OREGON DEPARTMENT OF FISH AND WILDLIFE

ROGUE FISH DISTRICT REPORT

TITLE: Upper Rogue Smolt Trapping Project, 2000

STREAM: Big Butte, Little Butte, South Fork Big Butte, Slate and West Fork Evans Creeks and the Little Applegate River

REPORT DATE: August 2000

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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. Trapping at these six sites was continued during the spring of 2000. The objectives of this project were to 1) obtain an estimate of the production of coho salmon (*Oncorhynchus kisutch*) 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. 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 (*O. tshawytscha*).

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 trapping period for all six sites was March 1 – June 30. However, the Slate 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. The remaining four traps were removed between June 14 and June 21 due to low streamflows and extremely low catches of steelhead and coho smolts. Each trap was operated 7 days per week. Due to high water during storm events, each of the smolt traps were disabled for short periods of time during the trapping season.

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. 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 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.

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.

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 1995). 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 native populations of spring chinook salmon, coho salmon, steelhead (summer and winter runs) and cutthroat trout (*O. clarki*). 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.

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 1). A natural waterfall at RM 1.6 is an apparent migration barrier for anadromous fish at most streamflows. There are anecdotal data that suggest that adult steelhead and 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%).

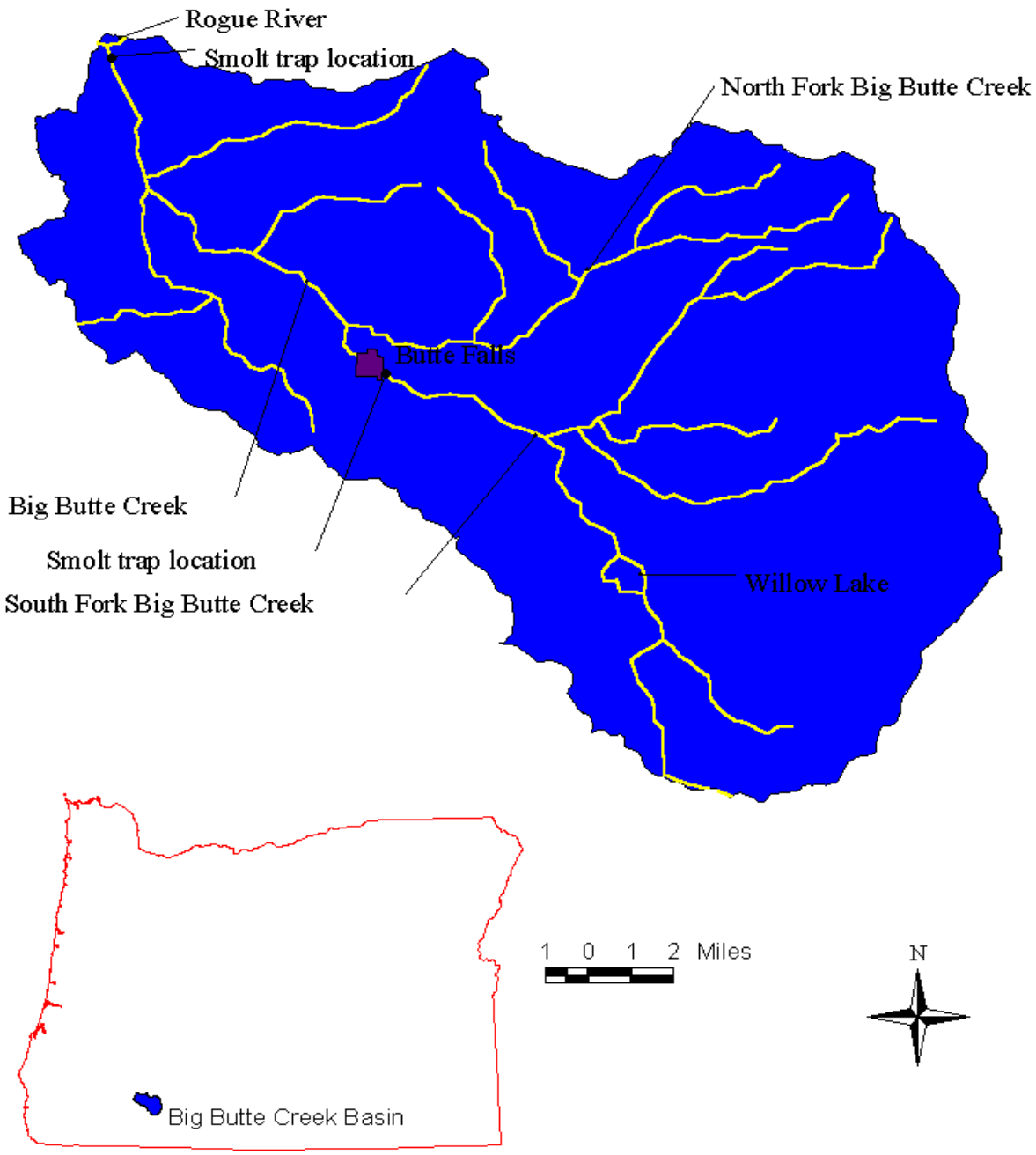

Figure 1. Smolt trap locations on Big Butte and South Fork Big Butte Creeks.

Little Butte Creek

The Little Butte Creek trap 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.

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).

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 4)

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).

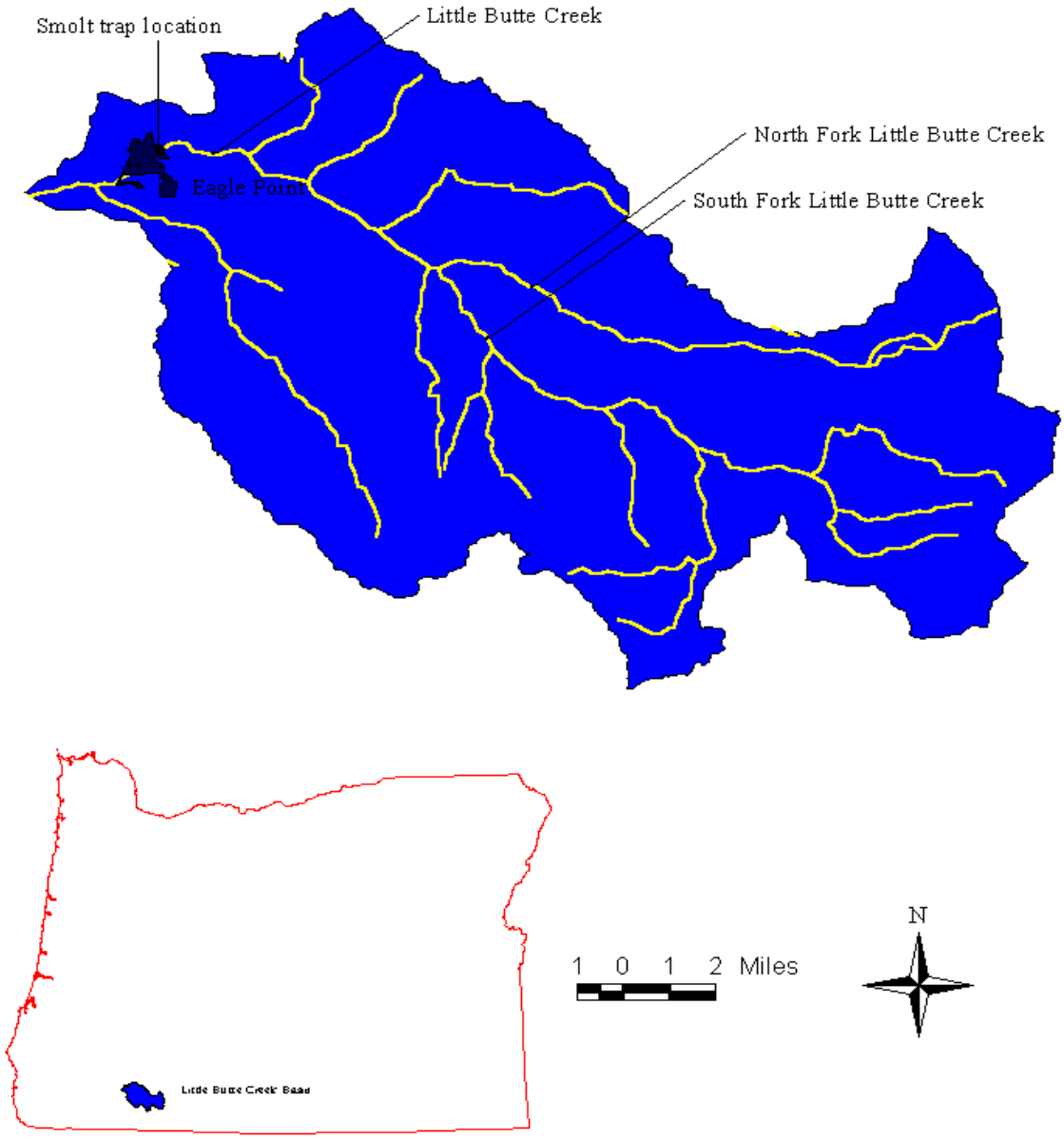

Figure 2. Smolt trap location on Little Butte Creek

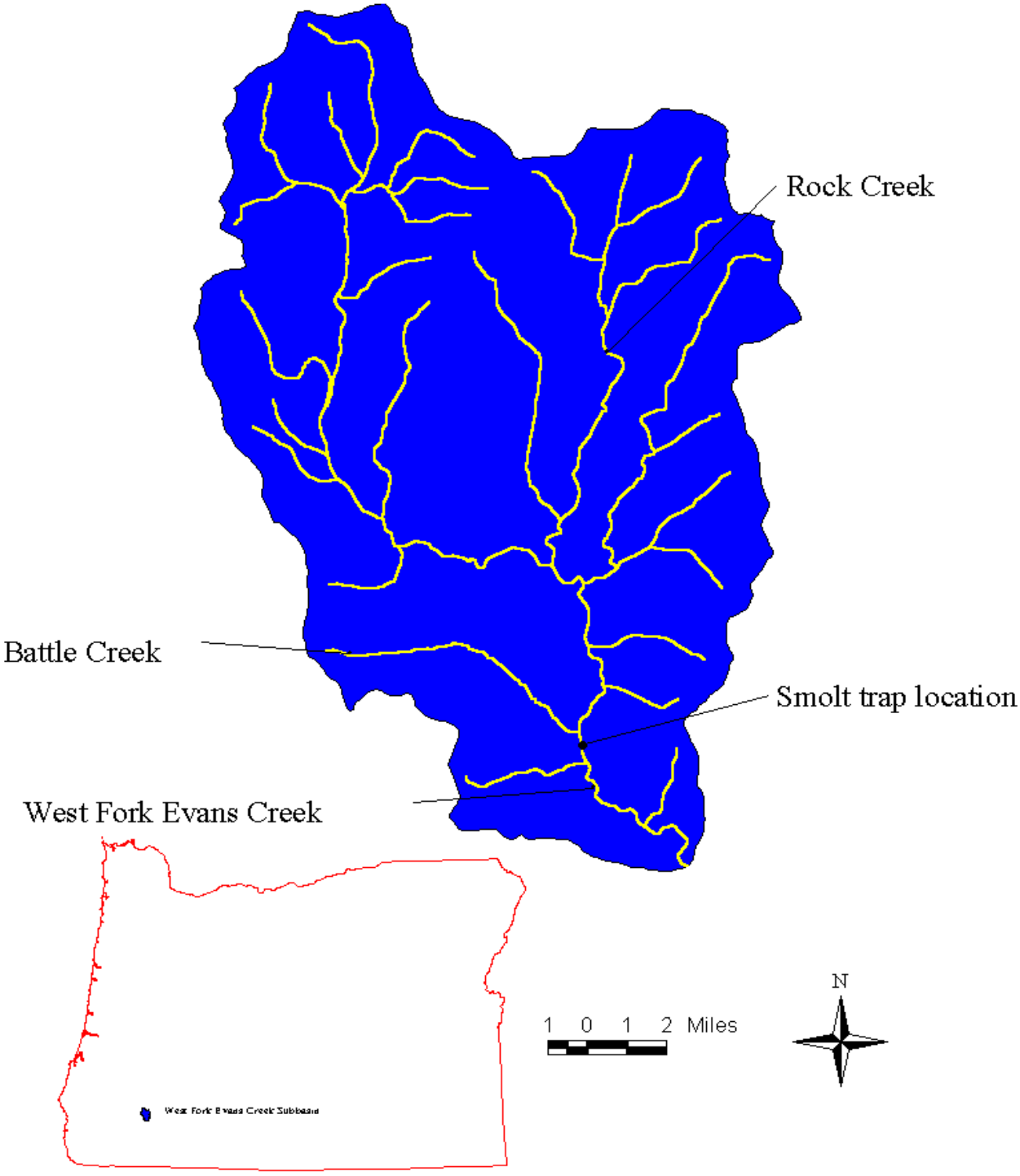

Figure 3. Smolt trap location on West Fork Evans Creek.

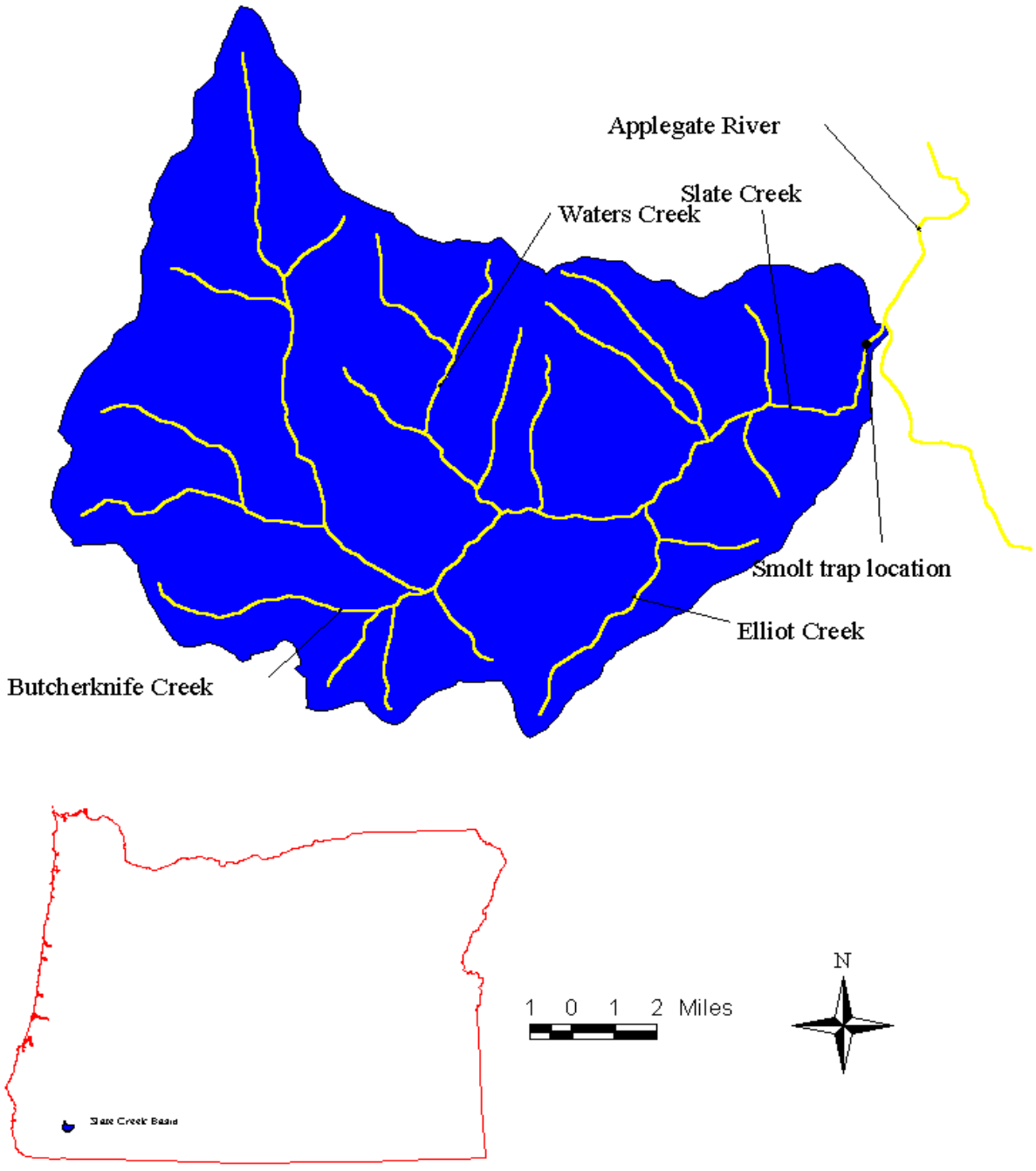

Figure 4. Smolt trap location on Slate Creek.

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 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 5).

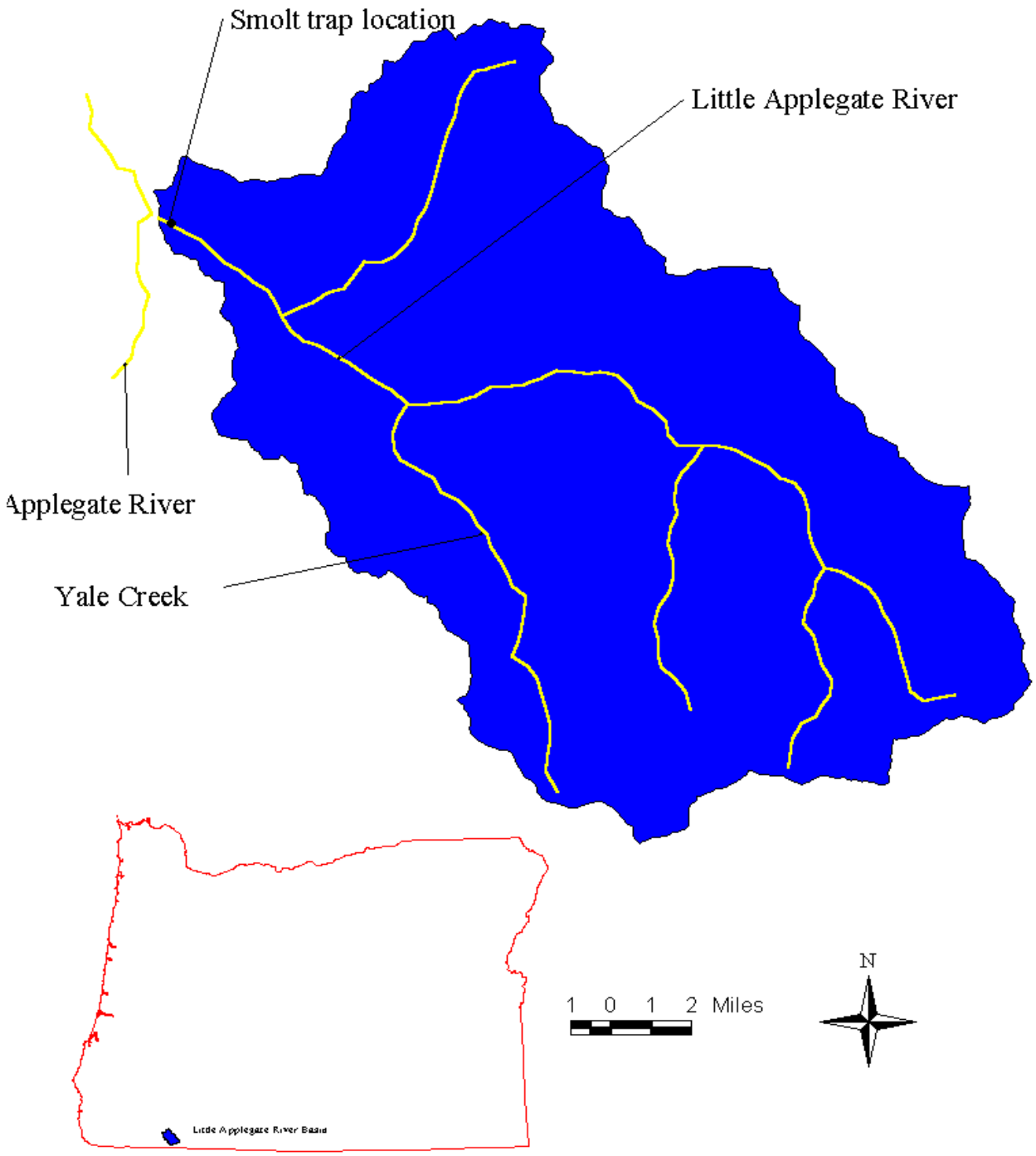

Figure 5. Smolt trap location on the Little Applegate River.

RESULTS

Smolt Production Estimates

Trap efficiencies for coho smolts ranged from 0% at the South Fork Big Butte Creek trap to 28% at the Little Butte Creek trap (Table 1). Big Butte Creek had the highest estimate of coho smolt production of the six streams sampled. None of the 37 coho smolts caught at the South Fork Big Butte Creek trap were recaptured; as a result, no population estimate could be calculated for this stream. Confidence intervals for the Little Butte, Big Butte and Slate Creek sites were relatively narrow. Population estimates for the other three sites were poor due to the low number of recaptured fish.

Table 1. 2000 coho smolt production 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 - 6/21	107	3,184	1,524	433	28 %	11,211	10,209 – 12,213
Big Butte	3/1– 6/21	110	3,381	1,954	466	24 %	14,206	12,932 – 15,479
West Evans	3/1 – 6/7	99	111	111	3	3 %	4,111	-3,294 – 11,516
S.Fork Big Butte	3/1– 6/14	106	37	37	0	0	NA	NA
Little Applegate	3/1 – 6/21	109	8	8	2	25 %	32	-16 – 80
Slate	3/1 – 6/1	90	277	275	27	10 %	2,827	1,668 – 3,986

Coho smolt production estimates tended to be higher at each site in 2000 than in previous years, with the exception of Little Butte and West Fork Evans Creeks (Fig. 6). The coho smolt estimate was higher at West Evans Creek in 2000 than in 1998 or 1999, but low trap efficiency led to extremely wide confidence intervals about the 2000 estimate and the 2000 data should not included in between-year comparisons at this trap site.

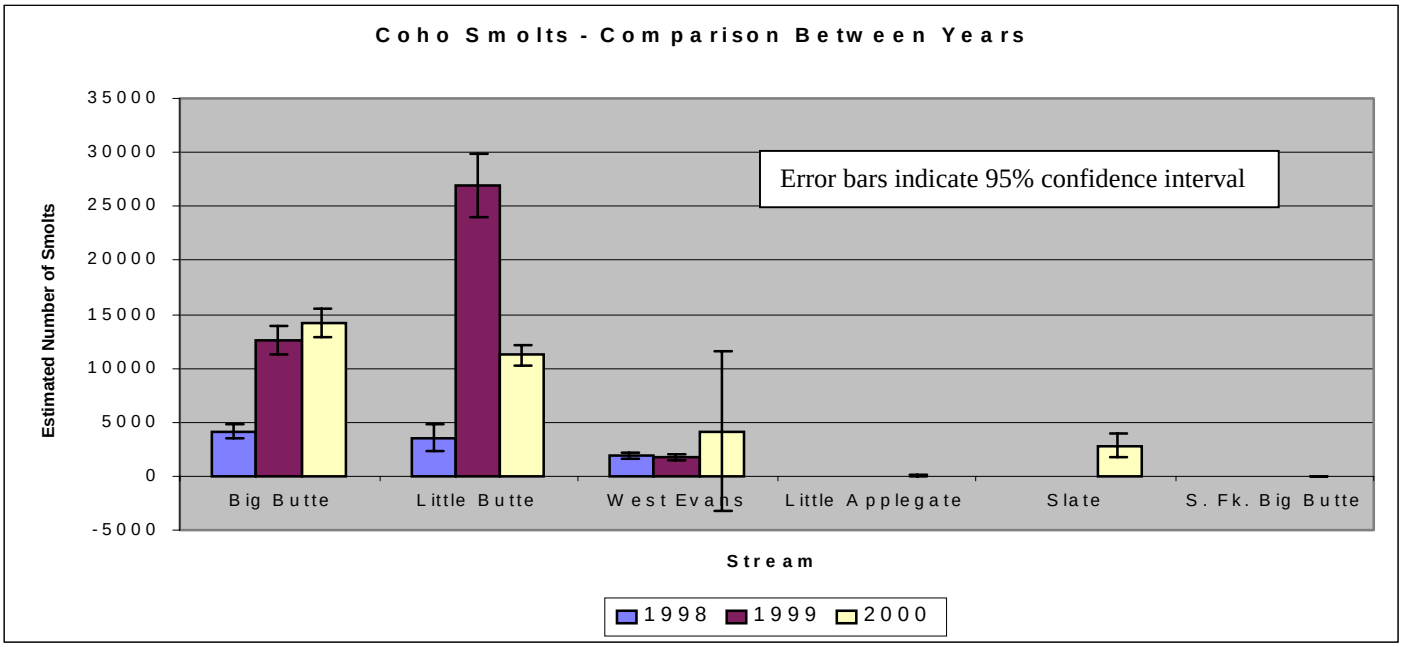

Figure 6. Between-year comparison of coho smolt estimates at each trap site (1998-2000).

Although the coho smolt estimates were lower at Little Butte Creek in 2000 than in 1999, the overall trend for the 1998-2000 seasons is an increase in smolt numbers.

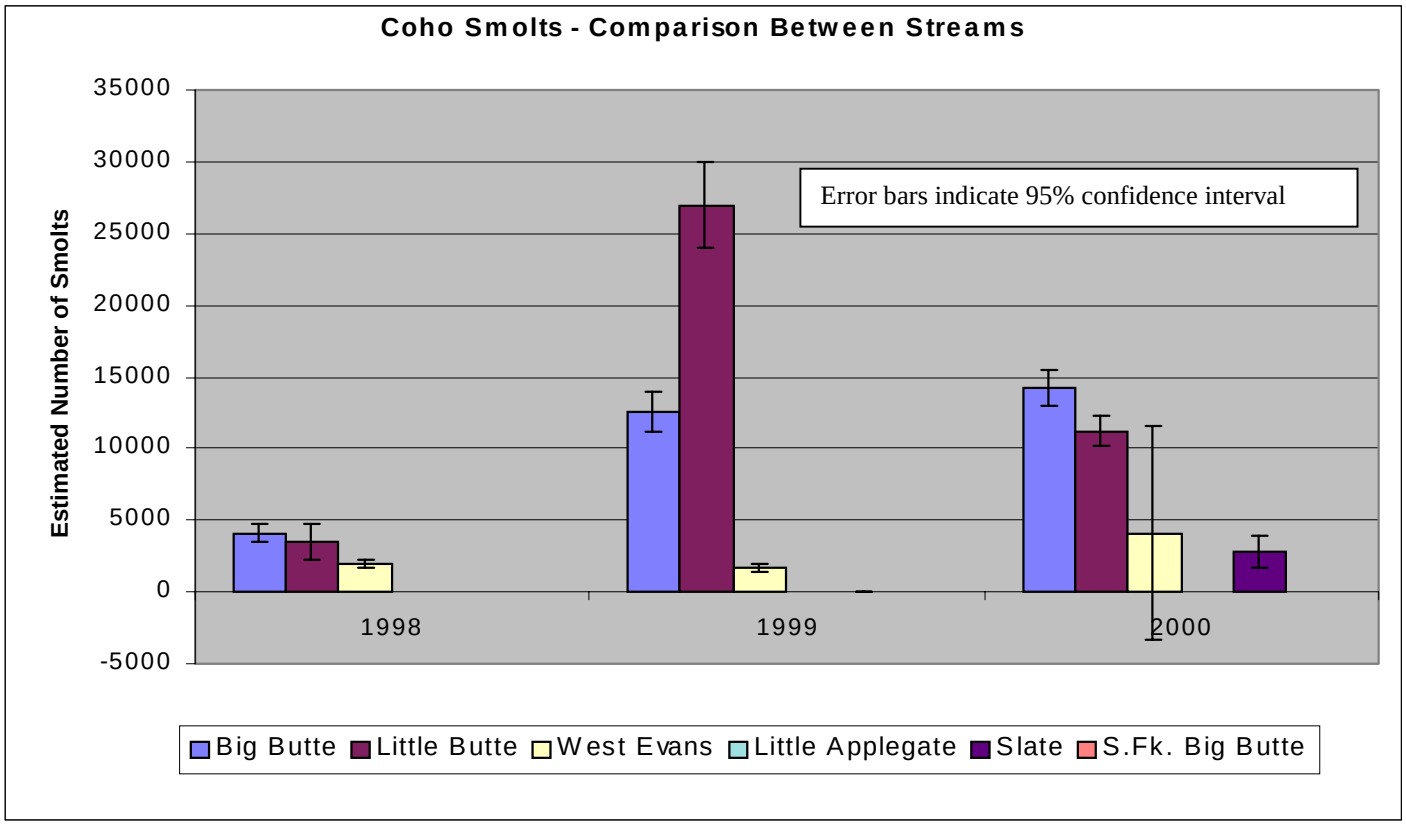

Figure 7. Between-stream comparison of coho smolt estimates (1998-2000).

Big Butte and Little Butte Creeks consistently produced the highest estimate of coho smolts during the 3 years of trapping (Figure 7). The Little Applegate River and West Fork Evans and Slate Creeks produced much lower numbers of coho smolts than did Big Butte or Little Butte Creeks. In 2000, coho smolts were captured at South Fork Big Butte Creek, but no estimate was possible due to the absence of recaptures at this site.

Steelhead smolt estimates exhibited an increasing trend over the 2-3 years of trapping at each site (Figure 8). Steelhead smolt estimates were higher in 2000 than in previous years at every site except Big Butte Creek. Due to the poor estimate and wide confidence intervals for the estimate at West Fork Evans Creek in 2000, it is not possible to determine if steelhead smolt numbers were significantly higher than in previous years.

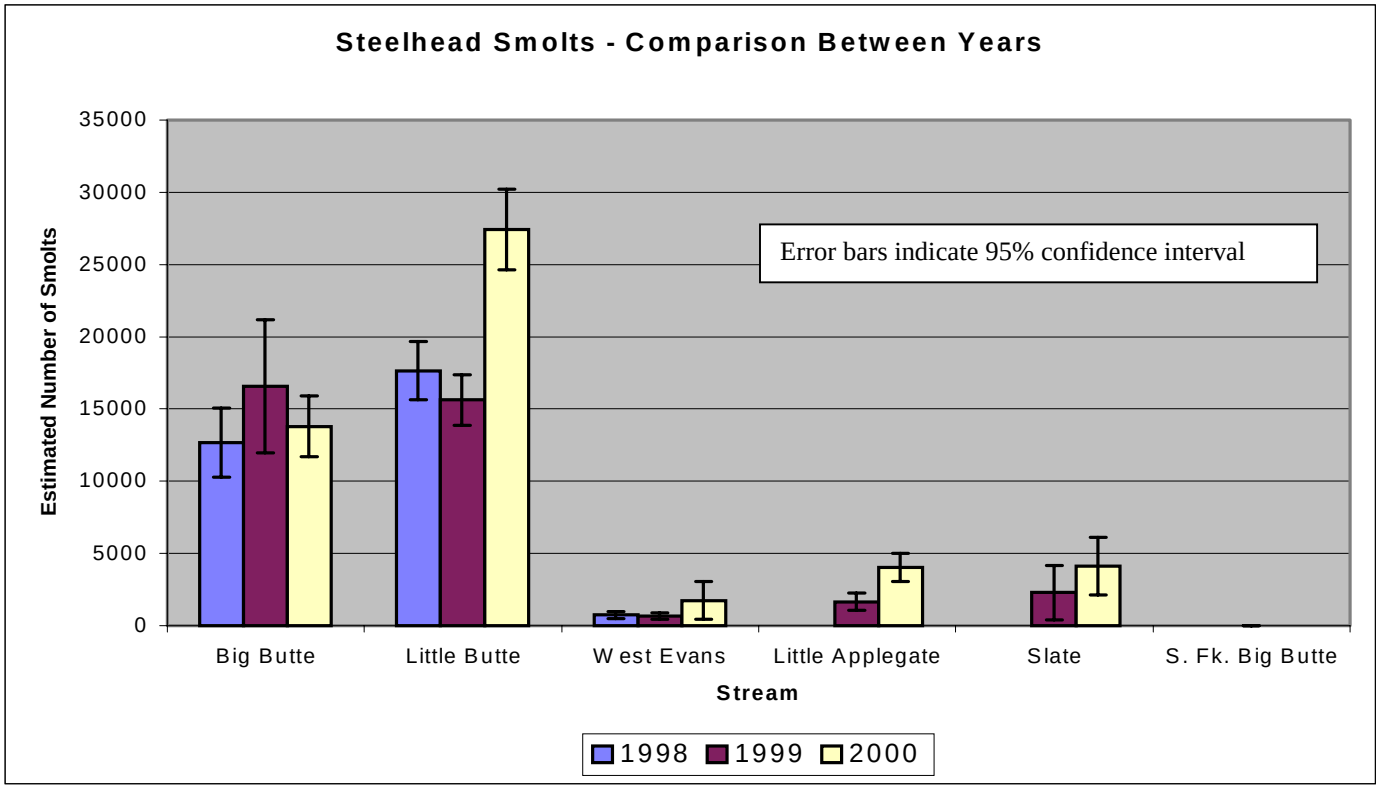

Figure 8. Between-year comparison of steelhead smolt estimates at each trap site (1998-2000).

Of the six streams in this study, Little Butte Creek produced the highest number of steelhead smolts in 2000 (Table 2). During the three years of this project, Little Butte and Big Butte Creeks consistently produced higher numbers of steelhead smolts than did the other streams (Figure 9). Trapping efficiencies for steelhead smolts were highest at Little Butte and Big Butte Creek and the Little Applegate River. The West Evans Creek trap had very low trapping efficiency, and as a result, the estimate for that stream had very wide confidence intervals. 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.

Table 2. 2000 steelhead smolt production 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 - 6/21	107	4,964	1,930	349	18 %	27,425	24,646 – 30,204
Big Butte	3/1– 6/21	110	1,669	1,423	172	12 %	13,793	11,680 – 15,906
West Evans	3/1 – 6/7	99	42	42	1	2 %	1,750	439 – 3,061
S.Fk Big Butte	3/1– 6/14	106	32	27	0	0	NA	NA
Little Applegate	3/1 – 6/21	109	543	524	70	13 %	4,052	3,076 – 5,028
Slate	3/1 – 6/1	90	321	320	25	8 %	4,115	2,134 – 6,096

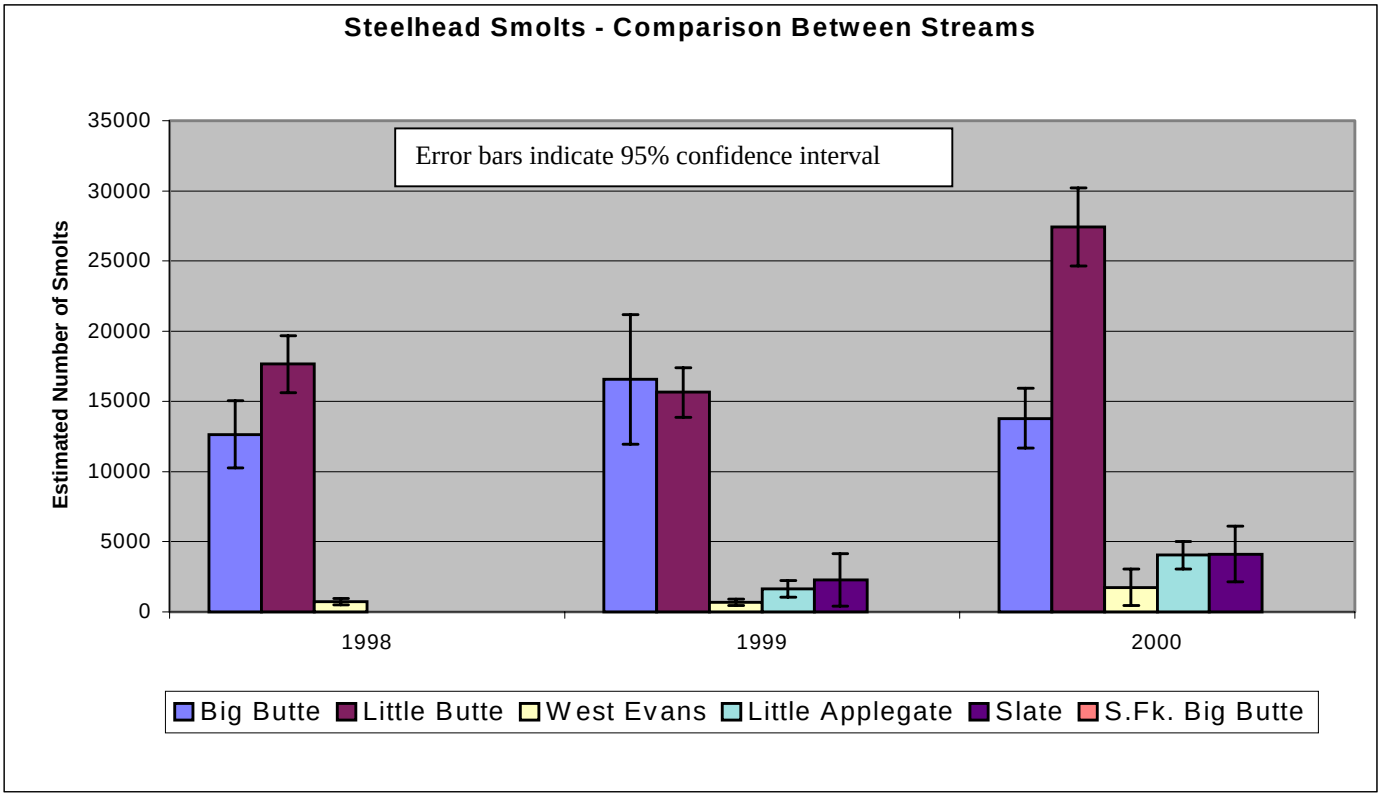

Figure 9. Between-stream comparison of steelhead smolt estimates (1998-2000).

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 3). This is consistent with the results of the 1998 (Vogt 1998) and 1999 (Vogt 1999) fish trapping studies.

Table 3.
Comparison of estimated number of coho and steelhead smolts per mile of habitat.

Stream	Coho	Steelhead
Little Butte	243.7	324.5
Big Butte	767.9	394.1
West Evans	221.0	69.4
Little Applegate	5.3	112.6
Slate	134.6	158.3
South Fork Big Butte	NA	NA

Timing of Out-Migration of Smolts

Coho smolt out-migration from Big Butte, and Slate Creeks peaked in late April, while the peak outmigration from Little Butte and West Evans Creeks occurred in early May (Figure 10). No peak in coho smolt outmigration was detected on the Little Applegate River, since weekly numbers of fish were low throughout the season. In general, peak outmigration by coho smolts occurred 2-3 weeks earlier in 2000 than in 1999.

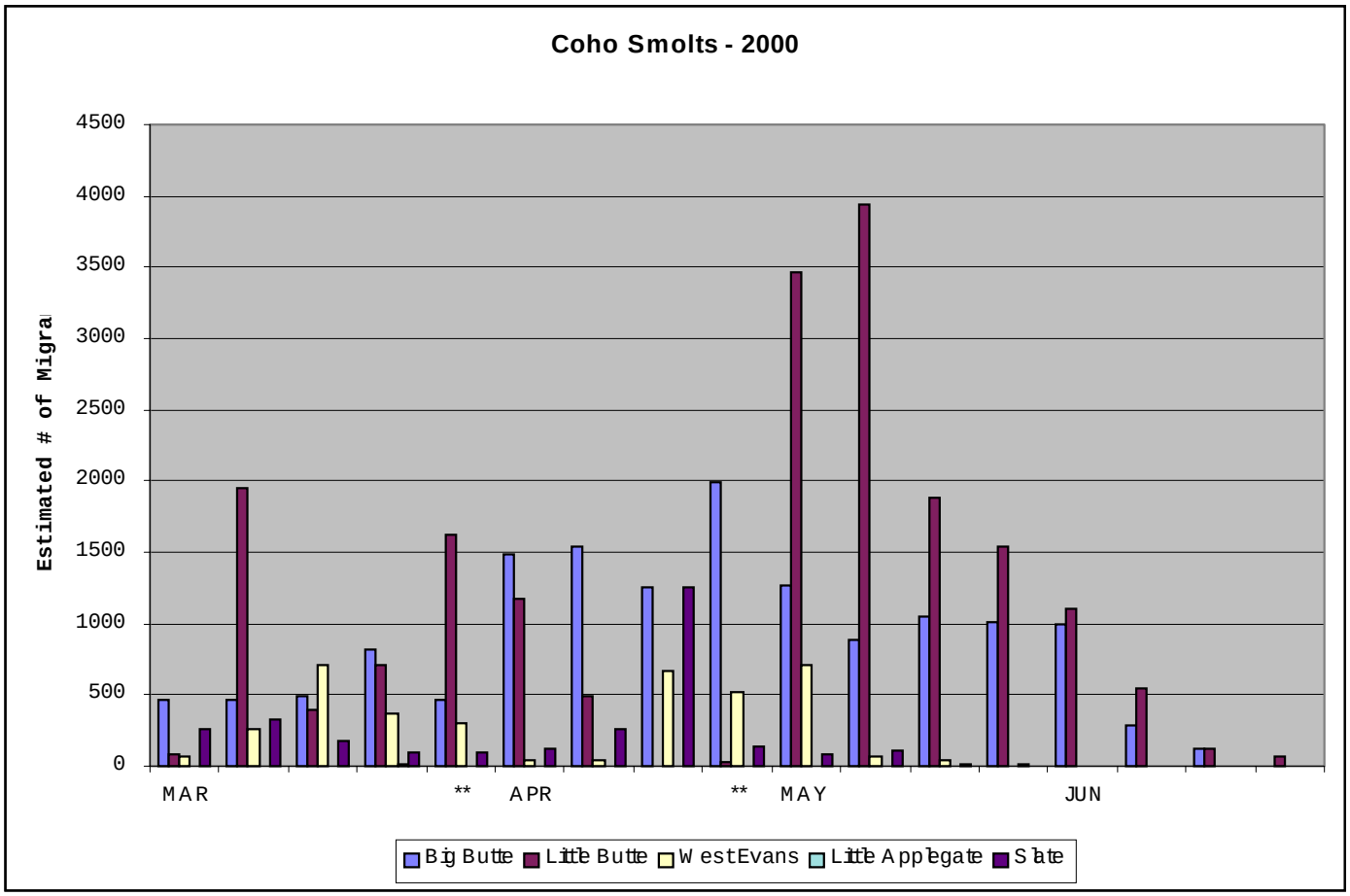

Figure 10. Estimated number of coho smolts out-migrating weekly from Big Butte, Little Butte, West Fork Evans and Slate Creeks and the Little Applegate River, 2000

With the exception of Big Butte Creek, steelhead smolt out-migration occurred earlier in 2000 than in 1999. Steelhead smolt estimates for Big Butte Creek peaked in mid-April (Figure 11) as they did in 1999 (Vogt 1999). Steelhead outmigration in Little Butte Creek peaked in early May in 2000, which was approximately one week earlier than in 1999. In 2000, steelhead estimates for Slate Creek and the Little Applegate River peaked in early April; this peak was about four weeks earlier than the 1999 peak for the Little Applegate and about two weeks earlier than the 1999 peak for Slate Creek. The 2000 peak of steelhead smolt outmigration from West Fork Evans Creek, which occurred in early March, was drastically different from the 1999 peak, which occurred in early May. One possible explanation for the early outmigration of smolts from West Fork Evans Creek was the low streamflows that occurred in the stream throughout the trapping season.

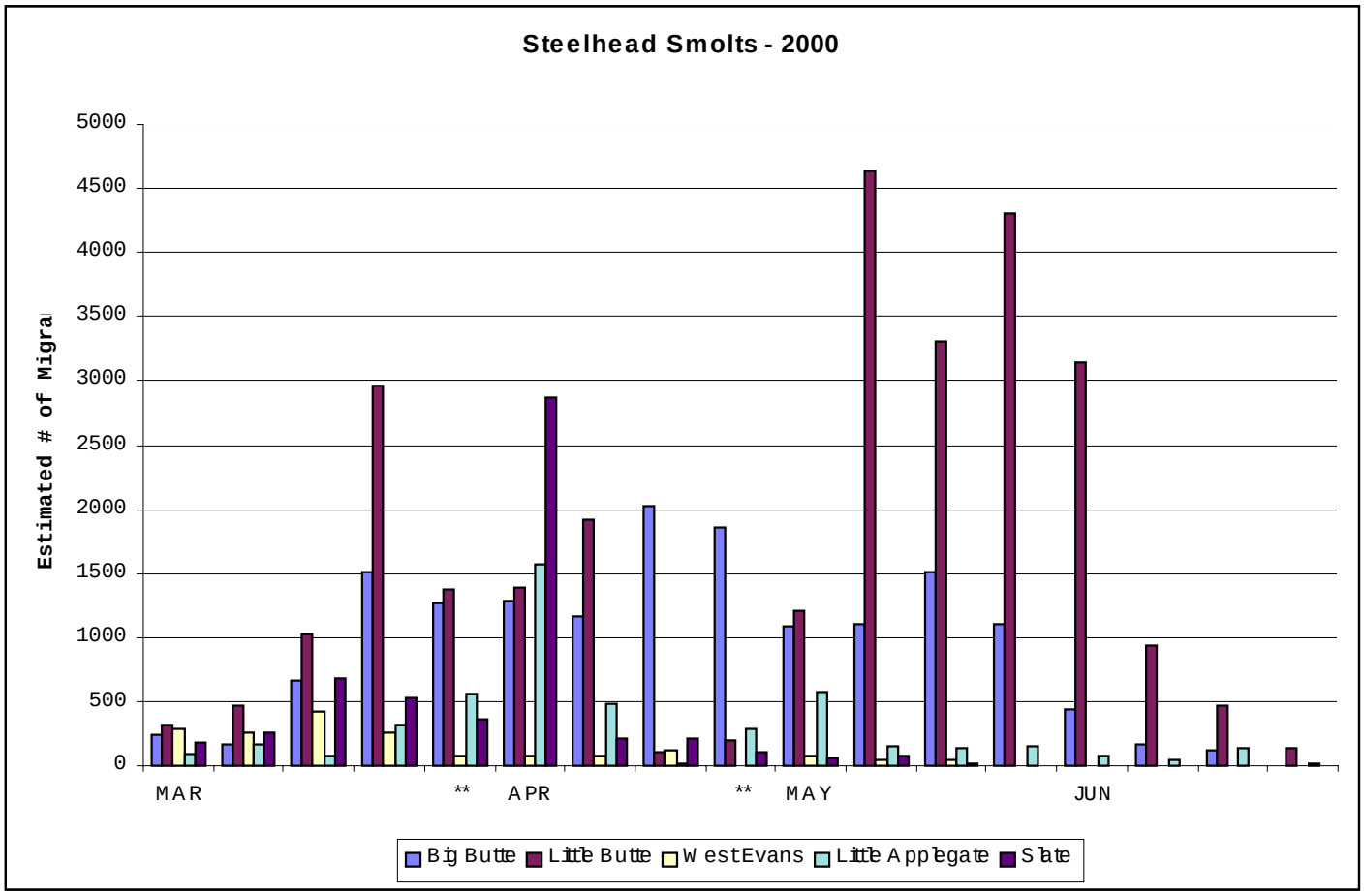

Figure 11. Estimated number of steelhead smolts out-migrating weekly from Big Butte, Little Butte, West Fork Evans and Slate Creeks and the Little Applegate River, 2000

Size of Smolts

Coho smolts captured at the West Fork Evans Creek trap have consistently been smaller than those captured from any of the other streams since trapping began in 1998 (Figure 12). Mean lengths of coho smolts in 2000 were similar for Big Butte, South Fork Big Butte and Slate Creeks and the Little Applegate River; coho smolts from Little Butte and West Fork Evans Creeks tended to be smaller than smolts from those streams. The average length of coho smolts in Big Butte, Little Butte and West Fork Evans Creeks has declined over the last 3 years.

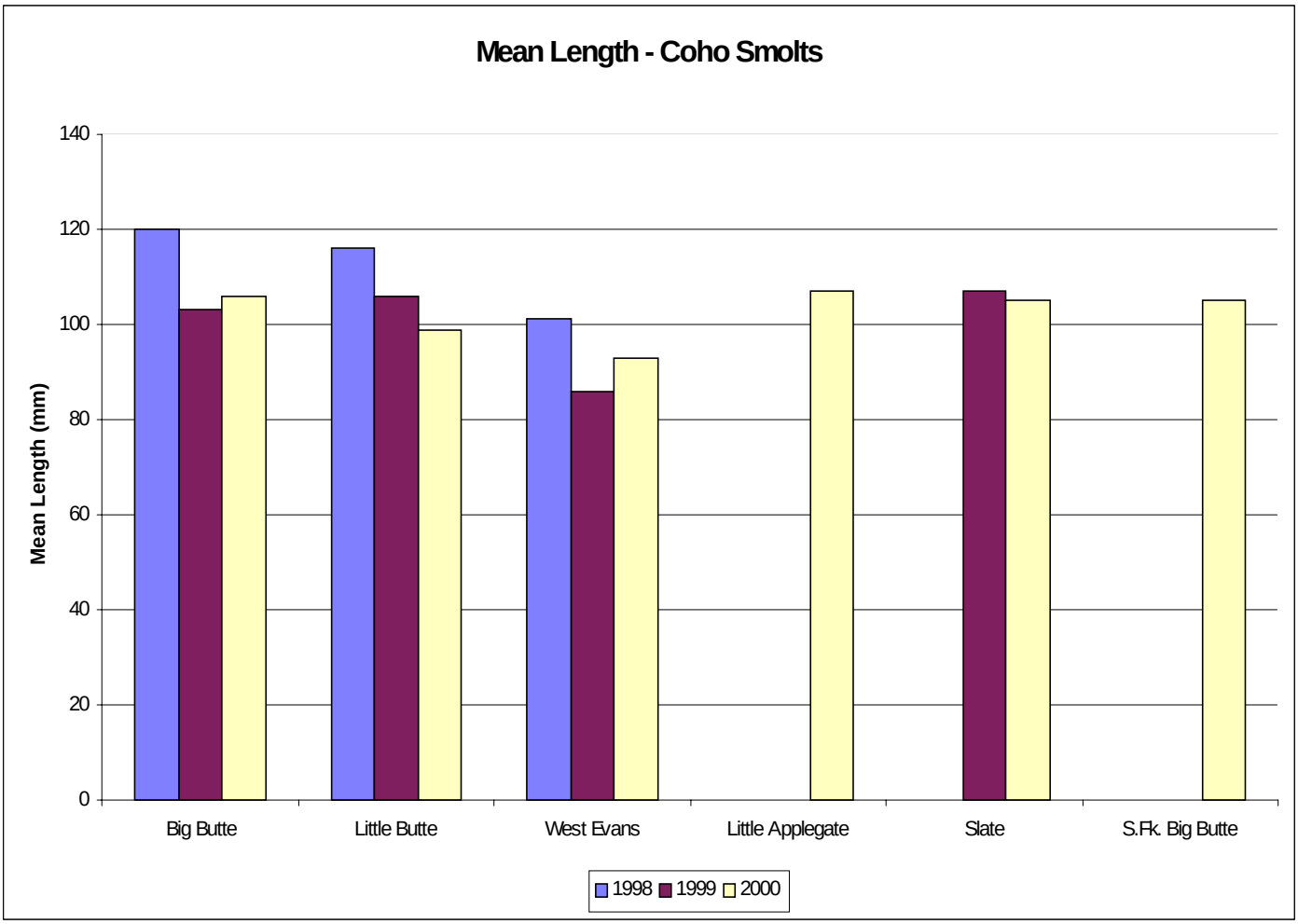

Figure 12. Mean length of coho smolts from each trap site (1998-2000)

Steelhead smolt lengths were fairly consistent between years at each site, with the exception of West Fork Evans and Slate Creeks (Figure 13). The three-year trend for steelhead at West Fork Evans Creek indicated that smolt size increased over the trapping period. During the first two years of trapping, steelhead smolts were typically smaller at West Fork Evans Creek than at the other trap sites. In 2000, steelhead smolts from West Fork Evans Creek had the highest mean length of all six sites. However, the mean length of smolts at this site was based on a very small sample size. The mean length of steelhead from Slate Creek in 2000 was approximately 10 mm shorter than for fish caught in 1999.

Figure 13. Mean length of steelhead smolts from each trap site (1998-2000)

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 4).

Table 4. Number of each species/lifestage captured in 2000 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	916	401	0	4	32	0
Trout Fry*	3,418	946	30	46	40	127
Steelhead (60-89 mm)	854	557	90	922	317	63
Steelhead (90-119 mm)	6,176	1,331	31	748	441	36
Cutthroat trout (60-89 mm)	2	6	0	1	13	0
Cutthroat trout (90-119 mm)	11	32	3	0	54	10
Cutthroat trout (120-159 mm)	54	82	16	1	135	8
Cutthroat trout ($\geq$ 160 mm)	18	15	4	1	24	1
Chinook	8,728	24,610	0	389	7,168	0
Pacific Lamprey (Adult)	3	0	0	2	6	0
Lamprey (Ammocetes)	1,469	161	0	150	16	0
Brook Lamprey	0	0	0	2	0	0

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

DISCUSSION

Trap efficiencies for Big Butte and Little Butte Creeks were relatively high again in 2000, especially for coho smolts. Trap efficiencies for coho smolts at these sites ranged from 24 - 28%, while efficiencies for steelhead smolts ranged from 12 - 18%. As a result, confidence intervals around the smolt estimates for these streams were relatively tight.

Trap efficiencies at the Slate Creek site improved dramatically since the 1999 season. In 1999, none of the marked coho and only 2% of marked steelhead were recaptured. In 2000, trap efficiencies at Slate Creek were 10% for coho and 8% for steelhead. Since trapping was conducted in exactly the same site each year, it appears that the higher efficiency rates in 2000 may be due to higher average streamflows during the trapping season.

In contrast to the Slate Creek site, trap catches at the West Fork Evans Creek site were very disappointing, given the fact that that site was the most efficient of all traps in 1998 and 1999. During the first two years of trapping, trap efficiencies for coho and steelhead smolts were between 22 and 29%. In 2000, trap efficiencies dropped to 3% and 2% for coho and steelhead, respectively. Low streamflows, prevalent throughout the trapping season, were the apparent reason for the low trap efficiencies. Low streamflows caused the trap to turn slowly throughout the trapping period, and this may have enabled fish to avoid the trap as they migrated downstream or swim back out of it after entering it. Due to the low trapping efficiency at this site, the smolt estimates for West Fork Evans Creek had extremely wide confidence limits, making comparison of the 2000 data with previous years virtually impossible.

Trap efficiency for coho smolts in the Little Applegate was 25%; however, this is based on recaptures of only 2 of the 8 fish marked. Trap efficiencies were relatively good (13%) for steelhead smolts at that site. Trap efficiency at the South Fork Big Butte trap was poor again for coho and steelhead smolts; no marked fish were recaptured at this site.

Big Butte Creek produced the highest estimate of coho smolts than any other stream in 2000. Little Butte Creek produced the highest number of steelhead smolts, followed by Big Butte Creek and Slate Creek. 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. This is consistent with the results from trapping conducted in 1998 and 1999 (Vogt 1998; Vogt 1999). 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.

At each trap site, coho smolt estimates were higher in 2000 than in 1999, with the exception of Little Butte Creek. Even though smolt estimates dropped in 2000 at Little Butte Creek, the overall trend at each trap site is increasing coho smolt numbers. This trend also applies to steelhead smolt estimates at each trap site.

Trapping results in 2000 on South Fork Big Butte Creek were similar to the results from 1999. These data seem 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 smolts and steelhead smolts (with visual external smolt characteristics) were caught at this site, we again 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. In 1999, we caught a small number of coho fry, but no smolts, which suggested that adult coho were able to get above the falls during the fall/winter of 1998/99, but that no (or very few) adults accessed that part of the stream during the fall/winter of 1997/98. In 2000, we caught a small number of coho smolts, but no fry, indicating again that adults did spawn above the falls in the fall/winter of 1998/99, since these smolts would be from the same year class as the fry from the previous year. Since there were no fry caught in 2000, it would appear that no coho adults spawned above the falls during the fall/winter of 1999/00.

The timing of peak outmigration of smolts appeared to occur two to three weeks earlier in 2000 than in 1999. Coho smolts were still being caught at the Little Butte trap in low numbers during the last week of trapping in late June. Steelhead smolt outmigration peaked earliest on West Fork Evans Creek in 2000 and this early peak may have been due to the low streamflow conditions that occurred during the entire trapping season.

The average length of coho smolts was smaller in West Fork Evans Creek than in any of the other streams. This is consistent with the results from 1998 and 1999. 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 the other streams trapped during this study than for those from West Fork Evans Creek.

Coho smolt size differed greatly between years at three of the trap sites. Coho smolts from West Fork Evans, Big Butte and Little Butte Creeks exhibited a trend toward smaller size during the three years of trapping. Coho smolt sizes did not appear to differ between years at the Slate Creek, Little Applegate and South Fork Big Butte sites.

The average length of steelhead smolts at the West Fork Evans Creek was much higher in 2000 than in previous years. However, this average is based on a fairly small sample size. Steelhead lengths at each of the other trap sites were very similar between years.

Of the three original 1998 trap sites, the Little Butte and Big Butte traps continued to produce good estimates of salmonid smolt production in 2000. Even though the same site was used on West Fork Evans Creek in 2000, trap efficiencies were very poor, and the estimates of steelhead and coho smolts were of little value for between year or between site comparisons. Of the three new sites added in 1999, the Little Applegate trap continued to produce good estimates of steelhead smolt abundance. Trap efficiency at Slate Creek also improved drastically, and I was able to get reasonably good estimates for both coho and steelhead smolts. Low numbers of anadromous fish were captured at the South Fork Big Butte Creek trap again in 2000, indicating that anadromous fish production above the falls is very low due to this natural migration barrier.

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