OREGON DEPARTMENT OF FISH AND WILDLIFE

ROGUE WATERSHED DISTRICT REPORT

TITLE: Upper Rogue Smolt Trapping Project, 2003

STREAM: Bear, Little Butte, Elk, Slate and West Fork Evans Creeks and the Little Applegate River

REPORT DATE: August 2003

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INTRODUCTION

In March 1998, the Rogue District office of the Oregon Department of Fish and Wildlife (ODFW) began a cooperative smolt trapping project with the Butte Falls Resource Area of the Bureau of Land Management (BLM) on three streams in the Rogue River basin. Trapping was expanded to 6 streams in 1999 when the Ashland Ranger District of the Rogue River National Forest (RRNF) became an additional partner in the project. Since 1999, some trap sites have been dropped and others added, and we continue to conduct smolt trapping on six Rogue River basin streams.

This trapping project is part of a statewide effort by ODFW to monitor juvenile salmonid production as outlined in the Oregon Plan for Salmon and Watersheds. The objectives of this project were to 1) obtain an estimate of the production of coho salmon (*Oncorhynchus kisutch*), chinook salmon (*O. tshawytscha*) and steelhead (*O. mykiss*) smolts; 2) determine the timing of outmigration of smolts; and 3) determine the sizes of smolts migrating from each of these stream systems. While mark-recapture estimates were not done for other species or life stages of fish, this project also provided some information on the abundance of pre-smolt steelhead and coho and resident and anadromous cutthroat trout (*O. clarki*).

METHODS

Five-foot rotary screw traps were installed at sites on Bear, Elk, Slate and West Fork Evans Creeks and on the Little Applegate River. Screw traps were positioned in the channel of each stream and anchored in place with cables attached to trees on each bank. Sites selected for these traps were generally characterized as having a steep riffle or constricted channel pouring into a pool that was deep enough to accommodate the five-foot trap. Rotary screw traps captured juvenile fish as they moved downstream and entered the funnel-shaped drum of the trap, which then directed the fish into a livebox.

Trapping on Little Butte Creek was done with the use of an irrigation diversion bypass trap on the Little Butte Creek Mill ditch near Eagle Point, Oregon. Fish entered the ditch at the diversion dam on Little Butte Creek, moved approximately ¼ mile down the ditch to the rotary fish screens, and were returned to Little Butte Creek

via a bypass pipe at the fish screens. Trapping was accomplished by placing a 4'x 4' x 8' box trap at the end of the bypass pipe to intercept fish as they returned to the stream.

The target trapping period for all six sites was March 1 – June 30, and each trap began operating March 1 this year. However, the Slate and West Fork Evans Creek traps were removed during the last week of May and the first week of June, respectively, due to streamflows that were too low to operate the traps. The Elk Creek trap was operated until June 22 when streamflows at that site dropped and the trap stopped turning. Trapping was discontinued at the Little Butte Creek site in mid June due to the low numbers of smolts being captured at that time and to prevent the loss of fish due to stress caused by high water temperatures. Streamflows and water temperatures remained good in the Little Applegate River and Bear Creek and the traps at these sites were operated until June 29. Each trap was operated 7 days per week.

Fish were collected daily from each trap, identified to species and life stage, and enumerated. Fork lengths were measured from a sample of up to 25 fish per week from each species and life stage. Each day, a subsample of all salmonids over 60 mm was marked with a caudal fin clip. A minimum of 25 fish of each species and life stage (fish over 60 mm) was marked each day unless fewer than 25 were captured. Marked fish were then transported upstream to a release point ranging from 0.2 to 0.5 miles upstream of the trap site and released. Fish that were not marked or that were previously marked and recaptured were released below the trap site. All fish mortalities occurring during handling and release were recorded.

Marked fish recaptured at each trap were enumerated to provide an estimate of trapping efficiency. Weekly and seasonal trapping efficiencies were calculated with the following formula:

$$E = R/M$$

where E = trap efficiency, R = the number of marked fish recaptured, and M = the number of marked fish released. The total number of migrants (N) passing the trap site during a given period of time was estimated with the formula:

$$N=C/E$$

where C = the number of unmarked fish captured. A 95% confidence interval around each estimate was calculated using the formula:

$$95\%\ CI = 1.96\ \sqrt{V}$$

where V = sample variance. A bootstrap program was used to estimate sample variance (Thedinga et al 1994).

TRAP LOCATIONS

Bear Creek

The trap site on Bear Creek was located approximately 0.6 mile upstream from the confluence of Bear Creek and the Rogue River (Figure 1). Bear Creek drains an area of approximately 246,000 acres. Land use within the Bear Creek basin consists of private timber (31%), publicly owned forest (20%), agriculture (39%),

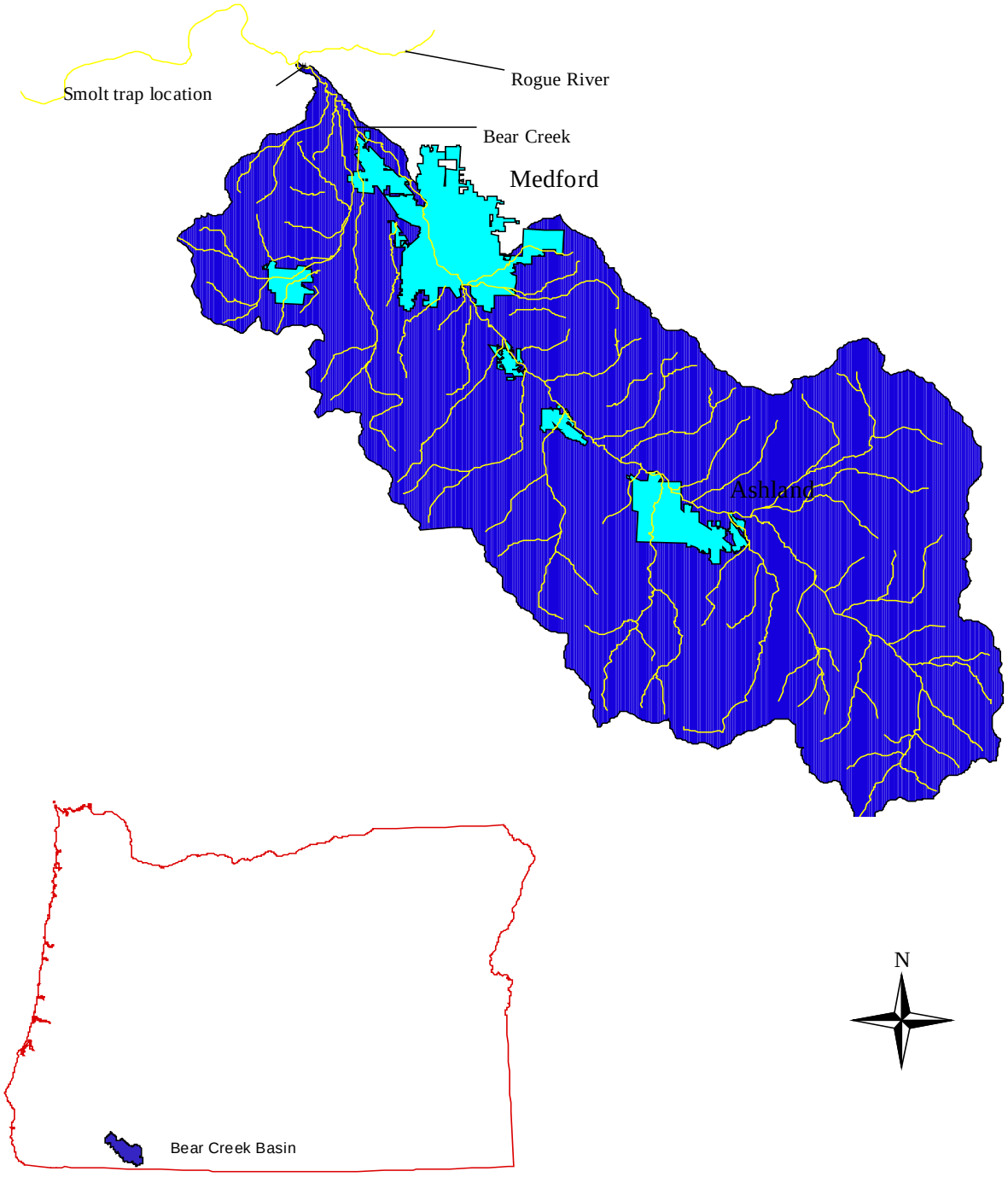


Figure 1. Smolt trap location on Bear Creek.

urban areas (7%) and mining and other uses (2%) (Prevost et al. 1995). The cities of Medford, Ashland, Central Point, Talent, Phoenix and Jacksonville are the major population centers in the Bear Creek basin.

Water quality and instream habitat are highly degraded in Bear Creek and many of its tributaries. Bear Creek has been placed on the Department of Environmental Quality (DEQ) list of water quality limited streams for a number of factors including high fecal coliform concentrations, streamflow modification, habitat modification and high summer water temperatures. The stream has been channelized over much of its length, especially where the stream flows through urban areas. Streamflows in Bear Creek are highly manipulated due to imports of water into the Bear Creek basin from the Klamath and Little Butte Creek basins, a water storage project at Emigrant Lake and the withdrawal of large amounts of water from Bear Creek for agricultural and municipal use.

Despite the poor condition of fish habitat in the Bear Creek basin, Bear Creek and its tributaries support native populations of fall chinook salmon, coho salmon, steelhead (summer and winter runs) and cutthroat trout. There are a total of 25.5 miles of chinook spawning habitat in the mainstem of Bear Creek and in a few of the larger tributaries. Coho spawning and rearing habitat occurs in approximately 30 miles of streams in the basin; steelhead spawn and rear in approximately 98 miles of habitat.

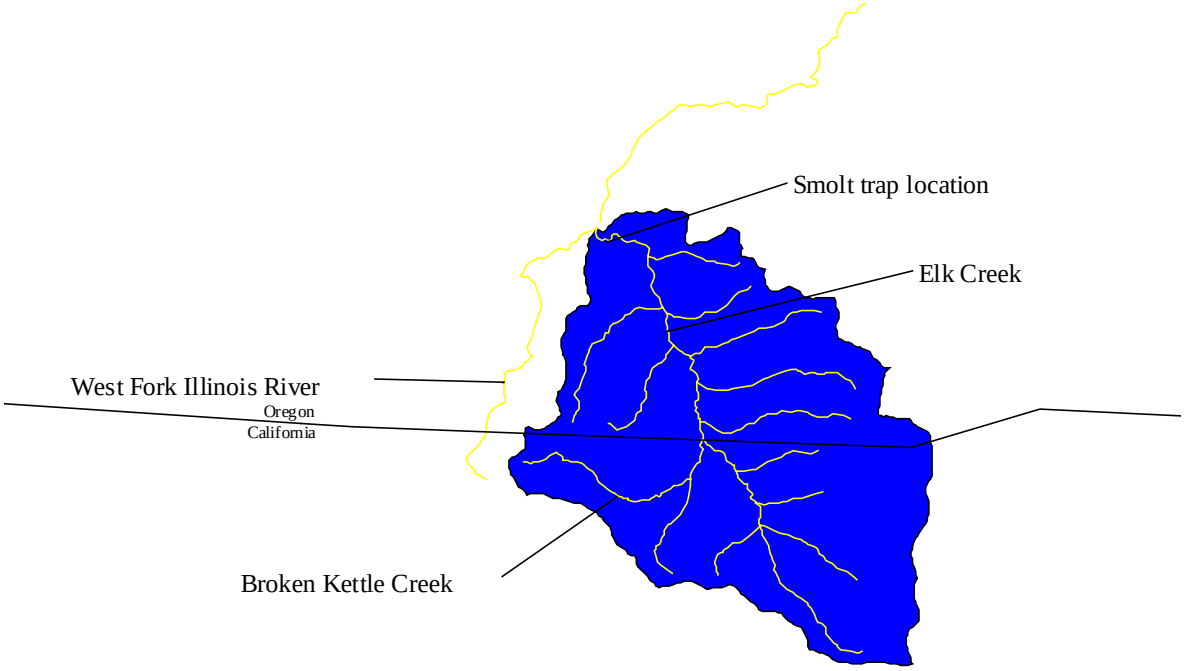
Elk Creek

Elk Creek drains an area of about 17,157 acres, making it the smallest subbasin in this trapping study. The smolt trap on this stream was located 0.3 miles upstream from the confluence of Elk Creek and the West Fork Illinois River (Figure 2). The Elk Creek drainage is bisected by the Oregon-California border, and approximately 60% (18 of 30 square miles) of the drainage lies in California. Land use in the Elk Creek drainage consists primarily of private or federally owned forest land. The largest single landowner is a private timber company that owns approximately 30% of the watershed; the USFS and other private interests own the remaining lands (Bauer and Goforth 1995).

Elk Creek supports populations of fall chinook and coho salmon, winter steelhead and cutthroat trout. Chinook spawning occurs in approximately 7.4 miles of streams in the Elk Creek drainage. Coho and steelhead spawning and rearing occurs in approximately 15 and 18 miles of streams within the basin, respectively.

Little Butte Creek

The Little Butte Creek trap was located at RM 5.5 near Eagle Point, Oregon (Figure 3). The Little Butte Creek watershed is approximately 238,600 acres in size. The federal government (BLM and USFS) owns forty-eight percent of the Little Butte watershed, while 50% of the basin is in private ownership. The remaining two- percent is land within the urban growth boundary of Eagle Point and land owned by the State of Oregon (BLM and USFS 1997). The principal land uses in the Little Butte Creek Basin are forest land (72.2%), range land (19.4%) and irrigated agricultural land (5.0%). Other land uses include non-irrigated agricultural lands and urban areas (Anthony and Grenbemer 1995).



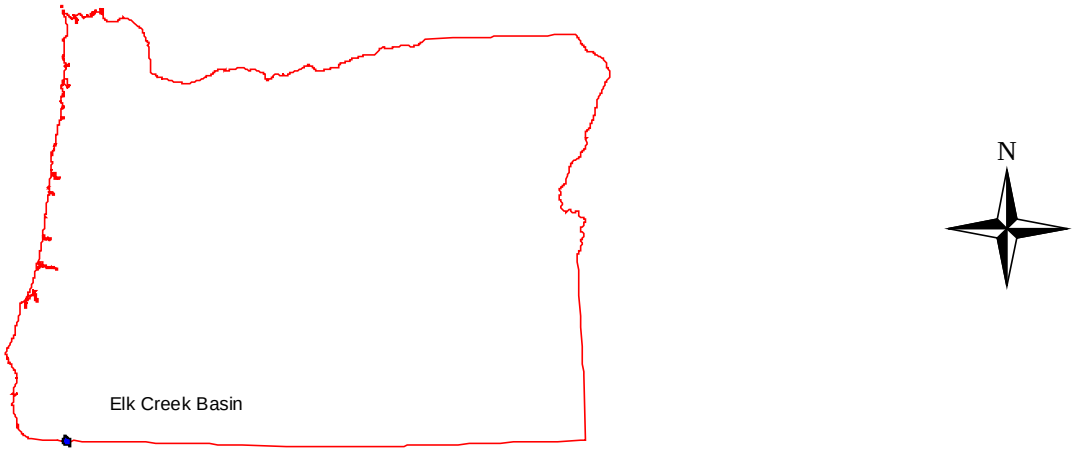


Figure 2. Smolt trap location on Elk Creek.

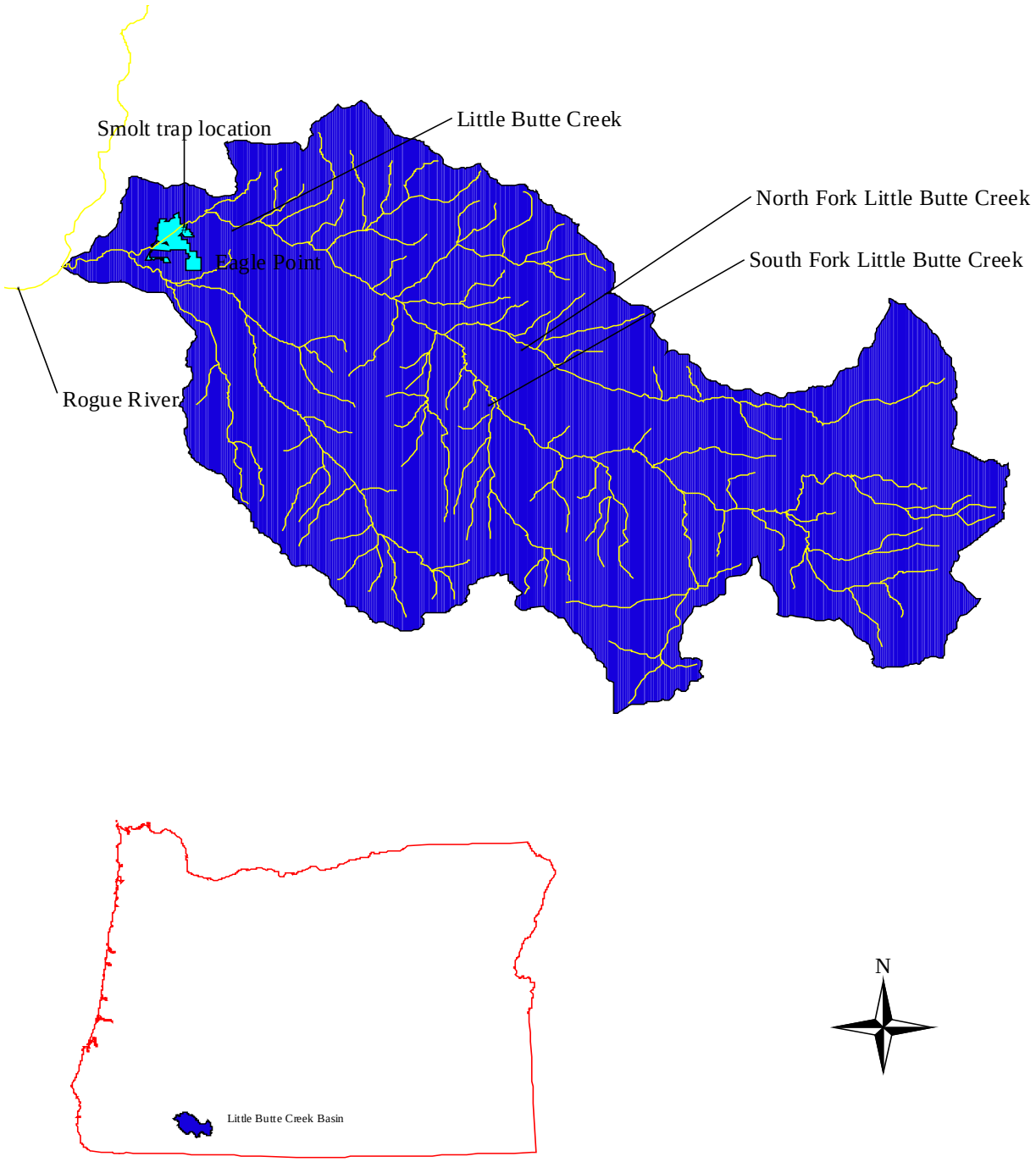


Figure 3. Smolt trap location on Little Butte Creek

Anadromous fish species present in the Little Butte Creek basin include chinook salmon (spring and fall runs), coho salmon and steelhead (summer and winter runs). There are 18 miles of known spawning habitat for chinook salmon in the basin as well as 55 and 96 miles of spawning and rearing habitat for coho salmon and steelhead, respectively. However, because this trap is located 5.5 miles upstream from the mouth of Little Butte Creek, the production of salmonids from lower Little Butte Creek is not estimated. In addition, the trap site is located upstream from the mouth of Antelope Creek, which supports populations of coho salmon and steelhead. There are approximately 6 miles of coho habitat and 19 miles of steelhead habitat in the Antelope Creek subbasin. As a result, the estimates of anadromous salmonid production at the Little Butte Creek trap site are underestimates of the production of the entire Little Butte Creek basin.

West Fork Evans Creek

The size of the West Fork Evans Creek Basin is 39,176 acres, of which 21,310 acres (54%) are in BLM ownership. The remaining non-BLM ownership is composed of agricultural (<0.05%), industrial forest (40%), non-industrial forest (<1%), and other federally-owned timber (4%) lands (BLM 1995). The upper portion of the basin is composed of highly erodible decomposed granitic soils. The high road density in the basin (4.8 miles of road/section) is a major factor in the introduction of decomposed granite sediments into West Fork Evans Creek and its tributaries (BLM 1995).

Coho salmon, steelhead (summer and winter runs) and cutthroat trout are present in the West Fork Evans Creek basin. There are approximately 23 and 26 miles of spawning and rearing habitat for coho and steelhead, respectively, in the basin. Chinook salmon are not present in the West Fork Evans Creek Basin. The trap site on West Fork Evans Creek was located at approximately RM 2.8 (Figure 4).

Slate Creek

Slate Creek supports populations of fall chinook, summer and winter steelhead, coho salmon and cutthroat trout. Fall chinook utilize approximately 14 miles of spawning habitat in Slate Creek and its tributaries. Coho and steelhead are known to utilize approximately 22 and 32 miles of habitat, respectively, in the Slate Creek subbasin. The Slate Creek smolt trap was located at RM 0.3 (Figure 5)

The Slate Creek subbasin is approximately 28,400 acres in size. The primary land uses in the Slate Creek subbasin are agriculture and rural residential at lower elevations and forest land at upper elevations. Forty-two percent of the subbasin is owned by the USFS, 18% is owned by BLM and the remaining 40% is in private ownership (Applegate River Watershed Council 1994).

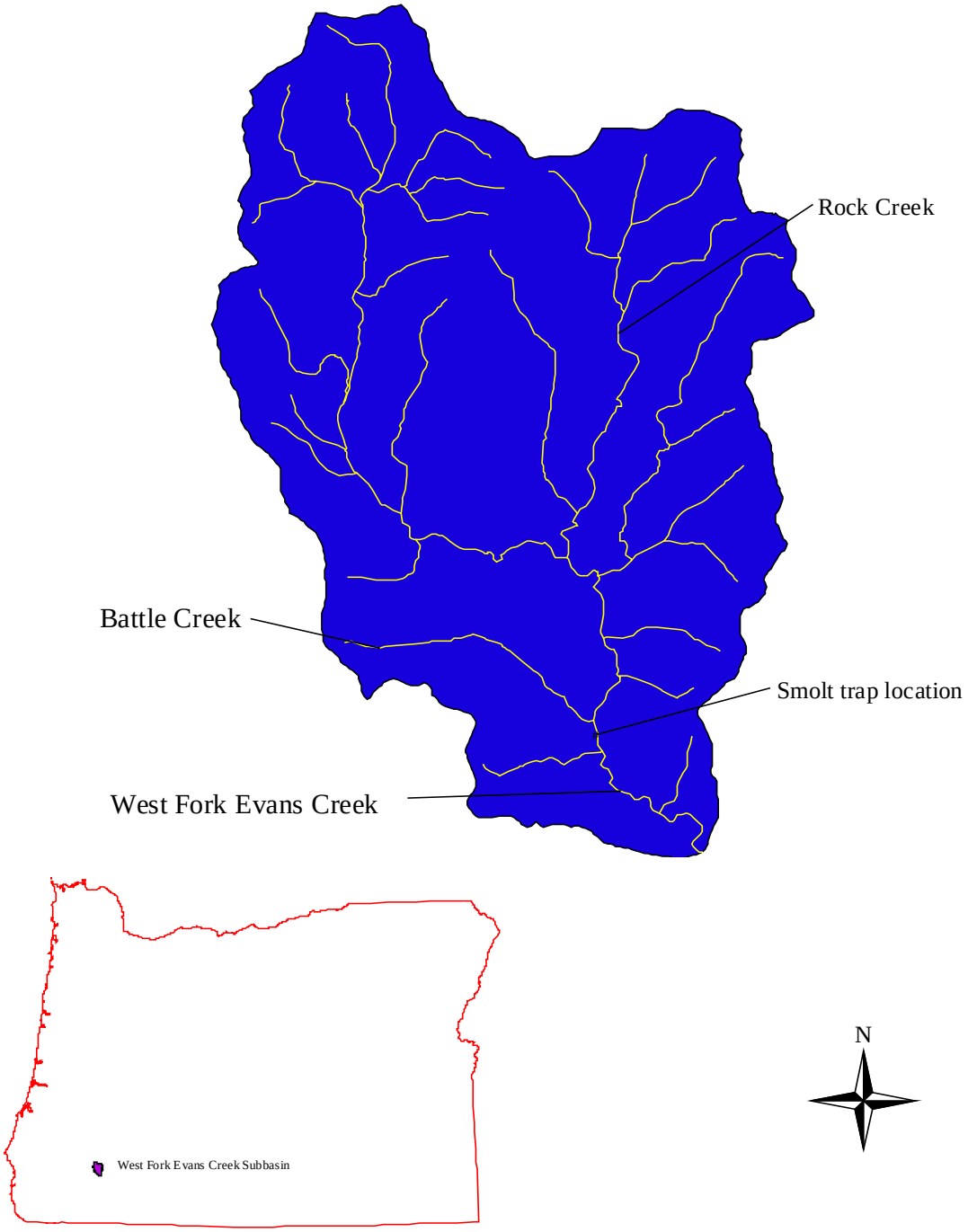


Figure 4. Smolt trap location on West Fork Evans Creek.

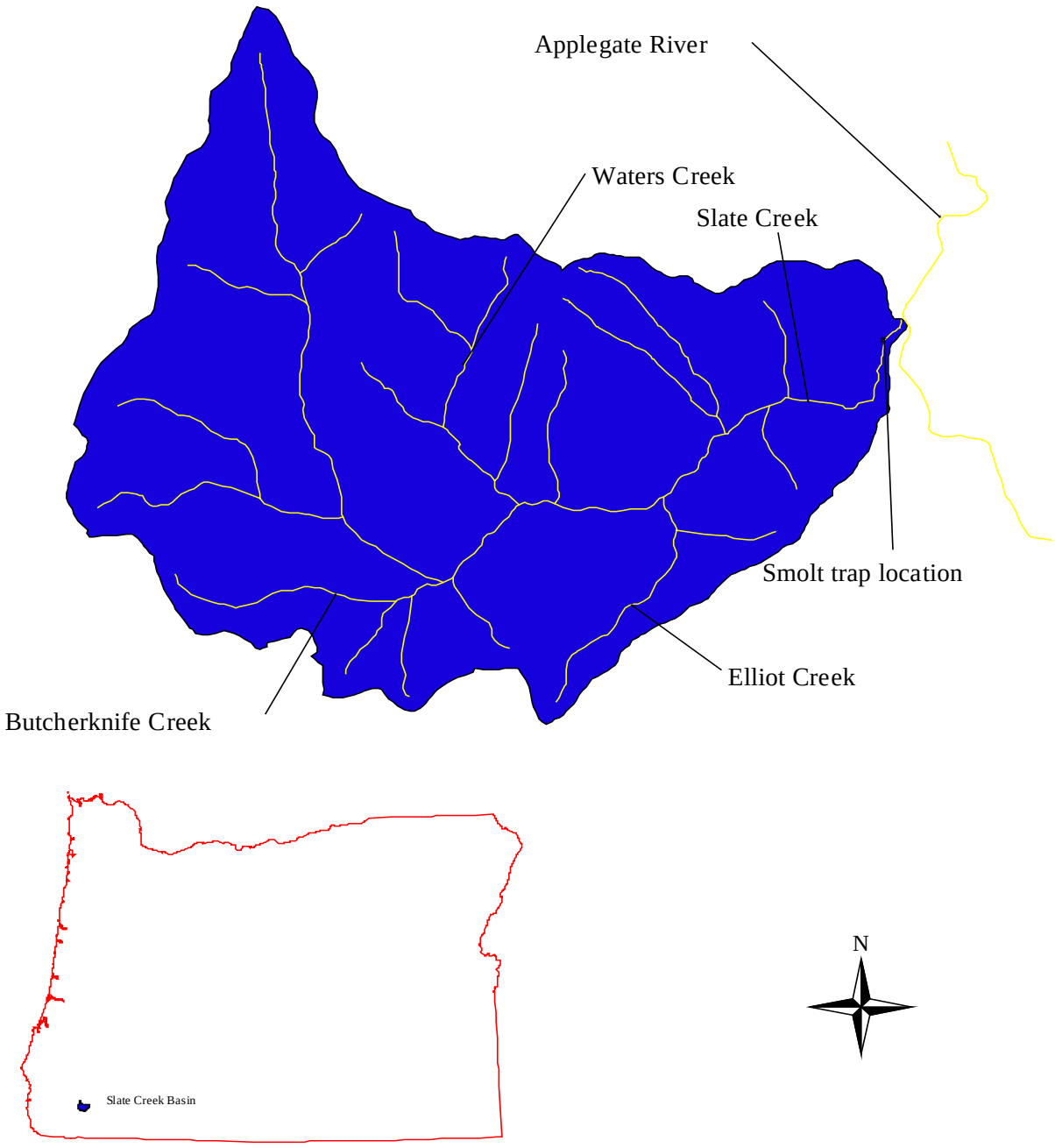


Figure 5. Smolt trap location on Slate Creek.

Little Applegate River

The Little Applegate River drains an area of approximately 72,200 acres and is the last major Applegate River tributary before fish passage is blocked at Applegate Lake. Over 70% of the subbasin is owned by either the U.S. Forest Service (32.2%) or BLM (40%); the remaining lands are owned by individuals or corporations (27.4%) and the State of Oregon (0.4%). Although private ownership of the basin is less than 30% of the area, approximately 60% of the fish habitat in the subbasin is located on private land (BLM and USFS 1995).

The Little Applegate River and its tributaries support populations of fall chinook and coho salmon, summer and winter steelhead and cutthroat trout. Approximately 5 and 6 miles of the Little Applegate River is utilized as spawning and rearing habitat by fall chinook and coho salmon, respectively; however, a natural waterfall located at approximately RM 1.5 may be a barrier to these species under low flow conditions. There are approximately 33 miles of known spawning and rearing habitat for steelhead in the basin. The smolt trap on this stream was located at approximately RM 0.2 (Figure 6).

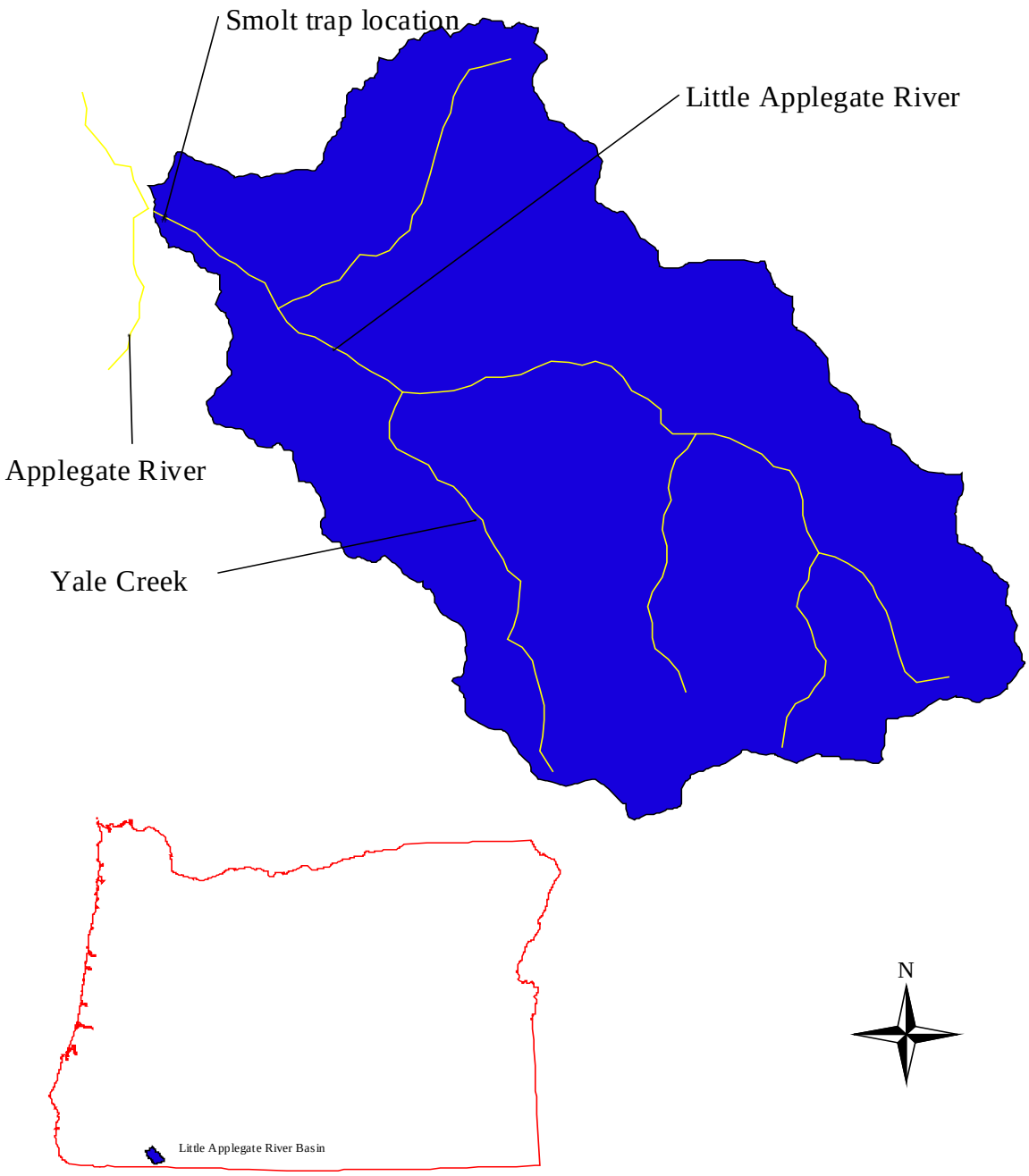


Figure 6. Smolt trap location on the Little Applegate River.

RESULTS AND DISCUSSION

Smolt Production Estimates

Coho smolt production estimates at Little Butte Creek in 2003 were the highest since trapping began there in 1998 (Figure 7). Similarly, coho smolt estimates were higher in Slate Creek and West Fork Evans Creek this year than in previous years of trapping. The coho smolt production estimate for Bear Creek in 2003 was low and similar to the estimate in 2001. No coho smolts were captured at the Little Applegate River site; this stream has produced low numbers of (or no) coho smolts each year since trapping began there in 1999. Elk Creek produced nearly identical numbers of coho smolts in 2002 and 2003 with a difference of only about 200 fish between the two years. Of the six streams currently monitored by this trapping project, Little Butte Creek has consistently produced the highest number of coho smolts each year of this study.

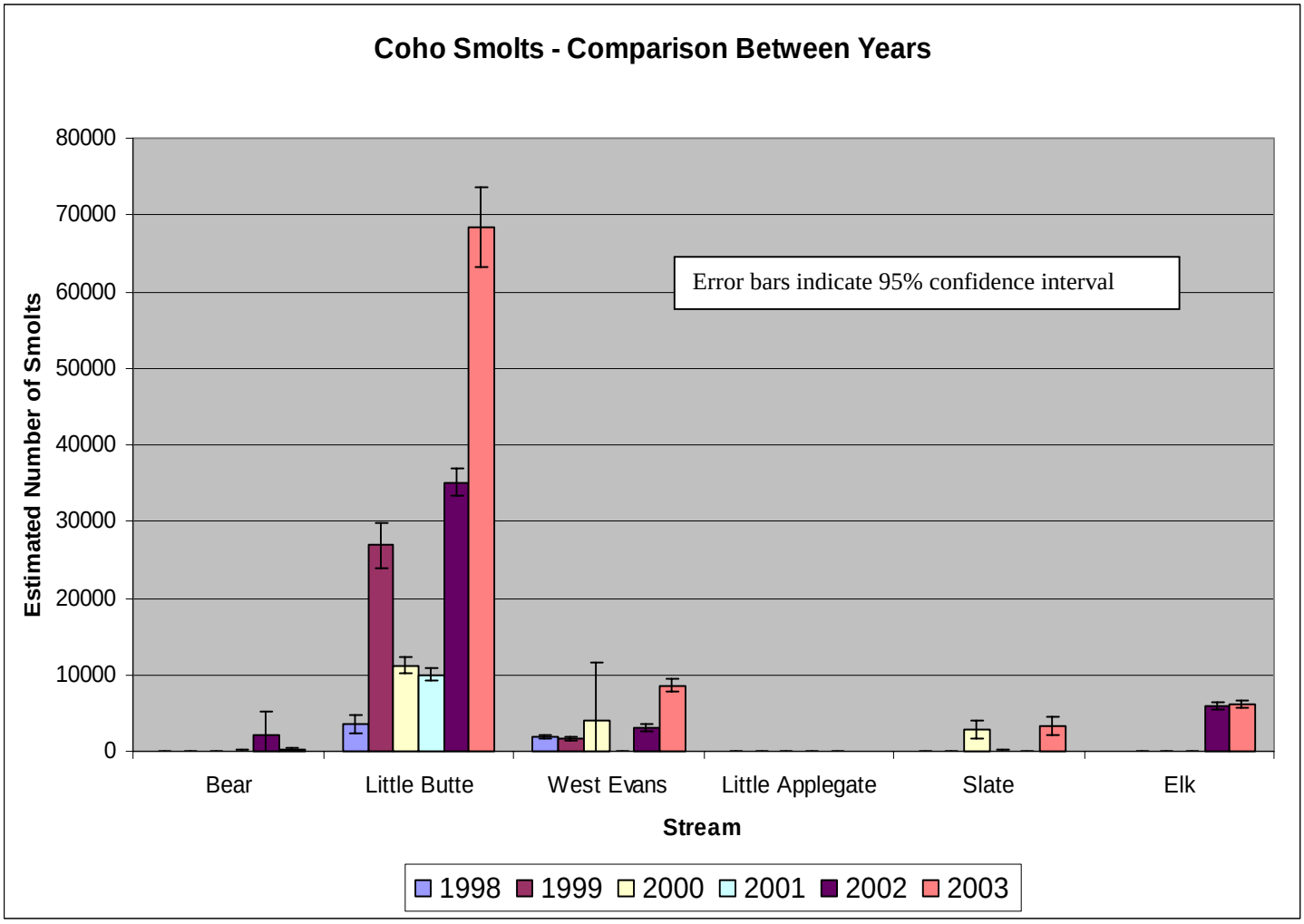


Figure 7. Between-year comparison of coho smolt estimates at each trap site (1998-2003).

Because the amount of habitat for coho differs between stream systems, I compared the production of coho smolts between streams by calculating the estimated number of coho smolts per mile of habitat available. On a fish-per-mile basis, Little Butte Creek produced the highest number of coho smolts in 2003 (nearly 1,600 per mile), followed by Elk and West Fork Evans Creeks (over 400 per mile) (Figure 8). All of the remaining streams trapped in 2003 produced fewer than 200 coho smolts per mile. In 1998, West Fork Evans Creek produced more coho smolts per mile of habitat than did Little Butte Creek and smolts produced per mile were similar between the two streams in 2000.

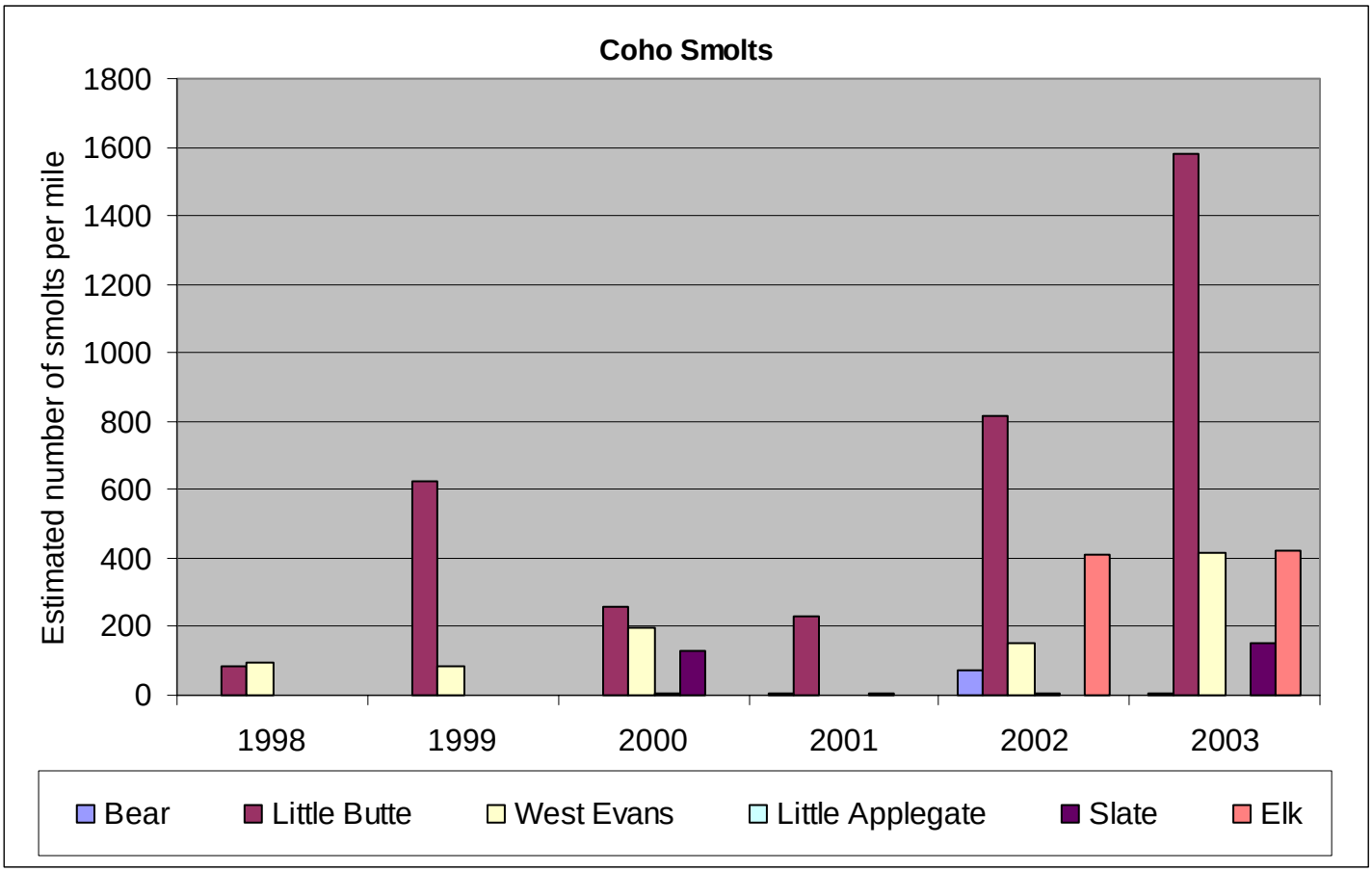


Figure 8. Estimated number of coho smolts produced per mile of habitat (1998-2003).

This year's steelhead smolt estimate for Little Butte Creek was lower than estimates for the three previous years (Figure 9) and it was slightly lower than the average number (approximately 22,000) of steelhead smolts produced over the six years of trapping at that site. The steelhead smolt estimate of 4,500 this year at the Little Applegate site is slightly lower than last year's estimate, but it is above the average of approximately 4,000 per year over the 5 years of trapping. As with the coho smolt estimates, the steelhead smolt estimates from 2002 and 2003 are remarkably similar at the Elk Creek trap. The estimate of steelhead smolts produced in West Evans Creek was the highest since trapping began at that site in 1998. In contrast, the number of steelhead produced in Bear Creek in 2003 was the lowest observed during the 3 year operation of that trap. However, the decline in the steelhead smolt production estimate this year may have been more a function of trap efficiency

than the abundance of steelhead smolts (see discussion on trap efficiency). Steelhead smolts were less numerous in Slate Creek this year than in past trapping seasons.

Of the six streams in this study, Little Butte and Bear Creeks produced the highest number of steelhead smolts in 2003 (Figure 9). Over the last several years, Little Butte Creek has consistently produced more steelhead smolts than any other stream included in our trapping study; however, the steelhead smolt estimate for Bear Creek was the highest of all trap sites in 2002 (Figure 9). As with coho, these results indicate that the Little Butte Creek watershed is an important steelhead-producing watershed in the Rogue Basin.

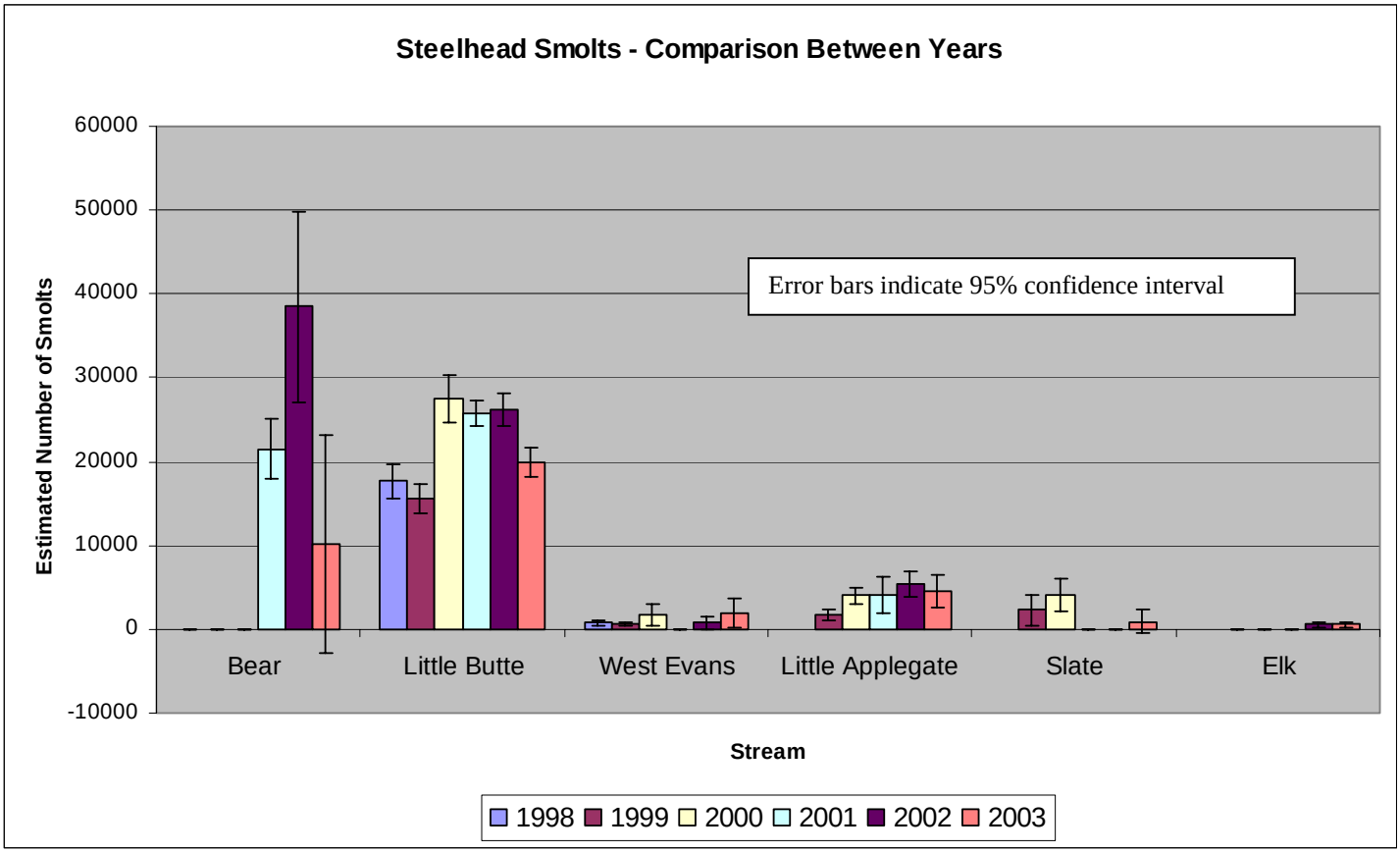


Figure 9. Between-year comparison of steelhead smolt estimates at each trap site (1998-2003).

When comparing steelhead smolt production between sites based on the number of smolts produced per mile of habitat, Little Butte Creek produced the highest steelhead smolt estimates each year with the exception of 2002 (Figure 10). Over the last 6 years, Little Butte Creek steelhead production has averaged over 300 steelhead smolts per mile of habitat. Bear Creek has the next highest level of steelhead production, with an average of nearly 240 smolts per mile. The Little Applegate River produces an average of 120 steelhead smolts per mile, followed by Slate Creek (78/mile), West Fork Evans Creek (50/mile) and Elk Creek (32/mile).

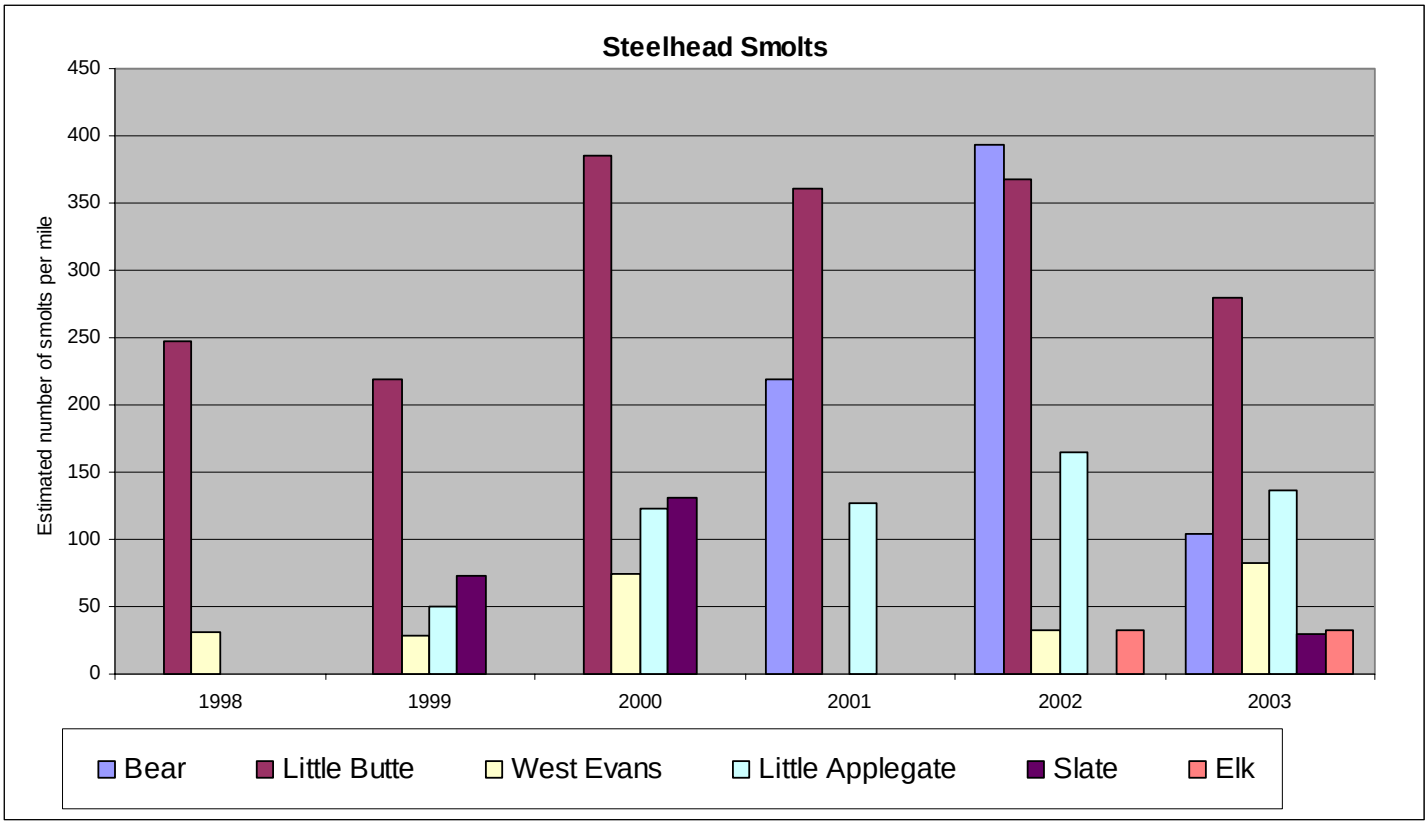


Figure 10. Estimated number of steelhead smolts produced per mile of habitat (1998-2003).

For the second consecutive year we attempted to estimate the number of chinook smolts produced at each of the trap sites and were successful at each site except Little Butte Creek. On Little Butte Creek, the large number of chinook captured during the peak weeks of outmigration made marking fish and looking for marks impractical, especially when we were attempting to work fish up as quickly as possible to minimize stress. In the other four streams, we marked a relatively low percentage of the total number of chinook captured; this resulted in relatively wide confidence intervals for each estimate (Figure 11).

Bear Creek produced an estimated 25,083 chinook smolts in 2003, which is well below the estimated production of over 200,000 chinook smolts in 2002 (Figure 11). Above-average winter streamflows, including very high peak flows in Bear Creek during December, January and February, may have reduced chinook production by scouring eggs that had been deposited.

Poor chinook egg survival may also have occurred in Little Butte Creek due to high streamflows after chinook had spawned. Although we could not estimate total chinook smolt production in Little Butte Creek, we captured over 130,000 chinook during the 2002 season, which followed a relatively mild winter. In 2003, less than 39,000 chinook smolts were captured. It is unlikely that differences in adult spawning escapement would account for this reduction in chinook smolt production, since more adult spring and fall chinook passed over Gold Ray dam in 2002 than in 2001. It is also unlikely that differences in trapping efficiency between the two years would account for such large differences in the number of chinook smolts captured.

Chinook smolt production from the Little Applegate River was slightly higher in 2003 than in 2002, but was relatively low when compared with other streams. No chinook smolt estimates were made in 2002 at Slate or Elk Creeks due to a lack of recaptured fish (Vogt 2002), so a comparison between the two years was not possible.

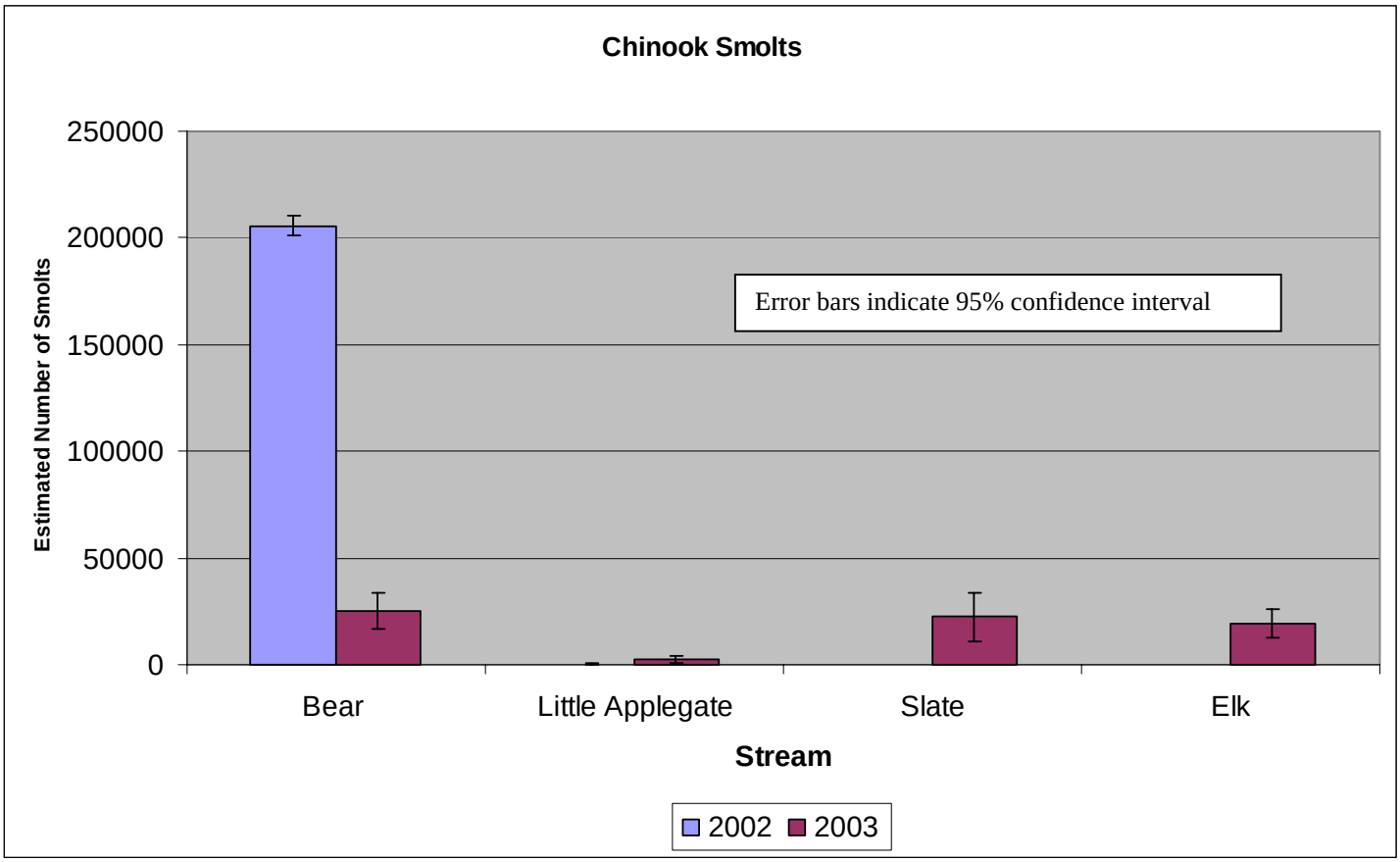


Figure 11. Between-year comparison of chinook smolt estimates at each trap site (2002-2003).

Trap Efficiency

Trap efficiencies for coho smolts ranged from 7% at the Bear Creek trap to 35% at the Elk Creek trap (Table 1). When first installed this spring, the traps at West Fork Evans and Slate Creeks did not turn well due to very low streamflows; however, shortly after trap installation, high levels of precipitation raised streamflows which caused the traps to work well for much of the trapping season. Because of the higher streamflows in these streams in 2003, we were able to operate these two traps for almost 3 weeks longer than we did in 2002 (Vogt 2002). Trapping efficiency for coho smolts at Slate Creek was 11% in 2003; in 2002, no coho smolts were captured since the trap turned slowly due to low streamflows (Vogt 2002). Trapping efficiency for coho smolts was very good at both Little Butte and West Fork Evans Creeks. No coho smolts were captured at the Little Applegate trap.

Table 1. 2003 coho smolt trap efficiencies and population estimates for each trap site.

Stream	Dates Trapped	# Days Trapped	# Coho Captured	# Coho Marked	# Coho Recaptured	Trapping Efficiency	Population Estimate	95% Confidence Interval
Little Butte	3/1 – 6/15	107	16,192	2,177	515	24%	68,321	63,143 – 73,499
Bear Creek	3/1 – 6/29	121	14	14	1	7%	197	16 - 378
West Evans	3/1 – 6/2	94	2,089	1,488	365	25%	8,527	7,695 – 9,359
Elk Creek	3/1 – 6/22	113*	2,157	1,600	565	35%	6,110	5,649 – 6,571
L Applegate	3/1 – 6/29	113*	0	0	0	NA	NA	NA
Slate	3/1 – 5/27	86*	364	359	40	11%	3,279	2,170 – 4,388

* Trap disabled one or more days by high flows/debris.

Trap efficiency for steelhead smolts was very good at Little Butte Creek but fairly low at Bear Creek (Table 2). Steelhead trap efficiency was below 10 percent at all the remaining trap sites except Elk Creek, where trap efficiency was good. The low trap efficiency at these four sites resulted in wide confidence intervals around the population estimates.

Table 2. 2003 steelhead smolt trap efficiencies and population estimates for each trap site.

Stream	Dates Trapped	# Days Trapped	# St Captured	# St Marked	# St Recaptured	Trapping Efficiency	Population Estimate	95% Confidence Interval
Little Butte	3/1 – 6/15	107	4,827	1,848	448	24%	19,946	18,195 – 21,697
Bear Creek	3/1 – 6/29	121	344	297	10	3%	10,118	-2,848 – 23,084
West Evans	3/1 – 6/2	94	134	130	9	7%	1,942	213 – 3,671
Elk Creek	3/1 – 6/22	113*	110	108	21	19%	567	290 – 844
L Applegate	3/1 – 6/29	113*	360	350	28	8%	4,500	2,598 – 6,402
Slate	3/1 – 5/27	86*	76	74	6	8%	938	-425 – 2,301

* Trap disabled one or more days by high flows/debris.

Trapping efficiency for chinook smolts ranged from 7-30% at four trap sites (Table 3). We were unable to calculate a population estimate for Little Butte Creek since we marked chinook for only a short time during the season. The population estimates for the other streams had fairly wide confidence intervals due to the relatively low numbers of fish marked. On Elk Creek, we captured a total of over 5,800 chinook but only marked 90 of them, since we only marked fish over 60 mm in length and fish exceeding that length were not captured until late in the season.

The Elk Creek, Little Applegate and Slate Creek traps were disabled for at least one day during the trapping season due to high streamflows and debris. The traps at Elk and Slate Creeks were out of operation for only short periods, so the production estimate for these traps was probably not significantly affected by the lost trapping time. The Little Applegate trap was disabled for periods of several days when high streamflows and debris submerged the trap; as a result, we probably underestimated actual production in the Little Applegate by missing both marked and unmarked fish during those extended periods of trap inactivity. The Bear Creek trap was never disabled by high streamflows and remained in operation the entire trapping season, but the efficiency of the trap was greatly reduced in April and May due to above average streamflows. During high flows the

thalweg of the stream shifted away from the trap, leaving the trap in a low velocity area that caused the trap to turn very slowly. During these flow conditions, trap catches were very low. As a result, the production estimates for Bear Creek likely underestimated the actual production of the stream.

Table 3. 2003 chinook smolt trap efficiencies and population estimates for each trap site.

Stream	Dates Trapped	# Days Trapped	# chinook Captured	# chinook Marked	# chinook Recaptured	Trapping Efficiency	Population Estimate	95% Confidence Interval
Little Butte	3/1 – 6/15	107	38,842	NA	NA	NA	NA	NA
Bear Creek	3/1 – 6/29	121	1,806	484	35	7%	25,083	16,478 – 33,688
West Evans	3/1 – 6/2	94	NA**	NA**	NA**	NA**	NA**	NA**
Elk Creek	3/1 – 6/22	113*	5,849	90	27	30%	19,497	12,489 – 26,505
L Applegate	3/1 – 6/29	113*	250	101	11	11%	2,294	478 – 4,110
Slate	3/1 – 5/27	86*	3,321	122	18	15%	22,439	11,047 – 33,831

* Trap disabled one or more days by high flows/debris.
** Species is not present in this stream

Timing of Downstream Migration

Peak downstream migration of coho smolts from Little Butte, West Fork Evans and Slate Creeks in 2003 was similar to previous years (Figure 12). Downstream migration of coho peaked much earlier this year on Bear Creek than during the two previous years. However, this peak is based on the capture of only 4 fish out of a total of 14 caught during the entire season. On Elk Creek, coho outmigration peaked in mid March in 2003, nearly two months earlier than in 2002. There was also a smaller, secondary peak of coho outmigration from Elk Creek in mid April.

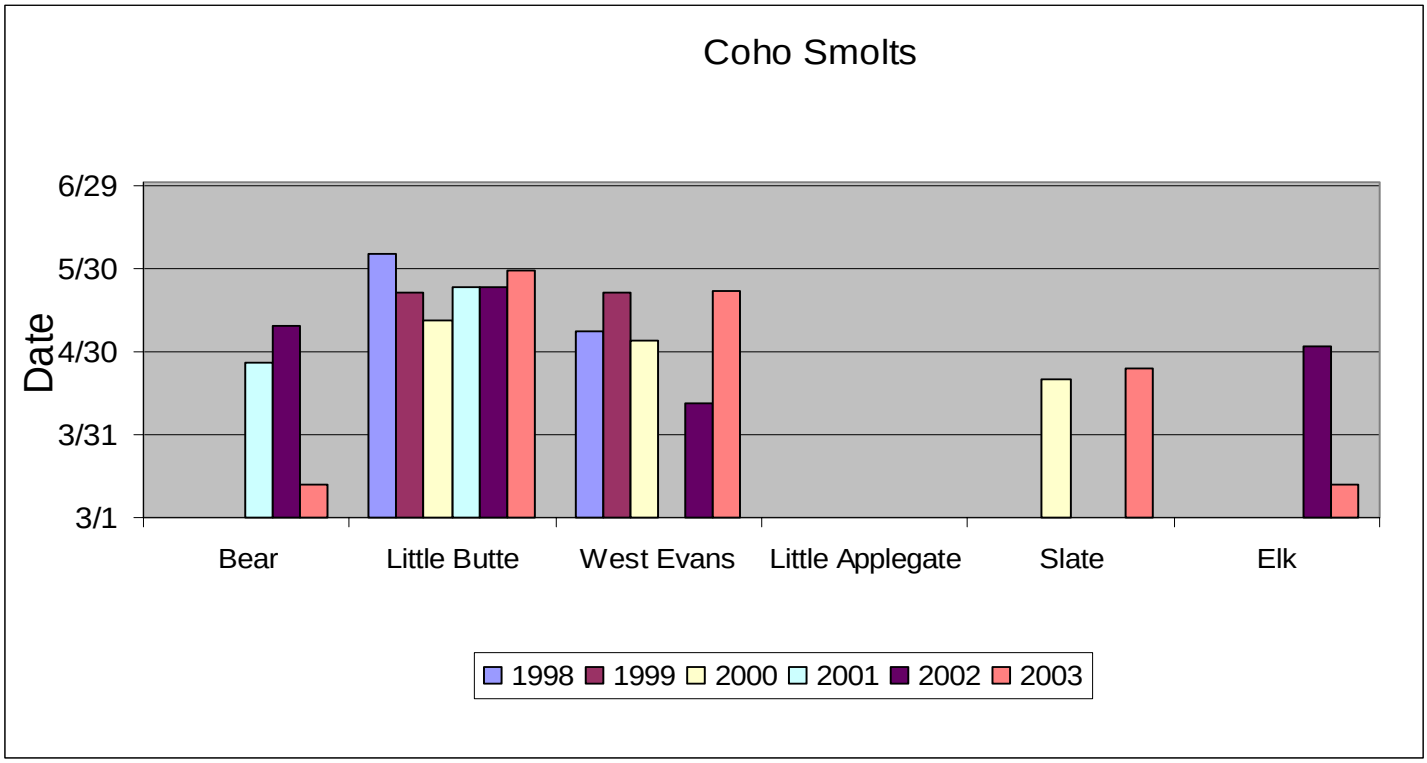


Figure 12. Date of peak week of migration of coho salmon smolts at 6 trap sites 1998-2003

In 2003, steelhead smolt downstream migration peaks varied between stream basins (Figure 13). Steelhead migration peaked earlier than in previous years in West Fork Evans Creek and in Elk Creek. Peak steelhead migration occurred in late May or early June on Bear and Little Butte Creeks, while peak outmigration from the other streams occurred before the end of April. The timing of peak migration in 2003 was within the range observed in previous years for the Little Applegate River and Slate Creek. For most trap sites, steelhead downstream migration peaked more than once during the trapping season.

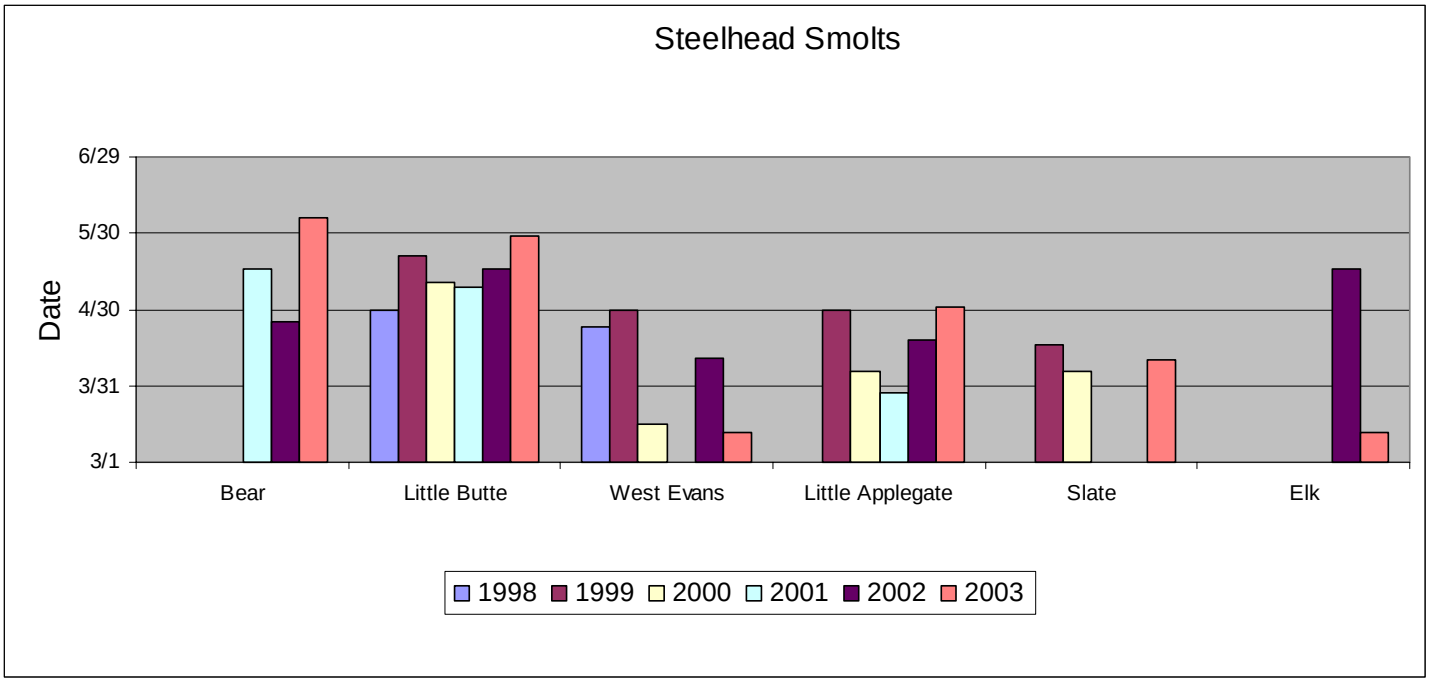


Figure 13. Date of peak week of migration of steelhead smolts at 6 trap sites 1998-2003.

The timing of peak chinook smolt emigration was similar in 2003 to previous years (Figure 14). Chinook downstream migration peaked in early April on Elk Creek in both 2002 and 2003, although there was also a large second peak of chinook emigrating in late May in 2003. Chinook downstream migration peaked slightly later this year than in previous years at Little Butte Creek, Slate Creek and Little Applegate River. Peak outmigration of chinook from Bear Creek was approximately one month later than the peaks observed in previous years.

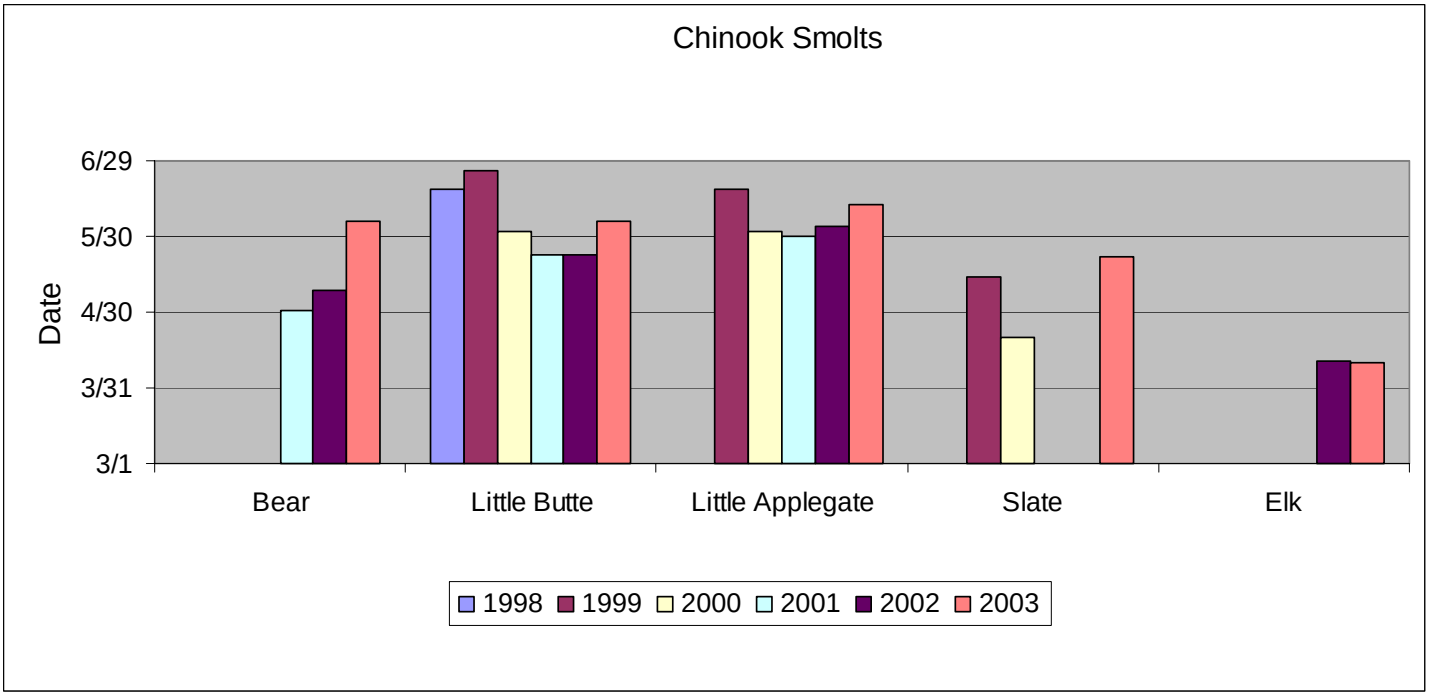


Figure 14. Date of peak week of migration of chinook smolts at 5 trap sites (1998-2003). Chinook are not present in West Fork Evans Creek

Size of Smolts

Mean coho smolt lengths during peak downstream migration are fairly similar between years at each site (Figure 15) with the exception of the Bear Creek site. Mean lengths of coho were smaller in 2003 than in previous years; however the number of fish measured at this site was small (n = 4) and the "peak" of outmigration was very early in the trapping season. Coho smolt sizes continue to be consistently smaller at West Fork Evans Creek than at other trap sites. Mean coho smolt lengths were highest in Little Butte Creek and Slate Creek in 2003.

There did not appear to be much variation in the mean length of steelhead smolts between streams in 2003 (Figure 16). Mean steelhead lengths varied from 140 mm at Slate and Little Butte Creeks to 164 mm at Elk Creek. Mean steelhead lengths in 2003 appeared to be slightly smaller in Little Butte and Bear Creeks than in previous years, while lengths of steelhead in the Little Applegate River and Elk Creek appeared to be slightly larger in 2003; however, no analysis was done to determine if these differences were statistically significant. Mean lengths of steelhead from West Fork Evans and Slate Creeks in 2003 were similar to previous years.

Mean length of chinook smolts during the peak of downstream migration appears to be related to the timing of peak migration. Chinook from Elk Creek were smaller than those from the other streams (Figure 17), and chinook emigration peaked earlier in Elk Creek than in the other streams. Conversely, chinook left Slate, Bear and Little Butte Creeks later in the season at a larger size. For a given stream, length of chinook smolts appears related to the timing of outmigration as well. In general, during years when chinook emigration peaks later in the season, the mean length of chinook smolts is larger.

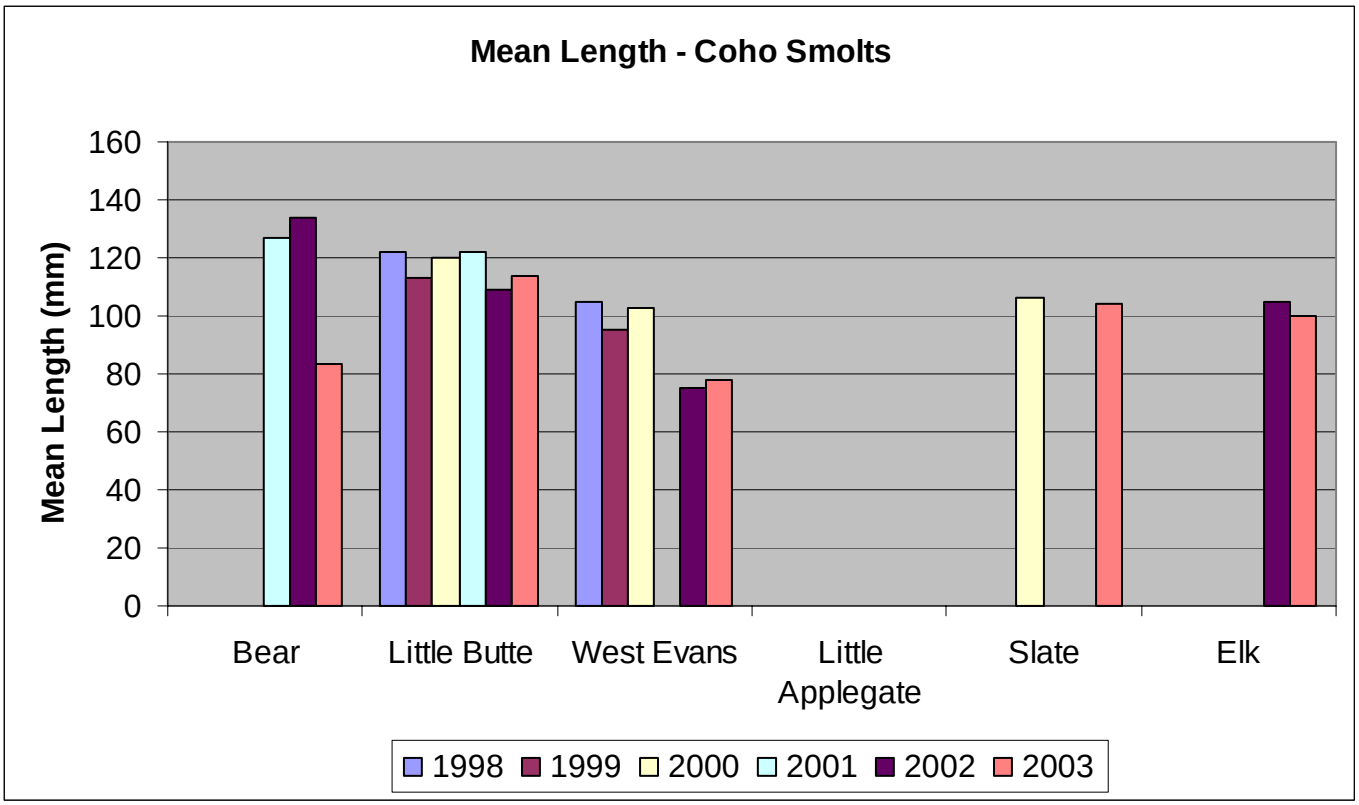


Figure 15. Mean length of coho smolts during the peak week of downstream migration at each trap site (1998-2003).

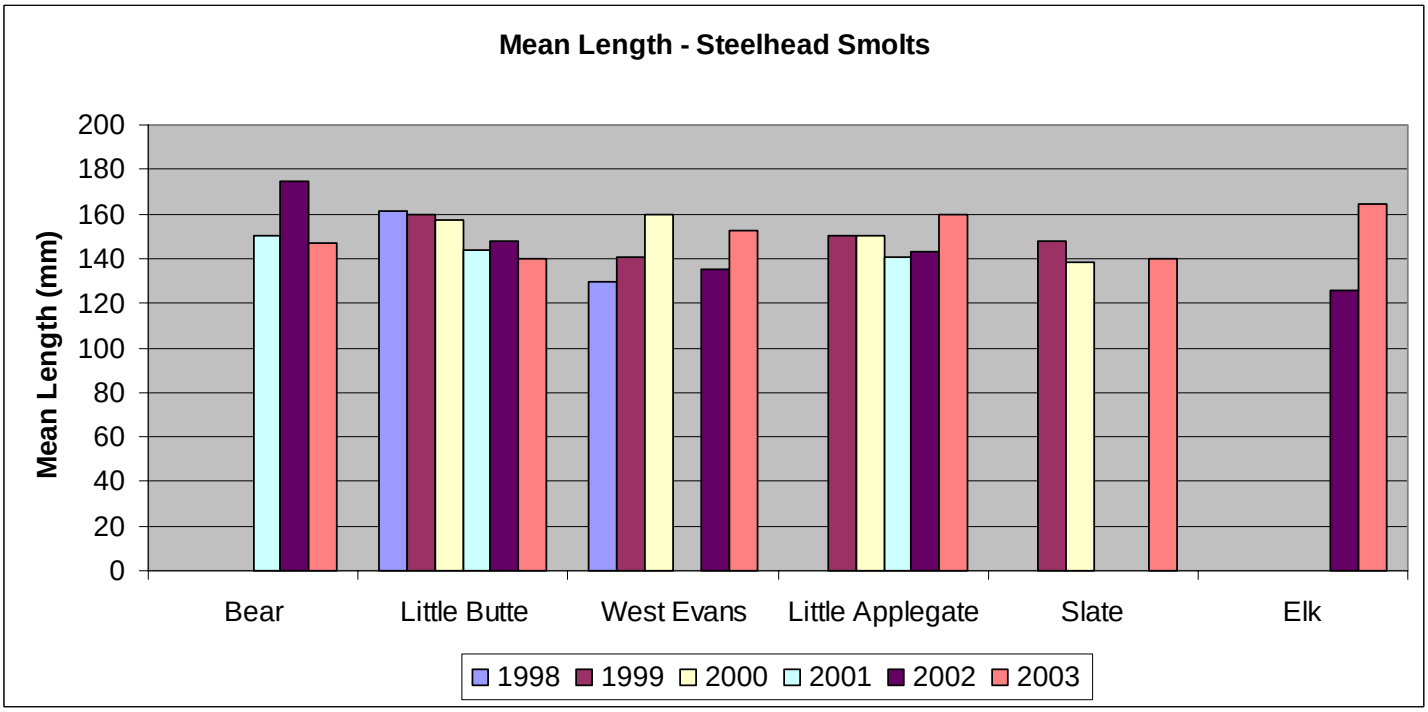


Figure 16. Mean length of steelhead smolts during the peak week of downstream migration at each trap site (1998-2003).

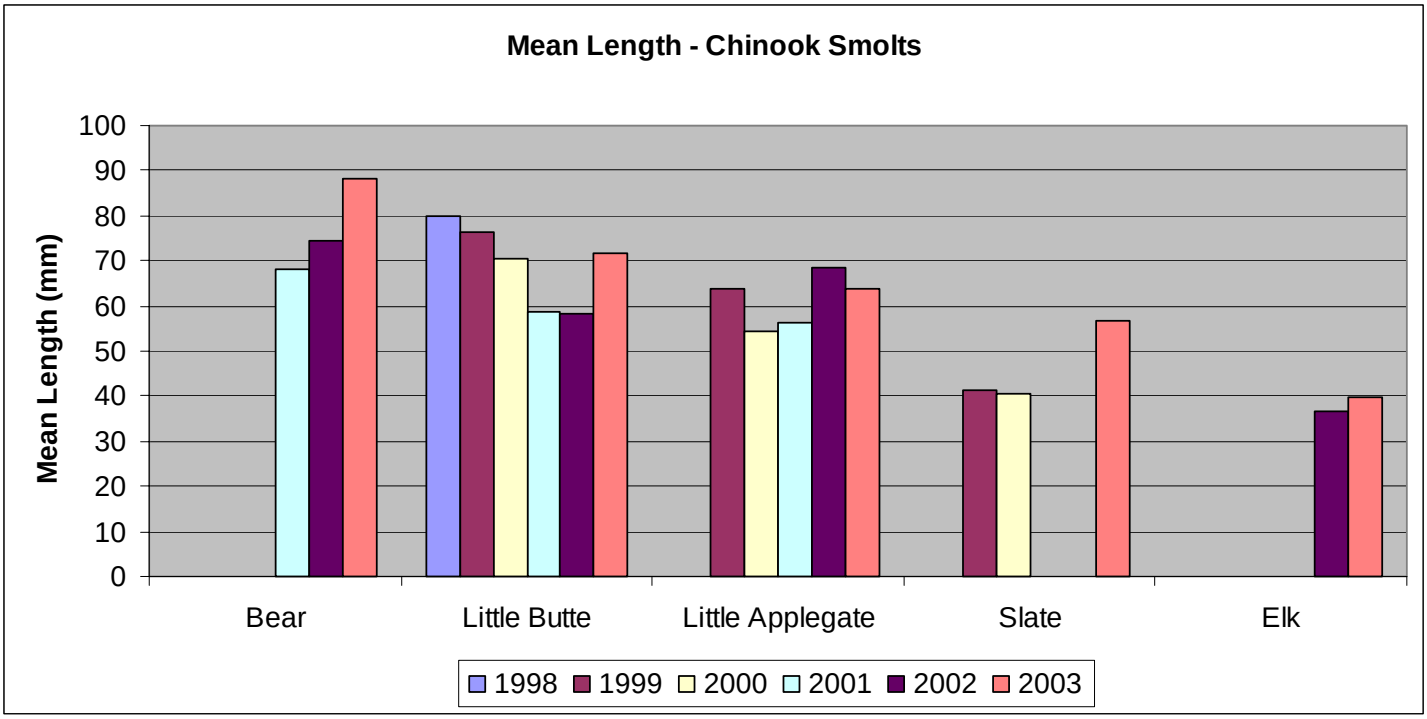


Figure 17. Mean length of chinook smolts during the peak week of downstream migration at each trap site (1998-2003). Chinook are not present in West Fork Evans Creek.

Abundance of Other Species and/or Lifestages

In addition to coho, chinook and steelhead smolts, pre-smolt coho and steelhead, as well as a number of other species, were captured at each trap site. Since coho and steelhead smolts and chinook were assumed to be migrating to the ocean when captured, the mark-recapture technique was used to estimate total smolt production from each stream. However, pre-smolt coho and steelhead captured at each trap may not have been on a seaward migration when trapped and were therefore not included in the estimate of smolt production. No production estimates were attempted for cutthroat trout, since the number of cutthroat captured at each trap site was very low, and since it was unknown whether cutthroat captured were resident or migratory fish. In addition, no estimates of lamprey production were attempted. Lamprey ammocetes caught during this study were all assumed to be Pacific lamprey (*Lampetra tridentata*); each of a subsample of lamprey ammocetes taken from several trap sites in 2001 were identified as Pacific lamprey by Dr. Doug Markle of Oregon State University (Jeannine Rossa, BLM, email communication 2001).

Since mark-recapture estimates were not made for pre-smolt coho and steelhead, cutthroat trout and lamprey, the actual number of fish captured at each trap was used as a measure of their abundance in each stream (Table 4).

Table 4. Number of each species/lifestage captured in 2003 for which a mark-recapture estimate was not made.

Species/Lifestage	Little Butte	Bear	West Evans	Little Applegate	Slate	Elk
Coho Fry	6,797	8	196	68	1,166	5,546
Trout Fry*	28,284	14	111	129	127	1,402
Steelhead (60-89 mm)	7,221	65	530	808	59	245
Steelhead (90-119 mm)	10,323	40	388	584	94	250
Cutthroat trout (60-89 mm)	1	0	12	3	4	6
Cutthroat trout (90-119 mm)	12	2	15	4	105	22
Cutthroat trout (120-159 mm)	31	1	33	7	218	53
Cutthroat trout ($\geq$ 160 mm)	14	0	7	0	18	48
Pacific Lamprey (Adult)	0	0	0	1	0	0
Lamprey (Ammocetes)	873	6	0	167	91	112

* Steelhead or cutthroat fry under 60 mm were classified as trout fry due to difficulty with identification of species.

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