Evaluate steelhead (*Oncorhynchus mykiss*) kelt outmigration from Lower Granite Dam to Bonneville Dam and test the use of transportation to increase returns of repeat spawners.

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Abstract

A field study was conducted at Lower Granite Dam, Washington; in the spring of 2002 to identify and enumerate kelt steelhead collected in the juvenile bypass system and evaluate their age-structure, and genetic profiles. We also investigated kelt steelhead migration rates, routes, and survival as well as compared return rates of transported verse in-river migration strategies.

Unlike most Pacific salmon, steelhead *(Oncorhynchus mykiss)* may spawn more than once during their lifetime, returning to the ocean following each spawning episode. In the Snake River, post-spawn steelhead (kelts) must pass up to eight dams on their spring (March/April –June) out-migration and consequently, thousands of kelts are incidentally collected in the juvenile bypass systems at mainstem dams. Previous work has discovered that thousands of natural- and hatchery-origin steelhead are collected in the Lower Granite Dam (LGR) juvenile bypass facility every year. This resource may be invaluable for restoration of ESA-listed populations.

This research was conducted during 11-consecutive weeks that spanned the period when most adult steelhead are encountered in the LGR bypass system; 31 March to 15 June 2002. During this period 8,678 adult steelhead were counted at the juvenile collection facility and 2,736 of those adult steelhead were sampled. The sample of 2,736 adult steelhead was composed of 2,617 in the kelt stage and 119 prespawners. Ultrasound examinations of sampled individuals revealed that 91% (7,893) of the adult steelhead counted in the bypass system were in kelt life stage. Our sample was composed of 50.1% (1,370) natural-origin and 49.9% (1,366) hatchery-origin kelt steelhead. Females dominated the sample of kelt steelhead representing 83.1% (2,176 females/2,617 total steelhead kelts). The predominant (42.3%) freshwater age for natural-origin kelt steelhead was 2 years, and 38.4% spent 1 year in saltwater while 29.7% spent 2 years in saltwater. All measures of genetic diversity were greater in the samples from Lower Granite Dam, then from any of the four reference hatcheries. Assignment tests indicated

that the majority of the unknown kelt steelhead collected at Lower Granite Dam assigned to Pahsimeroi Hatchery (43%).

To compare return rates of transported verse in-river migration strategies, we allocated 751 kelt steelhead to the transport treatment and 659 to the in-river treatment. Each of these fish had a PIT tag inserted in them to permit later observation of individuals. An additional 965 kelt steelhead that were not associated with transportation experiment also had PIT tags inserted in them. So far, 7 kelt steelhead that were barged to below Bonneville Dam have been detected at the Lower Granite Dam fish ladder. No fish from the in-river treatment have been detected at Lower Granite Dam as of 17 July 2003. However, fish are still being detected in the system and it appears to be too early to make conclusions on the experiment.

Migration rates, routes, and survival of kelt steelhead released at the tailrace of Lower Granite Dam were evaluated using 210 externally attached radio tags. With assistance from the U.S. Geological Survey and the University of Idaho, radio-tagged kelts were monitored using 168 aerial and underwater fixed receiver sites located from Lower Granite Dam tailrace to the Bonneville Dam tailrace, a distance of approximately 510 kilometers (rkm). Median travel times (hh:mm) for kelts were estimated at 262:40 (approximately 10 days) from LGR to Ice Harbor tailrace and 465:35 (approximately 19 days) from LGR to Bonneville tailrace. Telemetry tracking indicated that 13.3% (28/210) of the LGR tagged kelts reached the Bonneville Dam tailrace.

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Introduction

Steelhead (*Oncorhynchus mykiss*) may spawn more than once during their lifetime, returning to the ocean following each spawning event. In the Snake River, post-spawn steelhead (kelts) must pass up to eight dams on their spring (March/April –June) out-migration and consequently, thousands of kelts are incidentally collected in the juvenile bypass systems at mainstem dams. Previous work (Evans and Beaty 2000) has discovered that thousands of natural- and hatchery-origin steelhead are collected in the Lower Granite Dam juvenile bypass facility every year. Until recently, kelt steelhead were generally considered moribund animals and methods to enhance their survival were not explored. However, kelt steelhead may be an important source of genetic material for rebuilding depleted populations.

Repeat spawners (i.e., equivalent to the survival and rematuration of kelts) augmented early populations of steelhead in the Columbia Basin. Repeat spawners have been documented returning to their natal streams for decades (Long and Griffin 1937, Whitt 1954). Observations of this life history stage date back to the late 1800's when Idaho residents noticed that steelhead, unlike other salmon in the Snake River, did not all die after spawning but appeared to travel back to the ocean (Evermann 1895). Earlier scale analysis of Clearwater River steelhead indicated a repeat spawning rate of approximately 2% in 1952 (Whitt 1954), when only two dams impeded their migration. Rates averaging 1.6% have been documented for wild summer steelhead populations in both the Yakima River subbasin (above 4 mainstem dams; Hockersmith et al. 1995) and in the mid/upper Columbia (above 7-9 dams; L. Brown, WDFW, Wenatchee, pers. comm.). At the maximum, rates ranging annually from 2% to 9% have been estimated for the South Fork Walla Walla River (above 4 dams; J. Germond, ODFW, Pendleton, personal communication) and estimates of repeat spawners in tributaries of the lower Columbia River have exceeded 17% (NMFS 1996), with some fish returning to spawn four consecutive times (Leider et al. 1986).

Despite historic records of repeat spawners in the Columbia Basin, very little is known about the kelt life stage and to what extent they might help rebuild depleted steelhead populations. Kelt steelhead that re-mature to spawn again increase their total reproductive success (Clutton-Brock 1988) as well as increase the total number of spawning individuals and might increase genetic heterogeneity within a population. In addition to providing larger spawning runs and potentially contributing to genetic diversity, repeat spawners have already been subjected to selection processes throughout an entire life cycle and thus may have competitive advantages over first time spawners.

This study is designed in part to address some of the important kelt steelhead passage issues noted in recent Biological Opinions. For example, the December 2000 Biological Opinion further defines the need for kelt research under Reasonable and Prudent Alternatives (Adult Passage and Research 9.6.1.6 p 112).

> *The Corps shall initiate an adult steelhead downstream migrating (kelt) assessment program to determine the magnitude of passage, the contribution to population diversity and growth, and potential actions to provide safe passage. Evaluations should be conducted to…review literature, develop pilot testing regarding reconditioning, and initiate a kelt transportation pilot study as a possible means of reducing dam passage mortality.*

Evans and Beaty (2000) utilized ultrasound technology to identify kelt steelhead at the Snake River collector dams to better estimate the abundance of kelts during the spring migration. As a result, enumeration data for kelt were compiled for Little Goose bypass (1999 and 2000), McNary and John Day bypass facilities (2001; data collected by the USACE FFU) and most recently the Lower Granite bypass (2000, 2001, and 2002). Results revealed that approximately 2,780 wild kelts, equivalent to approximately 23% of the wild run above Lower Granite Dam, passed through the juvenile collections systems at Lower Granite and Little Goose dams in the spring of 2000 (Evans and Beaty, 2001). In 2001, approximately 4,695 wild kelts, equivalent to approximately 21% of the wild run, passed through Lower Granite bypass facility alone. Around 3,348 wild kelts were estimated passing through the bypass system in 2002 that was equivalent to approximately 7% of the wild run. The spill for 2002 was much higher than the previous 2 years of the study, which would suggest that a majority of the kelts were passing via alternative routes, possibly through the spillway (Wertheimer et al. 2001;Wertheimer et al. 2002) or the experimental removable spillway weir (RSW). The majority of kelts (> 75%) were considered to be in fair to good condition with a predominately female run (>80%).

Despite the large numbers and good condition of kelts at Lower Granite Dam, early telemetry work suggested that very few individuals successfully reach Bonneville Dam (Evans 2002). In 2001 only 5.7% (12/212) of instrumented kelt steelhead released at Lower Granite Dam were detected below Bonneville Dam.

If hydroelectric facilities hinder kelt steelhead outmigration a significant life history component of these stocks is being lost. Furthermore, if significant numbers of kelts are prevented from reaching the sea, then measures should be initiated to aid kelt survival. Assuming the vast majority of kelts that successfully arrive at Lower Granite Dam die before reaching the ocean, methods may be needed to improve kelt survival. Some potential ways of increasing the number of kelts that successfully reach the ocean are (1) kelt reconditioning, (2) transportation of kelts around mainstem dams, and/or (3) modification to the hydrosystem that would provide for increased passage success of kelts. Reconditioning is the process of culturing post-spawned fish until they are able to grow and develop mature gonads. Research conducted on wild Yakima R. steelhead has demonstrated that kelts can be reconditioned to spawn again (Evans et al. 2001; Hatch et al. 2002), and it is likely that these same methods can be successfully implemented to recondition Snake River kelts in future years. Mitigating for mortalities due to dam blockage of migration routes could potentially be achieved with transportation of kelts around mainstem dams, possibly allowing for a larger proportion of the run to reach the ocean and remature. Lastly, modifications to mainstem dams that would provide safer and quicker passage of kelts (e.g., increased spill or modifying bypass structures to specifically accommodate adult passage) may also be needed.

In 2002, we tested the feasibility of transporting kelts around mainstem dams to increase the number of fish that reach the ocean and subsequently return to the river to spawn again. As part of this study we also assessed the in-river passage behavior, travel times, passage routes, and system survival of kelts tagged and released from the Lower Granite Dam's juvenile bypass facility. Also information on kelt abundance, kelt run timing, age structure, genetics, sex ratios, and morphology is reported. These data will be important in making future decisions about operations, facilities, and options to improve kelt survival. The three objectives reported in this study are:

Objective 1. Enumerate kelt steelhead at the Lower Granite Dam juvenile bypass facility and collect data on age structure, genetics, and general attributes.

Objective 2. Evaluate return rates of kelt steelhead transported below Bonneville dam versus those allowed to migrate in-river from the Lower Granite Dam tailrace.

Objective 3. Estimate kelt steelhead passage rates, migration routes, and survival from Lower Granite Dam's juvenile bypass facility to the Bonneville Dam tailrace using radio telemetry.

Methods

Study Area: Research was conducted at the Lower Granite Dam (LGR) juvenile bypass facility, located at river mile 107.5 on the Snake River and approximately 435 river miles from the mouth of Columbia River (Figure 1). This was continuation of previous work at the site that demonstrated that a large collection of kelt steelhead was possible there.

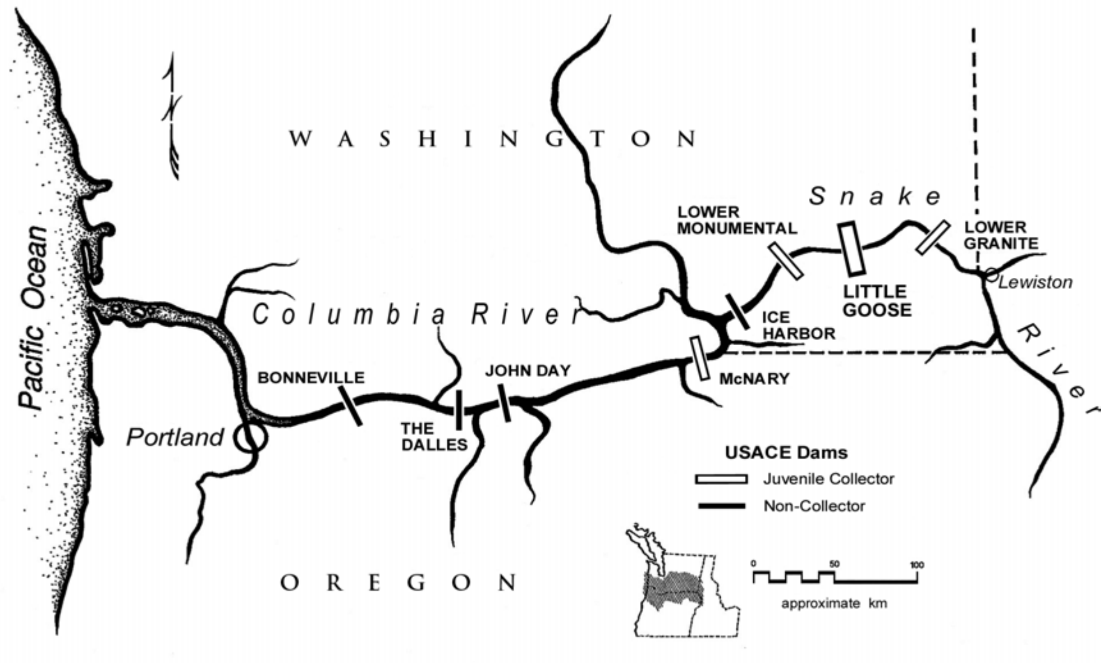

Figure 1. Map of study area with locations of Columbia and Snake river dams.

Furthermore, the LGR bypass facility is the first mainstem collection point at which emigrating kelts can be sampled and barging facilities are in place.

Objective 1. Enumerate kelt steelhead at the Lower Granite Dam juvenile bypass facility and collect data on age structure, genetics, and general attributes.

Steelhead Collection: Adult steelhead were removed from the Lower Granite bypass facility and transferred to a nearby 190-L sampling tank containing fresh river water. Fish were then anesthetized, measured for fork length, checked for marks, tags, coloration, and condition. Specimens were then scanned with an ultrasound machine (*see* Evans and Beaty 2001 *for detail regarding ultrasound methods*) to determine life history stage and gender. All fish identified by ultrasound as pre-spawn fallbacks were then released back into the river to resume migration. A subsample (representing the sampled steelhead kelts for the day) of kelt steelhead that were placed in the non-experimental group had scales removed for aging, and a small tissue sample collected for genotyping. Most fish identified as kelt steelhead received a passive integrated transponder (PIT) tag. Kelt steelhead that were not PIT tagged were released in the Lower Granite Dam tailrace. Fish that received PIT tags were then placed in one of two treatment groups for the transport experiment, assigned to the migration route survival experiment, or released in the tailrace.

Fish were sampled for 11 weeks during the peak kelt steelhead outmigration at Lower Granite bypass from 31 March to 15 June 2002. Sampling was conducted two days during week 1, then moved to a six day schedule during week 2 through 8, with a five day work week through week 9 and 10, until week 11 when there was a three day work week. Sample hours ranged from 6 a.m. to 6 p.m. with an occasional double shift from 5 p.m. to 8 p.m. These hours of sampling were used to maximize the hours of daylight due to the majority of the run utilizing daylight hours to navigate (Evans 2002; Wertheimer et al. 2002). In an effort to obtain kelts that would be passing during nighttime hours (8 p.m. to 6 a.m.) Corps trap operators were instructed to capture and hold a maximum of 35 kelts for sampling by the CRITFC sampling team. This capture schedule generally began the day of crew arrival for the week and ended the night prior to crew departure for the week. Only 35 fish were allowed to be captured out of concern for maintaining good fish health, the majority of night captures never obtained the maximum amount of fish, with only 3 nights reaching maximum captures. Randomization was not used to determine when to sample, however, because we sampled throughout the kelt out-migration, generally six days a week and obtained a large sample size, we assumed that our samples were representative of the general LGR kelt population in 2002.

<u>Kelt Abundance</u>: Adult steelhead were collected at the Lower Granite Dam juvenile bypass over an 11-week period in 2002. Abundance estimation of kelt steelhead was performed by estimating the proportion of kelts in the sample and applying that proportion to the total adult steelhead count by week. Weekly and total estimates of

proportion, variance, and 95% confidence intervals were calculated (Scheaffer et al. 1990).

To determine if observers at the juvenile bypass collector were correctly identifying kelt steelhead from prespawners, we compared kelt abundance estimates from the ultrasound determinations with Corps visual counts using a paired t test (Sokal and Rohlf 2000). Data pairs used were the kelt steelhead abundance estimated by ultra-sound determinations versus the Corps Observer kelt steelhead count for each of the 11 weeks.

Coloration and Condition: Kelt steelhead coloration and condition was recorded at the time of sampling. Condition was based on qualitative observations and classified as: Good- lack of any wounds or descaling; Fair- lack of any major wounds and/or descaling; and, Poor- major wounds and/or descaling. Coloration was also based on qualitative observations and had the following categories Bright; Intermediate; and Dark.

Kelt reconditioning research conducted on the Yakima River in 2000 demonstrated that kelts collected in poor condition did not survive the reconditioning process and many died after only a few days in captivity (Evans et al. 2001). Prior research at Lower Granite Dam indicates that approximately 8% of the kelts arriving at the bypass separator are in poor overall condition (Evans and Beaty 2001). Based on these data, we excluded poor condition kelt steelhead from the transportation versus in-river experiment but used them in the non-experimental group and radio telemetry experiment. The fish found in poor condition were either released, radio-tagged proportionally for the radio telemetry study then released, or PIT-tagged and released for the non-experimental group.

Length and Age Determination: Age data was collected from some kelt steelhead throughout the run. A sampling goal of approximately 40 fish per week was established and from these individuals 6 scales were collected and placed on gum cards. In the laboratory, scales were prepared and mounted according to methods described in Clutter and Whitesel (1956) and the International North Pacific Fisheries Commission (1963). Individual samples were visually examined and categorized using well-established scale age-estimation methods (Gilbert 1913, Borodin 1924, Van Oosten 1929). Age and repeat spawner estimates were corroborated by personnel at the Washington Department of Fish and Wildlife.

The method used for fish age description was that recommended by Koo (1955). A numeral followed by a period represents the number of winters a fish spent in freshwater (Table 5). The numeral following the period indicates the number of winters a fish spent in saltwater.

Genetic variability and assignment of kelt steelhead collected at Lower Granite Dam:

The purpose of this study was to 1) determine the genetic composition and diversity of kelt steelhead passing LGR as well as major steelhead hatchery facilities operating above LGR; and 2) assign kelt steelhead sampled at LGR to a stock of origin.

Sampling: Fin clips were taken from post spawned anadromous *O. mykiss* individuals (kelt steelhead) of unknown origin from Lower Granite Dam bypass system (LGR; n = 461), as well as from representative *O. mykiss* from four major steelhead producing hatcheries in the Snake River Basin (Dworshak n = 32, Little Sheep n = 59, Oxbow n = 55, and Pahsimeroi n = 62). While samples of kelt steelhead from LGR were of unknown origin, data for each individual was recorded of sex, length, and hatchery/wild (based upon presence/absence of adipose clips). Kelt samples were also subdivided (hatchery and wild subgroups) in secondary analyses to test for genetic divergence and differential assignment.

Laboratory: Fin clips were digested and DNA extracted using standard manufacture's protocols from Qiagen® DNeasy™ in conjunction with a Qiagen® 3000 robot. Genomic DNA was quantified and arrayed into 96 well plates for high throughput genotyping. Eight microsatellite loci (OMM1007-GenBank AF346669, OMM1020-GenBank AF346679, OMM1036-GenBank AF346686, OMM1046-GenBank AF346693, OMM1050-GenBank AF346694, *Ots*1-Banks et al. 1999, and *Ocl*1-Condrey and Bentzen

1998, and Ogo4-Olsen et al. 1998) were amplified and genotyped for each sample at each locus.

Data analyses: Data from each sample collection were analyzed for genetic diversity, genetic divergence based on allele frequencies (Fst; Weir and Cockerham 1984), and assignment testing (Paetkau et al. 1995) of individuals to each group (GeneClass; Cornuet et al. 1999). Secondarily, LGR kelt samples were subdivided into hatchery and wild groups to test for genetic differences between groups as well as test for differential stock assignment.

Measures of genetic diversity in this study include the following: expected heterozygosity (H_E), observed heterozygosity (H_O), average alleles per locus, allelic richness, and total number of alleles. Heterozygosity (observed and expected; Nei 1987) measures the proportion of individuals in the sample group that are heterozygous (different alleles at a locus). Allelic richness is the average number of alleles per locus corrected for differential sample size (Goudet 1995). Higher H_E, H_O, allelic richness, and total alleles in one sample group versus a second sample group is generally evidence for higher genetic diversity in the first sample group than the second.

The proportion of genetic variance attributable to division among samples was calculated with allele frequencies (F_{ST}; Weir & Cockerham 1984). F_{ST} estimates were obtained using GENEPOP v. 3.3 (Raymond & Rousset 1995a). Exact-significance testing methods were used to evaluate homogeneity of spatial distributions of genetic variance. Unbiased estimators of exact significance probabilities were obtained using the Markov-chain algorithm described in Guo and Thompson (1993), as implemented in GENEPOP, using 500,000 steps. To test for allele frequency homogeneity, the null hypothesis that alleles were randomly distributed among samples was evaluated (Raymond & Rousset 1995b). For single locus values, corrections were made against type I error using the sequential Bonferroni method (Rice 1989).

To further investigate the distinctiveness of each individual, an assignment test was performed. Assignment tests calculate the probability that an individual's multi-locus genotype derives from alternative groups (species or populations) and assigns membership to the most likely group (Paetkau et al. 1995). The more distinctive a population is relative to all other populations, the higher the assignment fidelity, and the more strongly an individual's genotype assigns to its population of origin relative to all other populations. Assignment probabilities were generated by using the program GeneClass (Cornuet et al. 1999).

Objective 2. Evaluate return rates of kelt steelhead transported below Bonneville dam versus those allowed to migrate in-river from the Lower Granite Dam tailrace.

<u>Transportation Evaluation</u>: To assess if kelt steelhead return rates could be enhanced by barging, we designed an experiment to compare fish that remained in-river with ones that were barged and released below Bonneville Dam.

The sampling procedures at the juvenile bypass separator used to estimate population proportion and abundance were used to provide specimens for this objective. A portion of steelhead identified as kelts and judged to be in good or fair condition were assigned to one of two treatment groups. The first group was called “In-river” and was composed of individuals that were released at the tailrace of Lower Granite Dam after tagging. We used a sleeve bag filled with enough water to cover the operculum to transport fish from the evaluation area to the flume. The second group termed “Transport” were placed on barges and released downstream of Bonneville Dam. Again, we used a sleeve bag to transport fish to the barges with enough water to cover the operculum. Once there, fish were placed into a net pen constructed of PVC tubing into an 8x8 square with a 10 ft deep nylon net wrapped and tied around the edges of the PVC square. When it was time for kelts to be released the net was removed so that kelts could then escape into the barge hold where they subsequently exited to the river. Each kelt in the experiment was implanted with a PIT tag (ISO 134.2 KHz) in the pelvic girdle for individual identification. Lists of tagged individuals were regularly uploaded to the Pacific State Fisheries Marine Council PITAGIS database (http://www.psmfc.org/pittag/). Return rates (i.e., repeat spawners) of fish from each treatment group were monitored using PIT tag detection equipment located at a variety of locations in the Snake and Columbia rivers (Table 1).

Table 1. List of PIT tag detection sites used in this study. Codes in bold are associated with juvenile bypass / sampling sites and codes in italics are associated with adult ladders.

Site	Location	Code
Lower Granite Dam (LGR)	Snake River (107.5 RM)	**GRJ,** *GRA*
Little Goose Dam (LG)	Snake River (70.3 RM)	**GOJ**
Lower Monumental Dam	Snake River (41.6 RM)	**LM2, LMJ**
Ice Harbor Dam	Snake River (9.7 RM)	*IHA*
McNary Dam	Columbia River (292.0 RM)	**MCJ, MCX, MCNTAL,** *MC1, MC2*
Bonneville Dam	Columbia River (146.1 RM)	**B1J, B2A, B2J, BVJ, BVX,** *BO1, BO2, BO3, BWL,*
Estuary Towed Array	Lower Columbia River	***TWX***

Objective 3. Estimate kelt steelhead passage rates, migration routes, and survival from Lower Granite Dam's juvenile bypass facility to the Bonneville Dam tailrace using radio telemetry.

As a continuation of last year's research, we used radio telemetry to assess kelt steelhead downstream migration rates, passage routes, behavior and survival. Kelts were radio tagged at Lower Granite Dam's juvenile bypass facility, released and monitored to Bonneville Dam tailrace. Radio tagged kelts were monitored with assistance from the University of Idaho (UI) and U.S. Geological Survey (USGS).

Telemetry: Following ultrasound identification, 210 kelts were radio tagged at the LGR bypass separator. The 210 kelts were chosen by condition to best represent the population sampled (Figure 10). The 150.600 frequency was selected because both UI and USGS receivers share compatibility with this frequency. Kelts were implanted with long-life (>50 day) radio transmitters. Radio tags (~3 grams) were externally attached to the base of the dorsal fin using a partially resorbing suture harness developed by the USACE-FFU in 2000 (Wertheimer et al. 2002). Following tagging, fish recovered in a holding bin and volitionally released via the flume that empties into the LGR tailrace. Radio tagging began when UI and USGS activated their receiver arrays downstream of Lower Granite Dam to ensure all specimens have an equal probability of detection throughout the study period.

Tag Monitoring

The movements of radio-tagged fish were monitored using an extensive array of radio telemetry receivers used in studies conducted by the UI and USGS. Radio-tagged kelts were detected/monitored at fixed telemetry sites in both the forebay and tailrace of each dam on the lower Snake R. (LGR, LGO, LMN, and IHR) and Columbia River (McN, JDD, TDA, and BON). Additional fixed sites are located within each reservoir. The movements of radio-tagged kelts were monitored from LGR to RM 114 (located at the 205-I bridge), a total migration distance of 321 miles.

Detection Efficiency

We expected to detect close to 95% of the tags passing a river reach, particularly reaches equipped with multiple receiver arrays. The probability of not detecting tags passing a dam or river reach decreases exponentially according to the number of receivers deployed there. For example, the probability of missing a tag passing a dam equipped with two arrays (e.g., one forebay and one tailrace) – each with a detection efficiency of 0.80 – is 0.04 $[(1-.80)^2]$, and the probability of detection is therefore 96%. However, we expected a high rate of kelt mortality[1] within each reservoir reach and the precision (95% CI) of survival estimates will weaken progressively downstream. Downstream survival will be calculated based on the total number of tagged kelts detected at each downstream telemetry site. In turn, this data will be used to construct a chronological detection history for each radio-tagged kelt.

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[1] Numerous factors maybe associated with kelt loss within and among river reaches and some examples include; mortality (by natural causes), harvest, tag loss or malfunction, miss detection, or mortality due to dams passage.

Numerous factors may also be associated with accurately assessing the passage history of radio-tagged kelts. As with many telemetry studies, fish loss within and among river reaches cannot always be attributed to specific causes. For example, loss can be attributed to mortality (by natural or unnatural [e.g., dam passage] causes), tag loss, tag malfunction, or missed detection. Furthermore, false-positive detection (an erroneously confirmed detection) could also account for errors in passage history summaries. We did not test for tag-malfunction or false-positive detection rates in this study and assume these factors had minimal impact on our results (Evans 2002; Wertheimer et al. 2001; Wertheimer et al. 2002).

Results / Discussion

Objective 1. Enumerate kelt steelhead at the Lower Granite Dam juvenile bypass facility and collect data on age structure, genetics, and general attributes.

Adult steelhead were collected at the Lower Granite Dam juvenile bypass over an 11-week period in 2002. Between 31 March and 15 June 2002, 8,678 adult steelhead were counted by USACE personnel in the juvenile bypass system. A sample of 2,736 adult steelhead were removed from the Lower Granite bypass separator and examined for life stage, gender, length, coloration, adipose fin presence, and condition (Figure 2). Scale samples for age determinations, and fin tissue samples for genetic profiling, were collected from 317 hatchery fish and 461 LGR fish, respectively. Selection for sampling of LGR fish attempted to best represent the run during collection times while fish at hatcheries were sampled using a simple random selection.

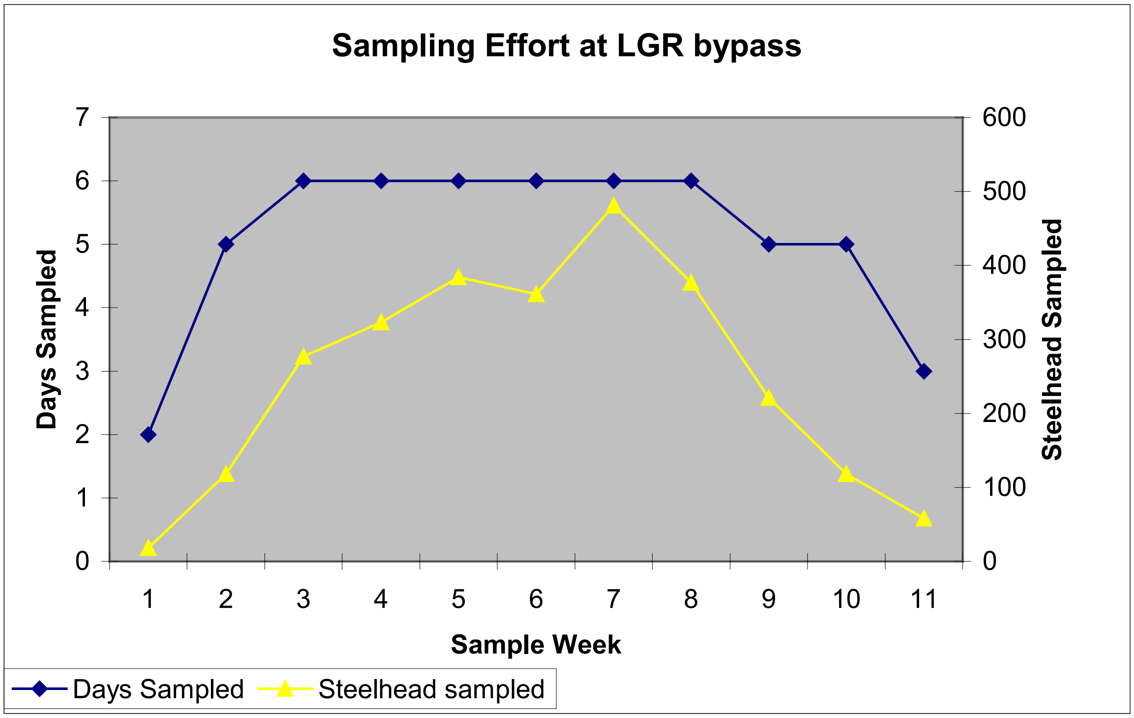

Figure 2. Sampling effort and steelhead collection at the Lower Granite bypass separator in 2002.

Kelt Abundance: Abundance estimation of kelt steelhead was performed by estimating the proportion of kelts in the sample and applying that proportion to the total adult steelhead count by week. Weekly estimates were then used to calculate a weighted total. Ultrasound examinations of collected specimens yielded determinations of gender, and life history stage (kelt / prespawn). We estimated that the weighted proportion of kelt steelhead in the sample collection was 0.909497 (95% bound +/- 0.068736) and the abundance was 7,893 (95% bound +/- 596) (Table 2). Appendix (A) contains data and formulas used for weekly proportion and variance calculations.

Table 2. Weekly and total kelt proportion and abundance point estimates and variance at the Lower Granite Dam bypass in 2002.

Sample Week	Dates 2002	Number Steelhead	Number Sampled	Proportion Kelt (est.)	Estimated Kelt Abundance	Variance of the Proportion Kelt
1	3/31-4/6	679	18	0.333333	226	0.012725
2	4/7-4/13	293	118	0.847458	248	0.00066
3	4/14-4/20	940	277	0.931408	876	0.000163
4	4/21-4/27	1070	323	0.931889	997	0.000138
5	4/28-5/4	859	384	0.984375	846	2.22E-05
6	5/5-5/11	1514	361	0.952909	1443	9.49E-05
7	5/12-5/18	797	481	0.97921	780	1.68E-05
8	5/19-5/25	1227	377	0.976127	1198	4.29E-05
9	5/26-6/1	740	221	0.972851	720	8.42E-05
10	6/2-6/8	287	118	1	287	0
11	6/9-6/15	272	58	1	272	0
Total		**8678**	**2736**	**0.909497**	**7893**	**0.001181**

The proportion of steelhead in the kelt life history stage was lowest in the first week of sampling, increased through the season and peaked at 100% during the final two weeks (Figure 3).

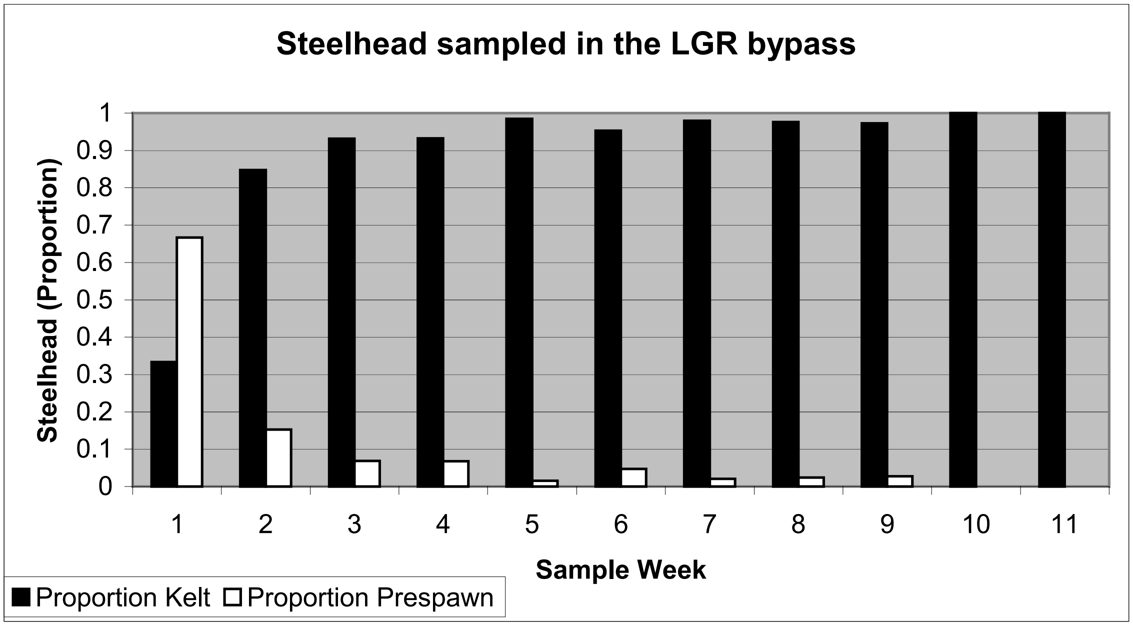

Figure 3. The proportion of steelhead in the kelt and prespawner life history stages collected at the Lower Granite Dam juvenile bypass in 2002.

Using ultrasound to differentiate kelt steelhead from prespawners in the bypass system was originally necessary to provide a more accurate estimation (Evans and Beaty 2000). When ultrasound was initially used for kelt steelhead determination the differences with USACE observers was noticeably large when trying to identify prespawn male vs. prespawn kelts (20-70% correctly identified) (Evans and Beaty 2001). However, it now appears that observers have become much more adept at identifying kelt steelhead in the bypass system. This year, observers were within 0.5% of the estimates using ultrasound (Table 3). There was no significant difference between Corp observer counts and Ultrasound determinations (paired t test = -0.320, p = 0.756). Given this high precision between the two methods and limited funding for anadromous fish projects, it may more prudent to focus funding and research efforts on reconditioning kelt steelhead, and further investigations to enhance survival rather than continuing to duplicate the task of identification with two methods.

Table 3. Number of adult steelhead present by sample week in the Lower Granite Dam juvenile bypass system and the number kelt steelhead as determined by ultrasound and by observation, in 2002.

		Number of kelt steelhead		
Sample Week	Number steelhead	Ultrasound determination	Corp observer determination	Difference in methods (ultra-obs)
1	679	226	181	45
2	293	248	216	32
3	940	876	885	-9
4	1070	997	1058	-61
5	859	846	855	-9
6	1514	1443	1509	-66
7	797	780	797	-17
8	1227	1198	1183	15
9	740	720	700	20
10	287	287	278	9
11	272	272	268	4
Total		7893	7930	-37 (.5%)

The composition of the kelt steelhead collection was almost evenly composed of natural and hatchery-origin fish, as evidenced by the presence or absence of an adipose fin (Figure 4). There was no significant difference between hatchery- and natural-origin kelt steelhead counts by week (t test = 0.014 df=10; p=0.989). The distributions are significantly different ($p<0.001$; $X^2=309.96$, d.f.=10; using a 2x11 contingency table) with hatchery-origin fish arriving about 2 weeks sooner than natural-origin fish. This shift may be a result of hatchery management, which can inadvertently shift run timing by artificial selection (Gharrett and Smoker 1993; Quinn et al. 2000; Robards and Quinn 2002).

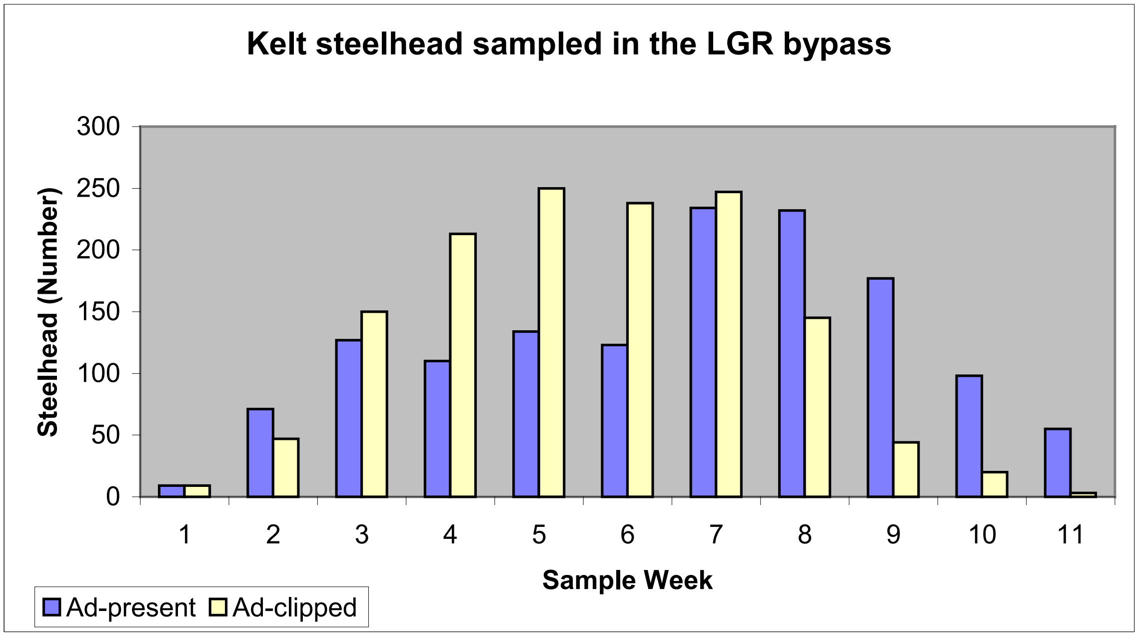

Figure 4. The number of adipose-present and adipose-clipped kelt steelhead in the collection at the Lower Granite Dam juvenile bypass system in 2002.

In terms of natural-origin steelhead, based on the kelt abundance estimated (Table 2), steelhead kelts at the Lower Granite bypass in 2002 made up approximately 8.6% of the run counted in the fish ladder during the upstream migration (1 June through 15 December 2002). This is a lower fraction of the run than in previous years, yet still represents approximately 3,952 ESA-listed individuals. In 2000 and 2001, approximately 23% and 21% of the natural-origin steelhead run were observed as kelts in the Lower Granite juvenile bypass. At least two factors may account for the lower abundance of natural-origin kelt steelhead in the bypass in 2002: 1. spill differences among years; and/or, 2. the addition of the removable spillway weir (RSW).

Spring-time spill at Lower Granite Dam varied among years from 2000 through 2002 (Figure 5). No spill occurred in 2001 and it peaked at 70,000 cfs in June of 2002. It is very likely with increased spill, that kelt steelhead tend to migrate through the spillway, thus avoiding the juvenile bypass system (Wertheimer et al. 2001). When no spill is occurring, the only migration routes for kelt steelhead are through the bypass, fish ladders, turbine, and navigational locks. In 2002, the RSW was installed and tested. This system provides an alternative route for kelt steelhead passage, and have been observed there (Steve Rainy, NMFS, personal communication), but the extent of kelt use has not been evaluated.

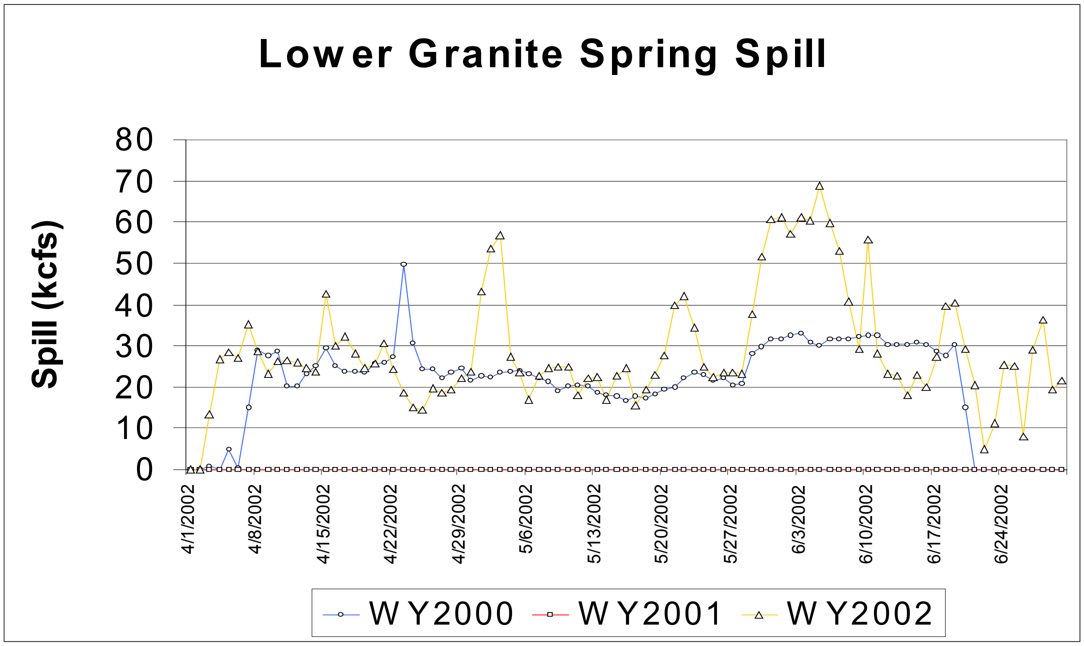

Figure 5. Spring-time spill at Lower Granite Dam in 2000 through 2002.

<u>Gender Determination:</u> Females dominated the sample collection of kelt steelhead in 2002 at juvenile bypass separator. Overall 83% (2,176/2617) of collected kelt steelhead were judged to be females (Figure 6). This phenomenon has been observed in previous years at Lower Granite Dam (Evans 2002), on the Yakima River (Hatch et al. 2002), and with Atlantic salmon (Fleming et al. 1996). Fleming et al. (1996) also detected gender differences between hatchery- and wild-origin Atlantic salmon when evaluating mortality. Wild males suffered 42% mortality after spawning whereas hatchery males

had 100% mortality. Wild females had 0% mortality and hatchery females had 42% mortality after spawning. It should be noted that these hatchery-origin Atlantic salmon spent their entire life cycle in captivity and had done so for many generations.

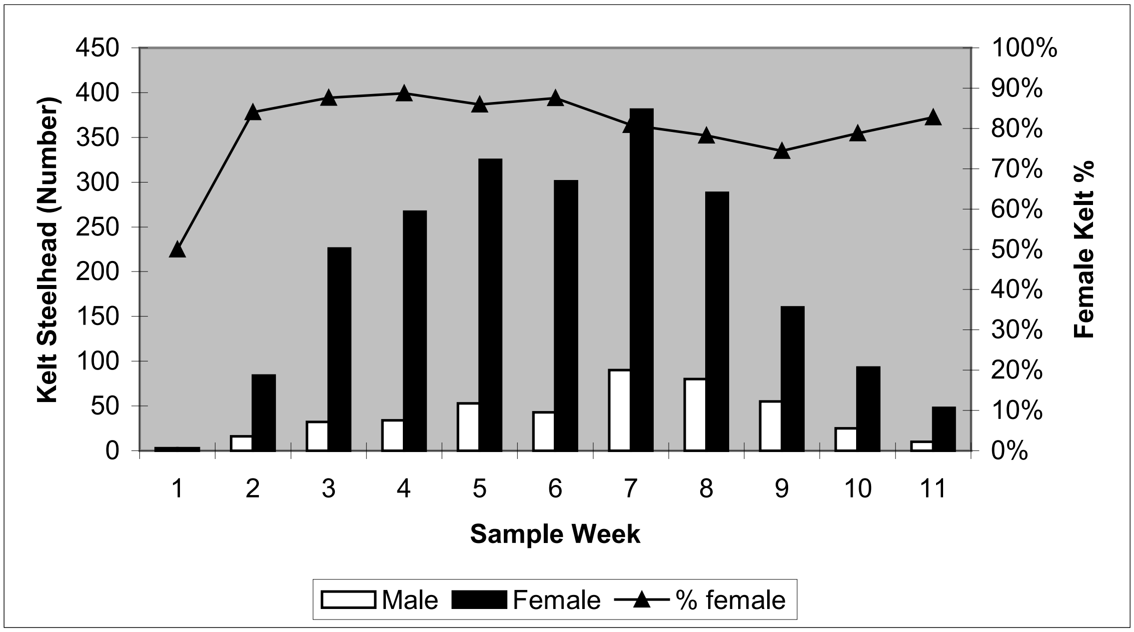

Figure 6. Distribution of male and female kelt steelhead at the Lower Granite Dam bypass, during sampling in 2002.

Coloration and Condition: Kelt steelhead condition and coloration data generated from 2002 are similar to data collected in previous years (Evans and Beaty 2000; Evans 2001). Of the 2,617 kelts sexed by ultrasound during the study period, 1,246 (47%) were in good condition and 866 (33%) were bright in coloration (Table 4). These numbers bode well for future recovery of this life history trait in the region. In general, pre-spawn fish were also in good condition, however, a greater percentage of these were darker in coloration than kelts (Table 4). Previous research has demonstrated that kelts that are in poor condition and dark in color have a low probability of successfully navigating the Columbia Basin hydrosystem on their out-migration to the ocean (Evans et al. 2001). Of the total number of kelts sampled, 9.5% were found to be poor in condition and dark in color.

Compared with 2000 and 2001 data on condition and coloration the number of good quality fish in 2002 decreased roughly 20% and as well as 30% for coloration. Robert

Werthiemer suggests, "that this could be due to the warm dry conditions of 2001 possibly leading to a relatively early and rapid spawning period, that, left fish in good condition for outmigration. While, the cold wet weather experienced in the spring of 2002 (and 2003), possibly led to a delayed and protracted spawning period, that left kelts in worse condition for outmigration." This seems like a plausible explanation but the authors would like sample years to be increased to provide for stronger evidence of a trend before this theory can be accepted as fact.

Table 4. Condition and coloration by classification (pre-spawner or kelt) of steelhead examined with ultrasound at the Lower Granite bypass, 2002.

No. LGR	**Pre-spawner**				**Kelt**			
Condition	Bright	Intermediate	Dark	**Total**	Bright	Intermediate	Dark	**Total**
Good	24	25	8	**57**	630	529	87	**1246**
Fair	1	12	11	**24**	151	422	164	**737**
Poor	4	8	26	**38**	85	300	249	**631**
Total	**29**	**45**	**45**	**119**	**866**	**1251**	**500**	**2617**

Length and Age Determination: Scale samples, for age determinations, were removed from 317 kelt steelhead sampled in the juvenile bypass system at Lower Granite Dam in 2002. All or a portion of 311 samples were readable and 6 samples were unreadable. Scale samples from 51 fish had unreadable freshwater zones, designated with (R.X). Since these fish were post spawn individuals the overall quality of the scales in terms of interpreting annuli was poor. We collaborated with John Sneva (WDFW) on interpreting many of these scales and agreement among readers was achieved on all samples with repeat spawner patterns.

Of the 311 samples, 138 were collected from kelt steelhead with intact adipose fins, identifying them as natural-origin. The predominant (42.3%) freshwater age of natural-origin fish was 2 years; 17.4% of the sample had spent 3 years in freshwater, and 13% were judged to be Age 1.X (Table 5). The predominant (38.4%) saltwater age for natural-origin kelt steelhead was 1 year, and 29.7% of the sample had spent 2 years in saltwater (Figure 7). Two fish in this group had scale patterns consistent with repeat spawning and 37 samples had unreadable freshwater zones.

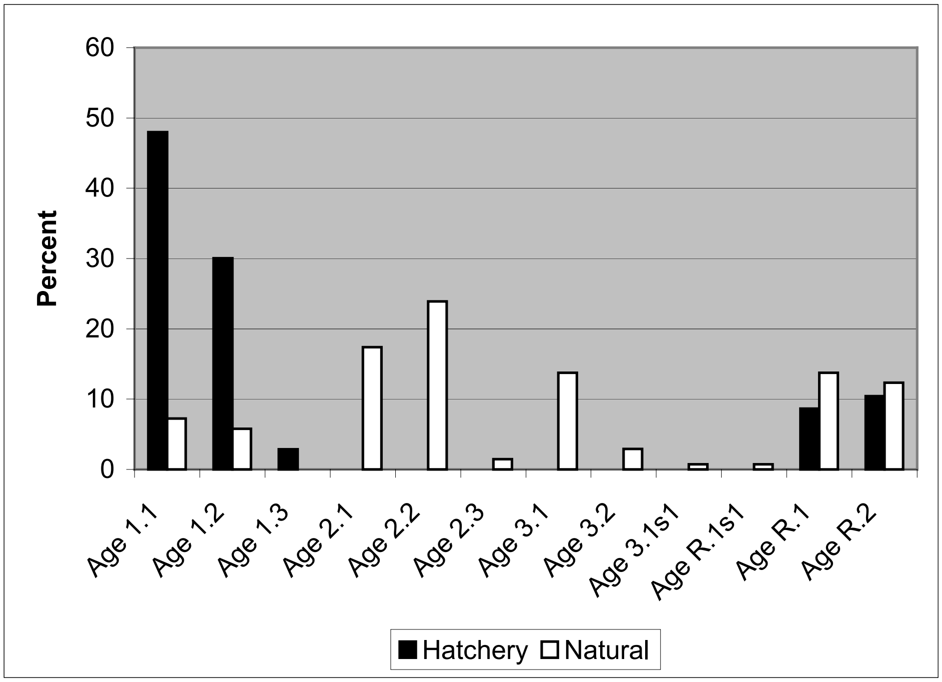

Figure 7. Distribution of age classes for kelt steelhead collected at the Lower Granite juvenile bypass in 2002.

Of the 311 samples, 173 were collected from kelt steelhead with missing adipose fins, identifying them as hatchery-origin. All hatchery steelhead in the Snake River are reared to the smolt stage in one year then released, therefore, (81%) of the samples exhibited scale patterns with one freshwater annulus. The remaining 19% had unreadable freshwater zones, but it is nearly certain that they were Age 1.X. The predominant (56.6%) saltwater age for hatchery-origin kelt steelhead was 1 year, and 40% of the fish in the sample had spent 2 years in saltwater (Table 5). Five (2.9%) of the hatchery-origin fish had spent 3 winters in saltwater (Figure 7).

Table 5. Age determinations estimated from scale pattern analysis of kelt steelhead collected at the Lower Granite Dam Juvenile Bypass in 2002.

	Origin			Origin	
	Hatchery	**Wild**		**Hatchery**	**Wild**
Age 1.1			**Age 3.1**		
Mean Fork Length (cm)	59.52	58.93	Mean Fork Length (cm)		59.76
Maximum	71.1	66.0	Maximum		66.0
Minimum	53.3	53.3	Minimum		55.9
Standard Deviation	2.81	4.28	Standard Deviation		2.73
Sample Size	83	10	Sample Size		19
Age 1.2			**Age 3.2**		
Mean Fork Length (cm)	70.78	69.22	Mean Fork Length (cm)		66.68
Maximum	88.9	78.7	Maximum		71.1
Minimum	53.3	63.5	Minimum		63.5
Standard Deviation	7.69	5.21	Standard Deviation		3.20
Sample Size	52	8	Sample Size		4
Age 1.3			**Age 3.1s1**		
Mean Fork Length (cm)	81.28		Mean Fork Length (cm)		76.2
Maximum	83.8		Sample Size		1
Minimum	73.7		**Age R.1s1**		
Standard Deviation	4.40		Mean Fork Length (cm)		66.0
Sample Size	5		Sample Size		1
Age 2.1			**Age R.1**		
Mean Fork Length (cm)		59.27	Mean Fork Length (cm)	59.44	60.82
Maximum		68.6	Maximum	63.5	68.6
Minimum		53.3	Minimum	53.3	55.9
Standard Deviation		3.24	Standard Deviation	2.85	3.22
Sample Size		24	Sample Size	15	19
Age 2.2			**Age R.2**		
Mean Fork Length (cm)		69.66	Mean Fork Length (cm)	70.98	69.92
Maximum		86.4	Maximum	83.8	81.3
Minimum		58.4	Minimum	58.4	58.4
Standard Deviation		5.54	Standard Deviation	8.82	6.48
Sample Size		33	Sample Size	18	17
Age 2.3			**2002 Composite**		
Mean Fork Length (cm)		76.20	Mean Fork Length (cm)	64.72	64.50
Maximum		78.7	Maximum	88.9	86.4
Minimum		73.7	Minimum	53.3	53.3
Standard Deviation		3.59	Standard Deviation	8.29	6.76
Sample Size		2	Sample Size	173	138

Genetic diversity/divergence of Hatchery samples: Genetic diversity varied from the four hatchery sample collections with average alleles per locus ranging from 10.5 to 12.8, H_E ranging from 0.74 to 0.84, H_O ranging from 0.73 to 0.80, total alleles from 84 to 102 (Table 6). Genetic diversity was consistently highest in the Pahsimeroi collection and generally lowest in the Dworshak collection (Table 6).

Significant genetic divergence between the four hatcheries was detected between all pairwise comparisons except between Pahsimeroi and Oxbow (Table 7). This indicates genetic divergence between hatcheries (except Pahsimeroi and Oxbow) is likely adequate for accurate individual assignment tests.

Table 6. Sample size and genetic diversity measures for four hatchery groups of steelhead and one group of kelt steelhead collected at Lower Granite Dam. (A = alleles)

	n	Total A	Average A	Allelic richness	He	Ho
Lower Granite Dam Kelts	461	155	19.4	12.1	0.82	0.75
Little Sheep Hatchery	32	91	11.4	9.5	0.74	0.73
Pahsimeroi Hatchery	59	102	12.8	10.9	0.84	0.80
Oxbow Hatchery	55	97	12.1	10.5	0.82	0.79
Dworshak Hatchery	62	84	10.5	10.2	0.77	0.76

Table 7. Pairwise Fst over all loci for four hatchery sample collections.

	Little Sheep	Pahsimeroi	Oxbow	Dworshak
Little Sheep	-------			
Pahsimeroi	0.044*	-------		
Oxbow	0.036*	0.009	-------	
Dworshak	0.068*	0.041*	0.041*	-------

* indicates significant value with sequential Bonferroni correction

<u>Genetic diversity of LGR Kelt steelhead samples:</u> Of the 461 kelt steelhead sampled at LGR, 47% were hatchery fish, 53% were wild fish, 85% were female, and 15% were male. All measures of genetic diversity (average alleles per locus = 19.4, $H_E = 0.82$, $H_O = 0.75$, and total alleles = 155) except heterozygosity were higher for the kelt steelhead collected at LGR than any of the four hatchery sample collections (Table 6). In fact, 28 alleles were found in the LGR samples that were not present in any of the hatchery samples (Appendix B). However, since the LGR sample group contained 461 samples and the sample size for the four hatchery groups averaged 52 samples, there was a greater chance of detecting more alleles in the LGR group. Yet allelic richness (average alleles corrected for differential sample size) was still larger in the LGR group (12.1) compared to allelic richness of four hatchery collections (average of 10.3).

Assignment tests of individual kelt samples: Assignment tests indicated the highest proportion of unknown origin kelt steelhead collected at LGR assigned to Pahsimeroi hatchery (43%), with the rest assigning as shown in Figure 1. Individual assignment likelihood values are including in Appendix C. Since there was not significant genetic divergence between Pahsimeroi and Oxbow hatchery sample collections in this study, assignments to these two hatcheries can be grouped together as a single stock representing 69% of assignments.

Hatchery vs. Wild kelt steelhead: When kelt samples were divided into subgroups of hatchery (n = 216) and wild (n = 245), genetic divergence was not significant between the groups (Fst = 0.003). Further, assignment of hatchery and wild groups to specific hatcheries were not significantly different (Table 3). Proportions of assignments for both subgroups were still highest to

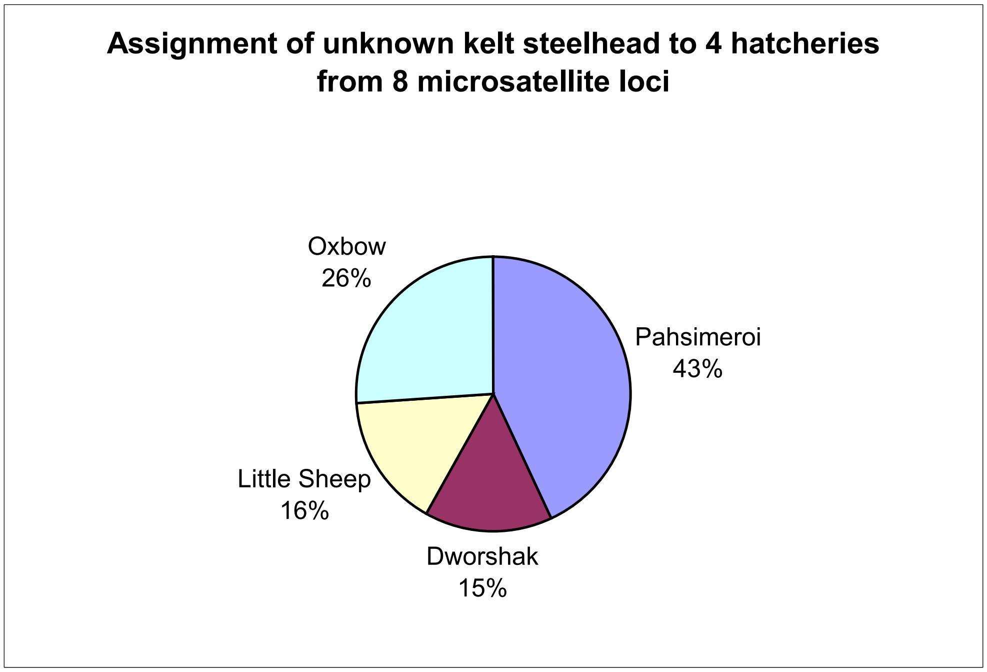

Figure 8. Assignment of unknown kelt steelhead to 4 hatcheries using 8 microsatellite loci.

Table 8. Percent of hatchery and wild kelt steelhead assigned to each of four hatcheries, and the difference in the proportion assignment . No significant differences by two tailed t-test.

	Hatchery kelts	Wild kelts	Difference
Dworshak	14.4%	15.9%	1.6%
Little Sheep	15.3%	15.9%	0.6%
Oxbow	28.7%	24.1%	4.6%
Pahsimeroi	41.7%	44.1%	2.4%
Total	100.1%	100.0%	na

Pahsimeroi and Oxbow hatcheries. Further, pairwise Fst between hatchery kelt steelhead and each of the four hatchery sample collections (Little Sheep = 0.031, Pahsimeroi = 0.007, Oxbow = 0.007, Dworshak = 0.023) indicate that hatchery kelt steelhead are most genetically similar to Pahsimeroi and Oxbow hatcheries. Of the 28 private alleles detected in the LGR kelt sample collection, 12 were from the hatchery subgroup, and 16 from the wild subgroup.

<u>Genetics Summary:</u> The majority (318 of 461) of kelt steelhead passing LGR assigned to Pahsimeroi/Oxbow stock. Stocks from these two hatcheries were genetically indistinguishable, possibly due to the same broodstock (Hells Canyon) propagated in these hatcheries. However, it is possible that data from additional microsatellite loci would provide adequate genetic information to differentiate the Pahsimeroi and Oxbow hatcheries (Bernatchez and Duchesne 2000). Stock assignments of some individuals were ambiguous, presumably due to the large number of unique alleles (28) detected in the LGR sample collection. In these cases, individuals were assigned to the most similar stock but not with strong confidence. The occurrence of 12 unique alleles in the hatchery LGR kelt subgroup may be a factor of sampling error (lower sample sizes from hatchery sample collections than the LGR kelt collection). However, it is likely that a portion of the kelt steelhead were from origins other than the four hatcheries included in this study since 16 unique alleles were found in the wild LGR kelt subgroup. Since the number of source/reference populations used for assignments were limited relative to the number of potential source populations, and several unique alleles were detected (not all due to

sampling error), additional reference populations are necessary for more precise stock assignments of kelt steelhead of unknown origin passing LGR.

Objective 2. Evaluate return rates of kelts transported below Bonneville dam versus kelts allowed to migrate in-river from the Lower Granite Dam tailrace.

Transportation Evaluation: To compare return rates of kelt steelhead transported by barge to below Bonneville Dam with fish released at the Lower Granite Dam tailrace, a total of 751 fish were PIT tagged and assigned to the transport group and 659 were PIT tagged and assigned to the in-river group. Release groups were allocated proportionally to the kelt steelhead abundance in the bypass (Figure 9). An additional 965 fish (Non-experiment) were PIT tagged and released at the Lower Granite Dam tailrace. These non-experiment fish were treated the same as the in-river group, but were not assigned to the in-river experiment group. Appendix (D) contains a listing of all PIT tag codes released in 2002 by this project.

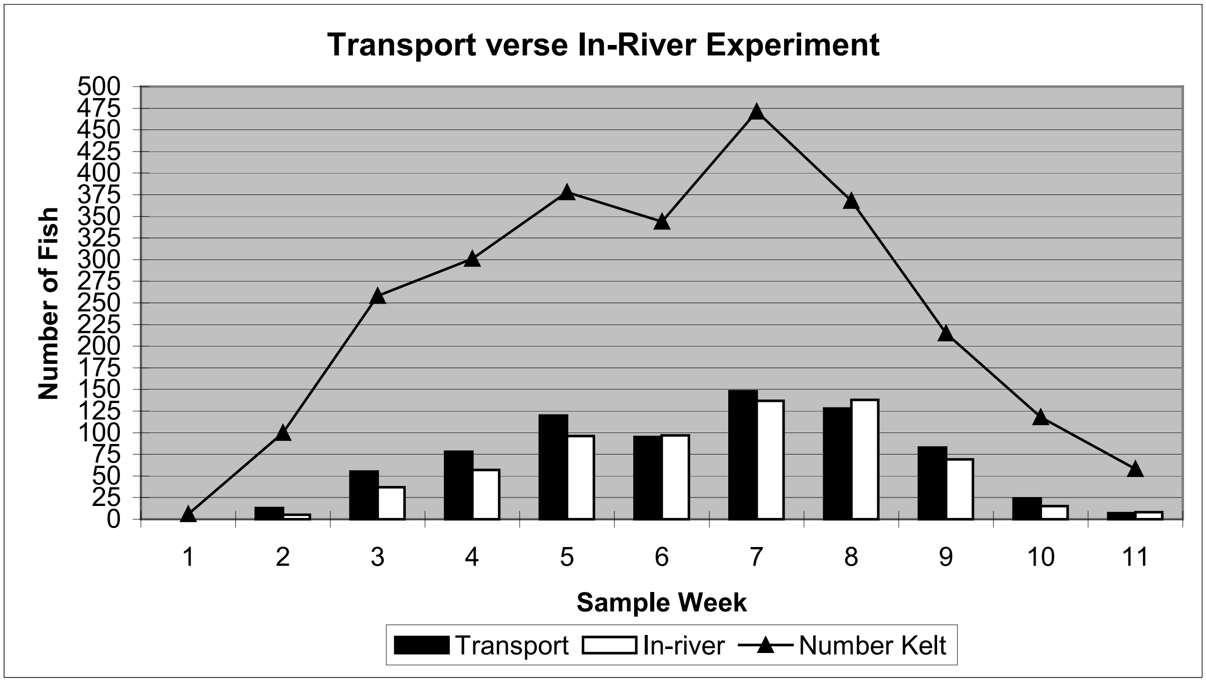

Figure 9. Allocation of kelt steelhead in tranport experiment at Lower Granite Dam in 2002.

We queried the PITTAG database on 17 July 2003 for all 2,375 PIT tags associated with this project that were released in 2002. This query revealed that 68 unique fish had been detected in at least one detection facility. Individual detection histories are included in Appendix (E). Of the 1,410 kelt steelhead in the transportation experiment, seven were detected ascending the Lower Granite Dam ladder (Table 9). All 7 fish were members of the transport group. Barging kelt steelhead around the hydrosystem may yield benefits, but it's premature to perform statistical analysis at this time on these data because it is very likely that additional fish will return to Lower Granite Dam during this migration season and the low sample sizes will negatively impact the power of statistical tests.

Table 9. Detection locations of PIT tag implanted kelt steelhead collected at Lower Granite Dam in 2002. Numbers with an asterisk (*) indicate migrations inconsistent with rematuration.

	Downstream Detection					Upstream Detection				
	LMN bypass	MCN bypass	MCN tailrace	BON bypass		Estuary	BON ladder	MCN ladder	IHR	LWG ladder
In-river (n=659)	1	11	5	1			1	2*		
Transport (n=751)						3	2* 10	7	1	7
Non-experiment (n=965)		24	4			2	1	3* 2		5* 2
Total (n=2,375)	1	35	9	1		5	2* 12	5* 9	1	5* 9

An additional 7 kelt steelhead from the non-experiment group were detected at the Lower Granite Dam ladder (Table 9), but only two of those fish demonstrated a migration consistent with rematuration. That is 5 fish immediately (between 2 and 7 days) upon release in the Lower Granite Dam tailrace ascended the fish ladder. This migration pattern is consistent with pre-spawn steelhead that fall-back through the bypass. These 5 fish were all identified as male kelt steelhead, but may have been misclassified (Type II error). Allen Evans (Evans, 2002) noted that identifying male kelt steelhead using ultrasound technology was more difficult than identifying females.

We further examined the PIT tag detection histories of individuals that were classified as male kelt-steelhead (Table 10), which revealed that 2 transported fish exhibited this same immediate upstream migration consistent with pre-spawners. In all, detection histories were acquired on 9 male steelhead. Of those fish only 2 exhibited migrations consistent with the premise that kelts would go out to sea and feed for a period of time and then return to spawn. Seven of the fish began migrating upstream immediately after release. Possible explanations for this behavior include misclassification of prespawners and kelts or that it is due to some male related phenomena. Observations in the Yakima River and at Lower Granite Dam show that the sex ratio for kelt steelhead is highly skewed toward females (generally over 80%). Also males tend to remain on the spawning grounds and fertilize several redds, whereas females tend to deposit eggs and rapidly move downstream (Todd Newson, personnel communication based on radio telemetry data on the Yakima River). This behavior, to remain at the spawning grounds, may motivate some post-spawn males to travel upstream (potentially crossing fish ladders) after a period of downstream migration. We did have 1 male kelt steelhead that was detected in the Columbia River Estuary 1 day after it was released from a barge below Bonneville Dam. This fish apparently was quickly leaving the freshwater system.

Table 10. Detection locations of PIT tag implanted male-kelt steelhead collected at Lower Granite Dam in 2002. Numbers with an asterisk (*) indicate migrations inconsistent with rematuration.

	LMN bypass	MCN bypass	MCN tailrace		Estuary	BON ladder	MCN ladder	IHR	LWG ladder
In-river (n=99)									
Transport (n=115)					1	2*			
Non-experiment (n=170)		1							5*
Total (n=384)	0	1	0		1	2*	0	0	5*

Reviewing PIT tag detection histories from female-kelt steelhead reveals that 2 fish in the In-river treatment were detected ascending the McNary Dam ladder between 10 and 18 days after their release in the Lower Granite Dam tailrace (Table 11). This migration pattern is not consistent with rematuration and migration and its unclear what caused this behavior. In contrast, two female-kelt steelhead released in the Lower Granite Dam tailrace (Non-experiment group) were detected 23 and 24 days later by the estuary towed array project near river mile 48 on the Columbia River. Two female kelts associated with the Transport group were detected in the estuary 1 day following their release from barges.

Table 11. Detection locations of PIT tag implanted female-kelt steelhead collected at Lower Granite Dam in 2002. Numbers with an asterisk (*) indicate migrations inconsistent with rematuration.

	Downstream Detection					Upstream Detection				
	LMN bypass	MCN bypass	MCN tailrace	BON bypass		Estuary	BON ladder	MCN ladder	IHR	LWG ladder
In-river (n=560)	1	11	5	1			1	2*		
Transport (n=636)						2	10	7	1	7
Non-experiment (n=795)		23	4			2	1	3* 2		2
Total (n=1,991)	1	34	9	1		4	12	5* 9	1	9

We have observed no differences between hatchery-origin verse natural-origin kelt steelhead. Our collection of kelt steelhead at Lower Granite Dam was evenly split between natural origin (1,370 of 2,736) and hatchery origin (1,366 of 2,736) individuals. Of the 59 female steelhead with PIT tag detection histories 31 were hatchery-origin and 28 were natural-origin. For the 9 males with detection histories 4 were hatchery-origin and 5 were natural-origin.

Lastly, there was a detection history for an additional fish that was sampled in the Lower Granite Dam bypass that already contained a PIT tag. This natural-origin fish had been tagged as a juvenile at Lower Granite Dam in 2000 and was subsequently collected by our sampling as a kelt in 2002 providing evidence of some continued display of iteroparity in Snake River steelhead.

Objective 3. Estimate kelt steelhead passage rates, migration routes, and survival from Lower Granite Dam's juvenile bypass facility to the Bonneville Dam tailrace using radio telemetry.

Telemetry: From week 3 to week 9, 210 kelts (108 in good condition, 58 in fair condition, and 44 in poor condition) were implanted with radio transmitters and released back into the LGR tailrace to resume migration. Based on fin-clips, 106 fish were of wild origin and 104 were from hatchery origin. There were 30 radio-tagged male and 180 female kelts. To ensure each tagged specimen had the same probability of detection during downstream migration, we did not deploy radio tags until the University of Idaho and U.S. Geological Survey receivers were programmed to scan for kelts. (Figure 10).

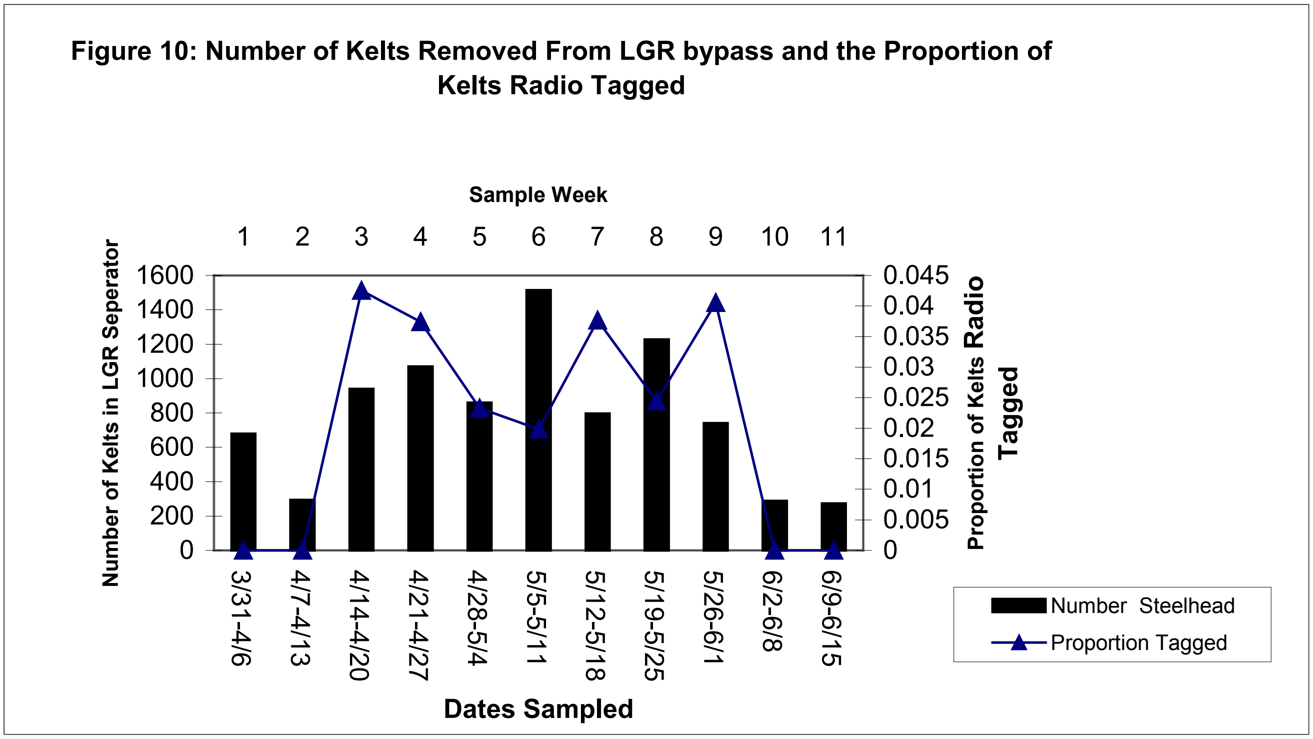

Figure 10: Number of kelts removed from the LGR juvenile bypass (histogram), and proportion of bypass kelts fitted with radio transmitters (dashed line) in 2002.

Detection Efficiency

Detection efficiencies were determined by the number of radio-tagged kelts that were not detected within a particular river segment but were subsequently contacted at a downstream site. For example, an individual not detected within the Lower Monumental pool, forebay, and tailrace that was subsequently contacted somewhere below the Lower Monumental tailrace was considered a missed detection. In general, radio-tagged kelts were detected within each of the seven river segments below Lower Granite Dam (Table 12).

Although telemetered kelts were certainly capable of passing a river segment undetected, it is unlikely any of the 210 tagged kelts could have escaped detection from the Lower Granite Dam tailrace to the Bonneville Dam tailrace, assuming the tag was not lost during emigration. Multiple segment misdetections (navigating more than one segment without being contacted) by an individual fish were observed in 2002 but these misses commonly occurred at dams with low detection efficiencies (i.e. Ice Harbor Dam). Detection efficiencies for the dams remained high and we are confident that the system-wide detection efficiency was more than adequate to assess overall passage success through the FCRPS.

Table 12. Detection efficiency of radio-tagged kelts released from Lower Granite bypass, 2002. Detection efficiency is based on the number of tagged kelts not contacted by telemetry receivers within a particular segment of the river.

Reach Location	**Est. Detection Efficiency**	**Detection (n)**	**Missed Detections (n)**
Lower Granite	94%	189	12
Little Goose	91%	134	13
Lower Monument	81%	74	17
Ice Harbor	66%	37	19
McNary	97%	36	1
John Day	93%	27	2
The Dalles	96%	28	1
Bonneville	100%	28	0

Contact Histories

Contact histories were constructed by reviewing detections at downstream receivers listed in Appendix (F). Of the 210 fish tagged and released from LGR facility, 28 (13.3%) were detected at the Bonneville Dam tailrace, approximately 510 rkm below the release location (Appendix G). Contact attrition rates (contact loss) per reach [2] ranged substantially from one dam to the next. Contact attrition rates were as high as 50% (37/74) between Lower Monument tailrace and Ice Harbor tailrace, and as low as 0% (0/28) between The Dalles Dam and Bonneville. Interestingly, kelts traveled the fastest through the Little Goose Dam and Lower Monument river reach (see *Travel Times*). Spill was provided for fish passage (see *Passage Routes*) in 2002. The number of individual kelts not detected, presumably due to mortality, was relatively consistent from the Lower Granite tailrace to the McNary tailrace (Appendix G), suggesting river conditions and dam passage impacted fish at approximately equal rates within the Snake River. In general, attrition rates were substantially higher for individuals traveling in the Snake River relative to the Columbia River (Appendix G), with only 17.6% of the radio-

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[2] A reach is defined as the river distance from tailrace to tailrace between two adjacent dams.

tagged fish contacted below Ice Harbor Dam (furthest downstream hydroelectric facility on the Snake River).

Travel Times

Downstream travel times were highly variable both within (Appendix G) and among river reaches (Table 12). In general, kelts traveled substantially slower in the Snake River relative to the Columbia River. Median travel times per reach ranged from 88 hours in the Ice Harbor Dam reach to 16 hours in the John Day Dam reach (Table 13). Median travel speeds ranged from 0.77 rkm/hr in the Lower Granite reach to 5.09 rkm/hr in the John Day Dam reach (Table 13). Cumulative median travel times for kelts were 262:40 (hh:mm; approximately 10 days) from LGR to Ice Harbor tailrace and 465:35 (approximately 19 days) from LGR to Bonneville tailrace (Appendix G). Cumulative attrition rates, travel times, contact locations, and the individual number of telemetry contacts for each radio-tagged kelt are presented in Appendix (G).

Table 13. Median and first and third quartiles of travel time and speed by river reach as exhibited by telemetered kelts in 2002.

River Reach	**Distance (rkm)***	**Travel Time** (median, first, and third quartiles)**	**Speed*** (median, first, and third quartiles)**	**Sample Size*******
LGR to LGO	59.5	77, 53,110	0.77, 0.54,1.12	129
LGO to LMN	46.7	96, 69, 162	0.48, 0.28,1.47	64
LMN to ICH	50.4	34, 26, 46	1.48,1.09, 1.93	33
ICH to McN	69.9	88, 63, 103	0.79, 0.67, 1.10,	18
McN to JDA	122.2	24, 7, 64	5.09,1.90,17.45,	27
JDA to TDA	36.4	16, 12, 26	2.27, 1.40, 3.03	26
TDA to BON	75.3	25, 10, 49	3.01, 1.53, 7.53	26

* Determined from tailrace to tailrace; telemetry arrays not the exact distance between facilities

** Travel time reported in hours

*** Speed reported in rkm/hour

**** Travel times could be calculated for fish detected in both tailraces

Fish condition (good, fair, or poor) appears to be positively correlated with the total distance traveled and overall passage success of radio-tagged kelts (Figure 11). The total distance traveled by an individual is defined as the distance between the release location and the site of last contact. Fish in good condition traveled on average 102 rkm while fish in fair condition averaged 44.7 rkm and kelts in poor condition only averaged 25.7 rkm. Of the 43 kelts in poor condition at release, one was detected at the final exit station, and most (39 or 90.6%) were not detected past Little Goose Dam. The relationship between fish condition and passage success did not appear to be affected temporally (*e.g.,* "good" fish generally exhibited the highest relative passage success regardless of sample week, and passage success was generally consistent among "good" condition fish throughout the study period; Figure 11; Appendix (H).

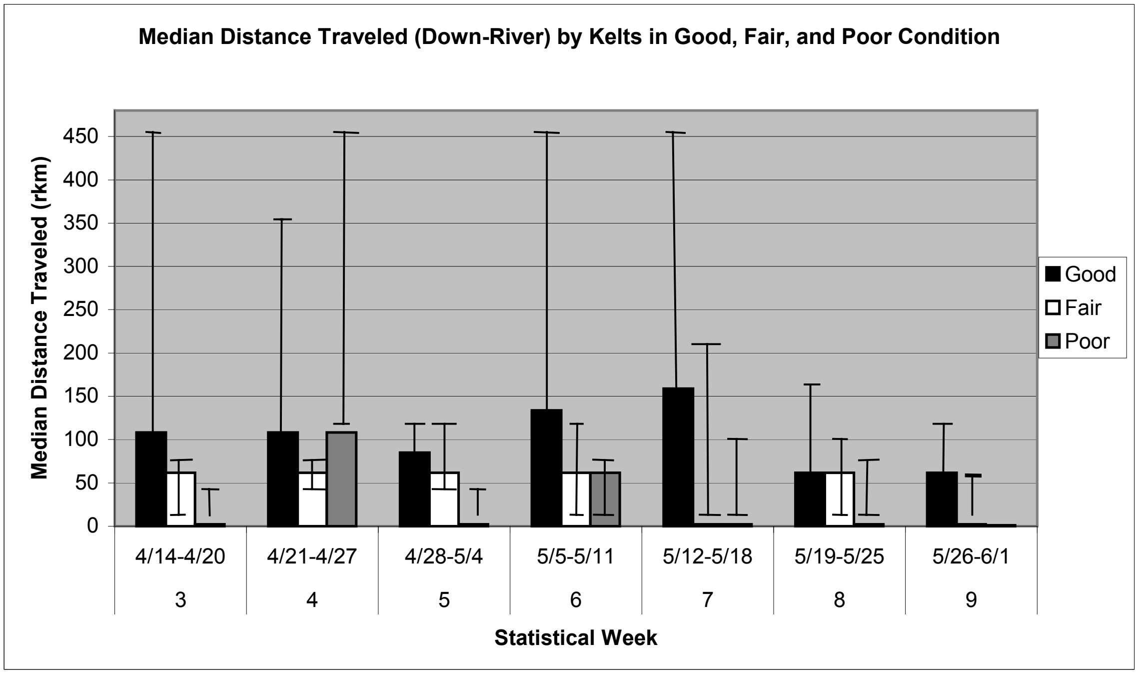


Figure 11. Median distance traveled by kelts released in poor, fair, and good condition in statistical weeks 3 through 9. Whiskers denote the first and third quartiles.

<u>Passage Routes</u>: Low-level drought conditions were present in the Snake River during the spring of 2002, however these conditions did not limit spill. With the increase in spill water in the Snake and Columbia Rivers, the majority of downstream migrating kelts emigrated via spill (Table 14). Turbine passage estimates were based on the number of kelts contacted in the tailrace (via the exit station receiver array) minus the number of individuals observed at that dam's bypass facility.

Passage routes at The Dalles and Bonneville dams were directly measured using telemetry arrays at both dams. At these dams, the majority of kelts passed via the spillway with an occasional fish utilizing the juvenile bypass facilities or turbine to emigrate (Table 14). These data may suggest that turbine passage rates of downstream migrating kelts are reduced when spill is provided.

Table 14: Estimated passage routes of kelts radio tagged and released from Lower Granite Dam, 2001. N/A indicates a lack of telemetry data (e.g., an array is not present in the indicated route). A hyphen denotes that a particular passage route does not exist (e.g., TDA does not have a bypass facility or there was no spill at LGO).

Location		**Passage Route**	
Dam	Turbine[a]	**Bypass**	**Spillway and/or sluiceway**
LGO	74 (54%)	62 (46%)	-
LMN	56 (72%)	22 (28%)	-
ICH	N.A.	N.A.	-
MCN	N.A.	14 (44%)[c]	N.A.
JDA	N.A.	N.A.	N.A.
TDA	0	-	19 (100%)
BONN[b]	0	3 (43%)	4 (57%)

[a] Minimum value based on individual contacts in the tailrace.

[b] A complete passage history was not available from one kelt passing Bonneville Dam.

[c] The remaining 56% of kelts passed McNary by an unknown route.

Table 15. Estimated passage routes of kelts radio tagged and released from Lower Granite Dam, 2002. N/A indicates a lack of telemetry data (e.g., an array is not present in the indicated route or no data collected). A hyphen denotes that a particular passage route does not exist (e.g., TDA does not have a bypass facility or there was no spill at LGO). NA= Not Available.

Location		**Passage Route**	
Dam	Turbine[a]	**Bypass**	**Spillway and/or sluiceway**
LGO	NA	NA	NA
LMN	NA	NA	NA
ICH	NA	NA	NA
MCN	NA	NA	NA
JDA	1 (6.6%)	1 (6.6%)	13 (86.6%)
TDA	0	-	9 (100%)
BONN[b]	2 (13.3%)	0	13 (86.6%)

[a] Minimum value based on individual contacts in the tailrace.

[b] A complete passage history was not available from one kelt passing Bonneville Dam.

In total, 86.6% (13/15) of the kelts with full passage histories passed the The Dalles Dam via non-turbine routes. At Bonneville Dam, 86.6% (13/15) of tagged kelts passed via non-turbine routes compared with 2001 when there was limited spill only 57 % (4/7) passed via spill (Table 15). In addition to a preference for non-turbine routes, kelt travel times were significantly decreased in 2002, which may have been due to an average flow year resulting in an abundance of spill (Wertheimer et al. 2001; Wertheimer et al. 2002).

For the purpose of this study, the term “attrition” was used to describe the lack of detection from dams further down the hydrosystem. However, because radio-tagged fish could not be recaptured after the study, we were unable to definitively state that each non-detected kelt died during downstream migration. In addition, the actual cause of death (e.g., dam passage, harvest, or physiological atrophy) can only be speculated upon with the available data. However, given the extent of radio telemetry coverage, the overall high tag retention rates observed (Wertheimer et al. 2002), and the low system-wide number of misdetections it seems probable that the vast majority of tagged kelts did not successfully navigate the FCRPS in 2002 (estimated survival of 13% based on radio telemetry).

Unfortunately, even with the near average spill year, attrition rates remained high in the Snake River hydrosystem. However, without having historical outmigration data to compare with, it is premature to identify a specific causative mechanism for kelt steelhead mortality. Furthermore, the observation that kelt steelhead released in fair and poor condition were less likely to be detected downriver, relative to fish in good condition, suggests that physical condition may play a role in overall migration success.

Summary

- Kelt Abundance: In total, 2,736 adult steelhead were sampled from the Lower Granite bypass separator between 31March and 15 June 2002. Of these, 50.1% were natural-origin. Natural-origin kelt steelhead entering the LGR bypass system in the spring of 2002 were estimated to make up approximately 7% (3,348/49,470) of the entire 2001 Snake River ESA-listed population.

- Sex: The vast majority of kelt steelhead observed in the Snake River bypass facilities were female (83.1%).

- Coloration and Condition: The largest proportion of kelts sampled were found to be in good condition (47%). Approximately 9.5% of all kelt steelhead were judged to be in poor condition and dark in coloration. These data suggest that a majority of the kelt steelhead observed at Lower Granite Dam have the potential to out-migrate to the ocean and return again to spawn.

- Length and Age: The predominant (42.3%) freshwater age for natural-origin kelt steelhead was 2 years, and 38.4% spent 1 year in saltwater while 29.7% spent 2 years in saltwater.

- Genetics: All measures of genetic diversity were greater in the samples from Lower Granite Dam then from any of the four reference hatcheries. Assignment tests indicated that the majority of the unknown kelt steelhead collected at Lower Granite Dam assigned to Pahsimeroi Hatchery (43%).

- Transport Experiment: A total of 1,410 kelt steelhead were inserted with PIT tags and 751 were assigned to the transport treatment and 659 were assigned to the in-river treatment. As of mid-July 2002, 7 of the transported fish and 0 of the in-river treatment have been detected at the Lower Granite Dam fish ladder. However, detections are still occurring so rigorous analysis will not be possible until later in the year.

- Telemetry: We radio-tagged 210 kelt steelhead and released them in the LGR tailrace to evaluate downstream migration. Only 13.3% (28/210) reached the Bonneville Dam tailrace. Condition (good, fair, or poor) appears to be correlated with migration success through FCRPS. Kelts released from LGR in good condition reached the Bonneville Dam tailrace with a higher frequency than kelts release in fair or poor condition.

- Of the kelts radio-tagged at LGR in 2002 (n=210) that were able to pass below the Columbia River dams (28), the majority navigated via spillway (73.3%).

- Cumulative median travel times (hh:mm) for kelts were estimated at 262:40 from LGR to Ice Harbor tailrace and at 465:35 from LGR to Bonneville tailrace, with kelt navigating the Snake River at a substantially slower rate of passage than kelts contacted in the Columbia River.

References

Banks, M.A., M.S. Blouin, B.A. Baldwin, and V.K. Rashbrook. 1999. Isolation and inheritance of novel microsatellites in chinook salmon (*Oncorhynchus tshawytscha*). J Hered 90:281-288. See erratum May/June 1999 for primer sequence corrections.

Bernatchez, l., and P. Duchesne. 2000. Individual-based genotype analysis in studies of parentage an population assignment: how many loci, how many alleles? Can. J. Fish Aquat. Sci. 57:1-12.

Borodin, N. 1924. Age of shad *Alosa sapidissima* as determined by scales. Transactions of the American Fisheries Society 54:178-184.

Clutter, R., and L. Whitesel. 1956. Collection and interpretation of sockeye salmon scales. International Pacific Salmon Fisheries Commission Bulletin 9.

Clutton-Brock, T.H. 1988. Reproductive Success, Studies of Individual Variation in Contrasting Breeding Systems. The University of Chicago Press, Chicago, IL.

Condrey, M.J. and P. Bentzen. 1998. Characterization of coastal cutthroat trout *(Oncorhynchus clarki clarki*) microsatellites and their conservation in other salmonids. Mol Ecol 7:787-789.

Cornuet J.M., Piry S., Luikart G., Estoup A., Solignac M., 1999 – New methods employing multilocus genotypes to select or exclude populations as origins of individuals. Genetics 153:1989-2000.

Evans, A.F., and R.E. Beaty. 2000. Identification and Enumeration of Steelhead *(Oncorhynchus mykiss)* Kelts at Little Goose Dam Juvenile Bypass Separator, 1999 Ann. Rep. To US Army Corps of Engineers, Walla Walla District, for Contract No. DACW68-99-M-3102. Prepared by the Columbia River Inter-Tribal Fish Commission, Portland, OR.

Evans, A.F. and R.E. Beaty 2001. Identification and Enumeration of Steelhead (*Oncorhynchus mykiss*) Kelts in the Juvenile Collection Systems of Lower Granite and Little Goose dams, 2000. To US Army Corps of Engineers, Walla Walla District, for Contract No. DACW68-99-M-3102. Prepared by the Columbia River Inter-Tribal Fish Commission, Portland, OR.

Evans, A.F. 2002. Steelhead (*Oncorhynchus mykiss*) kelt outmigration from Lower Granite Dam to Bonneville Dam: Abundance, downstream conversation rates, routes of passage, and travel times. To U.S. Army Corps of Engineers, Walla Walla District, for Contract No. DACW68-01-0016. Prepared by the Columbia River Inter-Tribal Fish Commission, Portland, OR.

Evermann, B.W. 1895. A report upon salmon investigations in the headwaters of the Columbia River, in the state of Idaho, in 1895, together with notes upon the fishes observed in the state in 1894 and 1895. Bulletin U.S. Fish Commission for 1895, 253-284.

Fleming, I.A., B. Jonsson, M.R. Gross, and A. Lamberg. 1996. An experimental study of reproductive behaviour and success of farmed and wild Atlantic salmon (Salmo salar). Journal of Applied Ecology 33:893-905.

Gharrett, A.J., and W.W. Smoker. 1993. Genetic components in life history traits contribute to population structure, pg 197-202 in In: Cloud, J.G. and G. H. Thorgaard (eds.) Genetic conservation of salmonid fishes. Plenum Press, New York.

Gilbert, C.H. 1913. Age at maturity of the Pacific coast salmon of the genus *Oncorhynchus*. United States Bureau of Fisheries Bulletin 32:1-22.

Goudet, J. 1995. FSTAT (Version 1.2): A computer program to calculate F- statistics. Journal of Heredity 86(6): 485-486.

Guo, S. W., and E. A. Thompson. 1993. Performing the exact test of Hardy-Weinberg proportions for multiple alleles. Biometrics 48:361-372.

Hatch, D. R., P. J. Anders, A. F. Evans, J. Blodgett, B. Bosch, D. Fast, and T. Newsome. 2002. Kelt reconditioning: A research project to enhance iteroparity in Columbia Basin steelhead (*Oncorhynchus mykiss*). Project 2000-017-00, Annual Report the Bonneville Power Administration, Portland, OR.

International North Pacific Fisheries Commission. 1963. Annual report –1961. Vancouver, British Columbia.

Koo, T.S.Y. 1955. Biology of the red salmon, *Oncorhynchus nerka* (Walbaum), of Bristol Bay, Alaska, as revealed by a study of their scales. Ph.D. Thesis, University of Washington, Seattle.

Leider, S. A., P. A. Hulett, J. J. Loch, and M. W. Chilcote. 1990. Electrophoretic comparison of the reproductive success of naturally spawning transplanted and wild steelhead trout through the returning adult stage. Aquaculture 88:239-252.

Long, J.B. and L.E. Griffin. 1937. Spawning and Migratory Habits of the Columbia River Steelhead Trout as determined by Scale Studies. Copeia. 1937:62

Nei, M. 1987. Molecular evolutionary genetics. Columbia University, New York, NY.

NMFS. 1996. Status review of West coast steelhead from Washington, Idaho, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-27.

Paetkau D., W. Calvert, I. Stirling, and C. Strobeck. 1995. Microsatellite analysis of population structure in Canadian polar bears. Molecular Ecology 4:347-354.

Quinn, T.P., M.J. Unwin, and M.T. Kinnison. 2000. Evolution of temporal isolation in the wild: genetic divergence in timing of migration and breeding in introduced populations of chinook salmon. Evolution 54:1372-1385.

Raymond, M., and F. Rousset. 1995a. GENEPOP (version 1.2): Population genetics software for exact tests and ecumenicism. Journal of Heredity 86:248-249.

Raymond, M., and F. Rousset. 1995b. An exact test for population differentiation. Evolution 49: 1280-1283.

Rice, W. R. 1989. Analyzing tables of statistical test. Evolution 43:223-225.

Robards, M.D., and T.P. Quinn. 2002. The migratory timing of adult summer-run steelhead in the Columbi River over six decades of environmental change. Transactions of the American Fisheries Society 131:523-536.

Scheaffer, R.L., L.O. Mendenhall, and L. Ott. 1990. *Elementary survey sampling Fourth Edition.* PWS-KENT Publishing Company. Boston, MA 02116. 390 pp.

Sokal, R.R., and F.J. Rohlf. 2000. Biometry. W.H. Freemand and Company, New York.

Van Oosten, J. 1929. Life history of the lake herring *Leucichthys artedi* (Le Sueur) of Lake Huron as revealed by its scales, with a critique of the scale method. United States bureau of Fisheries Bulletin 44:265-428.

Weir, B. S., and C. C. Cockerham. 1984. Estimating F-statistics for the analysis of population structure. Evol. 38:1358-1370.

Wertheimer, R.H., J. Dalen, P. Madson. M. Jones. 2001. Evaluation of steelhead kelt passage routes at Bonneville Dam, 2000. Annual Report to US Army Corps of Engineers, Portland District. Prepared by USACE Fisheries Field Unit, Cascade Locks, OR.

Wertheimer, R.H., J. Dalen, P. Madson. M. Jones. 2002. Evaluation of steelhead kelt project abundance, condition, passage, and conversion through Lower Columbia River dams. 2001 Draft Ann. Report To US Army Corps of Engineers, Portland District. Prepared by USACE Fisheries Field Unit, Cascade Locks, OR.

Whitt, C.R. 1954. The age, growth, and migration of steelhead trout in the Clearwater River, Idaho. MS thesis, University of Idaho, Moscow, ID.

Appendix A. Calculation of the stratified point estimate and approximate 95% confidence intervals of steelhead kelt proportions at the Lower Granite Dam juvenile bypass facility. Calculations follow Scheaffer et al. (1990; pages 117-118).

Estimator of the population proportion p:

$$\hat{p}_{st} = \frac{1}{N}(N_1\hat{p}_1 + N_2\hat{p}_2 + \cdots + N_L\hat{p}_L) = \frac{1}{N}\sum_{i=1}^{L} N_i\hat{p}_i$$

=(1/8678) * ((0.333333*679) + (0.847458*293) + (0.931408*940) + (0.931889*1070) + (0.984375*859) + (0.952909*1514) + (0.97921*797) + (0.976127*1227) + (0.972851*740) + (1*287) + (1*272))

=0.909497

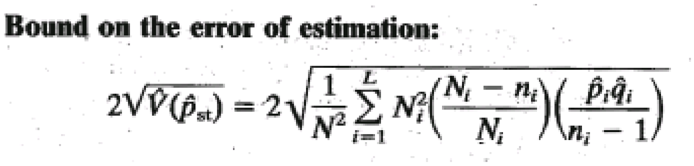
Estimated variance of $\hat{p}_{st}$:

$$\hat{V}(\hat{p}_{st}) = \frac{1}{N^2}[N_1^2\hat{V}(\hat{p}_1) + N_2^2\hat{V}(\hat{p}_2) + \cdots + N_L^2\hat{V}(\hat{p}_L)]$$
$$= \frac{1}{N^2}\sum_{i=1}^{L} N_i^2\hat{V}(\hat{p}_i)$$
$$= \frac{1}{N^2}\sum_{i=1}^{L} N_i^2\left(\frac{N_i - n_i}{N_i}\right)\left(\frac{\hat{p}_i\hat{q}_i}{n_i - 1}\right)$$

Week 1=((679-18)/679)*((0.333333*0.666667)/17)=0.012725
Week 2=((293-118)/293)*((0.847458*0.152542)/117)=0.00066
Week 3=((940-277)/940)*((0.931408*0.068592)/276)=0.000163
Week 4=((1070-323)/1070)*((0.931889*0.068111)/322)=0.000138
Week 5=((859-384)/859)*((0.984375*0.015625)/383)=0.0000222
Week 6=((1514-361)/1514)*((0.952909*0.047091)/360)=0.0000949
Week 7=((797-481)/797)*((0.97921*0.02079)/480)=0.0000168
Week 8=((1227-377)/1227)*((0.976127*0.023873)/376)=0.0000429
Week 9=((740-221)/740)*((0.972851*0.027149)/220)=0.0000842
Week 10=((287-118)/287)*((1*0)/117)=0
Week 11=((272-58)/272)*((1*0)/57)=0

$\text{Var}=1/(8678)^2[(679)^2(0.012725)+(293)^2(0.00066)+(940)^2(0.000163)+(1070)^2(0.000138)+(859)^2(0.0000222)+(1514)^2(0.0000949)+(797)^2(0.0000168)+(1227)^2(0.0000429)+(740)^2(0.0000842)+(287)^2(0)+(272)^2(0)]$

=0.0000873843



Bound on the error of estimation:

$$2\sqrt{\hat{V}(\hat{p}_{st})} = 2\sqrt{\frac{1}{N^2}\sum_{i=1}^{L} N_i^2\left(\frac{N_i - n_i}{N_i}\right)\left(\frac{\hat{p}_i\hat{q}_i}{n_i - 1}\right)}$$

+/- 0.01869603

The associated 95% confidence interval would be:

0.89080068-0.92819274

95% confidence interval on kelt abundance:

7,730-8,055

Appendix B. Allele frequencies of five sample collections at eight microsatellite loci. LGR = unknown origin kelt from Lower Granite Dam, n = sample size, A = total alleles.

OMM1007

	1	3	4	5	6	7	8	10	n	A
LGR	0.241	0.067	0.032	0.521	0.086	0.039	0.013	0.001	453	8
Little Sheep	0.422	0.017	0.043	0.362	0.052	0.103	0.000	0.000	58	6
Pahsimeroi	0.238	0.082	0.025	0.443	0.164	0.025	0.025	0.000	61	7
Oxbow	0.306	0.083	0.000	0.435	0.111	0.037	0.028	0.000	54	6
Dworshak	0.219	0.063	0.109	0.547	0.047	0.016	0.000	0.000	32	6

OMM1020

	1	2	3	4	5	6	7	8	9	10	n	A
LGR	0.109	0.001	0.634	0.047	0.024	0.007	0.010	0.080	0.033	0.054	436	10
Little Sheep	0.078	0.009	0.716	0.000	0.000	0.017	0.009	0.112	0.052	0.009	58	8
Pahsimeroi	0.074	0.016	0.525	0.016	0.016	0.000	0.000	0.156	0.074	0.123	61	8
Oxbow	0.038	0.019	0.604	0.000	0.028	0.000	0.019	0.132	0.038	0.123	53	8
Dworshak	0.141	0.047	0.703	0.063	0.000	0.000	0.000	0.031	0.000	0.016	32	6

OMM1036

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
LGR	0.022	0.015	0.021	0.053	0.009	0.051	0.038	0.054	0.071	0.272	0.060	0.035	0.021	0.032	0.031	0.020	0.013	0.014	0.020	0.015	0.013	0.013	0.024	0.002	0.006	0.007	0.007
Little Sheep	0.000	0.044	0.061	0.018	0.009	0.061	0.009	0.044	0.254	0.175	0.070	0.000	0.044	0.000	0.000	0.061	0.026	0.009	0.044	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pahsimeroi	0.025	0.017	0.008	0.107	0.000	0.025	0.008	0.033	0.074	0.281	0.041	0.066	0.017	0.041	0.025	0.033	0.000	0.008	0.000	0.000	0.000	0.025	0.033	0.000	0.000	0.017	0.025
Oxbow	0.000	0.000	0.021	0.115	0.010	0.042	0.000	0.031	0.083	0.271	0.063	0.052	0.063	0.000	0.000	0.021	0.021	0.010	0.000	0.000	0.000	0.000	0.104	0.031	0.000	0.010	0.000
Dworshak	0.031	0.078	0.125	0.016	0.000	0.047	0.031	0.047	0.031	0.172	0.063	0.047	0.031	0.000	0.031	0.000	0.000	0.000	0.109	0.000	0.000	0.031	0.031	0.000	0.000	0.000	0.000

28	29	30	31	32	35	n	A
0.009	0.011	0.024	0.014	0.000	0.001	424	32
0.000	0.009	0.053	0.000	0.000	0.000	57	18
0.008	0.000	0.041	0.041	0.000	0.000	60.5	23
0.000	0.010	0.031	0.010	0.000	0.000	48	19

0.000 0.000 0.000 0.016 0.016 0.047 32 19

OMM1046

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	22	n	A
LGR	0.001	0.012	0.031	0.066	0.073	0.108	0.123	0.148	0.124	0.135	0.022	0.025	0.026	0.042	0.026	0.009	0.007	0.009	0.008	0.004	0.001	426	21
Little Sheep	0.000	0.000	0.000	0.038	0.013	0.115	0.077	0.372	0.000	0.115	0.000	0.013	0.064	0.090	0.051	0.000	0.000	0.000	0.038	0.013	0.000	39	12
Pahsimeroi	0.000	0.000	0.042	0.050	0.042	0.125	0.208	0.158	0.083	0.133	0.000	0.033	0.050	0.050	0.008	0.008	0.000	0.008	0.000	0.000	0.000	60	14
Oxbow	0.000	0.000	0.010	0.060	0.070	0.110	0.150	0.090	0.260	0.140	0.010	0.010	0.000	0.070	0.000	0.010	0.000	0.000	0.010	0.000	0.000	50	13
Dworshak	0.000	0.000	0.000	0.060	0.120	0.060	0.340	0.100	0.040	0.040	0.000	0.000	0.000	0.000	0.080	0.040	0.000	0.060	0.020	0.040	0.000	25	12

OMM1050

	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	n	A
LGR	0.004	0.008	0.114	0.067	0.014	0.034	0.011	0.088	0.096	0.058	0.058	0.073	0.071	0.070	0.040	0.032	0.019	0.012	0.012	0.027	0.010	0.001	0.021	0.010	0.002	0.002	0.004	0.001	0.006	0.011	0.004	0.003	0.001	0.002	0.001	0.001	0.010	452	37
Little Sheep	0.018	0.000	0.193	0.009	0.018	0.000	0.000	0.061	0.272	0.088	0.105	0.044	0.044	0.044	0.000	0.018	0.026	0.009	0.009	0.000	0.000	0.009	0.000	0.009	0.000	0.000	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.000	57	19
Pahsimeroi	0.000	0.000	0.073	0.024	0.000	0.056	0.000	0.056	0.137	0.024	0.056	0.105	0.153	0.089	0.048	0.016	0.024	0.000	0.016	0.024	0.008	0.000	0.032	0.016	0.000	0.000	0.000	0.000	0.016	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	62	20
Oxbow	0.000	0.000	0.104	0.113	0.000	0.019	0.000	0.028	0.179	0.038	0.104	0.019	0.047	0.019	0.009	0.038	0.047	0.028	0.028	0.000	0.009	0.009	0.038	0.019	0.000	0.000	0.000	0.000	0.000	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.085	53	21
Dworshak	0.000	0.033	0.033	0.000	0.033	0.117	0.050	0.000	0.033	0.117	0.067	0.133	0.067	0.067	0.017	0.000	0.000	0.000	0.017	0.050	0.067	0.067	0.000	0.000	0.000	0.000	0.000	0.000	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	30	17

Ots1

	2	3	4	5	6	7	8	9	10	11	12	13	14	16	17	18	37	39	40	41	43	44	n	A
LGR	0.032	0.104	0.099	0.088	0.166	0.017	0.025	0.075	0.005	0.006	0.010	0.001	0.003	0.001	0.001	0.002	0.000	0.025	0.003	0.049	0.278	0.008	436	21
Little Sheep	0.000	0.013	0.063	0.112	0.050	0.000	0.000	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.000	0.038	0.663	0.038	40	9
Pahsimeroi	0.026	0.017	0.147	0.233	0.129	0.000	0.060	0.060	0.000	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.078	0.207	0.009	58	12
Oxbow	0.031	0.041	0.061	0.082	0.276	0.010	0.020	0.082	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.041	0.296	0.051	49	12
Dworshak	0.016	0.081	0.097	0.048	0.194	0.000	0.000	0.258	0.000	0.000	0.000	0.000	0.000	0.032	0.000	0.000	0.000	0.097	0.000	0.000	0.177	0.000	31	9

Ots1 (continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	n	A
LGR	0.004	0.013	0.015	0.116	0.149	0.303	0.073	0.101	0.030	0.074	0.077	0.038	0.006	396	13
Little Sheep	0.000	0.000	0.038	0.103	0.321	0.231	0.000	0.128	0.013	0.038	0.115	0.013	0.000	39	9
Pahsimeroi	0.000	0.000	0.000	0.143	0.071	0.214	0.157	0.143	0.043	0.157	0.057	0.014	0.000	35	9
Oxbow	0.000	0.000	0.037	0.134	0.122	0.256	0.012	0.183	0.037	0.073	0.085	0.061	0.000	41	10
Dworshak	0.000	0.000	0.000	0.018	0.196	0.554	0.089	0.000	0.036	0.000	0.071	0.036	0.000	28	7

Ogo4

	2	3	4	5	7	8	9	10	11	12	13	14	17	n	A
LGR	0.200	0.024	0.023	0.001	0.007	0.093	0.249	0.125	0.072	0.113	0.077	0.013	0.001	429	13
Little Sheep	0.151	0.023	0.012	0.000	0.000	0.047	0.209	0.221	0.058	0.081	0.174	0.023	0.000	43	10
Pahsimeroi	0.082	0.025	0.016	0.000	0.000	0.139	0.156	0.238	0.156	0.148	0.041	0.000	0.000	61	9
Oxbow	0.064	0.036	0.000	0.000	0.000	0.118	0.164	0.164	0.118	0.209	0.127	0.000	0.000	55	8
Dworshak	0.141	0.047	0.203	0.000	0.000	0.047	0.328	0.047	0.000	0.047	0.141	0.000	0.000	32	8

Appendix C. Assignment test results for each individual and -likelihood of assigning to each of four hatchery stocks (Little Sheep, Pahsimeroi, Oxbow, Dworshak).

	Individual ID	Little Sheep	Pahsimeroi	Oxbow	Dworshak	Stock Assignment
1	LGR101	16.92	17.25	18.61	18.19	Little Sheep
2	LGR105	22.53	15.28	19.67	20.74	Pahsimeroi
3	LGR111	15.48	15.92	16.82	15.37	Dworshak
4	LGR112	18.54	14.75	15.14	11.68	Dworshak
5	LGR113	12.94	16.2	15.79	14.12	Little Sheep
6	LGR114	18.15	15.43	15.42	18.63	Oxbow
7	LGR115	17.18	20.02	17.05	17.34	Oxbow
8	LGR116	19.3	16.39	13.9	14.61	Oxbow
9	LGR117	11.14	13.93	10.95	19.16	Oxbow
10	LGR118	20	17.77	13.11	19.2	Oxbow
11	LGR119	19.56	18.63	16.88	14.27	Dworshak
12	LGR121	17.9	11.3	13.08	18.15	Pahsimeroi
13	LGR122	22.53	14.36	19.6	20.31	Pahsimeroi
14	LGR123	24.15	17.81	22.65	16.48	Dworshak
15	LGR124	15.08	15.99	15.28	16.57	Little Sheep
16	LGR125	21.6	15.93	16.01	16.4	Pahsimeroi
17	LGR126	15.01	10.32	11.44	17.24	Pahsimeroi
18	LGR1274	18.19	14.42	14.57	15.42	Pahsimeroi
19	LGR1277	15.27	12.74	12.62	19.15	Oxbow
20	LGR1285	22.58	16.37	16.61	19.23	Pahsimeroi
21	LGR1287	19.07	14.52	17.32	15.59	Pahsimeroi
22	LGR1293	17.44	14.18	16.79	19.83	Pahsimeroi
23	LGR1295	13.65	11.17	12.99	18.57	Pahsimeroi
24	LGR1296	21.74	11.87	16.53	18.46	Pahsimeroi
25	LGR1297	17.43	14.99	14.8	19	Oxbow
26	LGR1298	16.68	13.32	12.81	17.14	Oxbow
27	LGR13	20.24	17.4	18.65	14.24	Dworshak
28	LGR132	10.54	13.33	10.32	15.02	Oxbow
29	LGR134	11.76	8.68	9.72	7.33	Dworshak
30	LGR135	15.85	11.26	12.16	12.95	Pahsimeroi
31	LGR1360	14.53	15.33	11.79	15.36	Oxbow
32	LGR1387	21.22	13.63	15.38	19.94	Pahsimeroi
33	LGR1388	9.38	7.13	8.46	8.68	Pahsimeroi
34	LGR1458	18.88	15.11	14.56	18.75	Oxbow
35	LGR1459	21.51	16.25	21.34	12.63	Dworshak
36	LGR1460	14.9	14.11	14.53	13.96	Dworshak
37	LGR1461	13.48	10.59	13.87	12.74	Pahsimeroi
38	LGR1462	16.14	11.98	13.83	16.67	Pahsimeroi
39	LGR1465	17.33	10.74	12.51	10.42	Dworshak
40	LGR1466	26.79	20.28	18.64	20.45	Oxbow
41	LGR1467	17.57	13.97	13.8	15.85	Oxbow

42	LGR1468	12.61	9.72	12.07	13.01	Pahsimeroi
43	LGR1469	18.71	14.44	17.58	18.74	Pahsimeroi
44	LGR1470	14.04	12.14	14.55	15.81	Pahsimeroi
45	LGR15	16.84	14.66	14.95	15.49	Pahsimeroi
46	LGR1550	15.38	12.48	11.91	15.25	Oxbow
47	LGR1581	17.06	12.22	13.62	18.1	Pahsimeroi
48	LGR1582	14.39	12.27	14.04	15.17	Pahsimeroi
49	LGR1583	13.81	12.58	11.92	12.7	Oxbow
50	LGR1584	19.88	15.11	19.68	15.7	Pahsimeroi
51	LGR1585	15.25	13.17	15.9	18.58	Pahsimeroi
52	LGR1586	18	15.79	17.84	19.84	Pahsimeroi
53	LGR1588	13.33	14.34	17.25	13.57	Little Sheep
54	LGR1589	14.1	12.01	12.91	16.27	Pahsimeroi
55	LGR1590	20.49	15.11	15.79	17.56	Pahsimeroi
56	LGR1592	16	14.09	14.09	14.18	Oxbow
57	LGR1682	9.96	12.64	13.55	11.48	Little Sheep
58	LGR1684	12.98	7.02	7.99	9.23	Pahsimeroi
59	LGR1685	14.63	14.77	15.68	13.54	Dworshak
60	LGR1686	11.06	15.09	14.02	18.97	Little Sheep
61	LGR1687	24.72	25.01	20.66	22.46	Oxbow
62	LGR1688	13.75	15.92	17.28	17.59	Little Sheep
63	LGR1691	17.22	14.52	12.31	18.11	Oxbow
64	LGR1693	15.96	14.45	15.2	23.11	Pahsimeroi
65	LGR1695	14.14	10.25	11.51	15.56	Pahsimeroi
66	LGR1696	12.44	15.75	14.51	17.84	Little Sheep
67	LGR1699	16.33	14.99	13.78	16.8	Oxbow
68	LGR170	17.42	15.7	12.77	11.89	Dworshak
69	LGR1700	18.83	16.86	16.82	22.84	Oxbow
70	LGR1701	21.44	14.82	16.76	24.36	Pahsimeroi
71	LGR171	15.55	13.19	13.4	12.77	Dworshak
72	LGR174	24.57	16.37	19.99	18.6	Pahsimeroi
73	LGR175	17.4	15.3	16.76	17.23	Pahsimeroi
74	LGR177	13.13	12.93	12.49	12.65	Oxbow
75	LGR180	12.22	13.78	12.53	21.02	Little Sheep
76	LGR183	14.34	10.05	12.73	13.14	Pahsimeroi
77	LGR186	8.16	8.74	7.93	12.08	Oxbow
78	LGR187	16.38	16.44	18.54	17.26	Little Sheep
79	LGR188	17.24	12.91	14.1	16.02	Pahsimeroi
80	LGR1882	17.67	11.99	10.97	11.73	Oxbow
81	LGR1882	19.69	14.38	13.46	14.14	Oxbow
82	LGR1883	21.26	15.57	18.67	19.85	Pahsimeroi
83	LGR1883	16.46	12.76	14.09	17.85	Pahsimeroi
84	LGR1885	17.39	11.42	11.2	15.51	Oxbow
85	LGR1885	25.24	17.79	19.21	20.08	Pahsimeroi
86	LGR1886	9.96	12.85	11.87	14.25	Little Sheep
87	LGR1886	10.02	13.92	13.69	15.72	Little Sheep
88	LGR1887	20.12	20.04	20.75	17.53	Dworshak
89	LGR1887	13.35	18.81	15.55	15.84	Little Sheep

90	LGR1888	17.54	14.73	15.39	13.6	Dworshak
91	LGR1888	12.68	12.17	13.71	12.28	Pahsimeroi
92	LGR1889	12.84	12.3	11.2	11.01	Dworshak
93	LGR1889	14.16	13.24	12.3	14.42	Oxbow
94	LGR1890	14.19	11.63	11.54	18.34	Oxbow
95	LGR1890	12.97	12.23	11.94	17	Oxbow
96	LGR1891	16.02	14.69	17.28	17.34	Pahsimeroi
97	LGR1891	15.18	14.14	17.97	15.5	Pahsimeroi
98	LGR1892	19.97	16.14	21.46	22.25	Pahsimeroi
99	LGR1892	14.43	12.63	16.36	20.92	Pahsimeroi
100	LGR1893	9.79	11.22	12.81	16.98	Little Sheep
101	LGR1893	16.88	16.31	21.04	19.86	Pahsimeroi
102	LGR1894	13.84	14.58	15.19	12.67	Dworshak
103	LGR1894	10.99	14.79	12.57	11.61	Little Sheep
104	LGR1895	20.13	16.25	15.19	19.33	Oxbow
105	LGR1895	20.33	14.86	15.91	18.65	Pahsimeroi
106	LGR1896	15.43	12.19	16.15	17.17	Pahsimeroi
107	LGR1899	15.43	15.51	13.78	12.11	Dworshak
108	LGR1901	18.48	15.99	17.33	19.46	Pahsimeroi
109	LGR1902	17.48	14.46	16.49	19.58	Pahsimeroi
110	LGR1903	14.33	12.49	13.53	22.73	Pahsimeroi
111	LGR1904	13.29	13.09	9.64	18.98	Oxbow
112	LGR1905	10.19	10.11	11.04	11.86	Pahsimeroi
113	LGR1906	16.43	13.09	14.31	14.66	Pahsimeroi
114	LGR1907	18.89	12.83	16.4	13.95	Pahsimeroi
115	LGR191	12.43	7.84	10.41	12.57	Pahsimeroi
116	LGR192	14.4	10.35	13	15.85	Pahsimeroi
117	LGR194	15.83	14.57	13.33	15.52	Oxbow
118	LGR195	18.09	15.04	13.97	15.74	Oxbow
119	LGR1952	13.83	18.17	17.3	16.53	Little Sheep
120	LGR1953	13.87	14.62	16.34	14.04	Little Sheep
121	LGR1954	11.99	13.77	13.08	22.32	Little Sheep
122	LGR1955	16.27	11.16	14.66	16.57	Pahsimeroi
123	LGR1956	12.76	11.92	13.16	15.02	Pahsimeroi
124	LGR1957	13.47	11.33	9.63	15.07	Oxbow
125	LGR1959	18.35	15.08	16.17	17.79	Pahsimeroi
126	LGR196	21.78	15.57	15.25	18.65	Oxbow
127	LGR1960	14.9	15.71	14.53	22.1	Oxbow
128	LGR1962	15.07	12.97	16.38	10.56	Dworshak
129	LGR1964	12.45	14.48	14.18	16.7	Little Sheep
130	LGR198	17.82	16.45	13.55	19.61	Oxbow
131	LGR2023	20.72	13.2	12.95	20.84	Oxbow
132	LGR2024	17.62	11.13	13.69	13.96	Pahsimeroi
133	LGR2025	19.39	15.28	17.53	15.5	Pahsimeroi
134	LGR2026	16.75	14.36	17.59	20.22	Pahsimeroi
135	LGR2028	15.69	17.39	16.3	18.66	Little Sheep
136	LGR2029	15.12	12.19	16.22	18.81	Pahsimeroi
137	LGR203	14.97	14.29	13.39	16.31	Oxbow

138	LGR2030	11.25	8.79	9.89	10.44	Pahsimeroi
139	LGR2032	13.83	10.87	11.17	14.64	Pahsimeroi
140	LGR2033	23.44	16.24	21.09	17.3	Pahsimeroi
141	LGR2034	17.74	14.43	14.16	19.68	Oxbow
142	LGR2035	21.45	14.97	16.96	14.74	Dworshak
143	LGR2038	14.97	12.53	11.66	16.6	Oxbow
144	LGR2039	24.98	16.98	17.66	27.1	Pahsimeroi
145	LGR204	17.64	16.17	15.67	12.69	Dworshak
146	LGR2040	20.98	15.2	14.42	17.67	Oxbow
147	LGR2041	16.31	13	10.63	12.74	Oxbow
148	LGR2044	20.57	16.04	16.44	16.3	Pahsimeroi
149	LGR2046	12.72	12.59	10.78	14.46	Oxbow
150	LGR205	15.64	14.73	16.24	11.55	Dworshak
151	LGR2053	22.02	15.54	18.71	19.33	Pahsimeroi
152	LGR2058	19.66	14.27	11.47	20.18	Oxbow
153	LGR2059	21.4	15.26	15.21	20.95	Oxbow
154	LGR206	15.16	17.71	15.97	15.77	Little Sheep
155	LGR2062	14.61	10	11.84	17.82	Pahsimeroi
156	LGR2064	14.14	13.97	15.42	13.5	Dworshak
157	LGR207	13.71	16.37	16.05	14.47	Little Sheep
158	LGR208	14	15.03	13.49	18.64	Oxbow
159	LGR209	21.2	12.87	12.28	21.67	Oxbow
160	LGR210	20.22	13.82	19.38	19.3	Pahsimeroi
161	LGR211	15.57	15.19	16.51	15.89	Pahsimeroi
162	LGR212	16.6	11.22	12.78	10.42	Dworshak
163	LGR213	12.12	10.1	10.48	14.82	Pahsimeroi
164	LGR214	10.04	8.78	10.45	8.74	Dworshak
165	LGR215	15.95	15.74	17.2	13.08	Dworshak
166	LGR216	16.31	16.56	15.78	13.87	Dworshak
167	LGR217	15.58	15.91	15.94	13.07	Dworshak
168	LGR2170	16.51	11.5	14.27	15.96	Pahsimeroi
169	LGR2172	16.8	14.45	15.24	17.91	Pahsimeroi
170	LGR2173	19.94	18.65	18.38	12.31	Dworshak
171	LGR2174	12.56	11.46	10.69	14.35	Oxbow
172	LGR2175	16.86	16.83	19.39	15.26	Dworshak
173	LGR2177	13.9	13.07	15.3	18.03	Pahsimeroi
174	LGR2178	17.62	12.94	12.51	19.75	Oxbow
175	LGR218	18.07	14.24	15.93	20.58	Pahsimeroi
176	LGR2180	11.8	9.23	8.74	14.21	Oxbow
177	LGR219	14.86	10.18	9.75	12.62	Oxbow
178	LGR221	16.85	20.25	19.66	17.41	Little Sheep
179	LGR2239	18.7	13.56	15.83	20.8	Pahsimeroi
180	LGR2241	22.93	20.39	21.49	21.23	Pahsimeroi
181	LGR2242	17.09	17	15.71	17.78	Oxbow
182	LGR2243	17.49	18.55	21.23	21.5	Little Sheep
183	LGR2244	9.6	10.88	10.01	16.88	Little Sheep
184	LGR2245	23.68	13.06	15.21	23.14	Pahsimeroi
185	LGR2247	15.99	14.25	13.36	14.4	Oxbow

186	LGR2249	13	14.7	13.99	16.88	Little Sheep
187	LGR225	14.88	15.03	15.45	12.84	Dworshak
188	LGR2251	17.53	16.97	18.45	20.04	Pahsimeroi
189	LGR2252	14.04	14.08	16.5	18.02	Little Sheep
190	LGR2253	21.5	21.79	22.24	21.22	Dworshak
191	LGR2254	14.92	12.67	13.41	14.86	Pahsimeroi
192	LGR2255	14.51	11.2	13.25	13.25	Pahsimeroi
193	LGR2256	11.34	12.34	14.63	15.38	Little Sheep
194	LGR2257	13.31	10.32	8.87	11.92	Oxbow
195	LGR2258	17.62	13.97	14.63	15.99	Pahsimeroi
196	LGR2259	15.18	11.98	14.94	15.04	Pahsimeroi
197	LGR226	18.71	14.92	17.87	15.98	Pahsimeroi
198	LGR2260	19.52	13.32	17.61	18.15	Pahsimeroi
199	LGR2261	14.01	12.1	8.88	16.36	Oxbow
200	LGR2262	15.47	14.57	17.62	13.41	Dworshak
201	LGR2263	15.63	10.56	11.38	15.91	Pahsimeroi
202	LGR2265	17.33	17.96	18.52	18.43	Little Sheep
203	LGR2266	15.17	12.54	15.12	15.65	Pahsimeroi
204	LGR2267	17.12	14.11	14.2	12.12	Dworshak
205	LGR2268	22.8	13.41	12.39	19.99	Oxbow
206	LGR227	5.81	5.31	6.73	4.65	Dworshak
207	LGR2270	19.26	12.54	14.99	19.23	Pahsimeroi
208	LGR2271	18.54	11.67	14.05	13.41	Pahsimeroi
209	LGR2272	11.57	12.48	11.43	17.18	Oxbow
210	LGR2273	13.92	16.51	16.07	12.24	Dworshak
211	LGR228	11.14	12.71	11.5	15.49	Little Sheep
212	LGR229	15.98	15.04	15.49	14.43	Dworshak
213	LGR230	15.23	14.38	12.15	19.48	Oxbow
214	LGR231	11.89	16.48	12.62	13.68	Little Sheep
215	LGR2353	17.01	17	18.03	19.63	Pahsimeroi
216	LGR2354	14.72	17.86	18.36	20.54	Little Sheep
217	LGR2355	13.54	14.83	15.82	15.3	Little Sheep
218	LGR2356	18.4	14.37	12.85	20.32	Oxbow
219	LGR2357	13.66	14.99	14.55	17.74	Little Sheep
220	LGR2358	11.52	13.54	12.2	13.57	Little Sheep
221	LGR2359	13.97	11.51	11.92	14.9	Pahsimeroi
222	LGR2360	20.46	15.61	13.33	19.08	Oxbow
223	LGR2361	16.2	12.03	14.11	14.61	Pahsimeroi
224	LGR2363	19.97	13.87	12.63	14.65	Oxbow
225	LGR2364	18.53	16.16	18.68	14.92	Dworshak
226	LGR2365	18.43	13.34	16	17.04	Pahsimeroi
227	LGR2366	15.26	13.97	13.72	13.23	Dworshak
228	LGR2367	17.08	13.51	13.95	14.31	Pahsimeroi
229	LGR2368	17.03	11.37	12.2	18.63	Pahsimeroi
230	LGR2369	8.19	12.44	12.86	12.99	Little Sheep
231	LGR2370	17.91	15.97	16.81	18.78	Pahsimeroi
232	LGR2371	12.72	12.82	13.61	18.78	Little Sheep
233	LGR2372	18.04	15.76	17.4	18.92	Pahsimeroi

234	LGR2373	18.84	17.02	18.91	21.33	Pahsimeroi
235	LGR2374	11.63	13.2	14.58	18.03	Little Sheep
236	LGR2446	23.61	16.55	13.67	17.1	Oxbow
237	LGR2448	13.94	9.97	11.75	15.83	Pahsimeroi
238	LGR2450	17.16	15.32	18.85	15.9	Pahsimeroi
239	LGR2685	14.07	13.15	11.48	13.83	Oxbow
240	LGR2686	20.56	11.82	17.08	18.88	Pahsimeroi
241	LGR2688	13.71	18.25	16.48	19.42	Little Sheep
242	LGR2689	16.32	15.52	15.7	18.87	Pahsimeroi
243	LGR269	16.82	15.47	17.07	11.36	Dworshak
244	LGR2690	19.68	17.16	15.28	18	Oxbow
245	LGR2691	14.96	14.67	15.63	19.31	Pahsimeroi
246	LGR270	16.68	13.79	15.21	20.03	Pahsimeroi
247	LGR271	10.82	11.27	10.22	9.67	Dworshak
248	LGR272	16.31	20.18	18.13	20.08	Little Sheep
249	LGR273	14.39	11.31	12.66	18.61	Pahsimeroi
250	LGR2730	17.22	14.01	14.49	14.17	Pahsimeroi
251	LGR2731	15.99	16.4	15.61	15.8	Oxbow
252	LGR2732	20.14	17.95	18.24	18.07	Pahsimeroi
253	LGR2733	14.46	11.82	9.83	18.33	Oxbow
254	LGR2734	16.66	12.47	12.02	15.27	Oxbow
255	LGR2735	10.03	11.09	10.97	9.7	Dworshak
256	LGR2736	10.77	8.05	10.92	16.14	Pahsimeroi
257	LGR2737	10.02	11.32	11.8	13.18	Little Sheep
258	LGR274	13	10.37	10.26	11.68	Oxbow
259	LGR2740	18.4	18	15.4	25.22	Oxbow
260	LGR2742	13.95	12.3	12.81	16.19	Pahsimeroi
261	LGR2744	10.45	8.84	11.34	15.79	Pahsimeroi
262	LGR2747	16.3	17.02	16.77	16.76	Little Sheep
263	LGR2749	17.57	14.58	15.71	18.83	Pahsimeroi
264	LGR2751	18.72	13.57	14.13	16.31	Pahsimeroi
265	LGR2753	12.18	12.62	10.85	18.53	Oxbow
266	LGR2755	21.27	17.12	13.75	18.15	Oxbow
267	LGR2757	17.53	18.37	19.88	20.96	Little Sheep
268	LGR2759	16.71	14.35	16.65	19.32	Pahsimeroi
269	LGR2761	14.01	15.27	15.5	17.22	Little Sheep
270	LGR2763	12.06	14.88	14.72	17.9	Little Sheep
271	LGR2764	13.92	14.53	15.6	19.22	Little Sheep
272	LGR2766	18.27	15.77	16.68	18.31	Pahsimeroi
273	LGR2767	9.22	13.42	13.23	14.46	Little Sheep
274	LGR2769	12.54	13.68	14.2	13.72	Little Sheep
275	LGR2770	21.05	19.47	16.53	17.43	Oxbow
276	LGR2771	16.63	15.87	13.17	17.54	Oxbow
277	LGR2772	16.78	16.38	16.72	16.14	Dworshak
278	LGR2773	14.63	16.64	13.61	20.15	Oxbow
279	LGR2774	18.4	17.54	20.23	20.14	Pahsimeroi
280	LGR2775	19.71	16.95	19.86	17.75	Pahsimeroi
281	LGR2776	17.42	15.66	18.29	16.17	Pahsimeroi

282	LGR2777	14.12	15.31	13.46	17.37	Oxbow
283	LGR2778	16.82	12.96	12.48	18.64	Oxbow
284	LGR2779	13.59	11.49	10.83	16.42	Oxbow
285	LGR2780	15.88	15.44	12.53	18.69	Oxbow
286	LGR2781	16.67	17.52	19.54	20.86	Little Sheep
287	LGR2782	17.49	14.27	19.39	16.86	Pahsimeroi
288	LGR2783	12.38	14.4	14.98	14.45	Little Sheep
289	LGR2784	21.56	17.49	17.98	22.52	Pahsimeroi
290	LGR2785	13.01	12.26	12.89	17.06	Pahsimeroi
291	LGR2786	17.9	11.28	15.03	17.53	Pahsimeroi
292	LGR2787	16.71	12.81	12.68	13.75	Oxbow
293	LGR281	19.71	13.47	14.28	17.76	Pahsimeroi
294	LGR283	17.12	15.67	14.47	16.83	Oxbow
295	LGR2842	12.07	12.46	9.76	15.72	Oxbow
296	LGR2844	13.11	8.51	9.16	13.44	Pahsimeroi
297	LGR2846	19.57	20.69	22.35	20.67	Little Sheep
298	LGR2848	23.2	16.49	18.01	15.51	Dworshak
299	LGR285	10.76	11.32	11.59	12.85	Little Sheep
300	LGR2850	17.84	21.19	16.32	20.79	Oxbow
301	LGR2854	9.08	7.59	10.07	8.62	Pahsimeroi
302	LGR2858	20.93	15.49	16.6	15.15	Dworshak
303	LGR2859	5.93	8.13	7.02	6.38	Little Sheep
304	LGR2860	12.79	12.04	14.95	15.26	Pahsimeroi
305	LGR2861	15.12	10.38	14.22	11.85	Pahsimeroi
306	LGR2863	14.08	11.4	11.43	16.02	Pahsimeroi
307	LGR2864	7.89	7.64	7.79	12.24	Pahsimeroi
308	LGR2865	16.09	17	18.91	13.03	Dworshak
309	LGR288	17.76	16.45	21.88	12.71	Dworshak
310	LGR2882	13.36	18.82	16.26	14.49	Little Sheep
311	LGR2883	12.08	14.49	14.74	16	Little Sheep
312	LGR2884	11.3	12.95	10.66	16.54	Oxbow
313	LGR2885	15.71	12.6	12.91	15.25	Pahsimeroi
314	LGR2886	15.01	12.67	16.54	17.35	Pahsimeroi
315	LGR2887	13.77	15.44	16.71	19.61	Little Sheep
316	LGR2888	17.21	14.23	12.45	19.96	Oxbow
317	LGR2889	14.98	12.6	14.05	12.29	Dworshak
318	LGR2893	13.97	11.49	12.48	16.42	Pahsimeroi
319	LGR2894	12.45	11.91	10.51	16.68	Oxbow
320	LGR2895	10.15	8.33	8.05	11.54	Oxbow
321	LGR291	20.89	16.91	17.65	19.15	Pahsimeroi
322	LGR293	12.77	11.65	14.44	13.37	Pahsimeroi
323	LGR295	20.21	15.46	17.1	18.38	Pahsimeroi
324	LGR300	17.37	10.32	11.46	19.84	Pahsimeroi
325	LGR302	14.89	11.3	11.02	12.46	Oxbow
326	LGR304	18.1	15.07	13.42	20.09	Oxbow
327	LGR342	12.74	11.8	11.45	12.48	Oxbow
328	LGR343	15.24	12.02	16.12	12.4	Pahsimeroi
329	LGR344	27.8	21.67	26.32	20.83	Dworshak

330	LGR347	13.36	15.98	15.23	19.82	Little Sheep
331	LGR347	15.52	11.32	11.41	12.21	Pahsimeroi
332	LGR348	13.52	13.43	12.62	15.67	Oxbow
333	LGR349	12.42	8.8	8.97	7.38	Dworshak
334	LGR350	15.31	14.63	12.43	13.83	Oxbow
335	LGR351	15.8	17.34	21.62	14.07	Dworshak
336	LGR351	19.11	16.95	16.5	16.33	Dworshak
337	LGR352	18.34	12.95	15.27	15.62	Pahsimeroi
338	LGR353	18.87	15.81	17.95	23.01	Pahsimeroi
339	LGR353	18.06	11.17	14.53	16.35	Pahsimeroi
340	LGR354	18.58	16.03	16.41	18.3	Pahsimeroi
341	LGR355	14.46	15.24	14.87	13.42	Dworshak
342	LGR355	15.92	13.17	15.44	16.26	Pahsimeroi
343	LGR356	14.46	15.68	16.99	12.22	Dworshak
344	LGR357	13.19	12.27	12.88	11.74	Dworshak
345	LGR358	11.35	11.06	11.33	11.52	Pahsimeroi
346	LGR362	14.91	13.51	12.38	14.42	Oxbow
347	LGR42	17.31	16.39	16.12	18.61	Oxbow
348	LGR43	11.18	13.81	13.22	18.6	Little Sheep
349	LGR441	14.94	15.54	13.01	16.23	Oxbow
350	LGR449	15.46	15.45	14.43	21.32	Oxbow
351	LGR450	15.54	11.47	11.9	16.89	Pahsimeroi
352	LGR451	15.41	13.12	12.13	10.86	Dworshak
353	LGR452	18.18	12.48	11.54	15.51	Oxbow
354	LGR453	18.02	15.66	13.55	16.52	Oxbow
355	LGR454	17.67	13.3	15.43	20.69	Pahsimeroi
356	LGR455	12.31	13.05	11.14	17.12	Oxbow
357	LGR456	14.47	14.91	15.87	14.92	Little Sheep
358	LGR457	12.43	12.84	14.02	14.15	Little Sheep
359	LGR458	19.08	14.38	15.77	15.07	Pahsimeroi
360	LGR459	18.75	10.58	11.49	15.66	Pahsimeroi
361	LGR46	25.44	21.21	20.98	25.79	Oxbow
362	LGR460	19.45	14.35	14.14	16.02	Oxbow
363	LGR461	18.14	13.54	13.53	14.18	Oxbow
364	LGR462	17.95	16.75	17.89	25.95	Pahsimeroi
365	LGR463	16.28	12.77	12.85	20.6	Pahsimeroi
366	LGR465	7.81	6.99	6.21	7.32	Oxbow
367	LGR466	15.61	14.5	16.93	14.37	Dworshak
368	LGR467	21.32	12.64	14.53	19.37	Pahsimeroi
369	LGR469	16.15	13.7	14.08	19.44	Pahsimeroi
370	LGR470	16.98	14.65	14.88	15.32	Pahsimeroi
371	LGR471	19.87	14.65	15.67	19.61	Pahsimeroi
372	LGR472	12.63	13.25	13.27	15.61	Little Sheep
373	LGR48	17.78	20.38	21.74	16.27	Dworshak
374	LGR49	15.94	15.26	16.52	12.88	Dworshak
375	LGR56	11.68	12.3	11.31	16.35	Oxbow
376	LGR605	17.38	13	14.47	13.68	Pahsimeroi
377	LGR607	19.72	12.36	15.31	13.68	Pahsimeroi

378	LGR608	11.12	9.99	12.45	13.64	Pahsimeroi
379	LGR609	13.47	12.35	14.19	17.53	Pahsimeroi
380	LGR610	23.19	15.01	14.59	17.72	Oxbow
381	LGR612	15.7	10.06	13.1	15.53	Pahsimeroi
382	LGR613	14.98	12.97	14.97	16.92	Pahsimeroi
383	LGR615	19.37	12.22	14.37	21.4	Pahsimeroi
384	LGR616	19.82	14.72	16.25	21.54	Pahsimeroi
385	LGR65	18.92	16.91	18.23	20.57	Pahsimeroi
386	LGR657	15.08	12.62	13.14	16.79	Pahsimeroi
387	LGR658	14.9	15.35	16.22	21.43	Little Sheep
388	LGR659	17.01	13.27	13.52	21.69	Pahsimeroi
389	LGR66	16.13	12.22	13.11	16.55	Pahsimeroi
390	LGR660	13.5	13.26	14.39	10.6	Dworshak
391	LGR661	16.65	14.33	17.55	13.51	Dworshak
392	LGR662	8.72	9.47	12.22	13.36	Little Sheep
393	LGR663	15.18	14.2	12.63	19	Oxbow
394	LGR664	12.95	13.91	13.29	17.6	Little Sheep
395	LGR665	22.96	14.28	14.58	18.82	Pahsimeroi
396	LGR666	18.77	12.98	17.32	13.94	Pahsimeroi
397	LGR667	13.7	12.79	15.37	15.61	Pahsimeroi
398	LGR668	10.8	11.85	12.13	11.55	Little Sheep
399	LGR70	17.32	12.43	12.12	17.85	Oxbow
400	LGR718	9.69	10	10.45	13.53	Little Sheep
401	LGR719	17.47	14.59	15.71	19.47	Pahsimeroi
402	LGR720	20.26	14.11	13.31	17.73	Oxbow
403	LGR721	13.07	13.87	14.46	16.36	Little Sheep
404	LGR722	16	10.32	10.61	17.88	Pahsimeroi
405	LGR723	15	12.31	12.16	13.63	Oxbow
406	LGR724	18.58	14.7	17.87	9.11	Dworshak
407	LGR725	16.79	14.84	13.29	14.62	Oxbow
408	LGR76	17.25	17.35	16.41	17.64	Oxbow
409	LGR775	13.72	12.74	11.2	17.27	Oxbow
410	LGR776	17.13	12.53	13.5	16	Pahsimeroi
411	LGR778	18.14	16.45	12.36	15.6	Oxbow
412	LGR78	12.79	14.13	13.66	13.68	Little Sheep
413	LGR781	15.01	12.73	13.62	14.72	Pahsimeroi
414	LGR785	12.96	8.88	10.23	16.24	Pahsimeroi
415	LGR786	15.24	13.11	9.52	17.93	Oxbow
416	LGR787	13.95	15.08	12.78	16.1	Oxbow
417	LGR788	17.79	14.1	16.9	16.42	Pahsimeroi
418	LGR790	15.54	12	12.91	11.65	Dworshak
419	LGR792	12.83	11.85	9.7	13.82	Oxbow
420	LGR793	16.41	12.04	15.52	12.38	Pahsimeroi
421	LGR794	17.23	11.01	13.43	22.69	Pahsimeroi
422	LGR795	16.22	17.52	16.46	16.41	Little Sheep
423	LGR796	15.47	13.17	14.63	16.01	Pahsimeroi
424	LGR798	19.78	13.32	18.27	22.49	Pahsimeroi
425	LGR799	16.62	11.42	12.45	22.2	Pahsimeroi

426	LGR80	12.17	11.67	14.68	11.77	Pahsimeroi
427	LGR800	16.73	15.22	14.32	16.19	Oxbow
428	LGR801	20.39	14.37	13.9	18.62	Oxbow
429	LGR802	15.13	14.32	14.58	13.73	Dworshak
430	LGR803	19.45	14.13	15.15	21.12	Pahsimeroi
431	LGR804	21.59	13.51	14.74	23.09	Pahsimeroi
432	LGR805	18.21	13.32	16.94	20.28	Pahsimeroi
433	LGR807	24.58	24.02	30.06	18.03	Dworshak
434	LGR808	17.12	17.81	17.66	16.86	Dworshak
435	LGR809	16.15	12.88	11.27	19.16	Oxbow
436	LGR812	21.08	13.98	15.76	18.58	Pahsimeroi
437	LGR814	12.07	15.57	15.2	19.73	Little Sheep
438	LGR84	14.78	15.6	15.2	13.59	Dworshak
439	LGR85	19.04	22.2	19.64	21.4	Little Sheep
440	LGR885	15.57	12.4	16.45	15.18	Pahsimeroi
441	LGR887	15.26	13.4	14.71	16.86	Pahsimeroi
442	LGR889	16.97	11.69	12.58	15.45	Pahsimeroi
443	LGR890	14.89	14.11	15.76	16.78	Pahsimeroi
444	LGR891	12.42	11.67	9.64	13.84	Oxbow
445	LGR892	20.45	16.1	17.74	18.2	Pahsimeroi
446	LGR893	12.73	12.47	13.13	18.7	Pahsimeroi
447	LGR894	14.58	17.66	17.77	13.01	Dworshak
448	LGR896	21.8	14.01	15.21	19.79	Pahsimeroi
449	LGR898	11.02	13.27	13.27	19.49	Little Sheep
450	LGR900	16.81	12.26	15.37	11.1	Dworshak
451	LGR901	18.21	13.35	15.4	14.51	Pahsimeroi
452	LGR902	17.38	14.88	15.41	20.1	Pahsimeroi
453	LGR903	24.68	13.92	18.83	19.27	Pahsimeroi
454	LGR906	16.66	14.33	15.12	15.03	Pahsimeroi
455	LGR907	17.17	14.15	16.38	13.76	Dworshak
456	LGR908	21.11	15.29	17.17	17.76	Pahsimeroi
457	LGR909	14.1	11.66	9.92	15.84	Oxbow
458	LGR923	19.4	13.37	14.22	19.75	Pahsimeroi
459	LGR924	21.65	12.99	15.5	15.76	Pahsimeroi
460	LGR925	19.33	14.46	15.93	12.88	Dworshak
461	LGR926	13.91	13.69	10.97	15.51	Oxbow

Appendix D. PIT tag codes associated with kelt steelhead captured and tagged at Lower Granite Dam in 2002

3D9.1BF0F8F085
3D9.1BF0FABE5B
3D9.1BF0FAD39C
3D9.1BF0FB4A65
3D9.1BF0FE95BE
3D9.1BF0FEEB5D
3D9.1BF1075D9F
3D9.1BF1080836
3D9.1BF1094326
3D9.1BF10991DE
3D9.1BF109F7F0
3D9.1BF10CEA54
3D9.1BF10D50FD
3D9.1BF119B4C6
3D9.1BF119B4CC
3D9.1BF119B533
3D9.1BF119B537
3D9.1BF119B597
3D9.1BF119B60A
3D9.1BF119B60B
3D9.1BF119B60E
3D9.1BF119B66E
3D9.1BF119B7CF
3D9.1BF119BACC
3D9.1BF119BAD4
3D9.1BF119BAD7
3D9.1BF119BADF
3D9.1BF119BAE2
3D9.1BF119BB1D
3D9.1BF119BB22
3D9.1BF119BB2F
3D9.1BF119BB92
3D9.1BF119BB9E
3D9.1BF119BBA6
3D9.1BF119BC11
3D9.1BF119BF47
3D9.1BF119BF4D
3D9.1BF119BF57
3D9.1BF119BF5E
3D9.1BF119BF64
3D9.1BF119BF6A
3D9.1BF119BF71
3D9.1BF119BF85
3D9.1BF119BF96
3D9.1BF119BF99
3D9.1BF119BF9E
3D9.1BF119BFA0
3D9.1BF119BFA5
3D9.1BF119BFA8
3D9.1BF119BFB9
3D9.1BF119C02C
3D9.1BF119C032
3D9.1BF119C04B
3D9.1BF119C051
3D9.1BF119C054
3D9.1BF119C056
3D9.1BF119C058
3D9.1BF119C059
3D9.1BF119C061
3D9.1BF119C251
3D9.1BF119C259
3D9.1BF119C2C8
3D9.1BF119C2CF
3D9.1BF119C2D4
3D9.1BF119C2DF
3D9.1BF119C348
3D9.1BF119C457
3D9.1BF119C458
3D9.1BF119C45D
3D9.1BF119C45E
3D9.1BF119C463
3D9.1BF119C467
3D9.1BF119C468
3D9.1BF119C4D1
3D9.1BF119C4DD
3D9.1BF119C4E1
3D9.1BF119C4EC
3D9.1BF119C4EE
3D9.1BF119C8A9
3D9.1BF119C8B1
3D9.1BF119C8B3
3D9.1BF119C8B6
3D9.1BF119C8BC
3D9.1BF119C8C8
3D9.1BF119C8D3
3D9.1BF119C8DB
3D9.1BF119CA42
3D9.1BF119CA49
3D9.1BF119CA4A
3D9.1BF119CA64
3D9.1BF119CFFF
3D9.1BF119D008
3D9.1BF119D077
3D9.1BF119D078
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3D9.1BF14B4B30
3D9.1BF14B4B3A
3D9.1BF14B4B51
3D9.1BF14B4B53
3D9.1BF14B4B64
3D9.1BF14B4B74
3D9.1BF14B4B7A
3D9.1BF14B4B85
3D9.1BF14B4B90
3D9.1BF14B4BE0
3D9.1BF14B4BE1
3D9.1BF14B4BE6
3D9.1BF14B4BEB
3D9.1BF14B4C03
3D9.1BF14B4C1F
3D9.1BF14B4C21
3D9.1BF14B4C23
3D9.1BF14B4C2F
3D9.1BF14B4C46
3D9.1BF14B4C47
3D9.1BF14B4C55
3D9.1BF14B4C59
3D9.1BF14B4C72
3D9.1BF14B4C77
3D9.1BF14B4C88
3D9.1BF14B4C8B
3D9.1BF14B4C95
3D9.1BF14B4CB5
3D9.1BF14B4CC2
3D9.1BF14B4CC3
3D9.1BF14B4CC6
3D9.1BF14B4CD0
3D9.1BF14B4CE0
3D9.1BF14B4CE2
3D9.1BF14B4CE3
3D9.1BF14B4CE8
3D9.1BF14B4CF1
3D9.1BF14B4CF9
3D9.1BF14B4D23
3D9.1BF14B4D28
3D9.1BF14B4D3A
3D9.1BF14B4D43
3D9.1BF14B4D46
3D9.1BF14B4D4F
3D9.1BF14B4D55
3D9.1BF14B4D5C
3D9.1BF14B4D5E
3D9.1BF14B4D5F
3D9.1BF14B4D61
3D9.1BF14B4D64
3D9.1BF14B4D6C
3D9.1BF14B4D70
3D9.1BF14B4D75
3D9.1BF14B4DB3
3D9.1BF14B4DBB
3D9.1BF14B4DBF
3D9.1BF14B4DD1
3D9.1BF14B4DD2
3D9.1BF14B4DD9
3D9.1BF14B4DDD
3D9.1BF14B4DE1
3D9.1BF14B4DE3
3D9.1BF14B4DE6
3D9.1BF14B4DF0
3D9.1BF14B4DF9
3D9.1BF14B4DFA
3D9.1BF14B4DFB
3D9.1BF14B4E05
3D9.1BF14B4E06
3D9.1BF14B4E09
3D9.1BF14B4E3D
3D9.1BF14B4E3F
3D9.1BF14B4E40
3D9.1BF14B4E42
3D9.1BF14B4ED7
3D9.1BF14B4EE2
3D9.1BF14B4EE5
3D9.1BF14B4EE9
3D9.1BF14B4EED
3D9.1BF14B4EEF
3D9.1BF14B4EF8
3D9.1BF14B4F0B
3D9.1BF14B4F0E
3D9.1BF14B4F0F
3D9.1BF14B4F12
3D9.1BF14B4F3B
3D9.1BF14B4F3D
3D9.1BF14B4F4C
3D9.1BF14B4F4D
3D9.1BF14B4F4F
3D9.1BF14B4F58
3D9.1BF14B4F5B
3D9.1BF14B4F5E
3D9.1BF14B4F78
3D9.1BF14B4F8C
3D9.1BF14B4F9D
3D9.1BF14B4F9E
3D9.1BF14B4FB5
3D9.1BF14B4FC0
3D9.1BF14B4FC6
3D9.1BF14B4FCC
3D9.1BF14B5051
3D9.1BF14B5069
3D9.1BF14B506C
3D9.1BF14B506D
3D9.1BF14B5085
3D9.1BF14B508A
3D9.1BF14B508B
3D9.1BF14B508D
3D9.1BF14B5094
3D9.1BF14B50A7
3D9.1BF14B50AA
3D9.1BF14B50AD
3D9.1BF14B50AE
3D9.1BF14B50B7
3D9.1BF14B50BB
3D9.1BF14B50BC
3D9.1BF14B50DE
3D9.1BF14B50E1
3D9.1BF14B50E8
3D9.1BF14B50FB
3D9.1BF14B5101
3D9.1BF14B510C
3D9.1BF14B510F
3D9.1BF14B5112
3D9.1BF14B5116
3D9.1BF14B5117
3D9.1BF14B511E
3D9.1BF14B511F
3D9.1BF14B512A
3D9.1BF14B5136
3D9.1BF14B513B
3D9.1BF14B513F
3D9.1BF14B5156
3D9.1BF14B515C
3D9.1BF14B5170
3D9.1BF14B5188
3D9.1BF14B5194
3D9.1BF14B519A
3D9.1BF14B519B
3D9.1BF14B519C
3D9.1BF14B51AE
3D9.1BF14B51B2
3D9.1BF14B51B3
3D9.1BF14B51B8
3D9.1BF14B51C2
3D9.1BF14B51C6
3D9.1BF14B51CA
3D9.1BF14B51CE
3D9.1BF14B51D2
3D9.1BF14B51ED
3D9.1BF14B51F2
3D9.1BF14B51F4
3D9.1BF14B520D
3D9.1BF14B5212
3D9.1BF14B521F
3D9.1BF14B5226
3D9.1BF14B5232
3D9.1BF14B523D
3D9.1BF14B524E
3D9.1BF14B525F
3D9.1BF14B5291
3D9.1BF14B529A
3D9.1BF14B52B1
3D9.1BF14B52B8
3D9.1BF14B52B9
3D9.1BF14B52C7
3D9.1BF14B52CA
3D9.1BF14B52DA
3D9.1BF14B52E0
3D9.1BF14B52E1
3D9.1BF14B532B
3D9.1BF14B533D
3D9.1BF14B5344
3D9.1BF14B534F
3D9.1BF14B5355
3D9.1BF14B5359
3D9.1BF14B535E
3D9.1BF14B5361
3D9.1BF14B5367
3D9.1BF14B5368
3D9.1BF14B536E
3D9.1BF14B5372
3D9.1BF14B5373
3D9.1BF14B537C
3D9.1BF14B537E
3D9.1BF14B537F
3D9.1BF14B5380
3D9.1BF14B5381
3D9.1BF14B5386
3D9.1BF14B53A2
3D9.1BF14B53A7
3D9.1BF14B53AA
3D9.1BF14B53AC
3D9.1BF14B53C0
3D9.1BF14B96DE
3D9.1BF14B96EA
3D9.1BF14B96EE
3D9.1BF14B96F3
3D9.1BF14B9721
3D9.1BF14B972E
3D9.1BF14B9888
3D9.1BF14B99B7
3D9.1BF14B99B7
3D9.1BF14B99FA
3D9.1BF14B9C36
3D9.1BF14B9DA0
3D9.1BF14B9E3F
3D9.1BF14B9E42
3D9.1BF14B9E80
3D9.1BF14B9EEB
3D9.1BF14B9EEF
3D9.1BF14B9F34
3D9.1BF14B9F37
3D9.1BF14BA0E4
3D9.1BF14BA2EC
3D9.1BF14BA4DE
3D9.1BF14BA9EF
3D9.1BF14BAB40
3D9.1BF14BAB54
3D9.1BF14BACC4
3D9.1BF14BADA4
3D9.1BF14BADB3
3D9.1BF14BAF66
3D9.1BF14BB825
3D9.1BF14BB827
3D9.1BF14BB832
3D9.1BF14BB83D
3D9.1BF14BB842
3D9.1BF14BB859
3D9.1BF14BB8E2
3D9.1BF14BB90D
3D9.1BF14BB915
3D9.1BF14BB925
3D9.1BF14BB940
3D9.1BF14BB99B
3D9.1BF14BB9A5
3D9.1BF14BB9A8
3D9.1BF14BB9C3
3D9.1BF14BB9DF
3D9.1BF14BBA6D
3D9.1BF14BBAFC
3D9.1BF14BBBC9
3D9.1BF14BBCB4
3D9.1BF14BBCB8
3D9.1BF14BBE9D
3D9.1BF14BBEBD
3D9.1BF14BC294
3D9.1BF14BC2A9
3D9.1BF14BC3D8
3D9.1BF14BC5D5
3D9.1BF14BC5F8

3D9.1BF14BC643	3D9.1BF14BC6A8	3D9.1BF14BC6BA	3D9.1BF14BC72D	3D9.1BF14BC885	3D9.1BF14BC9B8	3D9.1BF14BCB81
3D9.1BF14BC664	3D9.1BF14BC6B5	3D9.1BF14BC6BC	3D9.1BF14BC7F3	3D9.1BF14BC8A8	3D9.1BF14BC9E5	3D9.1BF14BCB84

Appendix E. Individual detection histories of kelt steelhead with implanted PIT tags collected at Lower Granite Dam in 2002.

Tag History for 2002 Lower Granite Kelts

TagId	EventDate	EventType	SiteID	FileId	Flags	RearTyp
3D9.1BF0F5C677						
	4/18/2000	TAG	LGRRRR	DMM00108.SH1		W
	4/22/2000	OBS	GOJ			
	7/9/2001	OBS	BWL			
	7/9/2001	OBS	B2A			
	7/9/2001	REC	COLR	TCB01190.BO2	RE RT RF	
	9/20/2001	OBS	GRA			
	4/24/2002	REC	LGRTAL	AFE02092.INR	KL AT RE	
3D9.1BF119D12E						
	5/13/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/26/2002	OBS	MCX			
3D9.1BF119D155						
	4/17/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	4/30/2002	OBS	MCX			
3D9.1BF1312E93						
	5/23/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	7/14/2003	OBS	BO3			
3D9.1BF131E2D0						
	4/17/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/14/2002	OBS	MCX			
	5/14/2002	REC	MCNTAL	RHW02134.MCN	AT KL FE	
3D9.1BF131EAB3						
	4/17/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	5/2/2002	OBS	MC1			
3D9.1BF1449EA8						
	6/2/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	6/15/2002	OBS	MCX			
3D9.1BF144B054						
	6/7/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	6/10/2002	OBS	LMJ			
3D9.1BF144B08A						
	6/7/2002	TAG	COLR	AFE02098.TRN	KL AT	W
	7/2/2003	OBS	BO3			
3D9.1BF144E52B						
	5/8/2002	TAG	COLR	AFE02098.TRN	KL AT	H
	5/9/2002	OBS	TWX			
3D9.1BF144EA57						
	5/30/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	6/5/2002	REC	MCNTAL	RHW02156.MCN	AT KL FE	
3D9.1BF144ECD6						
	4/11/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	4/18/2002	REC	MCNTAL	RHW02108.MCN	KL AT FE	
	4/18/2002	OBS	MCX			
3D9.1BF144F3A3						
	4/18/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	5/5/2002	OBS	MC1			

Tag History for 2002 Lower Granite Kelts

TagId	EventDate	EventType	SiteID	FileId	Flags	RearTyp
3D9.1BF144FDDE	4/24/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/5/2002	OBS	MCX			
3D9.1BF1450DE5	4/24/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	5/4/2002	OBS	MCX			
3D9.1BF1450E00	4/25/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/6/2002	OBS	MCX			
	5/11/2002	OBS	BVX			
3D9.1BF1451963	4/21/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	5/22/2002	OBS	MCX			
3D9.1BF1451C1D	4/21/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/3/2002	REC	MCNTAL	RHW02123.MCN	AT KL FE	
	5/3/2002	OBS	MCX			
3D9.1BF1451C5C	4/20/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	5/11/2002	OBS	MCX			
3D9.1BF145304D	6/7/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	6/14/2002	OBS	MCX			
3D9.1BF1456C0D	6/2/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	6/9/2002	OBS	MCX			
3D9.1BF148D6B9	4/19/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/4/2002	OBS	MCX			
3D9.1BF148D6C0	4/28/2002	TAG	COLR	AFE02098.TRN	KL AT	H
	9/12/2002	OBS	B2A			
	9/12/2002	OBS	BWL			
	9/30/2002	OBS	MC1			
	10/9/2002	OBS	GRA			
3D9.1BF148D6D0	4/26/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/14/2002	OBS	MC1			
3D9.1BF148DFB1	4/14/2002	TAG	COLR	AFE02098.TRN	KL AT	H
	9/1/2002	OBS	B2A			
	9/1/2002	OBS	BWL			
	9/9/2002	OBS	MC1			
	9/20/2002	OBS	GRA			
3D9.1BF1491911	5/4/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/20/2002	OBS	MCX			

Tag History for 2002 Lower Granite Kelts

TagId	EventDate	EventType	SiteID	FileId	Flags	RearTyp
3D9.1BF14960C4						
	4/18/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/2/2002	OBS	MCX			
3D9.1BF149624F						
	5/5/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	5/24/2002	OBS	MCX			
3D9.1BF149804A						
	4/20/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/2/2002	REC	MCNTAL	RHW02122.MCN	AT KL FE	
	5/2/2002	OBS	MCX			
3D9.1BF149807D						
	4/20/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	4/28/2002	OBS	MCX			
3D9.1BF1499595						
	4/20/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	10/5/2002	OBS	BWL			
	10/15/2002	OBS	MC1			
	11/3/2002	OBS	GRA			
3D9.1BF14995DC						
	4/23/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/5/2002	OBS	MCX			
3D9.1BF14AA876						
	6/15/2002	TAG	COLR	AFE02098.TRN	KL AT	W
	6/17/2002	OBS	B2A			
	6/17/2002	OBS	BWL			
3D9.1BF14AB812						
	6/2/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	6/11/2002	OBS	MCX			
3D9.1BF14AC6A1						
	4/19/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	5/5/2002	OBS	MCX			
3D9.1BF14AEE2C						
	5/29/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	6/28/2002	OBS	MCX			
3D9.1BF14B01A6						
	4/20/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/1/2002	OBS	MCX			
3D9.1BF14B15A5						
	4/3/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	4/6/2002	OBS	GRA			
3D9.1BF14B185B						
	4/12/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	4/18/2002	OBS	GRA			
3D9.1BF14B1EF4						
	4/26/2002	TAG	COLR	AFE02098.TRN	KL AT	W
	8/26/2002	OBS	BO1			
	10/3/2002	OBS	MC2			
	10/9/2002	OBS	GRA			

Tag History for 2002 Lower Granite Kelts

TagId	EventDate	EventType	SiteID	FileId	Flags	RearTyp
3D9.1BF14B2048						
	5/18/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/28/2002	OBS	MC2			
3D9.1BF14B2049						
	5/18/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/29/2002	OBS	MCX			
	5/29/2002	REC	MCNTAL	RHW02149.MCN	AT KL FE	
3D9.1BF14B21A8						
	4/21/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	4/23/2002	OBS	GRA			
3D9.1BF14B237F						
	5/6/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/15/2002	REC	MCNTAL	RHW02135.MCN	AT KL FE	
	5/15/2002	OBS	MCX			
3D9.1BF14B24D0						
	4/15/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	7/9/2002	OBS	MC1			
	7/16/2002	OBS	GRA			
3D9.1BF14B2712						
	5/8/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/21/2002	OBS	MCX			
	5/21/2002	REC	MCNTAL	RHW02141.MCN	AT FE RE	
3D9.1BF14B27A2						
	4/24/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/12/2002	OBS	MC1			
3D9.1BF14B293C						
	4/24/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/5/2002	OBS	MCX			
3D9.1BF14B29F3						
	5/20/2002	TAG	COLR	AFE02098.TRN	KL AT	H
	8/27/2002	OBS	BO1			
	9/6/2002	OBS	MC1			
	9/21/2002	OBS	GRA			
3D9.1BF14B37B6						
	4/12/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	4/23/2002	OBS	MCX			
3D9.1BF14B37DC						
	4/18/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	5/2/2002	OBS	MCX			
3D9.1BF14B41EE						
	4/16/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/1/2002	OBS	MCX			
3D9.1BF14B42F8						
	4/30/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	5/16/2002	REC	MCNTAL	RHW02136.MCN	AT KL FE	
	5/16/2002	OBS	MCX			
3D9.1BF14B4310						
	4/15/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	4/29/2002	OBS	MCX			

Tag History for 2002 Lower Granite Kelts

TagId	EventDate	EventType	SiteID	FileId	Flags	RearTyp
3D9.1BF14B4363						
	4/17/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	4/30/2002	OBS	MCX			
3D9.1BF14B45B1						
	5/31/2002	TAG	COLR	AFE02098.TRN	KL AT	W
	9/27/2002	OBS	B2A			
	9/27/2002	OBS	BWL			
	4/4/2003	OBS	MC1			
	4/5/2003	OBS	IHA			
	4/12/2003	OBS	GRA			
3D9.1BF14B499D						
	4/11/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	4/13/2002	OBS	GRA			
3D9.1BF14B4A61						
	5/15/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	6/7/2002	OBS	TWX			
3D9.1BF14B4A73						
	4/8/2002	TAG	LGRTAL	AFE02092.INR	KL AT	H
	4/15/2002	OBS	GRA			
3D9.1BF14B4BE1						
	4/18/2002	TAG	COLR	AFE02098.TRN	KL AT	W
	4/19/2002	OBS	BO1			
3D9.1BF14B4C2F						
	4/12/2002	OBS	BWL			
	4/12/2002	TAG	COLR	AFE02098.TRN	KL AT	H
3D9.1BF14B4E42						
	4/26/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	5/20/2002	OBS	TWX			
3D9.1BF14B4EE5						
	5/12/2002	TAG	COLR	AFE02098.TRN	KL AT	H
	5/14/2002	OBS	TWX			
3D9.1BF14B5094						
	4/28/2002	TAG	COLR	AFE02098.TRN	KL AT	W
	7/25/2002	OBS	BWL			
	10/9/2002	OBS	MC1			
	10/15/2002	OBS	GRA			
3D9.1BF14B513B						
	4/26/2002	TAG	COLR	AFE02098.TRN	KL AT	H
	9/17/2002	OBS	B2A			
	9/17/2002	OBS	BWL			
	10/1/2002	OBS	MC1			
	10/11/2002	OBS	GRA			
3D9.1BF14BAF66						
	5/30/2002	TAG	COLR	AFE02098.TRN	KL AT	W
	5/31/2002	OBS	TWX			
3D9.1BF14BB9DF						
	5/6/2002	TAG	COLR	AFE02098.TRN	KL AT	H
	9/5/2002	OBS	BWL			
3D9.1BF14BCB81						
	4/20/2002	TAG	LGRTAL	AFE02092.INR	KL AT	W
	5/5/2002	OBS	MCX			

Appendix F. Aerial and underwater telemetry receivers that detected telemetered kelts released from Lower Granite bypass in 2002.

SITE CATEGORY	RIVER	RIVER KM	RIVER MILE	SITE LOCATION	ANTENNAE TYPE	DESCRIPTION	SOURCE
Lower Granite tailrace	SNR	693.8	431.1	Oregon	Aerial		UI
Little Goose pool	SNR	659	409.5		Aerial	Willows Landing	UI
Little Goose tailrace	SNR	634.3	394.1	Oregon	Aerial		UI
Lower Monumental pool	SNR	615	382.1	Washington	Aerial	Lyon's Ferry Hatchery	UI
Lower Monumental pool	SNR	603.5	375.3	Oregon	Aerial	Ayers's Landing	UI
Lower Monumental tailrace	SNR	587.6	365.1	Washington		Lower Monumental tailrace North Side	
Lower Monumental tailrace	SNR	587.6	365.1	Oregon	Aerial	Lower Monumental tailrace South Side	UI
Ice Harbor pool	SNR	569.6	354	Oregon	Aerial	Walker Site	UI
Ice Harbor pool	SNR	553	343.7		Aerial	HANFORD LEFT BANK RECEIVER SITE	
Ice Harbor pool	SNR	553	343.7		Aerial	HANFORD RIGHT BANK RECEIVER SITE	
Ice Harbor pool	SNR	550	341.8	Oregon	Aerial	Fishhook Park	UI
Ice Harbor tailrace	SNR	537.2	333.8	Oregon	Aerial		UI
McNary pool	COL	525.7	326.7		Aerial	WWR RECEIVER SITE AS OF 09OCT96	
McNary tailrace	COL	467.3	290.4	Oregon	Aerial		UI
McNary tailrace	COL	467.1	290.3	Washington	Aerial	UMATILLA RIVER RECEIVER SITE	
McNary tailrace	COL	467	290.2	Washington	Aerial		UI
John Day pool	COL	443.3	275.5	Washington	Aerial	PATTERSON RECEIVER SITE	
John Day pool	COL	415.1	258	Washington	Aerial	Alderdale site	UI
John Day pool	COL	405	251.7	Oregon	Aerial	OAK SPRINGS RECEIVER SITE (installed July2001)	
John Day pool	COL	401	249.2	Washington	Aerial	PINE CREEK LAUNCH	
John Day pool	COL	396.3	246.3		Aerial	SHERARS FALLS DOWNSTREAM RECEIVER SITE	
John Day pool	COL	390	242.3	Washington	Aerial	Roosevelt site	UI
John Day pool	COL	382.1	237.4	Washington	Aerial	Sundale Park	UI
John Day pool	COL	370	229.9	Washington	Aerial	ROCK CREEK RECEIVER SITE	
John Day pool	COL	364.4	226.5	Washington	Aerial	PASTURE POINT LAUNCH	
John Day pool	COL	355.7	221.1	Oregon	Aerial	JOHN DAY RIVER RECEIVER SITE	
John Day forebay	COL	350.8	218	Oregon	Aerial	JOHN DAY RIVER BOAT LAUNCH RECEIVER SITE	
John Day forebay	COL	349.2	217	Middle	Aerial	Forebay Spillway	UI
John Day forebay	COL	349.2	217	Oregon	Aerial	Powerhouse	UI
John Day tailrace	COL	349.2	217	Washington	Aerial	Downstream Tip of Navlock	UI
John Day forebay	COL	349.2	217	Washington	Aerial	John Day Dam launch - forebay	UI
John Day forebay	COL	349.2	217	Washington	Aerial	Navlock	UI
John Day forebay	COL	349.2	217	Washington	Aerial	Nav Lock, furthest upstream	UI
John Day forebay	COL	349.2	217	Washington	Aerial	Forebay Spillway	UI
John Day forebay	COL	349.2	217	Oregon	Aerial	Powerhouse	UI
John Day forebay	COL	349.2	217	Middle	Aerial	Forebay Spillway	UI
John Day forebay	COL	349.2	217	Middle	Aerial	Powerhouse	UI
John Day forebay	COL	349.2	217	Oregon	Aerial	Powerhouse	UI
John Day forebay	COL	349.2	217	Washington	Underwater	Spillway	UI
John Day forebay	COL	349.2	217	Washington	Aerial	Forebay Spillway	UI

John Day tailrace	COL	345.1	214.4	Washington	Aerial	Spill Basin	UI
John Day tailrace	COL	345.1	214.4	Washington	Aerial		UI
John Day tailrace	COL	345.1	214.4	Washington	Aerial	Juvenile bypass	UI
John Day tailrace	COL	345.1	214.4	Washington	Aerial	Spill Basin	UI
John Day tailrace	COL	345.1	214.4	Washington	Aerial	Spill Basin	UI
John Day tailrace	COL	345.1	214.4	Washington	Aerial	Spill Basin	UI
John Day tailrace	COL	345.1	214.4	Oregon	Aerial	Powerhouse tailrace	UI
John Day tailrace	COL	345.1	214.4	Oregon	Aerial	Powerhouse tailrace	UI
John Day tailrace	COL	345.1	214.4	Oregon	Aerial	Powerhouse tailrace	UI
John Day tailrace	COL	345.1	214.4	Oregon	Aerial	Powerhouse tailrace	UI
John Day tailrace	COL	345	214.4	Oregon	Aerial		UI
The Dalles pool	COL	344.1	213.9	Oregon	Aerial	JOHN DAY DAM TAILRACE BOAT LAUNCH RECEIVER SITE	
The Dalles pool	COL	334.6	207.9	Oregon	Aerial	BIGGS BRIDGE LAUNCH	
The Dalles pool	COL	328.9	204.4	Oregon	Aerial	DESCHUTES RIVER RECEIVER SITE	
The Dalles pool	COL	327.1	203.3	Oregon	Aerial	Deschutes River Mouth	UI
The Dalles pool	COL	325.3	202.1	Oregon	Aerial	Wishram - Celilo site	UI
The Dalles pool	COL	320	198.9	Washington	Aerial	AVERY BOAT LAUNCH RECEIVER SITE	
The Dalles forebay	COL	309	192	Middle	Aerial	Powerhouse	USGS
The Dalles forebay	COL	309	192	Middle	Underwater	Powerhouse Trash Rack	USGS
The Dalles forebay	COL	309	192	Middle	Underwater	Powerhouse Trash Rack	USGS
The Dalles forebay	COL	309	192	Middle	Aerial	Spillway	USGS
The Dalles forebay	COL	309	192	Middle	Aerial	Powerhouse	USGS
The Dalles forebay	COL	309	192	Middle	Aerial	Non-Overflow Wall	USGS
The Dalles forebay	COL	309	192	Middle	Underwater	Spillway	USGS
The Dalles forebay	COL	309	192	Middle	Aerial	Spillway	USGS
The Dalles forebay	COL	309	192	Middle	Aerial	Spillway	USGS
The Dalles forebay	COL	309	192	Oregon	Aerial	Oregon Shore, on earthen dam	USGS
The Dalles forebay	COL	309	192	Washington	Aerial	Washington Shore, upriver of logging area	USGS
The Dalles forebay	COL	309	192	Middle	Underwater	Spillway	USGS
The Dalles forebay	COL	309	192	Middle	Aerial	Powerhouse	USGS
The Dalles forebay	COL	309	192	Middle	Aerial	Non-Overflow wall	USGS
The Dalles forebay	COL	309	192	Middle	Aerial	Spillway	USGS
The Dalles forebay	COL	309	192	Middle	Aerial	Powerhouse	USGS
The Dalles tailrace	COL	308.7	192	Washington	Aerial	Washington Shore, North Exit Station	USGS
The Dalles tailrace	COL	308.7	191.8	Oregon	Aerial	Tailrace Island South Exit Station	USGS
The Dalles tailrace	COL	308.7	191.8	Oregon	Aerial	BRZ Island	USGS
The Dalles tailrace	COL	308.7	191.8	Oregon	Aerial	South Spillway	USGS
The Dalles tailrace	COL	308.7	191.8	Oregon	Aerial	BPA Pumping Station, Across from Sluiceway	USGS
The Dalles tailrace	COL	308.7	191.8	Middle	Underwater	Spill Basin	USGS
The Dalles tailrace	COL	308.7	191.8	Middle	Underwater	Spill Basin	USGS
The Dalles tailrace	COL	308.7	191.8	Middle	Underwater	Spill Basin	USGS
The Dalles tailrace	COL	308.7	192	Middle	Underwater	Spill Basin	USGS
The Dalles tailrace	COL	308.7	191.8	Middle	Underwater	Spill Basin	USGS
The Dalles tailrace	COL	308.7	191.8	Middle	Underwater	Spill Basin	USGS
The Dalles tailrace	COL	308.1	191.4		Aerial	Lone Pine Site	UI
Bonneville Pool	COL	304.9	189.5	Oregon	Aerial	Just below Dalles	UI
Bonneville Pool	COL	304.9	189.5	Washington	Aerial	Just below Dalles	UI

Bonneville pool	COL	293	182	Oregon	Aerial	Mayer State Park - Lyle Site	UI
Bonneville pool	COL	290.7	180.7	Washington	Aerial	KLICKITAT RIVER RECEIVER SITE	
Bonneville pool	COL	286.5	178	Oregon	Aerial	Oregon Shore, Osprey Nest	USGS
Bonneville pool	COL	286.5	178	Washington	Aerial	Washington Shore, Sally Sauters	USGS
Bonneville pool	COL	276.4	171.8	Washington	Aerial	BINGEN MARINA RECEIVER SITE	
Bonneville pool	COL	273.2	169.8	Oregon	Aerial	HOOD RIVER BRIDGE LAUNCH	
Bonneville pool	COL	272.6	169.4	Oregon	Aerial	HOOD RIVER	
Bonneville pool	COL	272.5	169.3	Washington	Aerial	White Salmon Upstream	UI
Bonneville pool	COL	271	168.4	Washington	Aerial	White Salmon Mouth - upstream	UI
Bonneville pool	COL	270.9	168.2	Washington	Aerial	WHITE SALMON RIVER RECEIVER SITE	
Bonneville pool	COL	270.3	168	Washington	Aerial	White Salmon Mouth - downstream	UI
Bonneville pool	COL	267.5	166.25	Oregon	Aerial	Hood River, CRITFC Office	USGS
Bonneville pool	COL	264.7	164.5	Washington	Aerial	SR 14 Tunnel - NOT SURE WHERE THIS IS??	USGS
Bonneville pool	COL	261.3	162.4	Washington	Aerial	UPSTREAM OF LWS RECEIVER SITE	
Bonneville pool	COL	261	162.2	Washington	Aerial	Little White Salmon	USGS
Bonneville pool	COL	260.1	161.7	Washington	Aerial	LWD (DOWNSTREAM OF LWS) RECEIVER SITE	
Bonneville pool	COL	259.9	161.5	Washington	Aerial	Base of Cook-Underwood road across from Hood River	USGS
Bonneville pool	COL	250.3	155.6	Washington	Aerial	WIND RIVER UPSTREAM RECEIVER SITE	
Bonneville pool	COL	249.2	154.9	Washington	Aerial	WIND RIVER RECEIVER SITE	
Bonneville pool	COL	246.6	153.2	Washington	Aerial	Wind River mouth (Depot Road)	UI
Bonneville pool	COL	246.6	153.2	Oregon	Aerial	Across Depot Road, I-84 MP 48.8	UI
Bonneville pool	COL	242.7	150.1	Washington	Aerial	Stevenson Boat Launch	UI
Bonneville pool	COL	242.5	150.7	Oregon		HERMAN CREEK FIXED RECEIVER SITE	
Bonneville pool	COL	238.6	148.3		Aerial	Bridge of the Gods	UI
Bonneville pool	COL	235.3	146.2	Washington	Aerial	FORT RAINS FIXED SITE RECEIVER- WA SHORE	
Bonneville forebay	COL	234.2	145.5	Middle	Aerial	Receiver Bank, North Spillway	USGS
Bonneville forebay	COL	234.2	145.5	Washington	Aerial	Receiver Bank, North Power House	USGS
Bonneville forebay	COL	234.2	145.5	Oregon	Aerial	Entrance Antennae, South Power House	USGS
Bonneville forebay	COL	234.2	145.5	Washington	Aerial	Receiver Bank, North Power House	USGS
Bonneville forebay	COL	234.2	145.5	Oregon	Aerial	Receiver Bank, South Power House	USGS
Bonneville forebay	COL	234.2	145.5	Washington	Aerial	Receiver Bank, North Power House	USGS
Bonneville forebay	COL	234.2	145.5	Middle	Aerial	Receiver Bank, South Spillway	USGS
Bonneville forebay	COL	234.2	145.5	Oregon	Aerial	Entrance Antennae, South Power House	USGS
Bonneville forebay	COL	234.2	145.5	Washington	Aerial	Receiver Bank, Cascade Island	USGS
Bonneville forebay	COL	234.2	145.5	Oregon	Aerial	Receiver Bank, South Power House	USGS
Bonneville forebay	COL	234.2	234.2				
Bonneville forebay	COL	234.2	145.5	Oregon	Underwater	Power House 1,Submerged traveling screens	USGS
Bonneville forebay	COL	234.2	145.5	Washington	Aerial	Receiver Bank, Cascade Island	USGS
Bonneville forebay	COL	234.2	145.5	Washington	Aerial	Receiver Bank, North Power House	USGS
Bonneville forebay	COL	234.2	145.5	Middle	Aerial		USGS
Bonneville forebay	COL	234.2	145.5	Oregon	Aerial	Receiver Bank, South Power House	USGS
Bonneville forebay	COL	234.2	145.5	Middle	Aerial	Receiver Bank, North Spillway	USGS
Bonneville forebay	COL	234.2	145.5	Washington	Underwater	Power House 2 , Submerged traveling screens	USGS
Bonneville forebay	COL	234.2	145.5	Middle	Aerial	Receiver Bank, South Spillway	USGS
Bonneville forebay	COL	234.2	145.5	Oregon	Aerial	Receiver Bank, South Power House	USGS
Bonneville tailrace	COL	233.4	145	Oregon	Aerial	Receiver Bank, South Power House	USGS
Bonneville tailrace	COL	233.4	145	Oregon	Aerial	Receiver Bank, South Power House	USGS

Bonneville tailrace	COL	233.4	145	Oregon	Aerial	Receiver Bank, South Spillway	USGS
Bonneville tailrace	COL	233.4	145	Washington	Aerial	Receiver Bank, North Power House	USGS
Bonneville tailrace	COL	233.4	145	Washington	Aerial	Receiver Bank, North Spillway	USGS
Bonneville tailrace	COL	233.4	145	Washington	Aerial	Receiver Bank, North Power House	USGS
Bonneville tailrace	COL	233.4	145	Washington	Aerial	Receiver Bank, North Power House	USGS
Bonneville tailrace	COL	233.4	145	Oregon	Aerial	Receiver Bank, South Power House	USGS
Bonneville tailrace	COL	233.4	145	Washington	Aerial	Receiver Bank, North Power House	USGS
Bonneville tailrace	COL	233.4	145	Washington	Aerial	Receiver Bank, North Spillway	USGS
Bonneville tailrace	COL	233.4	145	Oregon	Aerial	Receiver Bank, South Spillway	USGS
Bonneville tailrace	COL	233.4	145	Oregon	Aerial	Receiver Bank, South Power House	USGS
Bonneville tailrace	COL	233.4	145	Oregon	Aerial	Receiver Bank, South Power House	USGS
Lower Columbia	COL	232.6	144.5	Washington	Aerial	Fish Outfall Sampling Facility	USGS
Lower Columbia	COL	232.3	144.3	Oregon	Aerial	Oregon shore, just down stream of outfall	USGS
Lower Columbia	COL	232.3	144.3	Washington	Aerial	Washington shore, just down stream of outfall	USGS
Lower Columbia	COL	232.3	144.3	Oregon	Aerial		UI
Lower Columbia	COL	232.3	144.3	Washington	Aerial	Washington shore, just down stream of outfall	USGS
Lower Columbia	COL	232.3	144.3	Oregon	Aerial	Oregon shore, just down stream of outfall	USGS
Lower Columbia	COL	232.3	144.3	Washington	Aerial		UI
Lower Columbia	COL	202	125.5	Oregon	Aerial	Oregon Shore, Reed Island Survival Gate	USGS
Lower Columbia	COL	202	125.5	Middle	Aerial	Reed Island Survival Gate	USGS
Lower Columbia	COL	202	125.5	Middle	Aerial	Reed Island Survival Gate	USGS
Lower Columbia	COL	202	125.5	Washington	Aerial	Washington shore, Reed Island Survival Gate	USGS
Lower Columbia	COL	202	125.5	Washington	Aerial	Washington shore, Reed Island Survival Gate	USGS
Lower Columbia	COL	202	125.5	Oregon	Aerial	Oregon Shore, Reed Island Survival Gate	USGS
Lower Columbia	COL	194.7	121	Oregon	Aerial	Mouth of Sandy River	USGS
Lower Columbia	COL	194.7	121	Washington	Aerial	Lady Island Survival Gate	USGS
Lower Columbia	COL	194.7	121	Washington	Aerial	Lady Island Survival Gate	USGS
Lower Columbia	COL	194.7	121	Oregon	Aerial	Mouth of Sandy River	USGS
Bonneville Exit Station	COL	181.9	113	Oregon	Aerial	I-205 Bridge	USGS
Bonneville Exit Station	COL	181.9	113	Oregon	Aerial	I-205 Bridge	USGS
Bonneville Exit Station	COL	181.9	113	Middle	Aerial	I-205 Bridge	USGS
Bonneville Exit Station	COL	181.9	113	Middle	Aerial	I-205 Bridge	USGS
Bonneville Exit Station	COL	181.9	113	Washington	Aerial	I-205 Bridge	USGS
Bonneville Exit Station	COL	181.9	113	Washington	Aerial	I-205 Bridge	USGS
Moving Barge 1						Moving Barge tracking fish	UI
Moving Barge 2						Moving Barge tracking fish	UI

Appendix G. Detection records for telemetered kelts released from Lower Granite Dam in 2002.

Kelt Travel Histories
Release 1 (4/17/02-5/5/02)

CODE	DATE	SITE NAME	NUMBER OF DETECTIONS	RIVER KM
107	4/17/2002	Lower Granite tailrace	1	693.8
108	4/19/2002	Little Goose pool	16	659
	4/18/2002	Little Goose pool	41	659
	4/20/2002	Lower Monumental pool	39	603.5
	4/26/2002	Lower Monumental tailrace	4	587.6
	4/26/2002	Ice Harbor pool	7	569.6
	4/27/2002	Ice Harbor pool	20	550
	4/28/2002	Ice Harbor tailrace	22	537.2
109	4/17/2002	Lower Granite tailrace	578	693.8
	4/18/2002	Lower Granite tailrace	16	693.8
	4/24/2002	Little Goose pool	54	659
	4/26/2002	Lower Monumental pool	24	615
	4/26/2002	Lower Monumental pool	23	603.5
110	4/20/2002	Little Goose pool	24	659
	4/23/2002	Lower Monumental pool	16	603.5
	5/6/2002	Moving Barge	2	536.4
	5/8/2002	Moving Barge	4	526.4
	5/9/2002	Moving Barge	6	528.4
	5/9/2002	Moving Barge	1	536.4
	5/10/2002	Moving Barge	1	536.4
	5/11/2002	Moving Barge	2	526.4
	5/16/2002	Moving Barge	3	524.8
	5/20/2002	Moving Barge	4	528.4
	5/21/2002	Moving Barge	2	526.4
	5/23/2002	Moving Barge	2	535.4
	5/24/2002	Moving Barge	2	526.4
	5/25/2002	Moving Barge	1	526.4
111	4/17/2002	Lower Granite tailrace	1	693.8
	4/19/2002	Little Goose pool	30	659
	4/23/2002	Lower Monumental tailrace	3	587.6
112	4/18/2002	Lower Granite tailrace	29	693.8
	4/19/2002	Little Goose pool	38	659
	4/22/2002	Lower Monumental pool	8	603.5
	4/23/2002	Lower Monumental tailrace	1	587.6
	4/24/2002	Ice Harbor pool	1	550

113	4/19/2002	Little Goose pool	3	659
114	4/17/2002	Lower Granite tailrace	2	693.8
	4/19/2002	Little Goose pool	51	659
	4/23/2002	Lower Monumental pool	13	615
	4/24/2002	Lower Monumental pool	126	603.5
	4/26/2002	Lower Monumental tailrace	2	587.6
	4/27/2002	Ice Harbor pool	5	550
	4/27/2002	Ice Harbor tailrace	6	537.2
	4/30/2002	John Day forebay	1	349.2
	5/1/2002	John Day forebay	419	349.2
	5/2/2002	John Day forebay	3230	349.2
	5/2/2002	John Day tailrace	1	345.1
	5/3/2002	The Dalles forebay	11	309
	5/3/2002	The Dalles tailrace	2	308.7
	5/4/2002	Bonneville forebay	889	234.2
	5/5/2002	Bonneville forebay	2142	234.2
	5/6/2002	Bonneville forebay	2073	234.2
	5/7/2002	Bonneville forebay	816	234.2
	5/8/2002	Bonneville forebay	455	234.2
	5/9/2002	Lower Columbia	2	232.6
	5/9/2002	Lower Columbia	21	232.3
	5/9/2002	Lower Columbia	28	202
	5/9/2002	Lower Columbia	4	194.7
	5/9/2002	Bonneville Exit Station	20	181.9
115	4/18/2002	Little Goose pool	34	659
116	4/17/2002	Lower Granite tailrace	3	693.8
	4/19/2002	Little Goose pool	24	659
	4/22/2002	Lower Monumental pool	1	603.5
	4/23/2002	Lower Monumental tailrace	8	587.6
	4/25/2002	Ice Harbor pool	1	550
	4/26/2002	Ice Harbor tailrace	2	537.2
117	4/19/2002	Little Goose pool	18	659
	4/23/2002	Lower Monumental pool	2	603.5
118	4/25/2002	Little Goose tailrace	1	634.3
119	4/18/2002	Lower Granite tailrace	5	693.8
	4/19/2002	Little Goose pool	32	659
	4/22/2002	Lower Monumental pool	3	603.5
120	4/17/2002	Lower Granite tailrace	1	693.8
	4/21/2002	Little Goose pool	14	659
	4/23/2002	Lower Monumental pool	8	615
	4/28/2002	Lower Monumental tailrace	5	587.6
121	4/18/2002	Lower Granite tailrace	3	693.8
	4/21/2002	Little Goose pool	22	659
	4/24/2002	Lower Monumental pool	40	615
122	4/21/2002	Little Goose pool	19	659
	4/22/2002	Little Goose pool	36	659
	4/24/2002	Little Goose tailrace	8	634.3
123	4/24/2002	Little Goose pool	34	659

124	4/19/2002	Lower Granite tailrace	1	693.8
	4/23/2002	Little Goose pool	38	659
	4/24/2002	Little Goose tailrace	7	634.3
	4/25/2002	Lower Monumental pool	15	615
	4/30/2002	Lower Monumental tailrace	4	587.6
125	4/19/2002	Lower Granite tailrace	2	693.8
	4/22/2002	Lower Monumental pool	4	615
	4/22/2002	Lower Monumental pool	25	603.5
	5/6/2002	Moving Barge	1	592.4
	5/9/2002	Moving Barge	4	594
126	4/22/2002	Little Goose pool	24	659
	4/27/2002	Little Goose tailrace	38	634.3
	5/8/2002	Moving Barge	1	597.2
	5/9/2002	Moving Barge	2	597.2
	5/12/2002	Moving Barge	3	597.2
	5/25/2002	Moving Barge	1	597.2
	5/30/2002	Moving Barge	1	598.8
	6/6/2002	Moving Barge	1	598.8
	6/12/2002	Moving Barge	1	598.8
127	4/20/2002	Little Goose pool	27	659
	4/22/2002	Lower Monumental pool	23	603.5
128	4/19/2002	Lower Granite tailrace	9	693.8
	4/22/2002	Little Goose pool	77	659
	4/24/2002	Little Goose tailrace	11	634.3
	4/25/2002	Lower Monumental pool	10	615
	4/29/2002	Lower Monumental tailrace	5	587.6
	5/7/2002	John Day forebay	20	349.2
	5/7/2002	The Dalles pool	2	327.1
	5/7/2002	The Dalles forebay	9	309
	5/8/2002	Bonneville forebay	925	234.2
	5/9/2002	Bonneville forebay	259	234.2
	5/9/2002	Lower Columbia	19	232.3
	5/9/2002	Lower Columbia	6	202
	5/9/2002	Bonneville Exit Station	16	181.9
129	4/19/2002	Lower Granite tailrace	70	693.8
	4/20/2002	Little Goose pool	76	659
	4/24/2002	Lower Monumental pool	32	615
	4/30/2002	Lower Monumental tailrace	1	587.6
	5/8/2002	John Day forebay	877	349.2
	5/9/2002	The Dalles pool	1	325.3
	5/9/2002	The Dalles forebay	2	309
	5/9/2002	Bonneville Pool	2	304.9
	5/11/2002	Bonneville pool	1	238.6
	5/11/2002	Bonneville forebay	244	234.2
	5/11/2002	Bonneville tailrace	2	233.4
	5/18/2002	Bonneville tailrace	2	233.4
	5/19/2002	Bonneville tailrace	11	233.4
	5/20/2002	Bonneville tailrace	1	233.4

	5/23/2002	Bonneville tailrace	12	233.4
	5/24/2002	Bonneville tailrace	6	233.4
	5/25/2002	Bonneville tailrace	50	233.4
	5/26/2002	Bonneville tailrace	21	233.4
	5/27/2002	Bonneville tailrace	39	233.4
	5/28/2002	Bonneville tailrace	22	233.4
	5/29/2002	Bonneville tailrace	2	233.4
	6/2/2002	Bonneville tailrace	1	233.4
	6/5/2002	Bonneville tailrace	3	233.4
	6/6/2002	Bonneville tailrace	57	233.4
	6/7/2002	Bonneville tailrace	136	233.4
	6/8/2002	Bonneville tailrace	14	233.4
	6/9/2002	Bonneville tailrace	14	233.4
	6/10/2002	Bonneville tailrace	41	233.4
130	4/19/2002	Lower Granite tailrace	7	693.8
	4/20/2002	Little Goose pool	21	659
	4/22/2002	Lower Monumental pool	4	615
	4/22/2002	Lower Monumental pool	36	603.5
	5/6/2002	John Day forebay	151	349.2
	5/7/2002	The Dalles pool	2	325.3
	5/8/2002	Bonneville forebay	1	234.2
	5/8/2002	Bonneville Exit Station	2	181.9
131	4/19/2002	Lower Granite tailrace	1	693.8
	4/21/2002	Little Goose pool	2	659
	4/23/2002	Lower Monumental pool	12	615
	4/24/2002	Lower Monumental pool	3	603.5
132	4/19/2002	Lower Granite tailrace	1	693.8
	4/21/2002	Little Goose pool	23	659
	4/24/2002	Lower Monumental pool	23	615
	5/8/2002	John Day forebay	768	349.2
	5/9/2002	John Day forebay	266	349.2
	5/10/2002	John Day forebay	1008	349.2
	5/11/2002	The Dalles forebay	3	309
	5/13/2002	Bonneville tailrace	2	233.4
	5/13/2002	Lower Columbia	10	232.3
	5/14/2002	Lower Columbia	6	194.7
	5/14/2002	Bonneville Exit Station	6	181.9
133	4/19/2002	Lower Granite tailrace	2	693.8
	4/20/2002	Little Goose pool	30	659
	4/23/2002	Lower Monumental pool	8	615
	4/23/2002	Lower Monumental pool	58	603.5
134	4/24/2002	Little Goose pool	19	659
	4/25/2002	Little Goose tailrace	8	634.3
	4/28/2002	Lower Monumental pool	3	615
135	4/21/2002	Little Goose pool	47	659
136	4/20/2002	Little Goose pool	53	659
	4/22/2002	Lower Monumental pool	8	615
	4/23/2002	Lower Monumental pool	60	603.5

	5/8/2002	John Day forebay	510	349.2
	5/8/2002	John Day tailrace	2	345.1
	5/8/2002	The Dalles forebay	559	309
	5/9/2002	Bonneville forebay	1343	234.2
	5/10/2002	Bonneville forebay	1639	234.2
	5/11/2002	Bonneville forebay	1037	234.2
	5/12/2002	Bonneville forebay	623	234.2
	5/12/2002	Bonneville tailrace	20	233.4
	5/12/2002	Lower Columbia	5	232.3
	5/12/2002	Lower Columbia	16	202
	5/13/2002	Lower Columbia	21	194.7
	5/13/2002	Bonneville Exit Station	11	181.9
137	4/21/2002	Little Goose pool	8	659
	4/24/2002	Lower Monumental tailrace	3	587.6
138	4/20/2002	Little Goose pool	63	659
139	4/25/2002	Little Goose pool	12	659
	4/27/2002	Little Goose tailrace	6	634.3
	4/27/2002	Lower Monumental pool	1	615
	4/30/2002	Lower Monumental tailrace	1	587.6
	5/6/2002	John Day forebay	749	349.2
	5/7/2002	The Dalles forebay	100	309
	5/8/2002	Bonneville forebay	162	234.2
	5/8/2002	Bonneville tailrace	1	233.4
	5/8/2002	Lower Columbia	1	232.3
	5/8/2002	Lower Columbia	4	202
	5/9/2002	Bonneville Exit Station	3	181.9
140	4/19/2002	Lower Granite tailrace	1	693.8
	4/22/2002	Lower Monumental pool	5	603.5
141	4/26/2002	Little Goose pool	49	659
142	4/24/2002	Little Goose pool	18	659
	4/26/2002	Little Goose tailrace	10	634.3
	4/27/2002	Lower Monumental pool	11	615
	4/30/2002	Lower Monumental tailrace	5	587.6
143	4/20/2002	Lower Granite tailrace	3	693.8
	4/21/2002	Little Goose pool	6	659
144	4/20/2002	Lower Granite tailrace	3	693.8
	4/24/2002	Little Goose pool	13	659
	4/25/2002	Little Goose tailrace	10	634.3
	5/9/2002	John Day forebay	22	349.2
	5/11/2002	Bonneville forebay	246	234.2
	5/11/2002	Lower Columbia	22	232.6
	5/11/2002	Lower Columbia	7	232.3
	5/12/2002	Lower Columbia	9	202
	5/12/2002	Bonneville Exit Station	2	181.9
145	4/20/2002	Lower Granite tailrace	2	693.8
	4/22/2002	Little Goose pool	16	659
	5/20/2002	Moving Barge	1	640.7
	5/21/2002	Moving Barge	1	640.7

146	4/20/2002	Lower Granite tailrace	1	693.8
	4/22/2002	Little Goose pool	1	659
	4/29/2002	Lower Monumental tailrace	5	587.6
147	4/26/2002	Little Goose tailrace	150	634.3
148	4/21/2002	Lower Granite tailrace	2	693.8
	4/24/2002	Little Goose pool	17	659
	4/25/2002	Little Goose pool	234	659
	4/29/2002	Little Goose tailrace	14	634.3
	5/2/2002	John Day forebay	1	349.2
149	4/21/2002	Lower Granite tailrace	1	693.8
	4/22/2002	Little Goose pool	19	659
	4/24/2002	Lower Monumental pool	1	615
	4/24/2002	Lower Monumental pool	11	603.5
	4/30/2002	Lower Monumental tailrace	7	587.6
150	4/21/2002	Lower Granite tailrace	1	693.8
	4/22/2002	Little Goose pool	41	659
	4/24/2002	Lower Monumental pool	6	615
151	4/21/2002	Lower Granite tailrace	1	693.8
	4/23/2002	Little Goose pool	12	659
	4/26/2002	Lower Monumental pool	9	615
	4/29/2002	Lower Monumental tailrace	6	587.6
152	4/22/2002	Little Goose pool	7	659
	4/24/2002	Lower Monumental pool	1	603.5
	4/27/2002	Lower Monumental tailrace	73	587.6
153	4/21/2002	Lower Granite tailrace	5	693.8
	4/22/2002	Little Goose pool	45	659
	4/27/2002	Ice Harbor tailrace	10	537.2
	5/2/2002	John Day forebay	458	349.2
	5/3/2002	John Day forebay	181	349.2
	5/4/2002	Bonneville forebay	732	234.2
	5/4/2002	Bonneville tailrace	3	233.4
	5/4/2002	Lower Columbia	15	232.3
	5/5/2002	Lower Columbia	9	202
	5/5/2002 t	Lower Columbia	9	194.7
	5/5/2002	Bonneville Exit Station	12	181.9
154	4/24/2002	Little Goose pool	4	659
	4/26/2002	Little Goose tailrace	12	634.3
155	4/21/2002	Lower Granite tailrace	2	693.8
	4/25/2002	Little Goose pool	31	659
	4/28/2002	Little Goose tailrace	8	634.3
	4/29/2002	Lower Monumental pool	11	615
156	4/21/2002	Lower Granite tailrace	1	693.8
	4/24/2002	Little Goose pool	73	659
	4/27/2002	Little Goose tailrace	26	634.3
	5/17/2002	Moving Barge	2	594
	5/21/2002	Moving Barge	1	594
157	4/21/2002	Lower Granite tailrace	1	693.8
	4/22/2002	Little Goose pool	30	659

	4/25/2002	Lower Monumental pool	67	615
158	4/26/2002	Little Goose pool	120	659
159	4/21/2002	Lower Granite tailrace	3	693.8
	4/23/2002	Little Goose pool	14	659
	4/25/2002	Little Goose tailrace	11	634.3
	5/3/2002	John Day forebay	1	349.2
	5/4/2002	John Day forebay	1	349.2
	5/12/2002 J	ohn Day forebay	5	349.2
	5/14/2002	John Day forebay	741	349.2
	5/15/2002	The Dalles forebay	81	309
	5/16/2002	Bonneville forebay	1207	234.2
	5/16/2002	Bonneville tailrace	4	233.4
	5/16/2002	Lower Columbia	21	232.3
	5/17/2002	Lower Columbia	8	202
	5/17/2002	Lower Columbia	2	194.7
	5/17/2002	Bonneville Exit Station	7	181.9
160	4/22/2002	Lower Granite tailrace	516	693.8
	4/23/2002	Lower Granite tailrace	479	693.8
	5/1/2002	Little Goose pool	29	659
161	4/21/2002	Lower Granite tailrace	1	693.8
	4/23/2002	Little Goose pool	5	659
	4/25/2002	Little Goose tailrace	4	634.3
	4/26/2002	Lower Monumental tailrace	6	587.6
	4/27/2002	Ice Harbor pool	20	569.6
162	4/21/2002	Lower Granite tailrace	7	693.8
	4/25/2002	Little Goose pool	8	659
	4/26/2002	Moving Barge	1	634.2
	4/28/2002	Little Goose tailrace	5	634.3
	4/29/2002	Lower Monumental pool	10	603.5
	5/1/2002	Lower Monumental tailrace	3	587.6
	5/1/2002	Ice Harbor pool	1	569.6
	5/2/2002	Ice Harbor tailrace	5	537.2
	5/9/2002	John Day pool	4	364.4
	5/9/2002	John Day forebay	618	349.2
	5/10/2002	John Day forebay	1607	349.2
	5/10/2002	Moving Barge	3	350.8
	5/11/2002	John Day forebay	2648	349.2
	5/11/2002	Moving Barge	6	350.8
	5/11/2002	John Day tailrace	3	345.1
	5/12/2002	The Dalles pool	2	325.3
	5/12/2002	The Dalles forebay	6	309
	5/13/2002	Bonneville Pool	8	304.9
163	4/21/2002	Lower Granite tailrace	1	693.8
	4/23/2002	Moving Barge	1	658.4
	4/27/2002	Moving Barge	1	664.8
164	4/21/2002	Lower Granite tailrace	13	693.8
	4/23/2002	Little Goose pool	20	659

	4/26/2002	Little Goose tailrace	3	634.3
	5/2/2002	Lower Monumental pool	38	603.5
165	4/22/2002	Little Goose pool	24	659
	4/23/2002	Moving Barge	1	635.8
	4/25/2002	Lower Monumental pool	17	615
	4/25/2002	Lower Monumental pool	30	603.5
	5/3/2002	Lower Monumental tailrace	6	587.6
	5/3/2002	Ice Harbor pool	6	569.6
	5/3/2002	Ice Harbor pool	2	550
	5/4/2002	Ice Harbor tailrace	1	537.2
	5/8/2002	McNary tailrace	1	467
	5/12/2002	John Day forebay	1	349.2
166	4/21/2002	Lower Granite tailrace	2	693.8
	4/23/2002	Little Goose pool	43	659
	4/24/2002	Little Goose tailrace	11	634.3
	4/25/2002	Lower Monumental pool	31	603.5
	5/3/2002	Ice Harbor pool	9	569.6
	5/4/2002	Ice Harbor tailrace	6	537.2
	5/6/2002	Moving Barge	7	471.4
	5/8/2002	John Day pool	1	364.4
	5/8/2002	John Day forebay	52	349.2
	5/9/2002	John Day forebay	1381	349.2
	5/10/2002	John Day forebay	1627	349.2
	5/11/2002	John Day forebay	1313	349.2
	5/11/2002	John Day tailrace	21	345.1
	5/11/2002	The Dalles pool	12	325.3
	5/12/2002	The Dalles forebay	1	309
	5/12/2002	The Dalles tailrace	1	308.7
	5/12/2002	Bonneville Pool	3	304.9
	5/12/2002	Bonneville pool	3	293
	5/13/2002	Bonneville pool	1	238.6
	5/13/2002	Bonneville forebay	1050	234.2
	5/14/2002	Bonneville forebay	2097	234.2
	5/14/2002	Lower Columbia	9	232.3
	5/14/2002	Lower Columbia	1	194.7
	5/14/2002	Bonneville Exit Station	3	181.9
167	4/22/2002	Lower Granite tailrace	1	693.8
	4/23/2002	Little Goose pool	27	659
	4/24/2002	Little Goose tailrace	14	634.3
	4/25/2002	Lower Monumental pool	10	615
	4/26/2002	Lower Monumental pool	67	603.5
	4/27/2002	Moving Barge	1	594
	5/4/2002	Lower Monumental tailrace	1	587.6
168	4/24/2002	Little Goose pool	30	659
	4/27/2002	Lower Monumental pool	62	603.5
	5/1/2002	Lower Monumental tailrace	5	587.6
	5/1/2002	Ice Harbor pool	6	569.6
169	4/24/2002	Little Goose pool	8	659

	5/6/2002		Moving Barge	1	594
	5/10/2002		Moving Barge	2	592.4
	5/13/2002		Moving Barge	2	594
	5/18/2002		Moving Barge	2	594
170	4/22/2002		Lower Granite tailrace	1	693.8
	4/23/2002		Little Goose pool	35	659
	4/23/2002		Moving Barge	1	658.4
	4/27/2002		Lower Monumental pool	9	615
	4/28/2002		Lower Monumental pool	51	603.5
	5/6/2002		Lower Monumental tailrace	7	587.6
	5/9/2002		Ice Harbor tailrace	3	537.2
171	4/24/2002		Little Goose pool	31	659
	4/27/2002		Little Goose tailrace	10	634.3
	4/28/2002		Lower Monumental pool	17	615
	4/28/2002		Lower Monumental pool	13	603.5
	5/4/2002		John Day forebay	1	349.2
172	4/25/2002		Little Goose pool	36	659
	4/26/2002		Little Goose tailrace	10	634.3
	4/27/2002		Lower Monumental pool	11	615
	4/27/2002		Moving Barge	1	611.7
	4/27/2002		Lower Monumental pool	71	603.5
	5/13/2002	Lower Monumental pool	Lower Monumental pool	13	603.5
	5/14/2002		Lower Monumental pool	9	603.5
	5/19/2002		Lower Monumental pool	32	603.5
	5/20/2002		Lower Monumental pool	6	603.5
	5/28/2002		Lower Monumental tailrace	2	587.6
	5/29/2002		Ice Harbor tailrace	1	537.2
173	4/24/2002		Lower Granite tailrace	1	693.8
174	4/22/2002		Lower Granite tailrace	2	693.8
	4/24/2002		Little Goose pool	1	659
175	4/22/2002		Lower Granite tailrace	1	693.8
	4/24/2002		Little Goose pool	42	659
	4/28/2002		Little Goose tailrace	11	634.3
	4/28/2002		Lower Monumental pool	9	615
176	4/24/2002		Lower Granite tailrace	2	693.8
	4/28/2002		Little Goose tailrace	7	634.3
177	4/22/2002		Lower Granite tailrace	1	693.8
	4/26/2002		Little Goose pool	29	659
	4/27/2002		Little Goose tailrace	25	634.3
	4/28/2002		Lower Monumental pool	4	615
	4/28/2002		Lower Monumental pool	100	603.5
178	4/23/2002		Lower Granite tailrace	1	693.8
	4/27/2002		Little Goose tailrace	1	634.3
	5/3/2002		Ice Harbor tailrace	5	537.2
	5/5/2002		McNary tailrace	97	467
179	4/24/2002		Little Goose pool	3	659
	4/25/2002		Little Goose tailrace	1	634.3
	4/25/2002		Lower Monumental pool	5	615

	4/26/2002	Lower Monumental pool	85	603.5
	5/3/2002	Ice Harbor pool	9	569.6
	5/5/2002	Ice Harbor tailrace	5	537.2
	5/9/2002	John Day pool	38	390
	5/10/2002	John Day forebay	504	349.2
	5/11/2002	John Day forebay	50	349.2
	5/11/2002	John Day tailrace	1	345.1
	5/11/2002	The Dalles pool	1	325.3
	5/11/2002	The Dalles forebay	3	309
	5/11/2002	The Dalles tailrace	2	308.7
	5/11/2002	Bonneville pool	6	304.9
	5/11/2002	Bonneville pool	10	293
	5/12/2002	Bonneville forebay	175	234.2
	5/12/2002	Lower Columbia	2	232.3
	5/13/2002	Lower Columbia	11	202
	5/13/2002	Bonneville Exit Station	7	181.9
180	4/24/2002	Lower Granite tailrace	1	693.8
	4/25/2002	Little Goose pool	9	659
	4/28/2002	Lower Monumental pool	9	615
	4/28/2002	Lower Monumental pool	11	603.5
	5/1/2002	Lower Monumental tailrace	2	587.6
181	4/23/2002	Lower Granite tailrace	1	693.8
	4/25/2002	Little Goose pool	5	659
	4/28/2002	Lower Monumental pool	3	615
	4/28/2002	Lower Monumental pool	3	603.5
	6/2/2002	The Dalles forebay	56	309
	6/3/2002	The Dalles forebay	1	309
	6/4/2002	The Dalles forebay	1363	309
	6/5/2002	The Dalles forebay	1572	309
	6/6/2002	Bonneville forebay	7	234.2
	6/6/2002	Bonneville tailrace	1	233.4
	6/6/2002	Lower Columbia	8	693.8
	6/6/2002	Lower Columbia	3	202
182	4/23/2002	Lower Granite tailrace	1	232.3
	4/24/2002	Little Goose pool	39	659
183	4/26/2002	Little Goose pool	69	659
184	4/25/2002	Little Goose pool	10	659
	4/28/2002	Little Goose tailrace	9	634.3
	4/29/2002	Lower Monumental pool	3	603.5
	5/3/2002	Lower Monumental tailrace	1	587.6
185	4/28/2002	Little Goose tailrace	7	634.3
186	4/23/2002	Little Goose tailrace	3	693.8
	4/25/2002	Little Goose pool	34	659
	4/29/2002	Lower Monumental pool	8	603.5
	4/30/2002	Lower Monumental tailrace	3	587.6
	5/1/2002	Ice Harbor pool	176	569.6
187	5/4/2002	Little Goose pool	9	659
188	5/5/2002	Little Goose tailrace	4	634.3

	5/7/2002	Lower Monumental pool	8	615
	5/9/2002	Ice Harbor pool	2	569.6
190	5/4/2002	Lower Granite tailrace	2	693.8
	5/8/2002	Lower Monumental pool	2	615
	5/15/2002	Lower Monumental tailrace	8	587.6
	5/25/2002	Moving Barge	1	526.4
	5/29/2002	Moving Barge	1	526.4
	6/6/2002	Moving Barge	1	526.4
	6/12/2002	Moving Barge	1	526.4
	6/20/2002	Moving Barge	1	526.4
191	5/4/2002	Lower Granite tailrace	1	693.8
	5/5/2002	Little Goose pool	11	659
	5/6/2002	Moving Barge	1	
	5/6/2002	Little Goose tailrace	5	634.3
	5/7/2002	Lower Monumental pool	6	603.5
192	5/4/2002	Lower Granite tailrace	1	693.8
	5/6/2002	Little Goose pool	63	659
	5/8/2002	Little Goose tailrace	9	634.3
	5/8/2002	Lower Monumental pool	11	603.5
	5/16/2002	Lower Monumental pool	10	603.5
	5/17/2002	Lower Monumental pool	33	603.5
	5/20/2002	Lower Monumental tailrace	1	587.6
193	5/5/2002	Little Goose pool	8	659
	5/7/2002	Little Goose tailrace	3	634.3
	5/11/2002	Lower Monumental tailrace	5	587.6
	5/12/2002	Lower Monumental tailrace	113	587.6
194	5/4/2002	Lower Granite tailrace	2	693.8
	5/6/2002	Little Goose pool	20	659
	5/8/2002	Little Goose tailrace	2	634.3
	5/10/2002	Lower Monumental pool	67	603.5
	6/4/2002	Lower Monumental tailrace	44	587.6
195	5/4/2002	Lower Granite tailrace	4	693.8
	5/5/2002	Little Goose pool	47	659
	5/6/2002	Little Goose tailrace	8	634.3
	5/7/2002	Lower Monumental pool	6	615
	5/7/2002	Lower Monumental pool	42	603.5
	5/17/2002	Lower Monumental tailrace	1	587.6
196	5/4/2002	Lower Granite tailrace	1	693.8
	5/7/2002	Little Goose tailrace	1	634.3
	5/10/2002	Lower Monumental pool	7	603.5
	5/15/2002	Lower Monumental tailrace	1	587.6
197	5/4/2002	Lower Granite tailrace	27	693.8
198	5/4/2002	Lower Granite tailrace	1	693.8
	5/5/2002	Little Goose pool	2	659
	5/6/2002	Little Goose pool	9	659
	5/8/2002	Lower Monumental pool	2	615
	5/8/2002	Lower Monumental pool	9	603.5
	5/9/2002	Lower Monumental pool	59	603.5

199	5/5/2002	Little Goose pool	12	659
200	5/7/2002	Little Goose pool	5	659
201	5/7/2002	Little Goose pool	17	659
202	5/5/2002	Little Goose pool	47	659
	5/7/2002	Little Goose tailrace	2	634.3
	5/7/2002	Lower Monumental pool	6	615
	5/7/2002	Lower Monumental pool	47	603.5
	5/10/2002	Lower Monumental tailrace	7	587.6
203	5/4/2002	Lower Granite tailrace	102	693.8
	5/6/2002	Little Goose pool	1	659
	5/9/2002	Lower Monumental pool	1	615
204	5/4/2002	Lower Granite tailrace	1	693.8
	5/10/2002	Lower Monumental pool	12	615
	5/11/2002	Lower Monumental pool	62	603.5
205	5/4/2002	Lower Granite tailrace	44	693.8
	5/5/2002	Little Goose pool	25	659
	5/9/2002	Moving Barge	5	645.5
	5/9/2002	Moving Barge	2	643.9
	5/10/2002	Moving Barge	2	655.1
	5/12/2002	Moving Barge	1	645.5
	5/16/2002	Moving Barge	1	645.5
	5/17/2002	Moving Barge	2	655.1
	5/18/2002	Moving Barge	1	655.1
	5/20/2002	Moving Barge	1	645.5
	5/21/2002	Moving Barge	2	655.1
	5/21/2002	Moving Barge	1	645.5
	5/22/2002	Moving Barge	2	655.1
	5/25/2002	Moving Barge	1	645.5
	5/26/2002	Moving Barge	1	656.8
206	5/4/2002	Lower Granite tailrace	1	693.8
	5/6/2002	Little Goose pool	20	659
	5/7/2002	Little Goose tailrace	6	634.3
	5/8/2002	Lower Monumental pool	16	603.5
207	5/5/2002	Lower Granite tailrace	1	693.8
	5/6/2002	Little Goose pool	35	659
	5/10/2002	Little Goose tailrace	4	634.3
	5/11/2002	Lower Monumental pool	6	615
	5/11/2002	Lower Monumental pool	9	603.5
	5/13/2002	Lower Monumental tailrace	4	587.6
	5/14/2002	Ice Harbor pool	10	569.6
	5/15/2002	Ice Harbor pool	5	550
208	5/6/2002	Little Goose pool	5	659
	5/8/2002	Little Goose tailrace	4	634.3
	5/9/2002	Lower Monumental pool	61	603.5
209	5/5/2002	Lower Granite tailrace	2	693.8
	5/6/2002	Little Goose pool	9	659
210	5/6/2002	Little Goose pool	8	659
211	5/5/2002	Lower Granite tailrace	11	693.8

	5/6/2002	Little Goose pool	131	659
212	5/7/2002	Lower Granite tailrace	327	693.8
	5/8/2002	Lower Granite tailrace	654	693.8
	5/9/2002	Lower Granite tailrace	414	693.8
	5/10/2002	Little Goose pool	36	659
	5/13/2002	Lower Monumental pool	12	603.5
	5/18/2002	Lower Monumental tailrace	3	587.6
	5/21/2002	Ice Harbor tailrace	5	537.2
	6/7/2002	John Day forebay	4	349.2
	6/7/2002	John Day tailrace	2	345.1
	6/7/2002	The Dalles forebay	136	309
	6/8/2002	Bonneville forebay	32	234.2
	6/8/2002	Bonneville tailrace	7	233.4

Kelt Travel Histories
Release 2 (5/5/02-5/30/02)

CODE	DATE	SITE NAME	NUMBER OF DETECTIONS	RIVER KM
107	5/5/2002	Moving Barge	1	687.3
	5/9/2002	Moving Barge	1	671.2
108	5/5/2002	Lower Granite tailrace	7	693.8
	5/7/2002	Little Goose pool	12	659
109	5/9/2002	Little Goose pool	83	659
	5/13/2002	Moving Barge	12	640.7
	5/22/2002	Moving Barge	6	592.4
110	5/7/2002	Little Goose pool	19	659
	5/10/2002	Little Goose tailrace	3	634.3
	5/10/2002	Lower Monumental pool	65	615
	5/10/2002	Moving Barge	1	621.4
111	5/5/2002	Lower Granite tailrace	1	693.8
	5/6/2002	Little Goose pool	10	659
112	5/5/2002	Lower Granite tailrace	1	693.8
	5/8/2002	Little Goose pool	114	659
	5/10/2002	Little Goose tailrace	4	634.3
	5/12/2002	Moving Barge	1	590.8
	5/12/2002	Lower Monumental tailrace	2	587.6
	5/13/2002	Ice Harbor pool	1	569.6
	5/14/2002	Moving Barge	1	550.6
	5/14/2002	Ice Harbor tailrace	5	537.2
	5/18/2002	John Day forebay	212	349.2
	5/19/2002	John Day forebay	695	349.2
	5/19/2002	John Day tailrace	2	345.1
	5/19/2002	The Dalles forebay	36	309
	5/19/2002	The Dalles tailrace	2	308.7
	5/20/2002	Bonneville Pool	9	304.9

	5/20/2002	Bonneville Pool	3	293
	5/21/2002	Bonneville forebay	676	234.2
	5/21/2002	Bonneville tailrace	2	233.4
	5/22/2002	Bonneville forebay	167	234.2
	5/22/2002	Bonneville tailrace	30	233.4
	5/22/2002	Lower Columbia	3	232.3
	5/22/2002	Lower Columbia	1	202
	5/22/2002	Lower Columbia	1	194.7
	5/22/2002	Bonneville Exit Station	3	181.9
113	5/9/2002	Moving Barge	1	658.4
	5/9/2002	Little Goose pool	23	659
	5/18/2002	Ice Harbor tailrace	39	537.2
114	5/5/2002	Lower Granite tailrace	1	693.8
	5/7/2002	Little Goose pool	25	659
	5/9/2002	Lower Monumental pool	3	615
	5/10/2002	Lower Monumental pool	33	603.5
	5/11/2002	Lower Monumental tailrace	3	587.6
	5/12/2002	Ice Harbor pool	2	550
	5/13/2002	Ice Harbor pool	3	550
115	5/5/2002	Lower Granite tailrace	2	693.8
	5/9/2002	Moving Barge	1	676.1
	5/10/2002	Little Goose pool	21	659
	5/12/2002	Little Goose tailrace	6	634.3
	5/13/2002	Lower Monumental pool	17	615
	5/13/2002	Lower Monumental pool	5	603.5
	5/22/2002	Lower Monumental tailrace	1	587.6
	5/23/2002	Moving Barge	1	547.3
	5/23/2002	Ice Harbor tailrace	1	537.2
	5/25/2002	McNary tailrace	1	467.3
	5/26/2002	John Day forebay	362	349.2
	5/27/2002	John Day forebay	898	349.2
	5/28/2002	John Day forebay	1636	349.2
	5/29/2002	John Day forebay	269	349.2
	5/30/2002 t	John Day forebay	773	349.2
	5/31/2002	John Day forebay	212	349.2
	5/31/2002	John Day tailrace	2	345.1
	5/31/2002	John Day tailrace	3	345
	5/31/2002	The Dalles forebay	3293	309
	6/1/2002	The Dalles forebay	562	309
	6/1/2002	Bonneville Pool	2	304.9
	6/1/2002	Bonneville Pool	5	293
	6/1/2002	Bonneville forebay	8	234.2
	6/2/2002	Bonneville forebay	1152	234.2
	6/3/2002	Bonneville forebay	872	234.2
	6/3/2002	Lower Columbia	3	232.6
	6/3/2002	Lower Columbia	11	232.3
	6/3/2002	Lower Columbia	7	202
	6/3/2002	Lower Columbia	7	194.7

	6/4/2002	Bonneville Exit Station	6	181.9
116	5/5/2002	Lower Granite tailrace	95	693.8
	5/6/2002	Moving Barge	1	687.3
	5/8/2002	Little Goose pool	7	659
	5/11/2002	Little Goose tailrace	10	634.3
	5/12/2002	Lower Monumental pool	8	615
	5/13/2002	Lower Monumental pool	64	603.5
117	5/6/2002	Moving Barge	1	666.4
	5/6/2002	Little Goose pool	22	659
	5/9/2002	Little Goose tailrace	2	634.3
	5/10/2002	Lower Monumental pool	16	603.5
	5/11/2002	Lower Monumental tailrace	11	587.6
	5/11/2002	Ice Harbor pool	15	569.6
	5/11/2002	Moving Barge	1	552.2
	5/12/2002	Ice Harbor pool	160	550
118	5/5/2002	Lower Granite tailrace	1	693.8
	5/5/2002	Moving Barge	1	682.5
	5/6/2002	Little Goose pool	1	659
	5/8/2002	Little Goose tailrace	3	634.3
	5/9/2002	Lower Monumental pool	3	603.5
	5/10/2002	Lower Monumental tailrace	2	587.6
	5/11/2002	Ice Harbor pool	9	569.6
	5/11/2002	Moving Barge	1	558.6
	5/23/2002	Moving Barge	1	565
	5/26/2002	Moving Barge	1	565
119	5/5/2002	Lower Granite tailrace	2	693.8
	5/9/2002	Little Goose tailrace	4	634.3
	5/10/2002	Lower Monumental pool	321	603.5
	5/10/2002	Moving Barge	1	606.9
	5/12/2002	Moving Barge	1	598.8
120	5/6/2002	Little Goose pool	25	659
	5/9/2002	Little Goose tailrace	1	634.3
	5/10/2002	Moving Barge	1	632.6
121	5/8/2002	Little Goose pool	40	659
	5/10/2002	Little Goose tailrace	10	634.3
	5/10/2002	Lower Monumental pool	2	603.5
	5/14/2002	Lower Monumental tailrace	30	587.6
122	5/10/2002	Lower Monumental pool	34	603.5
	5/13/2002	Lower Monumental pool	57	603.5
	5/14/2002	Lower Monumental pool	3	615
	5/15/2002	Lower Monumental pool	7	615
	5/16/2002	Lower Monumental pool	4	603.5
	5/17/2002	Lower Monumental pool	30	603.5
	5/23/2002	Lower Monumental pool	2	603.5
	5/24/2002	Lower Monumental pool	40	603.5
	5/24/2002	Lower Monumental pool	6	615
	5/25/2002	Lower Monumental pool	9	603.5
	5/30/2002	Lower Monumental pool	15	603.5

	6/1/2002	Lower Monumental tailrace	4	587.6
	6/5/2002	John Day forebay	9	349.2
	6/5/2002	The Dalles forebay	242	309
123	5/6/2002	Lower Granite tailrace	13	693.8
	5/7/2002	Little Goose pool	13	659
	5/8/2002	Little Goose tailrace	1	634.3
	5/8/2002	Moving Barge	1	613.3
	5/9/2002	Lower Monumental pool	86	615
124	5/6/2002	Lower Granite tailrace	2	693.8
	5/7/2002	Little Goose pool	10	659
	5/7/2002	John Day pool	12	364.4
	5/8/2002	John Day forebay	705	349.2
	5/8/2002	John Day tailrace	2	345.1
	5/8/2002	The Dalles pool	2	327.1
	5/8/2002	The Dalles pool	7	325.3
	5/9/2002	The Dalles forebay	41	309
	5/9/2002	The Dalles tailrace	5	308.7
	5/9/2002	Bonneville Pool	2	304.9
	5/9/2002	Bonneville pool	2	293
	5/10/2002	Bonneville pool	1	238.6
	5/10/2002	Bonneville forebay	803	234.2
	5/11/2002	Bonneville forebay	1038	234.2
	5/11/2002	Bonneville tailrace	7	233.4
	5/11/2002	Lower Columbia	8	202
	5/11/2002	Bonneville Exit Station	2	181.9
125	5/6/2002	Lower Granite tailrace 2	2	693.8
	5/9/2002	Moving Barge	1	672.8
	5/10/2002	Moving Barge	4	674.5
	5/10/2002	Little Goose pool	23	659
	5/12/2002	Little Goose tailrace	12	634.3
	5/16/2002	Lower Monumental tailrace	5	587.6
	5/17/2002	Ice Harbor pool	4	569.6
	5/18/2002	Ice Harbor pool	9	550
	5/20/2002	Ice Harbor tailrace	2	537.2
126	5/7/2002	Little Goose pool	11	659
	5/10/2002	Moving Barge	2	606.9
	5/13/2002	Moving Barge	1	606.9
	6/7/2002	Moving Barge	1	606.9
128	5/11/2002	Little Goose tailrace	12	634.3
129	5/6/2002	Lower Granite tailrace	19	693.8
	5/7/2002	Little Goose pool	18	659
	5/9/2002	Lower Monumental pool	29	603.5
130	5/6/2002	Lower Granite tailrace	2	693.8
	5/7/2002	Little Goose pool	96	659
131	5/16/2002	Lower Granite tailrace	2	693.8
	5/17/2002	Little Goose pool	8	659
	5/18/2002	Little Goose tailrace	5	634.3
	5/19/2002	Little Goose tailrace	4	634.3

	5/19/2002	Lower Monumental pool	6	603.5
	5/22/2002	Lower Monumental tailrace	1	587.6
	5/23/2002	Ice Harbor tailrace	3	537.2
	5/30/2002	Moving Barge	1	587.6
	6/3/2002	Moving Barge	1	595.6
	6/7/2002	Moving Barge	1	594
	6/9/2002	Moving Barge	1	595.6
132	5/15/2002	Lower Granite tailrace	2	693.8
133	5/17/2002	Little Goose pool	32	659
134	5/17/2002	Little Goose pool	9	659
	5/19/2002	Lower Monumental pool	17	615
	5/29/2002	Lower Monumental tailrace	1	587.6
	6/1/2002	John Day forebay	1019	349.2
	6/2/2002	John Day forebay	570	349.2
135	5/16/2002	Little Goose pool	12	659
	5/17/2002	Little Goose tailrace	3	634.3
	5/18/2002	Lower Monumental pool	18	615
	5/18/2002	Lower Monumental pool	17	603.5
	5/20/2002	Lower Monumental tailrace	8	587.6
	5/20/2002	Ice Harbor pool	7	569.6
	5/21/2002	Ice Harbor tailrace	2	537.2
	5/25/2002	John Day forebay	95	349.2
	5/25/2002	John Day tailrace	6	345.1
	5/26/2002	The Dalles forebay	21	309
	5/26/2002	The Dalles tailrace	1	308.7
	5/26/2002	Bonneville Pool	5	304.9
	5/26/2002	Bonneville Pool	2	293
	5/27/2002	Bonneville forebay	173	234.2
	5/28/2002	Bonneville forebay	765	234.2
	5/28/2002	Lower Columbia	15	232.3
136	5/16/2002	Little Goose pool	81	659
	5/17/2002	Little Goose pool	297	659
	5/19/2002	Little Goose tailrace	9	634.3
	5/20/2002	Lower Monumental pool	16	603.5
	5/22/2002	Ice Harbor pool	2	569.6
	5/24/2002	Ice Harbor tailrace	1	537.2
	5/26/2002	John Day forebay	7	349.2
	5/29/2002	John Day forebay	298	349.2
	5/29/2002	John Day tailrace	1	345.1
	5/29/2002	The Dalles forebay	128	309
	5/30/2002	The Dalles forebay	183	309
	5/30/2002	Bonneville pool	3	293
	5/31/2002	Bonneville forebay	186	234.2
	5/31/2002	Bonneville tailrace	1	233.4
	5/31/2002	Lower Columbia	8	232.3
	5/31/2002	Lower Columbia	2	202
	5/31/2002	Lower Columbia	11	194.7
	5/31/2002	Bonneville Exit Station	3	181.9

137	5/20/2002	Lower Monumental tailrace	4	587.6
	5/22/2002	Ice Harbor tailrace	3	537.2
138	5/15/2002	Lower Granite tailrace	2	693.8
	5/16/2002	Little Goose pool	1	659
139	5/15/2002	Lower Granite tailrace	52	693.8
	5/16/2002	Lower Granite tailrace	172	693.8
	5/18/2002	Little Goose pool	16	659
140	5/16/2002	Moving Barge	1	576.3
	5/20/2002	Moving Barge	1	577.9
	5/21/2002	Moving Barge	1	577.9
	5/25/2002	Moving Barge	1	577.9
	5/30/2002	Moving Barge	1	577.9
	6/6/2002	Moving Barge	1	576.3
141	5/17/2002	Little Goose pool	37	659
	5/17/2002	Lower Monumental pool	3	603.5
	5/20/2002	Ice Harbor pool	7	550
	5/20/2002	Ice Harbor tailrace	4	537.2
	5/24/2002	John Day forebay	1309	349.2
	5/25/2002	John Day forebay	947	349.2
	5/25/2002	The Dalles pool	2	325.3
	5/25/2002	The Dalles forebay	257	309
	5/26/2002	Bonneville Pool	1	304.9
	5/26/2002	Bonneville Pool	2	293
	5/26/2002	Bonneville forebay	44	234.2
	5/27/2002	Bonneville forebay	2510	234.2
	5/28/2002	Bonneville forebay	432	234.2
	5/28/2002	Bonneville tailrace	10	233.4
	5/28/2002	Lower Columbia	3	232.3
	5/28/2002	Lower Columbia	4	202
	5/28/2002	Lower Columbia	1	194.7
	5/28/2002	Bonneville Exit Station	6	181.9
142	5/15/2002	Lower Granite tailrace	1	693.8
	5/16/2002	Little Goose pool	10	659
	5/17/2002	Little Goose tailrace	4	634.3
	5/18/2002	Lower Monumental pool	8	615
	5/18/2002	Lower Monumental pool	4	603.5
	5/22/2002	Moving Barge	1	598.8
	5/25/2002	Lower Monumental tailrace	10	587.6
	5/25/2002	Ice Harbor pool	7	569.6
	5/26/2002	Ice Harbor pool	1	550
	5/26/2002	Ice Harbor tailrace	1	537.2
	5/29/2002	John Day forebay	58	349.2
	5/30/2002	John Day forebay	580	349.2
	5/31/2002	The Dalles pool	6	325.3
	5/31/2002	The Dalles forebay	8	309
	5/31/2002	Bonneville Pool	3	304.9
	5/31/2002	Bonneville forebay	82	234.2
	6/1/2002	Bonneville forebay	966	234.2

	6/2/2002	Bonneville forebay	822	234.2
	6/3/2002	Bonneville forebay	516	234.2
	6/3/2002	Bonneville tailrace	3	233.4
	6/3/2002	Lower Columbia	3	232.3
	6/3/2002	Lower Columbia	4	202
	6/3/2002	Bonneville Exit Station	6	181.9
143	5/17/2002	Little Goose pool	24	659
	5/19/2002	Little Goose tailrace	1	634.3
	5/20/2002	Lower Monumental pool	26	603.5
	5/27/2002	John Day forebay	12	349.2
	6/3/2002	John Day forebay	904	349.2
	6/4/2002	The Dalles forebay	441	309
	6/5/2002	Bonneville forebay	8	234.2
	6/5/2002	Lower Columbia	3	202
	6/5/2002	Lower Columbia	4	194.7
	6/6/2002	Bonneville Exit Station	2	181.9
144	5/15/2002	Lower Granite tailrace	1	693.8
	5/17/2002	Little Goose pool	58	659
	5/18/2002	Little Goose tailrace	2	634.3
	5/19/2002	Lower Monumental pool	3	603.5
	5/22/2002	Lower Monumental tailrace	4	587.6
	5/22/2002	Ice Harbor pool	9	569.6
	5/24/2002	Ice Harbor tailrace	4	537.2
	5/28/2002	John Day forebay	1026	349.2
	5/28/2002	John Day tailrace	1	345.1
	5/29/2002	The Dalles pool	4	325.3
	5/29/2002	The Dalles forebay	9	309
	5/29/2002	The Dalles tailrace	1	308.7
	5/30/2002	Bonneville pool	3	242.7
	5/30/2002	Bonneville tailrace	1	233.4
	5/30/2002	Lower Columbia	6	232.3
	5/30/2002	Lower Columbia	3	202
	5/30/2002	Bonneville Exit Station	3	181.9
145	5/18/2002	Moving Barge	1	650.3
	5/21/2002	Moving Barge	1	651.9
146	5/17/2002	Little Goose pool	5	659
147	5/18/2002	Little Goose pool	40	659
	5/20/2002	Moving Barge	2	631
	5/26/2002	Lower Monumental pool	1	615
	5/26/2002	Lower Monumental pool	4	603.5
148	5/17/2002	Little Goose pool	13	659
	5/18/2002	Little Goose pool	57	659
149	5/16/2002	Lower Granite tailrace	1	693.8
	5/18/2002	Little Goose pool	227	659
	5/18/2002	Moving Barge	1	664.8
150	5/16/2002	Lower Granite tailrace	49	693.8
	5/18/2002	Little Goose pool	10	659
	5/19/2002	Little Goose pool	62	659

	5/22/2002	Little Goose tailrace	7	634.3
	5/23/2002	Lower Monumental pool	13	603.5
	5/26/2002	Lower Monumental tailrace	11	587.6
	5/26/2002	Moving Barge	1	568.3
	5/27/2002	Ice Harbor tailrace	4	537.2
	5/30/2002	John Day forebay	1228	349.2
	5/31/2002	John Day forebay	1405	349.2
	6/1/2002	John Day forebay	1032	349.2
	6/1/2002	John Day tailrace	1	345.1
	6/1/2002	The Dalles pool	1	325.3
	6/1/2002	The Dalles forebay	21	309
	6/1/2002	The Dalles tailrace	1	308.7
	6/2/2002	Bonneville pool	1	246.6
	6/2/2002	Bonneville forebay	10	234.2
	6/2/2002	Bonneville tailrace	2	233.4
	6/2/2002	Lower Columbia	6	232.3
	6/2/2002	Lower Columbia	5	202
	6/2/2002	Lower Columbia	4	194.7
	6/3/2002	Bonneville Exit Station	3	181.9
151	5/18/2002	Little Goose pool	11	659
	5/22/2002	Little Goose pool	1302	659
	5/22/2002	Moving Barge	1	663.2
	5/23/2002	Little Goose pool	1669	659
	5/24/2002	Little Goose pool	1681	659
	5/24/2002	Moving Barge	1	653.5
	5/25/2002	Little Goose pool	1561	659
	5/25/2002	Moving Barge	1	663.2
	5/26/2002	Little Goose pool	1502	659
	5/27/2002	Little Goose pool	1584	659
	5/28/2002	Little Goose pool	1595	659
	5/29/2002	Little Goose pool	1293	659
	5/30/2002	Little Goose pool	1098	659
	5/30/2002	Moving Barge	2	655.1
	5/31/2002	Little Goose pool	1007	659
	6/1/2002	Little Goose pool	1069	659
	6/2/2002	Little Goose pool	1061	659
	6/3/2002	Little Goose pool	1085	659
	6/3/2002	Moving Barge	1	664.8
	6/4/2002	Little Goose pool	971	659
	6/5/2002	Little Goose pool	770	659
	6/6/2002	Little Goose pool	1040	659
	6/7/2002	Little Goose pool	1095	659
	6/7/2002	Moving Barge	1	663.2
	6/8/2002	Little Goose pool	1093	659
	6/9/2002	Little Goose pool	1060	659
	6/9/2002	Moving Barge	1	663.2
	6/10/2002	Little Goose pool	993	659
152	5/19/2002	Little Goose tailrace	2	634.3

	5/20/2002	Lower Monumental pool	156	603.5
	5/22/2002	Lower Monumental pool	727	603.5
	5/22/2002	Moving Barge	1	603.5
	5/23/2002	Lower Monumental pool	1332	603.5
	5/24/2002	Lower Monumental pool	1326	603.5
	5/25/2002	Lower Monumental pool	1658	603.5
	5/26/2002	Lower Monumental pool	1590	603.5
	5/27/2002	Lower Monumental pool	1674	603.5
	5/28/2002	Lower Monumental pool	1292	603.5
	5/29/2002	Lower Monumental pool	1218	603.5
	5/30/2002	Lower Monumental pool	729	603.5
	5/31/2002	Lower Monumental pool	1112	603.5
	6/1/2002	Lower Monumental pool	1170	603.5
	6/2/2002	Lower Monumental pool	1164	603.5
	6/3/2002	Lower Monumental pool	1195	603.5
	6/4/2002	Lower Monumental pool	923	603.5
	6/5/2002	Lower Monumental pool	620	603.5
	6/5/2002	John Day pool	236	415.1
	6/6/2002	John Day pool	731	415.1
	6/7/2002	John Day pool	816	415.1
	6/8/2002	John Day pool	925	415.1
	6/9/2002	John Day pool	1067	415.1
	6/10/2002	John Day pool	1072	415.1
	6/11/2002	John Day pool	1167	415.1
	6/12/2002	John Day pool	1061	415.1
	6/13/2002	John Day pool	655	415.1
	6/25/2002	John Day forebay	2	349.2
	6/26/2002	John Day forebay	2	349.2
153	5/16/2002	Lower Granite tailrace	2	693.8
	5/18/2002	Little Goose pool	38	659
	5/19/2002	Little Goose tailrace	6	634.3
	5/20/2002	Lower Monumental pool	43	603.5
	5/26/2002	Lower Monumental tailrace	1	587.6
	5/26/2002	Ice Harbor pool	23	569.6
	5/27/2002	Ice Harbor pool	23	569.6
	5/27/2002	Ice Harbor tailrace	1	537.2
154	5/17/2002	Little Goose pool	40	659
	5/21/2002	Little Goose tailrace	1	634.3
	5/22/2002	Moving Barge	3	621.4
	6/6/2002	Lower Monumental pool	134	615
	6/7/2002	Lower Monumental pool	293	615
	6/8/2002	Lower Monumental pool	123	615
	6/9/2002	Lower Monumental pool	160	615
	6/10/2002	Lower Monumental pool	199	615
	6/11/2002	Lower Monumental pool	213	615
	6/12/2002	Lower Monumental pool	72	615
	6/13/2002	Lower Monumental pool	57	615
	6/14/2002	Moving Barge	2	610.1

	6/18/2002	Moving Barge	1	610.1
	6/30/2002	Moving Barge	1	610.1
155	5/20/2002	Little Goose pool	7	659
	5/24/2002	Lower Monumental pool	42	603.5
156	5/18/2002	Little Goose pool	7	659
	5/21/2002	Lower Monumental pool	34	603.5
157	5/18/2002	Little Goose pool	25	659
	5/19/2002	Little Goose tailrace	3	634.3
	5/20/2002	Lower Monumental pool	1	603.5
158	5/19/2002	Little Goose tailrace	11	634.3
	5/20/2002	Lower Monumental pool	22	603.5
159	5/17/2002	Lower Granite tailrace	1	693.8
	5/19/2002	Little Goose pool	46	659
	5/22/2002	Lower Monumental pool	14	603.5
	5/26/2002	Moving Barge	4	590.8
	5/26/2002	Lower Monumental tailrace	4	587.6
	5/29/2002	Ice Harbor tailrace	1	537.2
	6/1/2002	John Day forebay	155	349.2
	6/11/2002	John Day forebay	8	349.2
160	5/18/2002	Lower Monumental tailrace	7	587.6
	5/20/2002	Ice Harbor tailrace	5	537.2
161	5/19/2002	Lower Granite tailrace	1	693.8
	5/21/2002	Little Goose pool	25	659
	5/23/2002	Lower Monumental tailrace	5	587.6
	5/23/2002	Ice Harbor pool	5	569.6
	5/25/2002	Ice Harbor tailrace	5	537.2
162	5/20/2002	Little Goose pool	30	659
	5/20/2002	Moving Barge	1	653.5
	5/25/2002	Little Goose tailrace	5	634.3
	5/26/2002	Lower Monumental pool	15	603.5
	6/5/2002	Lower Monumental pool	6	603.5
	6/5/2002	John Day pool	5	415.1
	6/8/2002	John Day pool	15	415.1
	6/12/2002	John Day pool	3	415.1
	6/23/2002	McNary tailrace	1	467.3
	6/24/2002	John Day forebay	406	349.2
	6/25/2002	John Day forebay	1135	349.2
	6/25/2002	The Dalles pool	1	325.3
	6/25/2002	The Dalles forebay	199	309
	6/25/2002	The Dalles tailrace	1	308.7
	6/26/2002	Bonneville forebay	456	234.2
	6/27/2002	Bonneville forebay	1039	234.2
	6/28/2002	Bonneville forebay	523	234.2
	6/28/2002	Bonneville tailrace	1	233.4
	6/28/2002	Lower Columbia	6	232.3
163	5/21/2002	Little Goose pool	2	659
	5/24/2002	Little Goose tailrace	6	634.3
	5/25/2002	Moving Barge	1	614.9

	5/30/2002	Moving Barge	1	608.5
164	5/20/2002	Little Goose pool	43	659
	5/20/2002	Moving Barge	1	653.5
165	5/20/2002	Little Goose pool	6	659
	5/27/2002	Lower Monumental tailrace	4	587.6
	5/28/2002	Ice Harbor pool	6	569.6
	5/28/2002	Ice Harbor pool	44	550
	5/29/2002	Ice Harbor pool	2	550
	5/30/2002	Ice Harbor tailrace	2	537.2
166	5/21/2002	Moving Barge	1	668
	5/22/2002	Little Goose pool	3	659
	5/23/2002	Little Goose tailrace	150	634.3
	5/24/2002	Little Goose tailrace	209	634.3
	5/25/2002	Lower Monumental pool	3	603.5
	5/27/2002	Lower Monumental tailrace	1	587.6
	5/30/2002	Moving Barge	1	579.5
	6/1/2002	Ice Harbor pool	6	569.6
	6/2/2002	Ice Harbor tailrace	1	537.2
	6/21/2002	Moving Barge	1	524.8
167	5/19/2002	Lower Granite tailrace	2	693.8
	5/20/2002	Little Goose pool	22	659
	5/23/2002	Little Goose tailrace	2	634.3
	5/23/2002	Lower Monumental pool	37	603.5
	5/29/2002	Lower Monumental tailrace	2	587.6
	5/30/2002	Ice Harbor tailrace	6	537.2
168	5/20/2002	Lower Granite tailrace	1	693.8
	5/20/2002	Little Goose pool	6	659
169	5/22/2002	Little Goose tailrace	6	634.3
170	5/21/2002	Little Goose pool	9	659
	5/22/2002	Little Goose tailrace	6	634.3
	5/22/2002	Lower Monumental pool	9	603.5
	5/25/2002	Lower Monumental tailrace	1	587.6
	5/26/2002	Ice Harbor pool	3	569.6
	5/27/2002	Ice Harbor tailrace	7	537.2
171	5/19/2002	Lower Granite tailrace	1	693.8
	5/20/2002	Little Goose pool	10	659
	5/22/2002	Little Goose tailrace	11	634.3
	5/24/2002	Lower Monumental tailrace	4	587.6
172	5/20/2002	Lower Granite tailrace	1	693.8
	5/22/2002	Little Goose pool	12	659
173	5/20/2002	Little Goose pool	1	659
	5/23/2002	Lower Monumental pool	47	603.5
	5/24/2002	Moving Barge	2	595.6
	5/30/2002	Moving Barge	1	595.6
	6/10/2002	Moving Barge	1	595.6
	6/18/2002	Moving Barge	1	595.6
175	5/20/2002	Little Goose pool	14	659
176	5/21/2002	Lower Granite tailrace	7	693.8

	5/24/2002	Little Goose pool	27	659
	5/27/2002	Lower Monumental pool	4	615
	5/27/2002	Lower Monumental pool	16	603.5
	5/31/2002	Lower Monumental tailrace	1	587.6
	6/1/2002	Ice Harbor tailrace	1	537.2
	6/2/2002	McNary tailrace	1	467.3
	6/3/2002	John Day forebay	305	349.2
	6/4/2002	The Dalles forebay	137	309
	6/4/2002	Bonneville Pool	1	304.9
	6/4/2002	Bonneville pool	1	242.7
	6/4/2002	Bonneville forebay	4	234.2
	6/4/2002	Bonneville tailrace	4	233.4
	6/4/2002	Lower Columbia	2	232.3
	6/5/2002	Lower Columbia	5	202
	6/5/2002	Lower Columbia	1	194.7
	6/5/2002	Bonneville Exit Station	5	181.9
177	5/24/2002	Little Goose tailrace	84	634.3
	5/26/2002	Lower Monumental tailrace	1	587.6
	5/31/2002	Lower Monumental tailrace	5	587.6
	6/1/2002	Lower Monumental tailrace	10	587.6
	6/2/2002	Lower Monumental tailrace	1	587.6
	6/4/2002	Lower Monumental tailrace	338	587.6
	6/5/2002	Lower Monumental tailrace	391	587.6
	6/6/2002	Lower Monumental tailrace	449	587.6
	6/7/2002	Lower Monumental tailrace	67	587.6
	6/8/2002	Lower Monumental tailrace	263	587.6
	6/9/2002	Lower Monumental tailrace	101	587.6
	6/10/2002	Lower Monumental tailrace	295	587.6
	6/11/2002	Lower Monumental tailrace	869	587.6
	6/12/2002	Lower Monumental tailrace	983	587.6
	6/13/2002	Lower Monumental tailrace	344	587.6
178	5/21/2002	Lower Granite tailrace	1	693.8
	5/23/2002	Little Goose pool	65	659
	5/24/2002	Little Goose tailrace	1	634.3
	5/27/2002	Lower Monumental tailrace	3	587.6
	5/27/2002	Ice Harbor pool	9	569.6
180	5/22/2002	Little Goose pool	8	659
	5/23/2002	Lower Monumental pool	2	603.5
182	5/22/2002	Little Goose pool	14	659
	5/23/2002	Little Goose tailrace	3	634.3
	5/24/2002	Lower Monumental pool	6	603.5
183	5/21/2002	Lower Granite tailrace	2	693.8
184	5/21/2002	Lower Granite tailrace	1	693.8
	5/22/2002	Little Goose pool	15	659
185	5/22/2002	Little Goose pool	23	659
	5/26/2002	Little Goose tailrace	5	634.3
	5/27/2002	Lower Monumental pool	7	615
186	5/22/2002	Little Goose pool	9	659

	5/25/2002	Lower Monumental pool	46	603.5
187	5/23/2002	Little Goose pool	20	659
	5/25/2002	Little Goose tailrace	2	634.3
	5/26/2002	Lower Monumental pool	25	603.5
	6/5/2002	John Day forebay	3	349.2
	6/6/2002	The Dalles forebay	19	309
	6/6/2002	Bonneville forebay	67	234.2
	6/7/2002	Bonneville forebay	883	234.2
	6/8/2002	Bonneville forebay	860	234.2
	6/8/2002	Lower Columbia	1	232.3
	6/8/2002	Lower Columbia	2	202
	6/9/2002	Bonneville Exit Station	1	181.9
188	5/23/2002	Little Goose pool	24	659
	5/25/2002	Little Goose tailrace	3	634.3
	5/26/2002	Moving Barge	1	627.8
	5/30/2002	Moving Barge	1	621.4
189	5/22/2002	Little Goose pool	10	659
190	5/23/2002	Little Goose pool	11	659
	5/26/2002	Lower Monumental pool	2	615
191	5/30/2002	Lower Granite tailrace	1	693.8
	5/31/2002	Little Goose pool	14	659
	6/1/2002	Little Goose tailrace	2	634.3
	6/2/2002	Lower Monumental pool	5	603.5
	6/3/2002	Lower Monumental tailrace	1	587.6
	6/5/2002	John Day forebay	119	349.2
	6/5/2002	John Day tailrace	2	345.1
	6/6/2002	The Dalles forebay	30	309
	6/6/2002	Bonneville pool	2	293
	6/6/2002	Moving Barge	1	262.3
	6/6/2002	Bonneville forebay	2	234.2
	6/6/2002	Lower Columbia	1	232.3
	6/7/2002	Bonneville Exit Station	5	181.9
192	5/31/2002	Little Goose pool	11	659
	6/2/2002	Lower Monumental pool	1	615
	6/3/2002	Lower Monumental pool	9	603.5
193	5/31/2002	Little Goose pool	18	659
	6/1/2002	Little Goose tailrace	5	634.3
	6/1/2002	Lower Monumental pool	6	615
	6/1/2002	Lower Monumental pool	19	603.5
	6/9/2002	Moving Barge	1	594
195	5/30/2002	Lower Granite tailrace	1	693.8
	5/31/2002	Little Goose pool	2	659
196	5/30/2002	Lower Granite tailrace	1	693.8
	5/31/2002	Little Goose pool	7	659
197	5/31/2002	Little Goose pool	6	659
199	5/31/2002	Little Goose pool	65	659
	6/1/2002	Little Goose tailrace	1	634.3
201	5/30/2002	Little Goose pool	1	659

	5/31/2002	Little Goose pool	1	659
202	5/31/2002	Little Goose pool	11	659
	6/1/2002	Little Goose tailrace	11	634.3
	6/2/2002	Little Goose tailrace	556	634.3
	6/3/2002	Little Goose tailrace	1010	634.3
	6/4/2002	Little Goose tailrace	376	634.3
203	5/31/2002	Lower Granite tailrace	1	693.8
206	5/30/2002	Lower Granite tailrace	1	693.8
	6/5/2002	Moving Barge	5	544.1
	6/6/2002	Ice Harbor tailrace	203	537.2
207	5/31/2002	Little Goose pool	24	659
	6/1/2002	Lower Monumental pool	2	615
	6/1/2002	Lower Monumental pool	12	603.5
	6/11/2002	Ice Harbor pool	4	550
208	5/31/2002	Little Goose pool	14	659
	6/2/2002	Lower Monumental pool	1	603.5
	6/3/2002	Ice Harbor pool	31	550
209	5/31/2002	Little Goose pool	8	659
	6/1/2002	Little Goose tailrace	5	634.3
	6/1/2002	Lower Monumental pool	2	615
	6/2/2002	Lower Monumental pool	11	603.5
210	5/31/2002	Little Goose pool	12	659
	6/2/2002	Little Goose tailrace	3	634.3
	6/2/2002	Lower Monumental pool	2	603.5
	6/3/2002	Lower Monumental tailrace	2	587.6
	6/3/2002	Ice Harbor tailrace	2	537.2
212	5/31/2002	Little Goose pool	10	659
	6/3/2002	Lower Monumental tailrace	1	587.6

Appendix H. Detailed analysis of telemetered kelt release condition versus passage success.

In 2002, 210 telemetered kelts were released at Lower Granite Dam. Prior to release, fish were judged to be in good, fair, or poor condition based on subjective investigator observation. Telemetered kelt releases are summarized in table 1.

Table 1. Condition, distance traveled, and sample size by condition for telemetered kelts released from the LGR bypass in 2002.

Sample Date	Statistical Week	Condition	Distance Traveled (rkm) Median	First Quartile	Third Quartile	n
4/14-4/20	3	Good	108.4	61.7	462.6	27
			61.7	2.2	61.7	9
			2.2	2.2	31.9	6
4/21-4/27	4	Good	108.4	61.7	350.9	23
			61.7	31.9	61.7	13
			108.4	108.4	462.6	4
4/28-5/4	5	Good	85	31.9	108.4	7
			61.7	31.9	108.4	6
			2.2	1.1	31.9	7
5/5-5/11	6	Good	133.6	85	462.6	11
			61.7	2.2	108.4	11
			61.7	2.2	61.7	8
5/12-5/18	7	Good	158.8	61.7	462.6	16
			2.2	2.2	206.3	7
			2.2	2.2	85	7
5/19-5/25	8	Good	61.7	2.2	158.8	17
			61.7	0	85	7
			2.2	2.2	61.7	6
5/26-6/1	9	Good	61.7	61.7	108.4	10
			2.2	1.1	55.3	5
			1.1	0	2.2	5

A simple histogram (Figure 1) of distance traveled suggests that kelts released in good condition generally exhibited superior passage success relative to kelts released in fair condition, and that kelts released in either good or fair condition exhibited superior passage success relative to kelts released in poor condition.

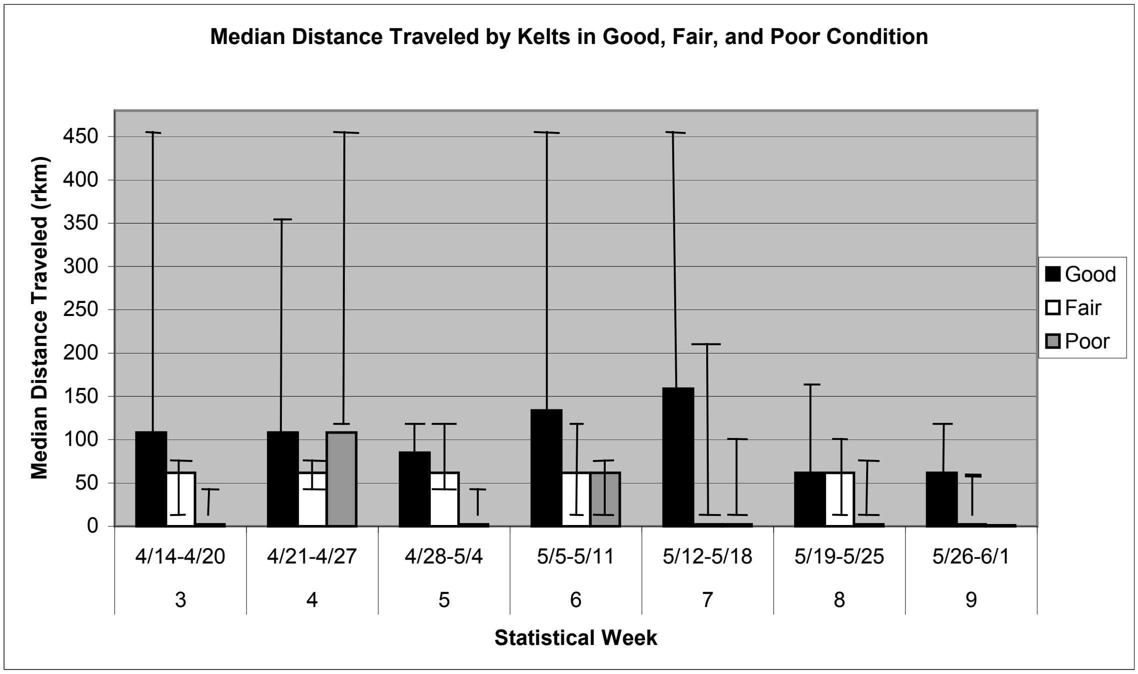

Figure 1. Median (histogram) and interquartile range (whiskers) of distance traveled by kelts released in poor, fair, or good condition, by statistical week, from the LGR bypass.

Table 2. Chi-square analysis of effect of condition and distance traveled.

H_0: Condition has no effect on distance traveled.
H_A: Condition does have an effect on distance traveled.

Distance Traveled (km)	**Poor**	**Fair**	**Good**	**Total Fish**	**chi-square**	**Chi-Square test**
0	3	4	2	**9**	2.4417989	0.294964735
	2.16	*2.52*	*4.32*			
2.2	20	15	14	**49**	9.7463557	0.007649019
	11.76	*13.72*	*23.52*			
61.7	12	21	28	**61**	1.431694	0.488777949
	14.64	*17.08*	*29.28*			
108.4	4	12	19	**35**	3.0867347	0.21366042
	8.4	*9.8*	*16.8*			
158.8	1	3	15	**19**	7.5820802	0.022572112
	4.56	*5.32*	*9.12*			
350.9	0	2	6	**8**	3.1607143	0.205901549
	1.92	*2.24*	*3.84*			
387.3	0	0	1	**1**	1.0833333	0.581777821
	0.24	*0.28*	*0.48*			
462.6	3	1	24	**28**	16.32398	0.000285294
	6.72	*7.84*	*13.44*			
Total	**43**	**58**	**109**	**210**		
				$X^2 =$	44.856691	
				v=(8-1)(3-1)=	14	
				$X^2_{0.05,3}$=	23.685	

Therefore, reject H_0
$0.025 < P < 0.05$

We tested the null-hypothesis that passage success does not vary throughout the out-migration period, (Table 2). The results of the chi-square test suggest that kelt condition did have an effect on distance traveled. My assumption is that kelts in better condition typically travel farther than kelts