NONE	NONE	0	0	0	0	0	0	0	0	1
9/13/2001	Selway	O'Hara Creek	NA	1	13	NONE	NONE	1	0	0	0	0	0	0	0	1
9/13/2001	Selway	O'Hara Creek	NA	2	13	NONE	NONE	0	0	0	0	0	0	0	0	1
9/13/2001	Selway	O'Hara Creek	NA	3	13	NONE	NONE	0	0	0	0	0	0	0	0	2
9/13/2001	Selway	O'Hara Creek	NA	4	13	NONE	NONE	1	0	0	0	0	0	2	0	2
9/13/2001	Selway	O'Hara Creek	NA	5	13	NONE	NONE	0	0	0	0	0	0	0	0	1
9/13/2001	Selway	O'Hara Creek	NA	6	13	NONE	NONE	0	1	0	0	0	0	0	0	0
9/13/2001	Selway	O'Hara Creek	NA	7	13	NONE	NONE	0	0	0	0	0	0	0	0	0
9/13/2001	Selway	O'Hara Creek	NA	8	13	NONE	NONE	0	2	0	0	0	0	0	0	1
9/13/2001	Selway	O'Hara Creek	NA	9	13	NONE	NONE	2	0	0	0	0	1	0	0	0
9/13/2001	Selway	O'Hara Creek	NA	10	13	NONE	NONE	0	0	0	0	0	0	1	0	1
9/13/2001	Selway	O'Hara Creek	NA	11	13	NONE	NONE	0	0	0	0	0	0	0	0	0
9/13/2001	Selway	O'Hara Creek	NA	12	13	NONE	NONE	0	0	0	0	0	0	1	0	0
9/13/2001	Selway	O'Hara Creek	NA	13	13	NONE	NONE	0	0	0	0	0	0	0	0	0
9/13/2001	Selway	O'Hara Creek	NA	14	13	NONE	NONE	0	0	0	0	0	0	0	0	0
9/13/2001	Selway	O'Hara Creek	NA	15	13	NONE	NONE	0	0	0	0	0	0	0	0	0

APPENDIX E. Downstream Townships, Ranges, and Sections of reaches surveyed, and downstream and upstream UTM coordinates of reaches surveyed. No UTM coordinate denotes no GPS reading could be obtained.

			Downstream			Downstream UTM		Upstream UTM	
Subbasin	**Stream**	**Reach**	**Township**	**Range**	**Section**	**Easting**	**Northing**	**Easting**	**Northing**
Upper Selway	Selway	1	29N	14E	8	0675118	508098	0674025	5073563
	Selway	2	28N	14E	6	0674025	5073563	0673342	506782
	Selway	3	28N	14E	19	0673343	5068782	0674360	506043
	Selway	4	27N	14E	3	0677512	5064101	--	--
	Selway	5	27N	14E	10	--	--	0678728	5057240
	Selway	6	27N	14E	27	0678728	5057040	0678744	5053645
	Selway	7	26N	14E	3	0678744	5053645	--	--
	Selway	8	26N	14E	10	--	--	--	--
	Selway	9	26N	14E	16	--	--	0678612	5048045
	Whitecap	1	29N	14E	8	0675118	5080998	0681433	5083672
	Whitecap	2	29N	14E	1	0681433	5083672	0685336	5084299
	Whitecap	3	30N	15E	32	0685336	5054299	--	--
	Canyon	1	30N	15E	32	0685336	5084299	0690830	5083987
	Running	1	30N	13E	21	--	--	--	--
	Running	2	30N	13E	31	--	--	--	--
	Eagle	1	30N	13E	29	--	--	--	--
	Bear	1	3N	13E	16	--	--	--	--
	Moose	1	32N	12E	11	0659599	5109485	0666245	5118256
Lower Selway	Meadow	1	31N	9E	14	0631879	5100307	0632462	5090421
	O'Hara	1	32N	7E	25	0614629	5104457	0615028	5098852
S. Fk. Clearwater	Mill, Upper	1	No Loc.	No Loc.	No Loc.	0576974	5060733	0575907	5058884
	Mill, Lower	1	4N	4E	26	0582970	5075503	0581097	5071695
	Meadow Creek	1	29N	4E	1	0583483	5081076	0585821	5083641
Lochsa	Colt Killed Cr.	1	8N	24W	23	0688382	5146353	0690215	5142202
	Big Sands Cr.	1	8N	15E	1	--	--	--	--