2007-2008 SALMON SPAWNER SURVEYS

Kelsey Creek, West Tributary, and Richards Creek

Prepared for:

CITY OF BELLEVUE

Utilities Department
450 110th Ave. NE
PO Box 90012
Bellevue, WA 98009-9012

March 2008

THE WATERSHED COMPANY

SALMON SPAWNER SURVEY 2007: KELSEY CREEK AND TRIBUTARIES

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1. ABSTRACT

The City of Bellevue monitored spawning activity in the Kelsey Creek watershed in 2007, marking the seventh consecutive year that this information has been collected. Weekly foot surveys were conducted on the Kelsey Creek mainstem, the West Tributary, and the Confluence Reach of Richards Creek between September 3 and December 17, 2007. There was a strong run of chinook in 2007, but relatively few sockeye or coho salmon were observed. Spawning escapement for the Kelsey System index area (based on cumulative redd counts) is estimated at 193 chinook, 20 coho, and 20 sockeye in 2007. Most spawning activity occurred in the Kelsey Creek mainstem, where 77 chinook redds, 8 sockeye redds, and 6 coho redds were recorded. There were no chinook or sockeye redds, and two coho redds constructed in the West Tributary survey area, while no redds were recorded in the Richards Creek survey area. Carcass counts (n=159) indicated that 14 percent of the chinook salmon in the overall 2007 return were wild fish (unclipped), 77 percent were hatchery fish (clipped), and 9 percent were unknown.

The spawning estimates identified in this report do not comprise the total escapement for the Kelsey Creek watershed. The regional Salmon Watcher Program and the Washington Department of Fish and Wildlife documented salmon upstream of the Kelsey Creek and West Tributary index reaches. For more information about the Salmon Watcher Program and, when completed, the 2007 Salmon Watcher Report, visit http://dnr.metrokc.gov/wlr/waterres/salmon/.

2. INTRODUCTION

The Puget Sound region supports a number of cultural, recreational, and commercially important salmonid species. Chinook salmon grow to be the largest, and are one of the most well known, species of salmonid. Listed under the Endangered Species Act in 1999 and reaffirmed as "threatened" in 2005 (U.S. Federal Register, 28 June 2005), the Puget Sound chinook salmon Evolutionarily Significant Unit (ESU) is composed of 22 distinct chinook salmon populations (Ruckleshaus et al. 2006; Puget Sound Salmon Recovery Plan 2007). Sixteen additional chinook salmon populations historically inhabiting Puget Sound have been lost and are now extinct (Ruckleshaus et al. 2006).

Partially motivated by the federal ESA listing of chinook salmon, a number of salmon conservation planning efforts were initiated in the Puget Sound region, each designed to guide salmon restoration actions ranging from the local level to the regional scale. Some of these salmon conservation entities include the Puget Sound Shared Strategy, the Governor's Salmon Recovery Office, and the Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Salmon Recovery Council. Monitoring annual trends in chinook population abundance (as well as the health of other aquatic resources) is an essential part of the salmon conservation planning effort, and will help guide restoration. The City of Bellevue has monitored the spawning effort of anadromous salmonids in the Kelsey Creek watershed since 2000. This report documents spawning activity that was observed in the Kelsey Creek watershed in 2007, and compares these observations with those recorded in previous years.

WRIA 8, the most highly urbanized watershed in the Puget Sound ESU, is inhabited by two of the 22 distinct populations of chinook salmon: the Cedar River and the Sammamish River chinook (Ruckleshaus et al. 2006). The chinook population determinations are based on a variety of parameters, including genetics, run timing, and morphology. Chinook salmon in WRIA 8 are primarily produced in three watersheds: the Cedar River, the Big Bear/Cottage Lake system, and Issaquah Creek. Some production also occurs in smaller Lake Washington tributaries such as the Kelsey Creek system (WDFW/PSIT 2004). Two hatcheries, one at Portage Bay operated by the University of Washington and the other on Issaquah Creek operated by the WDFW, also release salmon within WRIA 8. A direct tributary to Lake Washington, Kelsey Creek is categorized as a Tier 2 satellite area, and is most closely associated with the Sammamish/North Lake Washington population.

Located almost entirely within the City of Bellevue, the Kelsey Creek watershed has historically provided spawning and rearing habitat for anadromous salmonids like chinook (*Oncorhynchus tshawytscha*), sockeye (*O. nerka*), and coho (*O. kisutch*) salmon, as well as migratory cutthroat trout (*O. clarki*). From its headwaters in the Phantom Lake and Larsen Lake wetlands, Kelsey Creek flows northward to Bel-Red Road before bending southward, where it is joined by a series of small tributaries before discharging to Mercer Slough and ultimately into Lake Washington. Although not as large as some other Lake Washington tributaries, the Kelsey Creek watershed encompasses approximately 10,870 acres, contains more than 19 miles of streams, and is an important component of the greater WRIA 8 watershed.

With impervious surfaces exceeding 40 percent of the watershed area, aquatic habitat conditions have been significantly impacted by development (Scott et al. 1986; Moscrip and Montgomery 1997). Six "factors of decline" identified for the Kelsey Creek watershed include: 1) fish access and passage barriers, 2) increased sedimentation/altered sediment transport processes, 3) poor water quality (increased temperature, other), 4) loss of channel complexity and connectivity, 5) altered hydrology and flow, and 6) degradation of riparian condition (Kerwin 2001).

Management objectives for the Lake Washington chinook management unit include an annual escapement of 1,200 chinook to the Cedar River index reach. Although an interim escapement goal of 350 chinook to the Bear Creek/Cottage Creek index area of the North Lake Washington population (Kelsey Creek is a sub area within the North Lake population) is currently in use, the Cedar River escapement goal (1,200 fish) is thought to provide adequate protection for the North Lake Washington population. With a mean (1998 – 2004) escapement of 723, returns to the Cedar River index area indicate that the Cedar River chinook population is currently depressed. Periodic spawner surveys and adult escapement estimates in other Lake Washington stream systems like Kelsey Creek will help quantify annual production and better define the distribution of natural spawning. Reliable documentation of adult escapement in Lake Washington tributaries will also help guide conservation efforts, develop recovery objectives, and enhance the ability to make well-informed management decisions.

Chinook salmon typically enter Mercer Slough near the beginning of September (Table 4) and proceed to spawning areas further upstream in the Kelsey Creek watershed where spawning continues into early November. Sockeye salmon typically begin migrating upstream in Kelsey Creek in early September, and live fish are observed on the spawning grounds until late October

or early November. Coho salmon typically start entering Kelsey Creek in October and run through December (Washington Trout 2001; Taylor Associates 2002; The Watershed Company 2003-2007). Migratory cutthroat trout typically begin their upstream movement in January, but they have been known to be in the system as early as November. Their spawning typically continues through the early spring. Resident and migratory (steelhead) rainbow trout have also been observed in Kelsey Creek tributaries (Paulsen, pers. comm., 27 February 2003; Washington Trout 2001).

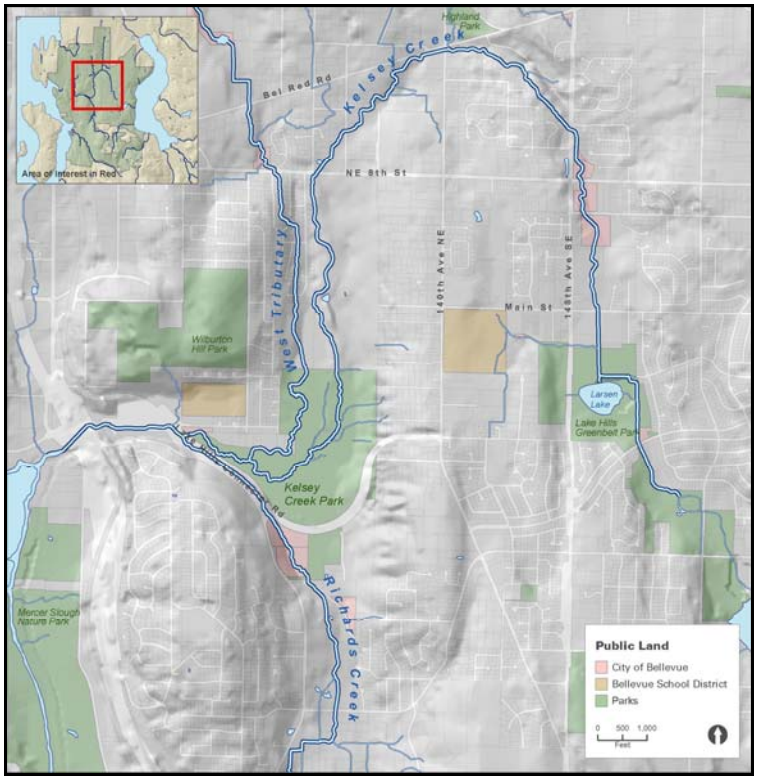


Figure 1. Primary streams where annual spawner surveys are conducted in the Kelsey watershed.

In the fall and early winter of 2007, The Watershed Company worked cooperatively with City of Bellevue staff to perform weekly spawner surveys of the mainstem of Kelsey Creek and two of its primary tributaries, the West Tributary and Richards Creek (Figure 1). This report documents the fifth consecutive year of weekly observations in both the West Tributary and Kelsey Creek. Prior to 2003, survey efforts in the West Tributary and Richards Creek were less intense, and these tributaries were only surveyed sporadically using spot checks. These ongoing salmon spawner surveys will provide the City with accurate data regarding the abundance, timing, and distribution of anadromous salmonid activity within Kelsey Creek and the West Tributary.

3. METHODS

3.1 Survey Protocol

The Kelsey Creek mainstem and two of its larger tributaries, the West Tributary and Richards Creek, were surveyed by foot on a weekly basis throughout the fall of 2007 to quantify the number of anadromous salmonids that use these streams for spawning. Weekly surveys were scheduled to span the duration of the chinook, coho, and sockeye runs, the dates of which are based on observations from previous years. Maps, survey protocol, and reach descriptions for each of the streams are provided below.

During each stream survey, all observations of salmonids, including chinook, coho, and sockeye salmon, and cutthroat trout, are recorded (Appendices B, C, and D). Where possible, the species, sex, origin (presence or absence of the adipose fin), and spawning condition (pre-spawn mortality or successful spawner) of each fish are identified. All live fish observed during each weekly survey are recorded, with the result that live spawners persisting on the spawning grounds for more than a week may be recorded more than once. Length measurements (total, fork, post-orbital hypural [POH], and body depth) and scale samples were collected from all chinook and coho carcasses that were encountered (scale samples are not collected from sockeye carcasses). Tissue samples (fin clips) were not collected from any fish in 2007. To prevent redundant observations, the lower jaw from each carcass was removed using pruning shears after all relevant data was recorded.

3.2 Redd Counts

During each weekly survey, new redds are enumerated by species and their location marked with flagging, which is later referenced using a GPS. Flagging the redd locations also ensured that old, but still visible, redds were not counted twice. Redds were defined as either "active" or "practice." Active redds generally had a well-defined pit and tailspill with substrate that was bright as a result of fresh cleaning. Active redds are often attended by one to several adult fish. Digs with less definition or poor construction were considered test digs and recorded as practice redds (and not used to estimate total escapement). If fish were not present on a redd, a combination of redd diameter, substrate size, and position within the stream was used to estimate which salmon species constructed the redd. The size of each redd was measured , and was based on the total area of substrate disturbance, including the tailspill. Consistency among redd counts was maximized by using the same surveyor to conduct most weekly surveys.

3.3 Escapement Estimates

Due to a patchwork of private land ownership, regular surveys are not conducted over the entire Kelsey Creek watershed and cumulative redd counts for the full range of available spawning habitat are not available. Therefore, the surveyed portions of Kelsey Creek, West Tributary, and Richards Creek serve as index reaches for the Kelsey Creek watershed. Other potential spawning sites outside the Kelsey System index area include the upper West Tributary, Goff Creek, and Valley Creek. Although some chinook, sockeye, and coho spawning likely occurs in these outlying areas, most of the spawning effort (>75%) is thought to occur within the surveyed index reaches.

There are a variety of techniques for estimating spawning escapement (Hilborn et al. 1999; Hahn et al. 2003), and two escapement estimates are provided in this report. Escapement estimates for the index area were generated using methods described in *Puget Sound Chinook Salmon (Oncorhynchus tshawytscha) Escapement Estimates and Methods – 1991* (Smith and Castle 1994), and these methods are consistent with those used by the WDFW to estimate escapement for other WRIA 8 index areas. The two escapement estimates are provided for comparison purposes only. The first method is based on cumulative redd counts and a second method is based on area under the curve (AUC) using live counts.

The redd-based escapement estimate uses a cumulative redd count. In the Kelsey System index area, weekly surveys throughout the spawning period enabled the enumeration of all new redds during the spawning season. Total redds were calculated as the number of new redds constructed in the survey area during the survey period. The total number of redds is then multiplied by 2.5 adults/redd (Orrell 1976) to estimate the total escapement for the index area.

The AUC escapement estimate is based on live counts of adult fish observed over the course of the spawning season (Ames 1984). These counts are used to calculate the total number of fish days (F) for the season using the equation:

$$F_{t+1} = [(C_t + C_{t+1})/2] \bullet (J_{t+1} - J_t)$$

where:

F = Fish days,
C = Live count for each survey,
J = Julian Day of each survey, and
t = First survey of the spawning period.

Fish days are then used to determine the AUC escapement using the equation:

$$AUC = \sum(F_t \ldots F_{t+n})/V$$

where:

AUC = Area Under the Curve,
F = Fish days,
t = First survey of the spawning period,
n = Total number of surveys conducted, and
V = Number of days a fish can be counted.

*V is assumed to be 10 days for chinook in Kelsey Creek, as well as other regularly surveyed streams in WRIA 8 (Berge et al. 2006).

**$\sum(F_t \ldots F_{t+n})$ is a summation of Fish days for each survey over the entire survey period.

4. STUDY AREA AND REACH DESCRIPTIONS

Foot surveys are conducted in three major streams in the Kelsey Creek index area: 1) the Kelsey Creek mainstem (8 survey reaches), 2) the West Tributary (4 survey reaches), and 3) Richards

Creek (5 survey reaches – surveyed every other week). Maps of the three streams and descriptions of their respective survey reaches are included in this section.

4.1 Kelsey Creek

The index area in the Kelsey Creek mainstem (WRIA 8, Stream 0259) consists of eight consecutive survey reaches, beginning at the downstream end with Reach A (RM 3.0) and continuing upstream from Reach 1 through Reach 7 at RM 5.8 (Figure 2). Spawning effort in these survey reaches has been monitored from 2003 to 2007. Reach A was added to the 2003 survey (and enlarged in 2006) due to the presence of improved spawning habitat (spawning gravel transported into reach). Endpoints for Reaches 1 through 7 were established by the Washington Department of Fish and Wildlife (WDFW) during 1999 chinook spawner surveys. Weekly foot surveys generally begin with Reach A (in Kelsey Creek Park) and extend through Reach 7 near the Bellevue Christian Reformed Church on 148th Avenue NE. The 2007 Kelsey Creek surveys began on September 5 and were performed over a 15-week time period ending on December 10.

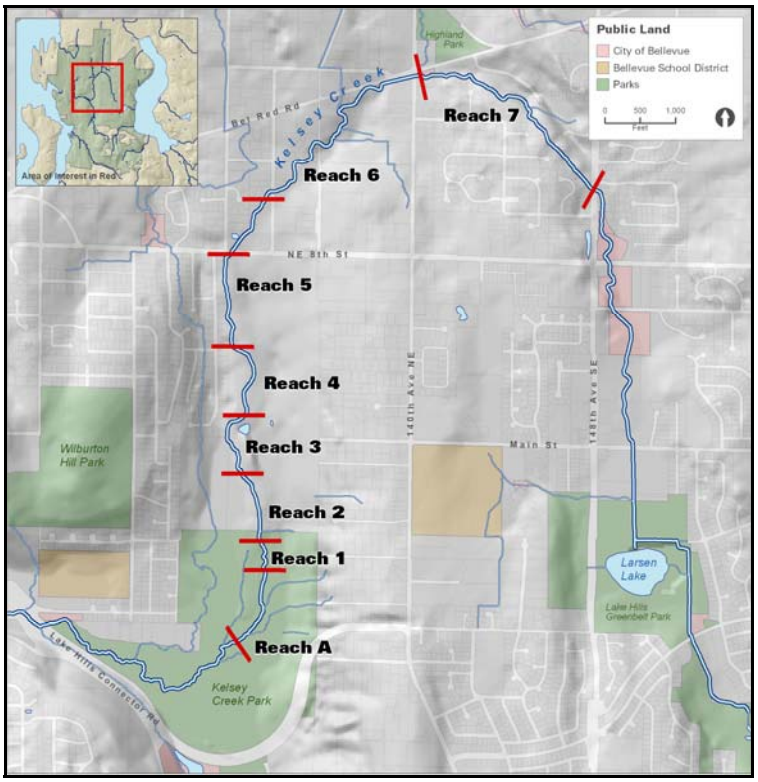


Figure 2. Kelsey Creek mainstem and survey reaches.

A beaver leveler device was installed below the survey area in the Kelsey Creek mainstem prior to the 2006 spawning season to allow salmon to pass through a beaver dam that has acted as a migration barrier in past years. The leveler device remained in place throughout the 2007 spawning season, but, due to changes in beaver activity, is no longer functional in its present location and may be moved in the future.

Reach A begins near the southeast corner of the back pastures of Kelsey Farm (RM 3.0), and extends upstream to a wide bend in Kelsey Creek adjacent to the nearby trail, approximately halfway through the park property (RM 3.2). From this point, Reach 1 then extends up to the footbridge crossing Kelsey Creek near the northern park boundary (RM 3.4). Reach 2 continues from this footbridge upstream into the Glendale Golf Course to the third footbridge in the golf course (RM3.6). Reach 3 then extends from the third footbridge upstream to the first concrete weir located by the golf course pumphouse on the east bank (RM3.8). From the pumphouse, Reach 4 extends upstream past several concrete weirs to a high footbridge with large rock armoring the east bank (RM 4.0). Reach 5 then extends upstream to the culvert outfall under NE 8th Street at the north property line of the golf course (RM4.3). Due to private property access issues, there is a two-block gap between Reaches 5 and 6. Reach 6 begins approximately 150 feet downstream of the 134th Avenue NE bridge at the property boundary fence (R.M. 4.4) and extends upstream to the confluence with Valley Creek, just upstream of 140th Avenue NE (RM 5.1). Access was restricted on a small portion (approximately 400 feet) of Reach 6 that is located immediately upstream from 14th Avenue NE and borders private property (parcel number 2725059140). This small stretch of the creek was not surveyed. From the confluence with Valley Creek, Reach 7 extends upstream to the culvert outfall under 148th Avenue NE (RM 5.8).

4.2 West Tributary

The index area for the West Tributary (WRIA 8, Stream 0264) consists of four consecutive survey reaches, extending from the confluence with Kelsey Creek's mainstem (RM 0.0) upstream to the north end of the Glendale Golf Course (RM 0.9) (Figure 3). The 2007 West Tributary surveys began on September 3, and were conducted over a sixteen-week period ending on December 17. One survey was not conducted during the week of November 12, 2007 due to extended high water conditions.

Reach 1 of the West Tributary extends upstream from the Kelsey Creek confluence (RM 0.00) to the first footbridge at the south end of Kelsey Creek Park (RM 0.27). Reach 2 continues upstream to the second footbridge, adjacent to the playground in Kelsey Creek Park (RM 0.45). From the playground, Reach 3 extends around the oxbow and upstream to the park's north property line adjacent to the Glendale Golf Course (RM 0.65). Reach 4 extends from the property line upstream to the north end of the Glendale Golf Course (RM 0.92). These survey reaches have remained the same since 2003. During previous years (2001 and 2002), however, only Reaches 2 through 4 were surveyed (although they were labeled as Reaches 1-3). The survey conducted in 2000 extended from the south end of Kelsey Creek Park upstream to NE 8th Street.

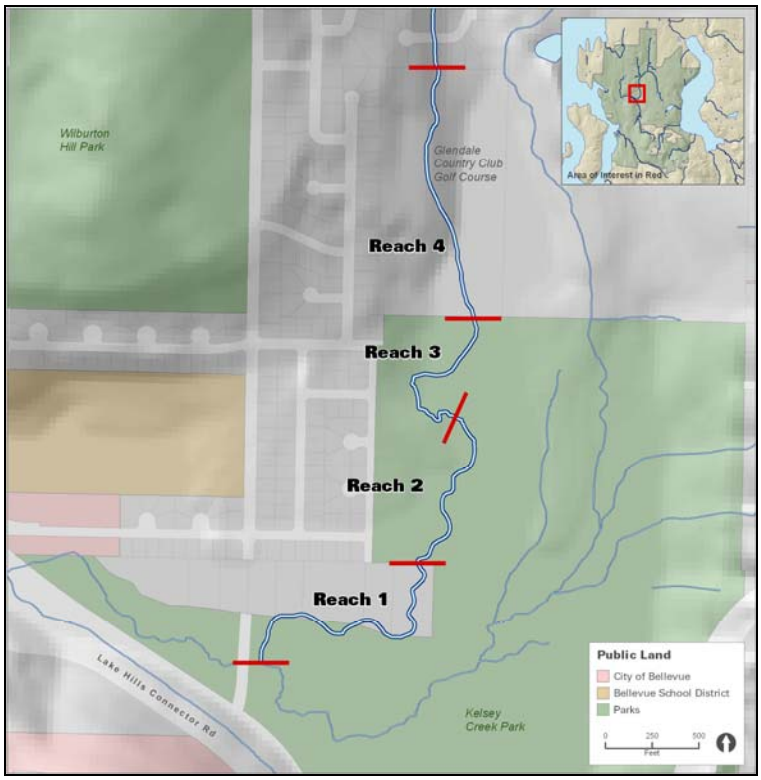


Figure 3. West Tributary and survey reaches.

4.3 Richards Creek

Spawner surveys in Richards Creek (WRIA 8, Stream 0261) were conducted bi-weekly (every other week) in 2007, but only included the lowest Confluence Reach (Figure 4). A series of beaver dams extending throughout the Beaver Pond Reach, just upstream of Lake Hills Connector, currently acts as a fish passage barrier and prevents salmon from reaching spawning areas located in Reaches 1 through 4 of Richards Creek. Due to this barrier area, Reaches 1 through 4 were not surveyed in 2006 or 2007. Salmon Watcher volunteers were used to observe upstream sites in case some salmon were able to pass through the beaver pond reach. Surveys of the Richards Creek Confluence Reach began on September 3 and extended over a 15-week period ending on December 10. The Confluence Reach extends along lower Richards Creek from the Kelsey Creek confluence upstream approximately 0.25 mile to the culvert below Richards Road.

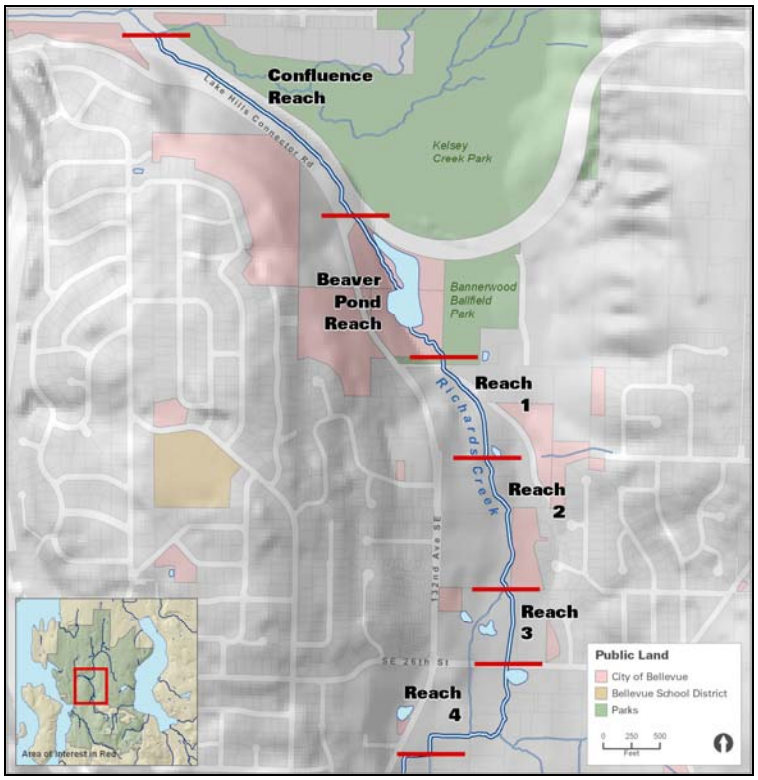


Figure 4. Richards Creek and survey reaches.

5. RESULTS

The Kelsey Creek mainstem had a relatively large chinook spawning escapement in 2007 (escapement ~193 fish), but few chinook were observed in either the West Tributary or Richards Creek. The size of the 2007 chinook salmon run was similar to last year's, but the number of sockeye observed in the survey area was much lower than in 2006. Coho numbers were up slightly in 2007, but remain low overall. City of Bellevue staff worked cooperatively with biologists from The Watershed Company to complete 15 weekly walk-through surveys of Kelsey Creek, 15 weekly surveys of the West Tributary, and 8 surveys of Richards Creek that extended throughout the 2007 spawning season (Tables 4, 6, and 9). The weekly survey effort began in the week of September 3, 2007 and extended to the week of December 17, 2007.

Length statistics in 2007 include measurements made on fish from all three streams in the Kelsey System index area (Kelsey Creek, West Tributary, and Richards Creek). Mean fork length for male chinook returning to the overall index area was 79.9 centimeters (55 min., 96 max.), total length averaged 82.2 centimeters (57 min., 100 max.), and POH averaged 63.3 centimeters (46 min., 77 max.). Length measurements for male chinook were based on a sample size of 67 measurable carcasses (Figures 5 and 6). Mean fork length for female chinook in the overall index area was 80.8 centimeters (33 min., 101 max.), total length averaged 82.9 centimeters (34 min., 103 max.), and POH averaged 67.5 centimeters (28 min., 83 max.). Length measurements for female chinook were based on a sample size of 67 measurable carcasses (Figures 5 and 6).

Average body size of chinook salmon carcasses in the Kelsey Creek mainstem (Mean female POH=67.6cm; Mean male POH=63.4cm) was larger than the average body size of chinook carcasses observed in the West Tributary (Mean female POH=59cm; Mean male POH=58.5cm), but the West Tributary sample size was low (*n*=2 males; *n*=1 female). Comparisons of body size statistics between the two streams may have limited utility in 2007, due to the small sample of measurable carcasses in the West Tributary. Many of the carcasses observed in the West Tributary washed into the upper survey area after long periods of stream-residence, and are often too badly decomposed for accurate body size measurements.

Few sockeye were observed in 2007, compared to last year. Only two female sockeye carcasses were recovered (mean fork, total and POH lengths were 59, 60.5, and 49.5 cm, respectively) and no male sockeye carcasses were recovered.

Coho observations were up from last year, but remain relatively low overall. Mean fork length for male coho returning to the overall index area was 57 centimeters (56 min., 58 max.), total length averaged 59 centimeters (57 min., 61 max.), and POH averaged 45.3 centimeters (43 min., 47 max.). Length measurements for male coho were based on a sample size of four measurable carcasses (Figures 7 and 8). Mean fork length for female coho in the overall index area was 58.8 centimeters (50 min., 71 max.), total length averaged 60.3 centimeters (52 min., 72 max.), and POH averaged 47.7 centimeters (41.5 min., 58 max.). Length measurements for female coho were based on a sample size of five measurable carcasses (Figures 7 and 8).

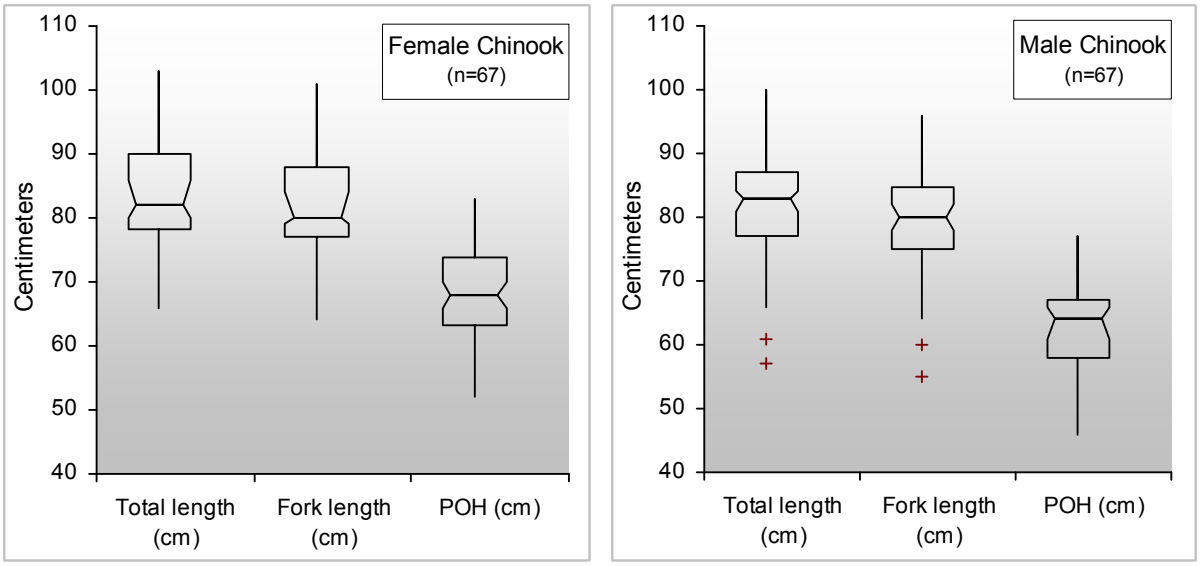


Figure 5. Mean length statistics for male and female chinook salmon carcasses from the Kelsey System index area in 2007.

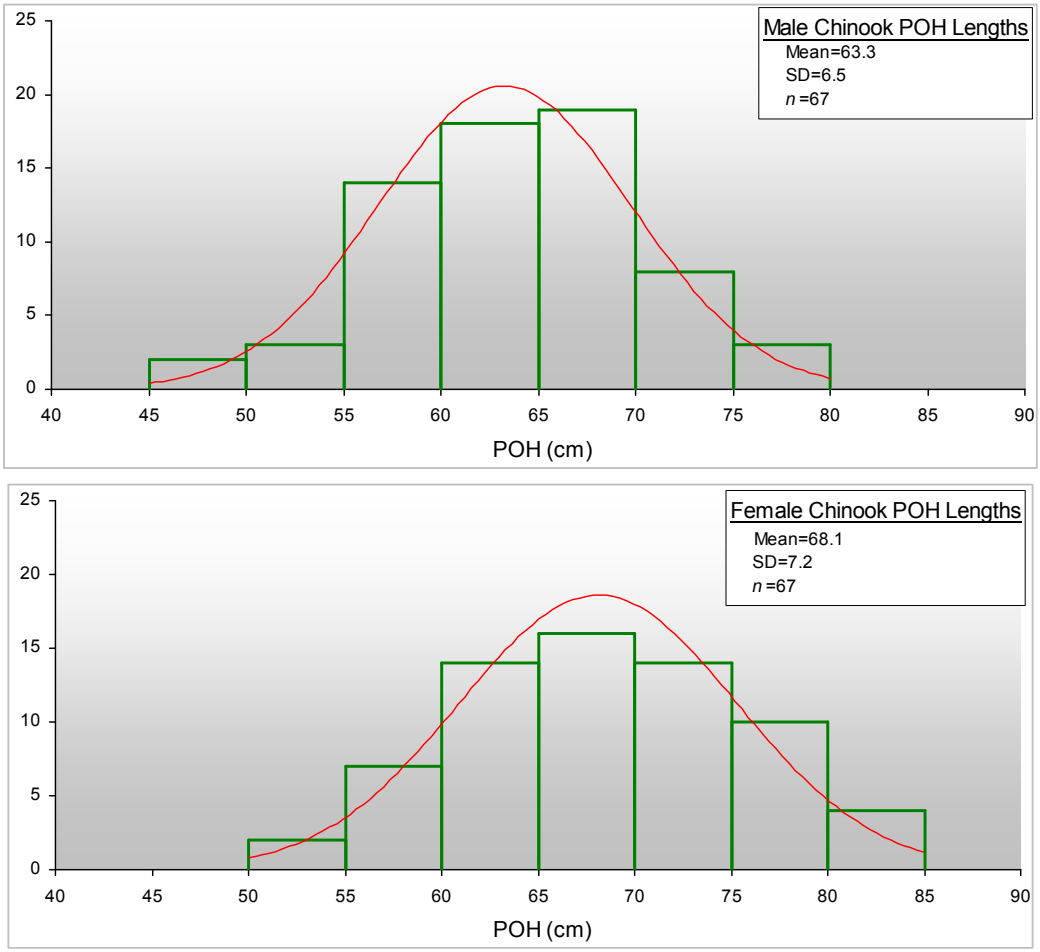


Figure 6. POH length frequency distribution for male and female chinook salmon carcasses from the Kelsey System index area in 2007.

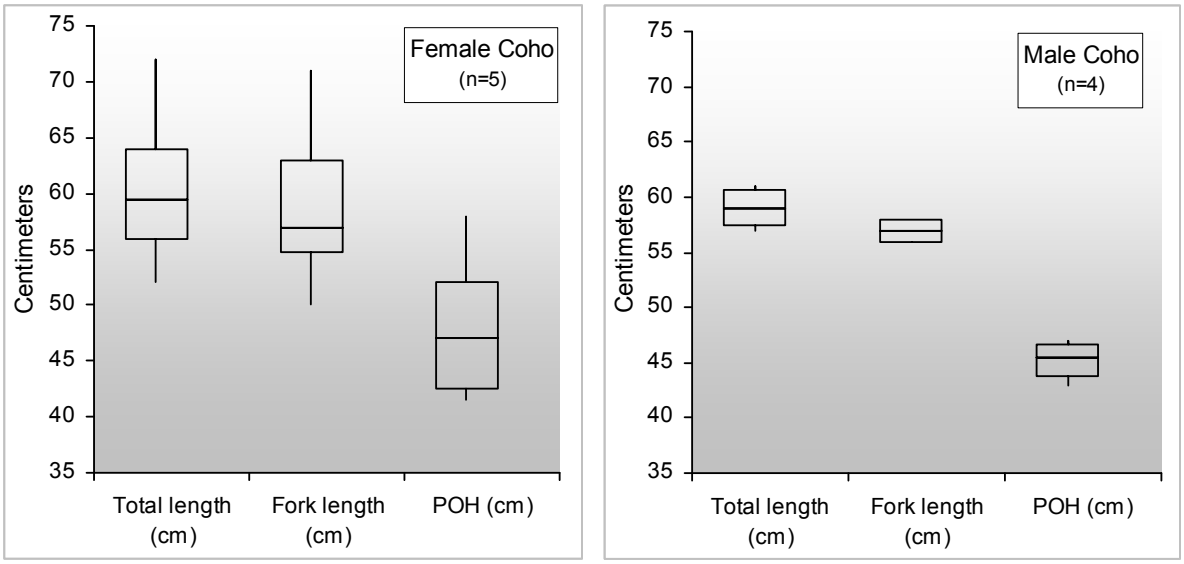


Figure 7. Mean length statistics for female and male coho salmon carcasses from the Kelsey System index area in 2007.

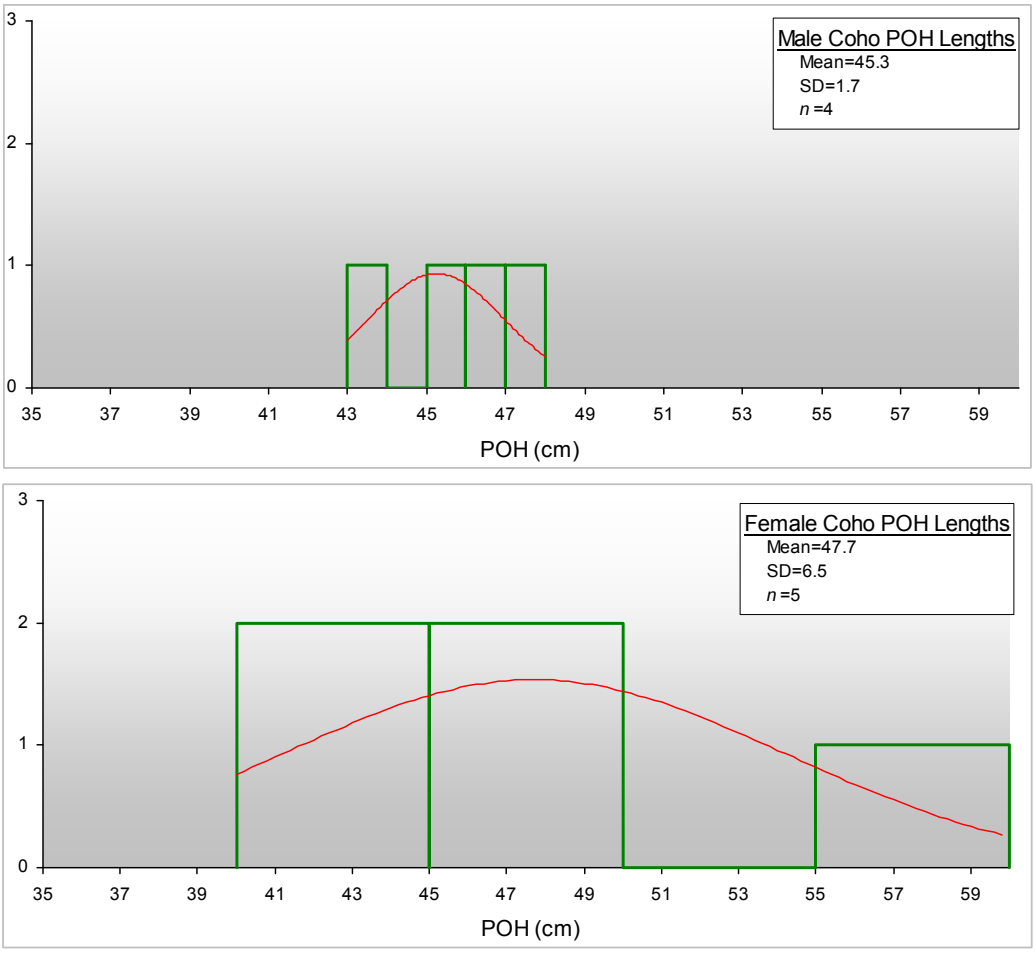


Figure 8. POH length frequency distribution for female and male coho salmon carcasses from the Kelsey System index area in 2007.

5.1 Kelsey Creek

Similar to last year, large numbers of chinook spawned in the Kelsey Creek mainstem, but this year's sockeye run was much lower than last year. Slightly more coho salmon were observed in 2007 than in 2006, but coho spawner numbers remain low in Kelsey Creek. Table 1, organized by species and reach, briefly summarizes the counts of live adults, carcasses and redds observed over the course of the 2007 spawning season.

Table 1. A summary of total returns for Kelsey Creek in 2007.

Kelsey	Chinook			Coho			Sockeye		
Reach	Spawner	Carcass	Redd	Spawner	Carcass	Redd	Spawner	Carcass	Redd
A	4	9	1	0	1	2	0	1	0
1	4	0	1	0	0	0	0	0	0
2	7	1	3	0	0	1	0	0	0
3	10	11	1	1	1	1	0	1	1
4	38	30	17	0	2	0	7	2	4
5	37	9	11	1	1	0	1	0	0
6	39	21	11	1	0	0	6	1	3
7	81	67	32	0	1	2	0	0	0
Total	**220**	**148**	**77**	**3**	**6**	**6**	**14**	**5**	**8**

Chinook Salmon

Two hundred twenty (220) live chinook salmon and one hundred forty eight (148) chinook carcasses were observed in the Kelsey Creek mainstem during the 2007 spawner surveys (Table 1, Figure 10). A total of 77 chinook redds were constructed within the survey area, and spawning was observed in all eight survey reaches. Chinook escapement to the Kelsey Creek mainstem index area in 2007 (Table 2, Figure 9) is estimated at 193 fish (redd-based) or 149 fish (Live Count AUC).

Table 2. Chinook spawning escapement estimates for the Kelsey Creek mainstem.

			Chinook Escapement	
Year	Carcasses	Redds	Live Count AUC	Redd-Based
2006	193	72	107	180
2007	159	77	149	193

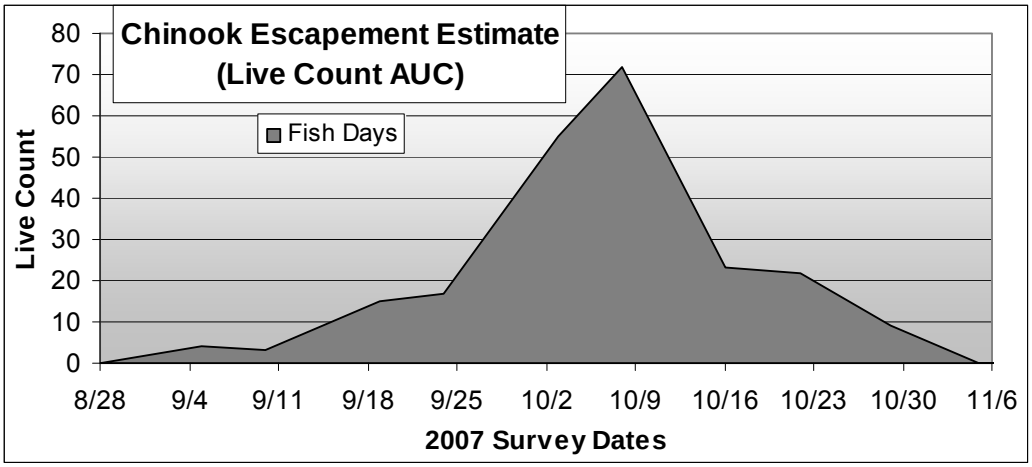


Figure 9. 2007 Area Under the Curve escapement estimate for chinook salmon in the Kelsey Creek mainstem.

Based on the presence or absence of adipose fins on carcasses in the Kelsey index area, 114 (77%) of the Kelsey Creek chinook (carcasses) were hatchery-origin fish (clipped), 21 (14%) were wild (unclipped), and the remaining 13 (9%) were unknown (Table 3). Sex ratio was relatively even, and approximately 47 percent of the Kelsey Creek chinook (carcasses) were female, 49 percent were male, and 4 percent were unidentified. Chinook salmon were first observed in the Kelsey Creek mainstem on September 5, live adults were last observed on the spawning grounds during the week of October 29, and carcasses were last recovered during the week of November 12 (a duration of approximately 11 weeks, Table 4). The upper reaches (Reaches 6 & 7) of Kelsey Creek were heavily utilized by chinook for spawning in 2007.

Table 3. Origin and gender of chinook salmon (carcasses) in the Kelsey mainstem.

		Gender			**Origin**		
Year	*n*	Female	Male	Unid.	Marked	Unmarked	Unid.
2000	15	47%	53%	0%	---	---	---
2001	8	63%	38%	0%	---	---	---
2002	11	45%	55%	0%	---	---	---
2003	1	100%	0%	0%	---	---	---
2004	0	---	---	---	---	---	---
2005	32	53%	31%	16%	50%	19%	31%
2006	193	42%	54%	3%	83%	8%	8%
2007	148	47%	49%	4%	77%	14%	9%

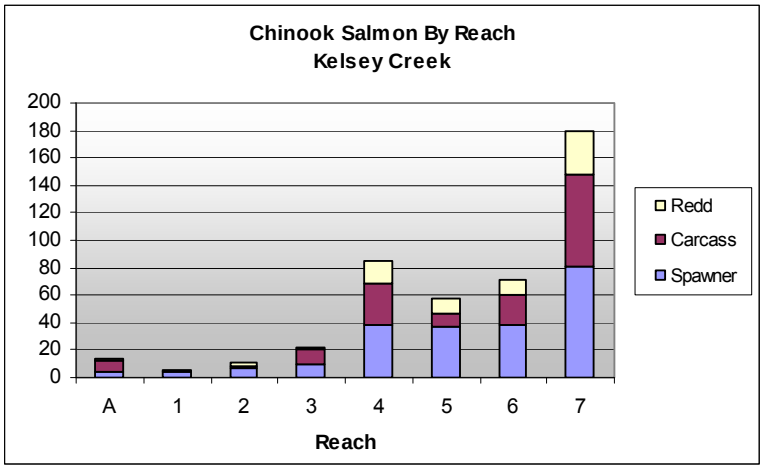


Figure 10. Chinook salmon spawner, carcass, and redd counts from each reach of Kelsey Creek during the 2007 spawner surveys.

Table 4. Annual duration of the Kelsey Creek spawner survey (2000 to 2007) denoting spawner, carcass, and redd observations by date.

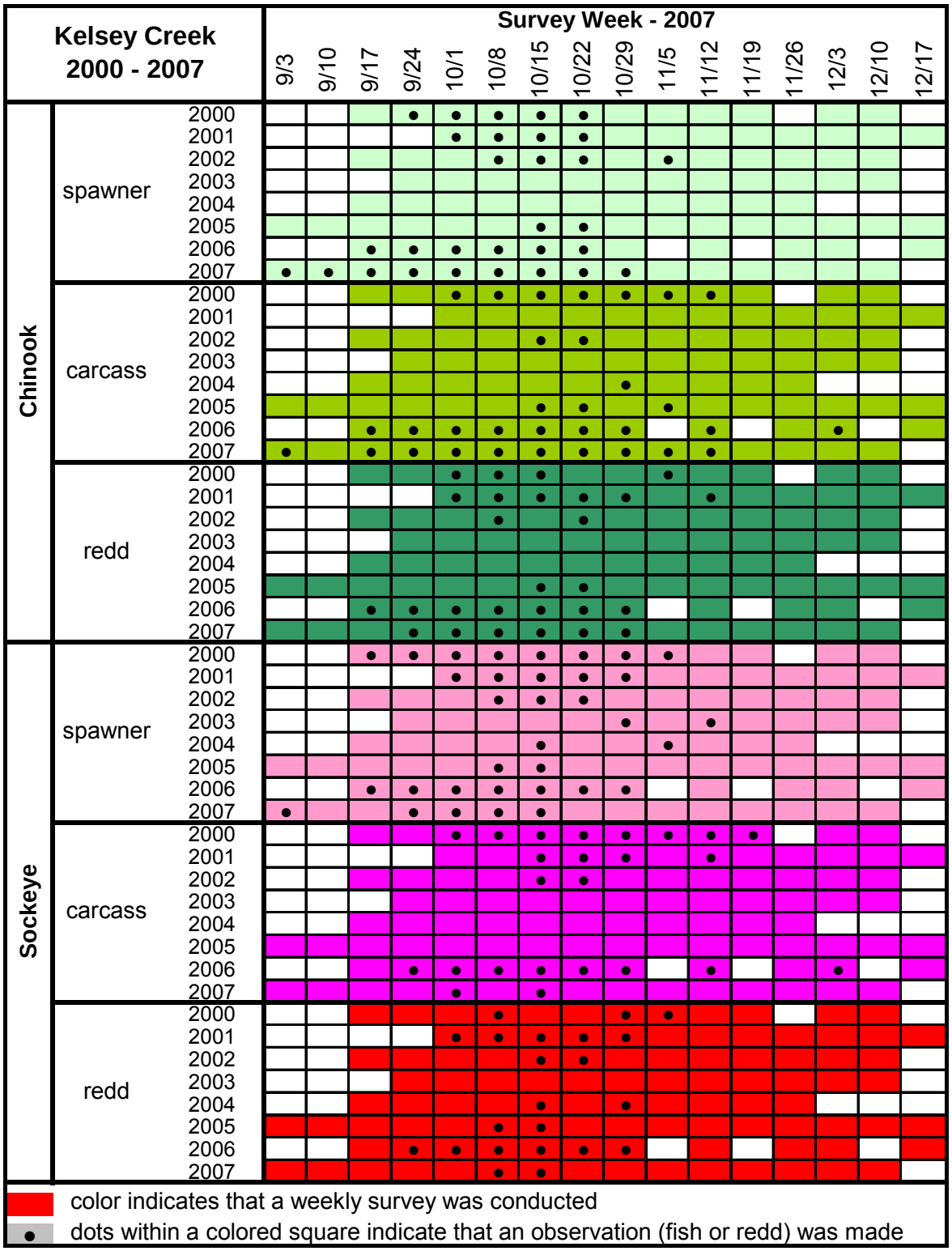
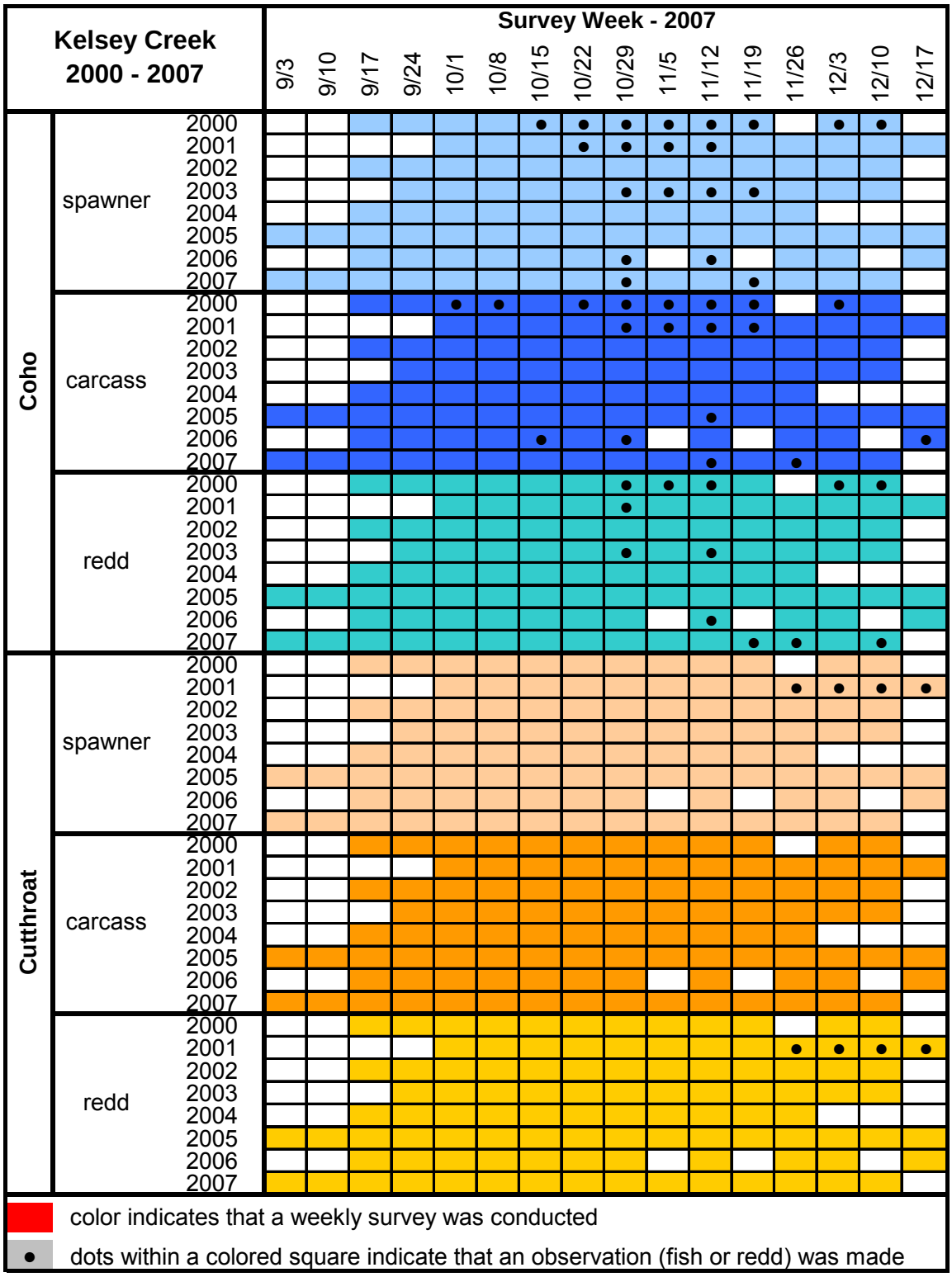


Table 4. Continued.



Sockeye Salmon

Fourteen live sockeye spawners were observed in Kelsey Creek in the 2007 spawner surveys, and five sockeye carcasses were recovered (Table 1, Figure 11). A total of eight sockeye redds were constructed within the survey area. Sockeye escapement to the Kelsey System index area is estimated at either 11 fish (Live Count AUC) or 20 fish (redd-based).

The adipose fins of sockeye from local hatcheries are not clipped, precluding a distinction between hatchery and "wild" returns. Approximately 80 percent of the sockeye (carcasses) returning to Kelsey Creek were female, and 20 percent were male. Sockeye salmon were first observed in Kelsey Creek on September 3, and live adults were last observed on the spawning grounds during the week of October 15 (a duration of approximately 7 weeks, Table 4).

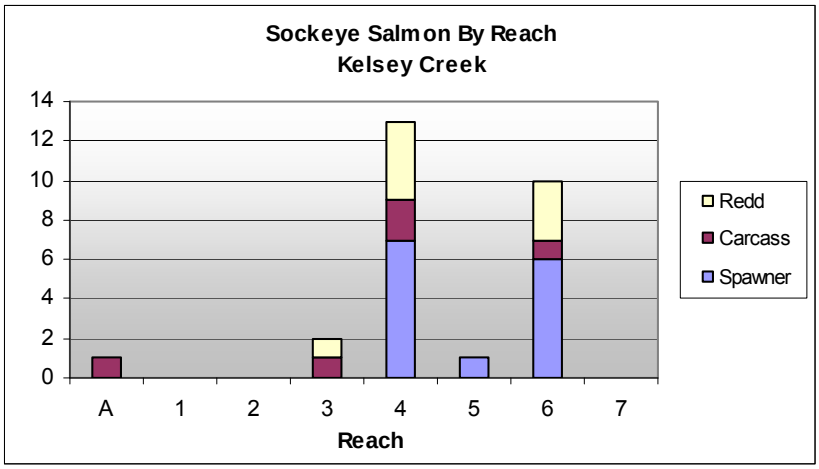


Figure 11. Sockeye salmon spawners, carcasses, and redds observed in Kelsey Creek during the 2007 spawner surveys.

Coho Salmon

Nine coho salmon (3 live fish and 6 carcasses) and six coho redds were observed in the 2007 Kelsey Creek spawner surveys (Table 1, Figure 12). Coho escapement to the Kelsey System index area is estimated at either 3 fish (Live Count AUC) or 15 fish (redd-based).

Fifty percent of the coho (carcasses) were female and 50 percent were male; four (67%) of the coho carcasses had adipose fin clips, one (17%) carcass was unclipped, and one

(17%) was unknown. Coho salmon were first observed in Kelsey Creek on October 29, and live adults were last observed on the spawning grounds during the week of November 19 (a duration of approximately 4 weeks, Table 4).

Rainy weather and high flow events frequently occur in Kelsey Creek during the fall and coincide with the peak coho spawning period. This often leads to missed surveys, or surveys conducted when stream flows and water clarity are not optimal. These conditions generally result in lower chances of observing live spawners, carcasses, and redds during the late fall when the coho generally spawn. Unattended redds observed in the late fall spawner surveys (peak coho spawning) are recorded as coho redds, despite the possibility that some may have been constructed by migratory cutthroat trout.

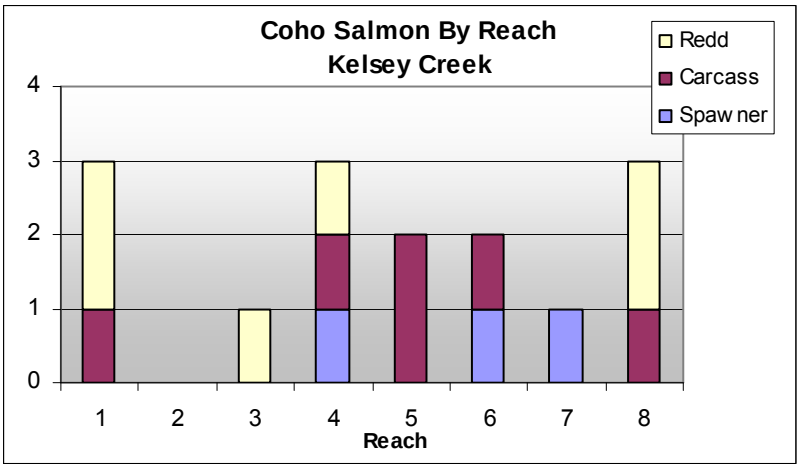


Figure 12. Coho salmon spawners, carcasses, and redds observed in Kelsey Creek during the 2007 spawner surveys.

Cutthroat Trout

No adult cutthroat trout (spawners or carcasses) or cutthroat trout redds were observed in Kelsey Creek during the 2007 spawner surveys. The 2007 spawner surveys, however, likely concluded prior to migratory cutthroat trout entering the Kelsey Creek system.

Spawning Trend Data

Reach 7 received the heaviest chinook spawning activity in 2007, followed by Reaches 4, 5, and 6 (Figure 13). Few redds were observed in Reaches A, 1, 2, or 3 in 2007. The spatial distribution of 2007 spawning activity in the Kelsey Creek mainstem is depicted in reach-specific aerial photos in Appendix A, and run timing is summarized in Table 4.

Last year (2006) Reach A was heavily utilized by chinook for spawning, while Reach 7 received little spawning activity (Figure 13). In contrast, Reach 7 received the most spawning activity in 2007, and relatively few redds were observed in Reach A. The reason for this difference is unclear. A possible explanation is that relatively low 2006 stream flows during the chinook spawning period may have prompted more fish to build redds lower in the system, while relatively higher 2007 stream flows (there were a number of rain events in the fall of 2007 when

the chinook were migrating) may have provided chinook salmon easier access to upper reaches of the system in 2007.

Chinook appeared to utilize Reaches 4, 5, and 6 relatively equally for spawning in both 2006 and 2007, while few redds are ever observed in Reaches 1, 2, or 3. The concrete grade control weirs that are dispersed throughout this area of Kelsey Creek may affect spawning distribution in Reaches 4 and 5. One of the taller weirs in (lower) Reach 5 appeared to partially block upstream access for some chinook in 2006 and 2007, resulting in a relatively heavy concentration of redds built immediately downstream from the problem weir. Without the partial barrier, more of these fish may have continued upstream and built redds in different reaches higher in the system. Prior to 2006, many chinook migrated up the West Tributary (presumably due to passage barriers in the lower mainstem of Kelsey Creek), and few redds were observed in the mainstem. Although Reaches 4, 5, and 6 were often used for spawning prior to 2006, a clear pattern of redd distribution is difficult to discern due to low overall redd counts (Figure 13).

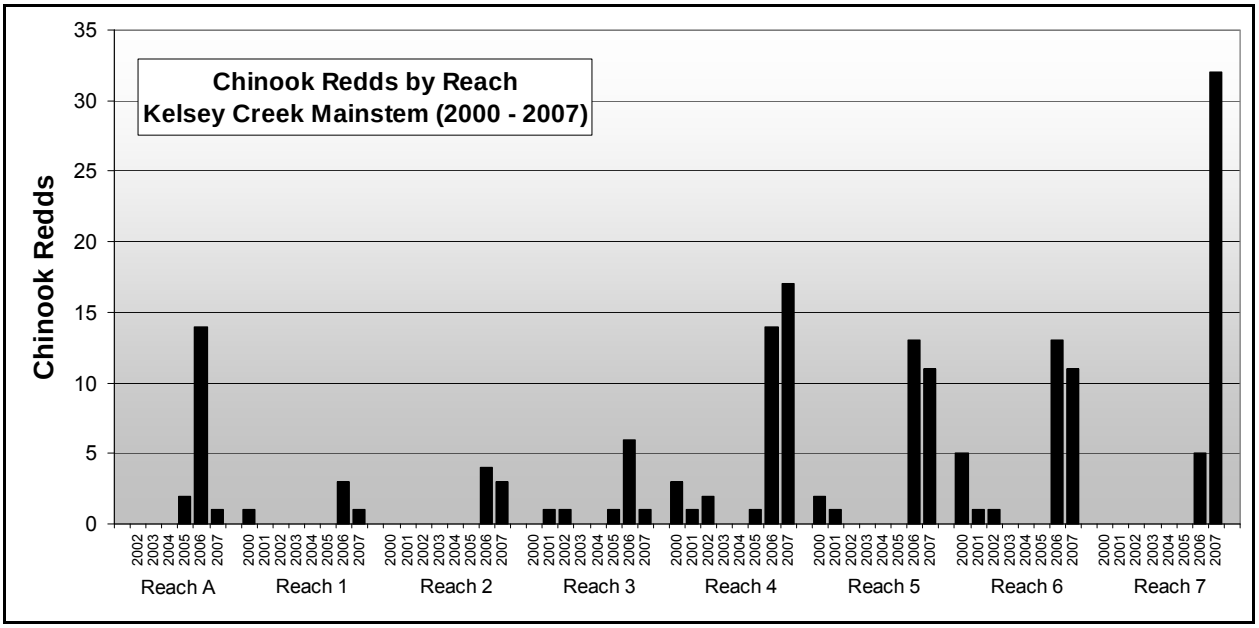


Figure 13. Chinook redds per reach in Kelsey Creek, 2000 to 2007.

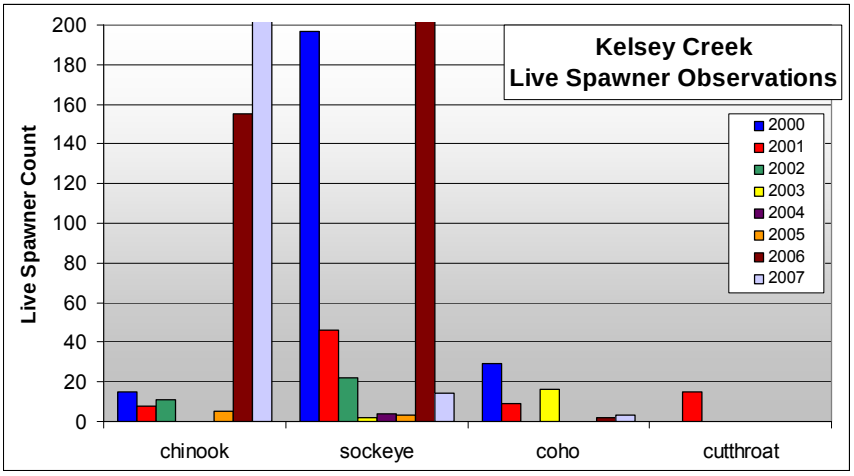


Figure 14. Total number of live spawner observations per species per year in Kelsey Creek from the year 2000 to 2007. The live sockeye count in 2006 totaled 388 and the chinook count in 2007 was 220.

5.2 West Tributary

Few fish were observed in the West Tributary in 2007 relative to other years (Table 5). No chinook redds were constructed in the survey area and all chinook using this stream likely migrated upstream beyond the survey reaches to spawn. Two coho redds were observed in Reach 4 of the West Tributary this year, but no sockeye were recorded. There was no evidence of any major fish passage issues in the West Tributary in 2007.

In 2007, the Washington Department of Fish and Wildlife conducted three spawner surveys (October 5, 10, and 17) in the Goff Creek basin (tributary to the West Tributary) during the peak chinook spawning period. The Goff Creek survey area is upstream from the West Tributary survey area, and any fish observed in Goff must pass through the West Tributary survey reaches. A total of seven chinook carcasses, nine live chinook, and no chinook redds were observed in Goff Creek in 2007. No other species were recorded. Six (85%) of the chinook carcasses were male fish and one (15%) was female. One (15%) of the carcasses was unclipped and the remaining six (85%) were clipped.

Table 5. Total returns for the West Tributary in 2007.

W Trib	Chinook			Coho			Sockeye		
Reach	Spawner	Carcass	Redd	Spawner	Carcass	Redd	Spawner	Carcass	Redd
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	1	0	0	0	2	0	0	0	0
4	0	7	0	2	1	2	0	0	0
Total	**1**	**7**	**0**	**2**	**3**	**2**	**0**	**0**	**0**

Chinook Salmon

Eight chinook salmon (live spawners and carcasses) were observed in the West Tributary during the 2007 spawner surveys, one of which was a live spawner, and seven of which were carcasses (Table 5, Figure 15). No redds were observed in the survey area. Based on the presence or absence of adipose fins, four (~60%) of the seven West Tributary chinook (carcasses) were hatchery origin fish (clipped), and three (~40%) were unknown (too badly decomposed to determine). Two of the seven West Tributary chinook carcasses were male, three were female, and one was unknown (Table 7). Chinook body length data was combined with measurements from Kelsey Creek and Richards Creek fish, and average length statistics are presented in Figures 5 and 6 above. Live chinook salmon were only observed in the West Tributary on September 3 (one week), but carcasses were observed in the survey area until the week of October 29 (a duration of approximately 9 weeks, Table 6). Some carcasses likely washed into the upper survey area from upstream locations, explaining the fact that carcasses, but no redds, were observed.

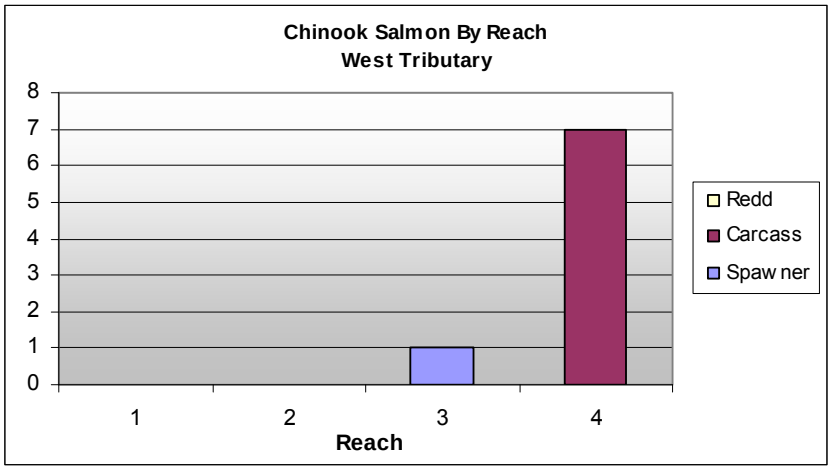


Figure 15. Chinook salmon carcasses, live spawners, and redds observed in the four reaches of West Tributary during the 2007 spawning season.

Sockeye Salmon

No sockeye salmon or sockeye redds were observed in the West Tributary survey area in 2007. This number is significantly less than last year's (2006) return, when 19 live spawners, 33 carcasses, and 8 redds were recorded in this area.

Coho Salmon

Two live coho salmon spawners, three coho carcasses, and two coho redds were observed during the 2007 West Tributary surveys (Table 5, Figure 16). Of the three coho carcasses, two were female and one was male. All three (100%) coho carcasses had adipose fin clips (hatchery origin). Coho salmon were first observed in the West Tributary on November 5, and the last coho observation (a coho redd) was recorded on December 3 (a duration of approximately 4 weeks, see Table 6).

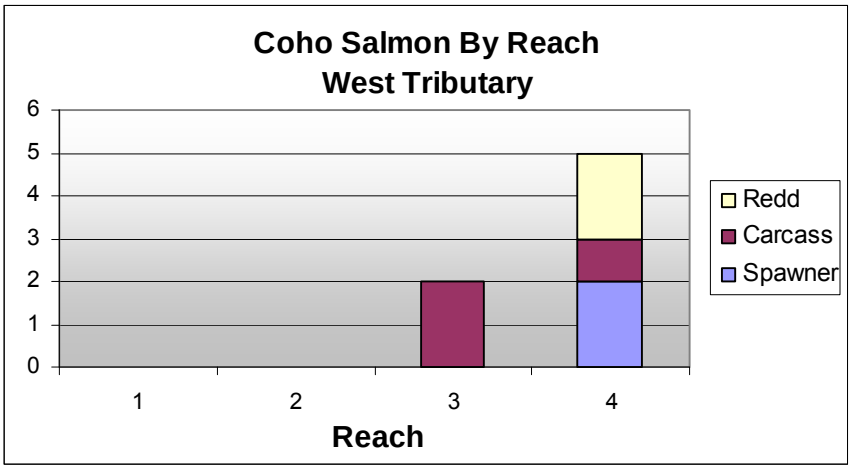


Figure 16. Coho salmon carcasses, live spawners, and redds observed in the four reaches of West Tributary during the 2007 spawning season.

Cutthroat Trout

One migratory cutthroat trout carcass was observed in Reach 4 of the West Tributary in 2007. The female carcass was found on December 21, and measured 42.5 centimeters (total length), 42 centimeters (fork length), and 35 centimeters (POH length).

Table 6. Annual duration of the West Tributary spawner survey (2000 to 2007) denoting spawner, carcass, and redd observations by date.

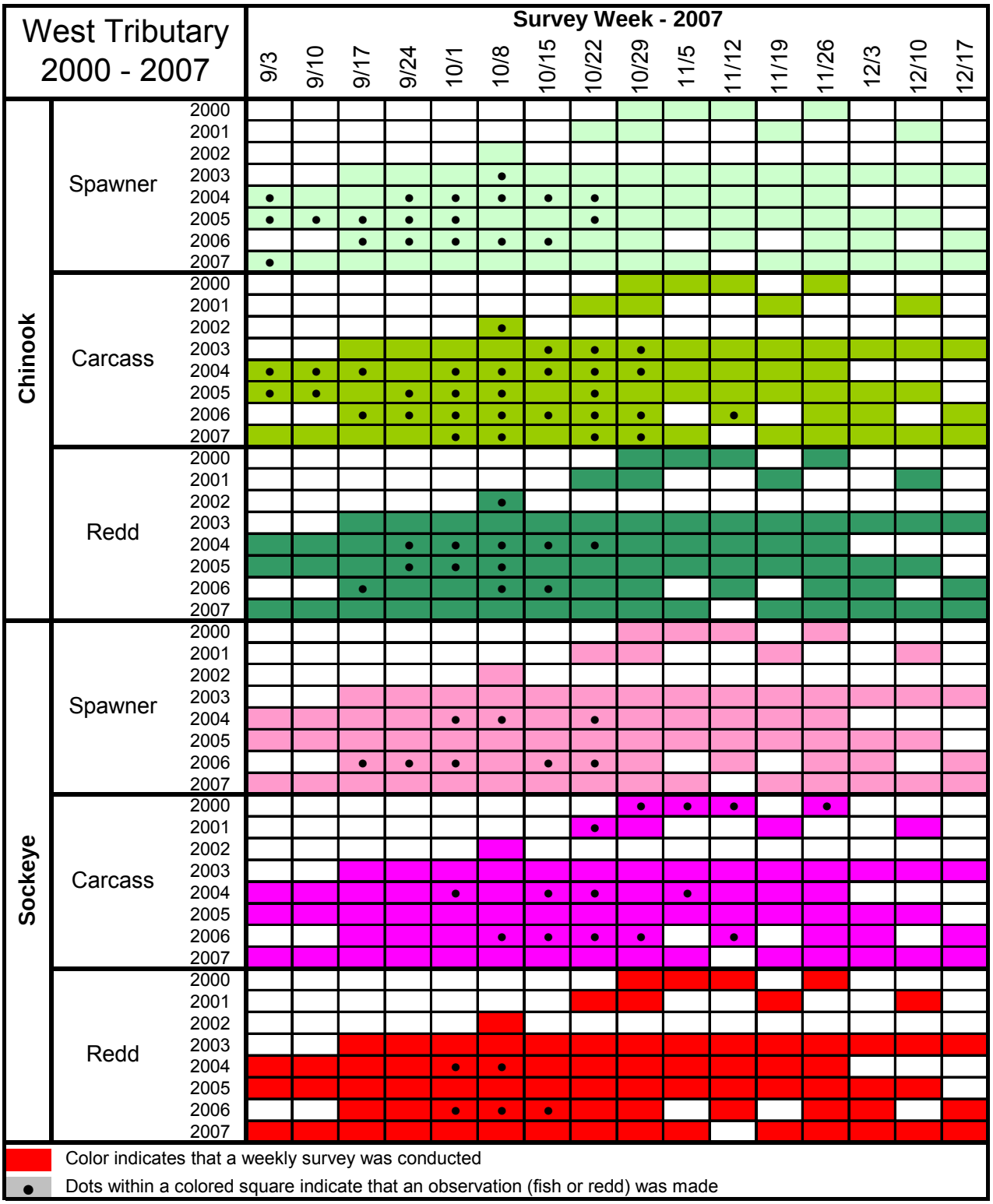


Table 6. Continued.

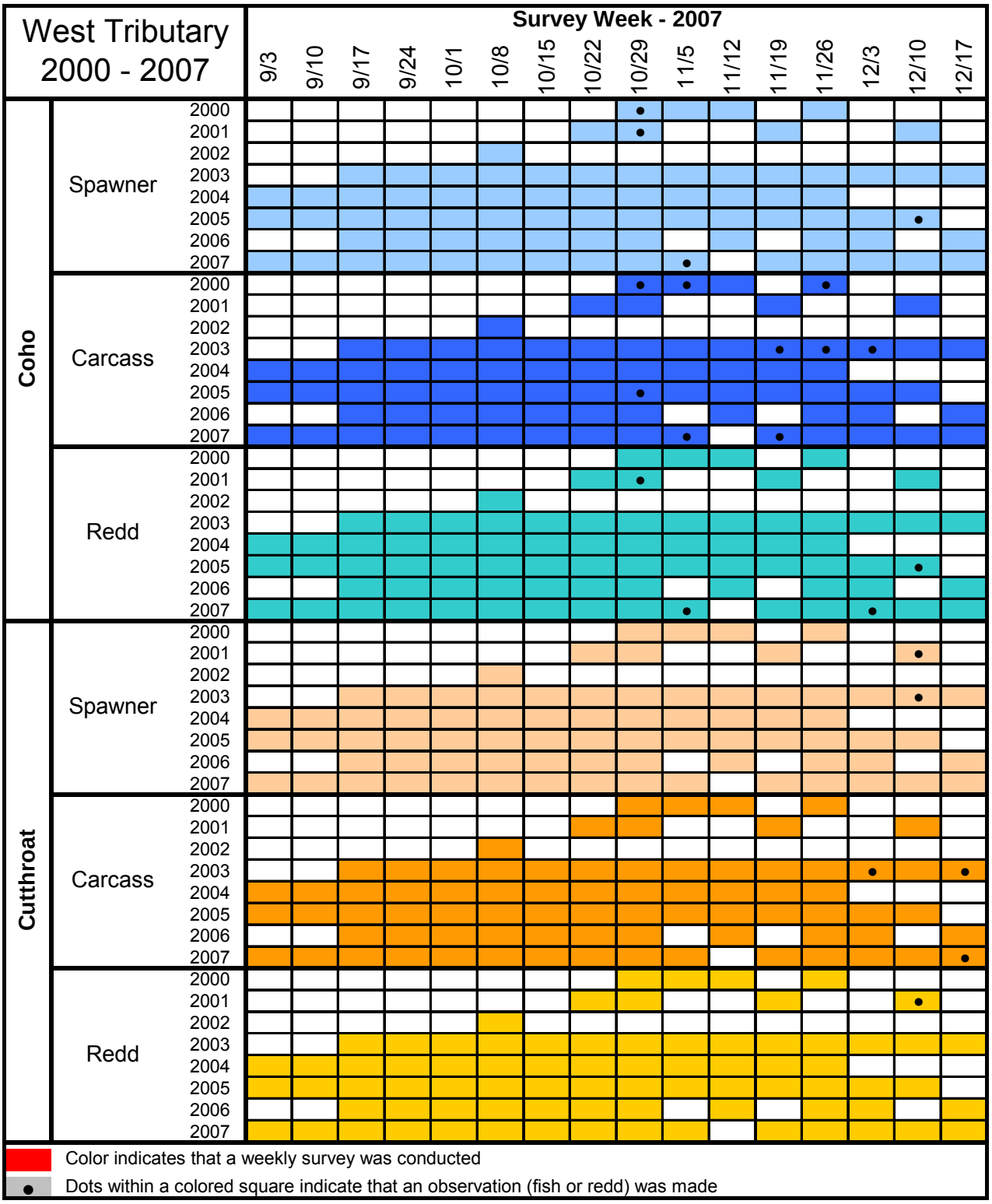


Table 7. Relative abundance of male and female returning salmonids observed in the West Tributary (2003-2007). Total Observed only includes those fish for which a positive gender determination was possible. Survey data for the West Tributary is incomplete prior to 2003.

Species	Year	Total Obs.	Male	Female
Chinook	2003	6	33%	67%
	2004	81	30%	70%
	2005	40	43%	58%
	2006	59	49%	51%
	2007	7	33%	67%
Sockeye	2003	0	NA	NA
	2004	10	30%	70%
	2005	0	NA	NA
	2006	37	35%	65%
	2007	0	NA	NA
Coho	2003	2	50%	50%
	2004	0	NA	NA
	2005	2	0%	100%
	2006	1	0%	100%
	2007	3	33%	67%

Spawning Trend Data

The timing of live spawners, carcasses, and redds observed in the West Tributary is summarized by species and date in Table 6 for each survey year. Although the 2000 through 2002 spawner surveys consisted of "spot checks" that occurred between one and four times per year, surveys from 2003 to 2007 were consistently conducted on a weekly basis in the West Tributary. A comparison of the number of live spawners returning to the West Tributary, per species per year, is shown in Figure 17.

Although chinook have used the West Tributary for spawning in the past, no chinook redds were observed in the West Tributary survey area in 2007. Chinook typically use Reaches 3 or 4 of the West Tributary for spawning, and redds have never been observed in Reaches 1 or 2. It is likely that some fish also migrate through the West Tributary survey reaches to spawn upstream. In 2006, 6 chinook redds were observed in Reach 4, and in 2005, 4 chinook redds were observed in Reach 4 and 5 redds were constructed in Reach 3 (9 total redds in 2005). Prior to 2006, spawning distribution in the West Tributary was affected by a partial fish barrier in the lower Kelsey Creek mainstem that caused many chinook to migrate up the West Tributary (rather than the Kelsey mainstem) to spawn. In 2006, the migration barrier on the Kelsey mainstem was removed, and much of the spawning effort subsequently shifted from the West Tributary over to the Kelsey Creek mainstem.

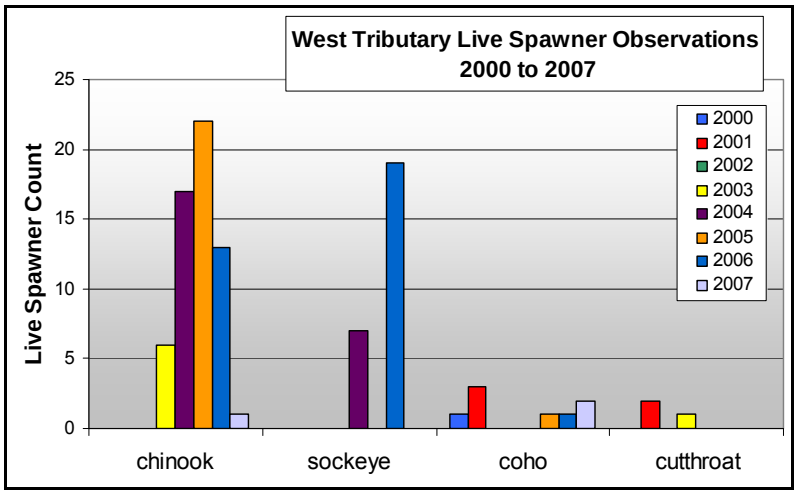


Figure 17. Live spawner observations in the West Tributary from 2000-2007.

5.3 Richards Creek

The Confluence Reach of Richards Creek was surveyed weekly in 2006 and 2007, but the upper four reaches were not surveyed at all. An early season assessment of the Beaver Pond Reach (immediately upstream from the Confluence Reach) indicated that a series of beaver dams and ponds coupled with dense reed canarygrass growth created a fish passage barrier. The lower quarter mile (Confluence Reach) of Richards Creek was surveyed bi-weekly (every other week) in 2007 to monitor fish use in this area. Spot checks were conducted in the lower, accessible portion of the Beaver Pond Reach. It is unlikely that any anadromous fish successfully bypassed the barriers in the Beaver Pond Reach to spawn in the upper reaches of Richards Creek in 2006 or 2007. Unless beaver activity is managed in these areas, fish passage is likely to be blocked (or at least impaired) in lower Richards Creek.

Four chinook carcasses were recovered in 2007, but no other species were observed. No redds were observed in the Confluence Reach of Richards in 2007. The stream channel is heavily incised with undercut banks in many areas of the Richards Creek Confluence Reach, resulting in long deepwater runs. Spawning habitat is limited in this portion of Richards Creek, and it primarily serves as a migration corridor for fish trying to access upper areas of the stream. These conditions also decrease the ability to recover fish carcasses (especially smaller sockeye) and accurately assess the sex and origin of live spawners.

Table 8. Total returns for Richards Creek in 2007.

	Chinook			Coho			Sockeye		
Reach	**Spawner**	**Carcass**	**Redd**	**Spawner**	**Carcass**	**Redd**	**Spawner**	**Carcass**	**Redd**
Confl.	0	4	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
Total	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table 9. Survey timing frequency and observations of species presence in Richards Creek during fall spot surveys from 2000 to 2007.

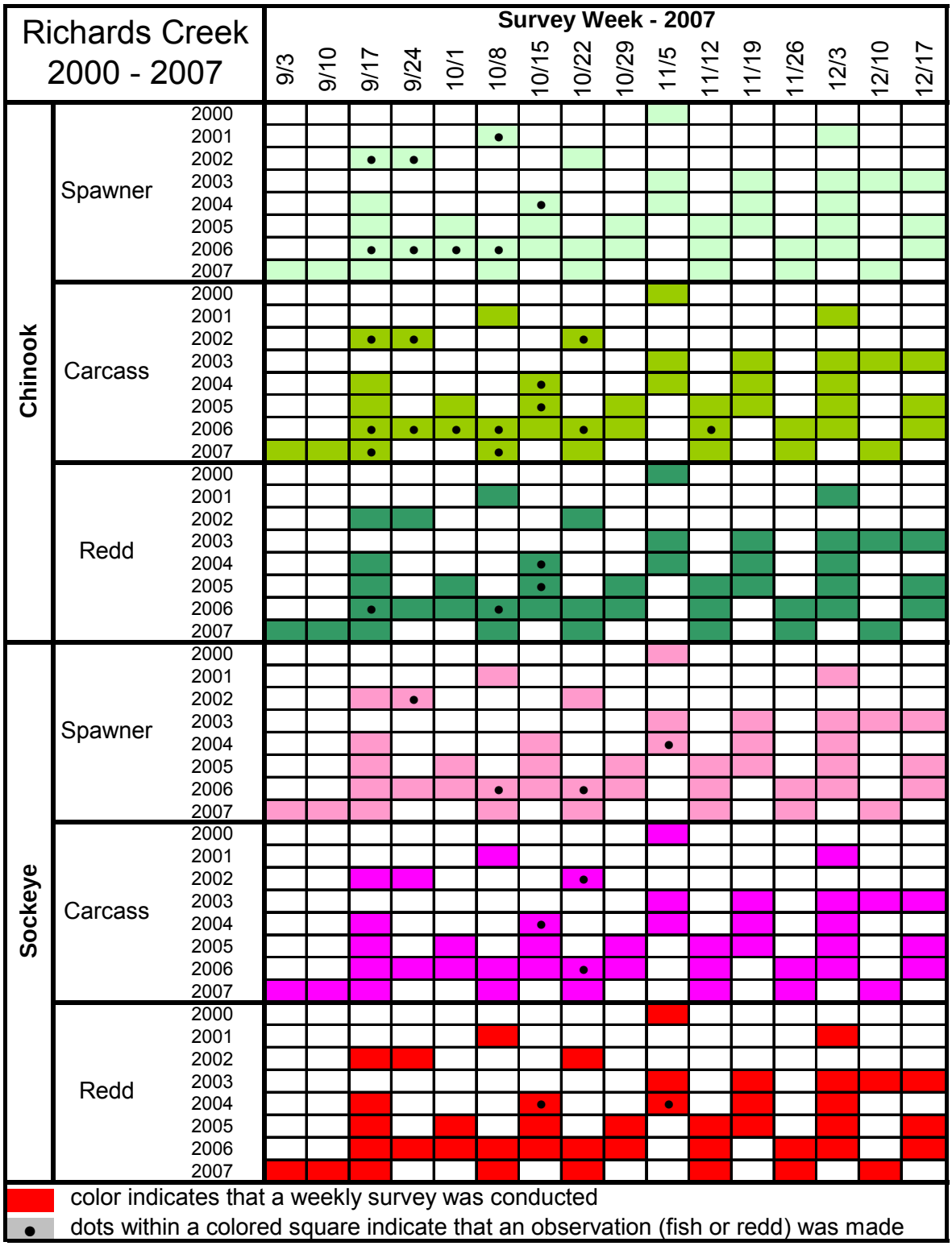
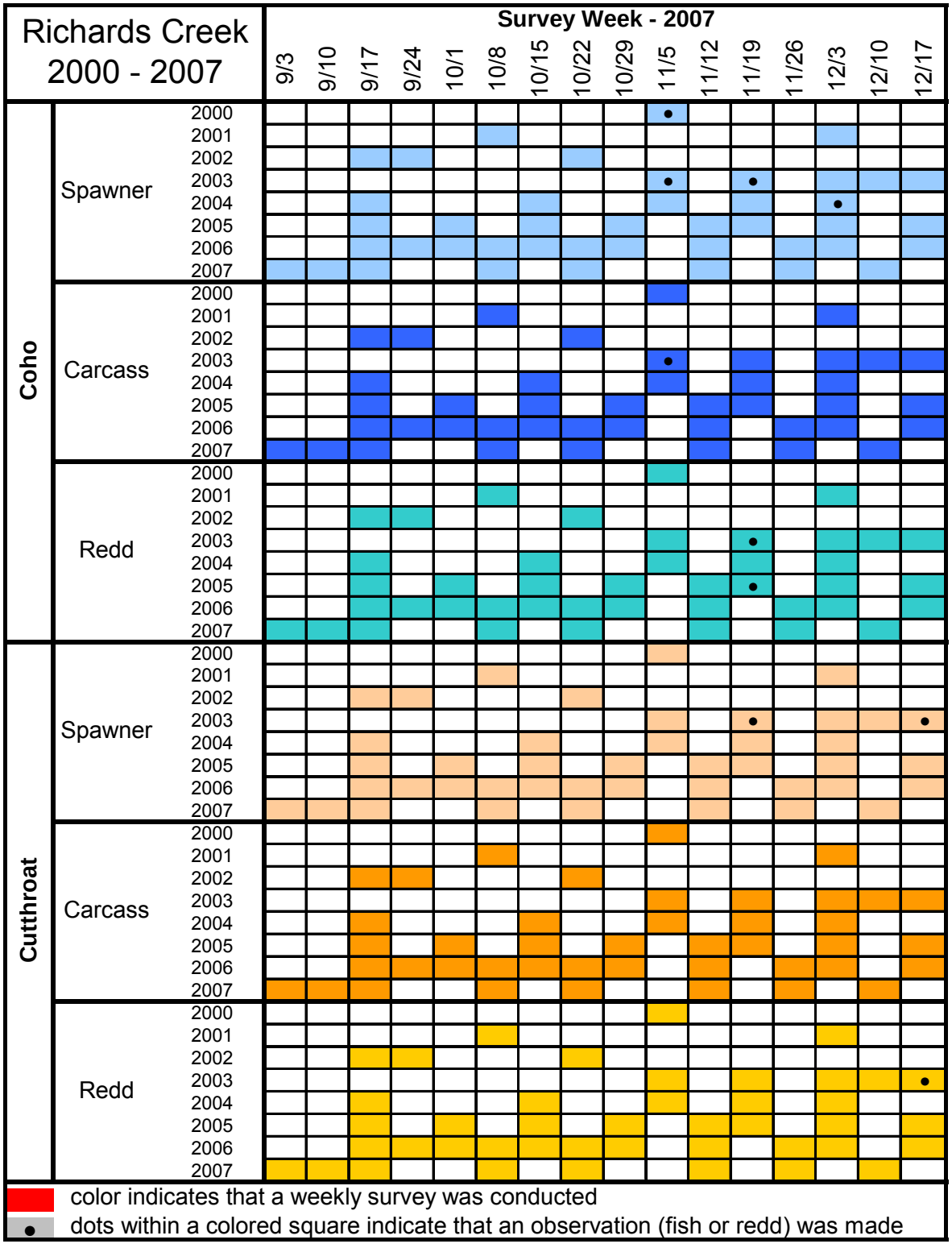


Table 9. Continued.



Chinook Salmon

Four chinook salmon were observed in Richards Creek during the 2007 spawner surveys, all of which were carcasses (see Table 8, Figure 18). All fish were observed in the Confluence Reach or the very lower portion of the Beaver Pond Reach, and beaver dam barriers are thought to have prevented any fish from reaching the upper reaches of Richards Creek. No redds were observed in the Confluence Reach. Based on the presence or absence of adipose fins, two (50%) of the Richards Creek chinook (carcasses) were hatchery fish (clipped), and origin of the remaining two chinook was unknown (too decomposed/eaten to tell if they were marked). Two (50%) of these chinook were male and two (50%) were female. Chinook body length data was combined with measurements from Kelsey Creek and the West Tributary, and average length statistics are presented in Figures 5 and 6 above. Chinook salmon carcasses were first found in Richards Creek on September 17, and the last carcass was observed in the week of October 8 (a duration of approximately 4 weeks, see Table 9).

Sockeye Salmon

No sockeye salmon carcasses, live spawners, or redds were observed in Richards Creek in 2007.

Coho Salmon

No coho salmon carcasses, live spawners, or redds were observed in Richards Creek in 2007.

Cutthroat Trout

No cutthroat trout carcasses, live spawners, or redds were observed in Richards Creek in 2007.

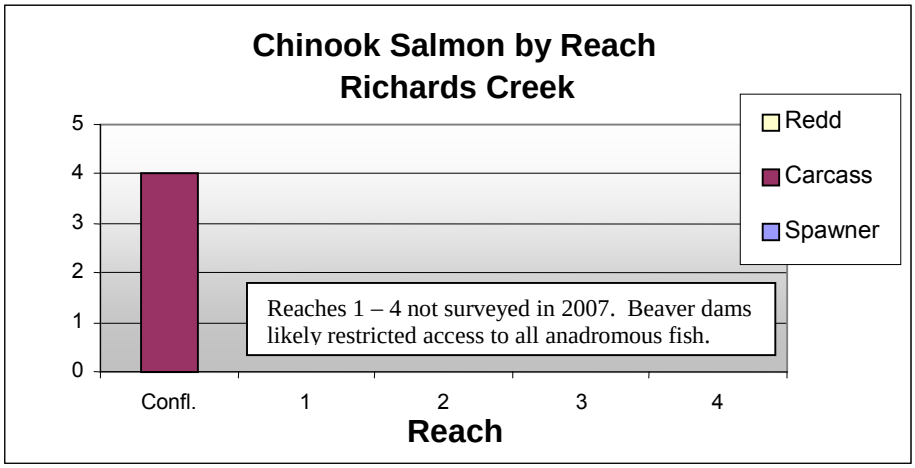


Figure 18. Chinook salmon observations in Richards Creek, 2007.

5.4 Scale Samples and Genetic Samples

As in past years, scale samples were collected from all chinook and coho carcasses and submitted to the WDFW for analysis. Scale samples were collected from a total of 130 chinook salmon carcasses and 9 coho salmon carcasses in 2007, (Appendix C). Each sample included at least six scales per fish and documentation of fork length, POH length, and total length. Genetic tissue samples were not collected in 2007, but have been taken in previous years.

6. DISCUSSION

6.1 Spawning Escapement and Redd Distribution

Spawning escapement (redd-based) for the overall index area (Kelsey Creek, West Tributary, and Richards Creek combined) in 2007 was estimated at 193 chinook, 20 sockeye, and 20 coho. An alternative estimate generated using a live-count AUC indicates that escapement was 149 for chinook, 11 for sockeye, and 5 for coho (Figure 9). As mentioned previously, these escapement estimates are based on regularly surveyed index reaches in the Kelsey basin and they have not been expanded to the entire Kelsey Basin. The two estimates are provided for comparison purposes, and the procedure for calculating the Kelsey escapement is consistent with the methodology used by the WDFW in other WRIA 8 survey areas. Redd counts and spawning escapement estimates for index reaches in the Cedar River, Bear Creek (two of the larger WRIA 8 basins with wild chinook production), and Kelsey Creek are provided in Table 10 for general run-size comparison.

Table 10. Escapement estimates and redd counts from index areas within other primary chinook production basins in WRIA 8 (Steve Foley pers. comm.).

Basin		2005	2006	2007
Cedar River	*AUC Escapement*	518	1066	1730
	Redds	339	587	899
Bear Creek	*AUC Escapement*	320	328	186
	Redds	122	NA	89
Kelsey Creek	*AUC Escapement*	19	107	149
	Redds	14	72	77

Survey conditions were generally good in 2007, and chinook redd counts are thought to be relatively accurate. Heavy rains and a series of extended high-water events beginning in November, however, reduced the effectiveness of some surveys during the coho spawning period (potentially causing a slight underestimate in the coho escapement estimate). Most spawning effort occurred in the upper Kelsey Creek mainstem in 2007, with 32 (42%) of the 77 chinook redds constructed in Reach 7 (Table 1, Figure 19). The fall of 2007 was relatively wet, and a series of rain events that occurred during the spawning season may have enhanced migration conditions, facilitating access to the upper portions (Reach 7) of the basin. In the past, spawning activity has not been this heavily concentrated in Reach 7. A relatively heavy concentration of redds (many of the redds were super-imposed) was also observed in upper Reach 4/lower Reach 5, downstream from a high grade-control weir that may act as a partial fish migration barrier. Spawning activity was limited in the West Tributary and only two coho redds were observed. Fish passage barriers in Richards Creek prevented fish from spawning in the upper reaches and no redds were observed in the lower reach.

Similar to the four previous years, no migratory cutthroat trout spawners or carcasses were observed in the mainstem of Kelsey Creek during the surveys. Redds that were unattended in November were generally attributed to coho, but could, in some instances, have been constructed by cutthroat trout. The 2007 surveys may have concluded prior to the start of the typical spawning period for migratory cutthroat trout. They have typically been observed spawning

after the first of the year, and have only been observed previously in the 2001 survey, which continued until the last week in December.

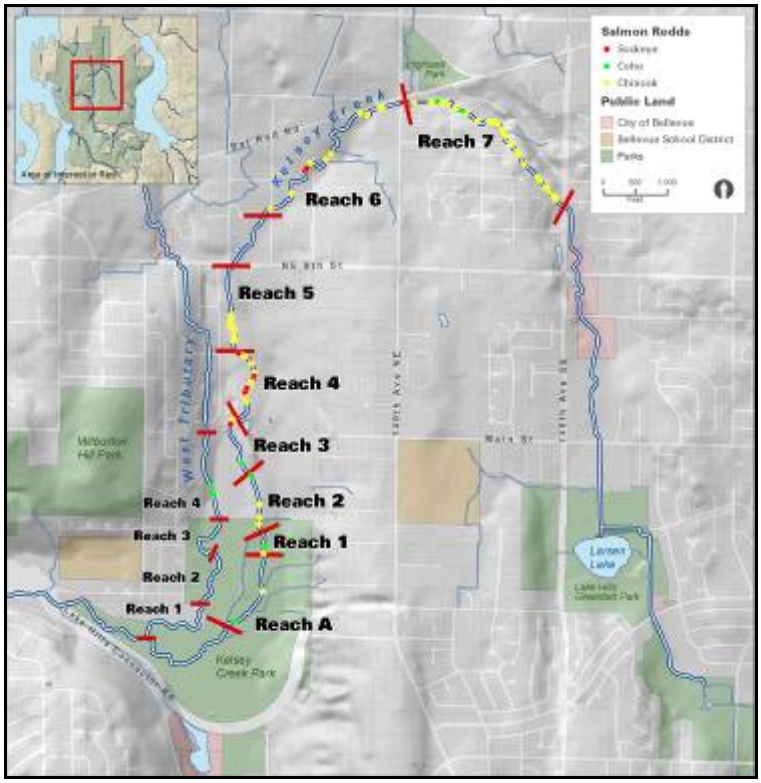


Figure 19 2007 redd distribution in the Kelsey index area (no redds in Richards Creek).

6.2 Access to Spawning Areas

Chronic fish passage issues in lower Kelsey Creek were addressed in 2006 with the installation of a beaver leveler device, which allowed migrating fish to negotiate beaver dam areas formerly impassable at lower flows. No fish passage problems through the wetland beaver complex downstream from the survey area were observed in 2007. However, one of the concrete grade-control weirs located in lower Reach 5 appeared to act as a passage barrier for some chinook in 2007 (Figure 20). A relatively heavy concentration of redds was observed in upper Reach 4/lower Reach 5 (Figure 19), immediately downstream from the problem weir. Many of the chinook appeared unable or unwilling to jump this high vertical drop, and constructed redds in the stream immediately downstream from the weir (in sub-optimal spawning habitat), often superimposing redds upon one another due to limited space. However, this weir was not a total barrier, and many chinook were able to bypass the structure and access spawning reaches upstream.

No migration barriers were observed on the West Tributary in 2007. However, beavers are currently active in the area between the Kelsey Farm vehicle bridge and the downstream edge of the golf course. Beaver check dams in this area have created partial migration barriers in the past, and could easily do so again. This area should be monitored for blockages prior to the next spawning season.

Similar to the 2006 spawning season, access to the upper reaches of Richards Creek was blocked in 2007 by a series of beaver dams located in the Beaver Pond Reach, just upstream from the regularly surveyed Confluence Reach. In 2007, three chinook carcasses were found upstream from the lowermost beaver dam in the Beaver Pond Reach following a high flow event, indicating that temporary passage through this area may have been available. However, the beaver pond/wetland complex in the Beaver Pond Reach currently acts as a total fish migration barrier at most stream flows, and it is unlikely that chinook were able to bypass this area to spawn in the upper reaches of Richards Creek in 2007.

Figure 20. A photo of the concrete grade-control weir in Reach 5 that may have been a partial migration barrier in 2007.

6.3 Redd life

Redd life refers to the period of time a redd is readily visible, and is typically estimated at 21 days for streams in Washington State (Orrell 1976; Hahn 2003). However, Kelsey Creek is an urban stream with accentuated peak flows and mobile substrates (Scott et al. 1986; Moscrip and Montgomery 1997) that effectively decrease the average redd life in this basin. Redds in the Kelsey basin are sometimes visible for up to 21 days, but a single rain event that raises discharge (as measured at the stream gauge in Mercer Slough) over 100 cubic feet per second (cfs) will often obscure any redds that have been constructed. Also, redds that are located higher in the watershed (Reach 7) were typically visible longer than redds that were situated lower in the watershed (Reaches A and 1). This is likely due to the fact that less stormwater is discharged to the upper reaches of the Kelsey mainstem, and peak flows are not magnified to the same extent in this area. Based on qualitative observations (not rigorously documented), a rough estimate for average redd life in the Kelsey basin is 14 days. However, redd life in the Kelsey mainstem likely varies from reach to reach, with slightly higher redd life in the upper reaches and lower redd life in downstream reaches. A shorter redd life due to mobile substrates in Kelsey Creek is consistent with observations from previous survey teams as well (Taylor and Associates 2002).

6.4 Discharge

Although water flows were low at times, it was a relatively wet fall and flows were generally favorable (for salmonids) in September and October of 2007 (Figure 21), during the peak spawning migration. A series of modest rain events periodically occurred during the chinook spawning period in 2007, and provided favorable conditions for both upstream migration and instream holding. These fall freshets may have enhanced access to the upper portions of the Kelsey Creek mainstem (Figure 19), where spawning and rearing conditions are thought to be more favorable than in other areas. Substrates are relatively stable and gravel scour (and presumably egg mortality) is likely lower in Reach 7, where many of the redds were constructed in 2007. A flood of record for Kelsey Creek occurred on December 3rd, scouring many portions of the Kelsey System index area and likely resulting in significant egg mortality in 2007.

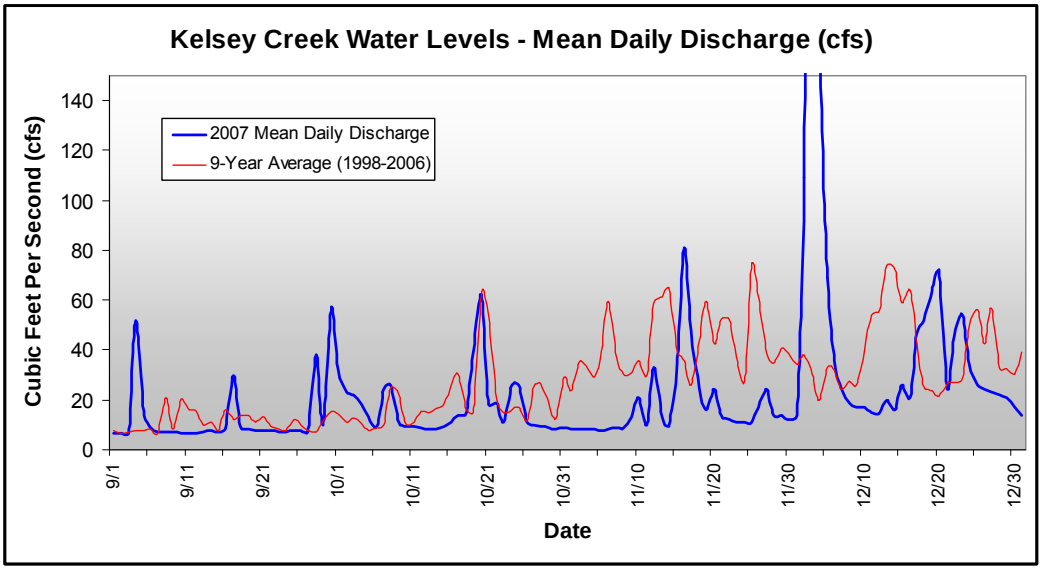


Figure 21. Mean daily discharge in the Kelsey Creek basin from September through December in 2007 and 9-year average discharge (1998-2006), measured at the USGS stream flow gauge in Mercer Slough (USGS Gauge #12120000). A high-flow event on 12/3/2007 produced a mean daily discharge of 553 cfs.

6.5 Fish Origin

Similar to last year, a large percentage (77%) of the chinook observed in 2007 were hatchery-origin (clipped) fish, while 14 percent were wild origin (unclipped); the origin of the remaining 9 percent was undetermined. The high percentage of hatchery fish in the 2007 run indicates that, despite the strong return, chinook production in the Kelsey basin is still limited by some factor or combination of factors. Although the Kelsey spawner surveys effectively monitor the annual spawning effort of adult salmonids, estimates of egg-to-juvenile survivorship and overall juvenile salmonid production from the basin are currently unknown.

6.6 Pre-Spawn Mortality

Each year in Kelsey Creek, as in other urban streams, a number of female (and male) chinook experience pre-spawn mortality, or die before they have a chance to deposit their eggs. Females that die before they deposit their eggs typically have 100 percent egg retention with eggs still in skeins that are relatively tight. Female pre-spawn can be monitored by inspecting the body cavity of each carcass to assess egg retention, but pre-spawn mortality in male fish is difficult to determine in the field, and is not tracked in these surveys.

In 2007, a total of 76 female chinook carcasses were recorded in the Kelsey Creek index area (including the West Tributary and Richards Creek). Of these female chinook, 15 percent experienced pre-spawn mortality (died from unknown factors), 9 percent were killed by predators (before spawning), 51 percent spawned successfully, and spawning success was unknown in the remaining 25 percent of the carcasses (Table 11).

Table 11. Pre-spawn mortality in Kelsey Creek.

Year	Pre-Spawn Mortality (Yes, No, Unknown*)	Count	Percent Total
2007	Yes	11 (unknown factors)	15%
		7 (Predation-related)	9%
	No	39	51%
	Unknown	19	25%

*Unknown indicates that the carcass was either too decomposed or mangled to accurately assess the true cause of death.

Pre-spawn mortality in chinook salmon is not exclusive to Kelsey Creek, and has been recorded in other WRIA 8 spawning areas as well. Other estimates (Table 12) indicate that pre-spawn mortality in WRIA 8 streams can range from 0.8% to 23% (Berge et al. 2006).

Table 12. Prespawn mortality for chinook salmon in other WRIA 8 streams (Berge et al. 2006).

Year	Watershed	Number Carcasses Sampled	Percent Pre-spawn mortality
2003	Cedar River	134	1.5%
	Bear Creek	95	8%
	Issaquah Creek	71	23%
2004	Cedar River	232	3%
	Bear Creek	69	4%
	Issaquah Creek	Not Sampled	---
2005	Cedar River	122	0.8%
	Bear Creek	138	6.5%
	Issaquah Creek	79	22.7%

6.7 Physical Habitat Characteristics by Reach

Kelsey Creek

Physical stream habitat conditions in the surveyed portions of the Kelsey Creek mainstem have changed little since 2005. Reaches A and 1 are relatively dynamic and have experienced some flood-driven changes in channel morphology, but other reaches are relatively confined by bank armoring and have little opportunity for lateral migration of the stream channel. Typical stream habitat conditions and photos characterizing individual survey reaches are provided below.

Reach A and Reach 1

Figure 22. Typical habitat in Reach A and Reach 1.

Reach A and Reach 1 are dynamic reaches with wide riparian areas and relatively unconstrained floodplains that promote frequent, small-scale channel changes and adjustments. The stream channel in these reaches changes from year to year, generally in response to flood events and the formation of small debris jams. The lower end of Reach A was extended approximately one-eighth mile downstream in 2006 because of recent gravel deposition to capture any additional spawning activity that might occur. The riparian corridor through Reaches A and 1 is forested to the east, with a mixture of forest, open space, and pasture to the west. Although a low levee constrains portions of the western bank, the channel contains very little armoring and meanders freely through the east side of Kelsey Creek Park. In both reaches, the stream is well connected to its floodplain, reaching bankfull very quickly during rain events. A fair amount of medium- to small-sized woody debris, much of it live, is present in Reach A, but is less prevalent in Reach 1.

Pieces of large wood in the channel are present, but not abundant, and many of the debris dams consist of medium- and small-sized material that accumulates and shifts relatively easy.

There is very little gravel in the banks along Reach A, which typically is clay underlain by glacial till, but relatively good spawning gravels have slowly been migrating into these reaches as the stream adjusts to channel changes that occurred in the upper watershed. The gravels are relatively mobile, and accumulate over the underlying clay in pool run-outs and in bars behind debris jams. These gravel bars were popular spawning areas for chinook and sockeye in 2006, but received less spawning activity in 2007.

Reach 2

Figure 23. Typical habitat in Reach 2.

Reach 2 is a relatively short reach with few pools that extends through the downstream portion of the Glendale Golf Course upstream to the third footbridge. Substrate is a mix of small- to medium-sized cobbles and gravels with some fines, and riparian vegetation is predominantly composed of cut grass on both banks, with little overhead cover. Although the substrate generally appears to be good for spawning, few fish build redds in this reach, possibly due to a lack of overhead cover. Many sections of the grass-lined streambank have sloughed into the stream during high flow events, or have fractured and are slowly falling into the channel. Although the root structure of the riparian grass generally holds the stream banks together well, it fails to adequately prevent soil erosion in this area. The golf course fairway crosses the stream in two places within Reach 2, and trees or tall shrubs are undesirable (for golfers) in large tracts of this reach.

Reach 3

Figure 24. Typical habitat in Reach 3.

Reach 3 extends from the third footbridge in the golf course upstream to the first concrete weir and, other than a few private parcels near the upper end of the reach, flows primarily across land owned by the golf course. The stream flows along the base of a small hill (west of the channel) that is well forested with a conifer/hardwood mix that provides substantial overhead shading for the stream. The east side of the stream, however, is bordered by a golf course fairway and has a very narrow riparian area vegetated with grass and a few shrubs. Many portions of the reach contain suitable spawning substrate, but there is very little large wood in the stream channel.

Reach 4

Figure 25. Typical habitat in Reach 4.

Similar to Reaches 2 and 3, Reach 4 is bordered by the golf course on both sides. The stream has been channelized and armored (generally with large boulders) throughout Reach 4, and much of the channel is heavily incised. A series of concrete weir structures designed to alleviate downcutting and dissipate energy are spaced throughout the length of Reach 4. Although the higher weirs in this reach may impede fish passage during times of low stream flow, the majority of spawning chinook in 2006 and 2007 successfully negotiated the Reach 4 weirs and spawned upstream. A stream enhancement project designed to improve fish passage over these grade control structures is currently being planned.

A section of channel in Reach 4 was restored in 2005 by adding gravel, log structure complexes, and bioengineering to decrease erosion alongside golf course infrastructure, while at the same time improving fish passage across the weir. The log structures provide some of the only large wood available in this area. Reach 4 has a narrow riparian buffer lining both banks that is vegetated with some native shrubs, but largely dominated by Himalayan blackberry and Japanese knotweed. Approximately half the reach, however, is well shaded by a stand of mature Douglas-fir trees.

Reach 5

Figure 26. Typical habitat in Reach 5.

Reach 5 is bounded on the west by the golf course and by a series of private residences along the east side. Channel morphology in Reach 5 is similar to that of Reach 4 in that the stream is heavily incised with frequent streambank armoring (boulders) and a series of concrete grade-control weirs spaced throughout the reach. Floodplain areas are very small and limited in number. The stream channel is relatively straight with low sinuosity throughout Reach 5, and the concrete weir structures are designed for grade control and energy dissipation. As described previously, some of these grade control structures may act as partial fish migration barriers. A stream enhancement project designed to improve fish passage over these grade control structures is currently being planned.

The narrow riparian buffer along Reach 5 is dominated in many areas by Himalayan blackberry and Japanese knotweed, or by grass lawns with a mix of ornamental shrubs. Many streamside residents actively seek to improve their views across the creek to the golf course, sometimes cutting/trimming larger trees and shrubs along the creek.

Reach 5 is followed by a two-block gap in the survey extending from the culvert beneath NE 8th Street upstream to the start of Reach 6 at the 134th Avenue NE bridge. This is a private parcel with no access.

Reach 6

Figure 27. Typical habitat in Reach 6.

Land use in Reach 6 is primarily residential with some commercial properties toward the upstream end of the reach. The lower half of the reach flows along the power utility corridor and through a residential area. Although the channel is less confined in lower Reach 6, streambanks are still heavily armored (rip-rap) in this area. The channel parallels Bel-Red Road along the upper half of the reach, where it is heavily confined by rip-rap banks and metal sheet piling. Downcutting is a concern in these areas with heavy armoring on both sides of the stream.

Riparian buffer width varies, but is typically wide and well shaded along the lower half, and narrow and sparse in the upper half of Reach 6. Invasive species such as English ivy, Japanese knotweed, and Himalayan blackberry are a concern in many areas of the reach, but are especially dense in the upper portions of Reach 6. Substrate varies between gravels and angular cobble throughout the reach, but most of the spawning areas are located in the downstream half where the channel is wider and less rip-rap is present.

Reach 7

Figure 28. Typical habitat in Reach 7.

The majority of Reach 7 has a wide riparian buffer dominated by conifers. This reach begins at the Valley Creek-Kelsey Creek confluence, and stream flows in Reach 7 are roughly 50 percent of those in the downstream reaches. It is bordered on both sides by residential development that is typically set back to the top of slope. Although streambank armoring is present in isolated areas of Reach 7, it is much less prevalent than in Reaches 5 or 6. The riparian buffer contributes both large and small woody debris to the channel, creating pools and slowing the transport of sediment. Accordingly, many areas of the reach contain gravel suitable for spawning. Blackberry dominates the riparian zone in some areas, but is often shaded out by native trees and shrubs.

West Tributary

Stream habitat in the West Tributary has changed little since 2003. Physical stream habitat conditions and photos characterizing individual reaches in the West Tributary are cited below.

Reach 1

Figure 29. Typical habitat in Reach 1 of the West Tributary.

Reach 1 is characterized by a wide riparian buffer with abundant cover provided by willow and alder, a low gradient, sandy substrate with little exposed gravel, and few small pools. The dense riparian vegetation grows into and over the channel, providing abundant overhead shade and small wood that adds complexity to the channel. Despite good riparian conditions in Reach 1, suitable spawning substrates are limited and fish typically migrate through this reach to access spawning areas further upstream. Access is difficult in Reach 1, and it is generally difficult to conduct foot surveys in this reach due to the dense riparian vegetation that grows throughout the stream channel.

Reach 2

Figure 30. Typical habitat in Reach 2 of the West Tributary.

Reach 2 also has a relatively low gradient and flows through the lower end of Kelsey Park. Although narrow in some areas, the riparian zone is densely vegetated with native shrubs in Reach 2 and is in good condition. Despite the good riparian area, much of the reach is composed of glide habitat, with few well-defined riffles or pools. Substrate is primarily composed of sand and silt with some small gravels, and spawning habitat is highly limited in this area of the stream. Similar to Reach 1, fish typically migrate through this reach to access spawning areas further upstream.

Reach 3

Figure 31. Typical habitat in Reach 3 of the West Tributary.

Reach 3, which includes the oxbow and the section up to the park's north property line, has a narrow, relatively well-vegetated riparian zone. A habitat restoration project is already planned for the oxbow area in Reach 3 and downstream areas in Reach 2, which will enhance the stream channel and its riparian area. As in Reaches 1 and 2, low gradient throughout much of the reach results in a depositional area with substrates that are generally dominated by sands and silt. A small debris jam located near the vehicle bridge at the north parking lot acted as a fish passage barrier in previous years, but did not appear to hinder migration in 2006 or 2007. Beavers were active in the upper end of Reach 3, in the area below the golf course and upstream from the

vehicle bridge at the north parking lot. The beaver activity created a series of side channels and backwater ponds in this part of the reach.

Reach 4

Figure 32. Typical habitat in Reach 4 of the West Tributary.

Reach 4 extends through the golf course with a slightly higher gradient and a gravel substrate more suitable for salmonid spawning than the lower reaches. Similar to Reach 2 of the Kelsey mainstem, the riparian vegetation in Reach 4 of the West Tributary is predominantly composed of cut grass on both banks, with little overhead cover. Many sections of the grass-lined streambank have sloughed into the stream during high flow events, or have fractured and are slowly falling into the channel. Although the root structure of the riparian grass generally holds the stream banks together well, it fails to adequately prevent soil erosion in this area. A long stretch of the reach is well-shaded by a narrow stand of Douglas-fir trees growing along the stream, but the remainder of the reach is unshaded. Golfers require an open line-of-sight across the creek in some portions of this reach, but much of Reach 4 is situated between two fairways

where a wider riparian zone likely would not impact golfers. With an abundance of high-quality substrates, Reach 4 is often used as a spawning area.

Richards Creek

Confluence Reach

The Confluence Reach flows through a relatively straight channel that is situated between the two lanes of the Lake Hills Connector. The reach extends from the Kelsey Creek confluence upstream to the culvert passing beneath the Richards Road intersection. Although the riparian corridor is relatively narrow, averaging approximately 150 feet in width, it is densely vegetated with alder and willow that overhang the stream channel, often growing through the water and trapping a variety of small woody debris. This is a low-gradient reach without well-defined riffles or pools, and is generally dominated by glide habitat. Gravels and cobbles are rare, and the substrate is dominated by sands and silt throughout the Confluence Reach. Due to its low gradient and silty substrates, this reach is not a good candidate for restoration. The Confluence Reach primarily acts as a migration corridor, and fish passage conditions should be assessed annually in this area.

Beaver Pond Reach

Figure 33. Typical habitat in the Beaver Pond Reach of Richards Creek.

The area between the Confluence Reach and Reach 1 of the regular Richards Creek survey is a wetland/beaver pond area referred to as the Beaver Pond Reach. Three main beaver dams and a series of smaller, check dams were identified in this area in 2006 and 2007. The upper two dams divert the stream flows out of the regular channel and through a broad reed canarygrass wetland area. The entire area is flooded and densely vegetated, and a single stream channel is difficult to locate. The beaver pond/wetland complex in the Beaver Pond Reach acts as a fish migration barrier at most stream flows. Although fish may have temporary access through this area during flood events, it is likely that few fish successfully bypass the series of barriers that are present in this reach. The fish passage barriers in this portion of Richards Creek will need to be corrected before fish can access the upper reaches of this creek at all flows.

7. RECOMMENDATIONS

Many of the most basic projects would involve widening the riparian buffer, removing invasive plants, installing large wood or log structures in the channel, removing armor to soften streambanks, or widening the floodplain/meandering the stream. These types of restoration projects would primarily address three of the six factors of decline identified earlier: altered sediment transport processes, loss of channel complexity, and degradation of riparian condition. One primary factor, fish passage barriers, was effectively addressed in 2006 using the beaver leveler device described earlier. Passage over partial fish migration barriers (such as the concrete grade control weirs interspersed throughout the Kelsey mainstem) should be assessed annually. Other important factors like poor water quality and altered hydrology are affected by patterns of land use over large upland areas and must be addressed at the watershed scale. The following list contains general recommendations specific to each area that was surveyed in 2007.

7.1 Kelsey Creek

1. *Fish Passage:* Prior to the start of the spawning season, the lower Kelsey Creek mainstem should be walked (preferably the middle of August) from the Richards Creek confluence upstream to the Kelsey Farm to locate any impassable debris jams or braided channels which might impede fish passage at low flow, monitor the condition of reed canarygrass in and adjacent to the channel, and determine appropriate corrective measures. Concrete grade control weirs that are dispersed throughout Reaches 4, 5, and 6 hinder fish passage at low stream flows. A fish passage project designed to address these issues is currently being developed by the City of Bellevue (Kit Paulsen pers. comm. 2008). Two of the higher-priority problem areas are listed below.

    a. A concrete grade control structure with a high vertical drop in lower Reach 5 was a partial migration barrier for chinook salmon in 2007 (and likely in 2006 as well). Bioengineering techniques should be used to even the gradient around the structure and reduce the vertical height of this drop.

    b. A series of old concrete weirs and rip-rap banks could be removed from the stream channel where it flows through the utility corridor in the lower portion of Reach 6. Streambank armoring is causing the stream to downcut in this area, and is slowly exposing small portions of the underground pipeline. Widening the floodplain in this area will decrease the stream's energy during high flow events and slow downcutting. Log structures, stream channel modifications, and riparian area improvements could all be implemented to alleviate downcutting and improve stream habitat for fish.

2. *Smolt Production:* Annual smolt production estimates and emigration timing schedules should be obtained for the Kelsey Creek basin. Salmonid smolts could be monitored using a standard fence trap or weir structure located at some point in the Kelsey Creek mainstem downstream from the West Tributary and Richards Creek confluence. Annual production estimates based on juvenile emigration studies for the Kelsey basin would complement spawning escapement information and provide a clearer picture of Kelsey Creek's contribution to overall salmon recovery efforts.

3. *Streambed Scour and Sediment Transport:* A sediment transport and gravel scour study should be conducted in the Kelsey Creek mainstem to assess the effects of development, stormwater runoff, and high stream discharge on spawning substrates and sediment transport in this urban stream system.

4. *Augmentation of Large Wood:* Pieces of strategically placed large wood or log structures should be placed in Reaches A, 1, 2, 3, 4 and 6. These structures would help increase habitat complexity and retain spawning gravels moving though this system.

    a. Some larger key logs or structures in Reaches A and 1 would provide additional overhead cover for spawning fish, and may help retain/slow gravel substrates that appear to be moving quickly through these reaches of the stream. Due to the influx of gravel substrates and the high quality of the riparian corridor, this area of Kelsey Creek is a good candidate for enhancement using pieces of large wood or log structures within the channel.

    b. In Reach 2, installing some low-lying log structures, slightly increasing the width of the riparian zone, planting the riparian zone with a variety of low-growing shrub species, and even excavating some small meanders in the channel would vastly improve the stream habitat conditions for fish without impacting golfers' line-of-sight or impairing their access to the course. Implementing these habitat improvements would help convert this reach from a long, straight run into a more complex area with pools, riffles, overhead cover, and suitable spawning gravels.

5. *Riparian Plantings:* Riparian buffers should be widened and riparian vegetation should be enhanced throughout the survey area, but especially along selected areas of Reaches 2, 3, 4 and 6. Non-native invasive species like blackberry and Japanese knotweed should be removed in these areas.

6. *Reduce Armoring:* Rip-rap armoring and concrete grade control structures in selected stream segments should be removed and bioengineering techniques should be used to address bank erosion or property damage. Rip-rap and other streambank armoring techniques are present throughout the survey reach, but are exceptionally dense in Reaches 4, 5 and 6. Stream channel and riparian area restoration work could be conducted in many areas of Reach 6 without impacting commercial or residential property.

7. *Survey Additional Areas:* Spot surveys should be conducted along Valley Creek and Coal Creek during peak spawning periods to get estimates of fish use in this portion of the watershed.

8. *Water Quality Monitoring:* Water temperature and heavy metal concentrations should be monitored throughout the Kelsey Creek watershed to record spatial and temporal fluctuations and assess their effects on salmonids inhabiting the creek.

7.2 West Tributary

1. *Augmentation of Large Wood:* Pieces of strategically placed large wood or log structures should be placed in the upper part of Reach 3 and throughout Reach 4. These structures would help increase habitat complexity and retain spawning gravels in these portions of the stream.

2. *Bioengineering and Riparian Plantings:* Riparian buffers should be widened and riparian vegetation should be enhanced along Reach 4. Rip-rap armoring along selected streambanks in Reach 4 should be removed and bioengineering techniques should be used in these areas to address bank erosion. Installing some low-lying log structures, slightly increasing the width of the riparian zone, planting the riparian zone with a variety of low-growing shrub species, and even excavating some small meanders in the channel would vastly improve the stream habitat conditions for fish without impacting golfers' line-of-sight or impairing their access to the course. Implementing these habitat improvements would help increase habitat complexity, while strengthening streambanks and slowing the rate of soil erosion.

7.3 Richards Creek

1. *Monitor Fish Passage Conditions:* Lower Richards Creek, from the Kelsey Creek confluence up to Bannerwood Park, should be screened for fish migration barriers prior to the spawning period in 2008. These natural fish migration barriers should be monitored, but perhaps not breeched, as they redirect spawning fish into the Kelsey Creek mainstem where better spawning habitat is available.

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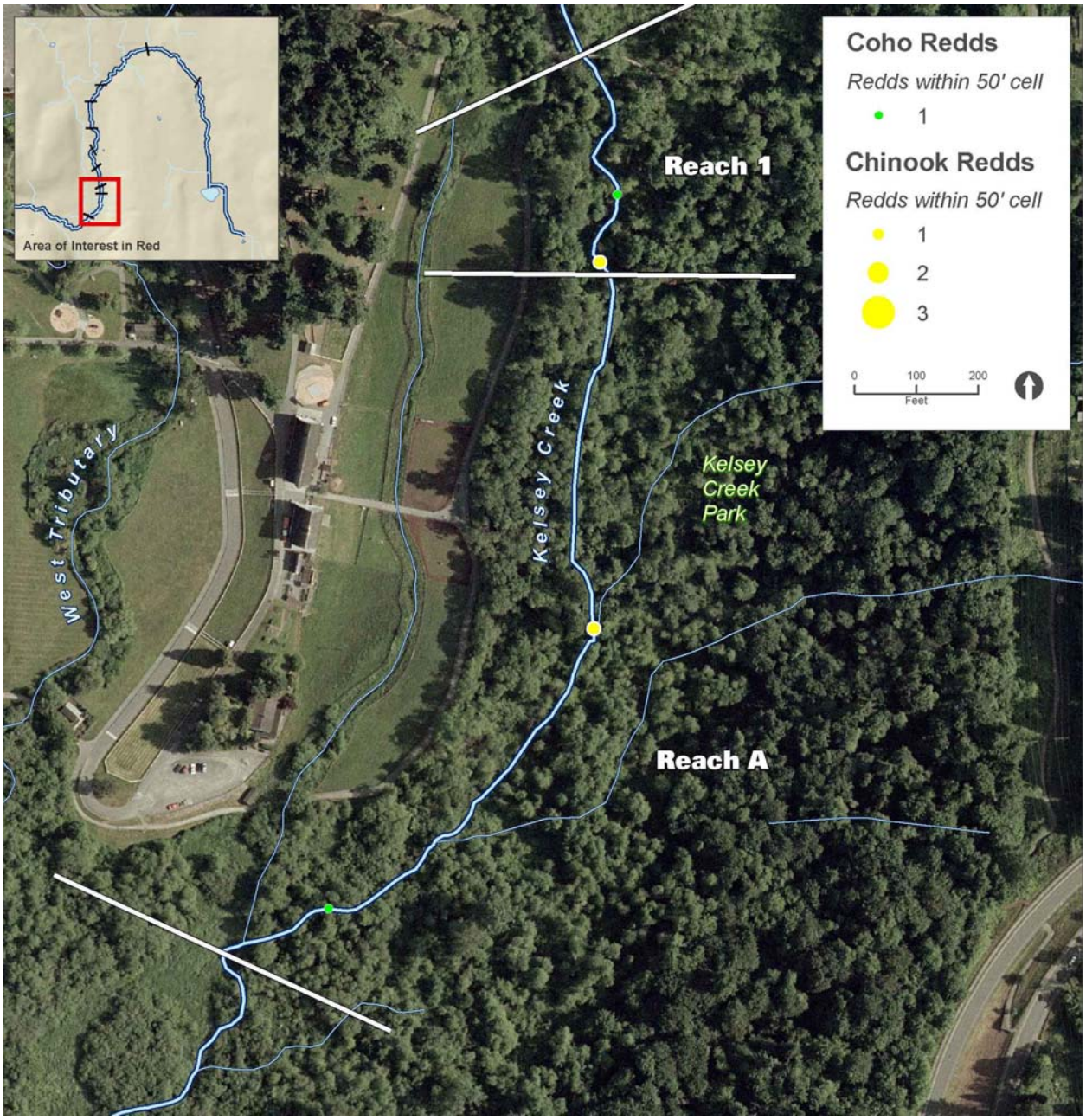
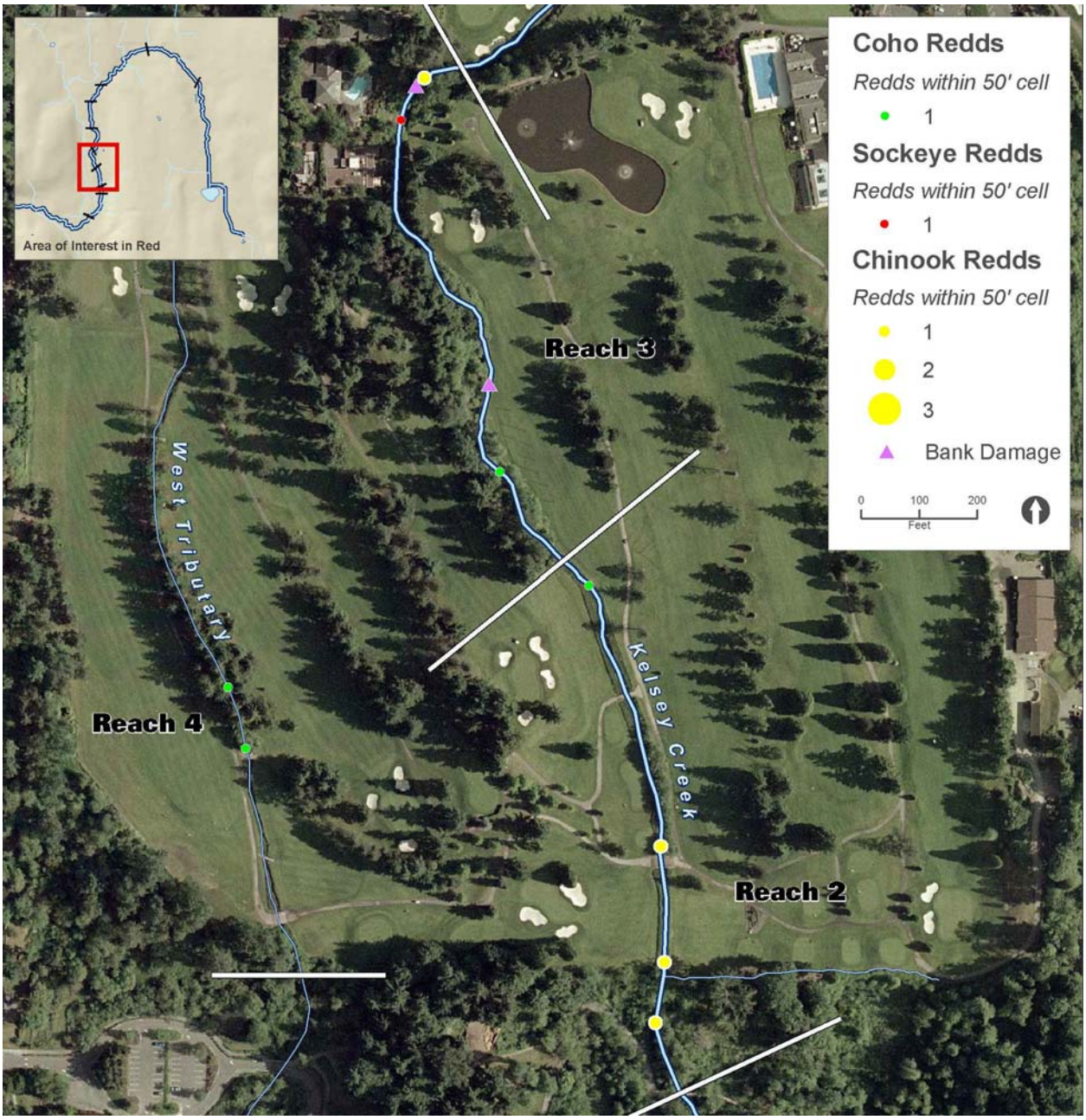
Appendix A
Kelsey Creek Redd Distribution Maps

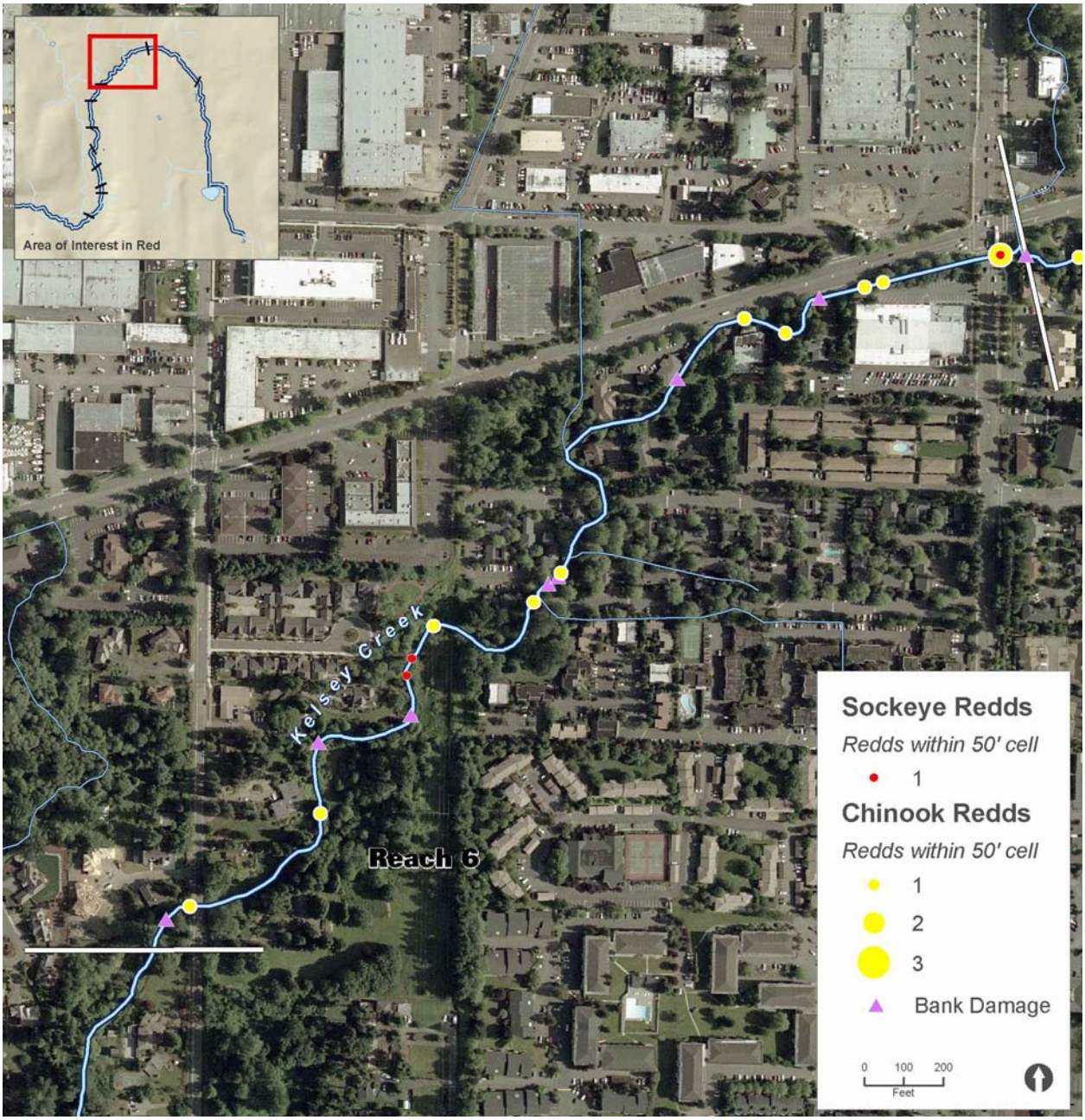


Appendix A-1. Aerial view of Reaches A and 1 showing reach breaks and 2007 redd distribution.

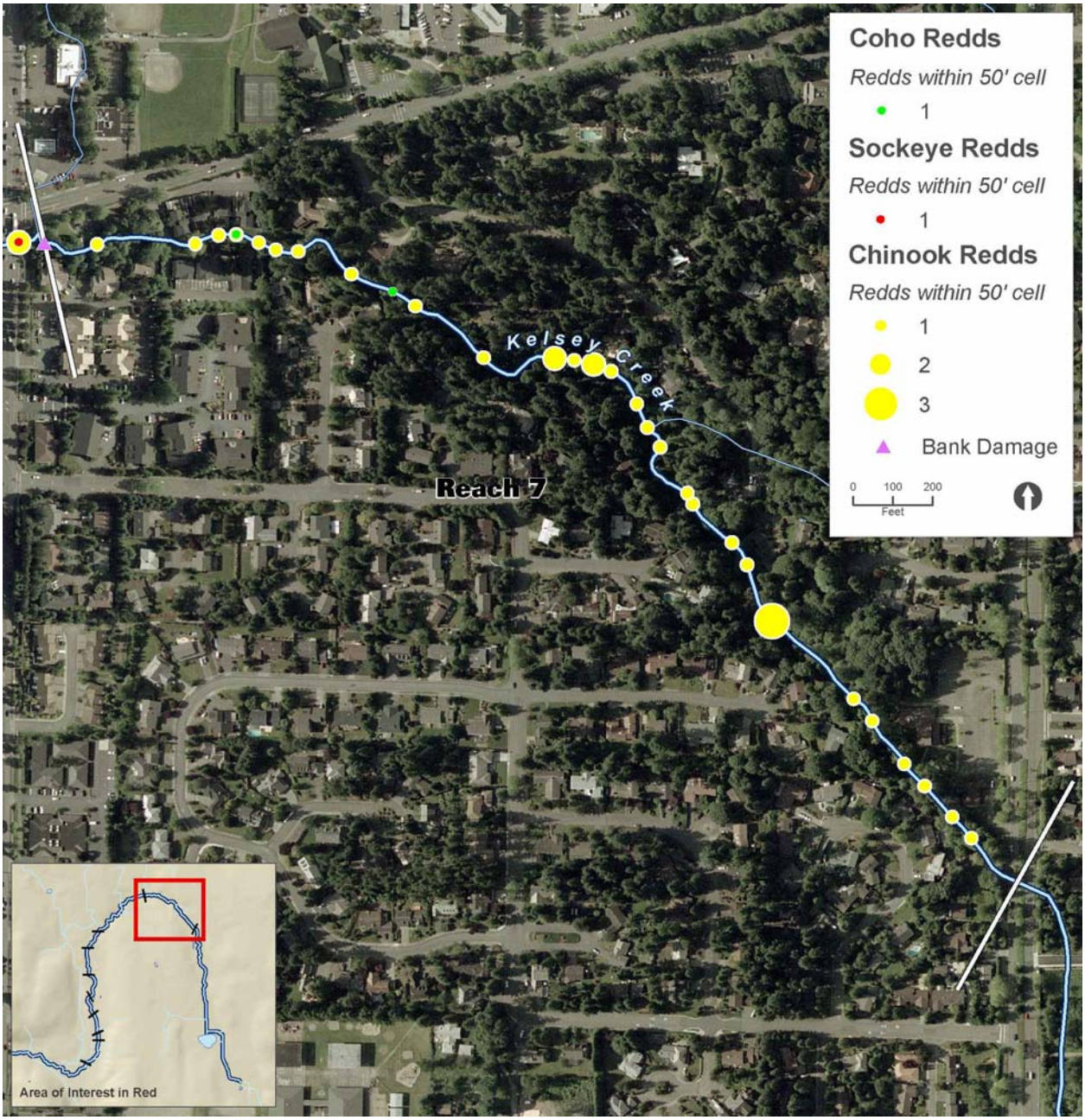


Appendix A-2. Aerial view of Reaches 2 and 3 showing reach breaks and 2007 redd distribution.

Appendix A-3. Aerial view of Reaches 4 and 5 showing reach breaks and 2007 redd distribution.



Appendix A-4. Aerial view of Reach 6 showing reach breaks and 2007 redd distribution.



Appendix A-5. Aerial view of Reach 7 showing reach breaks and 2007 redd distribution.

Appendix B
2007 Spawner Survey Data:

- **Kelsey Creek**
- **West Tributary**
- **Richards Creek**

Stream	Stream #	Basin	Year	Date	Month	Week	Reach	Sex	TL	FL	POH	%UN-spawned	Ad-Clipped	Carcass (C) or Live Fish (S)	Comments
Kelsey	0259	08	2007	09.05.2007	09	38	1	F					Y	S	Upper Reach 1
Kelsey	0259	08	2007	09.05.2007	09	38	3	F					Y	S	Middle Reach 3
Kelsey	0259	08	2007	09.05.2007	09	38	5	F	34.0	33.0	28.0	100	Y	C	Below first big weir; eggs still in skein
Kelsey	0259	08	2007	09.05.2007	09	38	6	F					Y	S	
Kelsey	0259	08	2007	09.05.2007	09	38	6	F					N	S	
Kelsey	0259	08	2007	09.05.2007	09	38	A	F					Y	S	Lower Reach A
Kelsey	0259	08	2007	09.10.2007	09	39	1	F					Y	S	very beginning of R1
Kelsey	0259	08	2007	09.10.2007	09	39	6	U					U	S	upper end of Reach 6 at Valley Cr. Confluence
Kelsey	0259	08	2007	09.10.2007	09	39	A	U					U	S	Same fish as last week?
Kelsey	0259	08	2007	09.19.2007	09	40	2	F					Y	S	Upper R2 in between 2nd/3rd foot bridges
Kelsey	0259	08	2007	09.19.2007	09	40	3	F	81.0	79.0	60.0	100	Y	C	Signs of predation; skein in tact; silver coloration; upper end R3
Kelsey	0259	08	2007	09.19.2007	09	40	3	M	100.0	96.0	70.0	NA	Y	C	lower end R3
Kelsey	0259	08	2007	09.19.2007	09	40	5	F					Y	S	lower end R5
Kelsey	0259	08	2007	09.19.2007	09	40	5	F					Y	S	Lower end R5; near house with E. ivy bank
Kelsey	0259	08	2007	09.19.2007	09	40	5	M					N	S	Lower end R5; 3 fish in same area, no redd
Kelsey	0259	08	2007	09.19.2007	09	40	5	M					Y	S	End of R5 in large pool by culvert
Kelsey	0259	08	2007	09.19.2007	09	40	5	F	72.0	68.0	52.0	0	Y	C	Just before 2nd set of weirs in deep undercut; signs of predation
Kelsey	0259	08	2007	09.19.2007	09	40	6	U					N	S	Possible Jack; Lower end R6
Kelsey	0259	08	2007	09.19.2007	09	40	6	M					U	S	Both fish on large redd (#3); upstream of undercut cypress
Kelsey	0259	08	2007	09.19.2007	09	40	6	F					U	S	Both fish on large redd (#3)
Kelsey	0259	08	2007	09.19.2007	09	40	6	F					N	S	In between weir 2&3; LARGE female
Kelsey	0259	08	2007	09.19.2007	09	40	6	M					N	S	near end of R6
Kelsey	0259	08	2007	09.19.2007	09	40	6	U					Y	S	upstream of Early World
Kelsey	0259	08	2007	09.19.2007	09	40	6	M					Y	S	downstream of Valley confluence
Kelsey	0259	08	2007	09.19.2007	09	40	6	F					Y	S	downstream of Valley confluence; before 140th Ave
Kelsey	0259	08	2007	09.19.2007	09	40	6	F					Y	S	downstream of Valley confluence; before 140th Ave
Kelsey	0259	08	2007	09.19.2007	09	40	7	U					U	S	At valley confluence
Kelsey	0259	08	2007	09.19.2007	09	40	7	M	85.0	82.0	61.0	NA	Y	C	culvert at Illahee Apts across from YMCA
Kelsey	0259	08	2007	09.19.2007	09	40	A	F				100	Y	C	skein in tact; Found mid-span Reach A; head missing

Kelsey	0259	08	2007	09.24.2007	09	41	3	F					Y	S	
Kelsey	0259	08	2007	09.24.2007	09	41	3	F					Y	S	
Kelsey	0259	08	2007	09.24.2007	09	41	3	F	87.0	85.0	70.0	100.0	Y	C	
Kelsey	0259	08	2007	09.24.2007	09	41	4	F					U	S	On redd
Kelsey	0259	08	2007	09.24.2007	09	41	4	M						S	
Kelsey	0259	08	2007	09.24.2007	09	41	4	F					U	S	On redd at top R4
Kelsey	0259	08	2007	09.24.2007	09	41	4	M					U	S	On redd at top R4
Kelsey	0259	08	2007	09.24.2007	09	41	5	F					Y	S	On redd
Kelsey	0259	08	2007	09.24.2007	09	41	6	F				U	U	C	Head only - Predation mortality
Kelsey	0259	08	2007	09.24.2007	09	41	6	M				NA	N	C	Skin and tail only - predation
Kelsey	0259	08	2007	09.24.2007	09	41	6	U				U	Y	C	
Kelsey	0259	08	2007	09.24.2007	09	41	6	M				NA	U	C	Head only - Predation mortality
Kelsey	0259	08	2007	09.24.2007	09	41	6	M				NA	U	C	Head only - Predation mortality
Kelsey	0259	08	2007	09.24.2007	09	41	6	F					U	S	
Kelsey	0259	08	2007	09.24.2007	09	41	6	M					Y	S	
Kelsey	0259	08	2007	09.24.2007	09	41	6	M					Y	S	
Kelsey	0259	08	2007	09.24.2007	09	41	6	M					Y	S	below reach 7
Kelsey	0259	08	2007	09.24.2007	09	41	6	F	70.0	68.0	57.0	U	Y	C	
Kelsey	0259	08	2007	09.24.2007	09	41	7	M					N	S	below reach 7
Kelsey	0259	08	2007	09.24.2007	09	41	7	M					N	S	Ilahee Apts
Kelsey	0259	08	2007	09.24.2007	09	41	7	F					Y	S	Illahee Apts
Kelsey	0259	08	2007	09.24.2007	09	41	7	M					Y	S	
Kelsey	0259	08	2007	09.24.2007	09	41	7	M					N	S	
Kelsey	0259	08	2007	09.24.2007	09	41	A	F					U	S	
Kelsey	0259	08	2007	09.24.2007	09	41	A	M					Y	S	
Kelsey	0259	08	2007	10.03.2007	10	42	6	U					U	S	powerline corridor area
Kelsey	0259	08	2007	10.03.2007	10	42	6	F					Y	S	above second weir
Kelsey	0259	08	2007	10.03.2007	10	42	6	U					U	S	above second weir
Kelsey	0259	08	2007	10.03.2007	10	42	6	U					N	S	above third weir
Kelsey	0259	08	2007	10.03.2007	10	42	6	U					U	S	
Kelsey	0259	08	2007	10.03.2007	10	42	6	U					U	S	under first bridge
Kelsey	0259	08	2007	10.03.2007	10	42	6	M					Y	S	
Kelsey	0259	08	2007	10.03.2007	10	42	6	F					Y	S	
Kelsey	0259	08	2007	10.03.2007	10	42	6	M					Y	S	under 140th NE

Kelsey	0259	08	2007	10.03.2007	10	42	6	F					N	S	under 140th NE
Kelsey	0259	08	2007	10.03.2007	10	42	6	M	80.0	78.0	64.0	NA	Y	C	abover third weir
Kelsey	0259	08	2007	10.03.2007	10	42	7	M				NA	U	C	partial carcass, skin
Kelsey	0259	08	2007	10.03.2007	10	42	7	M				NA	U	C	
Kelsey	0259	08	2007	10.03.2007	10	42	7	F					U	S	Illahee apts
Kelsey	0259	08	2007	10.03.2007	10	42	7	M					U	S	upstream of Illahee - neighborhood
Kelsey	0259	08	2007	10.03.2007	10	42	7	U					U	S	upstream of Illahee - neighborhood
Kelsey	0259	08	2007	10.03.2007	10	42	7	F					N	S	upstream of Illahee - neighborhood
Kelsey	0259	08	2007	10.03.2007	10	42	7	F					Y	S	on redd near electrofishing area
Kelsey	0259	08	2007	10.03.2007	10	42	7	M					Y	S	on redd near electrofishing area
Kelsey	0259	08	2007	10.03.2007	10	42	7	M					Y	S	on redd near electrofishing area
Kelsey	0259	08	2007	10.03.2007	10	42	7	M					Y	S	
Kelsey	0259	08	2007	10.03.2007	10	42	7	U					U	S	
Kelsey	0259	08	2007	10.03.2007	10	42	7	U					U	S	
Kelsey	0259	08	2007	10.03.2007	10	42	7	U					U	S	
Kelsey	0259	08	2007	10.03.2007	10	42	7	M					Y	S	Near coho rearing pond
Kelsey	0259	08	2007	10.03.2007	10	42	7	M					Y	S	Near coho rearing pond
Kelsey	0259	08	2007	10.03.2007	10	42	7	U					U	S	Near coho rearing pond
Kelsey	0259	08	2007	10.03.2007	10	42	7	F					Y	S	
Kelsey	0259	08	2007	10.03.2007	10	42	7	U					U	S	
Kelsey	0259	08	2007	10.03.2007	10	42	7	U					U	S	
Kelsey	0259	08	2007	10.03.2007	10	42	7	F					Y	S	
Kelsey	0259	08	2007	10.03.2007	10	42	7	M					Y	S	
Kelsey	0259	08	2007	10.03.2007	10	42	7	F					Y	S	
Kelsey	0259	08	2007	10.03.2007	10	42	7	M					Y	S	at 148th Ave NE
Kelsey	0259	08	2007	10.03.2007	10	42	7	F					N	S	at 148th Ave NE
Kelsey	0259	08	2007	10.03.2007	10	42	7	M					Y	S	at 148th Ave NE
Kelsey	0259	08	2007	10.03.2007	10	42	7	M	80.0	75.0	60.0	NA	N	C	at church near end of R7
Kelsey	0259	08	2007	10.03.2007	10	42	7	F	88.0	84.0	68.0	100	Y	C	possible predation mortality
Kelsey	0259	08	2007	10.03.2007	10	42	7	M	95.0	94.0	72.0	NA	Y	C	
Kelsey	0259	08	2007	10.04.2007	10	42	2	M					Y	S	
Kelsey	0259	08	2007	10.04.2007	10	42	2	F					Y	S	
Kelsey	0259	08	2007	10.04.2007	10	42	3	M	98.0	96.0	74.0	NA	Y	C	Steve's fish?
Kelsey	0259	08	2007	10.04.2007	10	42	4	F					N	S	just above restoration reach

Kelsey	0259	08	2007	10.04.2007	10	42	4	F					Y	S	just above restoration reach
Kelsey	0259	08	2007	10.04.2007	10	42	4	F					Y	S	building a redd
Kelsey	0259	08	2007	10.04.2007	10	42	4	M					N	S	In weirs below tall bridge
Kelsey	0259	08	2007	10.04.2007	10	42	4	M					U	S	In weirs below tall bridge
Kelsey	0259	08	2007	10.04.2007	10	42	4	U					U	S	In weirs below tall bridge
Kelsey	0259	08	2007	10.04.2007	10	42	4	F					N	S	In weirs below tall bridge
Kelsey	0259	08	2007	10.04.2007	10	42	4	M					Y	S	In weirs below tall bridge
Kelsey	0259	08	2007	10.04.2007	10	42	4	F					U	S	upper R-4
Kelsey	0259	08	2007	10.04.2007	10	42	4	F					Y	S	
Kelsey	0259	08	2007	10.04.2007	10	42	4	U					U	S	
Kelsey	0259	08	2007	10.04.2007	10	42	4	F	79.0	78.0	65.0	0	Y	C	
Kelsey	0259	08	2007	10.04.2007	10	42	4	M	80.0	77.0	61.0	NA	Y	C	
Kelsey	0259	08	2007	10.04.2007	10	42	4	F	85.0	83.0	67.0	U	N	C	2/3 body found only (no head)
Kelsey	0259	08	2007	10.04.2007	10	42	4	F	90.0	86.0	73.0	0	Y	C	found near above male near redd
Kelsey	0259	08	2007	10.04.2007	10	42	5	F					Y	S	One redd, start of R5
Kelsey	0259	08	2007	10.04.2007	10	42	5	M					Y	S	
Kelsey	0259	08	2007	10.04.2007	10	42	5	F					Y	S	Start of R5
Kelsey	0259	08	2007	10.04.2007	10	42	5	F					Y	S	Start of R5
Kelsey	0259	08	2007	10.04.2007	10	42	5	F					Y	S	On redd
Kelsey	0259	08	2007	10.04.2007	10	42	5	F					Y	S	On redd
Kelsey	0259	08	2007	10.04.2007	10	42	5	M					Y	S	On redd
Kelsey	0259	08	2007	10.04.2007	10	42	5	M					Y	S	On redd
Kelsey	0259	08	2007	10.04.2007	10	42	5	M					Y	S	Below first weirs
Kelsey	0259	08	2007	10.04.2007	10	42	5	F					Y	S	Top of reach
Kelsey	0259	08	2007	10.04.2007	10	42	5	U					N	S	Top of reach
Kelsey	0259	08	2007	10.04.2007	10	42	5	F	86.0	84.0	79.0	100	Y	C	Start of R5
Kelsey	0259	08	2007	10.04.2007	10	42	A	F				U	U	C	Partial carcass with head
Kelsey	0259	08	2007	10.04.2007	10	42	A	F				U	N	C	Piece of belly and eggs only
Kelsey	0259	08	2007	10.04.2007	10	42	A	M	100.0	96.0	77.0	NA	Y	C	
Kelsey	0259	08	2007	10.08.2007	10	43	2	F					Y	S	
Kelsey	0259	08	2007	10.08.2007	10	43	2	M					U	S	
Kelsey	0259	08	2007	10.08.2007	10	43	2	M	94.0	93.0	74.0	NA	Y	C	
Kelsey	0259	08	2007	10.08.2007	10	43	3	M					Y	S	Top of R3
Kelsey	0259	08	2007	10.08.2007	10	43	3	F					Y	S	Top of R3

Kelsey	0259	08	2007	10.08.2007	10	43	3	M	86.0	84.0	67.0	NA	Y	C	
Kelsey	0259	08	2007	10.08.2007	10	43	4	M					N	S	
Kelsey	0259	08	2007	10.08.2007	10	43	4	F					N	S	
Kelsey	0259	08	2007	10.08.2007	10	43	4	F					Y	S	Together on redd
Kelsey	0259	08	2007	10.08.2007	10	43	4	M					U	S	Together on redd
Kelsey	0259	08	2007	10.08.2007	10	43	4	F					Y	S	
Kelsey	0259	08	2007	10.08.2007	10	43	4	F					N	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	4	F					Y	S	
Kelsey	0259	08	2007	10.08.2007	10	43	4	F					N	S	
Kelsey	0259	08	2007	10.08.2007	10	43	4	M					Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	4	M					Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	4	F					Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	4	F					N	S	
Kelsey	0259	08	2007	10.08.2007	10	43	4	F					N	S	
Kelsey	0259	08	2007	10.08.2007	10	43	4	M					Y	S	
Kelsey	0259	08	2007	10.08.2007	10	43	4	M					N	S	On redd in pool below last weir
Kelsey	0259	08	2007	10.08.2007	10	43	4	F					Y	S	On redd in pool below last weir
Kelsey	0259	08	2007	10.08.2007	10	43	4	M	72.0	69.0	58.0	NA	N	C	
Kelsey	0259	08	2007	10.08.2007	10	43	4	F	73.0	71.0	60.0	90	Y	C	
Kelsey	0259	08	2007	10.08.2007	10	43	4	M	84.0	81.0	64.0	NA	N	C	
Kelsey	0259	08	2007	10.08.2007	10	43	4	F	90.0	88.0	74.0	0	Y	C	Coded Wire Tag taken
Kelsey	0259	08	2007	10.08.2007	10	43	5	F					Y	S	
Kelsey	0259	08	2007	10.08.2007	10	43	5	F					Y	S	
Kelsey	0259	08	2007	10.08.2007	10	43	5	F					Y	S	
Kelsey	0259	08	2007	10.08.2007	10	43	5	M					Y	S	
Kelsey	0259	08	2007	10.08.2007	10	43	5	M					Y	S	
Kelsey	0259	08	2007	10.08.2007	10	43	5	F					Y	S	
Kelsey	0259	08	2007	10.08.2007	10	43	5	U					U	S	
Kelsey	0259	08	2007	10.08.2007	10	43	5	F					Y	S	
Kelsey	0259	08	2007	10.08.2007	10	43	5	U					U	S	
Kelsey	0259	08	2007	10.08.2007	10	43	5	F	82.0	80.0	67.0	U	Y	C	
Kelsey	0259	08	2007	10.08.2007	10	43	6	F					N	S	On redd in powerline area
Kelsey	0259	08	2007	10.08.2007	10	43	6	F					Y	S	after large shopping cart pool
Kelsey	0259	08	2007	10.08.2007	10	43	6	F					Y	S	

Kelsey	0259	08	2007	10.08.2007	10	43	6	M	Y	S	
Kelsey	0259	08	2007	10.08.2007	10	43	6	M	Y	S	on redd
Kelsey	0259	08	2007	10.08.2007	10	43	6	F	Y	S	on redd
Kelsey	0259	08	2007	10.08.2007	10	43	6	M	Y	S	together on redd above Early World
Kelsey	0259	08	2007	10.08.2007	10	43	6	F	Y	S	together on redd above Early World
Kelsey	0259	08	2007	10.08.2007	10	43	6	M	Y	S	together on redd above Early World
Kelsey	0259	08	2007	10.08.2007	10	43	6	F	Y	S	together on redd above Early World
Kelsey	0259	08	2007	10.08.2007	10	43	6	U	U	S	Below 140th
Kelsey	0259	08	2007	10.08.2007	10	43	6	U	U	S	Below 140th
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	Y	S	Upper R7 on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	Y	S	Upper R7 on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	Y	S	Upper R7 on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	Y	S	Upper R7 on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	Y	S	Upper R7 on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	Y	S	Upper R7 on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	Y	S	Upper R7 on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	Y	S	Upper R7 on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	U	U	S	
Kelsey	0259	08	2007	10.08.2007	10	43	7	U	U	S	
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	Y	S	
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	N	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	U	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	Y	S	On redd

Kelsey	0259	08	2007	10.08.2007	10	43	7	M					Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F					Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M					Y	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M					U	S	at Illahee on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F					U	S	at Illahee on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F					Y	S	at Illahee on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M					Y	S	at Illahee on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M					Y	S	at Illahee on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M					Y	S	at Illahee on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F					U	S	at Illahee on redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M					U	S	On redd
Kelsey	0259	08	2007	10.08.2007	10	43	7	F					Y	S	Onredd
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	66.0	64.0	51.0	NA	Y	C	
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	79.0	77.0	64.0	U	Y	C	
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	80.0	78.0	60.0	NA	U	C	pieces only
Kelsey	0259	08	2007	10.08.2007	10	43	7	M	88.0	87.0	67.0	NA	Y	C	
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	93.0	91.0	76.0	40	Y	C	
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	97.0	95.0	77.0	100	Y	C	
Kelsey	0259	08	2007	10.08.2007	10	43	7	F	113.0	101.0	83.0	80	Y	C	
Kelsey	0259	08	2007	10.08.2007	10	43	A	F	83.0	81.0	66.0	U	Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	2	M					Y	S	
Kelsey	0259	08	2007	10.15.2007	10	44	3	M					Y	S	
Kelsey	0259	08	2007	10.15.2007	10	44	3	U					U	S	
Kelsey	0259	08	2007	10.15.2007	10	44	3	F	60.0	58.0	48.0	U	N	C	
Kelsey	0259	08	2007	10.15.2007	10	44	3	M	95.0	93.0	75.0	NA	N	C	
Kelsey	0259	08	2007	10.15.2007	10	44	4	M					N	C	
Kelsey	0259	08	2007	10.15.2007	10	44	4	F					N	C	
Kelsey	0259	08	2007	10.15.2007	10	44	4	M					Y	C	Tail only
Kelsey	0259	08	2007	10.15.2007	10	44	4	U					U	S	
Kelsey	0259	08	2007	10.15.2007	10	44	4	F					N	S	on redd just above restoration reach
Kelsey	0259	08	2007	10.15.2007	10	44	4	F					N	S	
Kelsey	0259	08	2007	10.15.2007	10	44	4	M					U	S	
Kelsey	0259	08	2007	10.15.2007	10	44	4	M					Y	S	
Kelsey	0259	08	2007	10.15.2007	10	44	4	M					Y	S	

Kelsey	0259	08	2007	10.15.2007	10	44	4	F						Y	S	
Kelsey	0259	08	2007	10.15.2007	10	44	4	F						Y	S	On redd
Kelsey	0259	08	2007	10.15.2007	10	44	4	F						Y	S	On redd
Kelsey	0259	08	2007	10.15.2007	10	44	4	F	79.0	77.0	66.0	0		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	4	M	80.0	78.0	62.0	NA		N	C	
Kelsey	0259	08	2007	10.15.2007	10	44	4	F	82.0	81.0	67.0	50		Y	C	Predation mortality
Kelsey	0259	08	2007	10.15.2007	10	44	4	M	83.0	81.0	66.0	NA		N	C	
Kelsey	0259	08	2007	10.15.2007	10	44	4	F	86.0	84.0	72.0	U		N	C	
Kelsey	0259	08	2007	10.15.2007	10	44	4	F	89.0	87.0	74.0	0		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	4	M	90.0	87.0	69.0	NA		Y	C	head with body detached - estimatied lengths
Kelsey	0259	08	2007	10.15.2007	10	44	4	F	90.0	89.0	74.0	0		N	C	
Kelsey	0259	08	2007	10.15.2007	10	44	4	F	90.0	89.0	75.0	0		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	4	F	94.0	92.0	78.0		0	Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	4	F	98.0	96.0	80.0	U		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	4	M	100.0	96.0	76.0	NA		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	4	F	102.0	99.0	83.0	5		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	5	U						U	S	
Kelsey	0259	08	2007	10.15.2007	10	44	5	F						Y	S	
Kelsey	0259	08	2007	10.15.2007	10	44	5	F	76.0	72.0	62.0	0		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	5	M	76.0	73.0	58.0	NA		N	C	
Kelsey	0259	08	2007	10.15.2007	10	44	6	U						U	C	Valley Creek confluence
Kelsey	0259	08	2007	10.15.2007	10	44	6	F						Y	S	Just below bridge
Kelsey	0259	08	2007	10.15.2007	10	44	6	F						N	S	
Kelsey	0259	08	2007	10.15.2007	10	44	6	M						N	S	
Kelsey	0259	08	2007	10.15.2007	10	44	6	F						U	S	
Kelsey	0259	08	2007	10.15.2007	10	44	6	F	61.0	60.0	51.0	0		N	C	
Kelsey	0259	08	2007	10.15.2007	10	44	6	M	61.0	60.0	49.0	NA		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	6	M	70.0	68.0	54.0	NA		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	6	F	76.0	73.0	59.0	U		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	6	F	78.0	77.0	64.0	0		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	6	M	78.0	77.0	62.0	NA		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	6	F	83.0	80.0	69.0	0		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	6	M	84.0	83.0	65.0	NA		Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	6	M	85.0	83.0	66.0	NA		Y	C	pieces, head missing

Kelsey	0259	08	2007	10.15.2007	10	44	6	F	92.0	91.0	78.0	U	N	C	
Kelsey	0259	08	2007	10.15.2007	10	44	6	F	93.0	91.0	75.0	0	N	C	
Kelsey	0259	08	2007	10.15.2007	10	44	6	M	96.0	95.0	74.0	NA	Y	C	
Kelsey	0259	08	2007	10.15.2007	10	44	A	F	66.0	64.0	54.0	U	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F					Y	S	On redd above Illahee apts
Kelsey	0259	08	2007	10.16.2007	10	44	7	F					Y	S	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M					Y	S	
Kelsey	0259	08	2007	10.16.2007	10	44	7	U					U	S	
Kelsey	0259	08	2007	10.16.2007	10	44	7	U					U	S	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M					U	S	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F					U	S	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F					Y	S	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M					Y	S	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	57.0	55.0	46.0	NA	Y	C	Head missing
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	69.0	67.0	55.0	NA	Y	C	Coded Wire Tag taken
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	70.0	69.0	58.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	70.0	69.0	57.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	71.0	69.0	59.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	72.0	69.0	59.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	73.0	71.0	60.0	0	N	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	73.0	71.0	57.0	NA	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	74.0	72.0	61.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	74.0	72.0	61.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	74.0	72.0	57.0	NA	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	75.0	74.0	58.0	NA	N	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	79.0	77.0	67.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	79.0	77.0	64.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	80.0	77.0	63.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	81.0	80.0	64.0	NA	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	81.0	79.0	61.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	81.0	80.0	64.0	U	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	81.0	76.0	61.0	NA	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	83.0	80.0	66.0	NA	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	83.0	80.0	64.0	NA	Y	C	

Kelsey	0259	08	2007	10.16.2007	10	44	7	F	85.0	82.0	70.0	100	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	85.0	82.0	65.0	NA	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	86.0	84.0	69.0	U	Y	C	Coded Wire Tag taken
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	87.0	85.0	66.0	NA	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	87.0	86.0	68.0	NA	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	88.0	86.0	71.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	88.0	86.0	68.0	NA	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	89.0	87.0	70.0	NA	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	89.0	88.0	73.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	90.0	89.0	73.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	M	91.0	89.0	72.0	NA	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	93.0	92.0	76.0	0	Y	C	
Kelsey	0259	08	2007	10.16.2007	10	44	7	F	94.0	91.0	76.0	100	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	1	M					Y	S	
Kelsey	0259	08	2007	10.22.2007	10	45	1	F					Y	S	
Kelsey	0259	08	2007	10.22.2007	10	45	3	M					Y	S	
Kelsey	0259	08	2007	10.22.2007	10	45	3	M	77.0	75.0	57.0	NA	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	3	M	84.0	81.0	66.0	NA	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	3	F	88.0	86.0	72.0	U	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	4	M				NA	U	C	Predation, parts only
Kelsey	0259	08	2007	10.22.2007	10	45	4	F					Y	S	In restoration reach
Kelsey	0259	08	2007	10.22.2007	10	45	4	F					U	S	on redd just above restoration reach
Kelsey	0259	08	2007	10.22.2007	10	45	4	M					U	S	on redd just above restoration reach
Kelsey	0259	08	2007	10.22.2007	10	45	4	F					Y	S	
Kelsey	0259	08	2007	10.22.2007	10	45	4	F	75.0	75.0	64.0	0	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	4	F	82.0	80.0	68.0	U	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	5	U					U	S	
Kelsey	0259	08	2007	10.22.2007	10	45	5	F					Y	S	
Kelsey	0259	08	2007	10.22.2007	10	45	5	F					Y	S	
Kelsey	0259	08	2007	10.22.2007	10	45	5	F					N	S	
Kelsey	0259	08	2007	10.22.2007	10	45	5	M					Y	S	
Kelsey	0259	08	2007	10.22.2007	10	45	5	M					Y	S	
Kelsey	0259	08	2007	10.22.2007	10	45	5	U					U	S	
Kelsey	0259	08	2007	10.22.2007	10	45	6	F					Y	S	

Kelsey	0259	08	2007	10.22.2007	10	45	6	M					Y	S	Near top of reach 6
Kelsey	0259	08	2007	10.22.2007	10	45	6	F					Y	S	Just below confluence on redd
Kelsey	0259	08	2007	10.22.2007	10	45	6	M	73.0	69.0	55.0	NA	U	C	
Kelsey	0259	08	2007	10.22.2007	10	45	7	M					Y	S	
Kelsey	0259	08	2007	10.22.2007	10	45	7	F					U	S	
Kelsey	0259	08	2007	10.22.2007	10	45	7	M					N	S	
Kelsey	0259	08	2007	10.22.2007	10	45	7	M					N	S	On redd
Kelsey	0259	08	2007	10.22.2007	10	45	7	F					N	S	On redd
Kelsey	0259	08	2007	10.22.2007	10	45	7	M	66.0	64.0	53.0	NA	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	7	M	72.0	70.0	57.0	NA	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	7	M	78.0	75.0	60.0	NA	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	7	M	80.0	77.0	58.0	NA	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	7	F	82.0	80.0	68.0	0	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	7	M	82.0	79.0	62.0	NA	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	7	F	82.0	79.0	67.0	0	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	7	M	82.0	81.0	65.0	NA	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	7	M	83.0	81.0	65.0	NA	N	C	
Kelsey	0259	08	2007	10.22.2007	10	45	7	M	86.0	84.0	67.0	NA	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	7	M	87.0	84.0	66.0	NA	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	7	F	91.0	88.0	73.0	0	Y	C	Coded Wire Tag taken
Kelsey	0259	08	2007	10.22.2007	10	45	7	F	102.0	100.0	81.0	0	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	A	M				NA	U	C	Predation, parts only
Kelsey	0259	08	2007	10.22.2007	10	45	A	M	76.0	74.0	61.0	NA	Y	C	
Kelsey	0259	08	2007	10.22.2007	10	45	A	M	92.0	90.0	70.0	NA	Y	C	
Kelsey	0259	08	2007	10.29.2007	10	46	2	M					Y	S	
Kelsey	0259	08	2007	10.29.2007	10	46	3	M					Y	S	On Redd near top of R3
Kelsey	0259	08	2007	10.29.2007	10	46	3	F					Y	S	On Redd near top of R3
Kelsey	0259	08	2007	10.29.2007	10	46	3	M	73.0	72.0	58.0	NA	N	C	
Kelsey	0259	08	2007	10.29.2007	10	46	4	F				U	Y	C	Predation, parts only
Kelsey	0259	08	2007	10.29.2007	10	46	4	U				U	U	C	Predation, parts only
Kelsey	0259	08	2007	10.29.2007	10	46	4	F					Y	S	On redd in restoration reach
Kelsey	0259	08	2007	10.29.2007	10	46	4	F	77.0	77.0	65.0	0	Y	C	Coded Wire Tag taken
Kelsey	0259	08	2007	10.29.2007	10	46	4	M	83.0	82.0	66.0	NA	Y	C	
Kelsey	0259	08	2007	10.29.2007	10	46	5	F					N	S	

Kelsey	0259	08	2007	10.29.2007	10	46	5	U					U	S	At reach break (weir)
Kelsey	0259	08	2007	10.29.2007	10	46	5	M					N	S	At reach break (weir)
Kelsey	0259	08	2007	10.29.2007	10	46	5	F					Y	S	At reach break (weir)
Kelsey	0259	08	2007	10.29.2007	10	46	5	M					U	S	Just above start of reach
Kelsey	0259	08	2007	10.29.2007	10	46	5	F	75.0	74.0	62.0	0	Y	C	Coded Wire Tag taken
Kelsey	0259	08	2007	10.29.2007	10	46	5	M	88.0	86.0	69.0	NA	Y	C	
Kelsey	0259	08	2007	10.29.2007	10	46	6	F					U	S	Under powerline utility
Kelsey	0259	08	2007	10.29.2007	10	46	7	U				U	N	C	Predation, skin only
Kelsey	0259	08	2007	10.29.2007	10	46	7	F					N	S	
Kelsey	0259	08	2007	10.29.2007	10	46	7	M	57.0	56.0	43.0	NA	N	C	
Kelsey	0259	08	2007	10.29.2007	10	46	7	M	72.0	70.0	56.0	NA	Y	C	
Kelsey	0259	08	2007	10.29.2007	10	46	7	F	80.0	79.0	67.0	0	Y	C	
Kelsey	0259	08	2007	10.29.2007	10	46	7	F	80.0	79.0	64.0	0	N	C	
Kelsey	0259	08	2007	10.29.2007	10	46	7	M	82.0	80.0	64.0	NA	Y	C	
Kelsey	0259	08	2007	10.29.2007	10	46	7	M	83.0	82.0	64.0	NA	Y	C	
Kelsey	0259	08	2007	10.29.2007	10	46	7	F	86.0	84.0	70.0	U	Y	C	
Kelsey	0259	08	2007	11.05.07	11	47	3	M	82.0	80.0	66.0	NA	Y	C	Predation mortality
Kelsey	0259	08	2007	11.05.07	11	47	4	U				U	U	C	Predation, parts only
Kelsey	0259	08	2007	11.05.07	11	47	5	F	79.0	77.0	68.5	5	N	C	
Kelsey	0259	08	2007	11.05.07	11	47	A	F	91.0	88.0	75.0	U	Y	C	Predation mortality
Kelsey	0259	08	2007	11.14.2007	11	48	4	M	60.0	58.0	46.0	NA	N	C	
Kelsey	0259	08	2007	11.14.2007	11	48	4	F	72.0	71.0	58.0	100	Y	C	Very bright/fresh fish
Kelsey	0259	08	2007	11.14.2007	11	48	5	M	61.0	58.0	47.0	NA	Y	C	
Kelsey	0259	08	2007	11.14.2007	11	48	6	U				U	U	C	Heavily decomposed
Kelsey	0259	08	2007	11.14.2007	11	48	A	F	60.0	59.0	49.0	5	Y	C	
Kelsey	0259	08	2007	11.19.2007	11	49	3	F					Y	S	Small fish
Kelsey	0259	08	2007	11.26.2007	11	50	3	F	58.0	57.0	43.0	U	U	C	Partial body found
Richards	0261	08	2007	09.20.2007	09	40	C	M				NA	U	C	Lower / upper jaw only; fresh kill from resident otter family; 3 otters spotted (1 adult, 2 pups). Signs of predation
Richards	0261	08	2007	10.11.2007	10	43	C	F				U	Y	C	Predation mortality
Richards	0261	08	2007	10.11.2007	10	43	C	F				U	U	C	Heavily decomposed
Richards	0261	08	2007	10.11.2007	10	43	C	M	86.0	84.0	63.0	NA	Y	C	Predation mortality
West Trib	0264	08	2007	09.06.2007	09	38	3	F					N	S	Middle Reach 3
West Trib	0264	08	2007	10.03.2007	10	42	4	M	83.0	80.0	58.0	NA	Y	C	

West Trib	0264	08	2007	10.03.2007	10	42	4	M	84.0	81.5	59.0	NA	Y	C	
West Trib	0264	08	2007	10.11.2007	10	43	4	F				U	Y	C	Too decomposed for scale sample
West Trib	0264	08	2007	10.11.2007	10	43	4	U				U	Y	C	Too decomposed for scale sample
West Trib	0264	08	2007	10.11.2007	10	43	4	F	80.0	78.0	59.0	50	Y	C	Too decomposed for scale sample
West Trib	0264	08	2007	10.26.2007	10	45	4	F				U	U	C	Heavily decomposed
West Trib	0264	08	2007	11.02.2007	11	46	4	F				U	U	C	Heavily decomposed
West Trib	0264	08	2007	11.08.2007	11	47	4	F					Y	S	
West Trib	0264	08	2007	11.08.2007	11	47	4	U					U	S	
West Trib	0264	08	2007	11.08.2007	11	47	4	M	58.0	56.0	45.0	NA	Y	C	
West Trib	0264	08	2007	11.21.2007	11	49	3	F	52.0	50.0	41.5	20	Y	C	
West Trib	0264	08	2007	11.21.2007	11	49	3	F	59.5	57.0	47.0	25	Y	C	

Appendix C
Carcass Measurements

Stream	Observation Date	Species	Spawner(S), Carcass(C)	Sex (M/F)	Adipose fin clipped (Y / N / U)	Total length (cm)	Fork length (cm)	POH (cm)	Body Depth (cm)	% egg retention	Pre-spawn mortality (Y / N / U)	Esimated time since death (days)	Scale samples collected (Y / N)	Genetic sample collected (Y / N)	Reach Number	Fish observation comments
Kelsey	09.19.2007	Chinook	C	F	Y				16.0	100	Y	4	N	N	A	skein in tact; Found mid-span Reach A; head missing
Richards	09.20.2007	Chinook	C	M	U					NA	U	2	N	N	C	Lower / upper jaw only; fresh kill from resident otter family; 3 otters spotted (1 adult, 2 pups). Signs of predation
Kelsey	09.24.2007	Chinook	C	F	U					U	U	2	N	N	6	Head only - Predation mortality
Kelsey	09.24.2007	Chinook	C	M	U					NA	U	2	N	N	6	Head only - Predation mortality
Kelsey	09.24.2007	Chinook	C	M	U					NA	N	4	N	N	6	Head only - Predation mortality
West Trib	10.11.2007	Chinook	C	F	Y					U	U	7	N	N	4	Too decomposed for scale sample
West Trib	10.11.2007	Chinook	C	U	Y					U	U	7	N	N	4	Too decomposed for scale sample
Richards	10.11.2007	Chinook	C	F	Y					U	U	3	N	N	C	Predation mortality
Richards	10.11.2007	Chinook	C	F	U					U	U	7	N	N	C	Heavily decomposed
Kelsey	10.15.2007	Chinook	C	M	Y						U		N	N	4	Tail only
Kelsey	10.22.2007	Chinook	C	M	U					NA	U	2	N	N	A	Predation, parts only
West Trib	10.26.2007	Chinook	C	F	U					U	U	8	N	N	4	Heavily decomposed
Kelsey	10.29.2007	Chinook	C	U	U					U	U	2	N	N	4	Predation, parts only
West Trib	11.02.2007	Chinook	C	F	U					U	U	8	N	N	4	Heavily decomposed
Kelsey	11.05.07	Chinook	C	U	U					U	U	6	N	N	4	Predation, parts only
Kelsey	11.14.2007	Chinook	C	U	U					U	U	10	N	N	6	Heavily decomposed

Kelsey	09.05.2007	Chinook	C	F	Y	34.0	33.0	28.0	10.0	100	Y	2	N	N	5	Below first big weir; eggs still in skein
West Trib	10.03.2007	Chinook	C	M	Y	83.0	80.0	58.0	19.0	NA	U	4	N	N	4	
Kelsey	10.08.2007	Chinook	C	M	U	80.0	78.0	60.0	20.0	NA	U	5	N	N	7	pieces only
West Trib	10.11.2007	Chinook	C	F	Y	80.0	78.0	59.0	19.0	50	Y	7	N	N	4	Too decomposed for scale sample
Kelsey	09.24.2007	Chinook	C	M	N					NA	U	3	Y	N	6	Skin and tail only - predation
Kelsey	09.24.2007	Chinook	C	U	Y					U	U	3	Y	N	6	
Kelsey	10.03.2007	Chinook	C	M	U					NA	U	4	Y	N	7	partial carcass, skin
Kelsey	10.03.2007	Chinook	C	M	U					NA	U	4	Y	N	7	
Kelsey	10.04.2007	Chinook	C	F	U					U	U	5	Y	N	A	Partial carcass with head
Kelsey	10.15.2007	Chinook	C	U	U						N	6	Y	N	6	Valley Creek confluence
Kelsey	10.22.2007	Chinook	C	M	U					NA	U	2	Y	N	4	Predation, parts only
Kelsey	10.29.2007	Chinook	C	F	Y					U	U	2	Y	N	4	Predation, parts only
Kelsey	10.29.2007	Chinook	C	U	N					U	U	2	Y	N	7	Predation, skin only
Kelsey	09.19.2007	Chinook	C	F	Y	72.0	68.0	52.0	20.0	0	N	2	Y	N	5	Just before 2nd set of weirs in deep undercut; signs of predation
Kelsey	09.19.2007	Chinook	C	F	Y	81.0	79.0	60.0	25.0	100	Y	3	Y	N	3	Signs of predation; skein in tact; silver coloration; upper end R3
Kelsey	09.19.2007	Chinook	C	M	Y	85.0	82.0	61.0	22.0	NA	U	1	Y	N	7	culvert at Illahee Apts across from YMCA
Kelsey	09.19.2007	Chinook	C	M	Y	100.0	96.0	70.0	30.0	NA	N	1	Y	N	3	lower end R3
Kelsey	09.24.2007	Chinook	C	F	Y	70.0	68.0	57.0	15.0	U	U	3	Y	N	6	
Kelsey	09.24.2007	Chinook	C	F	Y	87.0	85.0	70.0	23.0	100.0	Y	3	Y	N	3	
Kelsey	10.03.2007	Chinook	C	M	Y	80.0	78.0	64.0	22.0	NA	U	2	Y	N	6	abover third weir
Kelsey	10.03.2007	Chinook	C	M	N	80.0	75.0	60.0	17.0	NA	U	4	Y	N	7	at church near end of R7
West Trib	10.03.2007	Chinook	C	M	Y	84.0	81.5	59.0	22.0	NA	U	2	Y	N	4	
Kelsey	10.03.2007	Chinook	C	F	Y	88.0	84.0	68.0	22.0	100	Y	1	Y	N	7	possible predation mortality
Kelsey	10.03.2007	Chinook	C	M	Y	95.0	94.0	72.0	26.0	NA	U	3	Y	N	7	
Kelsey	10.04.2007	Chinook	C	F	Y	79.0	78.0	65.0	17.0	0	N	1	Y	N	4	
Kelsey	10.04.2007	Chinook	C	M	Y	80.0	77.0	61.0	18.0	NA		4	Y	N	4	
Kelsey	10.04.2007	Chinook	C	F	N	85.0	83.0	67.0	20.0	U	U	2	Y	N	4	2/3 body found only (no head)
Kelsey	10.04.2007	Chinook	C	F	Y	86.0	84.0	79.0	22.0	100	Y	1	Y	N	5	Start of R5
Kelsey	10.04.2007	Chinook	C	F	Y	90.0	86.0	73.0	18.0	0	N	6	Y	N	4	found near above male near redd
Kelsey	10.04.2007	Chinook	C	M	Y	98.0	96.0	74.0	26.0	NA		6	Y	N	3	Steve's fish?
Kelsey	10.04.2007	Chinook	C	M	Y	100.0	96.0	77.0	24.0	NA		5	Y	N	A	
Kelsey	10.08.2007	Chinook	C	M	Y	66.0	64.0	51.0	17.0	NA	U	3	Y	N	7	
Kelsey	10.08.2007	Chinook	C	M	N	72.0	69.0	58.0	16.0	NA	N	5	Y	N	4	
Kelsey	10.08.2007	Chinook	C	F	Y	73.0	71.0	60.0	16.0	90	Y	5	Y	N	4	

Kelsey	10.08.2007	Chinook	C	F	Y	79.0	77.0	64.0	20.0	U	U	2	Y	N	7	
Kelsey	10.08.2007	Chinook	C	F	Y	82.0	80.0	67.0	18.0	U	U	6	Y	N	5	
Kelsey	10.08.2007	Chinook	C	F	Y	83.0	81.0	66.0	18.0	U	U	7	Y	N	A	
Kelsey	10.08.2007	Chinook	C	M	N	84.0	81.0	64.0	18.0	NA	U	5	Y	N	4	
Kelsey	10.08.2007	Chinook	C	M	Y	86.0	84.0	67.0	24.0	NA	U	1	Y	N	3	
Kelsey	10.08.2007	Chinook	C	M	Y	88.0	87.0	67.0	24.0	NA	U	2	Y	N	7	
Kelsey	10.08.2007	Chinook	C	F	Y	90.0	88.0	74.0	21.0	0	N	3	Y	N	4	Coded Wire Tag taken
Kelsey	10.08.2007	Chinook	C	F	Y	93.0	91.0	76.0	22.0	40	N	2	Y	N	7	
Kelsey	10.08.2007	Chinook	C	M	Y	94.0	93.0	74.0	25.0	NA	U	5	Y	N	2	
Kelsey	10.08.2007	Chinook	C	F	Y	97.0	95.0	77.0	27.0	100	Y	3	Y	N	7	
Kelsey	10.08.2007	Chinook	C	F	Y	113.0	101.0	83.0	26.0	80	Y	3	Y	N	7	
Richards	10.11.2007	Chinook	C	M	Y	86.0	84.0	63.0	25.5	NA	N	3	Y	N	C	Predation mortality
Kelsey	10.15.2007	Chinook	C	M	Y	61.0	60.0	49.0	16.0	NA	U	2	Y	N	6	
Kelsey	10.15.2007	Chinook	C	F	Y	66.0	64.0	54.0	16.0	U	U	7	Y	N	A	
Kelsey	10.15.2007	Chinook	C	M	Y	70.0	68.0	54.0	16.0	NA	U	2	Y	N	6	
Kelsey	10.15.2007	Chinook	C	F	Y	76.0	72.0	62.0	16.0	0	N	5	Y	N	5	
Kelsey	10.15.2007	Chinook	C	M	N	76.0	73.0	58.0	17.0	NA	U	3	Y	N	5	
Kelsey	10.15.2007	Chinook	C	F	Y	76.0	73.0	59.0	15.0	U	U	8	Y	N	6	
Kelsey	10.15.2007	Chinook	C	F	Y	78.0	77.0	64.0	20.0	0	N	4	Y	N	6	
Kelsey	10.15.2007	Chinook	C	M	Y	78.0	77.0	62.0	18.0	NA	U	3	Y	N	6	
Kelsey	10.15.2007	Chinook	C	F	Y	79.0	77.0	66.0	18.0	0	N	2	Y	N	4	
Kelsey	10.15.2007	Chinook	C	M	N	80.0	78.0	62.0	18.0	NA	U	4	Y	N	4	
Kelsey	10.15.2007	Chinook	C	F	Y	82.0	81.0	67.0	23.0	50	Y	2	Y	N	4	Predation mortality
Kelsey	10.15.2007	Chinook	C	M	N	83.0	81.0	66.0	22.0	NA	U	10	Y	N	4	
Kelsey	10.15.2007	Chinook	C	F	Y	83.0	80.0	69.0	20.0	0	N	1	Y	N	6	
Kelsey	10.15.2007	Chinook	C	M	Y	84.0	83.0	65.0	22.0	NA	U	4	Y	N	6	
Kelsey	10.15.2007	Chinook	C	M	Y	85.0	83.0	66.0	22.0	NA	U	3	Y	N	6	pieces, head missing
Kelsey	10.15.2007	Chinook	C	F	N	86.0	84.0	72.0	17.0	U	U	5	Y	N	4	
Kelsey	10.15.2007	Chinook	C	F	Y	89.0	87.0	74.0	20.0	0	N	3	Y	N	4	
Kelsey	10.15.2007	Chinook	C	M	Y	90.0	87.0	69.0	20.0	NA	U	3	Y	N	4	head with body detached - estimatied lengths
Kelsey	10.15.2007	Chinook	C	F	N	90.0	89.0	74.0	23.0	0	N	3	Y	N	4	
Kelsey	10.15.2007	Chinook	C	F	Y	90.0	89.0	75.0	23.0	0	N	2	Y	N	4	
Kelsey	10.15.2007	Chinook	C	F	N	92.0	91.0	78.0	22.0	U	U	5	Y	N	6	
Kelsey	10.15.2007	Chinook	C	F	N	93.0	91.0	75.0	24.0	0	N	5	Y	N	6	

Kelsey	10.15.2007	Chinook	C	F	Y	94.0	92.0	78.0	19.0	0	N	4	Y	N	4	
Kelsey	10.15.2007	Chinook	C	M	N	95.0	93.0	75.0	25.0	NA	N	4	Y	N	3	
Kelsey	10.15.2007	Chinook	C	M	Y	96.0	95.0	74.0	25.0	NA	U	3	Y	N	6	
Kelsey	10.15.2007	Chinook	C	F	Y	98.0	96.0	80.0	25.0	U	U	2	Y	N	4	
Kelsey	10.15.2007	Chinook	C	M	Y	100.0	96.0	76.0	25.0	NA	U	4	Y	N	4	
Kelsey	10.15.2007	Chinook	C	F	Y	102.0	99.0	83.0	22.0	5	N	4	Y	N	4	
Kelsey	10.16.2007	Chinook	C	M	Y	57.0	55.0	46.0	13.0	NA	U	3	Y	N	7	Head missing
Kelsey	10.16.2007	Chinook	C	M	Y	69.0	67.0	55.0	17.0	NA	U	1	Y	N	7	Coded Wire Tag taken
Kelsey	10.16.2007	Chinook	C	F	Y	70.0	69.0	58.0	15.0	0	N	5	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	70.0	69.0	57.0	16.0	0	N	4	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	71.0	69.0	59.0	16.0	0	N	6	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	72.0	69.0	59.0	14.0	0	N	5	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	N	73.0	71.0	60.0	16.0	0	N	3	Y	N	7	
Kelsey	10.16.2007	Chinook	C	M	Y	73.0	71.0	57.0	19.0	NA	U	3	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	74.0	72.0	61.0	18.0	0	N	1	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	74.0	72.0	61.0	18.0	0	N	3	Y	N	7	
Kelsey	10.16.2007	Chinook	C	M	Y	74.0	72.0	57.0	17.0	NA	U	4	Y	N	7	
Kelsey	10.16.2007	Chinook	C	M	N	75.0	74.0	58.0	20.0	NA	U	5	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	79.0	77.0	67.0	17.0	0	N	5	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	79.0	77.0	64.0	17.0	0	N	3	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	80.0	77.0	63.0	18.0	0	N	3	Y	N	7	
Kelsey	10.16.2007	Chinook	C	M	Y	81.0	80.0	64.0	19.0	NA	U	3	Y	N	7	
Kelsey	10.16.2007	Chinook	C	M	Y	81.0	79.0	61.0	22.0	0	N	2	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	81.0	80.0	64.0	20.0	U	U	3	Y	N	7	
Kelsey	10.16.2007	Chinook	C	M	Y	81.0	76.0	61.0	20.0	NA	U	3	Y	N	7	
Kelsey	10.16.2007	Chinook	C	M	Y	83.0	80.0	66.0	20.0	NA	U	5	Y	N	7	
Kelsey	10.16.2007	Chinook	C	M	Y	83.0	80.0	64.0	20.0	NA	U	4	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	85.0	82.0	70.0	22.0	100	Y	4	Y	N	7	
Kelsey	10.16.2007	Chinook	C	M	Y	85.0	82.0	65.0	21.0	NA	U	4	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	86.0	84.0	69.0	20.0	U	U	5	Y	N	7	Coded Wire Tag taken
Kelsey	10.16.2007	Chinook	C	M	Y	87.0	85.0	66.0	22.0	NA	U	3	Y	N	7	
Kelsey	10.16.2007	Chinook	C	M	Y	87.0	86.0	68.0	20.0	NA	U	2	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	88.0	86.0	71.0	23.0	0	N	3	Y	N	7	
Kelsey	10.16.2007	Chinook	C	M	Y	88.0	86.0	68.0	22.0	NA	U	1	Y	N	7	

Kelsey	10.16.2007	Chinook	C	M	Y	89.0	87.0	70.0	21.0	NA	U	2	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	89.0	88.0	73.0	21.0	0	N	4	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	90.0	89.0	73.0	21.0	0	N	3	Y	N	7	
Kelsey	10.16.2007	Chinook	C	M	Y	91.0	89.0	72.0	25.0	NA	U	1	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	93.0	92.0	76.0	27.0	0	N	3	Y	N	7	
Kelsey	10.16.2007	Chinook	C	F	Y	94.0	91.0	76.0	25.0	100	Y	2	Y	N	7	
Kelsey	10.22.2007	Chinook	C	M	Y	66.0	64.0	53.0	15.0	NA	U	3	Y	N	7	
Kelsey	10.22.2007	Chinook	C	M	Y	72.0	70.0	57.0	18.0	NA	U	3	Y	N	7	
Kelsey	10.22.2007	Chinook	C	M	U	73.0	69.0	55.0	16.0	NA	U	5	Y	N	6	
Kelsey	10.22.2007	Chinook	C	F	Y	75.0	75.0	64.0	17.0	0	N	3	Y	N	4	
Kelsey	10.22.2007	Chinook	C	M	Y	76.0	74.0	61.0	20.0	NA	U	2	Y	N	A	
Kelsey	10.22.2007	Chinook	C	M	Y	77.0	75.0	57.0	19.0	NA	U	3	Y	N	3	
Kelsey	10.22.2007	Chinook	C	M	Y	78.0	75.0	60.0	19.0	NA	U	6	Y	N	7	
Kelsey	10.22.2007	Chinook	C	M	Y	80.0	77.0	58.0	21.0	NA	U	6	Y	N	7	
Kelsey	10.22.2007	Chinook	C	F	Y	82.0	80.0	68.0	17.0	U	U	4	Y	N	4	
Kelsey	10.22.2007	Chinook	C	F	Y	82.0	80.0	68.0	21.0	0	N	7	Y	N	7	
Kelsey	10.22.2007	Chinook	C	M	Y	82.0	79.0	62.0	20.0	NA	U	7	Y	N	7	
Kelsey	10.22.2007	Chinook	C	F	Y	82.0	79.0	67.0	19.0	0	N	6	Y	N	7	
Kelsey	10.22.2007	Chinook	C	M	Y	82.0	81.0	65.0	18.0	NA	U	6	Y	N	7	
Kelsey	10.22.2007	Chinook	C	M	N	83.0	81.0	65.0	21.0	NA	U	4	Y	N	7	
Kelsey	10.22.2007	Chinook	C	M	Y	84.0	81.0	66.0	19.0	NA	U	2	Y	N	3	
Kelsey	10.22.2007	Chinook	C	M	Y	86.0	84.0	67.0	23.0	NA	U	1	Y	N	7	
Kelsey	10.22.2007	Chinook	C	M	Y	87.0	84.0	66.0	21.0	NA	U	4	Y	N	7	
Kelsey	10.22.2007	Chinook	C	F	Y	88.0	86.0	72.0	21.0	U	U	5	Y	N	3	
Kelsey	10.22.2007	Chinook	C	F	Y	91.0	88.0	73.0	21.0	0	N	5	Y	N	7	Coded Wire Tag taken
Kelsey	10.22.2007	Chinook	C	M	Y	92.0	90.0	70.0	21.0	NA	U	7	Y	N	A	
Kelsey	10.22.2007	Chinook	C	F	Y	102.0	100.0	81.0	22.0	0	N	7	Y	N	7	
Kelsey	10.29.2007	Chinook	C	M	Y	72.0	70.0	56.0	17.0	NA	U	6	Y	N	7	
Kelsey	10.29.2007	Chinook	C	M	N	73.0	72.0	58.0	17.0	NA	U	2	Y	N	3	
Kelsey	10.29.2007	Chinook	C	F	Y	75.0	74.0	62.0	17.0	0	N	1	Y	N	5	Coded Wire Tag taken
Kelsey	10.29.2007	Chinook	C	F	Y	77.0	77.0	65.0	17.0	0	N	2	Y	N	4	Coded Wire Tag taken
Kelsey	10.29.2007	Chinook	C	F	Y	80.0	79.0	67.0	18.0	0	N	6	Y	N	7	
Kelsey	10.29.2007	Chinook	C	F	N	80.0	79.0	64.0	20.0	0	N	6	Y	N	7	
Kelsey	10.29.2007	Chinook	C	M	Y	82.0	80.0	64.0	18.0	NA	U	6	Y	N	7	

Kelsey	10.29.2007	Chinook	C	M	Y	83.0	82.0	66.0	20.0	NA	U	7	Y	N	4	
Kelsey	10.29.2007	Chinook	C	M	Y	83.0	82.0	64.0	21.0	NA	U	2	Y	N	7	
Kelsey	10.29.2007	Chinook	C	F	Y	86.0	84.0	70.0	18.0	U	U	3	Y	N	7	
Kelsey	10.29.2007	Chinook	C	M	Y	88.0	86.0	69.0	22.0	NA	U	1	Y	N	5	
Kelsey	11.05.07	Chinook	C	F	N	79.0	77.0	68.5	19.0	5	N	2	Y	N	5	
Kelsey	11.05.07	Chinook	C	M	Y	82.0	80.0	66.0	20.0	NA	U	2	Y	N	3	Predation mortality
Kelsey	11.05.07	Chinook	C	F	Y	91.0	88.0	75.0	21.0	U	U	5	Y	N	A	Predation mortality
Kelsey	10.29.2007	Coho	C	M	N	57.0	56.0	43.0	13.0	NA	U	7	Y	N	7	
West Trib	11.08.2007	Coho	C	M	Y	58.0	56.0	45.0	16.0	NA	U	2	Y	N	4	
Kelsey	11.14.2007	Coho	C	F	Y	60.0	59.0	49.0	15.0	5	N	2	Y	N	A	
Kelsey	11.14.2007	Coho	C	M	N	60.0	58.0	46.0	15.0	NA	U	2	Y	N	4	
Kelsey	11.14.2007	Coho	C	M	Y	61.0	58.0	47.0	14.0	NA	U	1	Y	N	5	
Kelsey	11.14.2007	Coho	C	F	Y	72.0	71.0	58.0	21.0	100	Y	1	Y	N	4	Very bright/fresh fish
West Trib	11.21.2007	Coho	C	F	Y	52.0	50.0	41.5	14.0	20	N	5	Y	N	3	
West Trib	11.21.2007	Coho	C	F	Y	59.5	57.0	47.0	15.5	25	N	5	Y	N	3	
Kelsey	11.26.2007	Coho	C	F	U	58.0	57.0	43.0	16.0	U	U	6	Y	N	3	Partial body found
Kelsey	10.04.2007	Sockeye	C	F	N					U	U	2	N	N	A	Piece of belly and eggs only
Kelsey	10.15.2007	Sockeye	C	M	N						N		N	N	4	
Kelsey	10.15.2007	Sockeye	C	F	N						N		N	N	4	
Kelsey	10.15.2007	Sockeye	C	F	N	60.0	58.0	48.0	14.0	U	U	4	N	N	3	
Kelsey	10.15.2007	Sockeye	C	F	N	61.0	60.0	51.0	14.0	0	N	3	N	N	6	

Appendix D
Redds:
Kelsey Creek Mainstem, West Tributary, and Richards Creek

Observation Number	Stream	Observation Date	Species	Reach Number	Active or Practice Redd	Fish on Redd (Y / N)	Redd Length (feet)	Redd Width (feet)	Redd Depth (inches)	Redd location description
1	Kelsey Creek	9/10/2007	Chinook	A	P	Y				Upper end reach A; Poorly developed
2	Kelsey Creek	9/19/07	Unknown	A	P	N				
3	Kelsey Creek	9/19/07	Unknown	1	P	N				
4	Kelsey Creek	9/19/07	Chinook	6	P	Y				
5	Kelsey Creek	9/19/07	Unknown	6	P	Y				
6	Kelsey Creek	9/19/07	Chinook	6	P	Y				
7	Kelsey Creek	9/24/07	Chinook	4	P	N				
8	Kelsey Creek	9/24/07	Chinook	4	A	Y	7	4	5	Just above restoration reach - redd in progress
9	Kelsey Creek	9/24/07	Unknown	4	P	N				
10	Kelsey Creek	9/24/07	Chinook	4	A	Y	6	7	10	Between weirs at top of R4
11	Kelsey Creek	9/24/07	Chinook	5	A	Y	8	4	8	Beginning of R5
12	Kelsey Creek	9/24/07	Chinook	5	P	N				
13	Kelsey Creek	9/24/07	Chinook	6	A	Y	6	4	5	Redd in progress
14	Kelsey Creek	10/4/2007	Chinook	2	A	Y	4	4	8	Early in R2
15	Kelsey Creek	10/4/2007	Chinook	4	P	Y				Just above restoration reach
16	Kelsey Creek	10/4/2007	Chinook	4	A	Y	6	4	8	Near upper end of R4
17	Kelsey Creek	10/4/2007	Chinook	4	A	Y	8	5	8	Under tall bridge
18	Kelsey Creek	10/4/2007	Chinook	4	A	Y	5	4	6	Under tall bridge
19	Kelsey Creek	10/4/2007	Chinook	5	A	Y	6	4	8	Start of R5
20	Kelsey Creek	10/4/2007	Chinook	5	A	Y	4	3	6	Start of R5
21	Kelsey Creek	10/4/2007	Chinook	5	A	Y	4	4	6	Start of R5
22	Kelsey Creek	10/4/2007	Chinook	7	P	N				Start of R7
23	Kelsey Creek	10/4/2007	Chinook	7	P	N				Early R7, before Illahee apts
24	Kelsey Creek	10/4/2007	Chinook	7	A	Y	12	5	8	At Illahee Apts
25	Kelsey Creek	10/4/2007	Chinook	7	P	Y				
26	Kelsey Creek	10/4/2007	Chinook	7	P	Y				
27	Kelsey Creek	10/4/2007	Chinook	7	A	Y	8	4	8	Near downstream end of electrofishing reach
28	Kelsey Creek	10/4/2007	Chinook	7	P	Y				
29	Kelsey Creek	10/4/2007	Chinook	7	P	Y				
30	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	4	4	10	
31	Kelsey Creek	08-Oct-07	Chinook	7	A	N	4	3	8	
32	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	5	3	6	Near Coho ponds

33	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	5	4	8	Just above coho ponds
34	Kelsey Creek	08-Oct-07	Chinook	7	A	N	4	3	6	Just above coho ponds
35	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	5	4	8	
36	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	6	4	10	Upper R7
37	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	6	4	6	Upper R7
38	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	8	4	10	Upper R7
39	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	4	3	8	Upper R7
40	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	6	4	10	Upper R7
41	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	6	4	10	Upper R7
42	Kelsey Creek	08-Oct-07	Chinook	2	A	Y	5	4	10	
43	Kelsey Creek	08-Oct-07	Chinook	2	A	N	4	4	12	
44	Kelsey Creek	08-Oct-07	Chinook	4	A	N	6	4	4	
45	Kelsey Creek	08-Oct-07	Sockeye	4	A	Y	3	3	6	Top of weir
46	Kelsey Creek	08-Oct-07	Chinook	4	A	Y	8	6	10	
47	Kelsey Creek	08-Oct-07	Chinook	4	A	Y	6	5	10	
48	Kelsey Creek	08-Oct-07	Sockeye	4	A	Y	3	3	10	partially superimposed
49	Kelsey Creek	08-Oct-07	Chinook	4	A	N	4	4	10	partially superimposed
50	Kelsey Creek	08-Oct-07	Chinook	4	A	Y	12	6	8	
51	Kelsey Creek	08-Oct-07	Chinook	4	A	Y	12	6	10	
52	Kelsey Creek	08-Oct-07	Chinook	4	A	Y	4	4	10	In pool below last weir of R4, just below R5
53	Kelsey Creek	08-Oct-07	Chinook	5	A	Y	8	4	10	Beginning of R5
54	Kelsey Creek	08-Oct-07	Chinook	5	A	Y	4	3	8	Beginning of R5
55	Kelsey Creek	08-Oct-07	Chinook	6	A	N	6	4	8	Lower R6
56	Kelsey Creek	08-Oct-07	Sockeye	6	A	Y	3	3	6	Powerline area
57	Kelsey Creek	08-Oct-07	Chinook	6	A	N	4	4	10	First large culvert
58	Kelsey Creek	08-Oct-07	Chinook	6	P	Y				
59	Kelsey Creek	08-Oct-07	Chinook	6	A	Y	5	4	6	Below early World
60	Kelsey Creek	08-Oct-07	Chinook	6	A	Y	5	3	6	before 140th, above early world
61	Kelsey Creek	08-Oct-07	Chinook	6	A	Y	6	3	6	before 140th, above early world
62	Kelsey Creek	08-Oct-07	Sockeye	6	A	N	3	2	4	Under 140th
63	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	5	3	8	Illahee Apts
64	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	7	4	10	Illahee Apts
65	Kelsey Creek	08-Oct-07	Chinook	7	A	N	12	5	12	Neighborhood after Illahee
66	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	10	6	12	
67	Kelsey Creek	08-Oct-07	Chinook	7	A	N	5	3	6	
68	Kelsey Creek	08-Oct-07	Chinook	7	A	Y	5	4	6	
69	Kelsey Creek	10/15/2007	Sockeye	3	A	N	3	2	8	
70	Kelsey Creek	10/15/2007	Chinook	4	A	Y	5	5	8	Between weirs of restoration site
71	Kelsey Creek	10/15/2007	Chinook	4	P	N				
72	Kelsey Creek	10/15/2007	Sockeye	4	A	Y	4	5	4	
73	Kelsey Creek	10/15/2007	Sockeye	4	A	Y	4	3	6	
74	Kelsey Creek	10/15/2007	Chinook	4	A	Y	7	5	8	Upper R4
75	Kelsey Creek	10/15/2007	Chinook	6	P	Y				beginning of R6
76	Kelsey Creek	10/15/2007	Sockeye	6	A	Y	5	4	6	
77	Kelsey Creek	10/15/2007	Chinook	6	A	N	8	5	6	
78	Kelsey Creek	10/15/2007	Chinook	6	A	N	7	4	4	
79	Kelsey Creek	10/15/2007	Chinook	6	A	Y	10	4	8	

80	Kelsey Creek	10/15/2007	Chinook	6	P	N				
81	Kelsey Creek	10/15/2007	Chinook	7	A	N	8	4	6	
82	Kelsey Creek	10/15/2007	Chinook	7	A	N	8	4	6	
83	Kelsey Creek	10/15/2007	Chinook	7	A	Y	8	4	8	
84	Kelsey Creek	10/15/2007	Chinook	7	A	Y	12	5	12	
85	Kelsey Creek	10/15/2007	Chinook	7	A	N	10	4	8	
86	Kelsey Creek	10/15/2007	Chinook	7	A	N	8	4	6	
87	Kelsey Creek	10/15/2007	Chinook	7	A	Y	10	6	10	Superimposed on redd from 10-8
88	Kelsey Creek	10/15/2007	Chinook	7	A	N	5	3	8	
89	Kelsey Creek	10/15/2007	Chinook	7	A	Y	10	4	10	Superimposed on redd from 10-8
90	Kelsey Creek	10/15/2007	Chinook	7	A	Y	5	3	6	
91	Kelsey Creek	10/22/2007	Chinook	A	A	N	8	5	6	
92	Kelsey Creek	10/22/2007	Chinook	1	A	Y	7	4	10	
93	Kelsey Creek	10/22/2007	Chinook	4	A	Y	6	4	6	In restoration reach
94	Kelsey Creek	10/22/2007	Chinook	4	A	Y	4	3	4	Just above restoration reach
95	Kelsey Creek	10/22/2007	Chinook	4	A	Y	9	4	6	
96	Kelsey Creek	10/22/2007	Chinook	5	A	Y	6	5	6	Superimposed on previous redd-Start of R5
97	Kelsey Creek	10/22/2007	Chinook	5	A	Y	5	5	6	Superimposed on previous redd-Start of R5
98	Kelsey Creek	10/22/2007	Chinook	5	A	Y	5	3	8	Superimposed on previous redd-Start of R5
99	Kelsey Creek	10/22/2007	Chinook	5	A	Y	5	3	8	Superimposed on previous redd-Start of R5
100	Kelsey Creek	10/22/2007	Chinook	6	A	Y	10	5	8	
101	Kelsey Creek	10/22/2007	Chinook	6	A	Y	5	4	8	Just below Valley C confluence
102	Kelsey Creek	10/22/2007	Chinook	7	A	Y	6	4	8	Behind Church
103	West Tributary	10/26/2007	Chinook	4	P	N				Upstream of last bridge in Golf Course
104	Kelsey Creek	10/29/2007	Chinook	3	A	Y	8	4	8	Top of R3, 100 feet down from weir
105	Kelsey Creek	10/29/2007	Chinook	5	A	Y	6	5	8	Superimposed on old redds/below tall weir
106	Kelsey Creek	10/29/2007	Chinook	7	A	Y	8	4	8	Superimposed on old redds
107	West Tributary	11/8/2007	Coho	4	A	Y				between bridge 2 and 3, downstream of Doug-fir stand
108	West Tributary	11/8/2007	Coho	4	P	N				
109	West Tributary	11/8/2007	Coho	4	P	N				
110	Kelsey Creek	11/19/2007	Coho	3	A	Y	8	4	3	tiny fish
111	Kelsey Creek	11/19/2007	Coho	4	P	N	10	5	4	possible flag removal, older
112	Kelsey Creek	11/19/2007	Coho	4	P	N	3	2	4	underneath bridge 2
113	Kelsey Creek	11/19/2007	Coho	7	A	N	9	6	5	upstream of first foot bridge
114	Kelsey Creek	11/26/2007	Coho	2	A	N	3	3	4	golf course upstream of 2nd foot bridge
115	Kelsey Creek	11/26/2007	Coho	7	A	N	4	3	5	Illahee apts at foot bridge, superimposed on chin redd
116	West Tributary	12/7/2007	Coho	4	A	N	4	4	3	Just above second bridge in golf course
117	Kelsey Creek	12/10/2007	Coho	A	A	N	4	3	4	In newly deposited gravel bars left from recent flood

118	Kelsey Creek	12/10/2007	Coho	1	A	N	4	3	4	
119	Kelsey Creek	12/10/2007	Coho	A	P	N				
120	Kelsey Creek	12/10/2007	Coho	4	P	N				Upper end of R4