Assessment and Monitoring of Non-Natal Rearing, Upstream Migration Patterns, and Life History Characteristics of Juvenile Coho and other Salmonids Utilizing McGarvey Creek (Lower Klamath River Sub-Basin) during 2010 and 2011

FINAL REPORT

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1.0 INTRODUCTION

The Yurok Tribe has relied on the Lower Klamath River and its fish for cultural, subsistence, and ceremonial purposes since time immemorial. Land management activities and stochastic events over the last 150 years have degraded Lower Klamath tributaries with pervasive sedimentation observed throughout spawning and rearing habitats. Concern over diminishing runs resulted in the 1997 listing of Klamath Basin coho salmon (*Oncorhynchus kisutch*) as threatened under the Federal Endangered Species Act (ESA) and the 2004 listing of coho salmon under the California Endangered Species Act (CESA). Other anadromous salmonids such as chinook salmon (*O. tshawytscha*), steelhead (*O. mykiss*) and coastal cutthroat trout (*O. clarki clarki*) that inhabit Lower Klamath tributaries have been petitioned to be listed under the Federal ESA, and despite the listings being determined "Not Warranted", concern regarding their status and long-term trends continues.

McGarvey Creek enters the Klamath River 6.4 river miles (RM) upstream of the Pacific Ocean (Figure 1). The watershed supports runs of chinook, coho, steelhead and coastal cutthroat and provides critical rearing habitat for non-natal fish populations, especially coho salmon (YTFP 2009). The watershed has been subjected to intense logging and road building activities including the construction of the U.S. Highway 101 bypass through the headwaters in the mid-1980's (Gale and Randolph 2000). Historic logging resulted in the extraction of virtually all conifers from riparian corridors and large wood recruitment zones throughout the watershed, in addition to removal of a majority of instream wood and naturally formed jams. Past management activities have also resulted in excessive sediment delivery to fluvial habitats of McGarvey Creek. These conditions continue to limit both the quantity and quality of habitat available for juvenile and adult salmonids and reduce productivity of natal and non-natal salmonids utilizing the drainage.

The Lower Klamath River Sub-basin Restoration Plan identified McGarvey Creek as a high priority watershed for restoration based on the number of salmonid populations persisting in the system and the potential for providing high quality coho habitat once restored (Gale and Randolph 2000). Therefore, the Yurok Tribe's Fisheries (YTFP), Watershed Restoration (YTWRD), and Environmental (YTEP) programs have been conducting watershed and fisheries investigations and implementing restoration in the watershed for over a decade. YTWRD completed a road inventory in 1997 and has since treated all medium and high priority road segments in coordination with Green Diamond Resource Company (GDRC). In addition to upslope restoration activities, YTFP has modified several fish passage barriers to re-establish salmonid access to upstream habitats and constructed habitat structures to immediately improve spawning and rearing conditions in the watershed (Gale 2007; Gale 2008). YTFP has also implemented extensive planting of riparian habitats and associated floodplains with native conifers that (when recruited to fluvial habitats) will facilitate the formation of complex habitats and retain high quality spawning gravels. In addition to efforts by YTFP and YTWRD, YTEP has been monitoring water quality and quantity in the watershed since water year 2002.

In order for the Yurok Tribe to assess the effectiveness of watershed restoration projects in Lower Klamath tributaries, essential baseline data must continue to be collected to assess and quantify existing conditions, monitor trends over time, and gauge the success of ongoing and future restoration projects. YTFP has been monitoring salmonid populations in the McGarvey

Creek watershed since 1997 and has gradually increased the effort and objectives over the past fourteen years. In 1997 YTFP initiated a long-term assessment and monitoring of McGarvey Creek salmonid populations and their associated habitat out of concerns over diminishing anadromous fish runs and a need to establish baseline data from which to monitor habitat and population trends over time. YTFP began annual outmigrant trapping in lower McGarvey Creek in 1997 and has been conducting juvenile salmonid summer abundance estimates in McGarvey Creek since 2002 (YTFP 2009). Consistent, long-term monitoring of McGarvey Creek salmonid populations allows YTFP to: 1) quantify juvenile emigration, 2) collect species/age composition data, 3) document population trends, 4) describe life-history patterns of McGarvey Creek salmonid populations, and 5) describe non-natal use of McGarvey Creek by juvenile salmonids, specifically coho, originating from throughout the Klamath Basin. This information will also allow YTFP to obtain the necessary data to continue guiding Lower Klamath resource management, habitat restoration planning and implementation, restoration effectiveness monitoring, and ESA-related issues.

2.0 STUDY AREA

McGarvey Creek is a small, low gradient coastal stream draining 8.9 square miles of moderately steep, forested lands in the Lower Klamath River (Figures 1 and 2). McGarvey Creek begins at an elevation of 75 feet at its confluence with the Klamath River and extends 4.9 miles to its headwaters, located at an elevation of 600 feet. The West Fork of McGarvey Creek, which is the principle tributary in the drainage, totals 2.2 miles in length. Virtually all of McGarvey Creek is owned by GDRC and is managed for commercial timber production.

The lower mainstem reach of McGarvey Creek is sinuous, flowing through a broad floodplain as it nears the Klamath River. Upper mainstem McGarvey Creek is moderately steep and confined by the valley side walls and contains natural and anthropogenic barriers to anadromous species. The West Fork of McGarvey is low gradient (≤3%) with the exception of one 2,235 ft. section (YTFP habitat mapping data 1996). Stream substrates within the drainage consist of highly embedded gravels with approximately 30% of the streambed consisting of silt or sand (YTFP habitat mapping data 1996).

The McGarvey Creek watershed receives high annual rainfall, averaging 100 inches per year. YTEP began operating a stream gage just downstream of the confluence of the mainstem and West Fork McGarvey in December 2001. Stream gage data collected in the watershed suggests that discharge is strongly related to rainfall, especially during winter when the groundwater table is elevated. The highest streamflow measurement taken by YTEP in McGarvey Creek was 292 cubic feet per second (cfs), although higher estimates have been made based on gage height and a rating curve generated by existing flow measurements.

McGarvey Creek affords fish access to and from the mainstem Klamath for much of the year with marginal or no access during periods of low flow in the summer months. In some years, streamflow in mainstem reaches can go subsurface for an indeterminate length during late summer (Beesley and Fiori 2007). In addition to native salmonids, McGarvey Creek also supports coastrange sculpin (*Cottus aleuticus)*, prickly sculpin (*Cottus asper*), Klamath

smallscale sucker (*Catostomus rimiculus)*, speckled dace (*Rhynichthys osculus)*, three spine stickleback (*Gasterosteus aculeatus),* Pacific lamprey (*Lampetra tridentata)*, and brook lamprey (*Lampetra lethophaga*).

Vegetation of the McGarvey Creek watershed was historically comprised of old growth conifers, predominantly coastal redwood (*Sequoia sempervirens*), Sitka spruce (*Picea sitchensis*) and Douglas fir (*Pseudotsuga menziesii*) with cedar (*Cedrus* spp.) and western hemlock (*Tsuga heterophylla*). Presently, riparian habitats of McGarvey Creek are dominated by red alder (*Alnus rubra*). Big leaf maple *(Acer macrophyllum*), vine maple (*Acer circinatum*), tanoak (*Lithocarpus densiflorus*), Pacific madrone (*Arbutus menziesii*), California laurel (*Umbellularia californica*) and willow (*Salix* spp.) are also found within riparian habitats of the watershed.

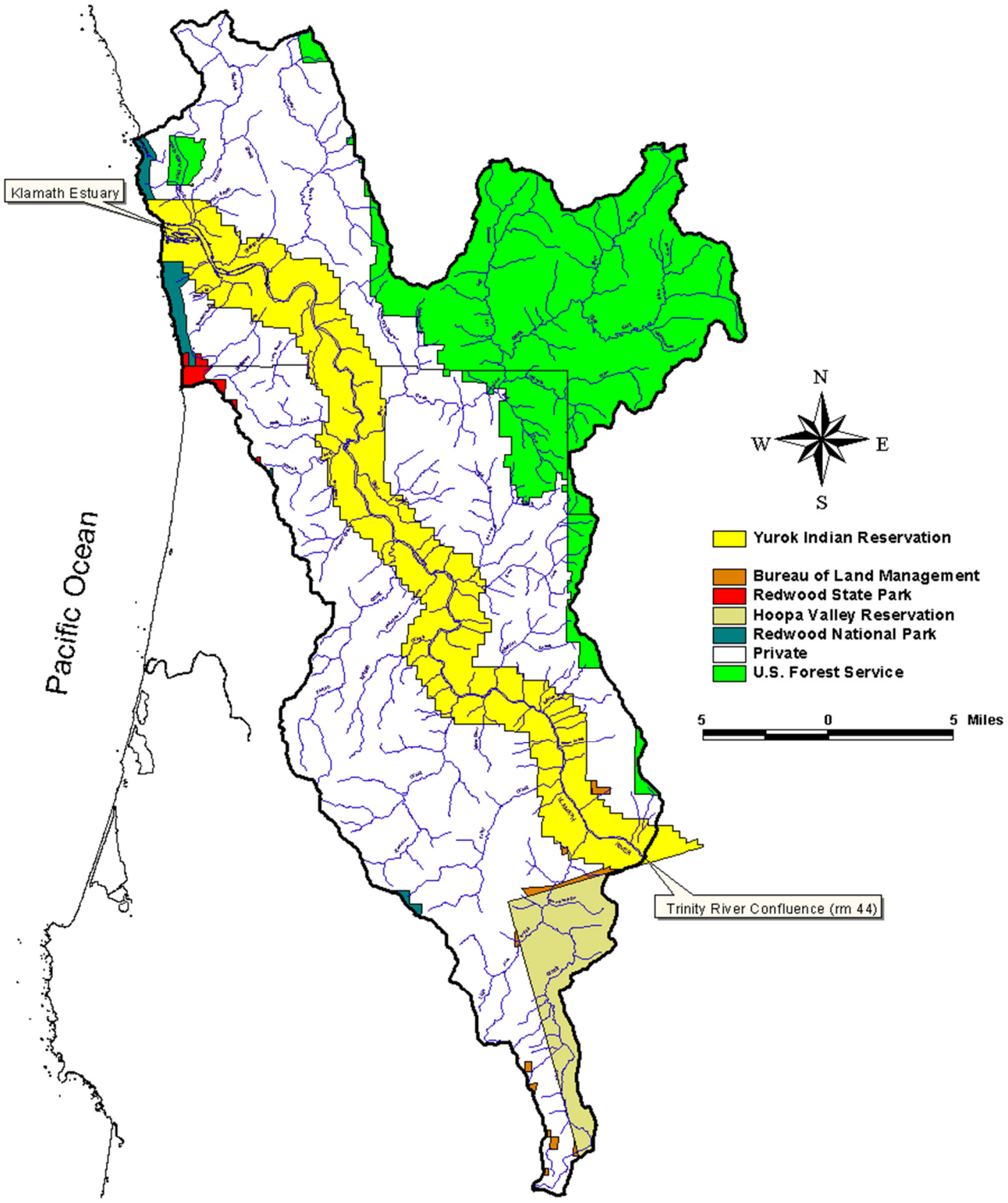

Figure 1. Lower Klamath River Sub-basin, California, with McGarvey Creek identified.

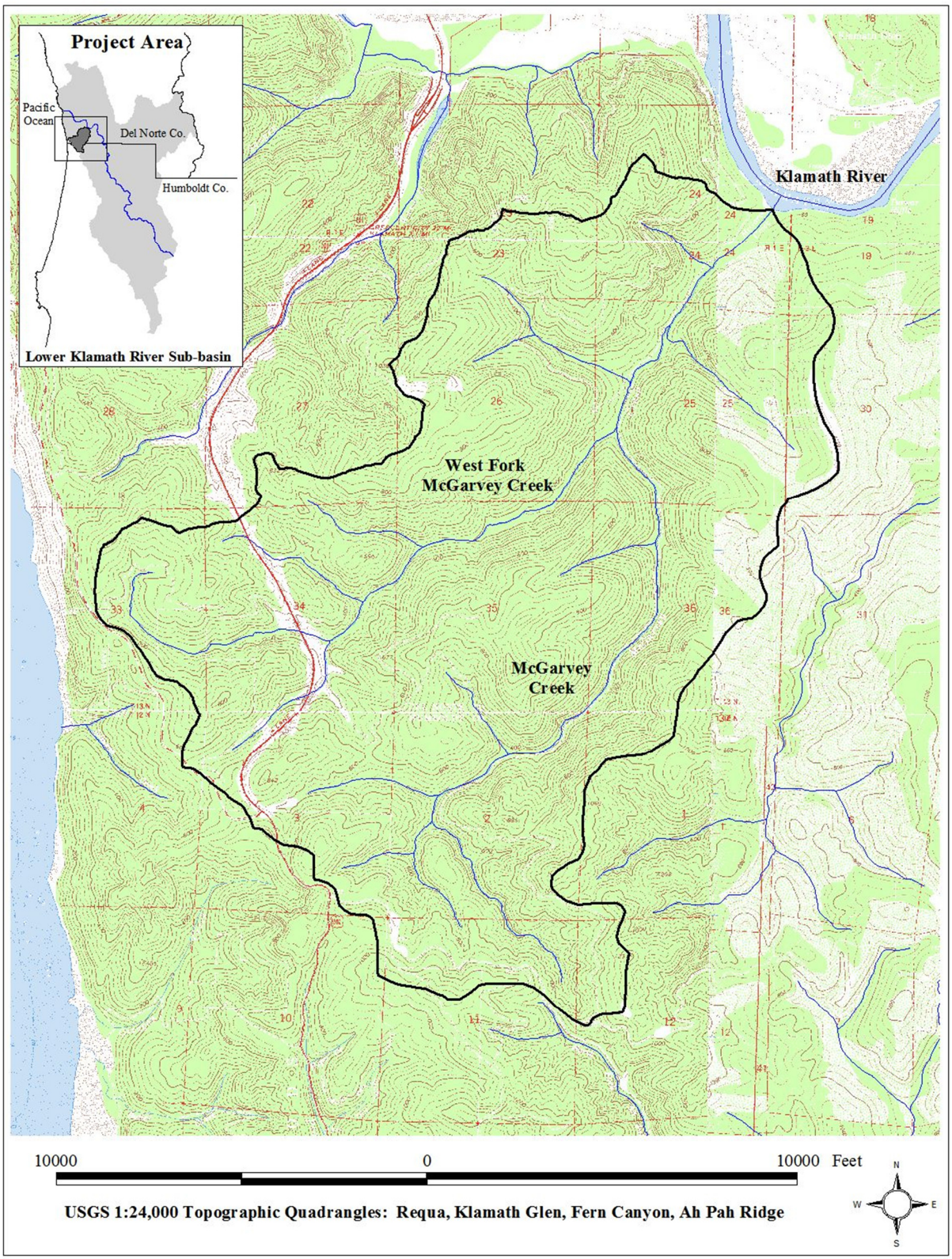

Figure 2. Map of the McGarvey Creek watershed, Lower Klamath River, California.

3.0 METHODS AND MATERIALS

3.1 Spawning Surveys

Spawner surveys were conducted on a bi-weekly basis throughout the anadromous reaches of McGarvey Creek (approximately 4 miles) as streamflow and visibility conditions permitted. Streamflow in McGarvey Creek prior to November is typically too low to permit adult fish passage into the drainage. Therefore, spawning surveys began November 3, 2010 and continued through April 5, 2011. The drainage was separated into three reaches for the purposes of these surveys (Figure 3):

> Reach 1: Lower Mainstem: From the mouth of McGarvey Creek extending upstream of the West Fork confluence ending at an unnamed tributary (1.76 miles).
>
> Reach 2: Upper Mainstem: Upstream of an unnamed tributary to the anadromous barrier (1.1 miles).
>
> Reach 3: West Fork: From the confluence with the mainstem to the anadromous barrier (.85 miles).Spawning survey crews consisting of one to two people performed bank-side visual surveys, moving upstream in each survey reach while recording observations of redds, live fish, carcasses, and other pertinent biological information (test redds, predators, etc.). During periods of increased streamflow or decreased visibility, additional crew members assisted with surveys to provide maximum coverage of the stream channel. When heavy rain resulted in unsuitable conditions, surveys were postponed until conditions improved. Survey conditions in McGarvey Creek are often challenging due to high turbidity (i.e. suspended sediment and tannins), which significantly impairs visibility and limits detailed data collection. Such conditions are noted when they occur. In order to maximize consistency between surveys, crews followed specific data collection protocols:

Redds: Each identified redd was assigned a location number ("R - #") and its geographical location was marked on a topographic map. Multiple redds in one location would be counted and described separately in the notes but grouped together under one location number on the map. Each new redd was flagged at the downstream extent of the disturbed substrate to prevent double counting between surveys. Crews measured redd dimensions of length, width, depth of water covering the mound (or "tail-spill"), and depth of water covering the pit. Other site-specific observations such as fish presence, habitat type, construction stage and redd age were recorded in a field notebook.

Live Fish Sightings: YTFP recorded all adult salmonids observed. Each fish sighting was assigned a location number ("F - #") and corresponding site location on the survey map. For each site, crews recorded the number of each species observed (if it could be determined with certainty) and habitat type. In addition, crews recorded the estimated age class (adult vs. jack), sex and relative condition of observed fish, as well as the presence of any clips, marks, or scars observed.

Carcasses: The location of each observed carcass was assigned a corresponding number ("C - #") on the survey map as they were encountered. Crews recorded species, sex, fork length,

estimated percent "spent" or spawned out (based on remaining eggs or sperm), relative physical condition and any identifying clips, marks or scars on all carcasses. A scale sample was collected when possible and a piece of flagging with the date was attached to each carcass so that it would not be recounted during subsequent surveys. Heads were collected from all adipose-clipped carcasses for coded-wire tag retrieval to determine if the fish had a hatchery origin. All carcasses were scanned with hand-held Allflex scanners for Passive Integrated Transponder (PIT) tags.

The number of redds was used to estimate a total number of spawning adult salmonids in McGarvey Creek. The number of redds observed was multiplied by a factor of two based on the assumption of two fish per redd. This methodology is used by the California Department of Fish and Game (CDFG) to estimate fall chinook escapement to mid-Klamath tributaries and other areas. YTFP determined a mark/recapture-based estimation was not possible due to small population sizes that result in a low number of marked fish (live or carcasses). This, in turn, results in a low number of observed "recaptures".

3.2 Summer Abundance Inventory (Single Stream Population Estimate)

Prior to this project, YTFP conducted single stream juvenile salmonid abundance inventories in McGarvey Creek from 2001 – 2008 using a snorkel and electrofishing methodology based on Hankin and Reeves (1988) and Hankin and Mohr (2008) (Voight 2006; YTFP 2009). Attempts were made to use a consistent approach over time; however, reach boundaries have required modification as our knowledge of fish utilization and environmental conditions in McGarvey Creek increased. A description of reach development is available in Voight (2006).

During 2010, summer abundance estimates were calculated for three reaches (Figure 3):

Lower Mainstem: 0.46 miles above the mouth of McGarvey Creek extending upstream of the West Fork confluence ending at an unnamed tributary (1.3 miles).

Upper Mainstem: Upstream of an unnamed tributary to the anadromous barrier (1.1 miles).

West Fork: Upstream of the confluence with the mainstem to the anadromous barrier (.85 miles).

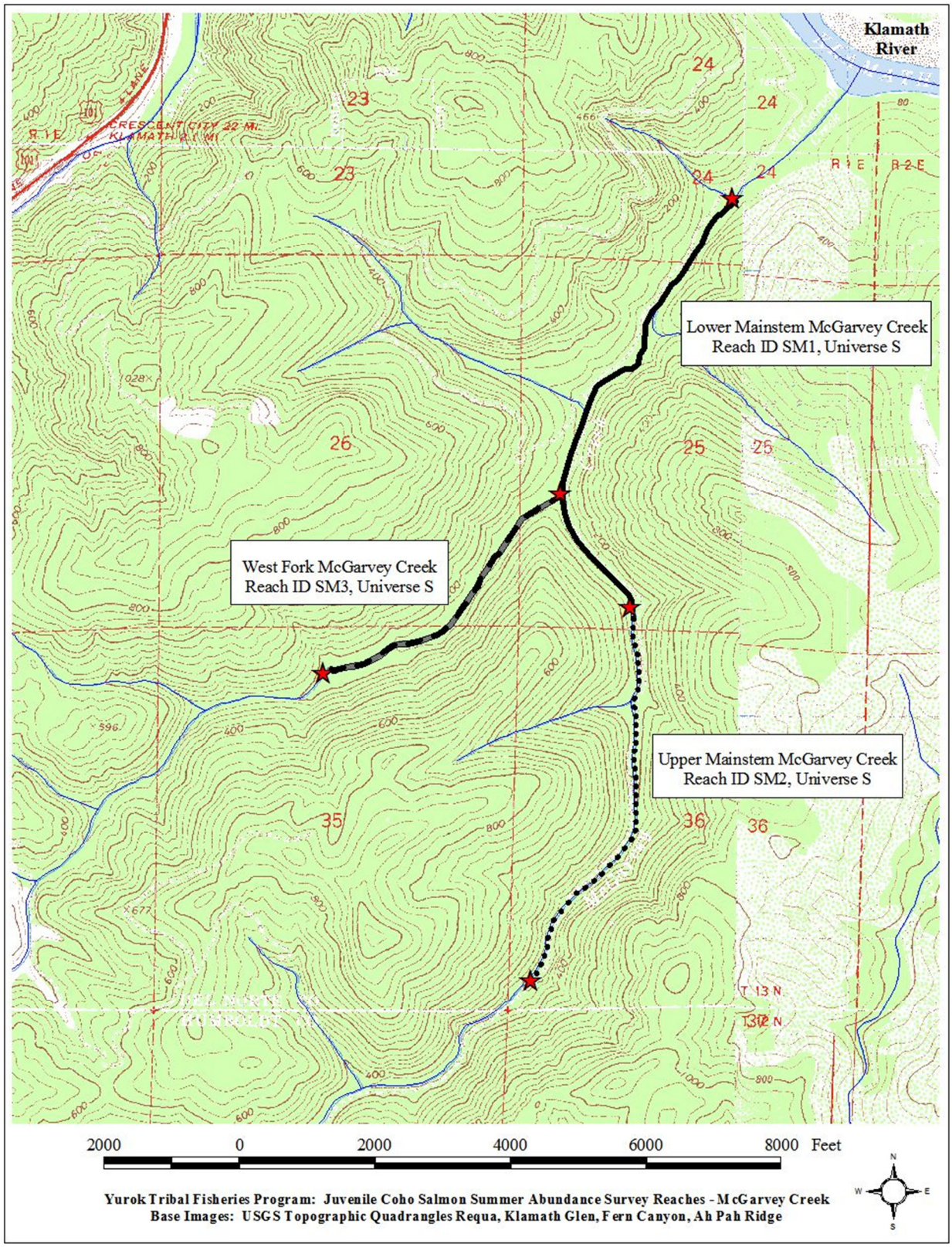

Figure 3. Reach locations sampled during 2010 juvenile salmonid summer abundance surveys.

3.2.1 Sampling Rates

YTFP used modified Hankin-Reeves protocols to conduct surveys (Hankin and Mohr 2008; Hankin and Reeves 1988). Survey crews first assigned habitat units in McGarvey Creek to one of five categories: shallow pool (SP), deep pool (DP, >1.1m z_{max}), run (RU), riffle (RI) and "other" (not surveyable due to habitat complexity, water clarity, etc.). Shallow pool and run strata were subsequently lumped into one stratum for sampling based on the observation that juvenile fish utilize these habitats in a similar manner (Dana McCanne, personal communication). A stratified systematic sampling (STRATSYS) algorithm was used to select the habitat units that were sampled (Phase I) and the sub-sample of units calibrated using electrofishing following initial dive counts (Phase II).

Single or two-phase sampling was conducted, depending on survey reach. In the Lower Mainstem and West Fork McGarvey Creek, snorkel surveys are not feasible. In these reaches, SP/RU habitat units were treated as RI and surveyed using a single-phase, multiple pass depletion electrofishing survey (Figure 4). All shallow pool/run habitats were sampled at a rate of 15% and riffles were sampled at a rate of 8% (Table 1). Deep pools were snorkeled at 100% frequency across all reaches in both single and double phase sampling. The "other" stratum contained habitat units that were not suitable for snorkeling or electrofishing, and thus no statistical inferences were made for these areas.

When snorkel observations are possible, a sub-sample of snorkeled SP/RU habitat units are subsequently sampled using electrofishing to develop a statistical relationship between the Phase I dive count and more reliable electrofishing estimate (Hankin and Reeves 1988). Habitat conditions in Upper McGarvey allow for this two-phase survey type (Figure 3). During Phase I, 33% of the SP/RU units were selected for an initial dive pass. Divers then flagged 25% of the Phase I SP/RU units sampled to undergo Phase II calibration (multiple pass depletion electrofishing). The resulting proportion of SP/RU units that were calibrated within the Upper Mainstem McGarvey reach was 8.25% (0.33 * 04.25= .0825)(Table 1). Riffles were sampled at the same rate as single phase surveys, with 1/12 (8%) selected for multiple pass depletion electrofishing surveys (Table 1). Deep pools were snorkeled at 100% frequency across all reaches.

Table 1. Sampling rates by survey phase/habitat strata, summer abundance survey, McGarvey Creek, 2010.

Reach Type/Location	SP/RU Phase I	SP/RU Phase II	SP/RU Calibration Rate	RI	DP
Lower Mainstem	Electrofish Only	15%	NA	8%	100%
West Fork	Electrofish Only	15%	NA	8%	100%
Upper Mainstem	33%	25%	8.25%	8%	100%

Figure 4. Yurok Tribal Fisheries Program Biologist Scott Silloway and Technician Robert Grubbs conducting a multiple pass depletion electrofishing survey in West Fork McGarvey Creek.

3.2.2 Data Analysis

Separate population estimates (with 95% confidence intervals) were made for age 0+ coho, age 0+ chinook, and age 1+ coastal cutthroat and steelhead in the RI and SP-RU habitat strata in each single stream reach. Actual counts of 0+ coho, 0+ chinook, 0+ trout, 1+ coastal cutthroat, and 1+ steelhead for all DPs are also reported. Estimation of trout numbers in DPs was unreliable due to the fact that these species are typically elusive and may seek cover for extended periods of time after first encountering a diver.

Jackknife Estimation for Electrofishing Sampling

Jackknife estimation was used for the electrofishing data where the total number of fish ($\hat{y}_i$) and sampling variance ($\hat{V}(\hat{y}_i)$) in unit *i* were estimated by:

$$\hat{y}_i = \sum_{j=1}^{r_i-1} c_{i\bullet j} + r_i c_{r_i}$$

$$\hat{V}(\hat{y}_i) = r_i(r_i - 1)c_{r_i}$$

where

r_i = the number of electrofishing passes in the i^{th} habitat unit

c_{r_i} = the number of fish captured in the r^{th} (last) pass in the i^{th} habitat unit

$c_{i\bullet j}$ = the number of fish captured in the j^{th} pass of the i^{th} habitat unit

Two-Phase Estimation for SP-RU Habitats in Snorkeled Reaches:

The total number of fish in SP-RU habitats ($\hat{T}_{SP/R}$) and sampling variance $\hat{V}(\hat{T}_{SP/R})$ were estimated by:

$$\hat{T}_{SP/R} = N\bar{\hat{y}}_2\left(\frac{\bar{x}_1}{\bar{x}_2} + \frac{\bar{L} - \bar{l}_1}{\bar{l}_2}\right)$$

$$\hat{V}(\hat{T}_{SP/R}) \approx N^2\left(1 - \frac{n_1}{N}\right)\left(\frac{\bar{L}}{\bar{l}_1}\right)^2 \frac{s^2_{\hat{y}|l}}{n_1} + N^2\left(1 - \frac{n_2}{n_1}\right)\left(\frac{\bar{x}_1}{\bar{x}_2}\right)^2 \frac{s^2_{\hat{y}|x}}{n_2}$$

$$s^2_{\hat{y}|l} = \frac{1}{n_2 - 1}\sum_{i=1}^{n_2}\left(\hat{y}_i - \bar{\hat{y}}_2 \frac{l_i}{\bar{l}_2}\right)^2$$

$$s^2_{\hat{y}|x} = \frac{1}{n_2 - 1}\sum_{i=1}^{n_2}\left(\hat{y}_i - \bar{\hat{y}}_2 \frac{x_i}{\bar{x}_2}\right)^2$$

where

N = total number of SP-RU habitat units

$\hat{y}_i$ = the jackknife estimate of the true number of fish in the i^{th} habitat unit

$\bar{\hat{y}}_2$ = the average jackknife estimate of the true number of fish in all Phase II sampled SP-RU habitat units

x_i = the observed number of fish counted during the dive in the i^{th} habitat unit

$\bar{x}_1$ = Phase I mean dive count of fish in SP-RU habitat units

$\bar{x}_2$ = Phase II mean dive count of fish in SP-RU habitat units

$\bar{L}$ = average length of all SP-RU habitat units

l_i = the length of the i^{th} habitat unit

$\bar{l}_1$ = average length of SP-RU habitat units sampled in Phase I

$\bar{l}_2$ = average length of SP-RU habitat units sampled in Phase II

n_1 = number of SP-RU habitat units sampled in Phase I

n_2 = number of SP-RU habitat units sampled in Phase II

Ninety-five percent confidence intervals can be approximated by $2\sqrt{\hat{V}(\hat{T}_{SP/R})}$. Small Phase II sample sizes might necessitate using $t_{0.025,n-1}\sqrt{\hat{V}(\hat{T}_{SP/R})}$ for the confidence interval.

Single-Phase Estimation for RI or SP-RU in Non-Snorkeled Reaches

$$\hat{T}_{hab} = N\bar{\hat{y}}\left(\frac{\bar{L}}{\bar{l}}\right)$$

$$\hat{V}(\hat{T}_{hab}) \approx N^2\left(1-\frac{n}{N}\right)\frac{s^2_{\hat{y}ll}}{n} + \frac{N}{n}\sum_{i=1}^{n}\hat{V}(\hat{y}_i)$$

$$s^2_{\hat{y}ll} = \frac{1}{n-1}\sum_{i=1}^{n}\left(\hat{y}_i - \bar{\hat{y}}\frac{l_i}{\bar{l}}\right)^2$$

where

hab = habitat unit type, either RI from all reaches or SP-RU from non-snorkeled reaches

N = total number of *hab* habitat units in the reach

n = number of *hab* habitat units sampled

$\hat{y}_i$ = the jackknife estimate of the true number of fish in the i^{th} habitat unit

$\bar{\hat{y}}$ = the average jackknife estimate of the number of fish in all sampled *hab* units

$\bar{L}$ = average length of all *hab* habitat units

l_i = the length of the i^{th} habitat unit

$\bar{l}$ = average length of sampled *hab* units

Ninety-five percent confidence intervals can be approximated by $2\sqrt{\hat{V}(\hat{T}_{hab})}$. Small sample sizes might necessitate using $t_{0.025,n-1}\sqrt{\hat{V}(\hat{T}_{hab})}$ for the confidence interval.

3.3 Outmigrant Trapping

YTFP conducted outmigrant trapping between January 2011 – June 2011 in mainstem McGarvey Creek just downstream of the lower bridge on GDRC Road # M-10 at RM 1.25 (Figure 5). This site was selected based on channel characteristics, accessibility, and previous monitoring conducted at this site. The trapping site was not located further downstream because the Klamath River routinely backfloods into lower McGarvey Creek during higher flow events. Therefore, the trap site was situated upstream of the typical inundation zone.

In December 2010, modified pipe trap was used to capture downstream migrating fish. The traps was placed approximately 700 feet downstream of the typical outmigrant trap installation site due to channel and flow dynamics and were operated between December 16, 2010 and January 24, 2011 for a total of 39 sample days.

The outmigrant trap was installed on January 12, 2011 and operated 24 hours a day, seven days a week through June 13, 2011 (127 sample days). However, the trap was periodically dismantled or damaged during high flows or storm events, which varied trapping effort.

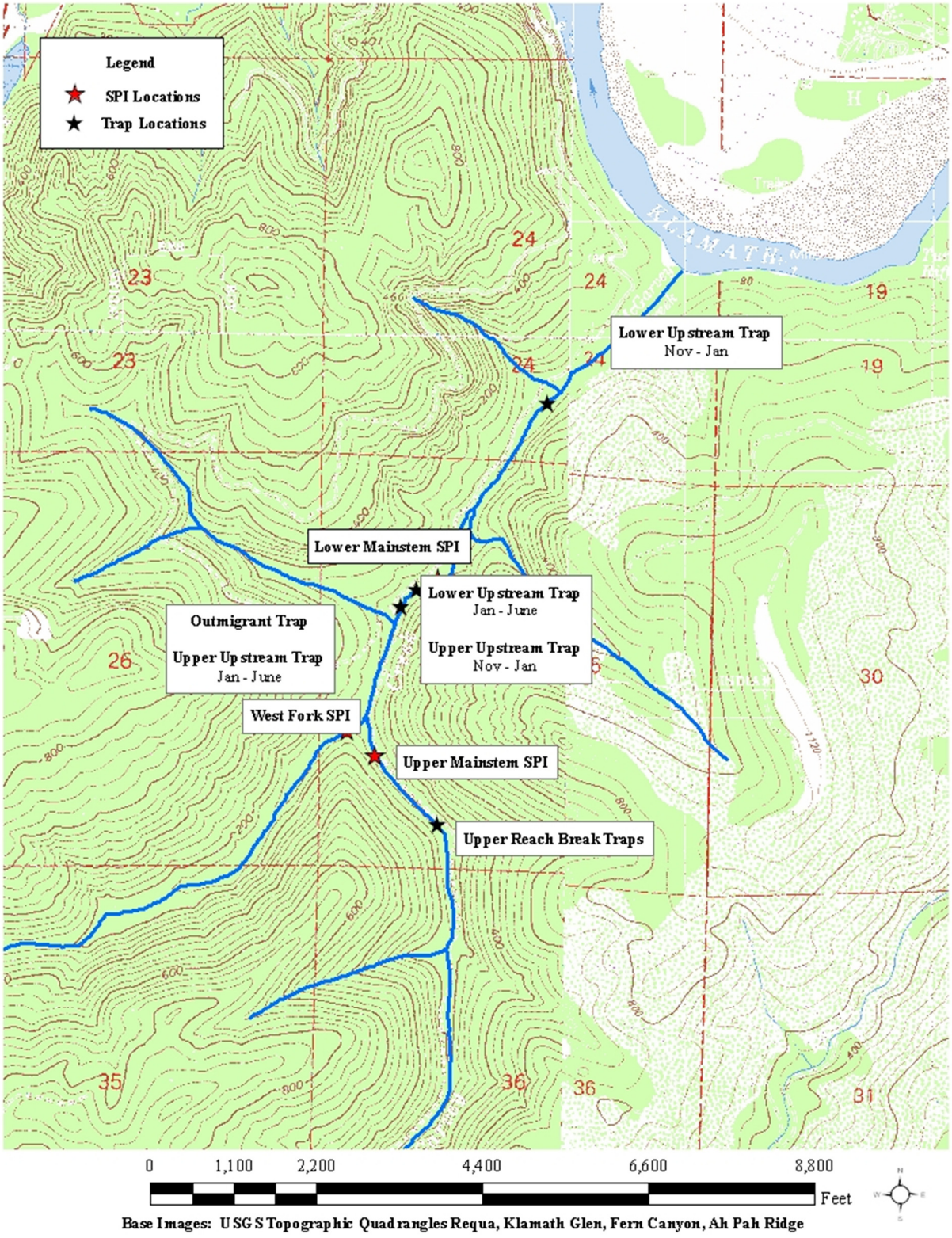

Figure 5. Map of the Lower Mainstem, Upper Mainstem, and West Fork of McGarvey Creek with trapping and stream-width passive interrogation (SPI) locations indicated.

3.3.1 Equipment

The outmigrant trap was constructed of weir panels, sand bags, T-posts, and 20 ft. sections of eight inch diameter PVC pipe leading from a frame net to the live boxes (Figures 6 - 8). Weir panels were made from one ft. by four ft. wood frames with ¼ inch hardware cloth. T-posts were used to position weir panels in a V-shaped configuration and the pipe was positioned at the vertex of this V-shape. The panels were positioned so that 95% of the stream channel was funneled to the pipe inlet. A two ft. wide passage was maintained in the weir to allow upstream fish migration. A 15 ft. long frame net with a four ft. by six ft. opening was inserted between the weir and the pipe during high flow periods to aid in dissipating streamflow (Figure 7). This allowed the trap to be operated over a wider range of discharge levels and minimized downtime associated with high flow events. Beginning in 2011, an upstream trap was installed adjacent to the weir panels (Figure 8).

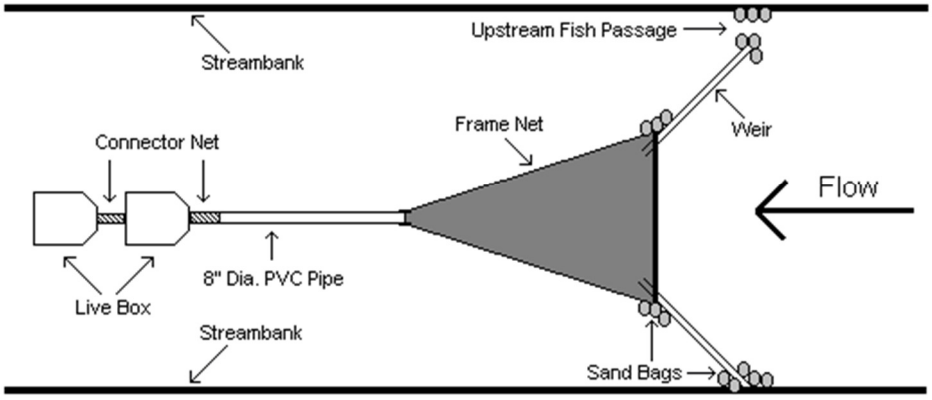

Figure 6. Schematic diagram of outmigrant trap deployed in McGarvey Creek, 1997-2011.

Figure 7. Live boxes used in outmigrant trap, McGarvey Creek, 2011.

Figure 8. Outmigrant trap and upper upstream fyke trap deployed in McGarvey Creek, 2011.

3.3.2 Biological Sampling

YTFP checked the trap daily in the morning hours to reduce holding times and temperature-induced stress. Captured fish were removed from live boxes in small groups of 20 - 30 fish and placed in five-gallon buckets. Holding water was replenished regularly to maintain water quality. All salmonids were anaesthetized using FINQUEL® MS-222 (tricaine methanesulfonate) and identified to species and age class. YTFP measured fork lengths from a random sample of up to 30 fish of each salmonid species, as well as inspected all captured salmonids for physical marks and passive integrated transponder (PIT) tags (see marking section, 3.3.3.1). Each captured salmonid was given a smolt condition factor as follows: parr (distinct parr marks), intermediate smolt (fading parr marks with some silvering), or smolt (no parr marks, distinct silver coloration and black pigment on fin margins). All non-salmonid species were enumerated and released downstream of the trap site and any invasive species captured were euthanized.

3.3.3 Emigration Estimates

Annual emigration estimates were calculated for all salmonid species. Mark-recapture methods were utilized to estimate species-specific trapping efficiencies throughout each trapping season. These efficiencies enabled expansion of captured fish numbers to estimate the total number of emigrants by species during each season. Kennan et al. (1994) and Polos (1997) noted the following assumptions are made when conducting such a mark-recapture experiment:

(1) Marked fish continue their migration downstream after release
(2) Handling and marking fish will not affect their behavior
(3) Marked and unmarked fish are evenly distributed when they migrate past the trapping site and exhibit similar behavior (equal capture probability)
(4) Fish do not lose their marks prior to passing through trap site
(5) All marks are observed and recorded
(6) Mortality of marked fish prior to recapture is minimal

3.3.3.1 Marking

Anesthetized salmonids were marked with a partial fin clip (only the tips of selected fins were removed) using surgical scissors. To increase reliability of trap efficiency estimates, several different clips were used to enable tracking of marked fish from discrete weekly marking periods. After all marked fish recovered from the anesthesia, they were transported 500 feet upstream of the trap in buckets and released into the creek.

3.3.3.2 Trapping Efficiency Estimation

All marked and recaptured fish from the outmigrant trap were categorized by mark type and assigned discrete marking time-periods (weekly intervals). Trap efficiency estimates for each marking period were calculated using the following formula:

$E = R/M * 100$

where

M = number of fish marked from a given marking period

R = number of fish recaptured from a given marking period

Estimates from each marking period were calculated using Darroch Analysis with Rank Reduction (DARR 2.0.2) software (Bjorkstedt 2005, Bjorkstedt 2010).

3.4 Upstream Migration Trapping

To further assess upstream and downstream migration patterns in the watershed, YTFP operated upstream fish traps from November 1, 2010 to June 13, 2011 at two locations in McGarvey Creek. The lower upstream trap installed on November 1, 2010 at RM 0.46 to mark fish for recapture further upstream On January 25, 2011 the lower upstream trap was relocated upstream to RM 1.1 in conjunction with the movement of the upper upstream trap and installation of the outmigration trap (Figure 5). The lower upstream trap operated 24 hours a day, four days a week throughout the trapping season for a total of 109 sample days.

The upper upstream trap was installed on November 1, 2010 and consisted of a weir located at RM 1.1 for the first 58 sampled days. On January 25, 2011 the trap was moved upstream to RM 1.25 and consisted of an upstream-oriented fyke net that operated in conjunction with the outmigrant pipe trap. The fyke trap was installed for 90 sample days between January 25, 2011 and June 13, 2011 and operated 24 hours a day, seven days a week during the season. However, the trap was occasionally dismantled or damaged during high flows or storm events.

YTFP also operated upstream and downstream fyke traps at the upper reach break (RM 1.76) of the McGarvey Creek Mainstem (Figure 5). These traps were intended to determine the extent of non-natal coho migration upstream in McGarvey Creek, however no confirmed non-natal coho were captured during the trapping period. The upstream trap was installed from January 19, 2011 to May 17, 2011 with the exception of a period from February 26, 2011 to April 7, 2011 for a total of 78 days of trapping. The downstream trap was installed from January 19, 2011 to June 7, 2011 with the exception of a period from February 26, 2011 to April 7, 2011 for a total of 99 days of trapping.

3.4.1 Equipment

The lower site consisted of a single three ft. by five ft. fyke net with two to four weir panels depending on flow. The upper trap consisted of weir panels constructed from four ft. long sections of ½ inch diameter pipe, which were spaced one inch apart from each other. Each weir panel was held together by a ¼ inch cable running through each pipe. The panels were covered with ¼ inch coated wire. The weir panels spanned the creek with a three ft. by four ft. opening for the fyke entrance, which extended upstream into a modified fyke trap (Figures 9 and 10). After relocation, the modified fyke trap was replaced with a three ft. x five ft. fyke net.

Figure 9. Lower upstream trap deployed in McGarvey Creek, 2010.

Figure 10. Upper upstream trap and modified pipe trap deployed in McGarvey Creek, 2010.

3.4.2 Biological Sampling

Captured fish were removed and placed in five-gallon buckets for holding. Holding water was replenished regularly to maintain water quality. All salmonids were anesthetized with MS-222 and identified to species and age class. We measured fork lengths from a random sample of up to 30 fish of each salmonid species. All salmonids were also inspected for marks and scanned for PIT tags. Each captured salmonid was given a smolt condition factor as follows: parr (distinct parr marks), intermediate smolt (fading parr marks with some silvering), or smolt (no parr marks, distinct silver coloration and black pigment on fin margins). Salmonids captured in the lower upstream trap were implanted with Full Duplex (FDX) PIT tags (see PIT Tag Marking section 3.5.1) and released upstream to be captured at the upper upstream trap to calculate trap efficiencies. Adult coho captured moving upstream were also implanted with FDX PIT tags to track movement throughout McGarvey Creek.

3.5 PIT Tag Monitoring

3.5.1 PIT Tag Marking

YTFP placed a total of 1,182 Passive Integrated Transponder (PIT) tags into salmonids in the McGarvey Creek drainage between August 3, 2010 and June 13, 2011 (Table 21, Appendix 1). Species tagged during the study included juvenile coho, coastal cutthroat, and steelhead. All tags utilized during the study were 12mm, 134.2 kHz, Biomark Super Tag 2 FDX PIT tags. Prior to

tagging, all fish were anesthetized with MS-222, measured to the nearest mm (fork length), weighed to the nearest 0.1 gram, and scanned for the presence of a PIT tag with a handheld PIT tag scanner (Allflex ISO RFID Portable Reader Model RS601). Fish not previously marked with a PIT tag were assessed for overall health and marked with a PIT tag if they met study criteria.

All PIT tags were sterilized in povidone/10% iodine hospital antiseptic solution before insertion into fish. YTFP applied PIT tags to fish ≥ 65mm into the body cavity by making a small surgical incision to the underside of the fish, near the pelvic fin, using a sterile stainless steel surgical blade. All fish ≥ 200 mm were implanted subcutaneously near the dorsal fin. During this procedure, a small surgical incision was made and the PIT tag was implanted just below the epidermis using a Biomark MK7 Implanter. After marking, all fish were scanned with the hand held scanner and the tag code was recorded as a PIT tag mark.

3.5.2 Remote PIT Tag Monitoring Stations

Three remote stream-width passive interrogation (SPI) tag monitoring systems were installed in McGarvey Creek to detect fish marked with full duplex PIT tags (Figure 4):

Lower SPI: Lower Mainstem, downstream of the outmigrant trap (RM 1.06).

West Fork SPI: West Fork, immediately upstream of the confluence with the mainstem (RM 1.57).

Upper SPI: Upper mainstem, immediately upstream of the confluence with the West Fork (RM 1.52).

The SPI antenna array monitoring systems consist of two 20 ft. x three ft. antenna arrays spanning the stream channel. In all three locations, the two antenna arrays were installed 10 ft. apart from each other to record directional movement (Figures 11, 12, 13 and 14). The antenna arrays are powered by a multiplexing transceiver (Destron Fearing, Inc. Model FS1001M) connected to four 12V deep cycle batteries that are recharged using two 175W solar modules. Batteries were replaced with freshly charged batteries when solar charging was not sufficient to maintain output. PIT tag data and transceiver diagnostic data are downloaded directly from the transceiver memory via a laptop computer in the field (Figure 15). All three SPI stations were installed on November 3, 2010 and are currently operational.

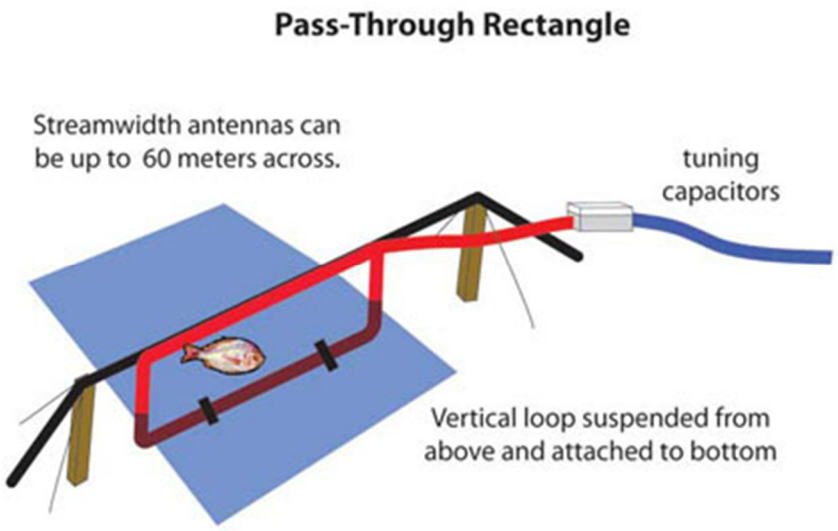

Figure 11. Diagram from Oregon RFID depicting the pass-through antenna design used in McGarvey Creek remote stream-width passive interrogation (SPI) monitoring stations.

Figure 12. Downstream view of Lower McGarvey SPI antennas during Spring 2011.

Figure 13. Downstream view of West Fork McGarvey SPI antennas during Spring 2011.

Figure 14. Downstream view of Upper Mainstem McGarvey SPI antennas during Spring 2011.

Figure 15. Multiplexer transceiver and laptop used to record and download data at all remote SPI monitoring stations.

3.5.3 PIT Tag Recaptures

Salmonids marked with FDX PIT tags were recaptured in upstream and downstream traps as well as on remote SPI stations. . Previously PIT tagged fish captured in traps are measured to nearest mm (fork length), weighed (g), and the PIT tag number is recorded electronically and on the datasheet. Marked fish were considered recaptured on an SPI station after the first detection of an individual's unique PIT tag number. It should be noted that a 'recapture' at a remote PIT tag station consists of all detections for the entire study period for an individual fish, with a maximum of one recapture per unique individual unless specified for a specific station.

4.0 RESULTS AND DISCUSSION

4.1 Spawning Surveys and Adult Recaptures

Conducting successful spawning surveys in McGarvey Creek is difficult due to small population sizes and frequent turbid conditions associated with suspended sediment and tannins. During spawning surveys conducted in winter 2010 – 2011, YTFP observed two chinook adults, 18 adult/jack coho, one adult steelhead, and 20 adult cutthroat in McGarvey Creek. Peak counts of live fish during spawning surveys were observed on December 6, 2010 (Table 2). Three adult coho and two jack coho carcasses were recovered during spawning surveys, none of which were previously implanted with PIT tags. A total of 20 redds were observed during this period, with

ten redds in Reach 1, two redds in Reach 2, and eight redds in Reach 3. One redd was identified as a chinook redd based on the presence of spawning chinook adults, and one a cutthroat redd based on diameter (approximately 12 inches). Based on the number of redds observed, an estimated 36 adult coho, two adult chinook, and two coastal cutthroat spawned in McGarvey Creek during 2010 – 2011.

On December 16, 2010, YTFP staff observed a live adult coho in Reach 2 and were able determine it was a PIT tag recapture using a hand-held Allflex scanner. This coho was originally PIT tagged at the McGarvey Creek outmigrant trap on November 17, 2008, measuring 79 mm and weighing 5.3 grams (YTFP 2009). This fish was first detected returning to McGarvey Creek at the Lower SPI station on December 10, 2010 at 5:15 am and within two hours was detected at the Upper SPI station.

Another PIT tagged adult coho was recorded passing the Lower SPI station on December 1, 2010 at 4:38 pm. This coho was originally marked at the McGarvey Creek outmigrant trap on November 8, 2008 at a size of 93 mm and 9.2 grams (YTFP 2009). During a 23-day period, this adult coho was detected a total of 24 times at all three SPI stations. On January 3, 2011 the Upper SPI station detected a coho that was originally marked in Waukell Creek, a tributary to the Klamath River estuary. This fish was originally PIT tagged on January 22, 2010 at a length of 110 mm and was assumed to be a returning jack coho.

YTFP also captured ten returning adult and jack coho in upstream and downstream traps during the winter 2010 - 2011 season (Table 3). Adult coho were trapped entering McGarvey Creek between November 9, 2010 and February 23, 2011 and ranged in size from 560 to 750 mm, while jacks ranged in size from 348 to 393 mm.

Table 2. Spawning survey data by reach and McGarvey Creek discharge as reported by Yurok Tribe Environmental Program Real-Time Monitoring, 2010-2011.

		Chinook		Coho		Steelhead		Adult	Unidentified			Discharge At
Date	Reach	Adult	Jack	Adult	Jack	Adult	1/2 pounder	Cutthroat (>12")	Adult Salmonid	New Redds	Carcasses	Gage Station
11/3/2010	1	0	0	0	0	0	0	0	0	0	0	16cfs
11/3/2010	2	0	0	0	0	0	0	0	0	0	0	
11/3/2010	3	0	0	0	0	0	0	0	0	0	0	
	Total:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
11/16/2010	1	0	0	0	0	0	0	0	0	0	0	21cfs
11/16/2010	2	0	0	0	0	0	0	0	0	0	0	
11/16/2010	3	0	0	0	0	0	0	0	0	0	0	
	Total:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
11/29/2010	1	0	0	3	0	0	0	0	0	7	0	80cfs
11/29/2010	2	0	0	0	0	0	0	0	0	1	0	
11/29/2010	3	0	0	0	0	0	0	0	0	0	1	
	Total:	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**8**	**1**	
12/6/2010	1	2	0	0	0	0	0	0	0	2	0	58cfs
12/8/2010	2	0	0	2	0	0	0	0	0	1	0	
12/6/2010	3	0	0	4	1	0	0	0	0	6	0	
	Total:	**2**	**0**	**6**	**1**	**0**	**0**	**0**	**0**	**9**	**0**	
12/16/2010	1	0	0	1	0	0	0	0	0	0	1	78cfs
12/16/2010	2	0	0	1	0	0	0	0	0	0	0	
12/16/2010	3	0	0	4	0	0	0	0	0	2	0	
	Total:	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**2**	**1**	
12/29/2010	1	Survey Cancelled Due to High Flows/Poor Water Visibility										227cfs
12/29/2010	2	Survey Cancelled Due to High Flows/Poor Water Visibility										
12/29/2010	3	Survey Cancelled Due to High Flows/Poor Water Visibility										
	Total:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
1/5/2011	1	0	0	0	0	0	0	0	0	0	3	41cfs
1/5/2011	2	0	0	0	0	0	0	0	0	0	0	
1/5/2011	3	0	0	0	0	0	0	0	0	0	0	
	Total:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	
1/19/2011	1	0	0	0	0	0	0	0	0	0	0	51cfs
1/19/2011	2	0	0	0	0	0	0	0	0	0	0	
1/19/2011	3	0	0	0	0	0	0	0	0	0	0	
	Total:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
1/25/2011	1	0	0	1	0	1	0	0	0	0	0	23cfs
1/25/2011	2	0	0	1	0	0	0	0	0	0	0	
1/25/2011	3	0	0	0	0	0	0	0	0	0	0	
	Total:	**0**	**0**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	
2/1/2011	1	0	0	0	0	0	0	10	0	1	0	14cfs
2/1/2011	2	0	0	0	0	0	0	10	0	0	0	
2/2/2011	3	0	0	0	0	0	0	0	0	0	0	
	Total:	**0**	**0**	**0**	**0**	**0**	**0**	**20**	**0**	**1**	**0**	
2/10/2011	1	0	0	0	0	0	0	0	0	0	0	2cfs
2/10/2011	2	0	0	0	0	0	0	0	0	0	0	
2/10/2011	3	0	0	0	0	0	0	0	0	0	0	
	Total:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	

Table 2, continued

Date	Reach	Chinook Adult	Chinook Jack	Coho Adult	Coho Jack	Steelhead Adult	Steelhead 1/2 pounder	Adult Cutthroat (>12")	Unidentified Adult Salmonid	New Redds	Carcasses	Discharge At Gage Station
2/24/2011	1	0	0	0	0	0	0	0	0	0	0	28cfs
2/24/2011	2	0	0	0	0	0	0	0	0	0	0	
2/24/2011	3	0	0	0	0	0	0	0	0	0	0	
	Total:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
3/2/2011	1	0	0	0	0	0	0	0	0	0	0	20cfs
3/2/2011	2	0	0	0	0	0	0	0	0	0	0	
3/2/2011	3	0	0	0	0	0	0	0	0	0	0	
	Total:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
3/22/2011	1	Survey Cancelled Due to High Flows/Poor Water Visibility										106cfs
3/22/2011	2	Survey Cancelled Due to High Flows/Poor Water Visibility										
3/22/2011	3	Survey Cancelled Due to High Flows/Poor Water Visibility										
	Total:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
4/5/2011	1	0	0	0	0	0	0	0	0	0	0	35cfs
4/5/2011	2	0	0	0	0	0	0	0	0	0	0	
4/5/2011	3	0	0	0	0	0	0	0	0	0	0	
	Total:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Season Total		2	0	17	1	1	0	20	0	20	5	

Reach Descriptions:

Reach # 1: Lower mainstem McGarvey Creek from the mouth to the confluence with West Fork McGavrey Creek

Reach # 2: Mainstem McGarvey Creek upstream of the West Fork confluence

Reach # 3: West Fork McGarvey Creek between the mouth and the anadromous barrier

Table 3. Summary of PIT tag recaptures at SPI monitoring stations for adult salmonids captured and marked in McGarvey Creek during 2010 – 2011.

Fish #	Date	Species	Fork Length (mm)	PIT Tag #	Marking Location	SPI Detection (Location)	Sex
1	9-Nov-10	Coho	348	985121016153958	Lower U/S Trap	Lower SPI	Jack
2	17-Nov-10	Coho	580	985121020501143	Upper U/S Trap	Lower SPI	
3	18-Nov-10	Coho	560	985121020498258	Upper U/S Trap	Lower SPI, Upper SPI	Male
4	16-Dec-10	Coho	690	985121015688072	Upper U/S Trap	Lower SPI	Male
5	11-Jan-11	Coho	730	985121020500685	Upper U/S Trap	Lower SPI	
6	11-Jan-11	Coho	393	985121020498422	Upper U/S Trap	Lower SPI, Upper SPI	Jack
7	15-Jan-11	Coho	630	985121020499233	Upper U/S Trap	No Detection	Female
8	25-Jan-11	Coho	750	985121020416151	Upper D/S Reach Break Trap	No Detection	Male
9	30-Jan-11	Coho	667	985121020418821	Upper U/S Trap	No Detection	
10	23-Feb-11	Coho	630	985121020935797	Upper D/S Reach Break Trap	Upper SPI, West Fork SPI, Lower SPI	Female

4.2 Summer Abundance Inventory

4.2.1 Chinook Salmon

Chinook salmon were not observed during either year in any reach.

4.2.2 Coho Salmon

YTFP has been conducting summer abundance estimates for juvenile coho in McGarvey Creek since 2001. Data indicates that there is a strong cohort (occurring every three years) which occurred during 2002, 2005, and 2008 (Hans Voight 2006, YTFP Unpublished Data)(Figure 16). During 2010, juvenile coho estimates (+/- 95% confidence intervals) for Lower Mainstem McGarvey, Upper Mainstem McGarvey, and the West Fork were 1208 (+/- 550), 476 (+/- 342), and 298 (+/- 280) (respectively)(Figure 17). Deep pool dive results indicate that juvenile coho abundance was greatest in pools in Lower McGarvey, where a total of 207 juvenile coho were observed. In Upper Mainstem McGarvey divers observed 21 coho, and two coho were observed in West Fork McGarvey deep pools.

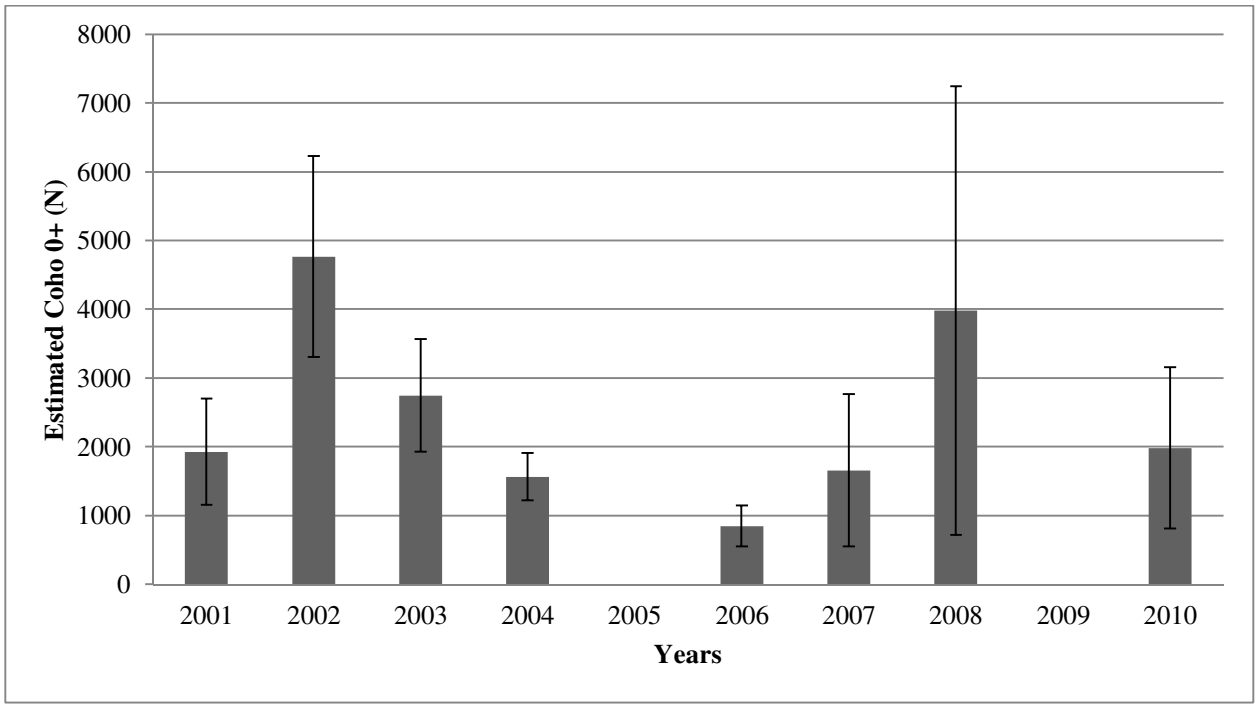

Figure 16. Estimated abundance of juvenile coho in McGarvey Creek (all reaches combined) for 2001 – 2004, 2006 – 2008, and 2010.

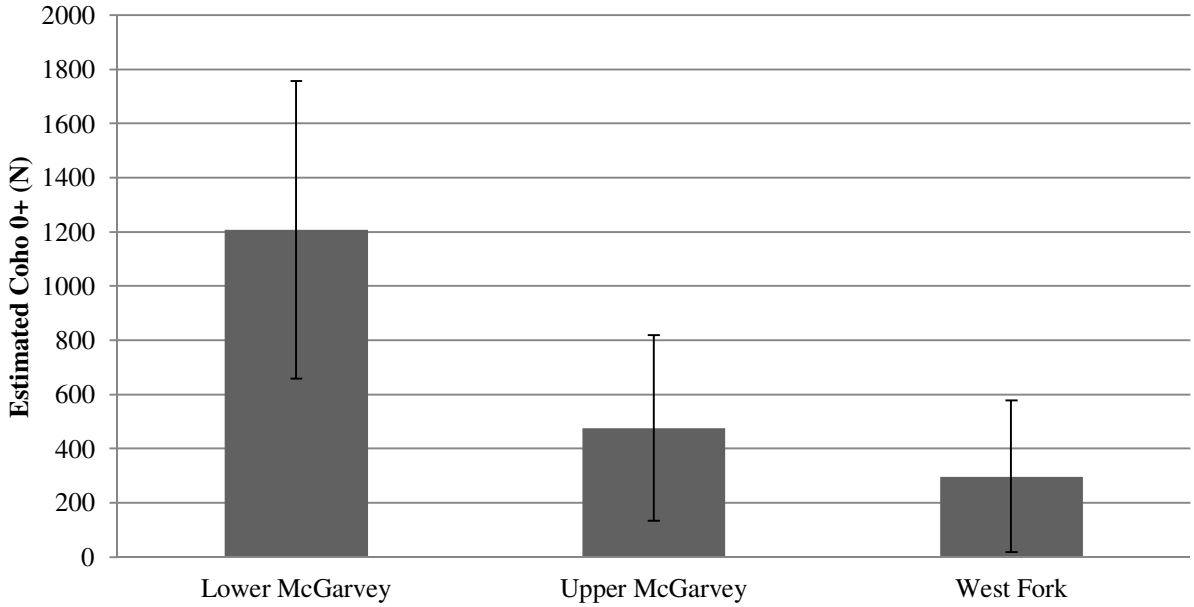

Figure 17. Estimated abundance of juvenile coho in Lower Mainstem, Upper Mainstem, and West Fork during 2010.

4.2.3 Coastal Cutthroat Trout and Steelhead Trout

Results from 2010 were separated into three categories: 1) 1+ steelhead, 2) 1+ cutthroat, and 3) 0+ trout. An estimated total of 253 age 1+ steelhead +/- 300 (95% confidence interval) utilized McGarvey Creek during 2010. The majority of 1+ steelhead trout, approximately 164 (+/- 154), were estimated utilizing the Lower Mainstem portion of McGarvey. Population estimates for 1+ trout in the Upper Mainstem were 53 (+/-91) and 36 (+/- 56) estimated to be in the West Fork (Figure 18). Observations during DP dives during 2010 resulted in twelve 1+ steelhead being observed, all of which were recorded in the Lower Mainstem Reach.

Total estimated abundance of age 1+ steelhead in the McGarvey Creek watershed during late summer of 2010 was consistent with previously reported results (YTFP 2009). Previous results from 2002 – 2006 have shown age 1+ trout population estimates to vary greatly, but estimates presented in Voight (2006) indicate that 1+ trout estimates have always exceeded 800 individuals.

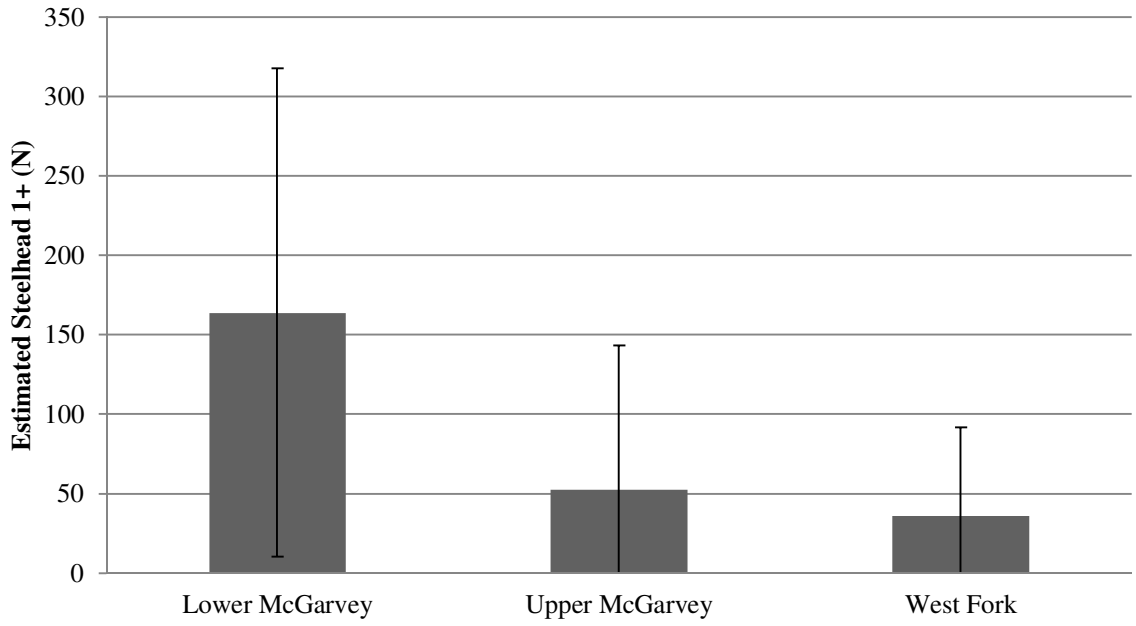

Figure 18. Estimated abundance of 1+ steelhead in Lower Mainstem, Upper Mainstem, and West Fork McGarvey Creek during 2010.

Coastal cutthroat were more abundant in McGarvey Creek during 2010 than steelhead. Abundance estimates for age 1+ coastal cutthroat were 3246 (+/- 1305) during 2010. Trends across years were similar, with the highest abundance of 1+ coastal cutthroat estimated to be residing in the Upper Mainstem, followed by the West Fork, and the lowest abundance in the Lower Mainstem (Figure 19). Observations in DP dive counts resulted in the highest observations of 1+ coastal cutthroat in the Lower Mainstem during 2010, with 65 individuals observed. Divers in the Upper Mainstem observed 30 age 1+ coastal cutthroat and 14 were observed in the West Fork.

Abundance estimates for age 0+ trout were not calculated during 2010, and no 0+ trout were observed during DP dives in all three stream reaches.

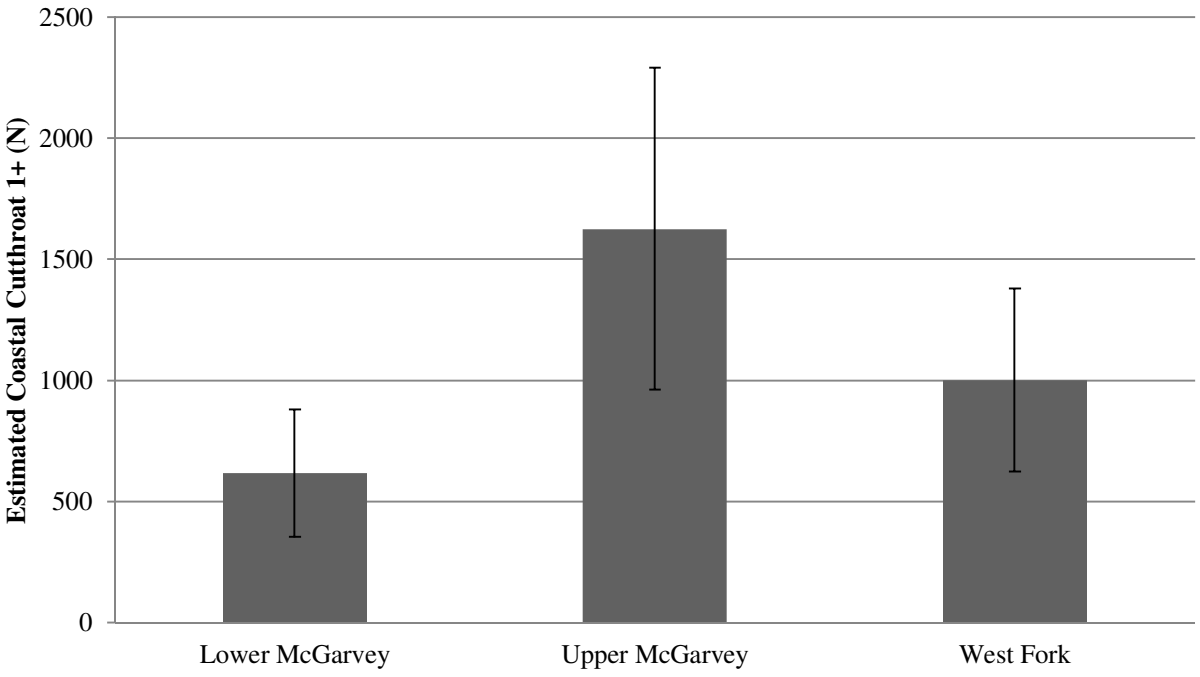

Figure 19. Estimated abundance of 1+ coastal cutthroat in Lower Mainstem, Upper Mainstem, and West Fork McGarvey Creek during 2010.

4.3 Outmigrant Trapping

The results of past sampling efforts in McGarvey Creek indicate that substantial upstream and downstream movement of juvenile salmonids occurs prior to the typically assumed emigration period (spring – early summer). A major component of this project was to compare population estimates between various life stages of each salmonid species to assess survival rates between life stages. To validate such comparisons, it was important to gain a better understanding of the magnitude of fish movement occurring between the summer abundance inventories and spring outmigrant trapping, as well as the extent of non-natal use in McGarvey Creek.

In 2008, YTFP determined that a substantial portion of juvenile coho salmon emigrated downstream as well as substantial numbers of non-natal juvenile coho migrated upstream during fall (YTFP 2009). However, operation of the trap during these months can result in increased trapping mortality due to high flows and large amounts of leaf litter transporting through the system. No salmon or trout were captured in the downstream fyke trap or modified pipe trap deployed during November and December of 2010. YTFP installed the outmigrant trap on January 11, 2011, after a majority of the leaf litter and other detritus had transported downstream and the risk of trap mortality decreased. The trap was run continuously through June, with the exception of a five day period starting on March 17, 2011 and an eleven day span beginning on March 25, 2011 due to high streamflow conditions. Fish capture data and emigration estimates generated from outmigrant trapping efforts conducted between January and June 2011 are summarized in Table 4 and Figure 20.

Table 4. Total number of juvenile salmonids captured by week in the outmigrant trap, McGarvey Creek, Winter – Spring 2011.

	Week Ending	# Days Sampled	Chinook	Trout YOY	Steelhead 1+ & Older	Coho Fry	Coho Yearling	Cutthroat
	Trap installed on 1/11/11 in conjunction with onset of fall rain and resumption of streamflow							
1	16-Jan-11	5	0	0	14	0	1	2
2	23-Jan-11	7	0	0	0	0	0	0
3	30-Jan-11	7	0	0	23	0	0	19
4	06-Feb-11	7	0	0	40	0	1	22
5	13-Feb-11	7	0	0	72	0	3	29
6	20-Feb-11	4	0	0	53	0	1	55
7	27-Feb-11	7	0	0	15	0	2	171
8	06-Mar-11	7	0	0	54	112	12	253
9	13-Mar-11	4	0	0	2	5	3	17
10	20-Mar-11	2	0	0	0	6	0	2
11	27-Mar-11	3	0	0	9	6	13	26
12	03-Apr-11	*Trap not operated due to high flows*						
13	10-Apr-11	6	267	0	90	179	9	159
14	17-Apr-11	7	57	0	100	28	19	135
15	24-Apr-11	4	7	0	38	9	15	135
16	01-May-11	7	37	0	157	23	96	485
17	08-May-11	7	52	0	250	7	66	228
18	15-May-11	7	54	0	54	2	34	73
19	22-May-11	7	85	0	41	0	22	54
20	29-May-11	7	34	0	15	1	5	24
21	05-Jun-11	7	13	0	5	5	6	7
22	12-Jun-11	7	11	0	2	4	2	4
23	19-Jun-11	1	24	0	4	0	3	0
	Trap pulled for year on 6/13/11 due to low flow							
	Total:	91	641	0	1,038	387	313	1,900

The 2010 – 2011 season was the 15th consecutive year that YTFP has conducted spring outmigrant trapping in Lower McGarvey Creek (Figure 21). Relatively consistent numbers of age 1+ and older steelhead and coastal cutthroat trout emigrated past the trap each year (Figure 17). Although coho salmon yearling emigrants were present every year, their estimated numbers varied substantially throughout the 15 year study period. Estimated numbers of emigrant chinook salmon young-of-the-year (YOY) have varied widely over the 15 year study period, with alternating periods of high abundance and extremely low or no abundance observed (Figure 21).

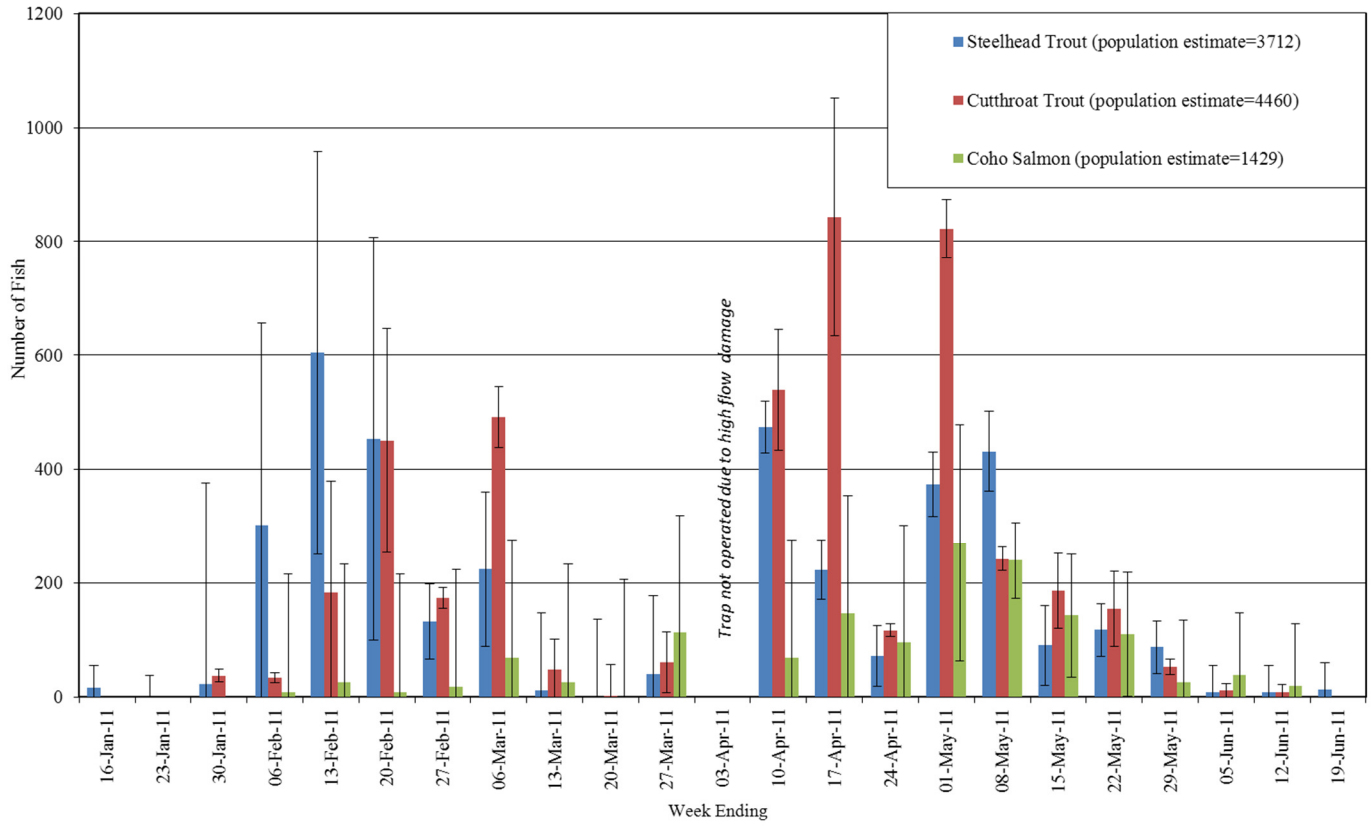

Figure 20. Estimated weekly number (+/- SD) of yearling and older coho salmon, steelhead and coastal cutthroat trout emigrating past the outmigrant trap, McGarvey Creek, Winter – Spring 2011.

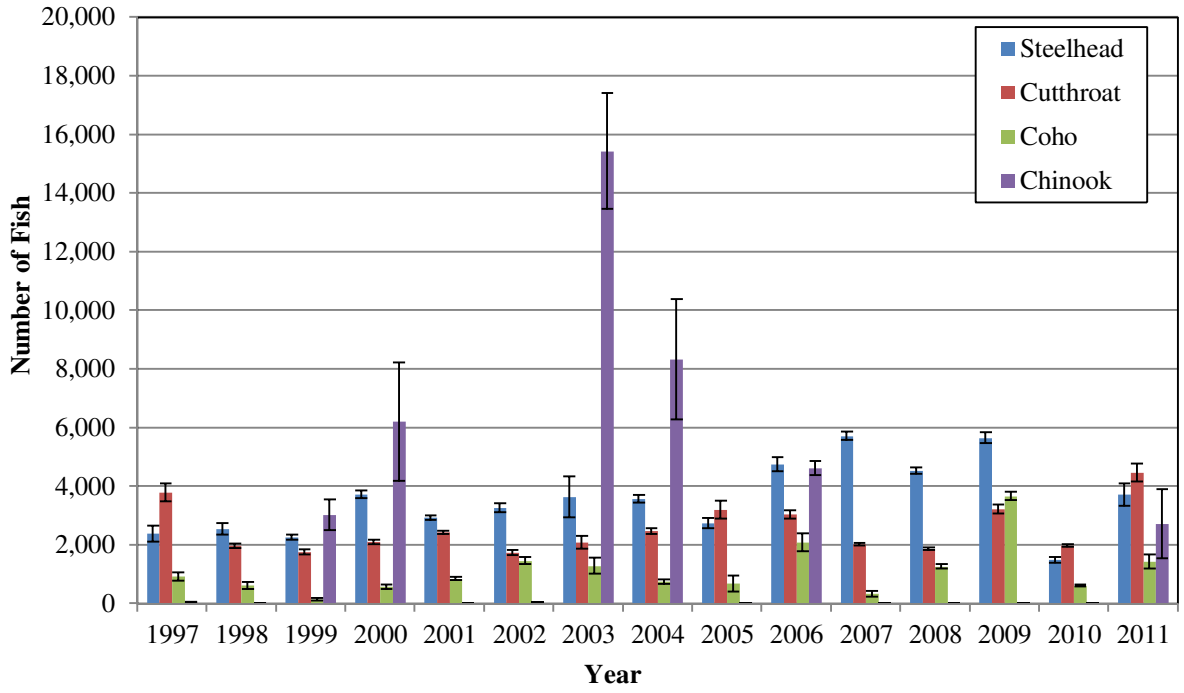

Figure 21. Estimated number of yearling and older steelhead, coastal cutthroat trout, coho salmon and chinook salmon emigrating past the outmigrant trap, McGarvey Creek, 1997 - 2011.

4.3.1 Coho Salmon

A total of 257 coho salmon yearlings were captured during 127 days of sampling between January and June of 2011 (Table 5). During January, only one coho salmon yearling was captured emigrating past the trap site. However, SPI data showed a significant portion of coho salmon yearlings emigrated prior to trap installation (Section 4.5.2). Spring emigration peaked noticeably during the month of May with a lesser peak occurring during the middle of March (Table 5; Figure 22).

Peak weekly capture of emigrating coho yearlings occurred during the week ending May 1, 2011 (n=81). Smaller numbers of emigrating coho were observed throughout the trapping period.

Trap efficiency for coho salmon yearlings during the 2011 trapping season varied between 12 – 30% and was calculated weekly based on trap recaptures (Table 5). Based on these efficiencies, an estimated 1,429 (+/-239) coho salmon yearlings emigrated past the outmigrant trap site and comprised 10% of all age 1+ and older salmonids emigrating past the McGarvey Creek trap during the sampling period.

Table 5. Mark-recapture summary for coho salmon yearlings captured in the outmigrant trap, McGarvey Creek, Winter - Spring 2011.

Mark Period	Week Ending	# of Days Marked	# Captured	# Marked	# Recaptured	Trap Efficiency (%)	Estimated # Outmigrants	Variance	Standard Deviation
Trap installed on 1/11/11 in conjunction with onset of fall rain and resumption of streamflow									
1	16-Jan-11	5	1	0	0	N/A	N/A	N/A	N/A
2	23-Jan-11	7	0	0	0	N/A	N/A	N/A	N/A
3	30-Jan-11	7	0	0	0	N/A	N/A	N/A	N/A
4	06-Feb-11	7	1	1	0	0.12 [1]	9	42,402[P]	205.9[P]
5	13-Feb-11	7	3	3	0	0.12 [1]	26	42,402[P]	205.9[P]
6	20-Feb-11	4	1	1	0	0.12 [1]	9	42,402[P]	205.9[P]
7	27-Feb-11	7	2	2	0	0.12 [1]	17	42,402[P]	205.9[P]
8	06-Mar-11	7	8	8	3	0.12 [1]	69	42,402[P]	205.9[P]
9	13-Mar-11	4	3	2	0	0.12 [1]	26	42,402[P]	205.9[P]
10	20-Mar-11	2	0	0	0	0.12 [1]	0	42,402[P]	205.9[P]
11	27-Mar-11	3	13	11	0	0.12 [1]	113	42,402[P]	205.9[P]
12	03-Apr-11	*trap not operated due to high flow damage*							
13	10-Apr-11	6	8	8	2	0.12 [1]	69	42,402[P]	205.9[P]
14	17-Apr-11	7	17	17	0	0.12 [1]	147	42,402[P]	205.9[P]
15	24-Apr-11	4	11	11	3	0.12 [1]	95	42,402[P]	205.9[P]
16	01-May-11	7	81	81	22	0.30	271	3,179.0	56.4
17	08-May-11	7	57	57	13	0.24	240	1,588	39.9
18	15-May-11	7	22	22	5	0.15 [2]	143	10,089[P]	100.4[P]
19	22-May-11	7	17	17	2	0.15 [2]	111	10,089[P]	100.4[P]
20	29-May-11	7	4	4	1	0.15 [2]	26	10,089[P]	100.4[P]
21	05-Jun-11	7	6	6	0	0.15 [2]	39	10,089[P]	100.4[P]
22	12-Jun-11	7	3	3	0	0.15 [2]	20	10,089[P]	100.4[P]
23	19-Jun-11	1	0	0	0	N/A	N/A	N/A	N/A
Trap operation continued but data summarized through end of funding contract period									
	Totals:	127	258	254	51	0.20	1,429	57,258.0	239.2

[#] - Estimated trap efficiency for pooled marking periods

[P] - Estimated variance and standard deviation for pooled marking periods

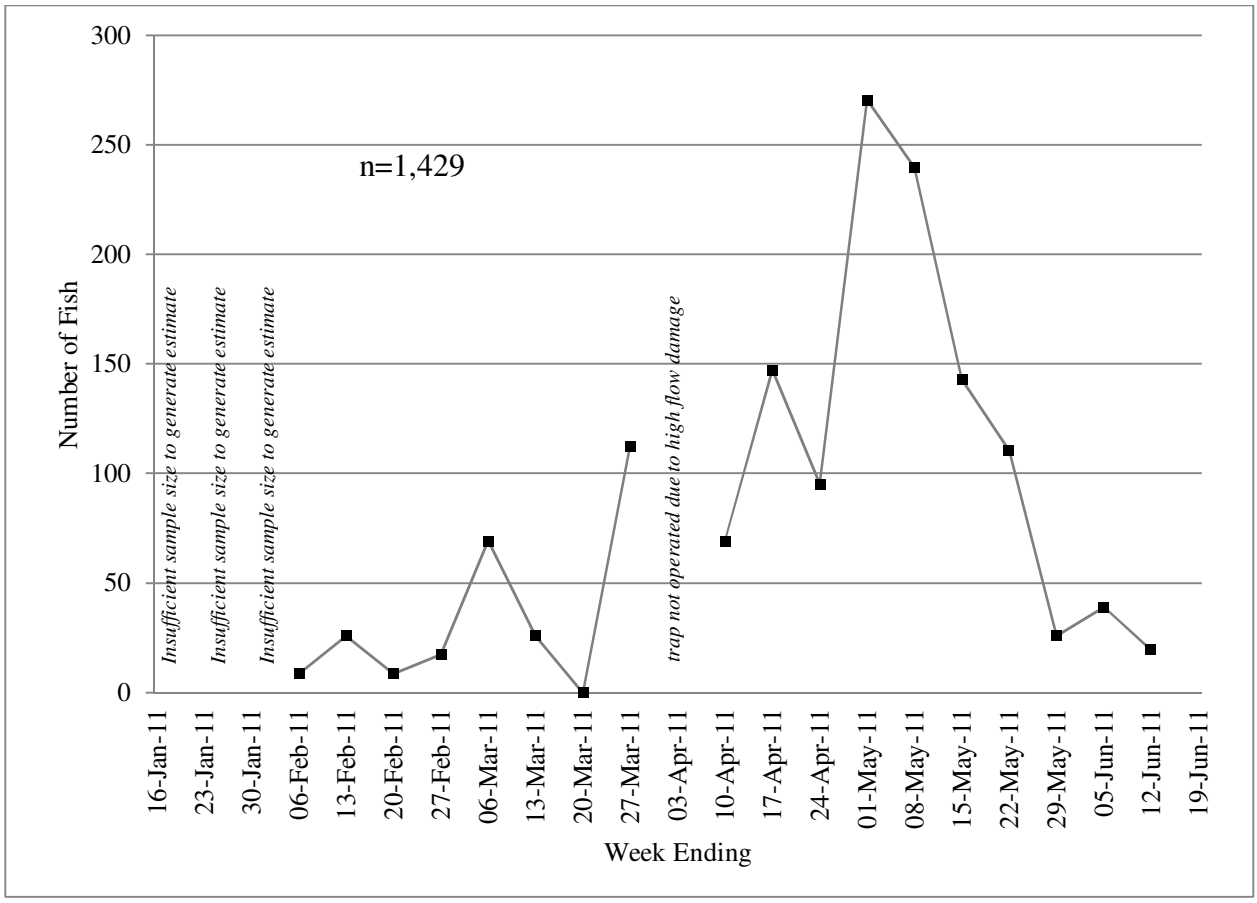

Figure 22. Estimated weekly number of coho salmon yearlings emigrating past the outmigrant trap, McGarvey Creek, Winter - Spring 2011.

Mean weekly fork lengths of coho salmon yearlings ranged from 88 mm (week ending January 16, 2011) to 113 mm (week ending May 8, 2011) (Table 6). Coho yearling size increased gradually throughout the trapping season until mid-May, at which time the average size of captured fish leveled off for the remainder of the spring trapping season (Figure 23).

Coho salmon fry were first captured during the week ending March 6, 2011 (Table 5). The peak weekly capture of coho fry occurred during week ending April 10, 2011 (n=179). Coho fry continued to be captured in small numbers through the end of the trapping season. Mean fork length of captured YOY coho salmon remained relatively stable from when they were initially observed in early March through mid-April, with lengths from 38.2 to 38.4 mm (Table 7). A steady increase in fish length of captured YOY coho was observed throughout the remainder of the trapping season (Figure 24). Mean fork length was largest for YOY coho captured in late June (~63.5 mm) (Table 7).

Table 6. Weekly mean fork length, fork length range, +/- 95% confidence interval, and sample size of coho salmon yearlings captured in the outmigrant trap, McGarvey Creek, Winter – Spring 2011.

Week #	Week Ending	FL (mm)	Range FL (mm)	95% CI	# Sampled
Trap installed on 1/11/11 in conjunction with onset of fall rain and resumption of streamflow					
1	16-Jan-11	88.00	88	-	1
2	23-Jan-11	-	-	-	-
3	30-Jan-11	-	-	-	-
4	06-Feb-11	89.00	89	-	1
5	13-Feb-11	97.67	-	18.74	3
6	20-Feb-11	92.00	92	-	1
7	27-Feb-11	95.00	91 - 99	7.84	2
8	06-Mar-11	89.08	82 - 96	2.81	12
9	13-Mar-11	88.33	80 - 96	9.08	3
10	20-Mar-11	-	-	-	-
11	27-Mar-11	99.62	80 - 116	5.26	13
12	03-Apr-11	*Trap removed due to high flows*			
13	10-Apr-11	101.78	88 - 115	6.62	9
14	17-Apr-11	103.58	83 - 119	4.36	19
15	24-Apr-11	108.87	97 - 127	4.38	15
16	01-May-11	111.33	86 - 136	2.46	96
17	08-May-11	113.06	92 - 142	2.43	66
18	15-May-11	110.76	92 - 123	2.64	34
19	22-May-11	112.27	93 - 125	3.46	22
20	29-May-11	109.40	104 - 115	3.9	5
21	05-Jun-11	112.33	100 - 123	6.57	6
22	12-Jun-11	104.50	102 - 107	4.9	2
23	19-Jun-11	94.00	68 - 109	25.58	3
Trap pulled for year on 6/13/11 due to low flow					

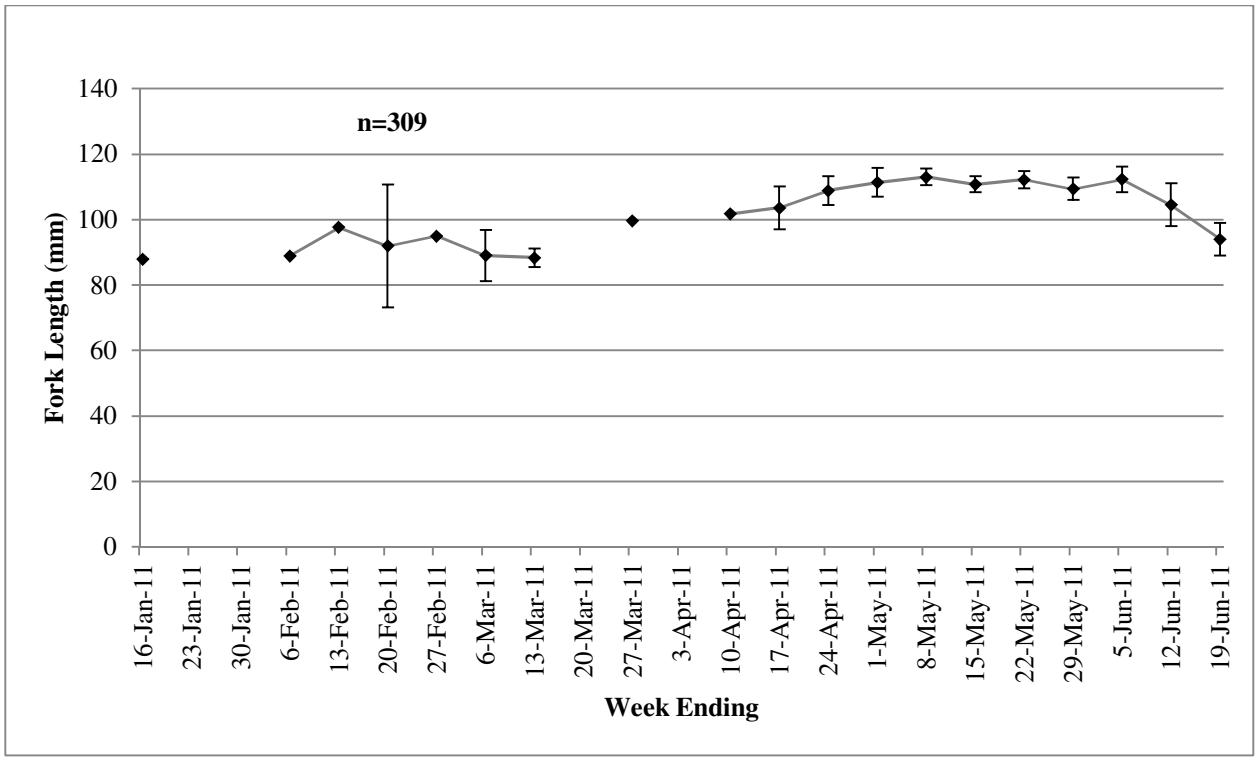

Figure 23. Mean weekly fork length (+/- 95% CI) of coho salmon yearlings sampled in the outmigrant trap, McGarvey Creek, Winter - Spring 2011.

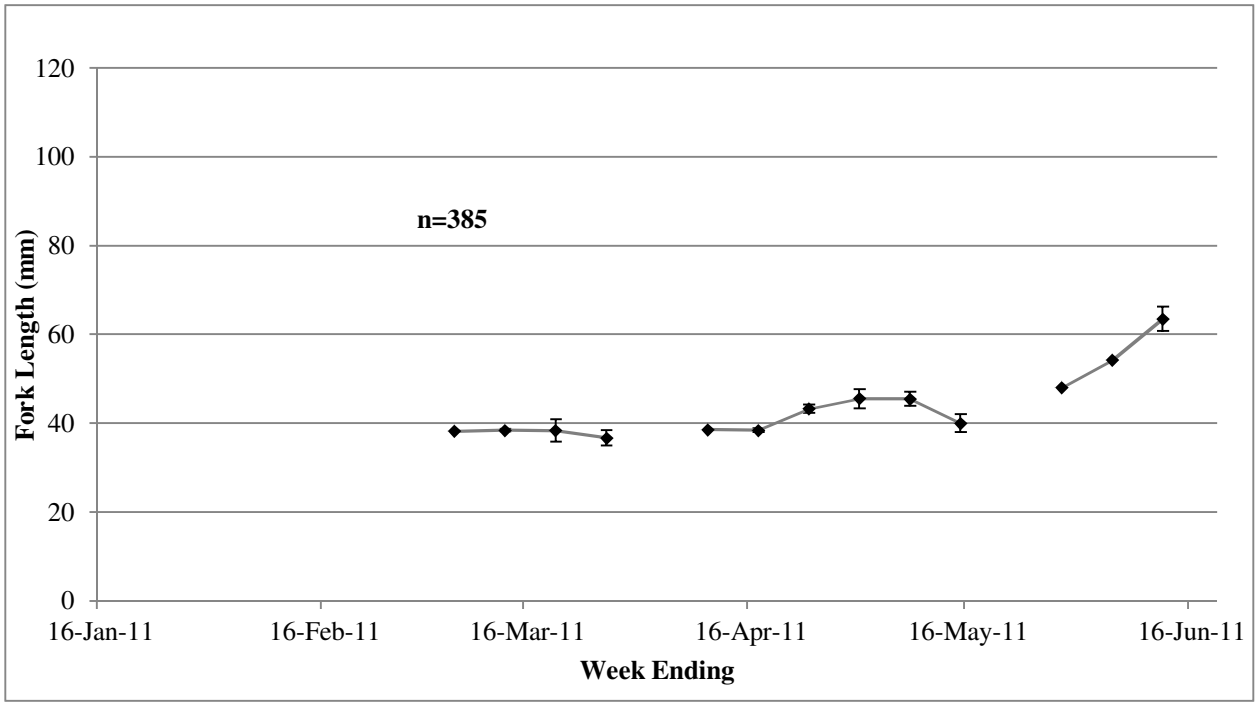

Figure 24. Mean weekly fork length (+/- 95% CI) of young-of-the-year coho salmon sampled in the outmigrant trap, McGarvey Creek, Winter - Spring 2011.

Table 7. Weekly mean fork length, fork length range, +/- 95% confidence interval, and sample size of coho salmon young-of-the-year captured in the outmigrant trap, McGarvey Creek, Winter – Spring 2011.

Week #	Week Ending	FL (mm)	Range FL (mm)	95% CI	# Sampled
Trap installed on 1/11/11 in conjunction with onset of fall rain and resumption of streamflow					
1	16-Jan-11	-	-	-	0
2	23-Jan-11	-	-	-	0
3	30-Jan-11	-	-	-	0
4	06-Feb-11	-	-	-	0
5	13-Feb-11	-	-	-	0
6	20-Feb-11	-	-	-	0
7	27-Feb-11	-	-	-	0
8	06-Mar-11	38.17	34 - 41	0.28	110
9	13-Mar-11	38.40	35 - 42	2.53	5
10	20-Mar-11	38.33	35 - 41	1.73	6
11	27-Mar-11	36.67	35 - 38	0.97	6
12	03-Apr-11	*Trap removed due to high flows*			
13	10-Apr-11	38.56	34 - 50	0.47	108
14	17-Apr-11	38.43	36 - 48	0.89	28
15	24-Apr-11	43.25	40 - 45	2.17	4
16	01-May-11	45.52	37 - 53	1.58	23
17	08-May-11	45.43	40 - 48	2.04	7
18	15-May-11	40.00	34 - 46	11.76	2
19	22-May-11	-	-	-	0
20	29-May-11	48.00	48		1
21	05-Jun-11	54.20	51 - 58	2.73	5
22	12-Jun-11	63.50	54 - 83	12.91	4
23	19-Jun-11	-	-	-	0
Trap pulled for year on 6/13/11 due to low flow					

The estimated number of coho salmon yearlings emigrating during the spring trapping period has varied substantially over the 15 year period of record (Figure 25). Peak spring emigration was documented during 2009 with an estimated 3,660 (+/-145) coho , and the lowest annual emigration estimate was observed in 1999 with 146 (+/-47) age 1+ coho emigrating past the trap site. The 2011 estimate of 1,429 (+/-239) coho yearling emigrants was above the estimated 15-year average of 1,109 (Figure 25). In addition to annual fluctuations in population size, one reason population estimates have varied during the 15 year study period may be due to traps being operated for different period of time. During the majority of the trapping years, the outmigrant trapping season began with the installation of the trap in mid-February and ran through June (Table 8).

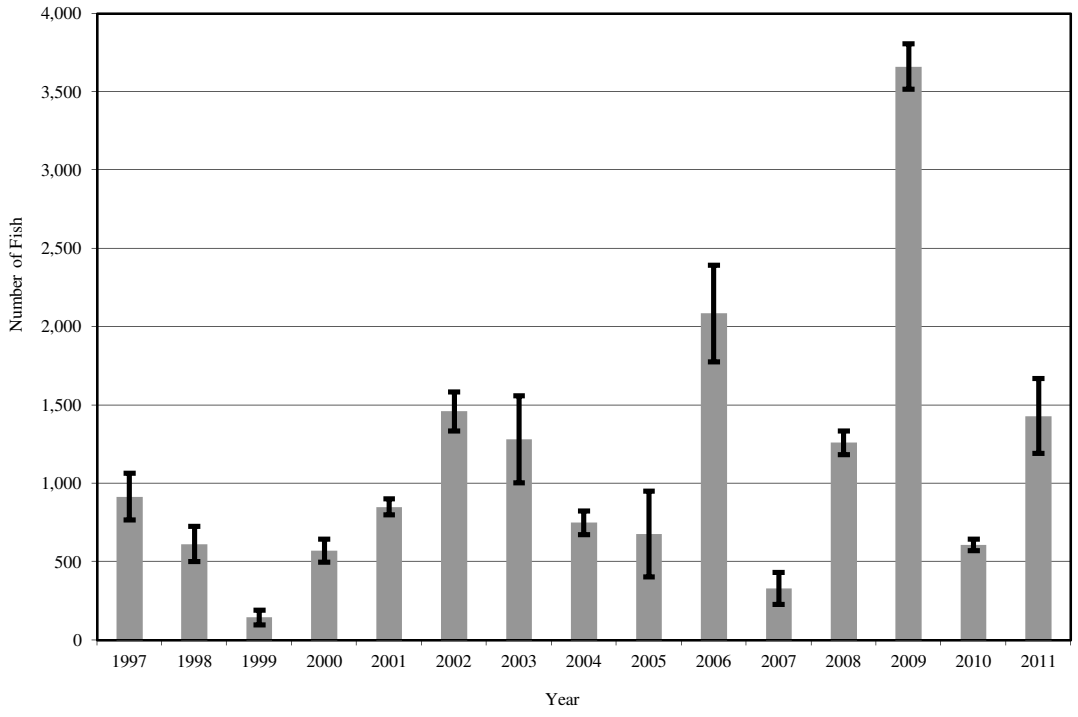

Figure 25. Estimated number (+/- S.D.) of coho salmon yearlings emigrating past the outmigrant trap, McGarvey Creek, 1997 - 2011.

Table 8. McGarvey outmigrant trap operation dates, 1997 - 2011

Year	Start Date	End Date	Year	Start Date	End Date
1997	11-Mar	19-Jun	**2005**	17-Feb	28-Jun
1998	3-Mar	19-Jun	**2006**	22-Feb	25-Jul
1999	18-Feb	24-Jun	**2007**	6-Feb	24-Jul
2000	17-Feb	20-Jul	**2008**	25-Jan	30-Jun
2001	13-Feb	12-Jun	**2009**	22-Jan	25-Jun
2002	12-Feb	1-Jul	**2010**	23-Mar	18-Jun
2003	26-Feb	1-Jul	**2011**	12-Jan	13-Jun
2004	25-Feb	29-Jun			

Uncertainties regarding the magnitude of non-natal upstream migrants and downstream emigrants prior to the annual installation of the outmigrant trap bring into question the comparability of these annual estimates: particularly in regard to whether smolts captured are natal or non-natal origin to McGarvey Creek. PIT tag data recorded on remote stations indicates that coho yearlings move into and out of McGarvey prior to the installation of our outmigrant traps. Future upstream and downstream migrant trapping should be conducted throughout the wet season (October through June) to provide a better understanding of natal and non-natal fish movements outside of the typical spring outmigrant trapping period. Obtaining a better understanding of the magnitude of non-natal rearing and migration patterns outside of the typical smolt emigration period will help us to more effectively develop monitoring approaches within McGarvey Creek. Such information will also provide insight into non-natal migration behaviors for other entities conducting similar monitoring throughout northern California and the Pacific Northwest, especially if this information is being used to compare survival rates between life history stages.

4.3.2 Steelhead Trout

YTFP captured 805 age 1+ steelhead emigrating during 127 days of outmigrant sampling during winter and spring 2011 (Table 8). The peak capture of 172 age 1+ steelhead emigrants occurred during the week ending May 8, 2011, with a smaller peak of 64 steelhead captured in mid-February. No trout fry (brood year 2010) were captured during the sample period (Table 4).

Trapping efficiency for age 1+ and older steelhead fluctuated from 11% to 84% during the trapping season (Table 8). Based on these efficiencies, an estimated 3,712 (**+/-**384) age 1+ steelhead migrated past the McGarvey Creek trap site between late January and June of 2011. Age 1+ steelhead comprised 32% of the overall salmonid emigration documented during the sampling period. Peak emigration occurred during mid-February, with similar-sized peaks occurring during mid-April and early May (Table 8, Figure 26). Emigration subsided for the season by the end of May. Steelhead capture numbers during the first week of the trapping season indicated that a portion of age 1+ and older steelhead had already emigrated prior to trap installation.

Table 9. Mark-recapture summary for age 1+ and older steelhead trout captured in the outmigrant frame net-pipe trap, McGarvey Creek, 2011.

Mark Period	Week Ending	# of Days Marked	# Captured	# Marked	# Recaptured	Trap Efficiency (%)	Estimated # Outmigrants	Variance	Standard Deviation
Trap installed on 1/11/11 in conjunction with onset of fall rain and resumption of streamflow									
1	16-Jan-11	5	14	0	0	0.84 [1]	17	1,466.4[P]	38.3[P]
2	23-Jan-11	7	0	0	0	0.84 [1]	0	1,466.4[P]	38.3[P]
3	30-Jan-11	7	19	19	9	0.84 [1]	23	1,466.4[P]	38.3[P]
4	06-Feb-11	7	32	31	7	0.11 [2]	302	11,7512.8[P]	342.8[P]
5	13-Feb-11	7	64	64	8	0.11 [2]	604	11,7512.8[P]	342.8[P]
6	20-Feb-11	4	48	47	0	0.11 [2]	453	11,7512.8[P]	342.8[P]
7	27-Feb-11	7	14	14	2	0.11 [2]	132	11,7512.8[P]	342.8[P]
8	06-Mar-11	7	45	45	9	0.20	225	3,358.3	58.0
9	13-Mar-11	4	2	0	0	0.17 [3]	12	17,918.1[P]	133.9[P]
10	20-Mar-11	2	0	0	0	0.17 [3]	0	1,7718.1[P]	133.9[P]
11	27-Mar-11	3	7	7	0	0.17 [3]	41	1,7718.1[P]	133.9[P]
12	03-Apr-11	*trap not operated due to high flow damage*							
13	10-Apr-11	6	81	81	17	0.17 [3]	474	1,7718.1[P]	133.9[P]
14	17-Apr-11	7	74	74	25	0.33	224	1113.7	33.4
15	24-Apr-11	4	25	25	14	0.35 [4]	72	2,112.8[P]	46.0[P]
16	01-May-11	7	130	130	40	0.35 [4]	374	2,112.8[P]	46.0[P]
17	08-May-11	7	172	172	65	0.40	432	1,573.0	39.7
18	15-May-11	7	27	27	5	0.30 [5]	91	1,166.2[P]	34.2[P]
19	22-May-11	7	35	35	12	0.30 [5]	117	1,166.2[P]	34.2[P]
20	29-May-11	7	9	9	1	0.22 [6]	87	1002.0[P]	31.7[P]
21	05-Jun-11	7	2	2	0	0.22 [6]	9	1002.0[P]	31.7[P]
22	12-Jun-11	7	2	2	0	0.22 [6]	9	1002.0[P]	31.7[P]
23	19-Jun-11	1	3	0	0	0.22 [6]	14	1002.0[P]	31.7[P]
Trap removed 6/13/2011 due to low flows									
	Totals:	127	805	784	214	0.27	3,712	147,223.3	383.7

[#] - Estimated trap efficiency for pooled marking periods

[p] - Estimated variance and standard deviation for pooled marking periods

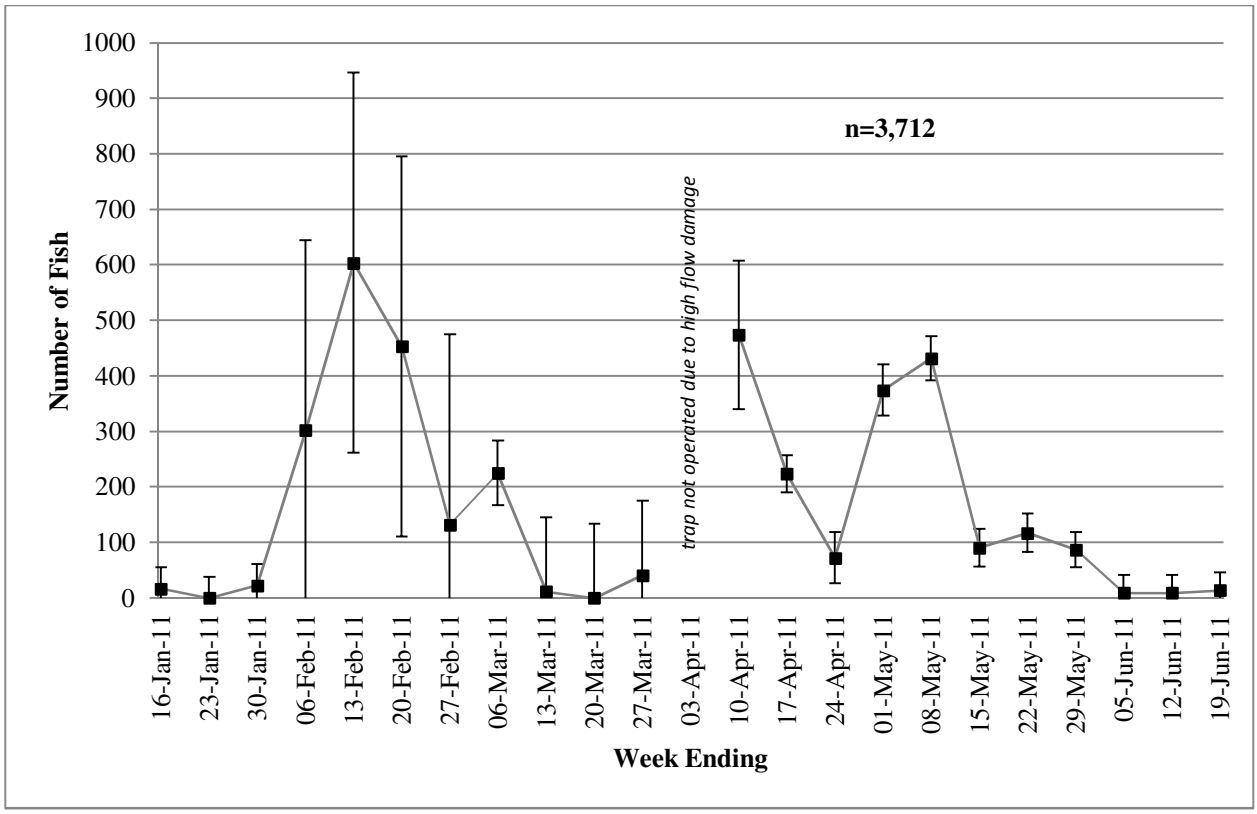

Figure 26. Estimated weekly number (+/- SD) of age 1+ and older steelhead trout emigrating past the outmigrant trap, McGarvey Creek, Winter - Spring 2011.

No YOY trout (coastal cutthroat or steelhead) were captured during late winter-spring 2011 outmigrant trapping (Table 4). One adult steelhead was observed during spawning surveys in McGarvey Creek during winter 2010 - spring 2011. Given that numerous adult cutthroat were observed on a presumed spawning migration during this time period, it seems likely that trout fry would have been captured in the trap. The lack of trout fry during the season was likely more related to a lack of successful steelhead and cutthroat redds located in close proximity of the trap site than it is necessarily an indicator of low spawning abundance or success in the drainage.

Mean weekly fork length of age 1+ and older steelhead peaked at 157 mm during mid-February and gradually decreased until early April, after which time it remained between or near 91 – 110 mm for the remainder of the season (Table 9, Figure 27). Larger smolts (> 170mm) captured during the first half of the trapping season were presumed to be almost exclusively non-natal fish that had immigrated into the system earlier in the fall or early winter. YTFP has routinely observed large numbers of steelhead smolts suddenly present in the creek following fall and early winter freshets, yet virtually all of the trout observed during summer juvenile abundance inventories were YOY. Future monitoring of upstream migrant traps and additional PIT tagging of juvenile steelhead is necessary to improve our understanding of the relative composition of natal vs. non-natal steelhead juveniles in the watershed.

Table 10. Weekly mean fork length, fork length range, +/- 95% confidence interval, and sample size of age 1+ and older steelhead captured in the outmigrant trap, McGarvey Creek, 2011.

Week #	Week Ending	FL (mm)	Range FL (mm)	+/- 95% CI	# Sampled
Trap installed on 1/11/11 in conjunction with onset of fall rain and resumption of streamflow					
1	16-Jan-11	145.0	82 - 218	30.87	14
2	23-Jan-11	-	-	-	-
3	30-Jan-11	119.3	73 - 211	18.11	23
4	06-Feb-11	128.2	64 - 224	15.26	40
5	13-Feb-11	156.5	72 - 289	11.81	72
6	20-Feb-11	157.0	73 - 237	13.53	53
7	27-Feb-11	122.9	83 - 195	22.24	15
8	06-Mar-11	142.4	73 - 219	11.84	54
9	13-Mar-11	97.0	80 - 114	33.32	2
10	20-Mar-11	-	-	-	-
11	27-Mar-11	134.3	97 - 210	23.28	9
12	03-Apr-11	*Trap removed due to high flows*			
13	10-Apr-11	102.1	76 - 173	3.28	90
14	17-Apr-11	109.2	80 - 205	4.43	100
15	24-Apr-11	110.9	85 - 157	5.24	38
16	01-May-11	109.2	76 - 260	3.66	157
17	08-May-11	103.5	78 - 132	1.52	250
18	15-May-11	104.3	78 - 132	3.73	54
19	22-May-11	91.0	86 - 131	3.27	41
20	29-May-11	109.3	88 - 125	5.08	15
21	05-Jun-11	102.4	89 - 125	13.14	5
22	12-Jun-11	101.0	98 - 104	5.88	2
23	19-Jun-11	106.8	85 - 137	21.45	4
Trap pulled for year on 6/13/11 due to low flow					

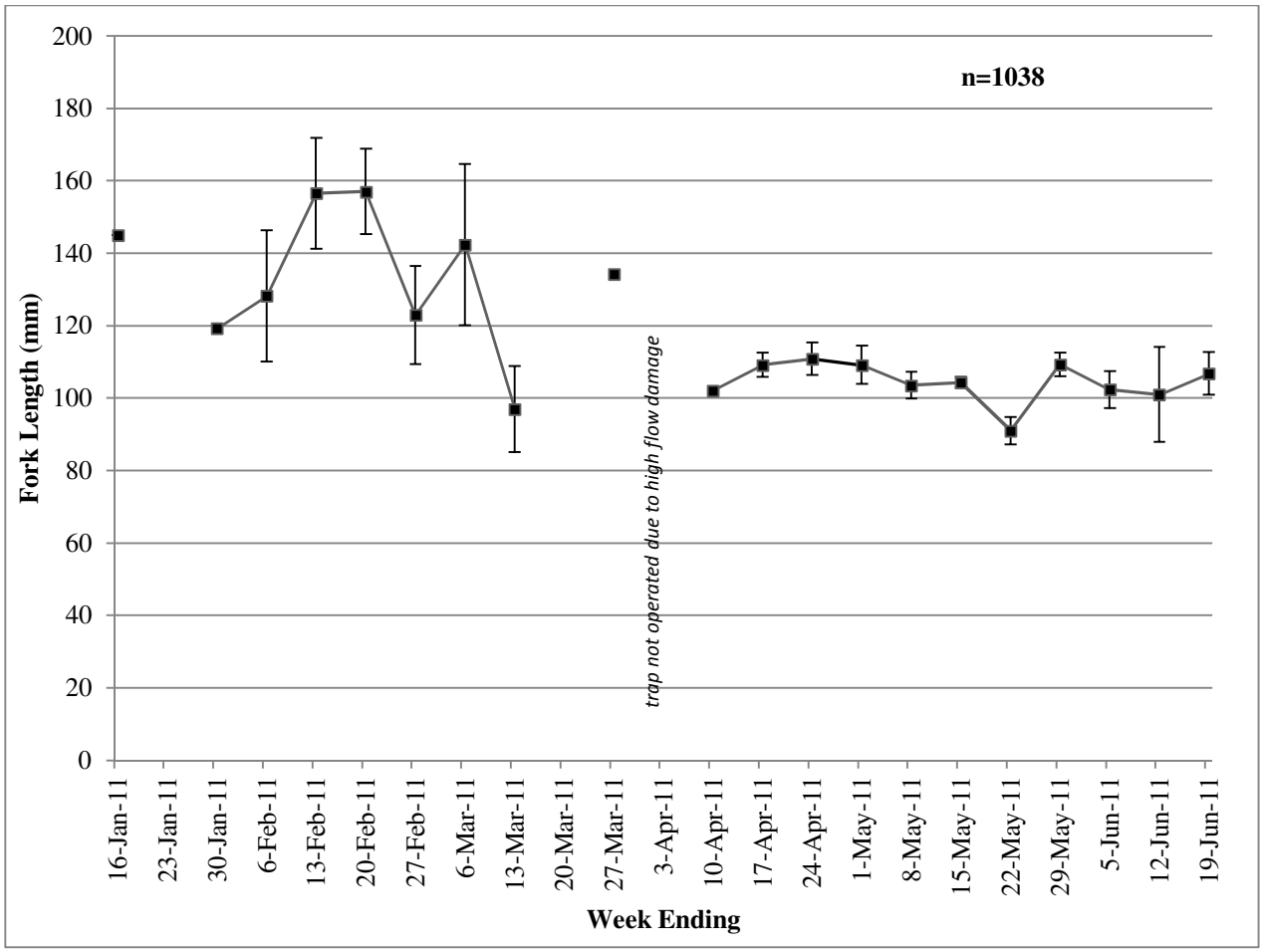

Figure 27. Mean weekly fork length (+/- 95% CI) of age 1+ and older steelhead trout sampled in the outmigrant trap, McGarvey Creek, 2011.

The estimated number of age 1+ and older steelhead emigrating past the McGarvey outmigrant trap during the spring trapping period showed a gradual increase from 1997 through 2009 (Figure 28). Peak spring emigration of 5,716 (+/- 148) steelhead was documented during 2007, while the lowest annual emigration estimate of 1,488 fish (+/-92) occurred in 2010. The estimated number of 1+ steelhead emigrants for 2011 was 3,712 (+/-384), which was near the 15 year average of 3,525 over the period of record (Figure 28). However, as was noted for coho salmon yearlings (see section 4.3.1), differences in trapping intervals over the 15 year period (1997 - 2011) and uncertainties regarding the magnitude and annual variability in both unknown origin upstream migrants and emigration occurring prior to outmigrant trap installation confound our ability to compare annual estimates and assess population trends of steelhead natal to McGarvey Creek over time. It is important that trapping activities continue to be expanded in the watershed to allow for further quantification of upstream and downstream migrants throughout the migration season (fall – early summer).

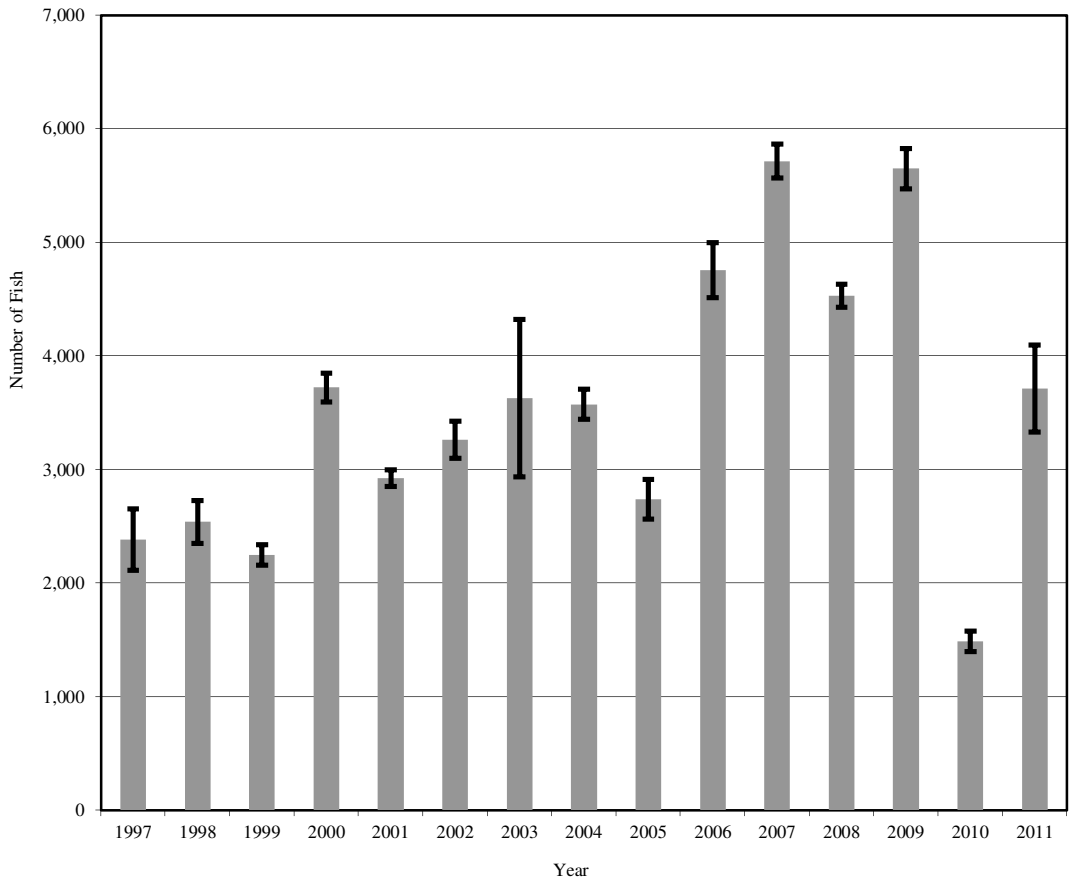

Figure 28. Estimated number (+/- S.D.) of age 1+ and older steelhead emigrating past the outmigrant trap site, McGarvey Creek, 1997 - 2011.

4.3.3 Coastal Cutthroat Trout

A total of 1,385 age 1+ and older coastal cutthroat trout were captured during the 2011 outmigrant sampling period (January 12 – June 13) (Table 10). The peak weekly capture of age 1+ and older cutthroat emigrants occurred during the week ending May 1, 2011 (n=348). As mentioned previously, no trout fry were captured during the 2011 spring emigration sampling.

Trapping efficiency for age 1+ and older cutthroat fluctuated between 12% and 76% during the trapping season (Table 10). Based on these efficiencies, an estimated 4,460 (**+/-**434) age 1+ cutthroat migrated past the McGarvey Creek trap site between late winter and spring 2011. Coastal cutthroat trout comprised 58% of the overall salmonid emigration during the sampling period. Even though peak capture of cutthroat trout was observed during the week ending May 1, 2011, peak emigration was estimated to occur during mid-April (Table 10, Figure 29).

Emigration subsided for the season by the middle of June, with only four age 1+ cutthroat captured during the remaining two weeks of the trapping season. Relatively small but consistent numbers of cutthroat were estimated to be emigrating past the trap site during the first two weeks of sampling (Table 10, Figure 29). Results observed during this study and in previous years indicate that cutthroat were also exhibiting emigration behavior in McGarvey Creek prior to the typical outmigrant trapping season (Table 10, Figure 29).

Table 11. Mark-recapture summary for age 1+ and older coastal cutthroat trout captured in the outmigrant trap, McGarvey Creek, 2011.

Mark Period	Week Ending	# of Days Marked	# Captured	# Marked	# Recaptured	Trap Efficiency (%)	Estimated # Outmigrants	Variance	Standard Deviation
	Trap installed on 1/11/11 in conjunction with onset of fall rain and resumption of streamflow								
1	16-Jan-11	5	2	0	0	N/A	N/A	N/A	N/A
2	23-Jan-11	7	0	0	0	N/A	N/A	N/A	N/A
3	30-Jan-11	7	15	15	6	0.40	38	118.1	10.7
4	06-Feb-11	7	16	15	7	0.47	34	71.3	8.4
5	13-Feb-11	7	22	22	6	0.12 [1]	183	38,662.4[P]	196.6[P]
6	20-Feb-11	4	54	53	3	0.12 [1]	450	38,662.4[P]	196.6[P]
7	27-Feb-11	7	112	112	66	0.64	174	62.3	7.9
8	06-Mar-11	7	176	175	68	0.36 [2]	491	2,584.1[P]	50.8[P]
9	13-Mar-11	4	17	5	0	0.36 [2]	47	2,854.1[P]	53.4[P]
10	20-Mar-11	2	1	0	0	0.36 [2]	3	2,854.1[P]	53.4[P]
11	27-Mar-11	3	22	21	4	0.36 [2]	61	2,854.1[P]	53.4[P]
12	03-Apr-11			*trap not operated due to high flow damage*					
13	10-Apr-11	6	137	137	32	0.25	540	5513.7	74.3
14	17-Apr-11	7	111	111	17	0.13	843	37854.9	194.6
15	24-Apr-11	4	89	87	60	0.76	117	4.2	2.1
16	01-May-11	7	348	346	148	0.42	822	2287.4	47.8
17	08-May-11	7	144	144	80	0.59	243	421.1	20.5
18	15-May-11	7	47	47	6	0.25 [3]	186	3,133.6[P]	60.4[P]
19	22-May-11	7	39	39	17	0.25 [3]	155	3,133.6[P]	60.4[P]
20	29-May-11	7	24	24	13	0.45 [4]	53	97.1[P]	9.9[P]
21	05-Jun-11	7	5	3	1	0.45 [4]	11	97.1[P]	9.9[P]
22	12-Jun-11	7	4	4	0	0.45 [4]	9	97.1[P]	9.9[P]
23	19-Jun-11	1	0	0	0	N/A	N/A	N/A	N/A
	Trap removed 6/13/2011 due to low flows								
	Totals:	127	1385	1360	534	0.39	4,460	90,810.2	301.3

[#] - Estimated trap efficiency for pooled marking periods

[p] - Estimated variance and standard deviation for pooled marking periods

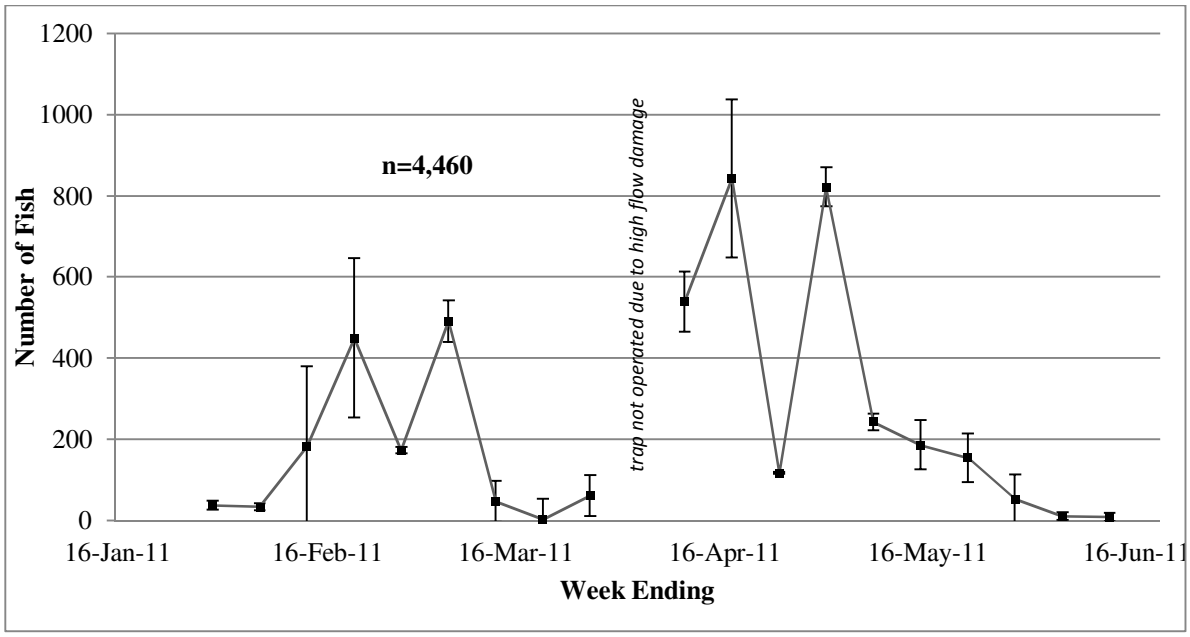

Figure 29. Estimated weekly number (+/- SD) of age 1+ and older coastal cutthroat trout emigrating past the outmigrant trap, McGarvey Creek, Winter - Spring 2011.

Mean weekly fork length of age 1+ and older cutthroat peaked between January and mid-February, with lengths ranging from 132.1 to 227.9 mm. Beginning in April, fork length measurements decreased over the remainder of the trapping season and ranged from 106 to 136 mm (Table 11, Figure 30). The larger mean size and wider range in sizes observed during the first four weeks of the trapping season through mid-February was primarily due to the increased presence of larger adults (presumably moving into the system to spawn) during this time period. After early March, capture data for cutthroat showed a decrease in mean size and a narrower size range, indicating that these fish were likely emigrating and natal to McGarvey Creek. The presence over the years of some smaller fish seemingly ripening and on a spawning migration confound YTFP's ability to readily partition emigrating juveniles from less predictable adult migrants simply based on size.

Table 12. Weekly mean fork length, fork length range, +/- 95% confidence interval, and sample size of age 1+ and older coastal cutthroat trout captured in the outmigrant trap, McGarvey Creek, 2011.

Week #	Week Ending	FL (mm)	Range FL (mm)	+/- 95% CI	# Sampled
Trap installed on 1/11/11 in conjunction with onset of fall rain and resumption of streamflow					
1	16-Jan-11	218.0	136 - 300	160.72	2
2	23-Jan-11	-	-	-	0
3	30-Jan-11	132.1	77 - 342	40.03	19
4	06-Feb-11	171.6	74 - 342	39.78	22
5	13-Feb-11	227.9	83 - 350	28.9	29
6	20-Feb-11	131.6	80 - 318	13.02	55
7	27-Feb-11	114.4	72 - 268	3.86	171
8	06-Mar-11	120.0	75 - 258	3.86	192
9	13-Mar-11	113.7	82 - 150	8.87	17
10	20-Mar-11	137.0	110 - 164	52.92	2
11	27-Mar-11	164.0	82 - 387	30.85	26
12	03-Apr-11	*Trap removed due to high flows*			
13	10-Apr-11	136.0	89 - 253	4.47	159
14	17-Apr-11	130.0	82 - 257	4.05	123
15	24-Apr-11	130.8	94 - 266	4.73	135
16	01-May-11	127.7	91 - 260	3.74	185
17	08-May-11	121.7	94 - 268	2.29	226
18	15-May-11	118.8	75 - 180	3.48	73
19	22-May-11	131.1	96 - 267	7.70	54
20	29-May-11	136.8	98 - 246	15.72	24
21	05-Jun-11	135.4	98 - 201	23.4	7
22	12-Jun-11	106.0	73 - 125	22.32	4
23	19-Jun-11	-	-	-	0
Trap pulled for year on 6/13/11 due to low flow					

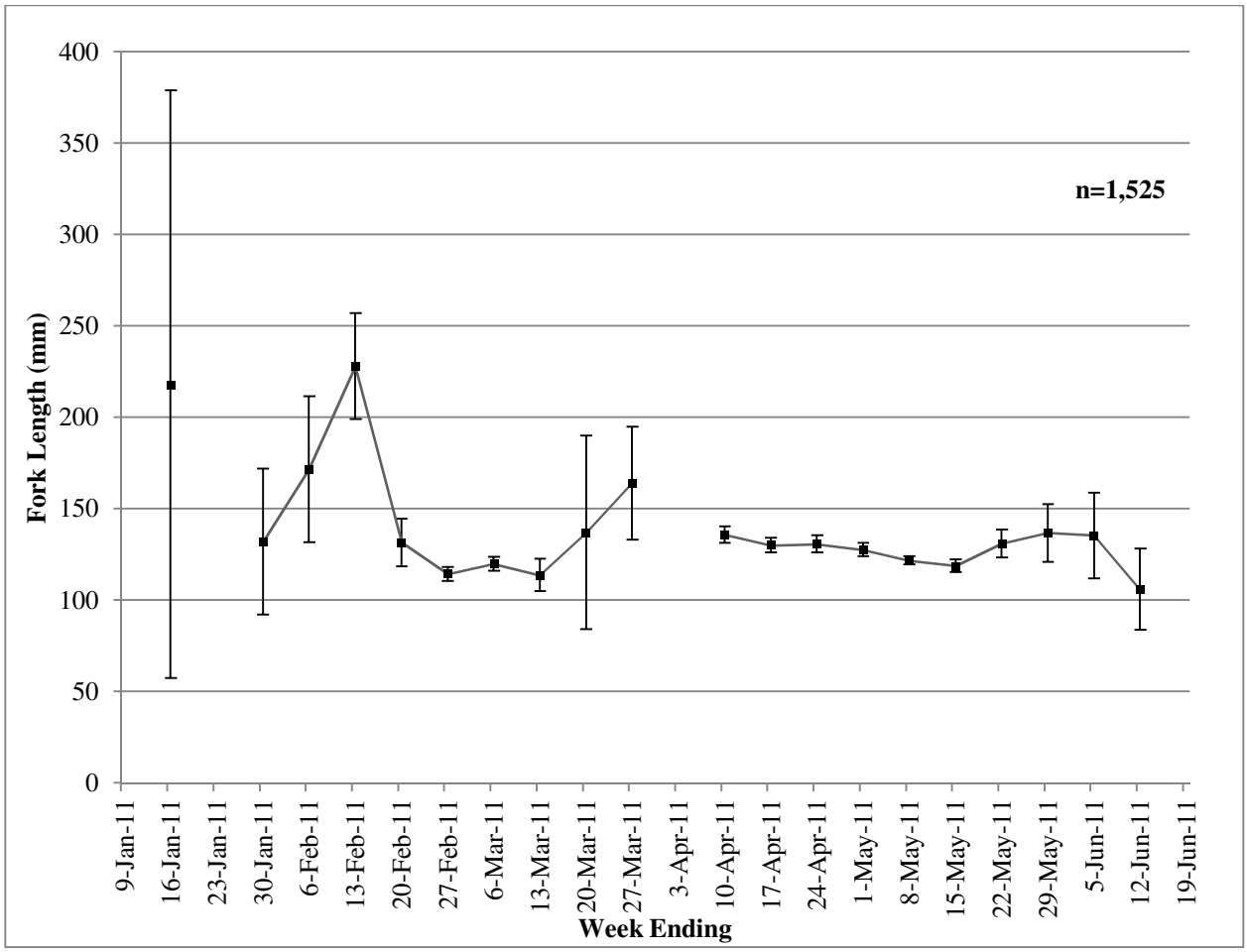

Figure 30. Mean weekly fork length (+/- 95% CI) of age 1+ and older coastal cutthroat trout sampled in the outmigrant trap, McGarvey Creek, 2011.

The estimated number of age 1+ and older cutthroat emigrating during the spring trapping period has fluctuated over the 15 year period of record (Figure 31). Prior to the 2010/2011 trapping season, peak annual emigration of 3,784 cutthroat (+/- 300) was documented during 1997, while the lowest annual emigration estimate of 1,735 (+/- 78) was documented in 2002. An estimated 4,460 (+/- 434) age 1+ and older cutthroat emigrated from McGarvey during the 2010/2011 outmigrant trapping period.

As was noted for coho and steelhead emigrants (see section 4.3.1.1 and 4.3.2.1), there are uncertainties regarding the magnitude and annual variability in migrants of unknown origin as well as emigration occurring prior to the annual installation of the outmigrant trap. These variables bring into question the comparability of these annual estimates for the purposes of estimating juvenile production from the system and assessing salmonid population trends over time. Other difficulties confounding monitoring coastal cutthroat includes distinguishing sexually mature adults from sexually immature juveniles and the corresponding behavioral differences exhibited by these two life stages. However, extensive use of the watershed by adult and juvenile cutthroat (natal and non-natal) emphasizes the importance of this system to

populations from throughout the Lower Klamath Sub-basin. It is important that trapping activities continue to be expanded to improve our ability to quantify upstream and downstream migrants throughout the wet season and increase the accuracy of annual smolt production estimates.

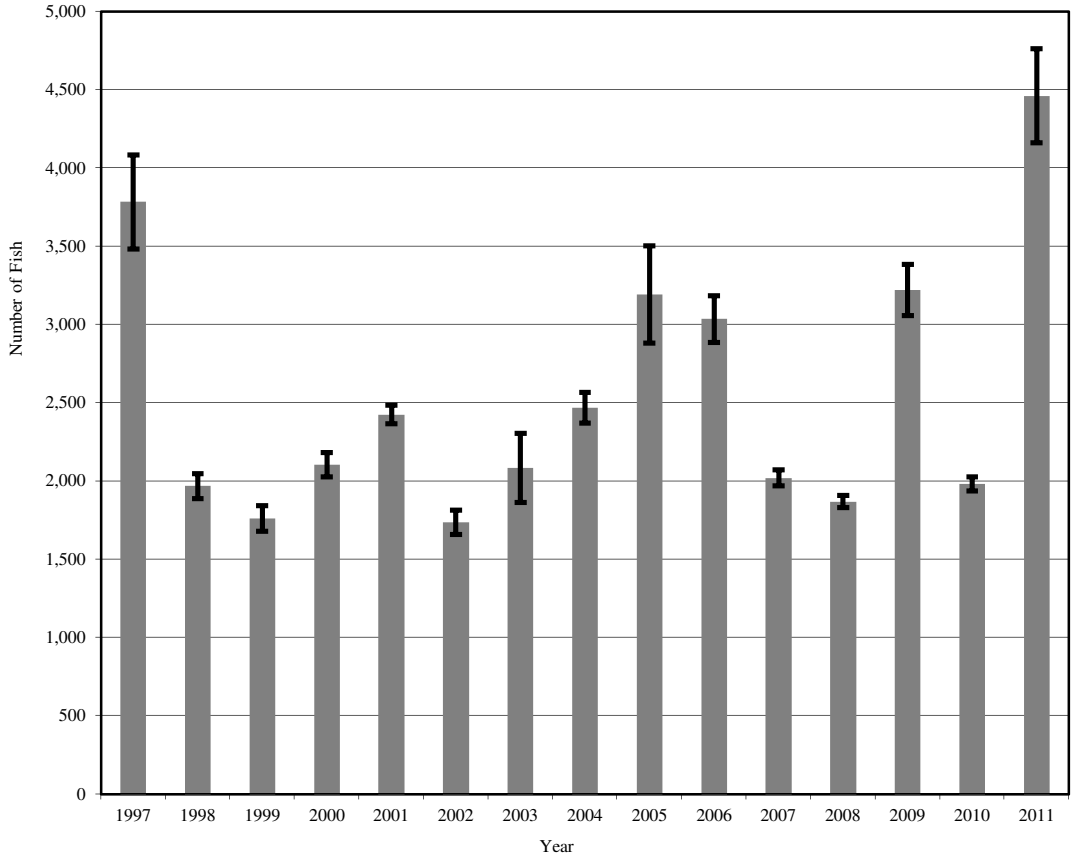

Figure 31. Estimated number (+/- S.D.) of age 1+ and older coastal cutthroat trout emigrating past the outmigrant trap, McGarvey Creek, 1997 - 2011.

4.3.4 Chinook Salmon

The estimated number of chinook salmon YOY emigrating during the spring trapping period varied widely over the 15 year period of record (1997 – 2011). Estimates have varied from relatively high abundance to years with extremely low or no abundance observed throughout the study period (Figure 32). The peak emigration estimate occurred in 2003, with 15,433 outmigrants, and very few or no outmigrants observed in 1997, 1998, 2001, 2002, 2005, and 2007 – 2010. Emigrant abundance of juvenile chinook in McGarvey Creek appears directly correlated with adult spawner presence the previous fall. YTFP has not detected any evidence of non-natal rearing by juvenile chinook in McGarvey Creek. However, they may rear in habitats located closer to the confluence with the Klamath River.

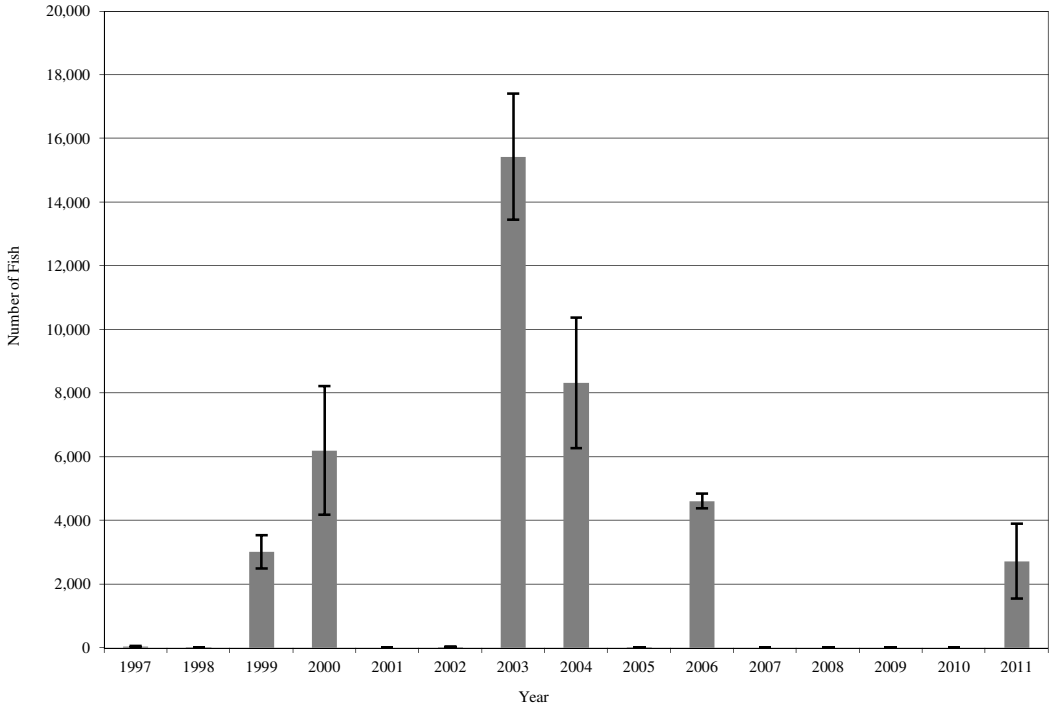

Figure 32. Estimated number of young-of-the-year chinook salmon emigrating past the outmigrant trap, McGarvey Creek, 1997 - 2011.

YTFP captured a total of 544 chinook YOY during the 2011 outmigrant sampling period (January 12 through June 13), which have not been captured in McGarvey Creek since 2006 (Table 12). The estimated number of chinook YOY emigrating through spring 2011 was 2,724 (+/-1,176). The peak weekly estimate of emigrating chinook YOY was 1,058 and occurred during the week ending April 10, 2011. Emigrating chinook YOY remained relatively consistent in early May, then slowly declined through the end of the trapping season (Figure 33).

Table 13. Mark-recapture summary for chinook salmon young-of-the-year captured in the outmigrant trap, McGarvey Creek, 2011.

Mark Period	Week Ending	# of Days Marked	# Captured	# Marked	# Recaptured	Trap Efficiency (%)	Estimated # Outmigrants	Variance	Standard Deviation
	Trap installed on 1/11/11 in conjunction with onset of fall rain and resumption of streamflow								
1	16-Jan-11	5	0	0	0	N/A	N/A	N/A	N/A
2	23-Jan-11	7	0	0	0	N/A	N/A	N/A	N/A
3	30-Jan-11	7	0	0	0	N/A	N/A	N/A	N/A
4	06-Feb-11	7	0	0	0	N/A	N/A	N/A	N/A
5	13-Feb-11	7	0	0	0	N/A	N/A	N/A	N/A
6	20-Feb-11	4	0	0	0	N/A	N/A	N/A	N/A
7	27-Feb-11	7	0	0	0	N/A	N/A	N/A	N/A
8	06-Mar-11	7	0	0	0	N/A	N/A	N/A	N/A
9	13-Mar-11	4	0	0	0	N/A	N/A	N/A	N/A
10	20-Mar-11	2	0	0	0	N/A	N/A	N/A	N/A
11	27-Mar-11	3	0	0	0	N/A	N/A	N/A	N/A
12	03-Apr-11		*trap not operated due to high flow damage*						
13	10-Apr-11	6	177	0	0	0.17 [1]	1058	1,392,103.8[P]	1179.9[P]
14	17-Apr-11	7	57	0	0	0.17 [1]	341	1,392,103.8[P]	1179.9[P]
15	24-Apr-11	4	6	0	0	0.17 [1]	36	1,392,103.8[P]	1179.9[P]
16	01-May-11	7	47	0	0	0.17 [1]	281	1,392,103.8[P]	1179.9[P]
17	08-May-11	7	51	13	0	0.17 [1]	305	1,392,103.8[P]	1179.9[P]
18	15-May-11	7	53	24	9	0.17 [1]	317	1,392,103.8[P]	1179.9[P]
19	22-May-11	7	61	55	23	0.38	160	751.8	27.4
20	29-May-11	7	47	47	34	0.76	62	35.9	6.0
21	05-Jun-11	7	15	13	2	0.27 [2]	55	3,180[P]	56.4[P]
22	12-Jun-11	7	9	9	4	0.27 [2]	33	3,180[P]	56.4[P]
23	19-Jun-11	1	21	0	0	0.27 [2]	77	3,180[P]	56.4[P]
	Trap operation continued but data summarized through end of funding contract period								
	Totals:	127	544	161	72	0.45	2,723	1,396,071.5	1181.5

[#] - Estimated trap efficiency for pooled marking periods

[p] - Estimated variance and standard deviation for pooled marking periods

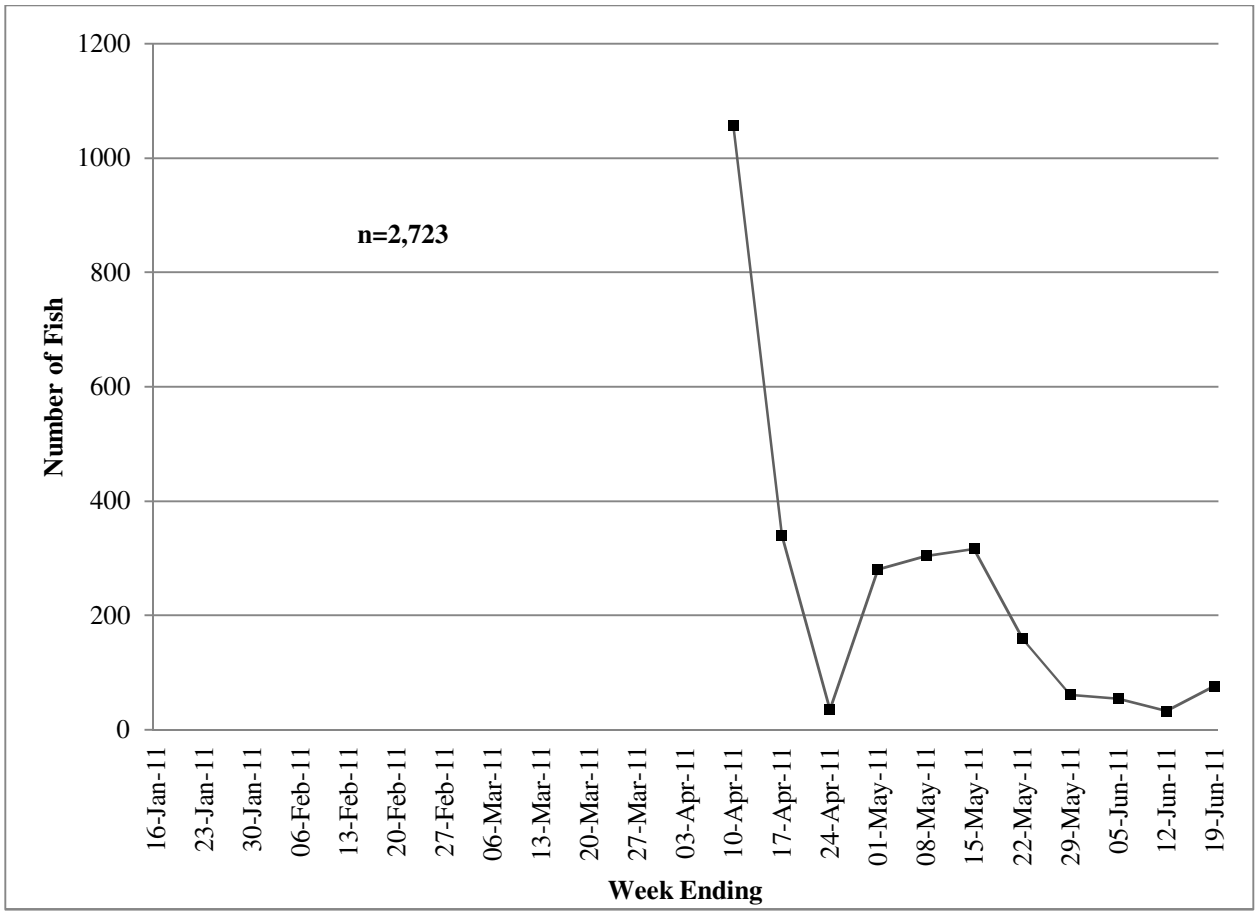

Figure 33. Estimated weekly number of chinook salmon young-of-the-year emigrating past the outmigrant trap, McGarvey Creek, Winter - Spring 2011.

Mean fork length of captured YOY chinook salmon remained relatively stable for the first few weeks of April, ranging from 40.3 to 40.8 mm (Table 13). A steady increase in length of captured YOY chinook was observed throughout the remainder of the trapping season (Figure 34). Mean fork length of YOY chinook was greatest for fish captured in late June at 64.1 mm (Table 13).

Table 14. Weekly mean fork length, fork length range, +/- 95% confidence interval, and sample size of chinook salmon captured in the outmigrant trap, McGarvey Creek, Winter – Spring 2011.

Week #	Week Ending	FL (mm)	Range FL (mm)	+/- 95% CI	# Sampled
Trap installed on 1/11/11 in conjunction with onset of fall rain and resumption of streamflow					
1	16-Jan-11	-	-	-	0
2	23-Jan-11	-	-	-	0
3	30-Jan-11	-	-	-	0
4	06-Feb-11	-	-	-	0
5	13-Feb-11	-	-	-	0
6	20-Feb-11	-	-	-	0
7	27-Feb-11	-	-	-	0
8	06-Mar-11	-	-	-	0
9	13-Mar-11	-	-	-	0
10	20-Mar-11	-	-	-	0
11	27-Mar-11	-	-	-	0
12	03-Apr-11	*Trap removed due to high flows*			
13	10-Apr-11	40.3	39 - 42	0.09	223
14	17-Apr-11	40.8	32 - 45	0.46	57
15	24-Apr-11	44.7	43 - 47	1.26	7
16	01-May-11	46.3	40 - 53	0.99	37
17	08-May-11	49.0	32 - 58	0.98	52
18	15-May-11	53.5	45 - 60	1.03	54
19	22-May-11	57.2	49 - 69	0.85	85
20	29-May-11	56.7	45 - 67	1.62	34
21	05-Jun-11	58.2	49 - 72	3.21	13
22	12-Jun-11	60.9	54 - 66	2.39	11
23	19-Jun-11	64.1	47 - 79	2.9	24
Trap pulled for year on 6/13/11 due to low flow					

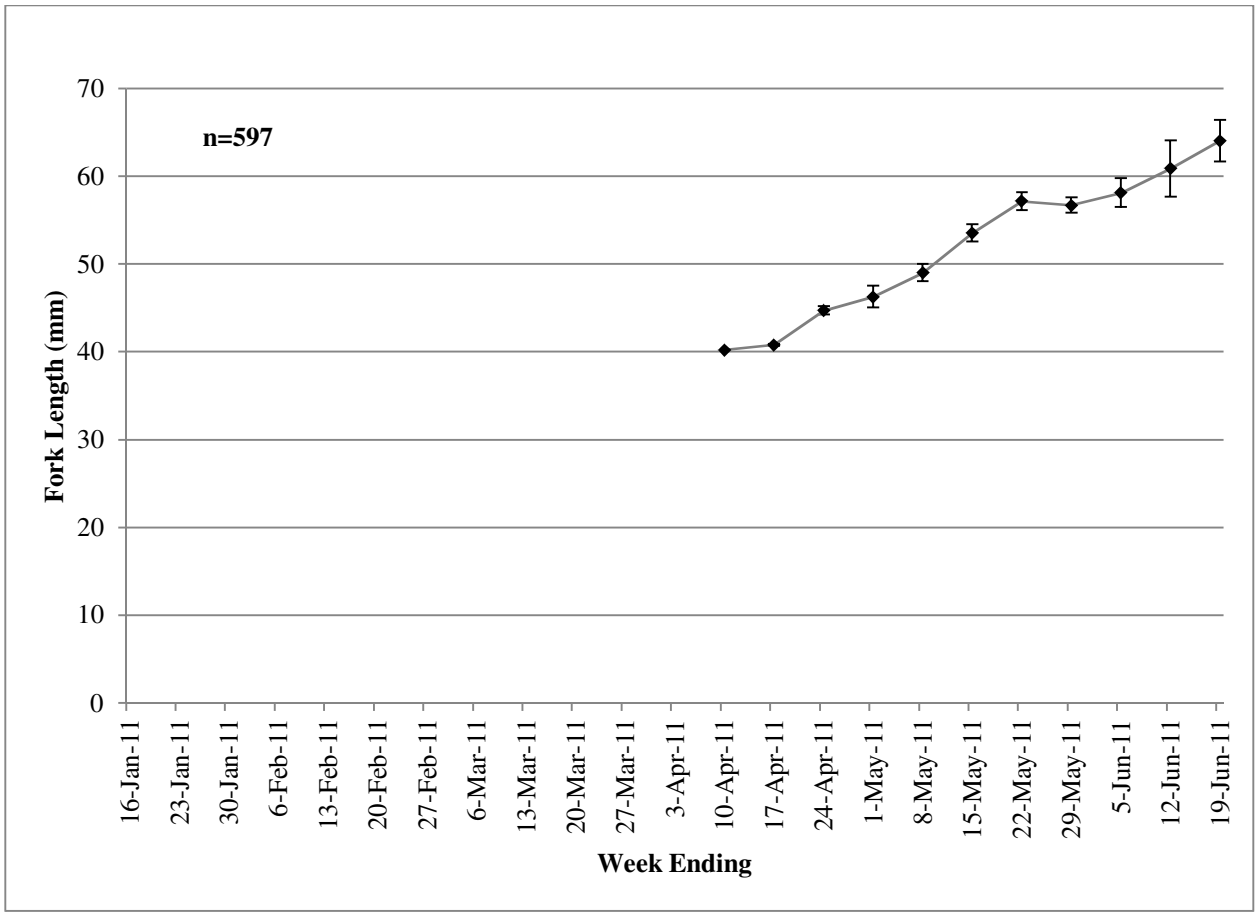

Figure 34. Mean weekly fork length (+/- 95% CI) of young-of-the-year chinook salmon sampled in the outmigrant trap, McGarvey Creek, Winter - Spring 2011.

4.4 Upstream Migration Trapping

During the 2010 – 2011 season, upstream migrant traps captured 1,308 salmonids (Tables 14 and 15). The upper upstream trap caught a total of 668 salmonids: two chinook fry, 368 steelhead, one coho fry, 70 coho juveniles, and 227 coastal cutthroat trout. The lower upstream trap caught four chinook, 312 steelhead, one coho fry, 74 coho juveniles, and 249 coastal cutthroat trout, totaling 640 salmonids

Table 15. Total number of juvenile salmonids captured by week in the upper upstream trap, McGarvey Creek, Fall 2010 – Spring 2011.

	# Days		Trout		Coho		
Week Ending	Sampled	Chinook	YOY	Steelhead	Fry	Juvenile	Cutthroat
Traps installed on 11/1/10 in conjunction with onset of fall rain and resumption of streamflow							
7-Nov-10	4	0	0	58	0	12	6
14-Nov-10	4	0	0	10	0	9	2
21-Nov-10	6	0	0	40	0	4	6
28-Nov-10	7	0	0	6	0	2	2
5-Dec-10	7	0	0	3	0	0	2
12-Dec-10	7	0	0	5	0	4	6
19-Dec-10	5	1	0	5	0	0	6
26-Dec-10							
2-Jan-11				*Trap not fishing*			
9-Jan-11	4	0	0	58	0	7	25
16-Jan-11	6	0	0	99	0	18	68
23-Jan-11	7	0	0	18	0	1	12
30-Jan-11	4	0	0	11	0	1	10
06-Feb-11	7	0	0	5	0	1	7
13-Feb-11	7	0	0	3	0	0	0
20-Feb-11	4	0	0	7	0	0	1
27-Feb-11	7	0	0	10	0	0	15
06-Mar-11	7	0	0	5	0	1	9
13-Mar-11							
20-Mar-11				*Trap not fishing due to high flows*			
27-Mar-11							
03-Apr-11	2	0	0	4	0	0	3
10-Apr-11	7	0	0	3	0	5	22
17-Apr-11	5	0	0	7	1	1	6
24-Apr-11				*Trap not fishing due to high flows*			
01-May-11	7	0	0	5	0	0	6
08-May-11	6	0	0	2	0	2	4
15-May-11	7	0	0	4	0	0	2
22-May-11	7	0	0	0	0	0	5
29-May-11	7	0	0	0	0	0	1
05-Jun-11	7	1	0	0	0	2	1
				Trap pulled on 6/13/2011 due to low flows			
Total:	148	2	0	368	1	70	227

Table 16. Total number of juvenile salmonids captured by week in the lower upstream trap, McGarvey Creek, Fall 2010 – Spring 2011.

Week Ending	# Days Sampled	Chinook	Trout YOY	Steelhead 1+ & Older	Coho Fry	Coho Yearling	Cutthroat
Traps installed on 11/1/10 in conjunction with onset of fall rain and resumption of streamflow							
7-Nov-10	4	0	0	116	0	5	10
14-Nov-10	4	0	0	41	0	10	9
21-Nov-10	4	0	0	11	0	2	11
28-Nov-10	4	0	0	22	0	5	13
5-Dec-10	3	0	0	10	0	3	29
12-Dec-10	5	0	0	11	0	6	25
19-Dec-10	5	0	0	17	0	13	19
26-Dec-10							
2-Jan-11				*Trap not fishing*			
9-Jan-11	5	0	0	13	0	11	22
16-Jan-11	5	0	0	20	0	7	18
23-Jan-11	4	0	0	4	0	2	13
30-Jan-11	5	0	0	7	0	2	12
06-Feb-11	5	0	0	6	0	1	9
13-Feb-11	5	0	0	1	0	1	6
20-Feb-11	2	0	0	0	0	0	2
27-Feb-11	5	0	0	19	0	1	15
06-Mar-11	3	0	0	4	0	0	9
13-Mar-11							
20-Mar-11				*Trap not fishing due to high flows*			
27-Mar-11	1	0	0	0	0	1	1
03-Apr-11	0	0	0	0	0	0	0
10-Apr-11	5	0	0	1	0	1	9
17-Apr-11	5	0	0	3	0	0	3
24-Apr-11				*Trap not fishing due to high flows*			
01-May-11	5	0	0	2	0	0	3
08-May-11	5	0	0	2	0	0	6
15-May-11	5	1	0	0	0	3	3
22-May-11	5	2	0	0	0	0	1
29-May-11	5	1	0	0	0	0	0
05-Jun-11	5	0	0	2	1	0	1
				Trap pulled on 6/13/2011 due to low flows			
Total:	109	4	0	312	1	74	249

4.4.1 Coho Salmon

A total of 144 juvenile coho were captured during a combined 257 days of sampling in both the upper and lower upstream traps. Peak weekly capture of juveniles occurred during the week ending January 16, 2011 at the upper upstream trap (n=18) and the week ending December 19, 2010 at the lower upstream trap (n=13). Trapping efficiency for upstream migrant coho salmon yearlings over the entire trapping season was estimated to be 14%. Weekly efficiencies could not be determined due to small sample size for upstream migrating coho (n=7). Based on this efficiency, an estimated 994 coho salmon yearlings migrated upstream.

Both trap sites captured age 1+ coho migrating upstream as soon as they were installed in November 2010, which indicates we likely missed the earlier component of this migration. Capture numbers declined substantially after January 2011 and continued to be low until the trap was removed in June 2011. Only two YOY coho salmon were captured during the sampling period, one at each trap site in weeks ending April 17, 2011 and June 5, 2011.

Mean weekly fork lengths of coho salmon yearlings at both upstream trap sites ranged from 90.0 mm (week ending January 23, 2011) to 109 mm (week ending March 27, 2011) (Table 16). Low capture numbers occurring during the latter part of the season made it difficult to compare fork lengths over the sampling period. Fork lengths of the two YOY coho captured in the upstream traps were 50 mm (May 31, 2011, lower upstream trap) and 55 mm (April 15, 2011, upper upstream trap).

Table 17. Weekly mean fork length, fork length range, +/- 95% confidence interval, and sample size of coho salmon yearlings captured in the lower upstream and upper upstream traps, Fall 2010 - Spring 2011.

Week #	Week Ending	FL (mm)	Range FL (mm)	95% C.I.	# Sampled
Trap installed on 11/1/10 in conjunction with onset of fall rain and resumption of streamflow					
1	7-Nov-10	93.7	80 - 102	3.3	16
2	14-Nov-10	99.2	80 - 348	3.34	19
3	21-Nov-10	93.2	86 - 108	6.12	6
4	28-Nov-10	98.9	78 - 114	8.29	7
5	5-Dec-10	94.3	91 - 99	4.71	3
6	12-Dec-10	98.1	83 - 109	5.01	10
7	19-Dec-10	93.2	80 - 103	3.88	13
8	26-Dec-10		*Trap not fishing*		
9	2-Jan-11				
10	9-Jan-11	102.3	86 - 118	4.57	18
11	16-Jan-11	100.8	87 - 118	3.08	25
12	23-Jan-11	90	85 - 98	7.92	3
13	30-Jan-11	95.3	92 - 100	4.71	3
14	6-Feb-11	111	110 - 112	1.96	2
15	13-Feb-11	104	104	-	1
16	20-Feb-11	-	-	-	0
17	27-Feb-11	98	98	-	1
18	6-Mar-11	102	102	-	1
19	13-Mar-11		*Trap not fishing due to high flows*		
20	20-Mar-11				
21	27-Mar-11	109	109	-	1
22	3-Apr-11	-	-	-	0
23	10-Apr-11	97.3	90 - 105	4.6	6
24	17-Apr-11	-	110	-	0
25	24-Apr-11		*Trap not fishing due to high flows*		
26	1-May-11	-	-	-	0
27	8-May-11	100.5	74 - 127	51.94	2
28	15-May-11	96.3	69 - 112	26.88	3
29	22-May-11	-	50 - 106	-	0
30	29-May-11	-	-	-	0
31	5-Jun-11	105.5	105 - 106	0.98	2
Traps pulled 6/13/11 due to low flow					

4.4.2 Steelhead Trout

A total of 680 age 1+ steelhead or older were captured during a combined 257 days of sampling in both upstream traps. Peak weekly capture for age 1+ steelhead occurred during the week of January 16, 2011 at the upper upstream trap (n=99) and the week of November 7, 2010 at the lower upstream trap (n=116). As with juvenile coho, age 1+ steelhead were captured in steady numbers as soon as the traps were installed, indicating that they began entering McGarvey Creek prior to the installation of the upstream traps. After January, captures of age 1+ steelhead declined and remained low until traps were removed in June 2011. One notable exception occurred at the lower upstream marking trap during the week ending February 27, 2011 when 19 steelhead were captured moving upstream.

Trapping efficiency was calculated for the entire trapping period instead of by week for age 1+ steelhead due to low recapture rates of upstream emigrants during the sampling period. Of the 264 individuals that were marked, only 21 were recaptured, resulting in an efficiency estimate of 8%.

Mean weekly fork lengths for age 1+ steelhead at both upstream traps ranged from 93.8 mm (week ending May 15, 2011) to 173.4 mm (week ending February 27, 2011) (Table 17). Mean weekly fork lengths peaked between the beginning of trapping season until the end of February, after which time they declined until trapping ceased in June 2011. This indicates a shift in the age class composition of fish utilizing the creek towards younger broods.

Table 18. Weekly mean fork length, fork length range, +/- 95% confidence interval, and sample size of steelhead captured in the lower upstream and upper upstream traps, Fall 2010 - Spring 2011.

Week #	Week Ending	FL (mm)	Range FL (mm)	95% C.I.	# Sampled
Trap installed on 11/1/10 in conjunction with onset of fall rain and resumption of streamflow					
1	7-Nov-10	121.9	62 - 261	9.59	101
2	14-Nov-10	159	62 - 250	13.86	51
3	21-Nov-10	171.1	83 - 245	10.1	51
4	28-Nov-10	164.5	82 - 330	18.48	28
5	5-Dec-10	141.5	76 - 215	28.18	13
6	12-Dec-10	161.3	62 - 260	34.36	16
7	19-Dec-10	139.6	58 - 288	26.39	22
8	26-Dec-10	*Trap not fishing*			
9	2-Jan-11				
10	9-Jan-11	161.8	64 - 344	16.59	71
11	16-Jan-11	143.7	61 - 253	9.91	119
12	23-Jan-11	119.8	67 - 228	22.02	23
13	30-Jan-11	147.3	72 - 219	25.4	18
14	6-Feb-11	130.2	83 - 228	31.68	11
15	13-Feb-11	137.5	86 - 184	41.86	4
16	20-Feb-11	146.9	96 - 208	28.96	7
17	27-Feb-11	173.4	82 - 217	14.7	29
18	6-Mar-11	110.4	82 - 164	14.79	9
19	13-Mar-11	*Trap not fishing due to high flows*			
20	20-Mar-11				
21	27-Mar-11	-	-	-	0
22	3-Apr-11	102	90 - 113	9.9	4
23	10-Apr-11	102.3	80 - 108	20.22	4
24	17-Apr-11	106.5	83 - 130	10.17	10
25	24-Apr-11	*Trap not fishing due to high flows*			
26	1-May-11	100.3	90 - 112	6.15	7
27	8-May-11	94.3	83 - 102	8.82	4
28	15-May-11	93.8	83 - 101	8.29	4
29	22-May-11	-	-	-	0
30	29-May-11	-	-	-	0
31	5-Jun-11	117.5	109 - 126	16.66	2
Traps pulled 6/13/11 due to low flow					

4.4.3 Coastal Cutthroat Trout

A total of 476 age 1+ or older coastal cutthroat trout were captured during a combined 257 days of sampling at the two upstream trap sites. Peak weekly capture of cutthroat occurred during the week ending January 16, 2011 at the upper upstream trap (n=68) and the week ending December 5, 2011 at the lower upstream trap (n=29). Age 1+ cutthroat were captured in the upper upstream trap as soon as it was operational, indicating that we may have missed the initial component of the upstream migration. Peak capture of upstream migrating age 1+ cutthroat occurred in January 2011, when 51% of the total cutthroat were captured moving upstream. In the lower upstream marking trap, cutthroat were also captured as soon as the trap was installed, but peak captures occurred earlier, with 43% of the total captures occurring in November and December and 26% in January. It is unclear whether peak captures in the upper upstream trap represent a true peak in upstream migration or were instead a function of decreased trap efficiency during November and December.

Trapping efficiency for age 1+ cutthroat trout was calculated for the entire sampling period instead of weekly due to low recapture rates. A total of 208 fish were marked in the lower upstream trap, and only 34 were recaptured in the upper upstream trap. The overall recapture rate was calculated to be 17%, and based on this efficiency an estimated 2,829 age 1+ cutthroat migrated upstream in McGarvey Creek. During the sampling period.

The overall average mean fork length for the entire trapping season for age 1+ cutthroat trout was slightly below 140 mm, and mean weekly fork lengths for fish captured at both upstream trap sites ranged from 96.3 mm (week ending February 13, 2011) to 196.6 mm (week ending December 19, 2011) (Table 18). Slightly larger average mean fork lengths were observed during November immediately following trap installation through the week ending February 6, 2011. This trend is likely due to the presence of larger fish (>200 mm) migrating into McGarvey Creek to spawn during that period.

Table 19. Weekly mean fork length, fork length range, +/- 95% confidence interval, and sample size of coastal cutthroat trout captured in the lower upstream and upper upstream traps, Fall 2010 - Spring 2011.

Week #	Week Ending	FL (mm)	Range FL (mm)	95% C.I.	# Sampled
Trap installed on 11/1/10 in conjunction with onset of fall rain and resumption of streamflow					
1	7-Nov-10	137.7	78 - 300	36.96	13
2	14-Nov-10	192.0	67 - 338	59.14	11
3	21-Nov-10	183.3	72 - 360	43.42	17
4	28-Nov-10	147.3	83 - 245	21.14	15
5	5-Dec-10	117.0	74 - 200	13.06	31
6	12-Dec-10	190.1	61 - 383	38.91	31
7	19-Dec-10	196.6	101 - 345	29.11	25
8	26-Dec-10	*Trap not fishing*			
9	2-Jan-11				
10	9-Jan-11	126.0	71 - 418	19.85	47
11	16-Jan-11	135.3	77 - 333	10.84	86
12	23-Jan-11	143.2	76 - 331	24.60	25
13	30-Jan-11	131.2	78 - 285	22.39	22
14	06-Feb-11	138.7	87 - 280	26.02	16
15	13-Feb-11	96.3	83 - 127	13.02	6
16	20-Feb-11	116.0	83 - 144	34.86	3
17	27-Feb-11	156.9	88 - 327	19.71	30
18	06-Mar-11	153.7	87 - 304	31.98	18
19	13-Mar-11	*Trap not fishing due to high flows*			
20	20-Mar-11				
21	27-Mar-11	145.0	145	-	1
22	03-Apr-11	146.7	140 - 157	10.27	3
23	10-Apr-11	137.1	83 - 267	14.31	31
24	17-Apr-11	105.9	80 - 134	14.20	9
25	24-Apr-11	*Trap not fishing due to high flows*			
26	01-May-11	137.0	109 - 156	12.20	9
27	08-May-11	120.3	97 - 183	15.21	10
28	15-May-11	116.8	95 - 166	24.90	5
29	22-May-11	130.2	98 - 208	32.06	6
30	29-May-11	98.0	98	-	1
31	05-Jun-11	131.5	111 - 152	40.18	2
Traps pulled 6/13/11 due to low flow					

4.4.4 Chinook Salmon

Upstream traps captured five young of the year chinook salmon between the dates of May 11, 2011 and June 5, 2011 (Table 19). Chinook fork lengths ranged from 52 mm to 63 mm with a mean fork length of 57.0 mm.

Table 20. Fork lengths for young-of-the-year chinook salmon, captured in the lower upstream and upper upstream traps, Spring 2011.

Capture Location	Capture Date	Fork Length (mm)
Lower Upstream	5/11/2011	52
Lower Upstream	5/16/2011	63
Lower Upstream	5/16/2011	62
Lower Upstream	5/27/2011	54
Upstream Fyke	6/5/2011	54

4.5. Full Duplex PIT Tag Data

4.5.1 Number of Fish Marked

A total of 1,182 salmonids were marked with FDX PIT tags at various trap locations and during separate sampling efforts between August 10, 2010 and June 13, 2011 (Appendix A). Marking occurred at every trap installed during the study period, during the juvenile salmonid summer abundance surveys, and during fisheries investigations in an off-channel alcove constructed during the summer of 2010 (McGarvey Alcove Pond)(Table 20). During this period, a total of 683 juvenile coho (fork length range: 61 - 136 mm), 279 steelhead (fork length range: 66 - 330 mm), and 220 coastal cutthroat (fork length range: 72 - 383 mm) were PIT tagged. Most of the juvenile coho were tagged during the single stream surveys (n=280) and at the outmigrant trap (n=193); however, coho were tagged at all locations. In addition to juvenile coho, ten adult coho (fork lengths ranged from 348 to 750 mm) were tagged at the lower upstream trap (n=1), upper reach trap (n=2), and the upper upstream trap (n=7). The majority of steelhead were tagged at the lower upstream trap (n=264), with an additional ten tagged at the upper upstream trap and five tagged at the upper reach break traps. Most cutthroat tags were also deployed at the lower upstream trap (n=208), and the alcove pond, upper upstream trap, and upper reach break traps each had four cutthroat tagged.

Table 21. Tagging locations, dates, and number tagged for coho, cutthroat, and steelhead in McGarvey Creek, August 10, 2010 to June 13, 2011.

	Number of Fish Tagged				
Tagging Location	**CO***	**CT**	**SH**	**Total**	**Dates Tagged**
Outmigrant Pipe Trap	193	0	0	193	13-Feb-2011 to 13-Jun-11
Lower Upstream Trap	69	208	264	541	2-Nov-2010 to 1-Jun-2011
Single Stream Surveys	275	0	0	275	10-Aug-2010 to 15-Sep-2010
Alcove Pond	114	4	0	118	19-Jan-2011 to 15-Jun-2011
Upper Upstream Trap	14	4	10	28	17-Nov-2010 to 30-May-2011
Upper Reach Break Traps	18	4	5	27	25-Jan-2011 to 2-Jun-2011
Total	**683**	**220**	**279**	**1182**	

*Does not include 10 coho adults tagged

4.5.2 PIT Tag Recaptures

4.5.2.1 SPI Station Recaptures

Of the 683 juvenile coho that were implanted with FDX PIT tags, 393 individuals were recaptured on at least one of the three SPI stations (Lower, Upper, West Fork) for an overall recapture rate of 58%. These 393 individuals logged a total of 1,249 SPI detections. Most of the individual juvenile coho recaptured at SPI stations during this study passed the Lower SPI (n= 384, 98%), which had a total of 858 individual SPI detections. The Upper SPI recorded 194 detections of 88 recaptured individuals (22% of total recaptures), and the West Fork SPI had 197 detections of 61 individuals (16% of total recaptures). Seven of the ten recaptured adult coho were recaptured at remote PIT tag stations (Figure 4). SPI stations also recaptured a total of 171 PIT tagged steelhead (1,436 total detections) and 121 cutthroat trout (840 total detections) with recapture rates of 61% and 55%, respectively.

PIT tagged fish that migrated downstream of the lower SPI with no subsequent detections were considered emigrants, and the date of last detection was considered their emigration date. It is possible that fish classified as emigrants could have moved back upstream without being detected by the lower SPI, or that those fish could have remained in McGarvey Creek downstream of the lower SPI (RM 1.06) for an indeterminate amount of time.

4.5.2.2 Summer Abundance Survey Recaptures

A total of 275 juvenile coho were tagged during the summer abundance surveys and 53.09% of these fish (n=146) were later recaptured at one of the SPI stations (Table 21). Of the 146 SPI recaptures, 130 of these fish were detected emigrating past the Lower SPI. Twenty-three of these presumed emigrants were tagged in the West Fork of McGarvey Creek, 73 were tagged in the Lower Mainstem reach, and 34 were tagged in the Upper Mainstem reach. The remaining 16 fish marked during the summer abundance surveys were last detected at either the upper SPI or the West Fork SPI. These fish may have emigrated without detection, died, or are still in residence.

Fish tagged within the three summer abundance survey reaches exhibited similar emigration movement patterns. Although emigration of the coho tagged during the summer surveys were detected each month during the study (November 2010 through June 2011), peaks in emigration of these tagged fish occurred during November and again in March through April (Figure 31). A total of 51.54% of the juvenile coho recaptures initially marked during summer abundance surveys migrated past the Lower SPI during November, and 30.77% of these coho emigrated during March through April.

Growth was calculated for fish tagged during the summer abundance survey and subsequently recaptured during the remainder of the study at any of the trapping locations. The majority of fish recaptured in traps were captured in the outmigrant pipe trap (78%) between March and June of 2011. Two coho tagged during the summer abundance surveys were also recaptured in the downstream upper reach trap (April 5, 2011 and May 2, 2011); two were recaptured in the upstream weir during January of 2011; and one was recaptured in the upstream fyke trap on January 30, 2011 (Table 23). The number of Days at Liberty (DAL) between initial mark and trap recapture ranged between 141 – 273 days. The mean growth for coho yearlings was 28.5 mm and 6.4 grams, ranging from 16 - 45 mm and 1.9 - 12.1 grams between initial marking during the summer of 2010 and subsequent recapture during winter – spring of 2011 (Table 24). Daily growth rate calculations for juvenile coho between summer abundance surveys and recapture ranged between 0.07 – 0.16 mm/day with a mean of 0.12 mm/day and 0.06 – 0.32 g/week with a mean of 0.19 g/week (Table 24).

Table 22. Number of juvenile coho and dates tagged during summer abundance surveys, McGarvey Creek, 2010.

Tagging Location	Number of coho tagged	Dates Tagged
Lower Mainstem Reach	160	10-Aug-2010 to 18-Aug-2010
Upper Mainstem Reach	71	9-Sep-2010 to 15-Sep-2010
West Fork Reach	44	24-Aug-2010 to 25-Aug-2010
Total	**275**	

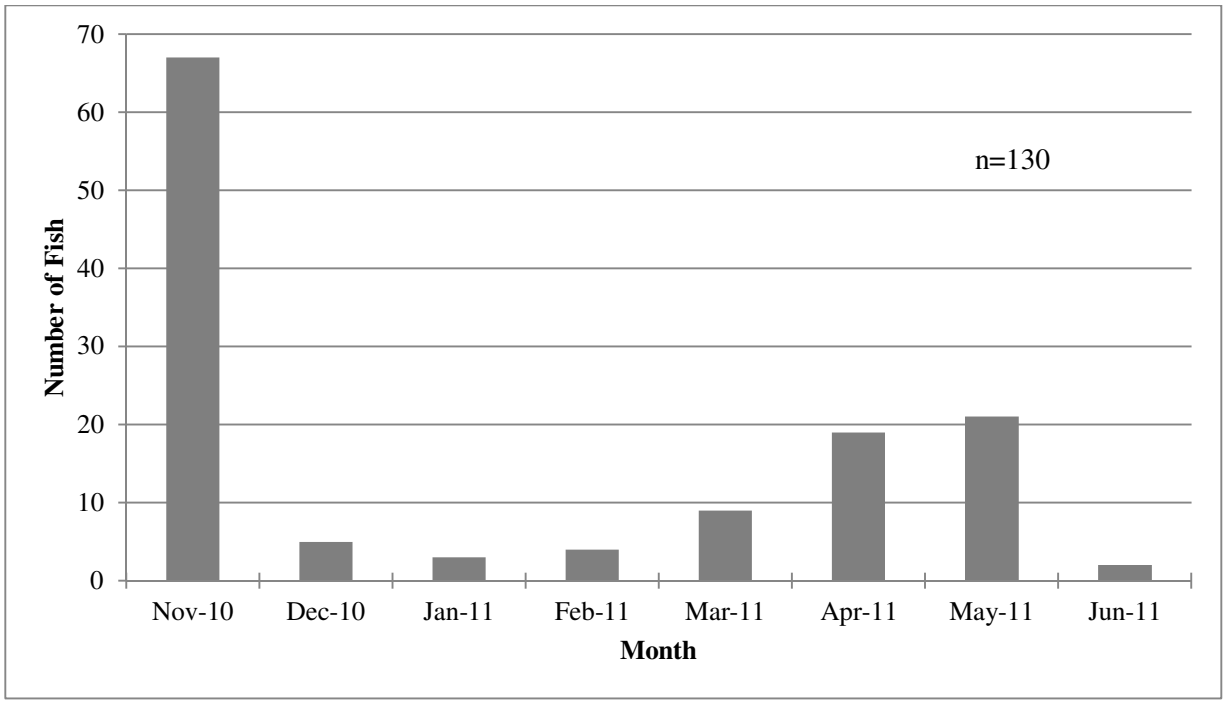

Figure 35. Number of juvenile coho salmon PIT tagged during summer abundance surveys emigrating past the lower SPI by month, McGarvey Creek, 2010 - 2011.

Table 23. Mark/recapture information and Days at Liberty for PIT tagged coho recaptured in McGarvey Creek more than 30 days after being tagged in McGarvey summer abundance surveys 2010-2011.

PIT Tag #	Mark Date	Mark Location	Recapture Date	Recapture Location	Days at Liberty (DAL)
985121015738742	8/16/2010	Lower Main Stem Reach	1/4/2011	U/S Weir	141
985121016154686	8/17/2010	Lower Main Stem Reach	3/22/2011	Outmigrant Pipe Trap	217
985121016221317	8/17/2010	Lower Main Stem Reach	5/17/2011	Outmigrant Pipe Trap	273
985121016486653	8/17/2010	Lower Main Stem Reach	1/30/2011	U/S Fyke	166
985121016491735	8/18/2010	Lower Main Stem Reach	4/27/2011	Outmigrant Pipe Trap	252
985121016491939	8/18/2010	Lower Main Stem Reach	4/25/2011	Outmigrant Pipe Trap	250
985121016498277	8/18/2010	Lower Main Stem Reach	3/23/2011	Outmigrant Pipe Trap	217
985121016515750	8/18/2010	Lower Main Stem Reach	5/31/2011	Outmigrant Pipe Trap	286
985121016518207	8/17/2010	Lower Main Stem Reach	5/13/2011	Outmigrant Pipe Trap	269
985121016666739	8/18/2010	Lower Main Stem Reach	1/13/2011	U/S Weir	148
985121016672525	8/17/2010	Lower Main Stem Reach	5/1/2011	Outmigrant Pipe Trap	257
985121016705458	8/16/2010	Lower Main Stem Reach	4/23/2011	Outmigrant Pipe Trap	250
985121016706529	8/18/2010	Lower Main Stem Reach	3/12/2011	Outmigrant Pipe Trap	206
985121020501353	8/16/2010	Lower Main Stem Reach	4/13/2011	Outmigrant Pipe Trap	240
985121015702373	8/17/2010	Lower Main Stem Reach	5/10/2011	Outmigrant Pipe Trap	266
985121015687747	9/9/2010	Upper Main Stem Reach	5/7/2011	Outmigrant Pipe Trap	240
985121016501712*	9/13/2010	Upper Main Stem Reach	5/2/2011	D/S Upper Reach Trap	231
985121016692318	9/13/2010	Upper Main Stem Reach	4/25/2011	Outmigrant Pipe Trap	224
985121016705587	9/9/2010	Upper Main Stem Reach	6/7/2011	Outmigrant Pipe Trap	271
985121016219889	9/9/2010	Upper Main Stem Reach	4/5/2011	D/S Upper Reach Trap	208
985121016151397	8/24/2010	West Fork Reach	4/13/2011	Outmigrant Pipe Trap	232
985121016219895	8/24/2010	West Fork Reach	3/22/2011	Outmigrant Pipe Trap	210
985121016501776	8/24/2010	West Fork Reach	5/19/2011	Outmigrant Pipe Trap	268

*Multiple recaptures; table reports last recapture event

Table 24. Growth of PIT tagged coho recaptured in McGarvey Creek more than 30 days after being tagged in McGarvey summer abundance surveys 2010-2011.

PIT Tag #	FL at Marking (mm)	FL at Recapture (mm)	Δ FL (mm)	Growth (mm/ day)	WT at Marking (g)	WT at Recapture (g)	Δ WT (g)	Growth (g/week)
985121015738742	80	98	18	**0.13**	6.5	10.6	4.1	**0.20**
985121016154686	82	98	16	**0.07**	5.1	10.2	5.1	**0.16**
985121016221317	75	111	36	**0.13**	5.4	13.3	7.9	**0.20**
985121016486653	81	100	19	**0.11**	7.0	11	4.0	**0.17**
985121016491735	67	101	34	**0.13**	4.9	10.2	5.3	**0.15**
985121016491939	84	106	22	**0.09**	7.1	11.8	4.7	**0.13**
985121016498277	85	116	31	**0.14**	7.8	16.8	9.0	**0.29**
985121016515750	70	108	38	**0.13**	5.2	13.1	7.9	**0.19**
985121016518207	77	104	27	**0.10**	5.2	11.9	6.7	**0.17**
985121016666739	69	87	18	**0.12**	4.0	7.9	3.9	**0.18**
985121016672525	73	105	32	**0.12**	4.8	11.7	6.9	**0.19**
985121016705458	78	110	32	**0.13**	7.0	14.7	7.7	**0.22**
985121016706529	76	96	20	**0.10**	5.5	9.9	4.4	**0.15**
985121020501353	85	119	34	**0.14**	7.5	17.6	10.1	**0.29**
985121015702373	79	116	37	**0.14**	6.9	16.5	9.6	**0.25**
985121015687747	64	94	30	**0.13**	3.3	8.6	5.3	**0.15**
985121016501712*	79	115	36	**0.16**	6.2	16.5	10.3	**0.31**
985121016692318	72	93	21	**0.09**	4.7	7.5	2.8	**0.09**
985121016705587	70	102	32	**0.12**	5.5	11	5.5	**0.14**
985121016219889	69	94	25	**0.12**	4.1	8.6	5	**0.15**
985121016151397	77	95	18	**0.08**	7.0	8.9	1.9	**0.06**
985121016219895	73	105	32	**0.15**	5.1	12.8	7.7	**0.26**
985121016501776	75	120	45	**0.17**	5.7	17.8	12.1	**0.32**

*Multiple recaptures; table reports last recapture event

4.5.2.3 Lower Upstream Trap Recaptures

One-third of the 69 juvenile coho PIT tagged at the lower upstream trap (moving upstream into McGarvey Creek) were later recaptured at one of the remote SPI stations. Of the 23 SPI recaptures, 21 were detected emigrating past the Lower SPI station. The other two juvenile coho recaptures were last detected at the West Fork SPI. It is possible these fish emigrated past the Lower SPI without detection, died, or are still in residence.

Emigration timing of the 21 outmigrants peaked during April and May 2011, with 52.39% of recaptured fish passing downstream during this period (Figure 36). Another smaller peak in emigration occurred in February 2011, when 14.29% moved past the Lower SPI station.

Days at Liberty and growth rates were calculated for fish that were marked in the lower upstream trap and recaptured in any trap during the season. DAL ranged between 42 – 167 days for coho salmon (n=3), 32 – 166 days for coastal cutthroat trout (n=19), and 54 – 201 days for steelhead (n=11) (Table 25). Mean growth for coho yearlings was 17 mm and 6.6 grams, with individual growth ranging between 5 – 19 mm and 2.1 – 12.2 grams (Table 26). Growth rates ranged between 0.11 – 0.21 mm/day with an average of 0.15 mm/day for fork length, and between 0.2 – 0.7 g/week with an average of 0.4 g/week for weight. Age 1+ steelhead had mean growth of 10.4 mm and 2.7 grams between fall 2010 and spring 2011, with individual growth ranging between 1 – 23 mm and -3.8 – 8.3 grams (Table 26). Growth rates ranged between 0.01 – 0.14 mm/day with an average of 0.1 mm/day and -0.4 – 0.7 g/week with an average of 0.2 g/week. Age 1+ cutthroat had mean growth of 9.2 mm and -0.3 grams, with growth ranging between -1 – 32 mm and -37.7 – 15.8 grams. Growth rates for cutthroat trout ranged between -0.02 – 0.35 mm/day with an average of 0.11 mm/day, and -3.1 and 1.1 g/week with an average of 0.0 g/week. One cutthroat displayed 1 mm of negative length change at recapture; most likely this can be attributed to measurement error. Five cutthroat recaptured displayed negative weight change between marking and recapture, and we assume these fish spawned between capture events.

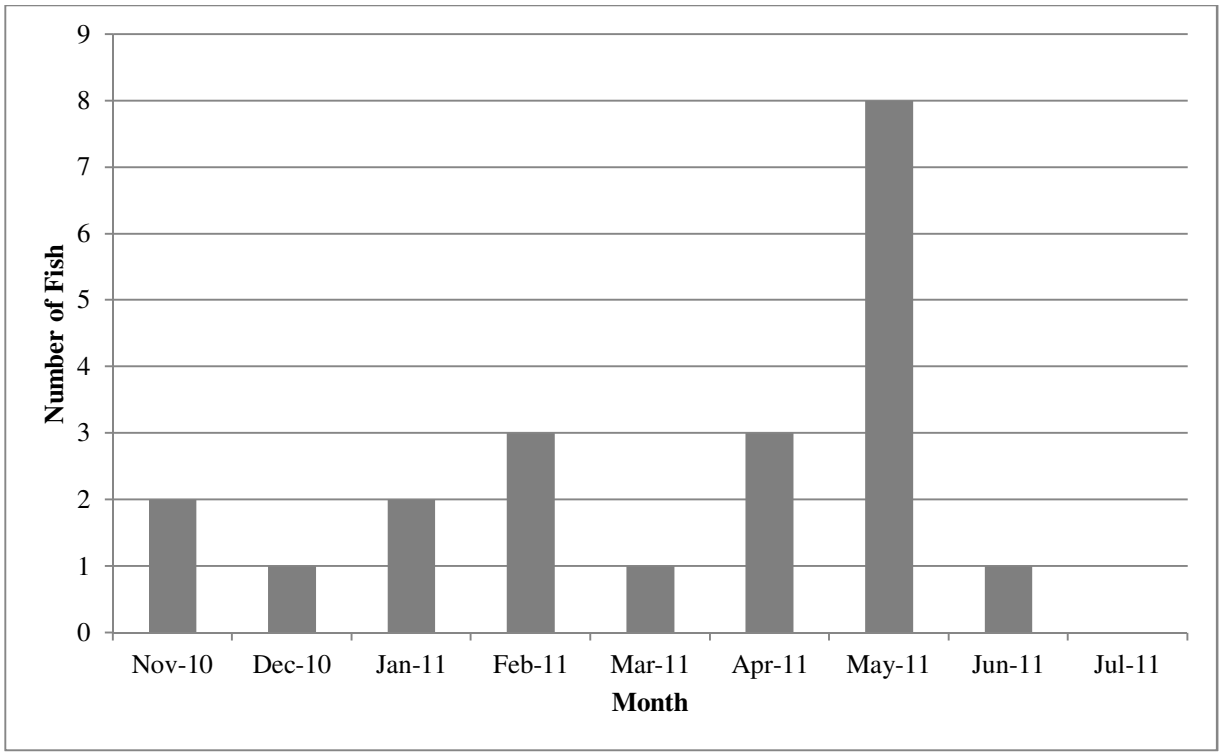

Figure 36. Number of juvenile coho salmon PIT tagged at the lower upstream trap emigrating past the lower SPI by month, McGarvey Creek, 2010 - 2011.

Table 25. Mark/recapture information and Days at Liberty for PIT tagged salmonids recaptured in McGarvey Creek more than 30 days after being tagged in the lower upstream trap, 2010-2011.

PIT Tag #	Species	Mark Date	Recapture Date	Recapture Location	Days at Liberty (DAL)
985121020465653	CO	11/12/2010	4/28/2011	Outmigrant Pipe Trap	167
985121020616167	CO	12/15/2010	4/23/2011	Outmigrant Pipe Trap	129
985121020500571	CO	12/8/2010	1/19/2011	McGarvey Alcove	42
985121020414782	CT	11/24/2010	3/24/2011	Outmigrant Pipe Trap	120
985121020415542	CT	1/13/2011	3/5/2011	Outmigrant Pipe Trap	51
985121020467889	CT	11/18/2010	2/5/2011	U/S Fyke	79
985121020496852	CT	1/28/2011	5/4/2011	Lower U/S Marking Trap	96
985121020497371	CT	11/16/2010	2/15/2011	Outmigrant Pipe Trap	91
985121020499124	CT	1/5/2011	5/22/2011	Outmigrant Pipe Trap	137
985121020499716	CT	1/11/2011	3/5/2011	Outmigrant Pipe Trap	53
985121020501624	CT	12/8/2010	3/2/2011	Lower U/S Marking Trap	84
985121020502194	CT	11/25/2010	5/10/2011	Lower U/S Marking Trap	166
985121020502456	CT	12/7/2010	2/10/2011	Outmigrant Pipe Trap	65
985121020608931	CT	1/4/2011	4/13/2011	D/S Upper Reach Trap	99
985121020616230	CT	2/1/2011	4/25/2011	Outmigrant Pipe Trap	83
985121020617252	CT	12/7/2010	3/3/2011	Outmigrant Pipe Trap	86
985121020618640	CT	12/15/2010	3/22/2011	Outmigrant Pipe Trap	97
985121020619493	CT	12/10/2010	2/4/2011	Outmigrant Pipe Trap	56
985121020898213	CT	1/4/2011	2/7/2011	Lower U/S Marking Trap	34
985121020923339*	CT	2/22/2011	4/23/2011	Outmigrant Pipe Trap	60
985121025581098	CT	4/8/2011	5/10/2011	U/S Fyke	32
985121025591540*	CT	4/15/2011	5/19/2011	Outmigrant Pipe Trap	34
985121015703575	SH	11/5/2010	4/7/2011	D/S Upper Reach Trap	153
985121020415380	SH	11/3/2010	2/2/2011	D/S Upper Reach Trap	91
985121020417300	SH	11/11/2010	2/14/2011	Outmigrant Pipe Trap	95
985121020426668	SH	11/2/2010	1/12/2011	U/S Weir	71
985121020460698	SH	11/11/2010	2/4/2011	D/S Upper Reach Trap	85
985121020467674	SH	12/17/2010	2/9/2011	D/S Upper Reach Trap	54
985121020500192	SH	11/5/2010	2/13/2011	Outmigrant Pipe Trap	100
985121020501033	SH	11/12/2010	2/10/2011	Outmigrant Pipe Trap	90
985121020501654*	SH	11/3/2010	2/9/2011	D/S Upper Reach Trap	98
985121020502465	SH	11/2/2010	5/22/2011	Outmigrant Pipe Trap	201
985121020620271	SH	11/2/2010	2/2/2011	Outmigrant Pipe Trap	92

*Multiple recaptures; table reports last recapture event

Table 26. Growth of PIT tagged salmonids recaptured in McGarvey Creek more than 30 days after being tagged in McGarvey summer abundance surveys, 2010-2011.

PIT Tag #	Species	FL at Marking (mm)	FL at Recapture (mm)	Δ FL (mm)	Growth (mm/ day)	WT at Marking (g)	WT at Recapture (g)	Δ WT (g)	Growth (g/week)
985121020465653	CO	91	110	19	**0.11**	8.2	13.9	5.7	**0.2**
985121020616167	CO	100	127	27	**0.21**	10.0	22.2	12.2	**0.7**
985121020500571	CO	100	105	5	**0.12**	11.0	13.1	2.1	**0.4**
985121020414782	CT	166	168	2	**0.02**	42.7	38.6	-4.1	**-0.2**
985121020415542	CT	131	134	3	**0.06**	22.1	23.5	1.4	**0.2**
985121020467889	CT	161	171	10	**0.13**	42.8	49.3	6.5	**0.6**
985121020496852	CT	166	183	17	**0.18**	49.7	62.6	12.9	**0.9**
985121020497371	CT	126	158	32	**0.35**	20.7	34.4	13.7	**1.1**
985121020499124	CT	84	110	26	**0.19**	6.5	13.7	7.2	**0.4**
985121020499716	CT	193	198	5	**0.09**	70.8	73.4	2.6	**0.3**
985121020501624	CT	260	264	4	**0.05**	172.8	151.3	-21.5	**-1.8**
985121020502194	CT	139	166	27	**0.16**	28.8	44.6	15.8	**0.7**
985121020502456	CT	255	263	8	**0.12**	161.7	171.3	9.6	**1.0**
985121020608931	CT	99	102	3	**0.03**	10.1	10.6	0.5	**0.0**
985121020616230	CT	110	130	20	**0.24**	13.3	21.7	8.4	**0.7**
985121020617252	CT	265	265	0	**0.00**	196.5	158.8	-37.7	**-3.1**
985121020618640	CT	261	261	0	**0.00**	178.0	157	-21.0	**-1.5**
985121020619493	CT	343	342	-1	**-0.02**	n/a	n/a	n/a	**n/a**
985121020898213	CT	79	83	4	**0.12**	4.8	6.5	1.7	**0.4**
985121020923339*	CT	190	190	0	**0.00**	83.1	74.4	-8.7	**-1.0**
985121025581098	CT	95	103	8	**0.25**	7.5	10.7	3.2	**0.7**
985121025591540*	CT	134	141	7	**0.21**	22.5	26.7	4.2	**0.9**
985121015703575	SH	98	111	13	**0.08**	9.6	12.8	3.2	**0.1**
985121020415380	SH	205	216	11	**0.12**	101.7	100.9	-0.8	**-0.1**
985121020417300	SH	192	205	13	**0.14**	80.1	88.4	8.3	**0.6**
985121020426668	SH	180	190	10	**0.14**	70.0	77.1	7.1	**0.7**
985121020460698	SH	188	198	10	**0.12**	72.6	76.7	4.1	**0.3**
985121020467674	SH	192	194	2	**0.04**	70.7	67.6	-3.1	**-0.4**
985121020500192	SH	180	181	1	**0.01**	59.2	58.1	-1.1	**-0.1**
985121020501033	SH	186	192	6	**0.07**	75.2	71.4	-3.8	**-0.3**
985121020501654*	SH	98	105	7	**0.07**	8.0	12.3	4.3	**0.3**
985121020502465	SH	84	107	23	**0.11**	6.2	12.4	6.2	**0.2**
985121020620271	SH	107	121	14	**0.15**	14.1	18.1	4.0	**0.3**

*Multiple recaptures; table reports last recapture event

4.5.2.4 Non-Natal Recaptures

Between November 7, 2010 and June 11, 2011, the remote SPI stations recaptured 26 non-natal coho salmon that were previously PIT tagged outside of the McGarvey Creek drainage. At the time this report was prepared, YTFP had identified tagging locations for 23 of these fish. Tagging locations for the remaining three fish are still pending. Ten of the 26 non-natal coho were not detected entering McGarvey Creek and may have entered before the SPI arrays were installed on November 3, 2010.

Residence times and movement patterns of non-natal coho in McGarvey Creek varied greatly over the study period. Time between first detection and last detection ranged from one day (n=6) to a maximum of 175 days, with a mean residence time of 65 days. Ten of the non-natal coho were detected only at the Lower SPI array, which is approximately 5,580 feet upstream of the confluence with the Klamath River (Figure 5), with residence times of up to 169 days. Three of these fish were detected more than four times at the Lower SPI, indicating continual movement within the reach and potential movement in and out of the creek over the duration of their residency.

Four of the 26 non-natal coho detected in McGarvey Creek traveled as far as the Upper Mainstem SPI array, which is approximately 8,000 feet upstream from mouth (Figure 5), and had residence times ranging from one to 143 days. Approximately one-third (n=9) of the non-natal coho were detected at the West Fork SPI station, which is approximately 8,300 feet upstream from mouth of the Klamath River (Figure 5). Residence times for these individuals ranged from one to 173 days; however, six of these fish were not detected entering the creek so their residence times are most likely underestimated. Three of the non-natal coho moved extensively throughout the creek with detections occurring at the Lower SPI, then the West Fork SPI, and then at the Upper Mainstem SPI prior to emigration. One non-natal coho marked in the Crescent City Fork of Blue Creek (Lower Klamath tributary) was initially detected in the West Fork, then traveled to the Upper Mainstem SPI, back to the West Fork, and then emigrated past the Lower SPI after 175 days of residency.

The majority of the fish, 19 of the 26 (73%), were detected leaving McGarvey Creek between the dates of November 20, 2010 and June 11, 2011 (Figure 33 and Table 24). Of these fish, most of the non-natal coho (42.11%) were detected leaving McGarvey Creek during May 2011 (Figure 33). It is possible that these fish continued to reside in the system downstream of the lower SPI station for indeterminate amounts of time. Seven of the non-natal coho were not detected emigrating from McGarvey Creek. These fish may have emigrated without detection past the lower SPI array, died, or are still residence.

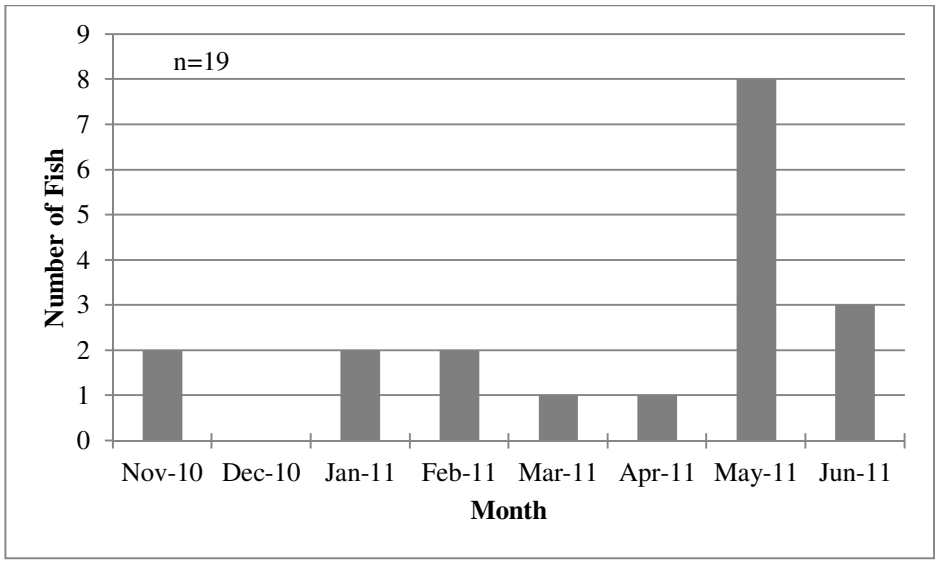

Figure 37. Date of last detection for non-natal juvenile coho salmon emigrating from McGarvey Creek, 2010 - 2011.

Table 27. Summary of non-natal PIT tagged coho detected at SPI arrays throughout McGarvey Creek, 2010 – 2011.

PIT ID Number	Exited	Extent of Movement	# Detections	Date Tagged	First Detection	Last Detection	Days in McGarvey[#]	Location Tagged
985121016153885	Y	Lower	2	7/6/2010	6/11/2011	6/11/2011	0	Slate Creek
985121016695597	Y	Lower	5	7/13/2010	1/27/2011	2/19/2011	23	Sandy Bar Klamath River
985121016705220	Y	Lower	4	7/15/2010	1/8/2011	4/29/2011	111	Slate Creek
985121022520032	Y	Lower	4	8/27/2010	2/16/2011	5/4/2011	77	Irving Creek
985120024748145	Y	Lower	6		5/12/2011	6/1/2011	20	Unknown
985121020467993	Y	Lower	8	7/26/2010	12/3/2010	5/21/2011	169	Lower Terwer Creek
985121020897984	Y	Lower	3	10/7/2010	11/7/2010	11/20/2010	13	Blue Creek
985121020464257	Y	Lower	3	10/7/2010	1/17/2011	5/15/2011	118	Blue Creek
985121020491517	Y	Lower	4	10/7/2010	3/31/2011	6/5/2011	66	Blue Creek
985121022501809	Y	Lower	3	10/25/2010	2/18/2011	5/25/2011	96	Sandy Bar Klamath River
985121022596181	Y	Lower - Upper - Lower	7	1/3/2011	1/25/2011	5/8/2011	103	Sandy Bar Klamath River
985121016154537		Lower - West Fork	5	7/13/2010	1/10/2011	4/6/2011	86	Sandy Bar Klamath River
985121016220498		Lower - West Fork	4	8/26/2010	11/16/2010	5/8/2011	173	Titus Creek
985121022530453	Y	Lower - West Fork - Lower	8		11/13/2010	11/23/2010	10	Aikens Pool
985121015688051	Y	Lower - West Fork - Upper - Lower	11	7/13/2010	1/9/2011	1/13/2011	4	Sandy Bar Klamath River
985121020463983	Y	Lower - West Fork - Upper - West Fork - Lower	12	10/7/2010	11/7/2010	5/1/2011	175	Blue Creek
985121016705985		Upper	2	1/22/2010	1/3/2011*	1/3/2011	0	Waukell Creek
985121016038850	Y	Upper - Lower	6	7/27/2010	1/2/2011*	3/29/2011	86	Sandy Bar Klamath River
985121022589397	Y	Upper - Lower	6	8/27/2010	12/31/2010*	2/17/2011	48	Irving Creek
985121022582833		West Fork	1	8/27/2010	2/27/2011*	2/27/2011	0	Irving Creek
985121016148784		West Fork	2	10/6/2010	11/7/2010*	11/7/2010	0	Blue Creek
985121022526918		West Fork	2	9/1/2010	11/7/2010*	11/7/2010	0	Salmon River
985161001302793		West Fork	2		1/1/2011*	1/1/2011	0	Unknown
985121016153846	Y	West Fork - Lower	5	8/17/2010	1/16/2011*	5/3/2011	107	Tom Martin Creek
985120025104730	Y	West Fork - Lower	5		12/20/2010*	1/12/2011	23	Unknown
985121020493323	Y	West Fork - Upper - Lower	7	10/7/2010	11/15/2010*	5/5/2011	171	Blue Creek

5.0 CONCLUSIONS/RECOMMENDATIONS

McGarvey Creek is a Lower Klamath River tributary that provides habitat for both natal and non-natal populations of salmonids including coho salmon, chinook salmon, steelhead and coastal cutthroat trout. YTFP has been monitoring salmonid populations in McGarvey Creek for the last fifteen years (YTFP 2009), with current monitoring focusing on coho salmon and encompassing all freshwater life stages. Recent monitoring efforts are illuminating the role McGarvey Creek plays in supporting juvenile salmonids from throughout the Klamath Basin, in addition to providing essential habitat and resources to support the life cycle processes of natal anadromous and resident salmonid species.

Summer abundance inventories in McGarvey Creek provide critical information as to how the mainstem and West Fork are used by juvenile salmonids in the typical low-flow season, and can also be used to gage brood year strength and assess the effects of ongoing restoration efforts. Summer abundance estimates for coho young of the year in 2010 were highest in the Lower Mainstem Reach of McGarvey Creek ($\hat{N}$=1,208), followed by the Upper Mainstem ($\hat{N}$=476) and the West Fork ($\hat{N}$=298). The highest densities of juvenile coho (Brood Year 2009) congregated in deep pools located in the Lower Mainstem of McGarvey Creek during summer months. We presume the majority of these coho were natal to McGarvey Creek, as fry redistributions immediately following emergence in spring tend to occur on a local level, and in a downstream direction (Lestelle 2007). During summer, warmer temperatures and reduced flows can cause juveniles to seek out deeper, in-channel habitats for summer rearing. Some of the juvenile fish found in the Lower Mainstem Reach were likely downstream migrants from higher up in the McGarvey system.

During spawner surveys conducted the following fall (Brood Year 2010) YTFP observed eight redds in Upper Mainstem McGarvey and ten redds in Lower Mainstem McGarvey, indicating adults may distribute evenly to spawn in both of these reaches, though the number of redds present in each reach for Brood Year 2009 is unknown and more data is needed to better assess this possibility. Higher counts of juveniles in the Lower Mainstem are possibly due to the presences of more suitable summer coho habitat—summer habitat inventories found 15 deep pools in the Lower Mainstem Reach, versus four in the Upper Mainstem Reach and two in the West Fork Reach. We recommend future efforts be designed in a manner that covers a complete three-year coho life cycle spanning the period from parental spawning to the return of the parental Brood Year's progeny, allowing more meaningful inferences to be made between observed life stages.

The Lower Klamath Sub-basin usually experiences heavy fall and winter rains that bring with them another redistribution of juveniles to suitable habitat for overwintering. Little is known about this redistribution period in McGarvey Creek because past trapping efforts have focused on the spring outmigration period and trapping is difficult in higher flows. To determine the extent of fish movement between summer abundance surveys and spring outmigration trapping, YTFP installed downstream fyke traps in the Lower Mainstem of McGarvey during November and December. These traps did not capture any fish, however in years past, downstream outmigrant trapping efforts in the same stream reach during this time of year yielded the highest

capture rates (YTFP 2009). Additionally, SPI data shows considerable emigration of tagged fish occurred in November 2010. It is most likely that no fish were captured in the downstream traps during November and December due to trap efficiency issues associated with high flows in 2010.

Results of PIT tagging efforts and data collected at the SPI stations in the Lower Mainstem, Upper Mainstem, and West Fork showed substantial numbers of fish migrating downstream during the fall months and presumably exiting McGarvey Creek. More than half (51.46%) of coho tagged during summer abundance inventories were detected moving downstream past the Lower SPI station during November, compared with only 30.77% leaving during March through April. This data suggests that some natal juvenile coho emigrate in the fall as well as the more typical spring period, however this ratio is unknown because we are unable to account for overwinter mortality prior to spring outmigration, as well as the possibility that some of these fish remained in the lower one mile of stream after passing downstream of the Lower SPI station. Some of these fish were subsequently detected in Waukell Creek, a Lower Klamath tributary located downstream at RM 3.19. Most of the fish that entered Waukell Creek did not emigrate from that system until spring, indicating they overwintered there. To a lesser extent, fish natal to McGarvey were also detected immigrating in to Salt and Panther creeks, which flow into the north side of the Klamath River at approximately RM 0.75. It is not known whether these fish are leaving McGarvey Creek due to rearing capacity limitations or if this emigration is driven by other factors.

Operation of the upstream migrant trap in McGarvey Creek revealed that considerable upstream movement of salmonids occurs in McGarvey Creek during fall and winter months. Approximately 46% of steelhead, 30% of cutthroat, and 52% of the coho captured in upstream traps occurred during November and December. It is unknown whether the upstream migrant steelhead and cutthroat were native to the drainage and returning or were truly non-natal. It is likely that a fraction of coho captured moving upstream were non-natal fish, as suggested by recaptures of fish marked elsewhere in the Mid and Lower Klamath Sub-basins; however, this proportion is unknown. It is also likely that many of these fish were McGarvey residents seeking suitable overwintering habitat in the stream. An attempt to estimate the population abundance of upstream emigrating fish was made with low confidence because weekly efficiencies of the upstream traps could not be calculated due to low recapture numbers.

Almost one-half of coho known to be non-natal emigrated from McGarvey Creek during May, suggesting a large portion of non-natal coho may use McGarvey Creek to overwinter. Similar upstream migration and subsequent overwinter rearing has been documented in several other Lower Klamath tributaries; typically in conjunction with precipitation events and increased streamflow (Hillemeier et al. 2009; Soto et al. 2008; YTFP, unpublished data). It is probable that a portion of these fish originated from the Mid Klamath Sub-basin, as has been documented in this and previous investigations. Between May 2007 and May 2008, 2.5% of coho tagged in the Mid Klamath as part of the Klamath River Coho Ecology Project were recaptured in Lower Klamath tributaries including McGarvey Creek (Hillemeier et al. 2009).

Past and present research efforts in the Klamath Basin and the Pacific Northwest as a whole are making it clear that coho salmon use a range of strategies to utilize river and stream habitats during the freshwater stage of their development. The importance of low gradient, coastal

streams to salmonids extends beyond providing quality spawning and rearing habitat to natal individuals. Tributaries like McGarvey Creek provide overwinter rearing habitat for fish from throughout the entire Klamath Basin. The mechanisms facilitating dispersal of these individuals from their natal streams are not well understood, but may include carrying capacity limitations, intraspecific competition, flow, and temperature (Lestelle 2007). In a large river system such as the Klamath, factors including unfavorable conditions in the mainstem (e.g. high flows and limited velocity refuge) during winter months can result in a large-scale seasonal redistribution of coho juveniles over tens or even over one hundred miles (Table 27, Lestelle 2007). Tributaries to the mainstem Klamath provide refuge for these individuals by providing low-velocity habitat and thermal refugia (e.g. pools, off-channel ponds).

The use of FDX PIT tags consistent with efforts from throughout the Klamath Basin, in combination with remote SPI stations at three locations in the creek made it possible to track approximate emigration timing and the presence of non-natal fish in the McGarvey system. However, the Lower Mainstem SPI station is located more than one mile from the mouth of McGarvey Creek, which resulted in a data gap for determining actual emigration timing or any fish utilizing the lower portion of the creek, including those entering an important off-channel habitat constructed by YTFP in 2010. One solution we recommend would be to install additional antenna arrays closer to the mouth of McGarvey Creek. This station will need to be periodically dismantled due to the danger posed by high flow events, which coupled with backwater events in the lower reach of McGarvey Creek can displacing antenna arrays and flood multiplex transceiver units. Therefore we also recommend investigating alternative options for the installation of PIT tag detection systems in this portion of McGarvey Creek. Periodic active detection events could provide important information on fish use of habitat downstream of traps and remote detection stations, as well as contribute information on the extent of non-natal use in this section. We are also currently investigating the potential of determining non-natal from natal fish by assessing genetics from tissue samples, though this may not be possible at such a fine geographic scale for coho salmon (Garza 2012; Bucklin et al. 2007).

Calculation of survival rates between life history stages was a primary objective of this study. The ability to assess survival rates between life stages by comparing population estimates for YOY summer abundance relative to the abundance of smolts migrating the following spring is based on the assumption that the stream is a closed system between these sampling periods. This and past studies, as well as other YTFP assessments (Soto et al. 2008; Hillemeier et al. 2009; YTFP 2009), have documented that McGarvey Creek and other Lower Klamath tributaries are not closed systems. Substantial emigration of juvenile salmonids during the fall and early winter occurs, prior to the typically-assumed emigration period in the spring. In addition, upstream migration of non-natal fish during the late fall and early winter occurs, creating difficulties in estimating survival rates between life stages. Before these types of estimations can be made confidently (in the Lower Klamath as well as other systems), it should first be determined how many natal fish leave and how many non-natal fish enter the system during the fall and early winter.

Future efforts to assess survival rates from one life stage to another in McGarvey Creek (and other areas where non-natal rearing occurs) should also include attempts to calculate efficiencies at upstream migrant traps. This could be accomplished by operating two upstream traps at two

separate locations, positioned close enough to confidently assume fish will move through both traps. The lower upstream trap could be used to mark fish with a PIT tag that would be used to estimate the efficiency of the upper upstream trap. SPI arrays should be installed below the lower upstream trap to determine how many fish turn around and emigrate downstream before reaching the upper upstream trap. In addition, upstream and downstream juvenile trapping efforts should continue to be conducted, beginning in the fall and continue through late spring, to assess movement and life history patterns for all the juvenile salmonids that leave and enter the system.

In addition to collecting data on the life history processes of natal and non-natal salmonids, past and future monitoring efforts in McGarvey Creek provide a unique long-term data set through which YTFP can assess effectiveness of restoration efforts in this watershed. Watershed restoration efforts in McGarvey Creek began in 1997 with road decommissioning and riparian planting. Since 2007 YTFP has been working with Rocco Fiori (Fiori Geosciences) to conduct innovative wood loading and off-channel restoration in the watershed (Gale 2008; Gale 2009; YTFP 2012). A common problem among habitat restoration projects is inadequate pre- and post-restoration monitoring, which can confound measures of restoration project success with stochastic variables such as annual variability in fish populations and changes in short-term habitat use due to annual weather events (Hicks 1991). Roni et al. (2003) found that "before-after" design monitoring programs can require 10 to 50 years to detect a doubling in juvenile coho abundance, and often short-term monitoring (less than 10 years) can fail to detect less-than dramatic results. This project provides an opportunity to help quantify the success of past habitat restoration projects over a long period of time by continuing to monitor juvenile use of in-channel habitats, as well as stream-wide juvenile production, over all seasons through many years, while providing at least ten years of pre-restoration baseline population data for projects undertaken from 2007 onwards. Though it is currently too soon to quantitatively address the successes and weaknesses of instream, riparian, and off-channel restoration efforts undertaken in the watershed, continued life cycle monitoring will make such assessments possible in years to come.

It is extremely important to continue long-term monitoring of salmonids in McGarvey Creek to build on existing knowledge of salmonid life cycle processes in this creek and other similar tributaries. Large-scale FDX PIT tagging began throughout the Mid and Lower Klamath Sub-basins in 2007, and we are just now beginning to see the benefits of these efforts on a life cycle scale as these tagged fish return. Recaptures of three adult coho PIT tagged as juveniles in the Lower Klamath provide particularly compelling evidence for the ability of long-term monitoring to shed light on important data gaps in the life cycles of anadromous salmonids. Two of these adults were tagged as smolts emigrating from McGarvey Creek in November 2008 and recaptured reentering McGarvey Creek in December 2011. The third was tagged in Waukell Creek in January 2010 and recaptured in McGarvey January 2011, and is presumed to be a returning coho jack. It has proven difficult in the past for YTFP to assess the relationship between returning spawners and the number of juveniles observed during summer abundance inventories because logistical difficulties such as turbidity and high flows often make spawner surveys intermittent or infeasible. Though we recommend the continuation of spawner surveys because of the important information they provide on redd locations and adult use of instream habitat, adult recaptures on SPI stations show that juvenile tagging efforts can provide invaluable information on numbers of returning adults. As trapping and population estimation methods in

McGarvey Creek are refined, these adult recaptures may prove to be extremely useful in making a connection between the number of smolts produced by the stream and the number of adults returning from the open ocean.

Life cycle monitoring in McGarvey Creek continues to uncover important ways that juvenile salmonids, particularly coho, utilize lower tributary habitats seasonally in the Klamath River and potentially in other similar large river systems in the Pacific Northwest. Considerable movement of juveniles occurs prior to the spring smolt outmigration period, beginning with a redistribution to find suitable habitat for summer months and followed by a larger-scale redistribution to find suitable overwinter rearing habitat. In addition to fish from throughout the Mid and Lower Klamath Basin moving into McGarvey Creek during this fall redistribution to seek refuge from mainstem Klamath River conditions, it appears that juveniles native to the drainage may redistribute to other Lower Klamath tributaries prior to smoltification. It is essential to further investigate the reasons for and magnitude of these seasonal redistributions to refine population estimation techniques, gage the relative importance of different in- and off-channel habitats, and identify potential limiting factors to coho production in McGarvey Creek. These investigations, along with continued monitoring of long-term trends in McGarvey Creek's salmonid populations, will help guide future management and restoration efforts in this and other lower Klamath tributaries.

Summary of recommendations:

- Future efforts be designed in a manner that covers a complete three-year coho life cycle
- Install additional SPI antenna arrays closer to the mouth of McGarvey Creek
- Investigate alternative options for PIT tag detection systems in the lower portion of McGarvey Creek, including periodic active detection events in the stream reach below the Lower SPI station
- Investigate the potential of determining non-natal from natal fish by assessing genetics from tissue samples
- Calculate efficiencies at upstream migrant traps, potentially by operating two upstream traps together specifically for this purpose
- Continue spawner surveys in McGarvey Creek to collect information on redd locations and adult habitat use
- Continue long-term monitoring of juvenile upstream and downstream movements, particularly during the period from fall through late spring

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APPENDIX A

LIST OF FISH IMPLANTED WITH FULL DUPLEX (FDX) PIT TAGS 2010-2011

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
5/16/2011	Lower Upstream Trap	CT	116	14.8	985121025518586
1/25/2011	D/S Upper Reach Trap	CO	750		985121020416151
2/23/2011	D/S Upper Reach Trap	CO	630		985121020935797
4/15/2011	D/S Upper Reach Trap	CO	93	9.7	985121025595198
4/15/2011	D/S Upper Reach Trap	CO	94	9.5	985121025578926
5/2/2011	D/S Upper Reach Trap	CO	112	14.7	985121025500546
5/3/2011	D/S Upper Reach Trap	CO	105	12	985121025588386
5/4/2011	D/S Upper Reach Trap	CO	115	15.5	985121025503785
5/4/2011	D/S Upper Reach Trap	CO	113	15.1	985121025509751
5/4/2011	D/S Upper Reach Trap	CO	104	11.5	985121025494575
5/10/2011	D/S Upper Reach Trap	CO	110	13.6	985121025494924
5/11/2011	D/S Upper Reach Trap	CO	118	16.8	985121025515293
5/11/2011	D/S Upper Reach Trap	CO	96	10.1	985121025515619
5/11/2011	D/S Upper Reach Trap	CO	123	19.2	985121025494919
5/18/2011	D/S Upper Reach Trap	CO	120	18.6	985121025431894
5/18/2011	D/S Upper Reach Trap	CO	109	13.2	985121025415252
5/18/2011	D/S Upper Reach Trap	CO	111	13.7	985121025518061
5/24/2011	D/S Upper Reach Trap	CO	111	13.3	985121025520210
5/31/2011	D/S Upper Reach Trap	CO	66	3.9	985121025437432
5/31/2011	D/S Upper Reach Trap	CO	68	3.6	985121025425314
08/12/10	Lower Mainstem (single stream)	CO	81	7.0	985121020416885
08/12/10	Lower Mainstem (single stream)	CO	83	5.8	985121020498305
08/12/10	Lower Mainstem (single stream)	CO	69	5.2	985121020609998
08/12/10	Lower Mainstem (single stream)	CO	87	9.7	985121020899234
08/12/10	Lower Mainstem (single stream)	CO	78	7.0	985121020502302
08/12/10	Lower Mainstem (single stream)	CO	75	5.8	985121020500636
08/12/10	Lower Mainstem (single stream)	CO	74	5.5	985121020496776
08/12/10	Lower Mainstem (single stream)	CO	74	4.9	985121020418360
08/16/10	Lower Mainstem (single stream)	CO	87	10.1	985121020501933
08/16/10	Lower Mainstem (single stream)	CO	84	8.1	985121020620363
08/16/10	Lower Mainstem (single stream)	CO	87	7.9	985121020497407
08/16/10	Lower Mainstem (single stream)	CO	81	6.8	985121020419266
08/16/10	Lower Mainstem (single stream)	CO	86	8.4	985121020609455
08/16/10	Lower Mainstem (single stream)	CO	82	7.0	985121020416535
08/16/10	Lower Mainstem (single stream)	CO	83	7.7	985121020497896
08/16/10	Lower Mainstem (single stream)	CO	85	7.5	985121020501353
08/16/10	Lower Mainstem (single stream)	CO	94	10.1	985121020500718
08/16/10	Lower Mainstem (single stream)	CO	84	7.5	985121020416788

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
08/16/10	Lower Mainstem (single stream)	CO	78	5.5	985121020613469
08/16/10	Lower Mainstem (single stream)	CO	82	8.0	985121020501357
08/16/10	Lower Mainstem (single stream)	CO	88	7.6	985121020500186
08/16/10	Lower Mainstem (single stream)	CO	75	5.5	985121020501383
08/16/10	Lower Mainstem (single stream)	CO	80	7.6	985121016707212
08/16/10	Lower Mainstem (single stream)	CO	85	9.6	985121015690143
08/16/10	Lower Mainstem (single stream)	CO	76	5.8	985121015690346
08/16/10	Lower Mainstem (single stream)	CO	77	5.7	985121016487731
08/16/10	Lower Mainstem (single stream)	CO	71	4.5	985121016217400
08/16/10	Lower Mainstem (single stream)	CO	88	9.7	985121016220679
08/16/10	Lower Mainstem (single stream)	CO	80	6.5	985121015738730
08/16/10	Lower Mainstem (single stream)	CO	78	5.7	985121016666479
08/16/10	Lower Mainstem (single stream)	CO	80	7.0	985121015690110
08/16/10	Lower Mainstem (single stream)	CO	78	7.0	985121016705458
08/16/10	Lower Mainstem (single stream)	CO	82	6.3	985121016506680
08/16/10	Lower Mainstem (single stream)	CO	79	6.9	985121015713003
08/16/10	Lower Mainstem (single stream)	CO	87	8.4	985121016527421
08/16/10	Lower Mainstem (single stream)	CO	81	6.4	985121015690877
08/16/10	Lower Mainstem (single stream)	CO	81	6.7	985121015687337
08/16/10	Lower Mainstem (single stream)	CO	75	5.2	985121016520523
08/16/10	Lower Mainstem (single stream)	CO	83	6.8	985121015688747
08/16/10	Lower Mainstem (single stream)	CO	73	4.7	985121016220320
08/16/10	Lower Mainstem (single stream)	CO	89	8.7	985121016151299
08/16/10	Lower Mainstem (single stream)	CO	91	9.3	985121015723204
08/16/10	Lower Mainstem (single stream)	CO	85	6.9	985121016151402
08/16/10	Lower Mainstem (single stream)	CO	87	7.8	985121016664003
08/17/10	Lower Mainstem (single stream)	CO	81	6.4	985121016154346
08/17/10	Lower Mainstem (single stream)	CO	73	4.7	985121015692677
08/17/10	Lower Mainstem (single stream)	CO	79	5.9	985121016217504
08/17/10	Lower Mainstem (single stream)	CO	84	7.7	985121016482382
08/17/10	Lower Mainstem (single stream)	CO	79	7.5	985121016706480
08/17/10	Lower Mainstem (single stream)	CO	81	6.5	985121016504238
08/17/10	Lower Mainstem (single stream)	CO	90	8.7	985121015689583
08/17/10	Lower Mainstem (single stream)	CO	72	4.6	985121016217298
08/17/10	Lower Mainstem (single stream)	CO	79	5.9	985121016518279
08/17/10	Lower Mainstem (single stream)	CO	84	7.5	985121016148874
08/17/10	Lower Mainstem (single stream)	CO	75	4.8	985121015711849
08/17/10	Lower Mainstem (single stream)	CO	81	6.7	985121016149796

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
08/17/10	Lower Mainstem (single stream)	CO	75	5.3	985121016689182
08/17/10	Lower Mainstem (single stream)	CO	96	11.0	985121015689898
08/17/10	Lower Mainstem (single stream)	CO	79	5.8	985121016153468
08/17/10	Lower Mainstem (single stream)	CO	79	5.5	985121016520823
08/17/10	Lower Mainstem (single stream)	CO	89	9.0	985121016491466
08/17/10	Lower Mainstem (single stream)	CO	75	6.5	985121016663550
08/17/10	Lower Mainstem (single stream)	CO	74	5.8	985121015690780
08/17/10	Lower Mainstem (single stream)	CO	82	6.4	985121016476235
08/17/10	Lower Mainstem (single stream)	CO	77	5.2	985121016518207
08/17/10	Lower Mainstem (single stream)	CO	82	6.4	985121016483512
08/17/10	Lower Mainstem (single stream)	CO	82	6.3	985121016484189
08/17/10	Lower Mainstem (single stream)	CO	73	4.7	985121016520959
08/17/10	Lower Mainstem (single stream)	CO	83	7.0	985121016517603
08/17/10	Lower Mainstem (single stream)	CO	79	6.3	985121016150967
08/17/10	Lower Mainstem (single stream)	CO	73	4.4	985121016704584
08/17/10	Lower Mainstem (single stream)	CO	78	5.9	985121016217405
08/17/10	Lower Mainstem (single stream)	CO	73	4.9	985121016525482
08/17/10	Lower Mainstem (single stream)	CO	88	8.1	985121016487596
08/17/10	Lower Mainstem (single stream)	CO	82	7.0	985121016708039
08/17/10	Lower Mainstem (single stream)	CO	90	8.7	985121016517283
08/17/10	Lower Mainstem (single stream)	CO	78	6.5	985121016517568
08/17/10	Lower Mainstem (single stream)	CO	86	8.9	985121016488389
08/17/10	Lower Mainstem (single stream)	CO	82	6.5	985121016519331
08/17/10	Lower Mainstem (single stream)	CO	79	6.9	985121015702373
08/17/10	Lower Mainstem (single stream)	CO	75	5.4	985121016221317
08/17/10	Lower Mainstem (single stream)	CO	75	4.9	985121016491218
08/17/10	Lower Mainstem (single stream)	CO	73	4.8	985121016219507
08/17/10	Lower Mainstem (single stream)	CO	85	7.7	985121016149344
08/17/10	Lower Mainstem (single stream)	CO	71	5.2	985121016491511
08/17/10	Lower Mainstem (single stream)	CO	75	5.3	985121016149338
08/17/10	Lower Mainstem (single stream)	CO	82	5.1	985121016154686
08/17/10	Lower Mainstem (single stream)	CO	89	10.2	985121016497192
08/17/10	Lower Mainstem (single stream)	CO	70	4.0	985121016485504
08/17/10	Lower Mainstem (single stream)	CO	72	4.7	985121016517111
08/17/10	Lower Mainstem (single stream)	CO	75	5.3	985121016150256
08/17/10	Lower Mainstem (single stream)	CO	72	5.8	985121015689852
08/17/10	Lower Mainstem (single stream)	CO	85	7.4	985121016517203
08/17/10	Lower Mainstem (single stream)	CO	96	10.5	985121016515764

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
08/17/10	Lower Mainstem (single stream)	CO	71	4.3	985121016517747
08/17/10	Lower Mainstem (single stream)	CO	83	7.1	985121016149232
08/17/10	Lower Mainstem (single stream)	CO	85	9.2	985121016148709
08/17/10	Lower Mainstem (single stream)	CO	85	7.3	985121016503012
08/17/10	Lower Mainstem (single stream)	CO	76	5.8	985121015708419
08/17/10	Lower Mainstem (single stream)	CO	78	6.1	985121016514229
08/17/10	Lower Mainstem (single stream)	CO	81	7.0	985121016486653
08/17/10	Lower Mainstem (single stream)	CO	82	6.8	985121016526075
08/17/10	Lower Mainstem (single stream)	CO	89	9.0	985121016154473
08/17/10	Lower Mainstem (single stream)	CO	75	5.1	985121016483342
08/17/10	Lower Mainstem (single stream)	CO	84	6.8	985121016519954
08/17/10	Lower Mainstem (single stream)	CO	85	7.3	985121015688661
08/17/10	Lower Mainstem (single stream)	CO	78	5.7	985121016152120
08/17/10	Lower Mainstem (single stream)	CO	92	10.0	985121016506500
08/17/10	Lower Mainstem (single stream)	CO	75	5.7	985121016483520
08/17/10	Lower Mainstem (single stream)	CO	74	4.4	985121016671712
08/17/10	Lower Mainstem (single stream)	CO	78	5.2	985121016154786
08/17/10	Lower Mainstem (single stream)	CO	89	8.5	985121016149333
08/17/10	Lower Mainstem (single stream)	CO	73	4.8	985121016672525
08/17/10	Lower Mainstem (single stream)	CO	85	7.8	985121016220016
08/18/10	Lower Mainstem (single stream)	CO	82	6.7	985121015718125
08/18/10	Lower Mainstem (single stream)	CO	81	6.2	985121016521228
08/18/10	Lower Mainstem (single stream)	CO	82	6.8	985121015687509
08/18/10	Lower Mainstem (single stream)	CO	90	8.9	985121016219886
08/18/10	Lower Mainstem (single stream)	CO	73	4.8	985121016219964
08/18/10	Lower Mainstem (single stream)	CO	83	6.8	985121016514085
08/18/10	Lower Mainstem (single stream)	CO	70	5.2	985121016515750
08/18/10	Lower Mainstem (single stream)	CO	72	4.5	985121016491147
08/18/10	Lower Mainstem (single stream)	CO	85	7.8	985121016498277
08/18/10	Lower Mainstem (single stream)	CO	77	5.9	985121016519594
08/18/10	Lower Mainstem (single stream)	CO	73	5.0	985121016673898
08/18/10	Lower Mainstem (single stream)	CO	79	6.3	985121016218758
08/18/10	Lower Mainstem (single stream)	CO	77	5.4	985121016152765
08/18/10	Lower Mainstem (single stream)	CO	71	4.5	985121016495741
08/18/10	Lower Mainstem (single stream)	CO	73	4.8	985121016497492
08/18/10	Lower Mainstem (single stream)	CO	74	5.1	985121016665211
08/18/10	Lower Mainstem (single stream)	CO	77	5.6	985121016151689
08/18/10	Lower Mainstem (single stream)	CO	73	4.5	985121016518589

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
08/18/10	Lower Mainstem (single stream)	CO	79	6.4	985121016505106
08/18/10	Lower Mainstem (single stream)	CO	69	4.1	985121015708232
08/18/10	Lower Mainstem (single stream)	CO	73	4.8	985121015708288
08/18/10	Lower Mainstem (single stream)	CO	70	4.3	985121016221883
08/18/10	Lower Mainstem (single stream)	CO	70	5.0	985121016495041
08/18/10	Lower Mainstem (single stream)	CO	75	6.4	985121016483720
08/18/10	Lower Mainstem (single stream)	CO	71	4.4	985121016221253
08/18/10	Lower Mainstem (single stream)	CO	89	8.4	985121016480870
08/18/10	Lower Mainstem (single stream)	CO	76	5.3	985121015688756
08/18/10	Lower Mainstem (single stream)	CO	69	4.0	985121016481541
08/18/10	Lower Mainstem (single stream)	CO	75	5.4	985121016153623
08/18/10	Lower Mainstem (single stream)	CO	75	5.4	985121016498391
08/18/10	Lower Mainstem (single stream)	CO	66	3.5	985121015692631
08/18/10	Lower Mainstem (single stream)	CO	74	5.1	985121016691349
08/18/10	Lower Mainstem (single stream)	CO	81	6.8	985121016687500
08/18/10	Lower Mainstem (single stream)	CO	84	7.1	985121016491939
08/18/10	Lower Mainstem (single stream)	CO	73	5.0	985121016488570
08/18/10	Lower Mainstem (single stream)	CO	75	5.8	985121016485751
08/18/10	Lower Mainstem (single stream)	CO	76	6.5	985121015691633
08/18/10	Lower Mainstem (single stream)	CO	71	4.5	985121016495847
08/18/10	Lower Mainstem (single stream)	CO	73	5.0	985121016519098
08/18/10	Lower Mainstem (single stream)	CO	72	5.0	985121016516785
08/18/10	Lower Mainstem (single stream)	CO	69	4.0	985121016666739
08/18/10	Lower Mainstem (single stream)	CO	71	4.3	985121016484958
08/18/10	Lower Mainstem (single stream)	CO	67	4.9	985121016491735
08/18/10	Lower Mainstem (single stream)	CO	76	5.5	985121016706529
08/18/10	Lower Mainstem (single stream)	CO	72	5.0	985121016151797
08/18/10	Lower Mainstem (single stream)	CO	70	4.7	985121016707126
11/2/2010	Lower Upstream Trap	CO	82	5.9	985121020499536
11/2/2010	Lower Upstream Trap	CO	71	4.4	985121020502155
11/4/2010	Lower Upstream Trap	CO	98	10.4	985121020614747
11/5/2010	Lower Upstream Trap	CO	90	8.0	985121015688113
11/5/2010	Lower Upstream Trap	CO	89	7.6	985121020413818
11/9/2010	Lower Upstream Trap	CO	348		985121016153958
11/11/2010	Lower Upstream Trap	CO	98	10.7	985121020500065
11/12/2010	Lower Upstream Trap	CO	103	13.2	985121020500513
11/12/2010	Lower Upstream Trap	CO	97	10.2	985121020463830
11/12/2010	Lower Upstream Trap	CO	104	12.9	985121020418742

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
11/12/2010	Lower Upstream Trap	CO	100	13.0	985121020501833
11/12/2010	Lower Upstream Trap	CO	93	10.3	985121020416539
11/12/2010	Lower Upstream Trap	CO	100	11.1	985121020460473
11/12/2010	Lower Upstream Trap	CO	91	8.2	985121020465653
11/18/2010	Lower Upstream Trap	CO	93	9.2	985121020497225
11/24/2010	Lower Upstream Trap	CO	114	17.7	985121020418108
11/25/2010	Lower Upstream Trap	CO	106	14.1	985121020416421
11/25/2010	Lower Upstream Trap	CO	103	11.8	985121020500539
11/25/2010	Lower Upstream Trap	CO	97	9.4	985121020500596
11/25/2010	Lower Upstream Trap	CO	99	11.3	985121020500571
11/30/2010	Lower Upstream Trap	CO	91	9.1	985121020499963
12/1/2010	Lower Upstream Trap	CO	99	11.2	985121020620348
12/1/2010	Lower Upstream Trap	CO	93	8.9	985121020619987
12/7/2010	Lower Upstream Trap	CO	101	11.0	985121020418880
12/7/2010	Lower Upstream Trap	CO	83	6.2	985121020616258
12/8/2010	Lower Upstream Trap	CO	106	12.7	985121020613446
12/8/2010	Lower Upstream Trap	CO	91	8.5	985121020612238
12/8/2010	Lower Upstream Trap	CO	100	11.0	985121020500159
12/10/2010	Lower Upstream Trap	CO	109	13.5	985121020500942
12/14/2010	Lower Upstream Trap	CO	90	8.4	985121020418350
12/14/2010	Lower Upstream Trap	CO	93	8.7	985121020414237
12/14/2010	Lower Upstream Trap	CO	85	6.5	985121020415428
12/15/2010	Lower Upstream Trap	CO	88	8.3	985121020619083
12/15/2010	Lower Upstream Trap	CO	92	8.7	985121020899070
12/15/2010	Lower Upstream Trap	CO	96	9.1	985121020616253
12/15/2010	Lower Upstream Trap	CO	100	10.0	985121020616167
12/15/2010	Lower Upstream Trap	CO	102	10.7	985121020418092
12/15/2010	Lower Upstream Trap	CO	102	11.3	985121020415728
12/15/2010	Lower Upstream Trap	CO	93	8.2	985121020499891
12/16/2010	Lower Upstream Trap	CO	88	7.8	985121020618644
12/16/2010	Lower Upstream Trap	CO	103	11.6	985121020500521
12/17/2010	Lower Upstream Trap	CO	80	6.9	985121020417549
1/4/2011	Lower Upstream Trap	CO	86	6.7	985121020499160
1/4/2011	Lower Upstream Trap	CO	89	7.9	985121020417633
1/5/2011	Lower Upstream Trap	CO	100	9.5	985121020899982
1/6/2011	Lower Upstream Trap	CO	93	8.6	985121025061735
1/6/2011	Lower Upstream Trap	CO	110	13.3	985121020501415
1/6/2011	Lower Upstream Trap	CO	106	12.4	985121020417157

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
1/6/2011	Lower Upstream Trap	CO	96	9.4	985121020463152
1/7/2011	Lower Upstream Trap	CO	90	7.2	985121020616280
1/7/2011	Lower Upstream Trap	CO	111	14.3	985121020613771
1/7/2011	Lower Upstream Trap	CO	97	10.0	985121020418103
1/7/2011	Lower Upstream Trap	CO	102	11.5	985121020498401
1/11/2011	Lower Upstream Trap	CO	87	7.6	985121020462119
1/11/2011	Lower Upstream Trap	CO	110	13.4	985121020501592
1/11/2011	Lower Upstream Trap	CO	105	12.3	985121020610507
1/13/2011	Lower Upstream Trap	CO	96	8.9	985121020616789
1/13/2011	Lower Upstream Trap	CO	117	17.6	985121020414631
1/14/2011	Lower Upstream Trap	CO	101	11.2	985121020498751
1/14/2011	Lower Upstream Trap	CO	97	9.2	985121020498083
1/19/2011	Lower Upstream Trap	CO	98	13.4	985121020611726
1/20/2011	Lower Upstream Trap	CO	85	6.5	985121020497429
1/26/2011	Lower Upstream Trap	CO	92	8.4	985121020500723
1/27/2011	Lower Upstream Trap	CO	94	9.4	985121020897222
2/2/2011	Lower Upstream Trap	CO	110	19.7	985121020414928
2/10/2011	Lower Upstream Trap	CO	104	10.7	985121020100745
2/23/2011	Lower Upstream Trap	CO	98	10.1	985121020917281
3/23/2011	Lower Upstream Trap	CO	109	14.2	985121020104294
5/10/2011	Lower Upstream Trap	CO	112	15.4	985121025504011
5/10/2011	Lower Upstream Trap	CO	108	13.0	985121025518161
1/19/2011	McGarvey Alcove	CO	99	11.3	985121020495343
1/19/2011	McGarvey Alcove	CO	104	12.5	985121020499688
1/19/2011	McGarvey Alcove	CO	107	13.4	985121020499319
1/19/2011	McGarvey Alcove	CO	107	14.5	985121020897746
1/19/2011	McGarvey Alcove	CO	90	8.9	985121020417686
1/19/2011	McGarvey Alcove	CO	88	7.3	985121020609979
1/19/2011	McGarvey Alcove	CO	107	14.1	985121020501504
1/19/2011	McGarvey Alcove	CO	90	8.1	985121020418744
1/19/2011	McGarvey Alcove	CO	95	9.6	985121020611267
1/19/2011	McGarvey Alcove	CO	107	13.9	985121020416191
1/19/2011	McGarvey Alcove	CO	96	10	985121020415006
1/19/2011	McGarvey Alcove	CO	114	16.4	985121020612311
1/19/2011	McGarvey Alcove	CO	114	16.3	985121020500919
1/19/2011	McGarvey Alcove	CO	95	9.7	985121020609989
1/19/2011	McGarvey Alcove	CO	111	14.8	985121020619504
1/19/2011	McGarvey Alcove	CO	93	9.2	985121020498318

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
1/19/2011	McGarvey Alcove	CO	93	9.8	985121020416176
1/19/2011	McGarvey Alcove	CO	95	9.1	985121020900986
1/19/2011	McGarvey Alcove	CO	80	5.3	985121020418361
1/19/2011	McGarvey Alcove	CO	99	11	985121020500956
1/19/2011	McGarvey Alcove	CO	116	17	985121020414646
1/19/2011	McGarvey Alcove	CO	101	11.2	985121020497007
1/19/2011	McGarvey Alcove	CO	98	10.5	985121020497270
1/19/2011	McGarvey Alcove	CO	98	10.4	985121020453416
1/19/2011	McGarvey Alcove	CO	112	14.7	985121020502568
1/19/2011	McGarvey Alcove	CO	111	15.5	985121020466815
1/19/2011	McGarvey Alcove	CO	105	13.5	985121020899255
1/19/2011	McGarvey Alcove	CO	95	9.3	985121020417272
1/19/2011	McGarvey Alcove	CO	95	10.1	985121020419110
1/19/2011	McGarvey Alcove	CO	103	12.1	985121020416368
1/19/2011	McGarvey Alcove	CO	102	12.8	985121020616032
1/20/2011	McGarvey Alcove	CO	100	11.4	985121020413909
1/20/2011	McGarvey Alcove	CO	97	10.3	985121020898729
1/20/2011	McGarvey Alcove	CO	81	6.7	985121020496504
1/20/2011	McGarvey Alcove	CO	113	15.4	985121020897410
1/20/2011	McGarvey Alcove	CO	110	15.8	985121020496713
1/20/2011	McGarvey Alcove	CO	106	13.4	985121020497261
1/20/2011	McGarvey Alcove	CO	106	13.8	985121020415931
1/20/2011	McGarvey Alcove	CO	92	9.1	985121020618968
1/20/2011	McGarvey Alcove	CO	100	10.3	985121020501661
1/20/2011	McGarvey Alcove	CO	95	9.3	985121020496945
1/20/2011	McGarvey Alcove	CO	96	7.2	985121020620375
1/20/2011	McGarvey Alcove	CO	108	14.6	985121020898591
1/20/2011	McGarvey Alcove	CO	88	7.9	985121020462730
1/20/2011	McGarvey Alcove	CO	83	6.3	985121020417796
1/20/2011	McGarvey Alcove	CO	95	8.6	985121020499755
1/20/2011	McGarvey Alcove	CO	100	11	985121020896241
1/20/2011	McGarvey Alcove	CO	93	8.4	985121020612203
1/20/2011	McGarvey Alcove	CO	85	6.9	985121020462975
3/8/2011	McGarvey Alcove	CO	116	16	985121020104814
3/8/2011	McGarvey Alcove	CO	92	8.4	985121020936241
3/8/2011	McGarvey Alcove	CO	108	13.1	985121020098823
3/8/2011	McGarvey Alcove	CO	110	12.6	985121020903740
3/8/2011	McGarvey Alcove	CO	119	19.9	985121020905756

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
3/8/2011	McGarvey Alcove	CO	111	15	985121020105451
3/8/2011	McGarvey Alcove	CO	112	13.8	985121020919125
3/8/2011	McGarvey Alcove	CO	113	14.8	985121020919181
3/8/2011	McGarvey Alcove	CO	115	15.7	985121020932051
3/8/2011	McGarvey Alcove	CO	101	11.2	985121020905462
3/8/2011	McGarvey Alcove	CO	107	12.9	985121020922946
3/8/2011	McGarvey Alcove	CO	105	12.4	985121020099991
3/8/2011	McGarvey Alcove	CO	105	12.5	985121020929146
3/8/2011	McGarvey Alcove	CO	93	8.2	985121020903119
3/8/2011	McGarvey Alcove	CO	119	16.3	985121020905530
6/14/2011	McGarvey Alcove	CO	85	7.4	985121025419640
6/14/2011	McGarvey Alcove	CO	78	6.4	985121025426702
6/14/2011	McGarvey Alcove	CO	73	5.3	985121025411843
6/14/2011	McGarvey Alcove	CO	61	4.7	985121025428538
6/14/2011	McGarvey Alcove	CO	65	3.7	985121025413338
6/14/2011	McGarvey Alcove	CO	93	10.5	985121025434881
6/14/2011	McGarvey Alcove	CO	89	9.4	985121025438486
6/14/2011	McGarvey Alcove	CO	78	6.1	985121025437437
6/14/2011	McGarvey Alcove	CO	81	6.7	985121025426760
6/14/2011	McGarvey Alcove	CO	80	6.3	985121025416355
6/14/2011	McGarvey Alcove	CO	80	6.8	985121025438534
6/14/2011	McGarvey Alcove	CO	87	8.4	985121025428627
6/14/2011	McGarvey Alcove	CO	74	5.7	985121025419805
6/14/2011	McGarvey Alcove	CO	91	10.8	985121025441217
6/14/2011	McGarvey Alcove	CO	92	9.8	985121025429966
6/14/2011	McGarvey Alcove	CO	64	4.3	985121025513308
6/14/2011	McGarvey Alcove	CO	80	6.8	985121025521663
6/14/2011	McGarvey Alcove	CO	66	3.4	985121025501552
6/14/2011	McGarvey Alcove	CO	84	7.4	985121025499155
6/14/2011	McGarvey Alcove	CO	91	9.7	985121025496764
6/14/2011	McGarvey Alcove	CO	81	9.5	985121025505798
6/15/2011	McGarvey Alcove	CO	90	8.8	985121025509391
6/15/2011	McGarvey Alcove	CO	83	6.3	985121025503794
6/15/2011	McGarvey Alcove	CO	100	11.8	985121025496529
6/15/2011	McGarvey Alcove	CO	108	16.2	985121025503802
6/15/2011	McGarvey Alcove	CO	94	10.6	985121025520218
6/15/2011	McGarvey Alcove	CO	95	10.1	985121025418501
6/15/2011	McGarvey Alcove	CO	68	3.7	985121025516514

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
6/15/2011	McGarvey Alcove	CO	89	8.2	985121025503546
6/15/2011	McGarvey Alcove	CO	92	10	985121025593671
6/15/2011	McGarvey Alcove	CO	93	9.9	985121025439565
6/15/2011	McGarvey Alcove	CO	93	11	985121025578443
6/15/2011	McGarvey Alcove	CO	85	7.6	985121025516097
6/15/2011	McGarvey Alcove	CO	91	10.3	985121025512210
6/15/2011	McGarvey Alcove	CO	80	4.8	985121025589846
6/15/2011	McGarvey Alcove	CO	80	6	985121025428652
6/15/2011	McGarvey Alcove	CO	96	11.4	985121025498197
6/15/2011	McGarvey Alcove	CO	85	7.8	985121025512374
6/15/2011	McGarvey Alcove	CO	77	5.5	985121025496445
6/15/2011	McGarvey Alcove	CO	85	7.2	985121025425508
6/15/2011	McGarvey Alcove	CO	79	6	985121025416114
6/15/2011	McGarvey Alcove	CO	83	7.6	985121025412413
6/15/2011	McGarvey Alcove	CO	95	10.2	985121025412370
6/15/2011	McGarvey Alcove	CO	85	7.2	985121025428586
6/15/2011	McGarvey Alcove	CO	101	13	985121025419784
6/15/2011	McGarvey Alcove	CO	90	9.6	985121025423658
6/15/2011	McGarvey Alcove	CO	90	9	985121025412543
6/15/2011	McGarvey Alcove	CO	87	8.2	985121025428543
6/15/2011	McGarvey Alcove	CO	89	9.2	985121025417523
6/15/2011	McGarvey Alcove	CO	89	9.2	985121025438419
2/13/2011	Outmigrant Pipe Trap	CO	82	5.9	985121020917183
2/15/2011	Outmigrant Pipe Trap	CO	92	8.1	985121020104833
2/22/2011	Outmigrant Pipe Trap	CO	91	9.1	985121020932525
2/22/2011	Outmigrant Pipe Trap	CO	99	9.5	985121020908090
3/2/2011	Outmigrant Pipe Trap	CO	86	8	985121020935433
3/3/2011	Outmigrant Pipe Trap	CO	92	8.4	985121020934836
3/4/2011	Outmigrant Pipe Trap	CO	83	6.6	985121020909536
3/4/2011	Outmigrant Pipe Trap	CO	96	9.5	985121020931721
3/6/2011	Outmigrant Pipe Trap	CO	95	9.6	985121020106751
3/6/2011	Outmigrant Pipe Trap	CO	87	6.9	985121020941477
3/8/2011	Outmigrant Pipe Trap	CO	80	5.1	985121020926868
3/12/2011	Outmigrant Pipe Trap	CO	89	7.3	985121020923270
3/22/2011	Outmigrant Pipe Trap	CO	107	13	985121020917232
3/22/2011	Outmigrant Pipe Trap	CO	104	12.4	985121020923142
3/22/2011	Outmigrant Pipe Trap	CO	80	5.4	985121020942967
3/22/2011	Outmigrant Pipe Trap	CO	95	9.4	985121020909288

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
3/22/2011	Outmigrant Pipe Trap	CO	110	13.8	985121020921836
3/22/2011	Outmigrant Pipe Trap	CO	86	7.2	985121020919416
3/23/2011	Outmigrant Pipe Trap	CO	99	9.9	985121020923356
3/23/2011	Outmigrant Pipe Trap	CO	100	11	985121020904642
4/5/2011	Outmigrant Pipe Trap	CO	100	10.8	985121025591954
4/6/2011	Outmigrant Pipe Trap	CO	115	15.4	985121025683105
4/6/2011	Outmigrant Pipe Trap	CO	88	7.8	985121025592011
4/6/2011	Outmigrant Pipe Trap	CO	114	15.6	985121025583578
4/7/2011	Outmigrant Pipe Trap	CO	97	10	985121025591233
4/10/2011	Outmigrant Pipe Trap	CO	104	11.9	985121025600281
4/10/2011	Outmigrant Pipe Trap	CO	112	14.7	985121025595031
4/11/2011	Outmigrant Pipe Trap	CO	118	15.3	985121025589109
4/11/2011	Outmigrant Pipe Trap	CO	101	9.5	985121025602906
4/11/2011	Outmigrant Pipe Trap	CO	97	9.3	985121025598056
4/11/2011	Outmigrant Pipe Trap	CO	110	14	985121025597918
4/13/2011	Outmigrant Pipe Trap	CO	98	9.1	985121025589099
4/13/2011	Outmigrant Pipe Trap	CO	114	15.9	985 121025585198
4/13/2011	Outmigrant Pipe Trap	CO	100	10.7	985121025588823
4/13/2011	Outmigrant Pipe Trap	CO	111	14	985121025671340
4/13/2011	Outmigrant Pipe Trap	CO	103	10.9	985121025598254
4/14/2011	Outmigrant Pipe Trap	CO	110	14.2	985121020096439
4/14/2011	Outmigrant Pipe Trap	CO	100	10	985121020918474
4/14/2011	Outmigrant Pipe Trap	CO	83	6.1	985121020928662
4/14/2011	Outmigrant Pipe Trap	CO	100	10.2	985121020922059
4/21/2011	Outmigrant Pipe Trap	CO	106	16.8	985121025668278
4/21/2011	Outmigrant Pipe Trap	CO	107	18.3	985121025598072
4/22/2011	Outmigrant Pipe Trap	CO	99	10.6	985121025585481
4/22/2011	Outmigrant Pipe Trap	CO	102	11.6	985121025597578
4/22/2011	Outmigrant Pipe Trap	CO	113	15.8	985121025675090
4/22/2011	Outmigrant Pipe Trap	CO	97	10.1	985121025597871
4/22/2011	Outmigrant Pipe Trap	CO	109	14	985121025588656
4/22/2011	Outmigrant Pipe Trap	CO	117	18	985121025588489
4/23/2011	Outmigrant Pipe Trap	CO	100	10.5	985121020908333
4/24/2011	Outmigrant Pipe Trap	CO	112	14.9	985121020919392
4/24/2011	Outmigrant Pipe Trap	CO	119	17.1	985121020919722
4/25/2011	Outmigrant Pipe Trap	CO	108	13.2	985121020107226
4/25/2011	Outmigrant Pipe Trap	CO	105	12.2	985121020099111
4/25/2011	Outmigrant Pipe Trap	CO	108	11.1	985121020100101

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
4/25/2011	Outmigrant Pipe Trap	CO	105	12.6	985121020934940
4/25/2011	Outmigrant Pipe Trap	CO	119	17.6	985121020936226
4/25/2011	Outmigrant Pipe Trap	CO	101	11.5	985121020918859
4/25/2011	Outmigrant Pipe Trap	CO	136	23.7	985121020917955
4/25/2011	Outmigrant Pipe Trap	CO	123	16.8	985121025598048
4/25/2011	Outmigrant Pipe Trap	CO	120	15.9	985121025680652
4/25/2011	Outmigrant Pipe Trap	CO	106	13.9	985121025595515
4/25/2011	Outmigrant Pipe Trap	CO	112	15.2	985121025576888
4/25/2011	Outmigrant Pipe Trap	CO	116	17.1	985121025583516
4/25/2011	Outmigrant Pipe Trap	CO	122	19.4	985121025674581
4/25/2011	Outmigrant Pipe Trap	CO	99	9.6	985121025591509
4/26/2011	Outmigrant Pipe Trap	CO	115	15.3	985121025508807
4/26/2011	Outmigrant Pipe Trap	CO	110	14	985121025591752
4/26/2011	Outmigrant Pipe Trap	CO	117	16.8	985121025595107
4/26/2011	Outmigrant Pipe Trap	CO	107	12.7	985121025582615
4/26/2011	Outmigrant Pipe Trap	CO	120	18.1	985121025592010
4/26/2011	Outmigrant Pipe Trap	CO	120	17.2	985121025681402
4/26/2011	Outmigrant Pipe Trap	CO	123	18.2	985121025677756
4/26/2011	Outmigrant Pipe Trap	CO	112	14.1	985121025520748
4/26/2011	Outmigrant Pipe Trap	CO	106	17.2	985121025496448
4/26/2011	Outmigrant Pipe Trap	CO	110	14.1	985121025599639
4/26/2011	Outmigrant Pipe Trap	CO	105	12.3	985121025518826
4/26/2011	Outmigrant Pipe Trap	CO	122	18.2	985121025510213
4/27/2011	Outmigrant Pipe Trap	CO	122	19.3	985121025588740
4/27/2011	Outmigrant Pipe Trap	CO	95	9	985121025595208
4/27/2011	Outmigrant Pipe Trap	CO	108	16	985121025589009
4/27/2011	Outmigrant Pipe Trap	CO	107	12.5	985121025583501
4/27/2011	Outmigrant Pipe Trap	CO	133	24.7	985121025585982
4/27/2011	Outmigrant Pipe Trap	CO	114	15.4	985121025600548
4/27/2011	Outmigrant Pipe Trap	CO	121	19.1	985121025602624
4/27/2011	Outmigrant Pipe Trap	CO	106	12.5	985121025580615
4/27/2011	Outmigrant Pipe Trap	CO	100	10.8	985121025597944
4/27/2011	Outmigrant Pipe Trap	CO	86	7.6	985121025580444
4/27/2011	Outmigrant Pipe Trap	CO	100	10.2	985121025581048
4/27/2011	Outmigrant Pipe Trap	CO	116	16.6	985121025600807
4/27/2011	Outmigrant Pipe Trap	CO	134	22.6	985121025580366
4/27/2011	Outmigrant Pipe Trap	CO	102	15.5	985121025678714
4/28/2011	Outmigrant Pipe Trap	CO	93	9	985121025518561

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
4/28/2011	Outmigrant Pipe Trap	CO	131	22.8	985121025499091
4/28/2011	Outmigrant Pipe Trap	CO	120	18.5	985121025508944
4/28/2011	Outmigrant Pipe Trap	CO	129	21.8	985121025518881
4/28/2011	Outmigrant Pipe Trap	CO	105	11.6	985121025516529
4/28/2011	Outmigrant Pipe Trap	CO	101	10.4	985121025508973
4/28/2011	Outmigrant Pipe Trap	CO	116	18.1	985121025513492
4/28/2011	Outmigrant Pipe Trap	CO	112	14.6	985121025520575
4/28/2011	Outmigrant Pipe Trap	CO	105	12	985121025498686
4/28/2011	Outmigrant Pipe Trap	CO	112	14.9	985121025496137
4/28/2011	Outmigrant Pipe Trap	CO	117	16.2	985121025496175
4/28/2011	Outmigrant Pipe Trap	CO	116	16	985121025513303
4/28/2011	Outmigrant Pipe Trap	CO	124	19.9	985121025518939
4/28/2011	Outmigrant Pipe Trap	CO	100	10.2	985121025498931
5/1/2011	Outmigrant Pipe Trap	CO	112	14.9	985121025496123
5/1/2011	Outmigrant Pipe Trap	CO	110	13.9	985121025499066
5/1/2011	Outmigrant Pipe Trap	CO	134	24.5	985121025503928
5/1/2011	Outmigrant Pipe Trap	CO	108	13.3	985121026104491
5/1/2011	Outmigrant Pipe Trap	CO	114	16.7	985121025516112
5/1/2011	Outmigrant Pipe Trap	CO	115	16.7	985121025587778
5/1/2011	Outmigrant Pipe Trap	CO	102	11.7	985121025518496
5/1/2011	Outmigrant Pipe Trap	CO	117	16.9	985121025496160
5/1/2011	Outmigrant Pipe Trap	CO	130	22.5	985121025501288
5/1/2011	Outmigrant Pipe Trap	CO	110	14	985121025496525
5/1/2011	Outmigrant Pipe Trap	CO	120	18.2	985121025601174
5/1/2011	Outmigrant Pipe Trap	CO	98	10.2	985121025513461
5/1/2011	Outmigrant Pipe Trap	CO	108	13.8	985121025506845
5/1/2011	Outmigrant Pipe Trap	CO	114	16.1	985121025516465
5/1/2011	Outmigrant Pipe Trap	CO	103	12.3	985121025518155
5/3/2011	Outmigrant Pipe Trap	CO	94	9.4	985121025583326
5/3/2011	Outmigrant Pipe Trap	CO	106	14	985121025598043
5/3/2011	Outmigrant Pipe Trap	CO	114	15.2	985121025602922
5/3/2011	Outmigrant Pipe Trap	CO	102	10.1	985121025598042
5/3/2011	Outmigrant Pipe Trap	CO	123	18.3	985121025595021
5/3/2011	Outmigrant Pipe Trap	CO	114	13.7	985121025600570
5/4/2011	Outmigrant Pipe Trap	CO	122	19.4	985121025518774
5/4/2011	Outmigrant Pipe Trap	CO	126	19	985121025601819
5/4/2011	Outmigrant Pipe Trap	CO	110	14.5	985121025506620
5/4/2011	Outmigrant Pipe Trap	CO	107	13.1	985121025501330

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
5/4/2011	Outmigrant Pipe Trap	CO	112	14.5	985121025508963
5/5/2011	Outmigrant Pipe Trap	CO	118	16.2	985121025496654
5/5/2011	Outmigrant Pipe Trap	CO	118	17.2	985121025518928
5/5/2011	Outmigrant Pipe Trap	CO	92	8.4	985121025503885
5/5/2011	Outmigrant Pipe Trap	CO	116	16	985121025512344
5/5/2011	Outmigrant Pipe Trap	CO	105	12.3	985121025503947
5/5/2011	Outmigrant Pipe Trap	CO	107	12.5	985121025520508
5/5/2011	Outmigrant Pipe Trap	CO	112	15.5	985121025508931
5/5/2011	Outmigrant Pipe Trap	CO	127	20	985121025500801
5/5/2011	Outmigrant Pipe Trap	CO	118	15.8	985121025505736
5/5/2011	Outmigrant Pipe Trap	CO	125	21.2	985121025579351
5/5/2011	Outmigrant Pipe Trap	CO	113	15.3	985121025496667
5/5/2011	Outmigrant Pipe Trap	CO	112	14.6	985121025496466
5/5/2011	Outmigrant Pipe Trap	CO	130	20.8	985121025498242
5/5/2011	Outmigrant Pipe Trap	CO	122	17.9	985121025505763
5/5/2011	Outmigrant Pipe Trap	CO	117	17.8	985121025513257
5/5/2011	Outmigrant Pipe Trap	CO	119	16.9	985121025512222
5/9/2011	Outmigrant Pipe Trap	CO	93	8.7	985121016495049
5/9/2011	Outmigrant Pipe Trap	CO	115	12.3	985121025510300
5/9/2011	Outmigrant Pipe Trap	CO	105	12.2	985121025520234
5/9/2011	Outmigrant Pipe Trap	CO	103	11.1	985121025510286
5/9/2011	Outmigrant Pipe Trap	CO	121	15.9	985121025510018
5/9/2011	Outmigrant Pipe Trap	CO	118	16	985121025507078
5/10/2011	Outmigrant Pipe Trap	CO	105	12.2	985121025521742
5/10/2011	Outmigrant Pipe Trap	CO	119	17.8	985121025515689
5/10/2011	Outmigrant Pipe Trap	CO	107	12.5	985121025501208
5/10/2011	Outmigrant Pipe Trap	CO	94	8.4	985121025494453
5/10/2011	Outmigrant Pipe Trap	CO	116	15.1	985121025513520
5/10/2011	Outmigrant Pipe Trap	CO	115	15.2	985121025515305
5/10/2011	Outmigrant Pipe Trap	CO	92	9	985121025505835
5/10/2011	Outmigrant Pipe Trap	CO	106	12.4	985121025496806
5/10/2011	Outmigrant Pipe Trap	CO	109	13.7	985121025496446
5/10/2011	Outmigrant Pipe Trap	CO	116	17	985121025503247
5/10/2011	Outmigrant Pipe Trap	CO	107	12.8	985121025506924
5/10/2011	Outmigrant Pipe Trap	CO	119	16.3	985121025500832
5/10/2011	Outmigrant Pipe Trap	CO	115	14.9	985121025505590
5/12/2011	Outmigrant Pipe Trap	CO	114	14.7	985121025520277
5/12/2011	Outmigrant Pipe Trap	CO	107	12.8	985121025582328

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
5/12/2011	Outmigrant Pipe Trap	CO	110	13	985121025518935
5/13/2011	Outmigrant Pipe Trap	CO	116	15.7	985121025438544
5/17/2011	Outmigrant Pipe Trap	CO	116	17.1	985121025505957
5/17/2011	Outmigrant Pipe Trap	CO	116	15.9	985121025593676
5/17/2011	Outmigrant Pipe Trap	CO	108	12.8	985121025509118
5/19/2011	Outmigrant Pipe Trap	CO	125	19.7	985121025516433
5/20/2011	Outmigrant Pipe Trap	CO	116	16.2	985121025500581
5/20/2011	Outmigrant Pipe Trap	CO	106	12	985121025507254
5/20/2011	Outmigrant Pipe Trap	CO	104	10.4	985121025521674
5/20/2011	Outmigrant Pipe Trap	CO	103	10.1	985121025496138
5/20/2011	Outmigrant Pipe Trap	CO	116	14.5	985121025494806
5/21/2011	Outmigrant Pipe Trap	CO	109	12.9	985121025520865
5/21/2011	Outmigrant Pipe Trap	CO	102	10.1	985121025518160
5/22/2011	Outmigrant Pipe Trap	CO	121	17.9	985121025426621
5/22/2011	Outmigrant Pipe Trap	CO	112	14.7	985121025438451
5/24/2011	Outmigrant Pipe Trap	CO	112	14.8	985121025501493
5/24/2011	Outmigrant Pipe Trap	CO	106	12.5	985121025494935
5/25/2011	Outmigrant Pipe Trap	CO	104	11.4	985121025416356
5/25/2011	Outmigrant Pipe Trap	CO	110	13.5	985121025511852
5/31/2011	Outmigrant Pipe Trap	CO	114	15.9	985121025414204
5/31/2011	Outmigrant Pipe Trap	CO	123	19.2	985121025425408
5/31/2011	Outmigrant Pipe Trap	CO	119	17.5	985121025438522
5/31/2011	Outmigrant Pipe Trap	CO	100	9.8	985121025417520
6/7/2011	Outmigrant Pipe Trap	CO	83	7.3	985121025501372
6/13/2011	Outmigrant Pipe Trap	CO	68	3.6	985121025412301
1/30/2011	Upper Upstream Trap	CO	667		985121020418821
2/6/2011	Upper Upstream Trap	CO	112	14.8	985121020934775
4/4/2011	Upper Upstream Trap	CO	99	10	985121025510284
4/4/2011	Upper Upstream Trap	CO	100	10.4	985121025498159
4/5/2011	Upper Upstream Trap	CO	91	8.7	985121025579000
4/9/2011	Upper Upstream Trap	CO	105	12.9	985121020098020
4/9/2011	Upper Upstream Trap	CO	90	7.8	985121020905003
4/13/2011	Upper Upstream Trap	CO		8.5	985121025578998
5/5/2011	Upper Upstream Trap	CO	74	4.6	985121025590455
5/5/2011	Upper Upstream Trap	CO	127	21.6	985121025508998
5/30/2011	Upper Upstream Trap	CO	106	13	985121025441209
2/10/2011	U/S Upper Reach Trap	CO	98	10.8	985121020105665
11/17/2010	Upper Upstream Trap	CO	580		985121020501143

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
11/18/2010	Upper Upstream Trap	CO	560		985121020498258
11/22/2010	Upper Upstream Trap	CO	78	5.2	985121020499904
11/27/2010	Upper Upstream Trap	CO	95	11.4	985121020957716
12/7/2010	Upper Upstream Trap	CO	99	10.0	985121020414537
12/7/2010	Upper Upstream Trap	CO	97	9.6	985121020609993
12/16/2010	Upper Upstream Trap	CO	690		985121015688072
1/11/2011	Upper Upstream Trap	CO	730		985121020500685
1/11/2011	Upper Upstream Trap	CO	393		985121020498422
1/15/2011	Upper Upstream Trap	CO	630		985121020499233
09/09/10	Upper Mainstem (single stream)	CO	69	4.1	985121016219889
09/09/10	Upper Mainstem (single stream)	CO	85	7.7	985121016521038
09/09/10	Upper Mainstem (single stream)	CO	64	3.3	985121015687747
09/09/10	Upper Mainstem (single stream)	CO	69	4.1	985121016707746
09/09/10	Upper Mainstem (single stream)	CO	65	3.4	985121016217440
09/09/10	Upper Mainstem (single stream)	CO	66	3.5	985121015717172
09/09/10	Upper Mainstem (single stream)	CO	69	4.1	985121016498278
09/09/10	Upper Mainstem (single stream)	CO	69	4.8	985121016502133
09/09/10	Upper Mainstem (single stream)	CO	66	4.5	985121015691847
09/09/10	Upper Mainstem (single stream)	CO	67	3.7	985121016480839
09/09/10	Upper Mainstem (single stream)	CO	74	5.2	985121015702098
09/09/10	Upper Mainstem (single stream)	CO	72	4.5	985121015687459
09/09/10	Upper Mainstem (single stream)	CO	72	4.9	985121016150183
09/09/10	Upper Mainstem (single stream)	CO	75	5.3	985121015690652
09/09/10	Upper Mainstem (single stream)	CO	77	7.2	985121016706428
09/09/10	Upper Mainstem (single stream)	CO	75	5.1	985121016497945
09/09/10	Upper Mainstem (single stream)	CO	79	6.2	985121016707949
09/09/10	Upper Mainstem (single stream)	CO	72	4.5	985121015691269
09/09/10	Upper Mainstem (single stream)	CO	73	5.4	985121016506756
09/09/10	Upper Mainstem (single stream)	CO	71	4.4	985121016707111
09/09/10	Upper Mainstem (single stream)	CO	94	10.3	985121016149347
09/09/10	Upper Mainstem (single stream)	CO	70	5.5	985121016705587
09/09/10	Upper Mainstem (single stream)	CO	65	3.7	985121016150612
09/09/10	Upper Mainstem (single stream)	CO	72	4.7	985121016152124
09/09/10	Upper Mainstem (single stream)	CO	65	3.7	985121016513927
09/09/10	Upper Mainstem (single stream)	CO	72	5.0	985121016525515
09/09/10	Upper Mainstem (single stream)	CO	73	5.4	985121016151143
09/09/10	Upper Mainstem (single stream)	CO	85	7.8	985121015739940
09/09/10	Upper Mainstem (single stream)	CO	69	4.4	985121016516386

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
09/09/10	Upper Mainstem (single stream)	CO	75	5.7	985121016708021
09/09/10	Upper Mainstem (single stream)	CO	74	5.1	985121015690530
09/09/10	Upper Mainstem (single stream)	CO	76	6.2	985121016527679
09/09/10	Upper Mainstem (single stream)	CO	70	4.7	985121015688302
09/09/10	Upper Mainstem (single stream)	CO	83	7.4	985121016501757
09/09/10	Upper Mainstem (single stream)	CO	75	6.2	985121016515766
09/09/10	Upper Mainstem (single stream)	CO	79	6.2	985121016152815
09/09/10	Upper Mainstem (single stream)	CO	85	7.8	985121016705331
09/09/10	Upper Mainstem (single stream)	CO	72	5.3	985121016707594
09/09/10	Upper Mainstem (single stream)	CO	83	7.9	985121016481871
09/13/10	Upper Mainstem (single stream)	CO	90	9.3	985121016497350
09/13/10	Upper Mainstem (single stream)	CO	76	5.8	985121016490653
09/13/10	Upper Mainstem (single stream)	CO	73	4.8	985121016506758
09/13/10	Upper Mainstem (single stream)	CO	82	7.1	985121015738742
09/13/10	Upper Mainstem (single stream)	CO	85	8.0	985121015713327
09/13/10	Upper Mainstem (single stream)	CO	78	6.0	985121016669807
09/13/10	Upper Mainstem (single stream)	CO	75	5.1	985121016662635
09/13/10	Upper Mainstem (single stream)	CO	80	6.4	985121016694537
09/13/10	Upper Mainstem (single stream)	CO	80	6.5	985121016671970
09/13/10	Upper Mainstem (single stream)	CO	79	6.2	985121016501712
09/13/10	Upper Mainstem (single stream)	CO	82	6.6	985121016493059
09/13/10	Upper Mainstem (single stream)	CO	74	5.0	985121016148501
09/13/10	Upper Mainstem (single stream)	CO	74	7.4	985121016151881
09/13/10	Upper Mainstem (single stream)	CO	72	4.7	985121016504120
09/13/10	Upper Mainstem (single stream)	CO	84	7.3	985121016519097
09/13/10	Upper Mainstem (single stream)	CO	72	4.7	985121016692318
09/13/10	Upper Mainstem (single stream)	CO	71	4.4	985121015690409
09/15/10	Upper Mainstem (single stream)	CO	73	4.1	985121016498164
09/15/10	Upper Mainstem (single stream)	CO	74	4.7	985121015691722
09/15/10	Upper Mainstem (single stream)	CO	71	6.5	985121015690856
09/15/10	Upper Mainstem (single stream)	CO	87	8.0	985121016497179
09/15/10	Upper Mainstem (single stream)	CO	66	3.4	985121015740599
09/15/10	Upper Mainstem (single stream)	CO	79	6.1	985121016520466
09/15/10	Upper Mainstem (single stream)	CO	77	5.8	985121016707816
09/15/10	Upper Mainstem (single stream)	CO	69	3.7	985121016494589
09/15/10	Upper Mainstem (single stream)	CO	73	4.6	985121016493281
09/15/10	Upper Mainstem (single stream)	CO	73	4.7	985121015687027
09/15/10	Upper Mainstem (single stream)	CO	72	4.4	985121016483329

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
09/15/10	Upper Mainstem (single stream)	CO	75	5.3	985121016492275
09/15/10	Upper Mainstem (single stream)	CO	71	4.4	985121016150257
09/15/10	Upper Mainstem (single stream)	CO	73	4.5	985121016692495
09/15/10	Upper Mainstem (single stream)	CO	68	3.9	985121016502541
08/24/10	West Fork (single stream)	CO	71	4.6	985121016499969
08/24/10	West Fork (single stream)	CO	72	5.1	985121016524877
08/24/10	West Fork (single stream)	CO	92	10.9	985121016695374
08/24/10	West Fork (single stream)	CO	84	7.2	985121016221436
08/24/10	West Fork (single stream)	CO	93	9.2	985121016519233
08/24/10	West Fork (single stream)	CO	77	7.0	985121016151397
08/24/10	West Fork (single stream)	CO	73	5.1	985121016219895
08/24/10	West Fork (single stream)	CO	82	7.1	985121015689548
08/24/10	West Fork (single stream)	CO	74	5.6	985121016507110
08/24/10	West Fork (single stream)	CO	68	4.1	985121016154652
08/24/10	West Fork (single stream)	CO	78	6.4	985121015740378
08/24/10	West Fork (single stream)	CO	80	6.6	985121016515598
08/24/10	West Fork (single stream)	CO	70	4.5	985121016150571
08/24/10	West Fork (single stream)	CO	78	7.5	985121016516268
08/24/10	West Fork (single stream)	CO	82	7.0	985121016521222
08/24/10	West Fork (single stream)	CO	76	6.8	985121016492267
08/24/10	West Fork (single stream)	CO	73	5.0	985121016487712
08/24/10	West Fork (single stream)	CO	74	4.9	985121016705062
08/24/10	West Fork (single stream)	CO	90	9.5	985121016513110
08/24/10	West Fork (single stream)	CO	70	4.2	985121016153716
08/24/10	West Fork (single stream)	CO	75	5.7	985121016501776
08/24/10	West Fork (single stream)	CO	85	8.5	985121016150287
08/24/10	West Fork (single stream)	CO	76	5.7	985121016528321
08/24/10	West Fork (single stream)	CO	91	10.1	985121016496286
08/24/10	West Fork (single stream)	CO	81	6.6	985121016507520
08/24/10	West Fork (single stream)	CO	81	6.6	985121016520299
08/25/10	West Fork (single stream)	CO	85	10.1	985121015691977
08/25/10	West Fork (single stream)	CO	81	6.8	985121016520072
08/25/10	West Fork (single stream)	CO	86	8.5	985121016153795
08/25/10	West Fork (single stream)	CO	71	6.1	985121016497561
08/25/10	West Fork (single stream)	CO	71	4.5	985121016149503
08/25/10	West Fork (single stream)	CO	80	6.8	985121016494507
08/25/10	West Fork (single stream)	CO	68	4.1	985121016149370
08/25/10	West Fork (single stream)	CO	96	12.5	985121016517853

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
08/25/10	West Fork (single stream)	CO	84	8.1	985121015691157
08/25/10	West Fork (single stream)	CO	89	9.2	985121016149927
08/25/10	West Fork (single stream)	CO	72	4.7	985121016486289
08/25/10	West Fork (single stream)	CO	87	9.2	985121016676987
08/25/10	West Fork (single stream)	CO	86	8.3	985121016037776
08/25/10	West Fork (single stream)	CO	75	5.5	985121016521028
08/25/10	West Fork (single stream)	CO	82	7.9	985121015689973
08/25/10	West Fork (single stream)	CO	78	6.7	985121016489618
08/25/10	West Fork (single stream)	CO	73	5.6	985121016521052
08/25/10	West Fork (single stream)	CO	89	9.4	985121016516899
5/24/2011	D/S Upper Reach Trap	CT	118	15.4	985121025509297
6/2/2011	D/S Upper Reach Trap	CT	165	46.2	985121025522830
6/2/2011	D/S Upper Reach Trap	CT	114	13.7	985121025501383
6/2/2011	D/S Upper Reach Trap	CT	116	17	985121025513067
11/3/2010	Lower Upstream Trap	CT	329		985121020464049
11/3/2010	Lower Upstream Trap	CT	235	135.8	985121020619953
11/4/2010	Lower Upstream Trap	CT	78	4.3	985121015707846
11/4/2010	Lower Upstream Trap	CT	94	8.4	985121020500220
11/5/2010	Lower Upstream Trap	CT	145	30.6	985121016509753
11/5/2010	Lower Upstream Trap	CT	102	10.0	985121020416507
11/5/2010	Lower Upstream Trap	CT	300		985121020415889
11/9/2010	Lower Upstream Trap	CT	179	53.9	985121016221589
11/11/2010	Lower Upstream Trap	CT	260	209.7	985121020418779
11/11/2010	Lower Upstream Trap	CT	308		985121020419401
11/11/2010	Lower Upstream Trap	CT	135	22.9	985121020496555
11/12/2010	Lower Upstream Trap	CT	338		985121020417539
11/12/2010	Lower Upstream Trap	CT	322		985121020416437
11/12/2010	Lower Upstream Trap	CT	194	72.0	985121020570068
11/12/2010	Lower Upstream Trap	CT	120	20.5	985121020464060
11/16/2010	Lower Upstream Trap	CT	195	70.9	985121020500104
11/16/2010	Lower Upstream Trap	CT	126	20.7	985121020497371
11/16/2010	Lower Upstream Trap	CT	72	4.3	985121020502662
11/17/2010	Lower Upstream Trap	CT	348		985121020468033
11/17/2010	Lower Upstream Trap	CT	185	54.6	985121020566387
11/18/2010	Lower Upstream Trap	CT	248	164.9	985121020500887
11/18/2010	Lower Upstream Trap	CT	174	55.5	985121020501177
11/18/2010	Lower Upstream Trap	CT	161	42.8	985121020467889
11/19/2010	Lower Upstream Trap	CT	343		985121016505274

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
11/19/2010	Lower Upstream Trap	CT	360		985121016496784
11/19/2010	Lower Upstream Trap	CT	165	54.7	985121015691490
11/24/2010	Lower Upstream Trap	CT	193	64.5	985121020897792
11/24/2010	Lower Upstream Trap	CT	166	42.7	985121020414782
11/24/2010	Lower Upstream Trap	CT	134	23.4	985121020417408
11/24/2010	Lower Upstream Trap	CT	168	47.7	985121020464996
11/25/2010	Lower Upstream Trap	CT	100	10.2	985121020416039
11/25/2010	Lower Upstream Trap	CT	107	12.0	985121020570635
11/25/2010	Lower Upstream Trap	CT	83	5.5	985121020902214
11/25/2010	Lower Upstream Trap	CT	123	20.4	985121020498343
11/25/2010	Lower Upstream Trap	CT	139	28.8	985121020502194
11/25/2010	Lower Upstream Trap	CT	132	21.6	985121020417877
11/25/2010	Lower Upstream Trap	CT	159	38.7	985121020615570
11/25/2010	Lower Upstream Trap	CT	195	83.5	985121020609840
11/25/2010	Lower Upstream Trap	CT	245	156.6	985121020416196
11/30/2010	Lower Upstream Trap	CT	74	4.2	985121020610874
11/30/2010	Lower Upstream Trap	CT	90	7.1	985121020463148
11/30/2010	Lower Upstream Trap	CT	119	17.0	985121020500569
11/30/2010	Lower Upstream Trap	CT	180	63.3	985121020616692
11/30/2010	Lower Upstream Trap	CT	97	10.3	985121020896295
11/30/2010	Lower Upstream Trap	CT	118	16.4	985121020496960
11/30/2010	Lower Upstream Trap	CT	122	18.2	985121020899254
11/30/2010	Lower Upstream Trap	CT	139	26.0	985121020464994
11/30/2010	Lower Upstream Trap	CT	159	37.4	985121020613209
11/30/2010	Lower Upstream Trap	CT	77	4.8	985121020465647
11/30/2010	Lower Upstream Trap	CT	125	19.2	985121020418982
11/30/2010	Lower Upstream Trap	CT	129	21.4	985121020617219
11/30/2010	Lower Upstream Trap	CT	146	132.0	985121020620663
11/30/2010	Lower Upstream Trap	CT	177	53.1	985121020501542
11/30/2010	Lower Upstream Trap	CT	77	3.9	985121020615732
11/30/2010	Lower Upstream Trap	CT	86	6.6	985121020615030
11/30/2010	Lower Upstream Trap	CT	95	8.7	985121020611783
11/30/2010	Lower Upstream Trap	CT	101	10.4	985121020426236
11/30/2010	Lower Upstream Trap	CT	137	26.7	985121020617193
12/1/2010	Lower Upstream Trap	CT	83	6.5	985121020618076
12/1/2010	Lower Upstream Trap	CT	84	5.5	985121020414182
12/1/2010	Lower Upstream Trap	CT	94	7.8	985121020901434
12/1/2010	Lower Upstream Trap	CT	85	6.0	985121020418953

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
12/1/2010	Lower Upstream Trap	CT	112	12.2	985121020618135
12/1/2010	Lower Upstream Trap	CT	86	6.5	985121020465378
12/1/2010	Lower Upstream Trap	CT	74	4.2	985121020615691
12/7/2010	Lower Upstream Trap	CT	265	196.5	985121020617252
12/7/2010	Lower Upstream Trap	CT	165	50.2	985121020414768
12/7/2010	Lower Upstream Trap	CT	205	89.5	985121020619881
12/7/2010	Lower Upstream Trap	CT	129	17.1	985121020416231
12/7/2010	Lower Upstream Trap	CT	255	161.7	985121020502456
12/8/2010	Lower Upstream Trap	CT	383		985121020610893
12/8/2010	Lower Upstream Trap	CT	343		985121020616775
12/8/2010	Lower Upstream Trap	CT	308		985121020896369
12/8/2010	Lower Upstream Trap	CT	302		985121020618129
12/8/2010	Lower Upstream Trap	CT	91	7.4	985121020610363
12/8/2010	Lower Upstream Trap	CT	90	7.3	985121020499678
12/8/2010	Lower Upstream Trap	CT	260	172.8	985121020501624
12/8/2010	Lower Upstream Trap	CT	89	6.6	985121020619449
12/9/2010	Lower Upstream Trap	CT	182	62.5	985121020499076
12/9/2010	Lower Upstream Trap	CT	95	8.5	985121020416649
12/9/2010	Lower Upstream Trap	CT	104	10.7	985121020501330
12/9/2010	Lower Upstream Trap	CT	97	8.4	985121020615702
12/10/2010	Lower Upstream Trap	CT	343		985121020619493
12/10/2010	Lower Upstream Trap	CT	344		985121015341214
12/15/2010	Lower Upstream Trap	CT	142	28.3	985121020417769
12/15/2010	Lower Upstream Trap	CT	245	119.7	985121020901458
12/15/2010	Lower Upstream Trap	CT	261	178.0	985121020618640
12/15/2010	Lower Upstream Trap	CT	343		985121020413820
12/16/2010	Lower Upstream Trap	CT	133	23.7	985121020419242
12/16/2010	Lower Upstream Trap	CT	101	11.1	985121003617164
12/16/2010	Lower Upstream Trap	CT	119	17.7	985121020418802
12/17/2010	Lower Upstream Trap	CT	101	12.3	985121020497746
12/17/2010	Lower Upstream Trap	CT	164	42.9	985121020450592
12/17/2010	Lower Upstream Trap	CT	154	35.5	985121020417386
12/17/2010	Lower Upstream Trap	CT	146	29.6	985121020899484
12/17/2010	Lower Upstream Trap	CT	163	48.1	985121020609409
12/17/2010	Lower Upstream Trap	CT	270	222.0	985121020896459
12/17/2010	Lower Upstream Trap	CT	302	232.8	985121020417383
12/17/2010	Lower Upstream Trap	CT	281	300.0	985121020493391
1/4/2011	Lower Upstream Trap	CT	99	10.1	985121020608931

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
1/4/2011	Lower Upstream Trap	CT	105	12.4	985121020502448
1/4/2011	Lower Upstream Trap	CT	130	20.0	985121020612323
1/4/2011	Lower Upstream Trap	CT	131	23.3	985121020615720
1/4/2011	Lower Upstream Trap	CT	141	28.1	985121020499952
1/4/2011	Lower Upstream Trap	CT	79	4.8	985121020898213
1/5/2011	Lower Upstream Trap	CT	84	6.5	985121020499124
1/5/2011	Lower Upstream Trap	CT	105	10.7	985121020415972
1/6/2011	Lower Upstream Trap	CT	104	12.1	985121020609506
1/6/2011	Lower Upstream Trap	CT	106	12.0	985121020467507
1/6/2011	Lower Upstream Trap	CT	85	5.9	985121020502696
1/6/2011	Lower Upstream Trap	CT	115	16.3	985121020416687
1/6/2011	Lower Upstream Trap	CT	80	5.1	985121020619954
1/7/2011	Lower Upstream Trap	CT	95	9.0	985121020615158
1/7/2011	Lower Upstream Trap	CT	145	28.2	985121020609438
1/7/2011	Lower Upstream Trap	CT	83	6.0	985121020453933
1/7/2011	Lower Upstream Trap	CT	83	6.3	985121020500948
1/7/2011	Lower Upstream Trap	CT	91	7.2	985121020619714
1/7/2011	Lower Upstream Trap	CT	99	9.5	985121020415663
1/7/2011	Lower Upstream Trap	CT	91	8.3	985121020611249
1/11/2011	Lower Upstream Trap	CT	95	8.3	985121020499069
1/11/2011	Lower Upstream Trap	CT	193	70.8	985121020499716
1/11/2011	Lower Upstream Trap	CT	78	5.0	985121020496734
1/11/2011	Lower Upstream Trap	CT	97	8.7	985121020502287
1/11/2011	Lower Upstream Trap	CT	146	30.1	985121020414910
1/11/2011	Lower Upstream Trap	CT	114	15.0	985121020501009
1/11/2011	Lower Upstream Trap	CT	93	7.9	985121020620596
1/12/2011	Lower Upstream Trap	CT	265	194.0	985121020617224
1/12/2011	Lower Upstream Trap	CT	142	29.8	985121020414565
1/12/2011	Lower Upstream Trap	CT	240	124.8	985121020417774
1/13/2011	Lower Upstream Trap	CT	131	22.1	985121020415542
1/13/2011	Lower Upstream Trap	CT	142	28.6	985121020418792
1/13/2011	Lower Upstream Trap	CT	177	58.7	985121020500195
1/13/2011	Lower Upstream Trap	CT	262	178.8	985121020501929
1/14/2011	Lower Upstream Trap	CT	88	6.9	985121020501365
1/14/2011	Lower Upstream Trap	CT	128	23.6	985121020418778
1/14/2011	Lower Upstream Trap	CT	92	7.7	985121020419064
1/19/2011	Lower Upstream Trap	CT	163	40.0	985121020498296
1/19/2011	Lower Upstream Trap	CT	144	36.3	985121020416459

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
1/19/2011	Lower Upstream Trap	CT	139	28.4	985121020496575
1/20/2011	Lower Upstream Trap	CT	126	18.5	985121020418831
1/20/2011	Lower Upstream Trap	CT	98	9.4	985121020500268
1/20/2011	Lower Upstream Trap	CT	89	7.8	985121020502562
1/21/2011	Lower Upstream Trap	CT	166	51.6	985121020500584
1/21/2011	Lower Upstream Trap	CT	91	8.3	985121020612645
1/21/2011	Lower Upstream Trap	CT	131	21.6	985121020462576
1/25/2011	Lower Upstream Trap	CT	101	10.9	985121020418551
1/25/2011	Lower Upstream Trap	CT	120	16.7	985121020419159
1/25/2011	Lower Upstream Trap	CT	144	30.7	985121020899330
1/25/2011	Lower Upstream Trap	CT	285	238.5	985121020610366
1/26/2011	Lower Upstream Trap	CT	87	7.0	985121020416148
1/27/2011	Lower Upstream Trap	CT	158	39.2	985121020415020
1/27/2011	Lower Upstream Trap	CT	134	24.5	985121020901774
1/28/2011	Lower Upstream Trap	CT	166	49.7	985121020496852
2/1/2011	Lower Upstream Trap	CT	110	13.3	985121020616230
2/2/2011	Lower Upstream Trap	CT	188	67.5	985121020493549
2/2/2011	Lower Upstream Trap	CT	122	17.6	985121020612810
2/2/2011	Lower Upstream Trap	CT	206	82.4	985121020498033
2/4/2011	Lower Upstream Trap	CT	99	10.6	985121020618566
2/4/2011	Lower Upstream Trap	CT	118	15.8	985121020497316
2/4/2011	Lower Upstream Trap	CT	139	27.5	985121020417914
2/7/2011	Lower Upstream Trap	CT	96	9.1	985121020917578
2/7/2011	Lower Upstream Trap	CT	127	19.4	985121020095362
2/10/2011	Lower Upstream Trap	CT	99	9.0	985121020940054
2/11/2011	Lower Upstream Trap	CT	85	5.5	985121020107600
2/14/2011	Lower Upstream Trap	CT	121	17.0	985121020908549
2/14/2011	Lower Upstream Trap	CT	144	28.6	985121020922823
2/22/2011	Lower Upstream Trap	CT	190	83.1	985121020923339
2/22/2011	Lower Upstream Trap	CT	178	64.4	985121020904440
2/22/2011	Lower Upstream Trap	CT	303	171.4	985121020904836
2/22/2011	Lower Upstream Trap	CT	139	25.2	985121020918889
2/22/2011	Lower Upstream Trap	CT	95	9.5	985121020923127
2/22/2011	Lower Upstream Trap	CT	124	18.0	985121020941066
2/22/2011	Lower Upstream Trap	CT	185	54.0	985121020107789
2/22/2011	Lower Upstream Trap	CT	134	23.6	985121020107250
2/23/2011	Lower Upstream Trap	CT	175	52.2	985121020103740
2/24/2011	Lower Upstream Trap	CT	165	51.0	985121020904116

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
3/2/2011	Lower Upstream Trap	CT	139	26.8	985121020098168
3/2/2011	Lower Upstream Trap	CT	87	6.8	985121020936935
3/2/2011	Lower Upstream Trap	CT	98	9.1	985121020107158
3/2/2011	Lower Upstream Trap	CT	96	9.0	985121020103087
3/2/2011	Lower Upstream Trap	CT	102	11.0	985121020100443
3/2/2011	Lower Upstream Trap	CT	99	9.7	985121020116504
3/2/2011	Lower Upstream Trap	CT	119	17.5	985121020932099
3/2/2011	Lower Upstream Trap	CT	220	109.2	985121020105921
3/23/2011	Lower Upstream Trap	CT	145	29.8	985121020921329
4/5/2011	Lower Upstream Trap	CT	148	31.1	985121025587317
4/5/2011	Lower Upstream Trap	CT	98	8.2	985121025496127
4/5/2011	Lower Upstream Trap	CT	170	45.1	985121025510071
4/5/2011	Lower Upstream Trap	CT	94	8.5	985121025496052
4/5/2011	Lower Upstream Trap	CT	252	15.7	985121025503972
4/5/2011	Lower Upstream Trap	CT	136	24.2	985121025583558
4/6/2011	Lower Upstream Trap	CT	267	172.0	985121025591210
4/8/2011	Lower Upstream Trap	CT	105	10.0	985121025603035
4/8/2011	Lower Upstream Trap	CT	95	7.5	985121025581098
4/15/2011	Lower Upstream Trap	CT	87	6.9	985121025580806
4/15/2011	Lower Upstream Trap	CT	134	22.5	985121025591540
4/15/2011	Lower Upstream Trap	CT	125	19.4	985121025594827
4/28/2011	Lower Upstream Trap	CT	156	34.2	985121025509150
4/28/2011	Lower Upstream Trap	CT	143	28.6	985121025506662
5/2/2011	Lower Upstream Trap	CT	106	12.1	985121025503979
5/2/2011	Lower Upstream Trap	CT	112	13.7	985121025494782
5/2/2011	Lower Upstream Trap	CT	119	15.9	985121025590740
5/3/2011	Lower Upstream Trap	CT	123	17.5	985121025591648
5/4/2011	Lower Upstream Trap	CT	119	15.7	985121025601839
5/10/2011	Lower Upstream Trap	CT	115	15.0	985121025513426
5/10/2011	Lower Upstream Trap	CT	95	8.5	985121025516361
6/1/2011	Lower Upstream Trap	CT	152	36.0	985121025439888
1/19/2011	McGarvey Alcove	CT	215	100.3	985121020415395
1/19/2011	McGarvey Alcove	CT	247	55.4	985121020498684
1/20/2011	McGarvey Alcove	CT	182	63.2	985121020419131
3/8/2011	McGarvey Alcove	CT	122	102.3	985121020941080
3/31/2011	Upper Upstream Trap	CT	140	27.6	985121020920618
4/1/2011	Upper Upstream Trap	CT	143	28.3	985121020919224
4/1/2011	Upper Upstream Trap	CT	157	38.7	985121025500536

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
11/27/2010	Upper Upstream Trap	CT	140	27.5	985121020499232
2/14/2011	D/S Upper Reach Trap	SH	204	78.3	985121020925930
2/14/2011	D/S Upper Reach Trap	SH	237	133.6	985121020923361
2/14/2011	D/S Upper Reach Trap	SH	201	83.1	954121020920619
2/14/2011	D/S Upper Reach Trap	SH	213	86.5	985121020107604
2/14/2011	D/S Upper Reach Trap	SH	278	34	985121020933558
11/2/2010	Lower Upstream Trap	SH	186	68.9	985121020417298
11/2/2010	Lower Upstream Trap	SH	190	77.2	985121020501599
11/2/2010	Lower Upstream Trap	SH	168	55.4	985121020565947
11/2/2010	Lower Upstream Trap	SH	180	70.0	985121020426668
11/2/2010	Lower Upstream Trap	SH	202	100.4	985121020498732
11/2/2010	Lower Upstream Trap	SH	170	52.7	985121020417289
11/2/2010	Lower Upstream Trap	SH	151	41.4	985121020496939
11/2/2010	Lower Upstream Trap	SH	158	44.8	985121020499758
11/2/2010	Lower Upstream Trap	SH	188	75.4	985121020462118
11/2/2010	Lower Upstream Trap	SH	175	60.4	985121020618501
11/2/2010	Lower Upstream Trap	SH	229	122.4	985121020496849
11/2/2010	Lower Upstream Trap	SH	198	81.4	985121020496941
11/2/2010	Lower Upstream Trap	SH	163	49.5	985121020502528
11/2/2010	Lower Upstream Trap	SH	195	86.3	985121020500281
11/2/2010	Lower Upstream Trap	SH	161	43.0	985121020452739
11/2/2010	Lower Upstream Trap	SH	191	73.6	985121020454113
11/2/2010	Lower Upstream Trap	SH	199	130.8	985121020496746
11/2/2010	Lower Upstream Trap	SH	220	131.6	985121020497719
11/2/2010	Lower Upstream Trap	SH	184	60.2	985121020454223
11/2/2010	Lower Upstream Trap	SH	154	42.7	985121020500056
11/2/2010	Lower Upstream Trap	SH	213	121.8	985121020498210
11/2/2010	Lower Upstream Trap	SH	210	101.2	985121020416407
11/2/2010	Lower Upstream Trap	SH	175	62.3	985121020498395
11/2/2010	Lower Upstream Trap	SH	174	58.0	985121020415929
11/2/2010	Lower Upstream Trap	SH	195	95.9	985121020462603
11/2/2010	Lower Upstream Trap	SH	224	131.6	985121020497752
11/2/2010	Lower Upstream Trap	SH	174	56.8	985121020416397
11/2/2010	Lower Upstream Trap	SH	182	68.9	985121020501862
11/2/2010	Lower Upstream Trap	SH	160	47.8	985121020566400
11/2/2010	Lower Upstream Trap	SH	155	38.7	985121020414138
11/2/2010	Lower Upstream Trap	SH	82	6.8	985121020570501
11/2/2010	Lower Upstream Trap	SH	98	9.5	985121020465370

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
11/2/2010	Lower Upstream Trap	SH	92	8.9	985121020418234
11/2/2010	Lower Upstream Trap	SH	107	14.1	985121020620271
11/2/2010	Lower Upstream Trap	SH	78	5.2	985121020464792
11/2/2010	Lower Upstream Trap	SH	80	5.6	985121020418399
11/2/2010	Lower Upstream Trap	SH	84	7.0	985121020502278
11/2/2010	Lower Upstream Trap	SH	114	15.8	985121020500898
11/2/2010	Lower Upstream Trap	SH	91	9.3	985121020499137
11/2/2010	Lower Upstream Trap	SH	81	5.5	985121020498532
11/2/2010	Lower Upstream Trap	SH	84	6.2	985121020502465
11/2/2010	Lower Upstream Trap	SH	100	10.8	985121020501532
11/2/2010	Lower Upstream Trap	SH	80	6.0	985121020467512
11/2/2010	Lower Upstream Trap	SH	73	4.9	985121020499125
11/2/2010	Lower Upstream Trap	SH	78	5.2	985121020463560
11/2/2010	Lower Upstream Trap	SH	72	4.3	985121020499607
11/2/2010	Lower Upstream Trap	SH	87	6.8	985121020502609
11/3/2010	Lower Upstream Trap	SH	239	134.0	985121020501567
11/3/2010	Lower Upstream Trap	SH	205	101.7	985121020415380
11/3/2010	Lower Upstream Trap	SH	184	76.2	985121020419560
11/3/2010	Lower Upstream Trap	SH	157	16.8	985121020497178
11/3/2010	Lower Upstream Trap	SH	188	74.3	985121020468017
11/3/2010	Lower Upstream Trap	SH	126	22.8	985121020419584
11/3/2010	Lower Upstream Trap	SH	108	11.5	985121020498853
11/3/2010	Lower Upstream Trap	SH	98	8.0	985121020501654
11/3/2010	Lower Upstream Trap	SH	78	4.9	985121020499643
11/3/2010	Lower Upstream Trap	SH	78	4.9	985121020413807
11/3/2010	Lower Upstream Trap	SH	115	15.1	985121020416434
11/3/2010	Lower Upstream Trap	SH	95	10.6	985121020501937
11/3/2010	Lower Upstream Trap	SH	85	6.3	985121020491925
11/3/2010	Lower Upstream Trap	SH	104	11.3	985121020500236
11/3/2010	Lower Upstream Trap	SH	92	7.5	985121020415925
11/3/2010	Lower Upstream Trap	SH	84	5.0	985121020501847
11/4/2010	Lower Upstream Trap	SH	104	10.3	985121016708110
11/4/2010	Lower Upstream Trap	SH	92	8.4	985121020414538
11/4/2010	Lower Upstream Trap	SH	76	5.2	985121020466332
11/4/2010	Lower Upstream Trap	SH	83	5.9	985121020415008
11/4/2010	Lower Upstream Trap	SH	176	60.1	985121020498801
11/4/2010	Lower Upstream Trap	SH	187	72.5	985121016477358
11/4/2010	Lower Upstream Trap	SH	174	58.1	985121016516132

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
11/4/2010	Lower Upstream Trap	SH	208	86.0	985121016671192
11/4/2010	Lower Upstream Trap	SH	160	44.9	985121016668405
11/4/2010	Lower Upstream Trap	SH	196	90.8	985121016154574
11/4/2010	Lower Upstream Trap	SH	103	10.1	985121016707492
11/5/2010	Lower Upstream Trap	SH	105	11.5	985121020499691
11/5/2010	Lower Upstream Trap	SH	98	9.6	985121015703575
11/5/2010	Lower Upstream Trap	SH	81	5.3	985121016500595
11/5/2010	Lower Upstream Trap	SH	72	4.6	985121020500119
11/5/2010	Lower Upstream Trap	SH	80	7.5	985121016518747
11/5/2010	Lower Upstream Trap	SH	82	5.4	985121015691012
11/5/2010	Lower Upstream Trap	SH	88	7.5	985121016500367
11/5/2010	Lower Upstream Trap	SH	180	69.2	985121016152001
11/5/2010	Lower Upstream Trap	SH	175	62.2	985121020497334
11/5/2010	Lower Upstream Trap	SH	197	77.0	985121016152137
11/5/2010	Lower Upstream Trap	SH	200	75.3	985121016524526
11/5/2010	Lower Upstream Trap	SH	178	63.0	985121020500541
11/5/2010	Lower Upstream Trap	SH	160	47.1	985121020497923
11/5/2010	Lower Upstream Trap	SH	179	59.1	985121020619907
11/5/2010	Lower Upstream Trap	SH	177	60.3	985121020418348
11/5/2010	Lower Upstream Trap	SH	180	59.2	985121020500192
11/5/2010	Lower Upstream Trap	SH	222	120.2	985121020497217
11/9/2010	Lower Upstream Trap	SH	250	199.8	985121016502778
11/9/2010	Lower Upstream Trap	SH	245	166.8	985121016517208
11/9/2010	Lower Upstream Trap	SH	166	48.7	985121016483354
11/11/2010	Lower Upstream Trap	SH	190	74.4	985121020500464
11/11/2010	Lower Upstream Trap	SH	192	80.1	985121020417300
11/11/2010	Lower Upstream Trap	SH	180	67.6	985121020501321
11/11/2010	Lower Upstream Trap	SH	192	81.3	985121020498104
11/11/2010	Lower Upstream Trap	SH	206	89.5	985121020500624
11/11/2010	Lower Upstream Trap	SH	186	71.7	985121020501758
11/11/2010	Lower Upstream Trap	SH	160	48.8	985121020417464
11/11/2010	Lower Upstream Trap	SH	188	72.6	985121020460698
11/11/2010	Lower Upstream Trap	SH	187	70.0	985121020501491
11/11/2010	Lower Upstream Trap	SH	168	49.4	985121020496531
11/11/2010	Lower Upstream Trap	SH	175	59.1	985121020499132
11/11/2010	Lower Upstream Trap	SH	164	50.4	985121020571354
11/12/2010	Lower Upstream Trap	SH	173	54.8	985121020463157
11/12/2010	Lower Upstream Trap	SH	181	63.5	985121020501436

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
11/12/2010	Lower Upstream Trap	SH	192	69.5	985121020497657
11/12/2010	Lower Upstream Trap	SH	164	44.0	985121020415446
11/12/2010	Lower Upstream Trap	SH	186	75.2	985121020501033
11/12/2010	Lower Upstream Trap	SH	215	115.3	985121020419129
11/12/2010	Lower Upstream Trap	SH	217	113.5	985121020497296
11/12/2010	Lower Upstream Trap	SH	210	102.7	985121020498191
11/12/2010	Lower Upstream Trap	SH	168	54.5	985121020467687
11/12/2010	Lower Upstream Trap	SH	162	49.8	985121020499529
11/12/2010	Lower Upstream Trap	SH	163	46.7	985121020499612
11/12/2010	Lower Upstream Trap	SH	171	49.3	985121020419594
11/12/2010	Lower Upstream Trap	SH	182	63.0	985121020490494
11/12/2010	Lower Upstream Trap	SH	176	59.3	985121020416523
11/12/2010	Lower Upstream Trap	SH	170	55.1	985121020462275
11/12/2010	Lower Upstream Trap	SH	200	78.0	985121020611347
11/12/2010	Lower Upstream Trap	SH	189	70.0	985121020464560
11/12/2010	Lower Upstream Trap	SH	181	67.3	985121020616706
11/12/2010	Lower Upstream Trap	SH	102	11.7	985121020417922
11/12/2010	Lower Upstream Trap	SH	125	22.7	985121020464984
11/12/2010	Lower Upstream Trap	SH	77	5.1	985121020500242
11/12/2010	Lower Upstream Trap	SH	80	5.6	985121020448807
11/12/2010	Lower Upstream Trap	SH	71	4.1	985121020417749
11/16/2010	Lower Upstream Trap	SH	221	121.3	985121020496520
11/16/2010	Lower Upstream Trap	SH	185	73.4	985121020500484
11/16/2010	Lower Upstream Trap	SH	135	27.5	985121020465610
11/16/2010	Lower Upstream Trap	SH	169	56.6	985121020502347
11/16/2010	Lower Upstream Trap	SH	175	57.6	985121020414146
11/16/2010	Lower Upstream Trap	SH	165	48.1	985121020418724
11/16/2010	Lower Upstream Trap	SH	89	7.5	985121020414064
11/17/2010	Lower Upstream Trap	SH	182	63.2	985121020494368
11/18/2010	Lower Upstream Trap	SH	211	109.3	985121020499271
11/19/2010	Lower Upstream Trap	SH	100	69.5	985121016517390
11/19/2010	Lower Upstream Trap	SH	146	46.2	985121016705274
11/24/2010	Lower Upstream Trap	SH	224	96.2	985121020419474
11/24/2010	Lower Upstream Trap	SH	187	72.9	985121020567023
11/24/2010	Lower Upstream Trap	SH	182	62.1	985121020616716
11/24/2010	Lower Upstream Trap	SH	185	66.8	985121020501511
11/24/2010	Lower Upstream Trap	SH	170	46.6	985121020497583
11/24/2010	Lower Upstream Trap	SH	98	12.0	985121020419225

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
11/24/2010	Lower Upstream Trap	SH	158	41.9	985121020611792
11/24/2010	Lower Upstream Trap	SH	152	38.1	985121020500438
11/25/2010	Lower Upstream Trap	SH	93	9.1	985121020418432
11/25/2010	Lower Upstream Trap	SH	82	5.8	985121020462039
11/25/2010	Lower Upstream Trap	SH	156	42.4	985121020499979
11/25/2010	Lower Upstream Trap	SH	164	49.7	985121020500759
11/25/2010	Lower Upstream Trap	SH	177	60.0	985121020500500
11/25/2010	Lower Upstream Trap	SH	206	97.2	985121020901517
11/25/2010	Lower Upstream Trap	SH	166	47.3	985121020610815
11/25/2010	Lower Upstream Trap	SH	178	59.4	985121020497783
11/25/2010	Lower Upstream Trap	SH	175	62.6	985121020417100
11/25/2010	Lower Upstream Trap	SH	170	51.0	985121020498642
11/25/2010	Lower Upstream Trap	SH	160	47.8	985121020616449
11/25/2010	Lower Upstream Trap	SH	119	19.4	985121020615749
11/25/2010	Lower Upstream Trap	SH	185	69.7	985121020619966
11/25/2010	Lower Upstream Trap	SH	83	6.4	985121020612743
11/30/2010	Lower Upstream Trap	SH	184	66.2	985121020499115
11/30/2010	Lower Upstream Trap	SH	215	110.3	985121020498102
11/30/2010	Lower Upstream Trap	SH	189	16.7	985121020419310
12/2/2010	Lower Upstream Trap	SH	196	66.6	985121020619070
12/2/2010	Lower Upstream Trap	SH	156	42.1	985121020418104
12/2/2010	Lower Upstream Trap	SH	103	12.5	985121020609406
12/2/2010	Lower Upstream Trap	SH	76	5.2	985121020617580
12/2/2010	Lower Upstream Trap	SH	96	10.8	985121020449762
12/2/2010	Lower Upstream Trap	SH	86	6.2	985121020463825
12/7/2010	Lower Upstream Trap	SH	208	102.1	985121020898720
12/7/2010	Lower Upstream Trap	SH	178	58.7	985121020896019
12/8/2010	Lower Upstream Trap	SH	141	28.2	985121020609526
12/8/2010	Lower Upstream Trap	SH	79	5.7	985121020609817
12/9/2010	Lower Upstream Trap	SH	86	6.5	985121020609558
12/9/2010	Lower Upstream Trap	SH	226	133.7	985121020417155
12/10/2010	Lower Upstream Trap	SH	260	157.3	985121020615043
12/15/2010	Lower Upstream Trap	SH	78	4.7	985121020901830
12/15/2010	Lower Upstream Trap	SH	91	8.4	985121020607802
12/15/2010	Lower Upstream Trap	SH	91	8.6	985121020417148
12/15/2010	Lower Upstream Trap	SH	109	12.9	985121020619016
12/16/2010	Lower Upstream Trap	SH	75	5.3	985121020617614
12/16/2010	Lower Upstream Trap	SH	203		985121020499591

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
12/17/2010	Lower Upstream Trap	SH	66	2.9	985121020419415
12/17/2010	Lower Upstream Trap	SH	119	19.2	985121020498187
12/17/2010	Lower Upstream Trap	SH	126	22.0	985121020612263
12/17/2010	Lower Upstream Trap	SH	192	70.7	985121020467674
12/17/2010	Lower Upstream Trap	SH	171	50.5	985121020500215
12/17/2010	Lower Upstream Trap	SH	143	31.9	985121020502713
1/4/2011	Lower Upstream Trap	SH	101	10.9	985121020414805
1/5/2011	Lower Upstream Trap	SH	88	7.0	985121020500989
1/6/2011	Lower Upstream Trap	SH	72	4.0	985121020500543
1/7/2011	Lower Upstream Trap	SH	169	45.7	985121020498783
1/7/2011	Lower Upstream Trap	SH	146	33.7	985121020498270
1/7/2011	Lower Upstream Trap	SH	85	6.4	985121020501318
1/7/2011	Lower Upstream Trap	SH	79	5.3	985121020614974
1/7/2011	Lower Upstream Trap	SH	191	72.6	985121020499655
1/11/2011	Lower Upstream Trap	SH	88	7.1	985121020418914
1/11/2011	Lower Upstream Trap	SH	226	125.0	985121020463822
1/11/2011	Lower Upstream Trap	SH	195	76.3	985121020608919
1/11/2011	Lower Upstream Trap	SH	157	45.0	985121020462959
1/11/2011	Lower Upstream Trap	SH	188	65.6	985121020419434
1/11/2011	Lower Upstream Trap	SH	96	9.9	985121020498129
1/11/2011	Lower Upstream Trap	SH	154	38.4	985121020500091
1/11/2011	Lower Upstream Trap	SH	135	28.0	985121020500466
1/12/2011	Lower Upstream Trap	SH	177	63.1	985121020462581
1/12/2011	Lower Upstream Trap	SH	179	62.8	985121020497588
1/13/2011	Lower Upstream Trap	SH	195	76.9	985121020500872
1/13/2011	Lower Upstream Trap	SH	183	67.7	985121020498618
1/13/2011	Lower Upstream Trap	SH	183	68.0	985121020502552
1/13/2011	Lower Upstream Trap	SH	96	8.5	985121020498413
1/13/2011	Lower Upstream Trap	SH	184	63.7	985121020419579
1/13/2011	Lower Upstream Trap	SH	196	75.1	985121020619518
1/14/2011	Lower Upstream Trap	SH	81	5.3	985121020419572
1/14/2011	Lower Upstream Trap	SH	72	4.2	985121020415504
1/19/2011	Lower Upstream Trap	SH	81	6.9	985121020416879
1/20/2011	Lower Upstream Trap	SH	191	84.5	985121020900997
1/20/2011	Lower Upstream Trap	SH	211	117.1	985121020615223
1/25/2011	Lower Upstream Trap	SH	129	23.7	985121020414151
1/25/2011	Lower Upstream Trap	SH	160	39.0	985121020414497
1/27/2011	Lower Upstream Trap	SH	219	98.7	985121020419147

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
1/27/2011	Lower Upstream Trap	SH	214	108.3	985121020462739
1/27/2011	Lower Upstream Trap	SH	214	98.2	985121020500085
1/27/2011	Lower Upstream Trap	SH	164	47.0	985121020500093
2/1/2011	Lower Upstream Trap	SH	168	47.1	985121020499255
2/1/2011	Lower Upstream Trap	SH	184	56.0	985121020415002
2/2/2011	Lower Upstream Trap	SH	83	7.1	985121020897178
2/2/2011	Lower Upstream Trap	SH	185	70.0	985121020616267
2/4/2011	Lower Upstream Trap	SH	87	7.6	985121020615000
2/4/2011	Lower Upstream Trap	SH	228	126.8	985121020608960
2/9/2011	Lower Upstream Trap	SH	86	7.9	985121020099952
2/22/2011	Lower Upstream Trap	SH	217	106.6	985121020908538
2/22/2011	Lower Upstream Trap	SH	157	44.1	985121020922944
2/22/2011	Lower Upstream Trap	SH	215	103.1	985121020103591
2/23/2011	Lower Upstream Trap	SH	95	9.3	985121020105615
2/23/2011	Lower Upstream Trap	SH	216	108.2	985121020903066
2/23/2011	Lower Upstream Trap	SH	200	83.6	985121020906439
2/23/2011	Lower Upstream Trap	SH	130	24.0	985121020904304
2/23/2011	Lower Upstream Trap	SH	190	73.5	985121020927855
2/23/2011	Lower Upstream Trap	SH	174	59.4	985121020923459
2/23/2011	Lower Upstream Trap	SH	168	54.1	985121020942467
2/23/2011	Lower Upstream Trap	SH	186	68.9	985121020923464
2/23/2011	Lower Upstream Trap	SH	108	13.0	985121020923458
2/23/2011	Lower Upstream Trap	SH	175	57.1	985121020908945
2/23/2011	Lower Upstream Trap	SH	197	81.2	985121020906167
2/23/2011	Lower Upstream Trap	SH	179	67.9	985121020907385
2/25/2011	Lower Upstream Trap	SH	190	70.1	985121020097060
2/25/2011	Lower Upstream Trap	SH	198	79.5	985121020919706
2/25/2011	Lower Upstream Trap	SH	82	6.3	985121020920530
3/2/2011	Lower Upstream Trap	SH	105	13.4	985121020120691
3/2/2011	Lower Upstream Trap	SH	122	20.2	985121020105739
3/2/2011	Lower Upstream Trap	SH	164	44.4	985121020917244
3/2/2011	Lower Upstream Trap	SH	103	11.6	985121020106933
4/6/2011	Lower Upstream Trap	SH	108	13.7	985121025602657
4/12/2011	Lower Upstream Trap	SH	122	19.1	985121025583342
4/15/2011	Lower Upstream Trap	SH	128	20.9	985121025576923
4/15/2011	Lower Upstream Trap	SH	104	12.9	985121025591247
4/25/2011	Lower Upstream Trap	SH	98	5.4	985121025680718
4/28/2011	Lower Upstream Trap	SH	110	14.2	985121025505810

Mark Date	Mark Location	Species	Fork Length (mm)	Weight (g)	Tag Number
5/2/2011	Lower Upstream Trap	SH	91	8.6	985121025494444
5/2/2011	Lower Upstream Trap	SH	101	11.7	985121025500588
6/1/2011	Lower Upstream Trap	SH	109	10.6	985121025436141
6/1/2011	Lower Upstream Trap	SH	126	21.3	985121025414233
3/31/2011	Upper Upstream Trap	SH	98	9.9	985121020918914
3/31/2011	Upper Upstream Trap	SH	90	8.8	985121020919205
4/1/2011	Upper Upstream Trap	SH	107	15.5	985121020934939
4/1/2011	Upper Upstream Trap	SH	113	14.2	985121025520245
11/22/2010	Upper Upstream Trap	SH	163	49.0	985121020417328
11/22/2010	Upper Upstream Trap	SH	196	81.1	985121020899985
11/22/2010	Upper Upstream Trap	SH	172	55.5	985121020417349
11/27/2010	Upper Upstream Trap	SH	330		985121020616670
11/27/2010	Upper Upstream Trap	SH	90	8.0	985121020416395
12/17/2010	Upper Upstream Trap	SH	288	169.5	985121020499116

APPENDIX B

McGarvey Creek Trap and SPI Antenna Locations

Trap Location	**Longitude**	**Latitude**
Lower Upstream Trap (November 2010 - January 2011)	-124.0010653	41.49568768
Lower Upstream Trap (January 2011 - June 2011)	-124.0072699	41.48881522
Upper Upstream Trap (November 2010 – January 2011)	-124.0072699	41.48881522
Upper Upstream Trap (January 2011 - June 2011)	-124.0080338	41.48820797
Outmigrant Trap	-124.0080338	41.48820797
Upper Reach Break Trap (U/S and D/S)	-124.0061747	41.48030491
SPI Location		
Lower Mainstem SPI	-124.0062274	41.48923902
West Fork SPI	-124.0105263	41.48367851
Upper Mainstem SPI	-124.0091792	41.4827714

APPENDIX C

McGarvey Creek Project Access Information

Access: Green Diamond Resource Company M10 access road, Klamath, California

Landowner Name: Green Diamond Resource Company

Landowner Contact Information:

Ryan Borque
Aquatic Monitoring Supervisor
Green Diamond Resource Company
P.O. Box 68
Korbel, CA 95550
(707) 668 – 4432

APPENDIX D

TOTAL PROJECT COSTS						
Agency Invoiced:	**California Department of Fish and Game**					
Grant Number:	**P0910317**					
Period Covered:	**July 1, 2010 through May 31, 2012**					
Project Title:	**Monitoring Natal and Non-Natal Salmonids in McGarvey Creek,**					
	Lower Klamath River					
PERSONAL SERVICES						
Level of Staff	**Number of Hours (CDFG)**	**Number of Hours (Yurok Tribe)**	**Hourly Rate**	**CDFG Share**	**Yurok Tribe Cost Share**	**Total Project Cost**
Senior Fisheries Biologist	97.93	95.95	$30.36	$2,972.86	$2,912.75	$90,247.08
Fisheries Biologist II	1087.63	161.86	$20.33	$22,114.24	$3,291.11	$3,291.11
Fisheries Biologist I	571.65	87.08	$17.88	$10,220.81	$1,556.98	$1,556.98
Fisheries Technician III	22	0.00	$16.09	$353.98	$0.00	$5,695.54
Fisheries Technician II	2194.12	622.34	$11.95	$26,788.42	$7,436.93	$7,436.93
Fisheries Technician I	703.69	357.97	$10.75	$7,566.42	$3,849.11	$3,849.11
Subtotal				$70,016.73	$19,046.88	$112,076.75
Staff Benefits @ 34.54%				$23,099.71	$7,664.68	$39,797.20
Total Personnel Services Costs				**$93,116.44**	**$26,711.57**	**$151,873.95**
* Actual Benefit Cost for CDFG Project was $24,185.61 but YTFP Covered $1085.99 to avoid budget overage						
OPERATING EXPENSES						
Description	**Number of Units**	**Unit**	**Unit Price**	**CDFG Share**	**Yurok Tribe Cost Share**	**Total Project Cost**
25 ft Frame Net	2	Nets	$800.00	$939.66	$156.00	$1,095.66
Trap Boxes	4	Boxes	$750.00	$1,711.03	$852.61	$2,563.64
PIT Tags	4000	Tags	$3.90	$12,300.00	$0.00	$12,300.00
Handheld PIT Tag Scanner	2	Scanners	$500.00	$0.00	$940.00	$940.00
PIT Tag Stations	2	Station	$2,500.00	$0.00	$5,000.00	$5,000.00
Waders and Boots	4	1 Full Set	$250.00	$500.00	$1,099.43	$1,599.43
Smith-Root Electrofisher	30	Days	$150.00	$0.00	$1,800.00	$1,800.00
Yamaha Side-by-Side UTV	6	Months	$500.00	$0.00	$3,000.00	$3,000.00
Snorkel Gear	2	1 Full Set	$350.00	$0.00	$1,000.00	$1,000.00
Migrant Trap Supplies (panels, cable, t-posts, erosion cloth, pvc)				$1,645.82	$726.55	$2,372.37
Office Supplies (waterproof paper and notebooks, pencils)				$60.52	$278.22	$338.74
Misc Field Supplies (nets, buckets, hip-chain, aquaseal)				$1,085.46	$1,619.95	$2,705.41
Fuel and Travel Expenses				$0.00	$2,400.85	$2,400.85
Worker's Compensation 2.72%				$1,904.46	$518.08	$2,422.53
Total Operating Expenses				**$20,146.95**	**$19,391.69**	**$39,538.63**
SUBTOTAL				$113,263.39	$46,103.25	$159,366.64
ADMINISTRATIVE OVERHEAD (Proposed 27.77%, Actual 27.89%				$32,644.61	$7,594.35	$40,238.96
GRAND TOTAL				**$145,908.00**	**$53,697.60**	**$199,605.59**
Yurok Tribal Fisheries Program Cost Share						
Total Cost Share	$53,697.60					
Total Cost Share Percentage	26.9%					