OREGON DEPARTMENT OF FISH AND WILDLIFE

ROGUE FISH DISTRICT REPORT

TITLE:	Upper Rogue Smolt Trapping Project, 1999
STREAM:	Big Butte, Little Butte, South Fork Big Butte, Slate and West Fork Evans Creeks and the Little Applegate River
REPORT DATE:	July 1999
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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 Big Butte, Little Butte and West Fork Evans Creeks. In March 1999, the Ashland Ranger District of the U.S. Forest Service became a cooperator in this project, and smolt trap sites in addition to the 1998 sites were selected on Slate Creek, South Fork Big Butte Creek and the Little Applegate River. The objectives of this project were to 1) obtain an estimate of the production of coho salmon and steelhead smolts; 2) determine the timing of outmigration of smolts; and 3) determine the sizes of smolts from each of these stream systems. An objective specific to the South Fork Big Butte Creek site was to determine the extent of anadromous fish production above the natural waterfall near the town of Butte Falls. 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, coho and chinook salmon.

METHODS

Five-foot rotary screw traps (E.G. Solutions) were installed at sites on Big Butte, South Fork Big Butte, Slate and West Fork Evans Creeks and on the Little Applegate River. These 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. The 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’x4’x8’ box trap at the end of the bypass pipe to intercept fish as they were returned to the stream.

The proposed trapping period for all three sites was March 1 – June 30; however due to high streamflow conditions at the beginning of March, trapping at all sites except the Little Butte trap began either the second or third week of March. The Slate Creek and West Fork Evans Creek traps were removed during the first week of June due to streamflows that were too low to operate the traps. Each trap was operated 7 days per week.

Fish at each trap site were collected from the trap daily, 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 fish over 60 mm was marked with a caudal fin clip; the fin clip alternated between an upper and lower caudal clip each week. 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.

For the subsample of steelhead that were measured, fish over 90 mm in length were given a qualitative designation based on the appearance of characteristics of the smoltification process. Fish that appeared uniformly silvery in color with faded parr marks were classified as “silver”; fish that had partially faded parr marks and had begun to become more silvery in color were classified as “partially silver”. Fish that did not show any of these “smolt-like” characteristics were classified as “not silver”.

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 migrant (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.

The number of migrants passing each trap site during the entire trapping season was estimated by using the overall seasonal trapping efficiency. The total number of fish passing the trap site was also calculated by using weekly efficiency rates to estimate weekly migrant numbers; weekly migrant estimates were then summed to produce a total migrant estimate. When a weekly trapping efficiency could not be used due to the absence of recaptures that week, the overall seasonal efficiency was used to calculate the number of fish migrating past the trap site that week. The estimate (weekly or seasonal) that had the narrowest 95% confidence interval was selected as the “ best” estimate of downstream migrant fish abundance.

Water temperatures were recorded daily at each trap site, and the mean weekly water temperature was calculated for each stream.

TRAP LOCATIONS

Big Butte Creek

The trap site on Big Butte Creek was located approximately 0.25 mile upstream from the confluence of Big Butte Creek and the Rogue River (Figure 1). Big Butte Creek drains an area of approximately 158,000 acres. The upper portion of the watershed (56,434 acres) is owned primarily by the USFS (74%) and private timber companies (18%). The City of Medford owns approximately 5.5% of the upper Big Butte Creek Basin, and the Big Butte Springs supply 26 million gallons of water per day to Medford and surrounding communities (USFS ?) Most of the central portion of the Big Butte Creek watershed (58,054 acres) is owned by private timber companies (43%), USFS (27%), and BLM (26%). The remainder of the central Big Butte Basin is privately owned and is composed primarily of agricultural lands and the town of Butte Falls (BLM 1995a). The 43,813 acres in the lower Big Butte Creek watershed are composed primarily of industrial timberland (42%) and BLM lands (32%); the remaining 26% of the watershed is in private ownership (BLM 1999)

Big Butte Creek and its tributaries support populations of spring chinook salmon, coho salmon and steelhead (summer and winter runs). There are a total of 13 miles of chinook spawning habitat in the mainstem of Big Butte Creek and a small section of the South Fork of Big Butte Creek. Coho spawning and rearing habitat occurs in approximately 18.5 miles of streams in the basin; steelhead spawn and rear in approximately 35 miles of habitat.

Little Butte Creek

The trap on Little Butte Creek was located at RM 5.5 near Eagle Point, Oregon (Figure 2). 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).

Anadromous fish species present in the Little Butte Creek basin include chinook salmon, 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 46 and 84.5 miles of spawning and rearing habitat for coho salmon and steelhead, respectively.

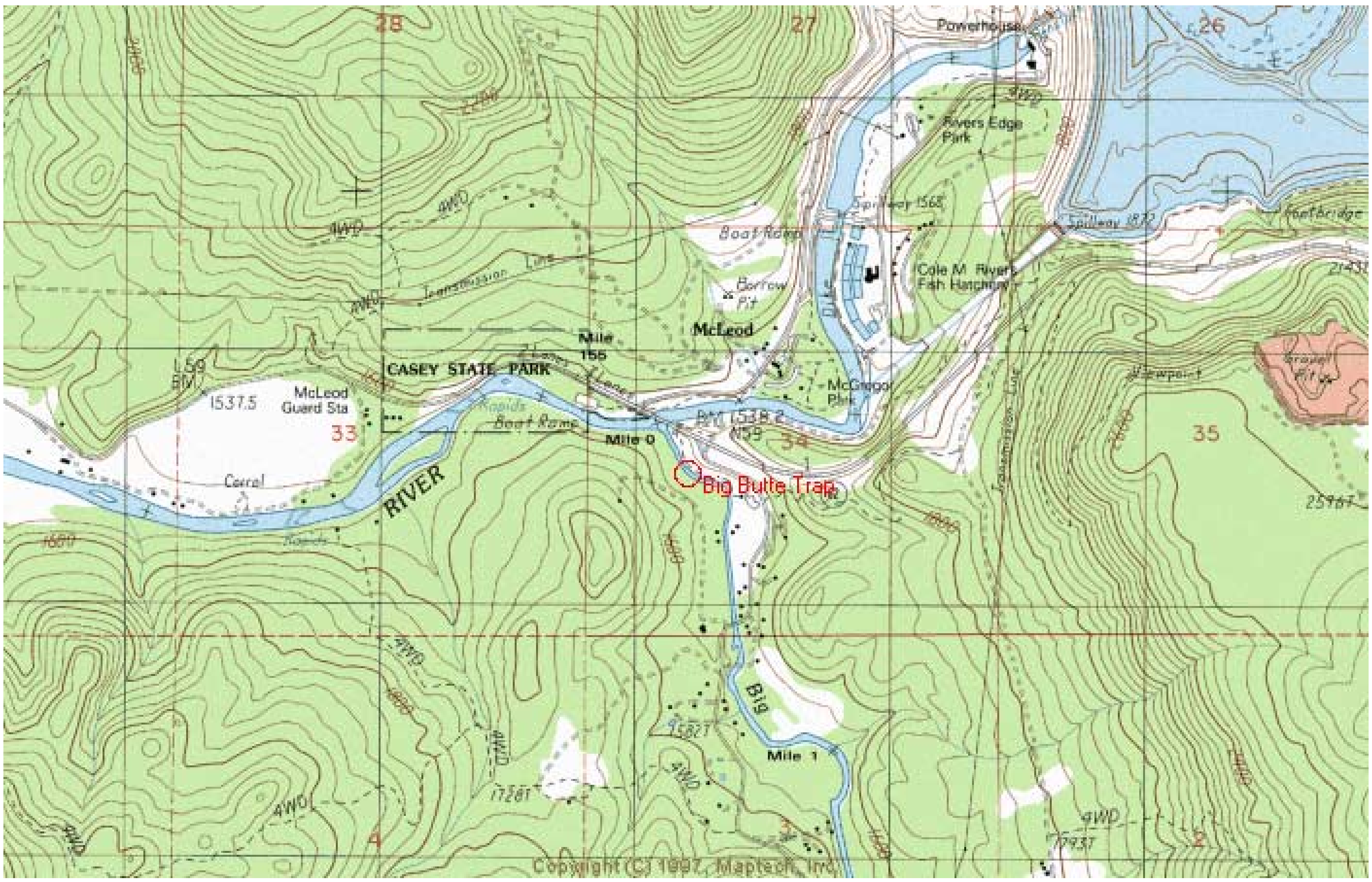

Figure 1. Smolt trap location on Big Butte Creek

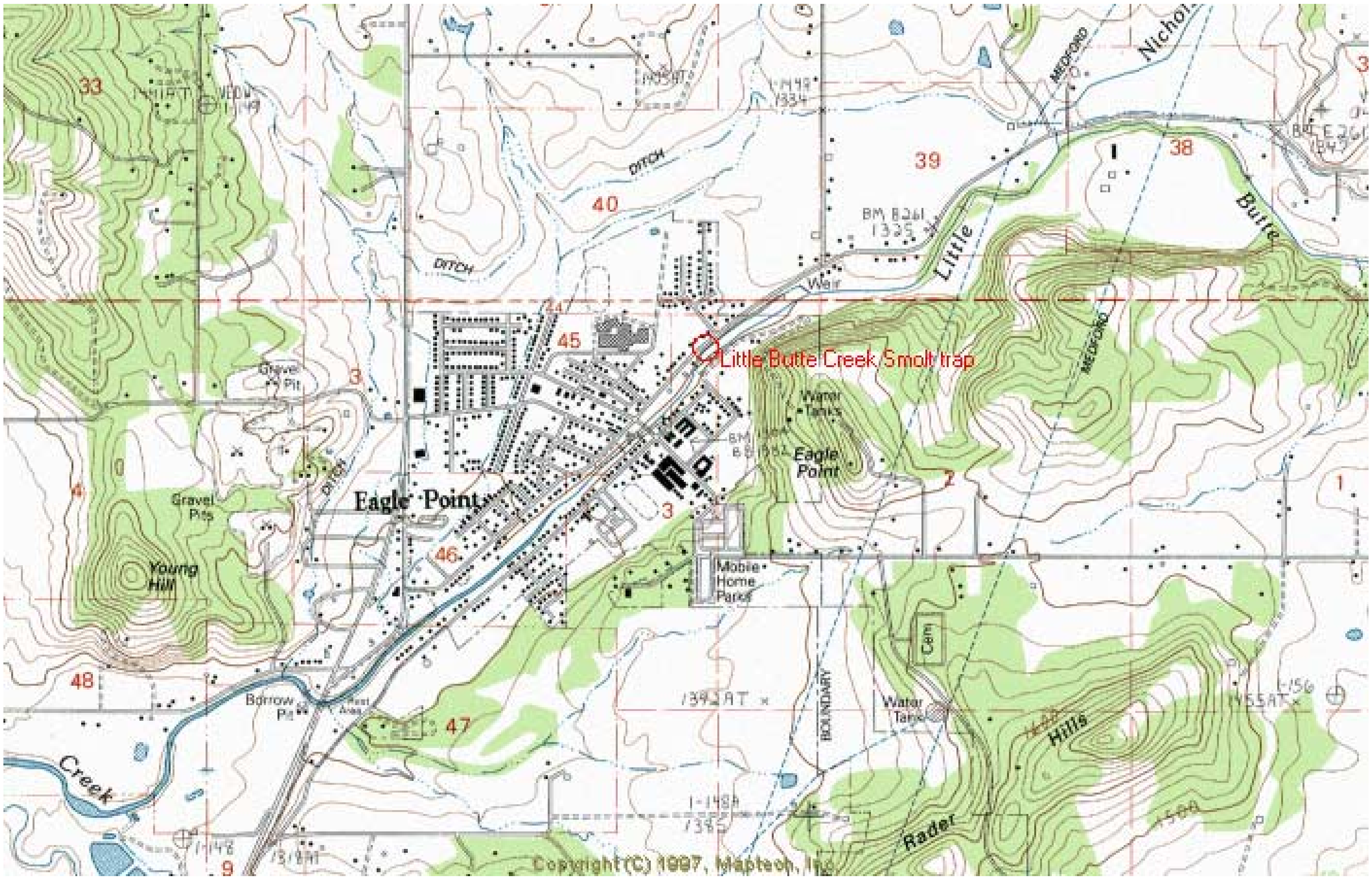

Figure 2. Smolt trap location on Little Butte Creek.

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 1995b). 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 1995b).

Coho salmon, steelhead (summer and winter runs) and cutthroat trout are present in the West Fork Evans Creek basin. There are 18.6 and 25.2 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 3).

South Fork Big Butte Creek

The smolt trap site on South Fork Big Butte Creek was located at approximately RM 2.6 near the town of Butte Falls (Figure 4). A natural waterfall at RM 1.6 is an apparent migration barrier for anadromous fish at most streamflows, although there is anecdotal data that suggest that adult steelhead and possibly coho salmon are able to migrate over the falls at high flows. This trap site was selected to determine the extent of anadromous fish production above these falls. In addition to use by anadromous fish populations, this stream is used by resident cutthroat and rainbow trout. The number of miles of habitat used by coho and steelhead in this stream has not been quantified.

The South Fork Big Butte Creek drains 92,379 acres in the Upper Big Butte Creek basin (USFS 1995, BLM 1995a). Most of this area is in federal ownership (BLM – 8%; USFS – 60%); the remaining lands are owned by timber companies (26%), private landowners (3%) and the Medford Water Commission (3%).

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 21 and 26 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).

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 miles of the Little Applegate River is utilized as spawning and rearing habitat by fall chinook. There are approximately 6 and 36 miles of known spawning and rearing habitat for coho and steelhead, respectively, in the basin. The smolt trap on this stream was located at approximately RM 0.2 (Figure 6).

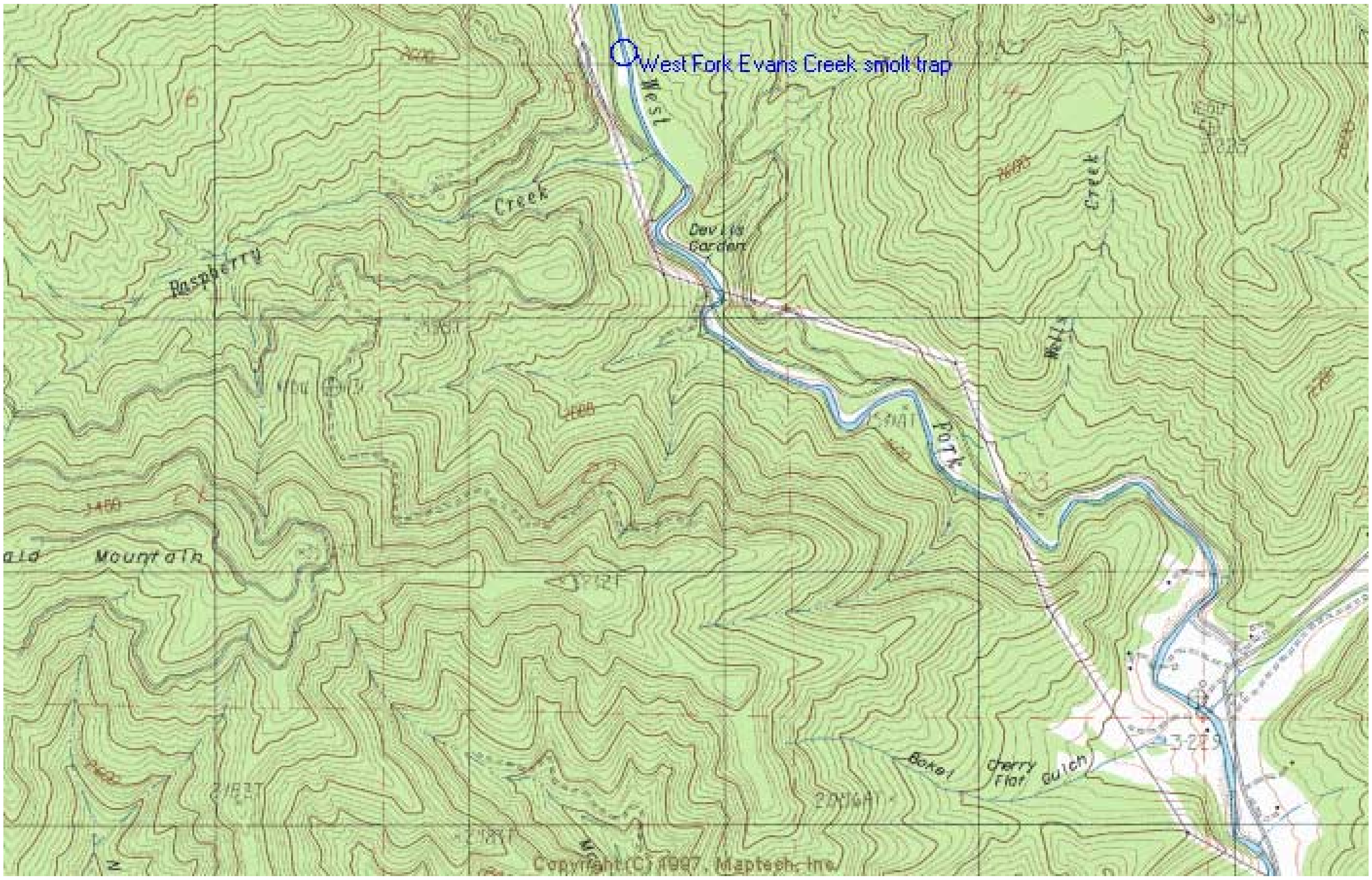

Figure 3. Smolt trap location on West Fork Evans Creek.

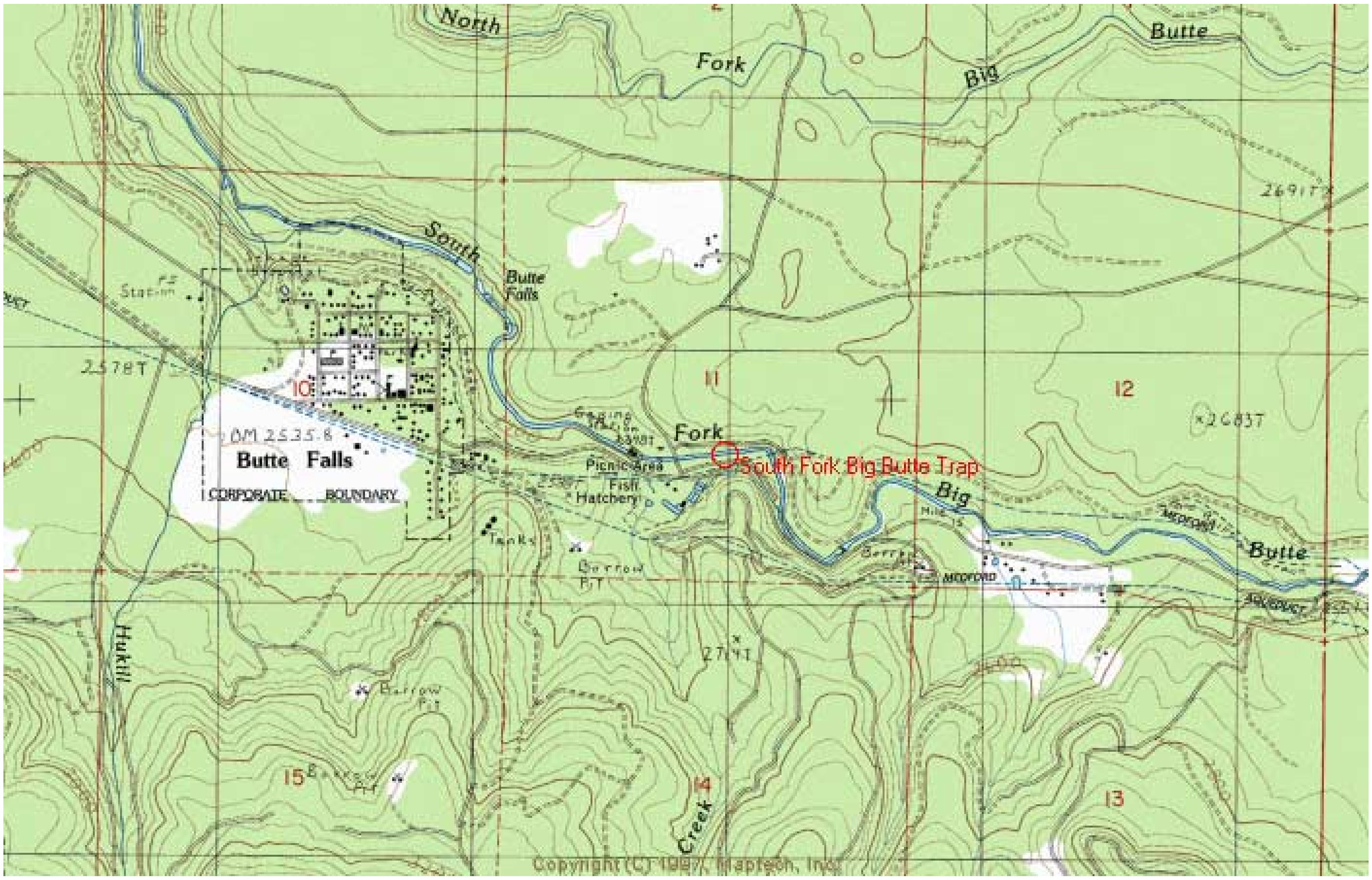

Figure 4. Smolt trap location on South Fork Big Butte Creek.

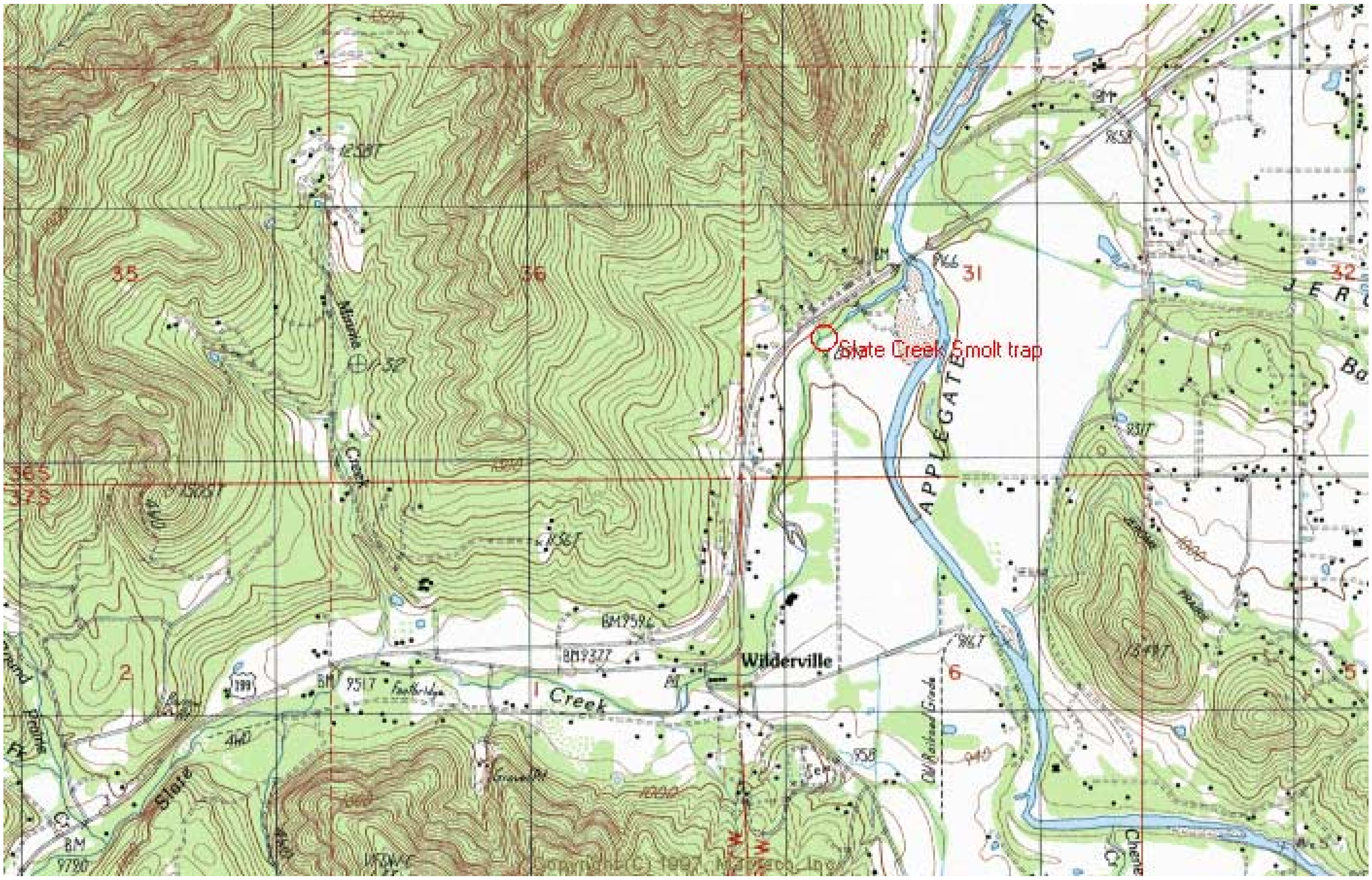

Figure 5. Smolt trap location on Slate Creek.

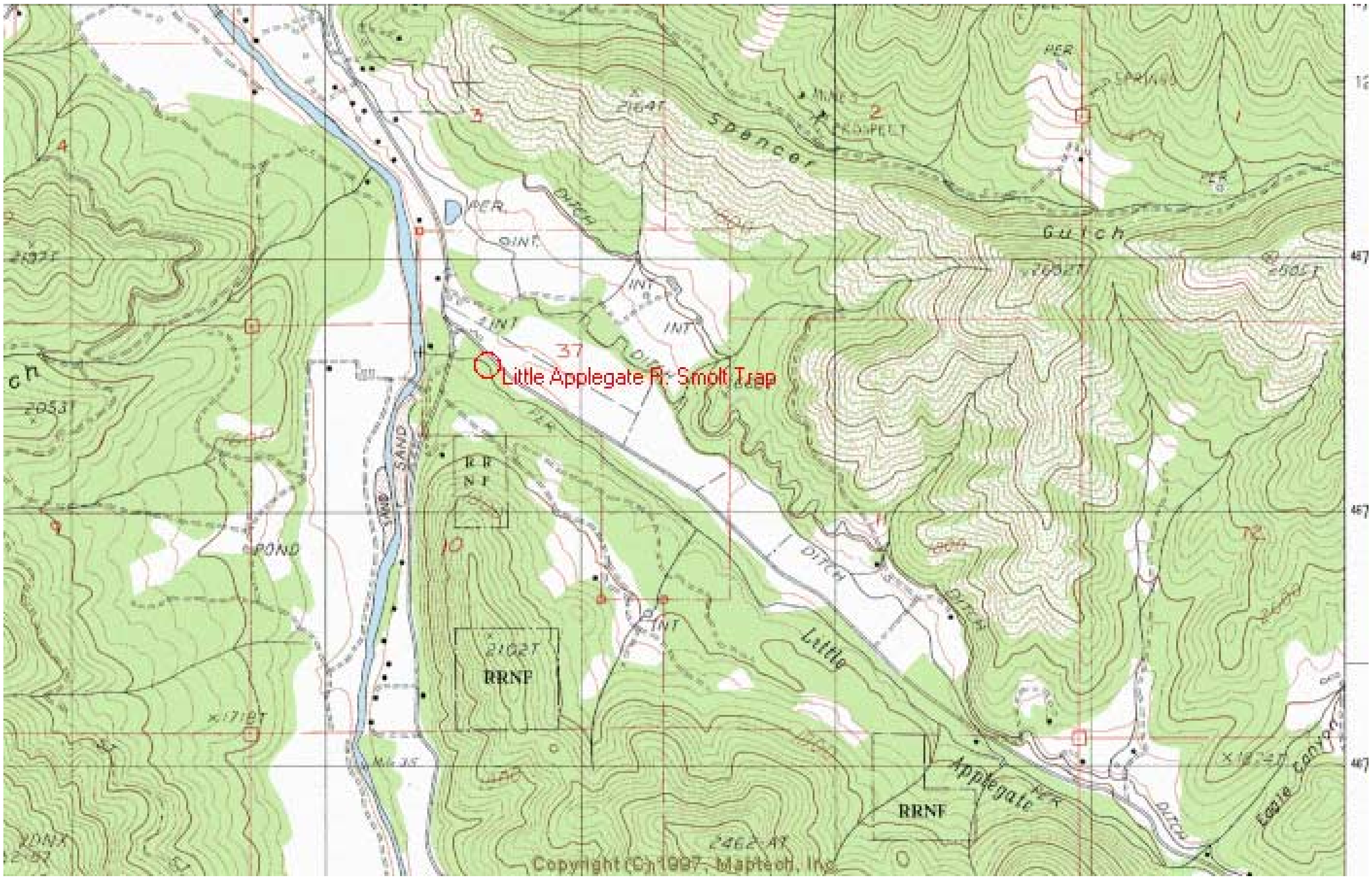

Figure 6. Smolt trap location on Little Applegate River.

RESULTS

Smolt Production Estimates

Trap efficiencies for coho smolts ranged from 0% at the Slate Creek trap to 29% at the West Fork Evans Creek trap (Table 1). Little Butte Creek had the highest estimate of coho smolt production of the six streams sampled. No coho smolts were caught at either the South Fork Big Butte Creek or Little Applegate River traps, and none of the 17 coho smolts caught at the Slate Creek trap were recaptured. Confidence intervals for the Little Butte, Big Butte and West Evans Creek sites were relatively narrow.

Table 1. 1999 coho smolt production estimates for each trap site.

Stream	Dates Trapped	# Days Trapped	# Coho Captured	# Coho Marked	# Coho Recap.	Trapping Effic.	Pop. Est.	95% Confidence Interval
Little Butte	2/28 - 6/27	120	4,445	1,767	291	17 %	26,939	23,942 – 29,936
Big Butte	3/16– 6/27	104	2,316	1,743	321	18 %	12,587	11,204 – 13,969
West Evans	3/8 – 6/2	87	498	484	142	29 %	1,700	1,421 – 1,979
S.Fork Big Butte	3/10– 6/27	110	0	0	0	NA	NA	NA
Little Applegate	3/8 – 6/27	112	0	0	0	NA	NA	NA
Slate	3/11 – 6/2	84	17	17	0	0 %	NA	NA

Coho smolt production estimates in 1999 were much higher at Little Butte and Big Butte Creeks than in 1998 (Table 2). In 1999, trapping efficiency was higher at the Little Butte trap, but dropped slightly at the Big Butte site. The coho smolt estimate for West Evans Creek in 1999 was about 12.5% lower than the 1998 estimate, and trap efficiency for the site was the same for both years.

Table 2. Comparison of 1998 and 1999 coho smolt production estimates and trap efficiencies for Little Butte, Big Butte and West Evans Creek

Stream	1998 Estimate	1998 Trap Efficiency	1999 Estimate	1999 Trap Efficiency
Little Butte	3,531	10 %	26,939	17 %
Big Butte	4,103	21 %	12,587	18 %
West Evans	1,944	29 %	1,700	29 %

The Big Butte Creek trap produced the highest estimate of steelhead smolt production, followed by Little Butte, Slate, Little Applegate and West Fork Evans Creeks (Table 3). While a few steelhead smolts were caught at the South Fork Big Butte trap, no marked fish were recaptured and no estimate could be calculated. Trapping efficiencies for steelhead smolts were highest at West Evans Creek, Little Butte Creek and the Little Applegate. The Big Butte and Slate Creek traps had very low trapping efficiencies, and as a result, the estimates for these streams had very wide confidence intervals. Although the actual number of steelhead smolts caught at Slate Creek was much lower than at the West Evans or Little Applegate traps, the estimate for number of smolts outmigrating was higher at Slate Creek than at those two traps.

Table 3. Steelhead smolt production estimates for Little Butte, Big Butte and West Fork Evans Creeks

Stream	Dates Trapped	# Days Trapped	# St Cap.	# St Marked	# St Recap.	Trapping Effic.	Pop. Est.	95% Confidence Interval
Little Butte	2/28 - 6/27	120	2,689	1,722	297	17 %	15,634	13,885 – 17,383
Big Butte	3/16– 6/27	104	994	930	56	6 %	16,567	11,951 – 21,183
West Evans	3/8 – 6/2	87	158	158	37	23 %	675	447 - 903
S.Fork Big Butte	3/10– 6/27	110	26	25	0	NA	NA	NA
Little Applegate	3/8 – 6/27	112	249	240	36	15 %	1,660	1,066 – 2,254
Slate	3/11 – 6/2	84	48	48	1	2 %	2,286	398 – 4,174

Because the amount of habitat for coho and steelhead differs between stream systems, I compared the production of each species between streams by calculating the estimated number of coho and steelhead smolts per mile of habitat available. On a fish-per-mile basis, Big Butte Creek produced the highest number of smolts of both species, followed by Little Butte Creek (Table 4). This is consistent with the results of the 1998 fish trapping study (Vogt 1998).

Table 4. Comparison of estimated number of coho and steelhead smolts per mile of habitat.

Stream	Coho	Steelhead
Little Butte	585.6	185.0
Big Butte	680.4	473.3
West Evans	91.3	26.7
Little Applegate	NA	46.1
Slate	NA	87.9
South Fork Big Butte	NA	NA

In Little Butte Creek, steelhead smolt numbers were lower in 1999 than in 1998, while Big Butte Creek experienced an increase in steelhead numbers during the same time period. Steelhead smolt numbers for both years were very similar at West Evans Creek, as was trap efficiency (Table 5).

Table 5. Comparison of 1998 and 1999 steelhead smolt production estimates and trap efficiencies for Little Butte, Big Butte and West Evans Creek

Stream	1998 Estimate	1998 Trap Efficiency	1999 Estimate	1999 Trap Efficiency
Little Butte	17,647	16 %	15,634	17 %
Big Butte	12,660	10 %	16,567	6 %
West Evans	735	22 %	675	23 %

Timing of Out-Migration of Smolts

Coho smolt out-migration from Big Butte, Little Butte and West Fork Evans Creeks peaked in mid- to late May (Figure 7). Coho outmigration peaked a second time in Big Butte and Little Butte Creeks in mid-June. On Big Butte and West Evans Creeks, coho smolt outmigration occurred approximately 2 weeks later in 1999 than in 1998 (Vogt 1998). On Little Butte Creek, the first peak in coho outmigration in late May of 1999 is about 1 week earlier than the 1998 peak; however, the second peak in 1999 is about two weeks later than the 1998 peak (Vogt 1998)

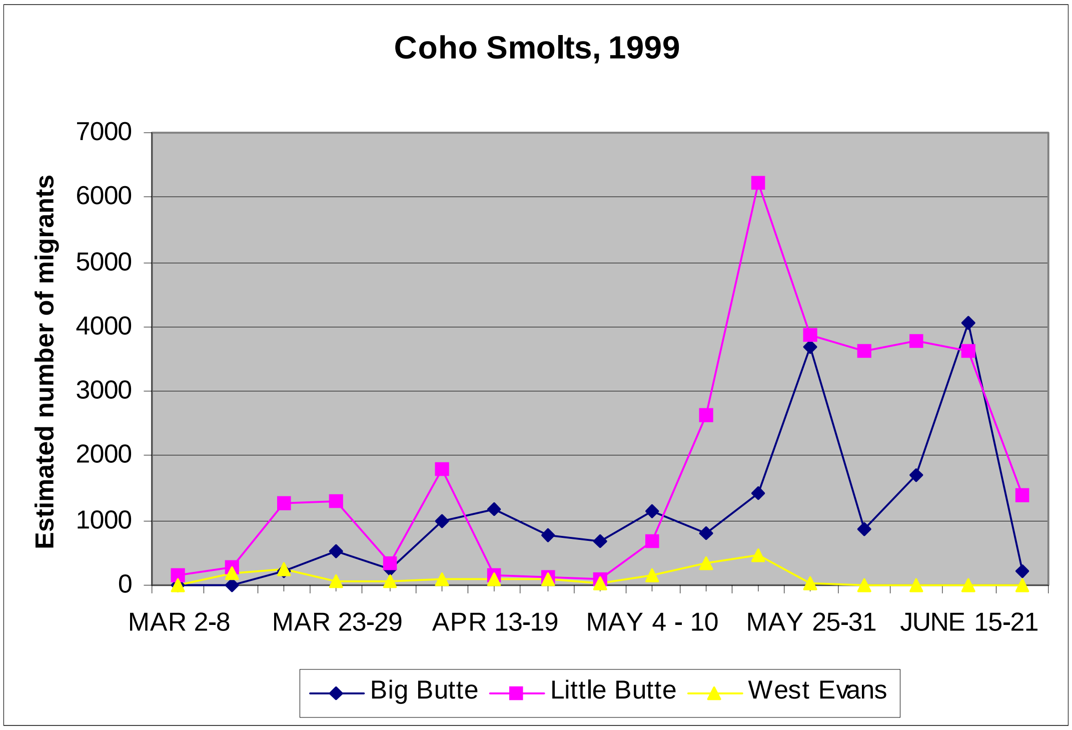

Figure 7. Estimated number of coho smolts out-migrating weekly from Big Butte, Little Butte and West Fork Evans Creeks, 1999

The peak of steelhead smolt out-migration was not well-defined at the West Fork Evans, Little Applegate and Slate Creek sites (Figure 8). Steelhead outmigration appeared to peak on West Fork Evans Creek around the week of May 18^{th}, which is about 2 to 3 weeks later than the peak observed in 1998 (Vogt 1998). However, in 1998, fairly high numbers of steelhead smolts continued to migrate downstream until early June. In Slate Creek the numbers of steelhead outmigrating peaked during the week of April 13^{th} and then dropped off to zero by the week of May 18^{th}. Numbers of steelhead smolts at the Little Applegate site never really peaked, but remained at fairly constant levels throughout the trapping season.

On Big Butte Creek, steelhead smolt out-migration appears to have peaked the week of the 13^{th} of April and again during the week of May 4^{th} (Figure 8). This first peak was actually about one week earlier than the peak of smolt migration observed in 1998 (Vogt 1998). Steelhead smolt numbers then dropped off and remained at low levels until trapping ended. Early in the trapping season, a high percentage of the fish over 120 mm exhibited external characteristics of smolts (i.e. silvery or partially silvery appearance); however, a large percentage of fish over 120 mm captured at the end of the season did not exhibit these external characteristics. A large number of the steelhead over 120 mm caught late in the season may not have been smolts, but may have been steelhead from the previous year class that had grown into that size category during the spring.

Steelhead smolt outmigration in 1999 peaked several times at the Little Butte Creek site (Figure 8), as it had in 1998 (Vogt 1998). The highest number of steelhead smolts migrating past the trap site in 1999 occurred the week of May 18th, which is about 2 weeks later than the main peak of outmigration in 1998. Again, many of the steelhead over 120 mm captured late in the season may not have been smolts; many of these fish did not have characteristics of smolts.

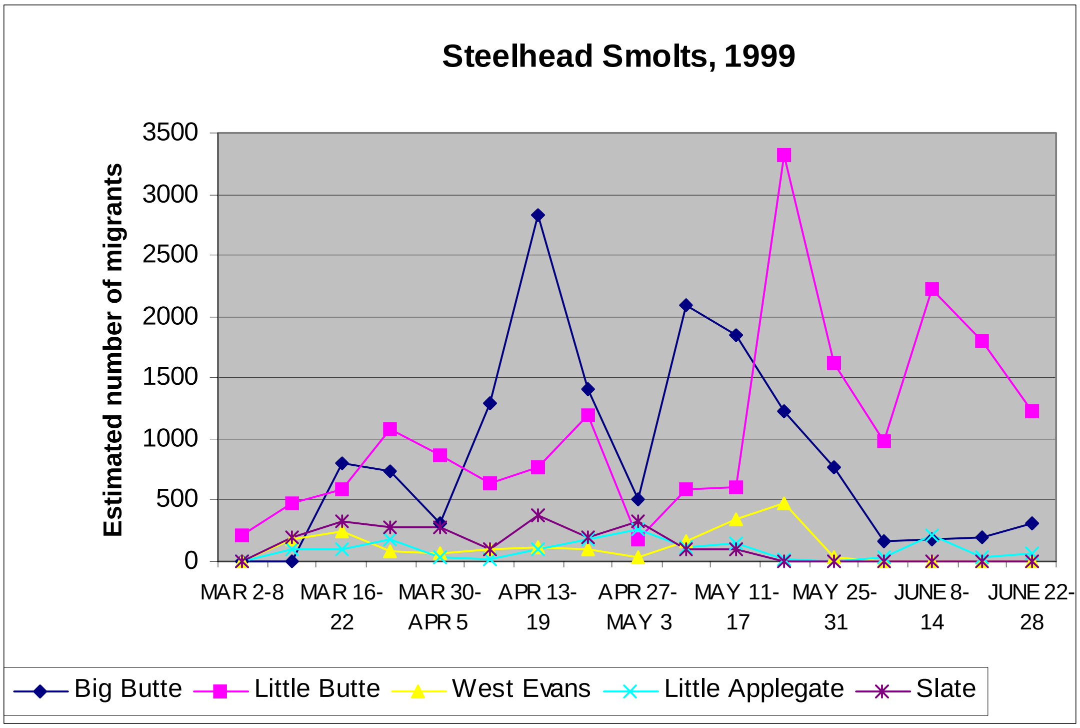

Figure 8. Estimated number of steelhead smolts out-migrating weekly from Big Butte, Little Butte, West Fork Evans and Slate Creeks and the Little Applegate River, 1999

Cooler water temperatures early in the 1999 trapping season may be partially responsible for the later peaks in coho and steelhead smolt outmigration at Big Butte, Little Butte and West Fork Evans Creeks. At each of these sites, coho and steelhead smolt numbers appeared to peak approximately 2 weeks later in 1999 than in 1998. The only exception was steelhead numbers in Big Butte Creek, which seemed to peak about 1 week earlier in 1999 than in 1998. Water temperatures in Big Butte Creek were slightly cooler in 1999 than in 1998 at the beginning of the trapping season, but by mid-April, 1999 water temperatures were higher than in the previous year (Figure 9). This trend was also observed in Little Butte

(Figure 10) and West Fork Evans Creeks, although the differences in water temperature between years appears to be greater for these two streams. In West Fork Evans Creek, water temperatures in 1999 tended to remain lower than in 1998 until mid-May.

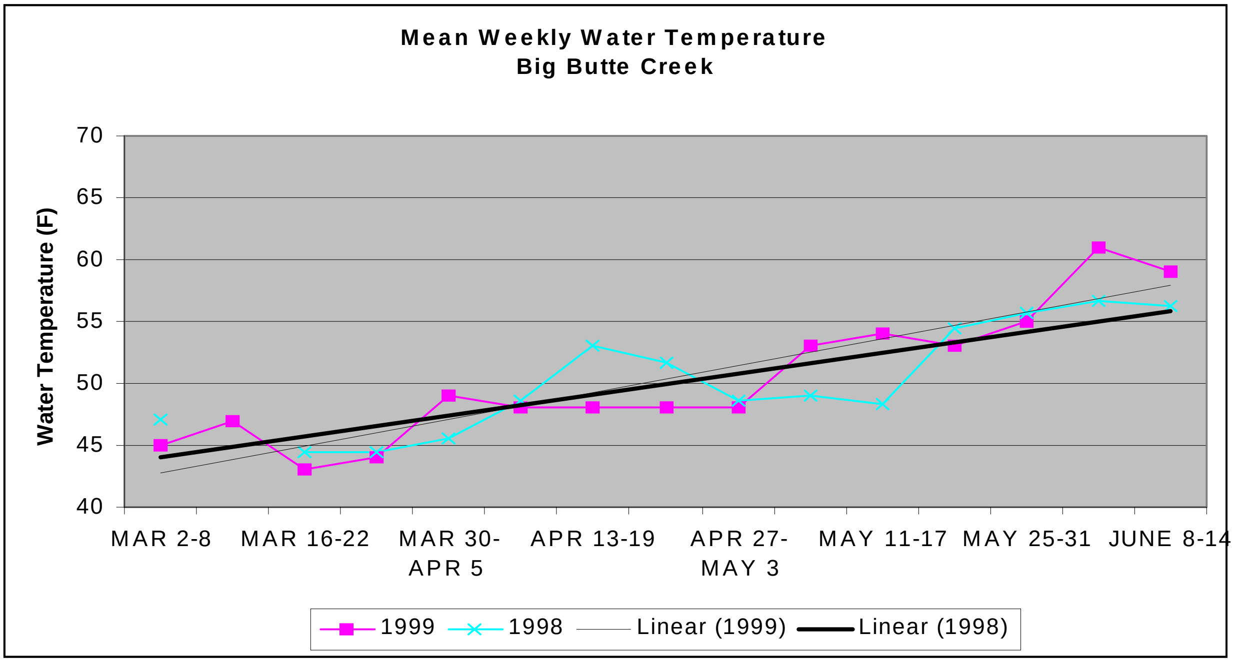

Figure 9. Mean weekly water temperatures in Big Butte Creek in 1998 and 1999.

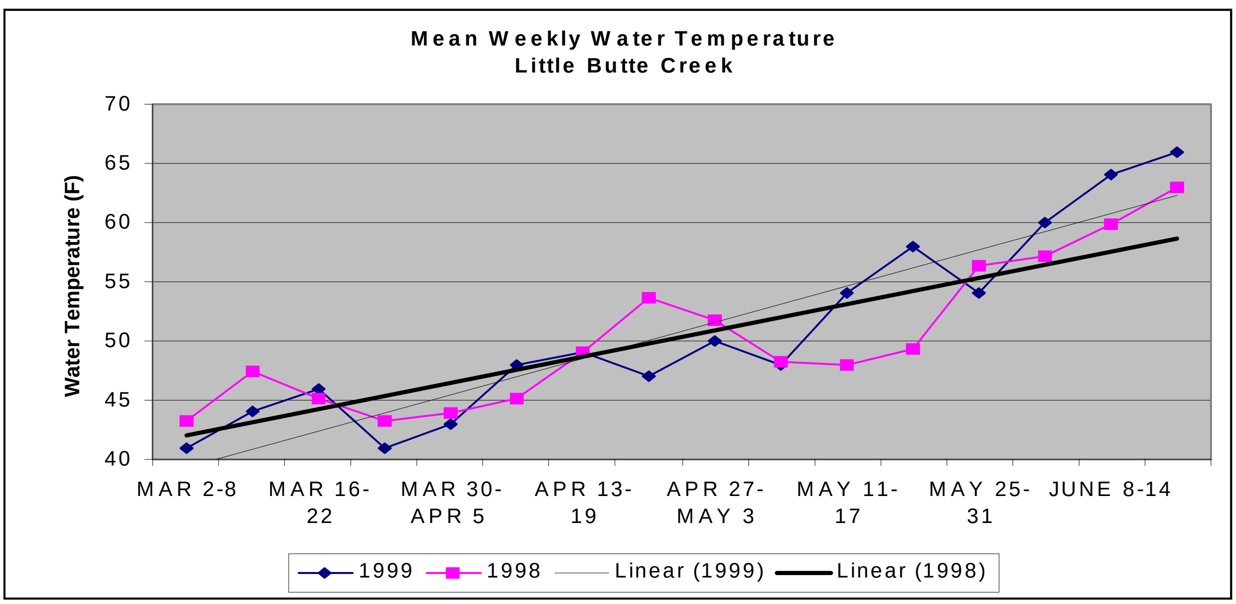

Figure 10. Mean weekly water temperatures in Little Butte Creek in 1998 and 1999.

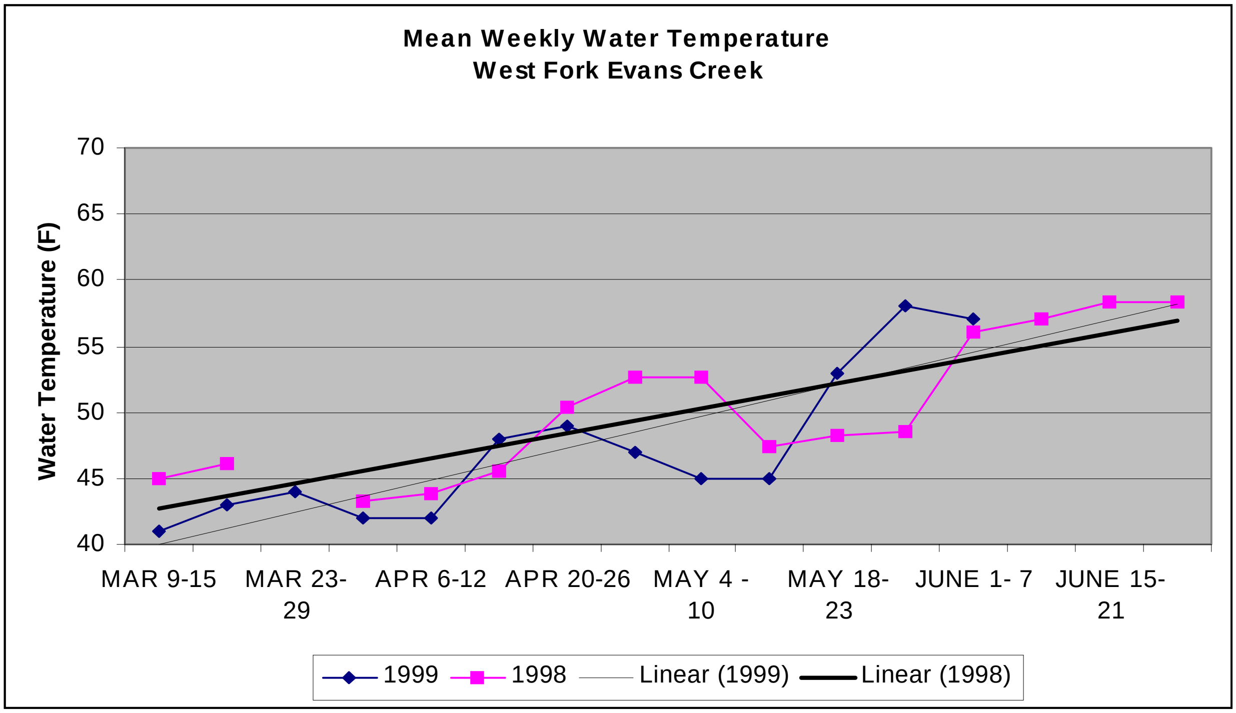

Figure 11. Mean weekly water temperatures in West Fork Evans Creek in 1998 and 1999.

Size of Smolts

Coho smolts captured at the West Fork Evans Creek trap were consistently smaller than those captured from any of the other streams throughout the trapping season (Figure 12). Weekly mean lengths of coho smolts were similar for Big Butte and Little Butte and Slate Creeks. The average length of all coho smolts in West Fork Evans Creek for the entire 1999 season was 86 mm; at Big Butte, Little Butte and Slate Creeks, coho captured during the trapping season averaged 103, 106 and 107 mm, respectively (Table 6). The average lengths of coho smolts was much lower in 1999 than in 1998; cooler water temperatures early in the trapping season may be partly responsible for this trend. Average size of coho smolts may also have been lower in 1999 than in 1998 due to increased competition, since estimates of coho smolt abundance were much higher in 1999.

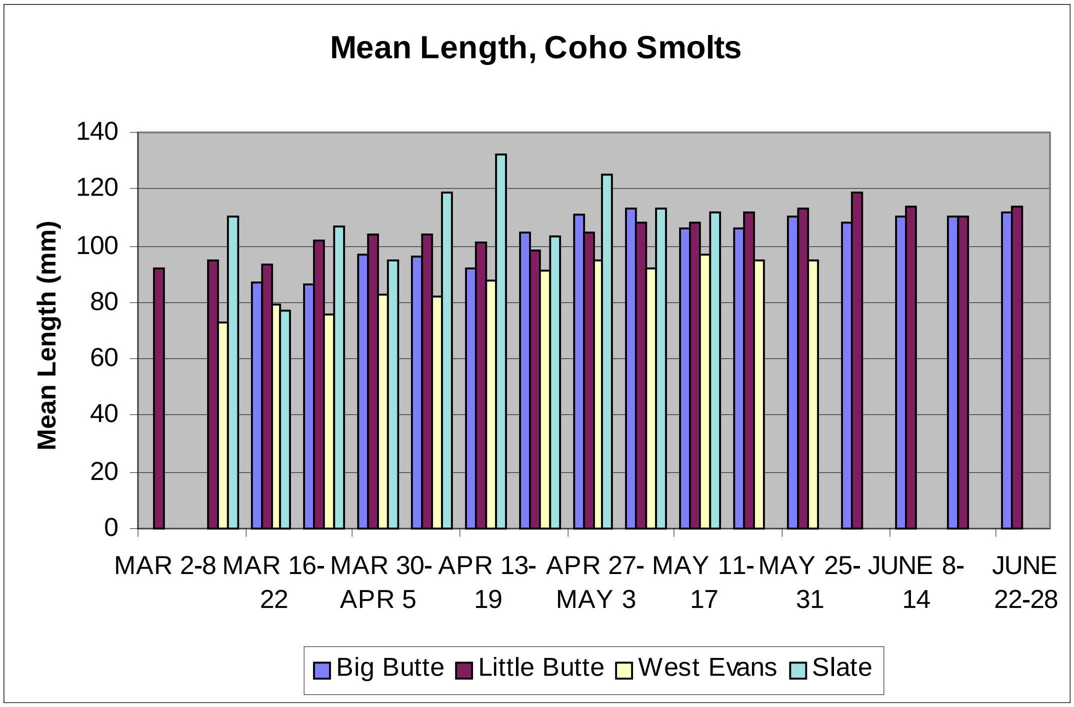

Figure 12. Weekly mean length of coho smolts from Big Butte, Little Butte, West Fork Evans and Slate Creeks, 1999

Table 6. Mean length of coho smolts from Big Butte, Little Butte, West Fork Evans and Slate Creeks in 1998 and 1999

	Mean Length (mm)			
Year	Big Butte Creek	Little Butte Creek	West Evans Creek	Slate Creek
1998	120	116	101	NA
1999	103	106	86	107

Steelhead smolts from Slate and West Fork Evans Creeks were smaller, on average, than those captured at the other three streams (Figure 13). Steelhead smolts from Big Butte and Little Butte Creeks tended to be larger than those from the other streams. For the entire 1999 trapping season, average steelhead smolt lengths ranged from 147 to 164 mm (Table 7). Average steelhead smolt lengths at Little Butte and Big Butte Creeks were very similar in 1998 and 1999, but steelhead lengths in West Fork Evans Creek were much higher in 1999 than in 1998.

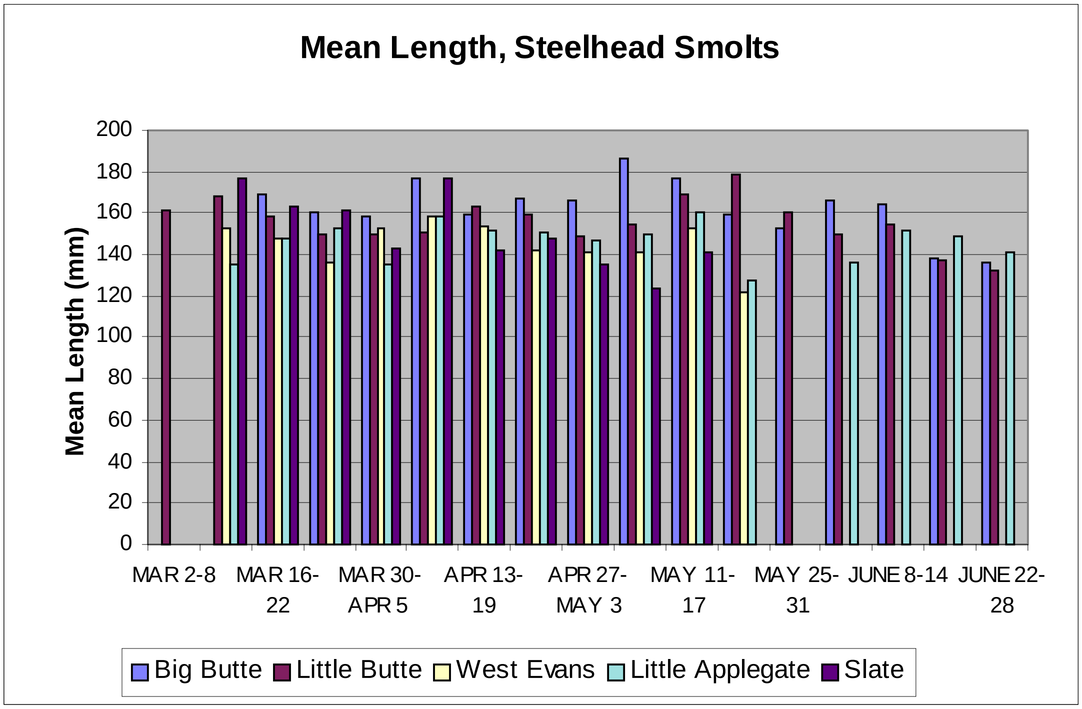

Figure 13. Weekly mean length of steelhead smolts from Big Butte, Little Butte, West Fork Evans and Slate Creeks, and the Little Applegate River, 1999.

Table 7. Mean length of steelhead smolts from Big Butte, Little Butte, West Fork Evans and Slate Creeks and the Little Applegate River in 1998 and 1999

	Mean Length (mm)				
Year	Big Butte Creek	Little Butte Creek	West Evans Creek	Slate Creek	Little Applegate River
1998	165	154	135	NA	NA
1999	164	156	147	151	149

Abundance of Other Species and/or Lifestages

In addition to coho salmon 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 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 sea-ward migration when trapped and were therefore not included in the estimate of smolt production. Chinook salmon, which begin to smolt and migrate to the ocean as 0+ fish, were captured at four of the trap sites and an estimate of chinook smolt production could have been made with the mark-recapture technique used in this study. However, since chinook fry at the beginning of the season were under 60 mm in length, we did not mark them and therefore could not estimate trapping efficiency for those fish. 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. No lamprey ammocetes were identified with the use of a dichotomous key; however, ammocetes were assumed to be Pacific lamprey.

Since mark-recapture estimates were not made for pre-smolt coho and steelhead, chinook salmon, 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 8).

Table 8. Number of each species/lifestage capture in 1999 for which a mark-recapture estimate was not made.

Species/Lifestage	Little Butte	Big Butte	West Evans	Little Applegate	Slate	South Fk. Big Butte
Coho Fry	775	1,163	102	53	14	21
Trout Fry*	6,314	1,302	150	211	28	280
Steelhead (60-89 mm)	1,253	212	212	135	4	67
Steelhead (90-119 mm)	1,998	357	164	186	33	39
Cutthroat trout (60-89 mm)	0	6	2	0	1	4
Cutthroat trout (90-119 mm)	2	10	21	0	11	16
Cutthroat trout (120-159 mm)	29	35	69	0	40	19
Cutthroat trout ($\geq$ 160 mm)	10	7	15	1	15	1
Chinook	2,438	17,537	0	1,805	607	0
Pacific Lamprey (Adult)	0	0	0	0	0	0
Lamprey (Ammocetes)	1,631	131	0	62	21	0

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

DISCUSSION

Trap efficiencies for the original three trap sites (Big Butte, Little Butte and West Fork Evans Creek) were relatively high again in 1999, especially for coho smolts. Trap efficiencies for coho smolts at these sites ranged from 17 – 29%, while efficiencies for steelhead smolts ranged from 6 – 23%. Trap efficiency for steelhead at Big Butte Creek (6%) was lower than in 1998 and the resulting estimate had fairly wide confidence intervals.

Of the three new trap sites added in 1999, coho smolts were only captured at the Slate Creek trap and no marked fish were recaptured. The Slate Creek trap also had very poor capture efficiency for steelhead smolts. Trap catches at Slate Creek were disappointing, since spawning surveys for chinook, coho and steelhead indicate that the Slate Creek subbasin supports large numbers of fish. The low numbers of fish captured at this trap were probably the result of a poor trap site, rather than low numbers of fish in the stream. No coho smolts were caught in the Little Applegate, but trap efficiencies were relatively high (15%) for steelhead smolts. Trap efficiency at the South Fork Big Butte trap was poor for all species, possibly due to a poor trap site. However, unlike the Slate Creek site, low numbers of fish caught at this trap may be an accurate reflection of low fish abundance, since large numbers of adult salmon and steelhead have not been documented above the trap site.

Little Butte Creek produced the highest estimate of coho smolts than any other stream; this estimate was more than twice the number of coho smolts produced in Big Butte Creek, the stream with the next highest production estimate. Big Butte Creek produced the highest number of steelhead smolts, followed by Little Butte Creek and Slate Creek. However, the Slate Creek estimate is relatively poor, due to the low trap efficiency and resulting wide confidence interval. When the number of miles of spawning and rearing habitat in each basin are considered, Big Butte Creek produced the highest number of both coho and steelhead smolts per mile of spawning and rearing habitat. Little Butte produced the second highest number of steelhead and coho smolts per mile of habitat. It should be noted that the number of smolts per mile of habitat could be overestimated for the Little Butte and Big Butte Creek basins, since these basins have not been fully surveyed to determine the exact number of miles of habitat used by each species. However, the Little Applegate, West Fork Evans and Slate Creek basins have been extensively surveyed and the miles of habitat used by each species is considered to be accurate.

Estimates of coho smolt numbers from Little Butte and Big Butte Creeks were much higher in 1999 than in 1998, but were lower in West Fork Evans Creek. Steelhead smolt estimates were lower in Little Butte and West Evans Creeks in 1999, but were higher in Big Butte Creek.

Trapping results on South Fork Big Butte Creek seemed to support the hypothesis that very limited production of anadromous salmonids occurs above the natural falls near the town of Butte Falls. Because a small number of coho fry and steelhead smolts (with visual external smolt characteristics) were caught at this site, we confirmed that some adult coho and steelhead are able to migrate over this waterfall. However, the extremely low number of juvenile coho and steelhead captured suggests that only a few adults successfully spawn above the falls. Given the fact that streamflows during the migration period have been favorable for adult migration the last 2 or 3 years, and that adult coho and steelhead runs have been at or above average over this time period, it appears that the waterfall on South Fork Big Butte is a natural barrier to anadromous salmonids under most flow conditions.

The timing of outmigration of smolts appeared to occur one to two weeks later in 1999 than in 1998. Coho smolts were still being caught at the Little Butte and Big Butte traps in low numbers during the last week of June. While no streamflow data for Little Butte Creek are available, it appeared that streamflows remained higher for extended periods of time on this stream than in the other streams. These higher flows may have influenced the timing of smolt migration from Little Butte Creek. Steelhead smolt outmigration ended earliest on Slate and West Fork Evans Creeks; the end of the migration appeared to coincide with very low streamflows in each stream. Steelhead over 120 mm were still being caught at the Big Butte, Little Butte and Little Applgegate traps at the end of June. However, many of these fish did not appear to be smolts but may have been large juveniles that will smolt next spring. Water temperatures were cooler during the early part of the trapping season in 1999 than in 1998, and this factor may also have contributed to the delayed migration timing. These cooler water temperatures were presumably the result of snow melt early in the spring; the entire Rogue Basin experienced higher than average snowpack during the winter of 1998-99.

The average length of both coho and steelhead smolts was smaller in West Fork Evans Creek than in any of the other streams. Many factors could be responsible for the differences in sizes of fish, including (but not limited to) water temperature, stream productivity, prey density and type, competition, and habitat quality. If the hypothesis that larger smolts tend to have higher survival rates than smaller smolts is true, smolt to adult survival may be higher for fish coming from Slate, Big Butte and Little Butte Creeks than for those from West Fork Evans Creek.

Smolt size differed greatly between years at each of the sites trapped in 1998 and 1999. Coho smolts from West Fork Evans, Big Butte and Little Butte Creeks were all smaller in 1999 than in 1998. On average, coho smolts were 10 to 15 mm shorter in 1999 than in 1998. However, lengths of steelhead smolts at the West Fork Evans Creek averaged 12 mm longer in 1999. Steelhead lengths at Big Butte and Little Butte Creeks were very similar between years.

Each of the three original 1998 trap sites (Little Butte, Big Butte, and West Fork Evans Creeks) continued to produce good estimates of salmonid smolt production in 1999. Of the three new sites added in 1999, the Little Applegate trap was the only site that produced good estimates of fish abundance. Trap efficiency at Slate Creek was much lower than expected, and a new site may be needed if trapping on Slate Creek continues in the future. Low numbers of anadromous fish were captured at the South Fork Big Butte Creek trap, indicating that anadromous fish production above the falls is very low due to this natural migration barrier. However, it may be advisable to continue trapping in this stream for at least one more season, since the status of fish populations cannot be accurately characterized with only one year of data.

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