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EA Engineering, Science, and Technology

COMPREHENSIVE ANALYSIS FOR WATER RIGHTS CLAIMS IN THE UPPER KLAMATH RIVER BASIN, OREGON

FISH SURVEY REPORT

Draft

Prepared for

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1. INTRODUCTION

The fish species composition within the Upper Klamath basin is varied (Table 1) and includes a trout fishery for both rainbow (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*). As recently as 1986 there was also a popular snag fishery for Lost River sucker (*Deltistes luxatus* Cope) and shortnose sucker (*Chasmistes brevirostris* Cope). In the past, these sucker species were extremely abundant and one of the staple foods of the Modoc and Klamath Indian Tribes (Moyle 1976). Both are now federally listed endangered species under the Endangered Species Act (ESA).

Another special-status species, bull trout (*Salvelinus confluentus*) is a candidate for listing under the ESA (Haas and McPhail 1991) and is considered a species of special concern throughout most of their range (Leary et al. 1993). The bull trout has been subjected to habitat alteration, and also to hybridization with the introduced, closely related brook trout (*Salvelinus fontinalis*), and it is now present in only a fraction of its previous range.

Instream flow requirements in the upper Klamath basin are being quantified using the Instream Flow Incremental Methodology (IFIM). IFIM sites were selected to represent the various habitat types within reaches of streams in the basin (EA 1994). These sites are located in four subbasins: The Williamson River, the Sprague River, the Sycan River, and the Wood River. Figure 1 shows the locations of the sites, and Table 1 describes them.

The Williamson River subbasin consists of about 1,300 square miles (832,000 acres). The headwaters of the Williamson River are located in the mountainous eastern portion of the upper Klamath watershed. The river arises at the 5,000 foot elevation from springs located about nine miles southwest of the Sycan Marsh. It is fed by many spring-fed creeks situated along Booth Ridge and Yamsay Mountain. The river flows northward, and then abruptly turns west and enters Klamath Marsh. It flows through the marsh, exiting from the southern end, and continues flowing south. It eventually drains into Upper Klamath Lake.

The North Fork Sprague River arises in the vicinity of Gearhart Mountain, and the South Fork arises near Coleman Rim. Both forks flow more or less westward until they meet about seven miles east of the town of Beatty. The main river winds its way west, emptying into the Williamson River in the vicinity of the town of Chiloquin, north of Upper Klamath Lake.

A major tributary of the Sprague River is the Sycan River. The Sycan River originates near Winter Ridge in the Paisley Ranger District. It flows along the southern edge of the Sycan Marsh, and discharge from the marsh flows into the river at the southern end of the marsh. The river continues southward until it joins the Sprague River one-half mile northwest of Beatty. The Sprague River, including the Sycan River, drains approximately 1,600 square miles (1,024,000 acres).

The Wood River originates about seventeen miles north of Agency Lake from Wood River Springs, near Kimball State Park. It is joined almost immediately by water from Sun Creek

and Annie Creek. As this river flows south into Agency Lake, many streams and springs draining the eastern slopes of the Cascade Mountains contribute to its flow.

The fish surveys described in this report represent a sample of the IFIM sites. The survey was designed as a qualitative investigation into the presence and relative abundance of fish species and to verify the distribution of species that are of historical and management importance to the Klamath Tribe.

2. METHODS

2.1 FISH SURVEY SITE SELECTION

Fish survey sites were randomly selected from stratified IFIM site types: (1) mainstem, (2) small river, (3) tributary. Table 3 is a list of the sites in each of these categories. Three different methods of sampling were used, based on the depth, width, turbidity, and accessibility of each of the IFIM sites: underwater observation by snorkeling, backpack electrofishing, and tow-barge electrofishing. Underwater observation is the least intrusive of the three methods, as the fish are not handled in any way, but it can only be used in areas of extremely low turbidity. Backpack electrofishing is more intrusive, as the fish are disturbed and handled, but can be used in areas of higher turbidity where snorkeling is not an option. Fish length can only be estimated with underwater observation, whereas the electroshocked fish can be measured and weighed. Tow-barge electrofishing was used in areas that were too wide, deep, and turbid to use the former methods, such as the larger river sites.

Tow-barge sites were selected first. Because of the size and weight of the electrofishing tow-barge and generator, its use was restricted to sites with vehicle access less than 100 ft from the site where the water was too deep for backpack electrofishing. Only mainstem and small river sites were considered. To select from these sites, all of the IFIM sites that were categorized as mainstem or small river were pooled and numbered sequentially. A random number generator on a pocket calculator was used to pick numbers. As each number was chosen, the site selected was either accepted or rejected, depending on whether or not it met the vehicle accessibility criterion. A total of 8 sites were selected this way, along with 2 alternate sites, out of a pool of 29 sites.

Underwater observation sites were selected next. The pool of sites comprised tributary sites and also the mainstem and small river sites not selected for tow-barge sites. The same random number process was used to select sites, and they were accepted or rejected on the basis of turbidity, with sites having known high turbidity being rejected. A total of 8 sites were selected, along with 2 alternates, out of a pool of 33 sites.

The pool of sites for backpack electrofishing included small river and tributary sites which had not been selected: the mainstem sites were too deep and wide for a backpack electrofisher to survey easily. The same random number process was used to select sites. There were no accessibility criteria for backpack electrofishing sites. A total of 8 sites were selected, along with 2 alternates, out of a pool of 21 sites.

2.2 FIELD METHODS

Three crews, each using one of the sampling methods (tow-barge, backpack electrofishers, snorkeling), sampled over a period of four days (8–11 September 1993). The tow-barge and backpack crews were accompanied by fishery biologists from the Klamath Tribe (Craig Beinz

and Larry Dunsmoor). The electrofishers used were a Smith-Root 3,500-watt barge-mounted electroshocker and Smith-Root Type 12 backpack electroshockers.

Sampling was begun in or near the IFIM site and continued upstream. A minimum length determination was not made a priori, but determined on a site-by-site basis. The primary criterion for site length determination was the inclusion of all habitat and cover types. For example, if a site was of a fairly homogeneous habitat, a shorter section of it would be sampled than if a site had many different habitat types. Stream segments sampled ranged in length from 55 to 575 feet. The snorkel crew recorded the number and size of fish of each species observed. Depending on stream width and crew size, electrofishing teams consisted of one to two shockers with one or two netters, each with an 18" net. Captured fish were kept in buckets or live wells and subsequently identified, measured, weighed, and released. Several of the electrofishing sites had to be subsampled for extremely abundant species (usually speckled dace). Scale samples were taken from a subsample of all salmonids caught except the special-status bull trout. The length and width of each site was measured, and shocking and snorkeling durations were recorded.

3. RESULTS

The sites were divided into four subbasins for analysis; Sycan River Basin, Sprague River Basin, Williamson River Basin, and Wood River Basin. Of the 28 sites sampled, 7 were in the Sycan River Basin, 8 were in the Sprague, 11 in the Williamson, and 2 in the Wood (Table 2).

Species composition by percentage was used to determine relative abundance at each site (Figures 2 through 5). To compare abundances between sites, catch per hour was calculated for salmonid species at each site by dividing the catch by the number of minutes sampled and multiplying by 60. The CPUE for rainbow, brook (+ bull), and brown trout are shown in Figures 6 through 8. Sampling efficiency and methods varied from site to site, so these estimates should be treated with some caution. Length frequency histograms (Figures 9 through 12) were produced for the salmonid species and for the Klamath large-scale sucker (*Catostomus snyderi*).

The sampling showed a wide variety of fishes in the basin, including four salmonid species: brown trout, rainbow trout, brook trout, and bull trout. Other common species were speckled dace (*Rhinichthys osculus* Girard), blue chub (*Gila coerulea* Girard) and tui chub (*Gila bicolor* Girard), marbled sculpin (*Cottus klamathensis* Gilbert), (possibly) slender sculpin (*Cottus tenuis*), and Klamath largescale sucker. Uncommon species present were Pacific lamprey (*Lampetra tridentata*), Pit-Klamath brook lamprey (*Lampetra lethophaga*), brown bullhead catfish (*Ictalurus nebulosus*), and fathead minnows (*Pimephales promelas*). A single redside shiner (*Richardsonius sp.*) was seen. The majority of the species seen were fishes native to the upper Klamath Basin. The only extant native fishes not seen were the lake-dwelling shortnose sucker, the Lost River sucker, and the Klamath River lamprey (*Lampetra similis*), although there is a question about whether the rainbow trout seen included redbands (see Discussion section).

3.1 SPECIES COMPOSITION IN THE SUBBASINS

The two sites in the Wood River Basin had high percentages of marbled sculpins and included rainbow trout, brown trout and Pacific lampreys. The Fort Creek site also contained brook trout.

The Sycan River Basin had high percentages of speckled dace at all sites except Calahan Creek (SY-9), which was 100 percent brook trout. Other species present in the basin included Klamath largescale sucker, chub species, sculpin species, lamprey species, and rainbow trout.

The Sprague River Basin included the only site in the survey where bull trout were seen, Deming Creek (SP-17). The other two tributary creeks sampled, Trout Creek (SP-8) and Fivemile Creek (SP-13), had high percentages of speckled dace and marbled sculpin. All mainstem sites had high percentages of chub species. Other fishes found in the basin were rainbow trout, brown trout, lamprey species, Klamath largescale suckers, fathead minnows, and brown bullhead.

Most of the tributaries of the Williamson River were 75 percent or more brook trout, with the exception of Larkin Creek (WM-10), which contained mainly rainbow trout and brown trout. The mainstem Williamson River sites had a wide variety of fish, and speckled dace made up the highest percentages in most instances. These sites also included all of the species found in the Sprague River basin except bull trout and brown bullhead.

4. DISCUSSION

The fish species observed in the upper Klamath Basin included 10 native species and 5 introduced species. Chubs (*Gila* spp.), speckled dace, and sculpins predominated in the lower elevations of the Williamson and Sprague rivers, although most species were represented. Higher in the basin, salmonid species became more evident. The brook trout, an introduced species, appears to be fairly abundant in the higher elevation, colder tributary streams, especially in the Williamson River basin. The only site in which the native bull trout (a species of special concern) was observed was Deming Creek in the Sprague River Basin.

The surveys that were conducted were qualitative investigations into the presence and relative abundance of fish species under existing conditions. Fish were observed, identified and counted, but this does not mean that other fish species were not present in low numbers, or in other parts of the stream. For example, bull trout are historically present in many of the colder water streams that were sampled, and it is possible that they were present but not in the particular part of the stream that was sampled, or were there in such extremely low numbers that they were not seen.

Lamprey species are probably under-represented due to an inherent low capture efficiency. These primitive fish are often buried in the mud and hence almost invisible to snorkeling observers, are not as affected by electrofishers as most other fish species and are often able to escape the nets if captured. The cryptic coloration and bottom-dwelling habits of sculpins makes it very difficult for both snorkel and electrofishing crews to see them. Speckled dace and tui chubs were also likely under-represented in several sites; the large numbers of fish made it impossible to capture all that were seen. After a representative sample of all sizes and species were caught, attention was focused on other, less-abundant species.

The native rainbow trout of Upper Klamath Lake are considered to be redbands, a rainbow trout subspecies (Logan and Markle 1993). Rainbow trout from a variety of sources were extensively stocked in the basin between 1922 and 1980. Stocking was terminated in most parts of the basin in 1980, because the introduced trout were not resistant to an endemic epizootic, *Ceratomyxa shasta*, and many were dying soon after being stocked (Logan and Markle 1993). The fact that redband trout could hybridize readily with the stocked fish and produce viable offspring, along with their phenotypic and ecological plasticity, makes taxonomy of rainbow trout difficult.

The non-native brown trout was stocked into Upper Klamath River Basin streams between 1925 and 1968 (Logan and Markle, 1993). Brown trout are now self-sustaining in the basin, and in some areas grow to fairly large sizes (see Figure 12).

Bull trout historically occurred throughout most of the cold water areas of the basin. The closely related brook trout, have been widely introduced throughout the basin since 1922, and appear to have a negative impact on the bull trout (Logan and Markle 1993). Leary et al. (1993) showed that bull trout and brook trout hybridize when these species occur together with the accompanying eventual displacement of the bull trout. Introduced rainbow trout, and

brown trout are also thought to have displaced many bull trout populations (Leary et al. 1993). Our findings support this hypothesis; brook, brown and rainbow, but no bull trout were found in many of the survey sites. It is possible that the rainbow trout found with the bull trout in Deming Creek were actually redband trout which occur naturally with bull trout in this basin.

Because the survey was conducted in the fall, the two endangered species of sucker were not present in the streams. These suckers only come into the streams (from Upper Klamath Lake) during their breeding seasons in March, April, and May. As they are protected under the ESA, disturbance of them is illegal. Also known locally as "mullet" (Klamath Consulting Service 1984), these fish were so abundant around the turn of the century that people were able to harvest them during spawning runs with pitchforks to use as garden fertilizer as well as food (Logan and Markle 1993). The Oregon State Game Commission designated the Lost River sucker a game species in 1959 and prohibited snagging. As snagging is the only effective means of capturing this species of sucker, regulations were changed again in 1961 to allow snagging (Logan and Markle, 1993). The sucker fishery in the basin was closed in 1987 due to the rapid drop in numbers.

The spawning times of the shortnose and Lost River suckers overlap with each other and with that of the Klamath largescale sucker, and hybridization is thought to have occurred between all of these species. This has been put forward as one factor contributing to the decline of these species. Hybridization is a threat to the purity of each species if introgression, or the infiltration of genes of one species into the gene pool of another, occurs. However, Moyle and Berg (1991) reported that hybridization (introgression) has not occurred from the gene pool of the Lost River sucker or the Klamath largescale sucker into that of the shortnose sucker. They could not exclude a small chance that introgression had occurred from shortnose sucker gene pool into Lost River sucker gene pool, although they state that this is also unlikely. They proposed that similar morphological characteristics found within these species were probably due to phenotypic plasticity rather than a combination of two distinct species.

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Figures

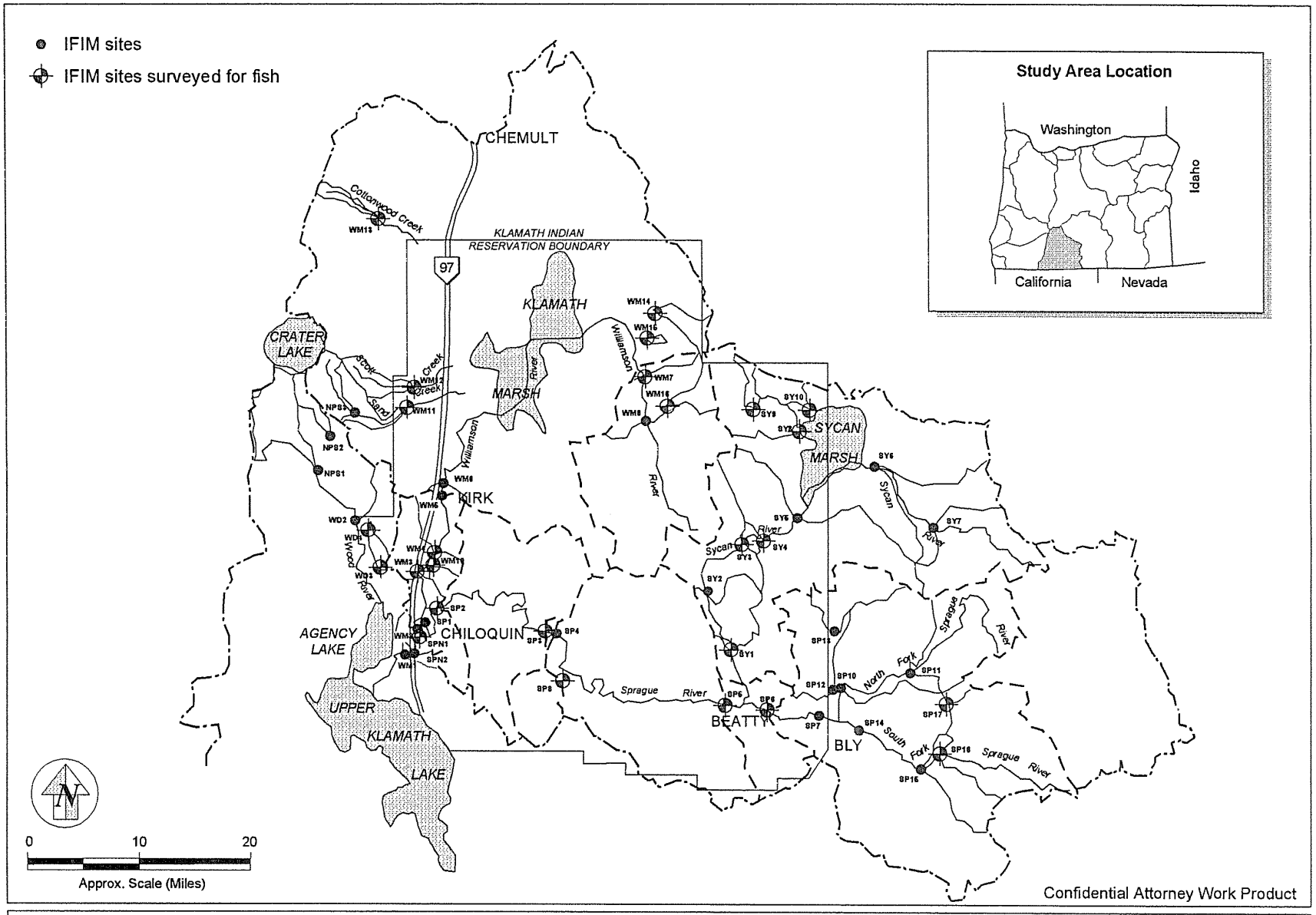

Figure 1. IFIM site location map including fisheries survey sites.
Upper Klamath Basin Instream Flow Study.

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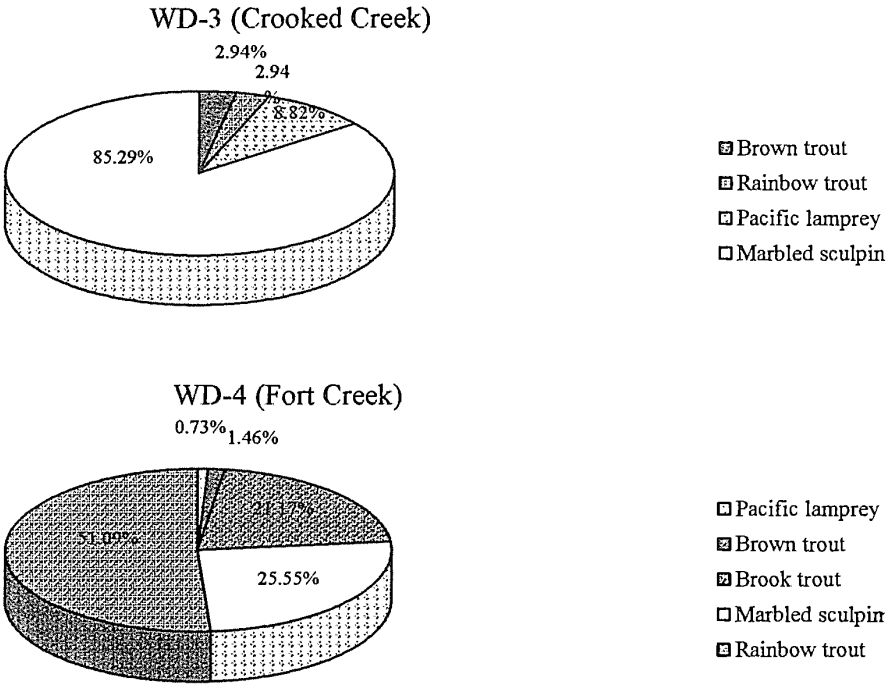


Figure 2. Fish composition by percent for the Wood River sites

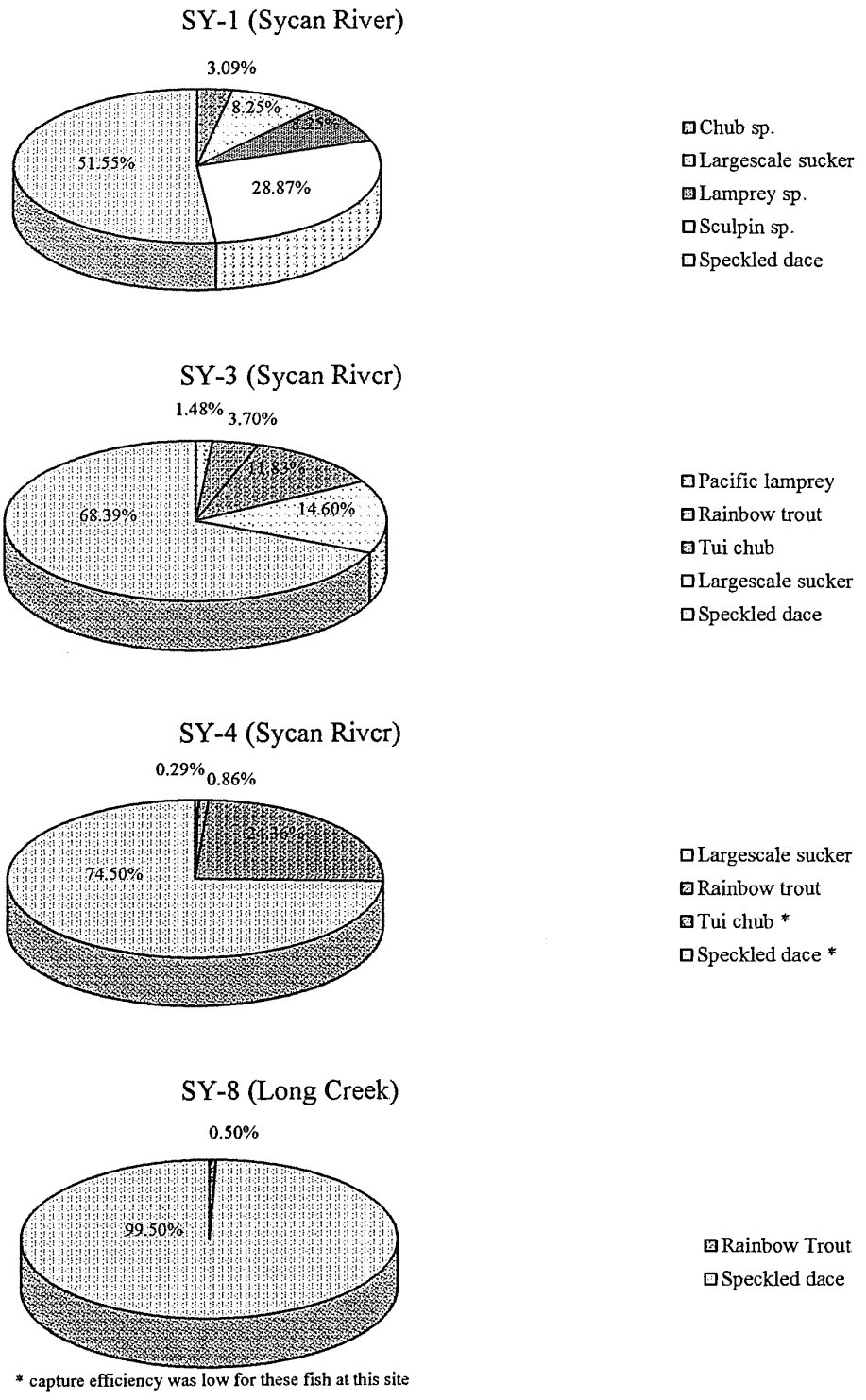


Figure 3. Fish composition by percent for the Sycan River sites

SY-6 (Sycan River)	**100% Speckled dace**
SY-9 (Calahan Creek)	**100% Brook trout**
SY-10 (Coyote Creek)	**100% Speckled dace**

Figure 3 (cont). Fish composition by percent for the Sycan River sites

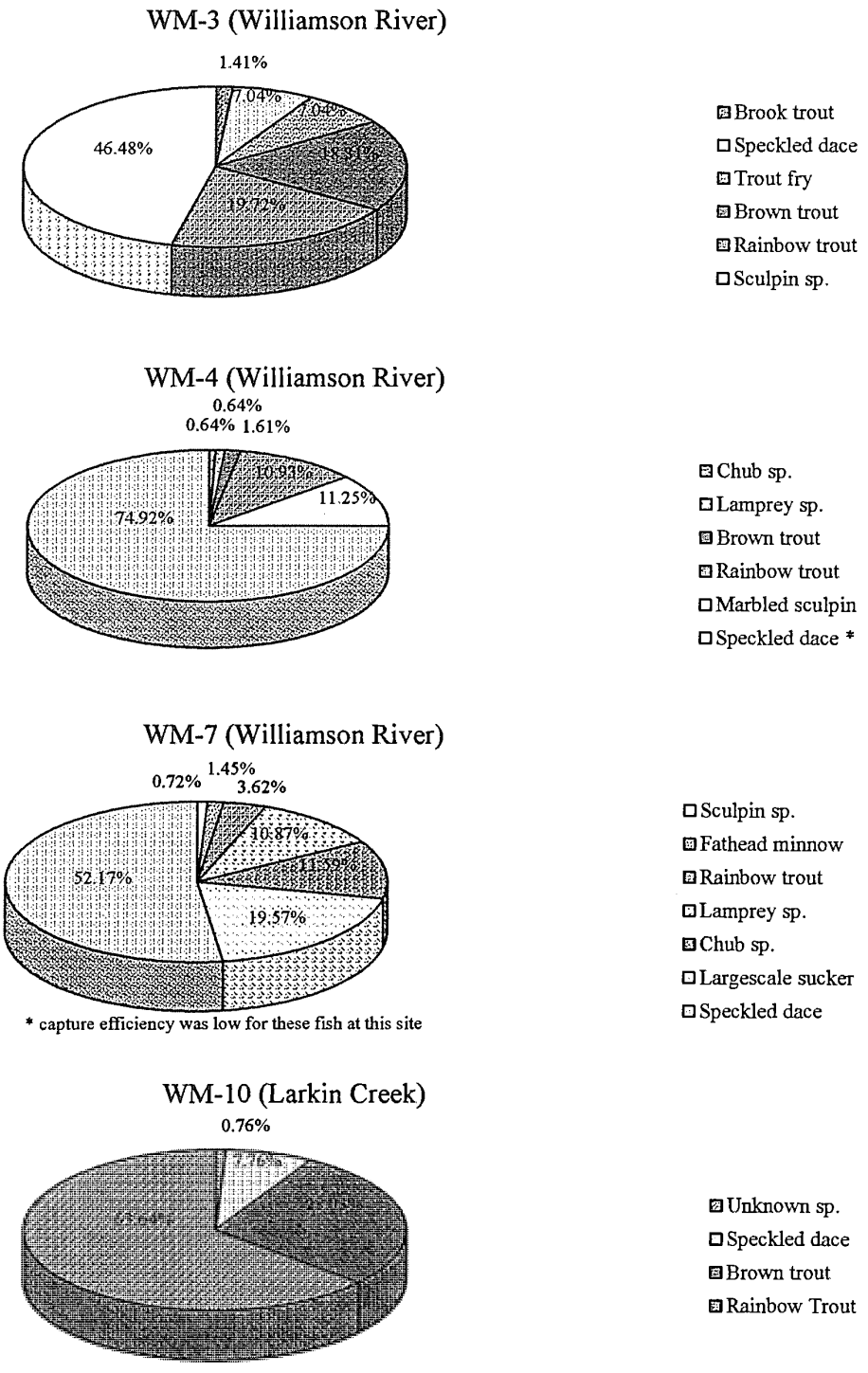


Figure 4. Fish composition by percent for the Williamson River sites

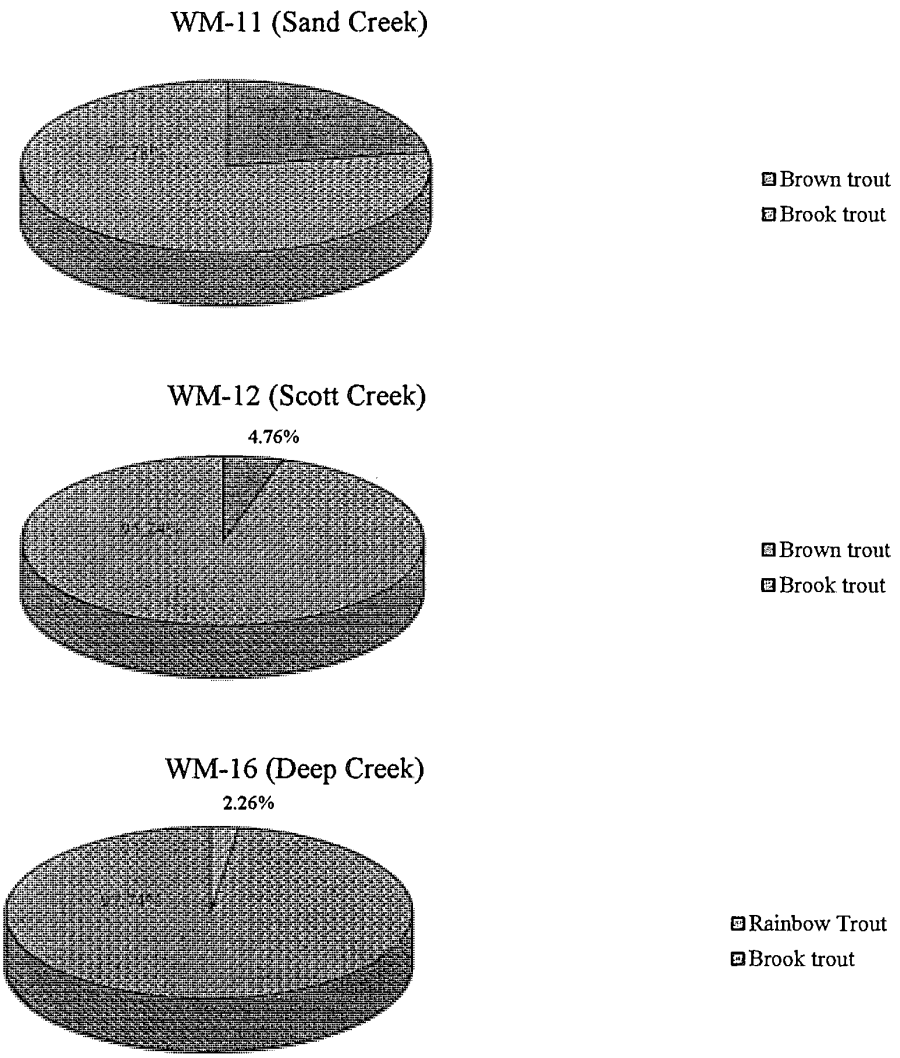


Figure 4 (cont.). Fish composition by percent for the Williamson River sites

WM-2 (Williamson River	**50% Rainbow trout**
	50% Brook trout
WM-13 (Cottonwood Creek)	**100% Brook trout**
WM-14 (Jackson Creek)	**100% Brook trout**
WM-15 (Irving Creek)	**100% Brook trout**

Figure 4 (cont.). Fish composition by percent for the Williamson River sites

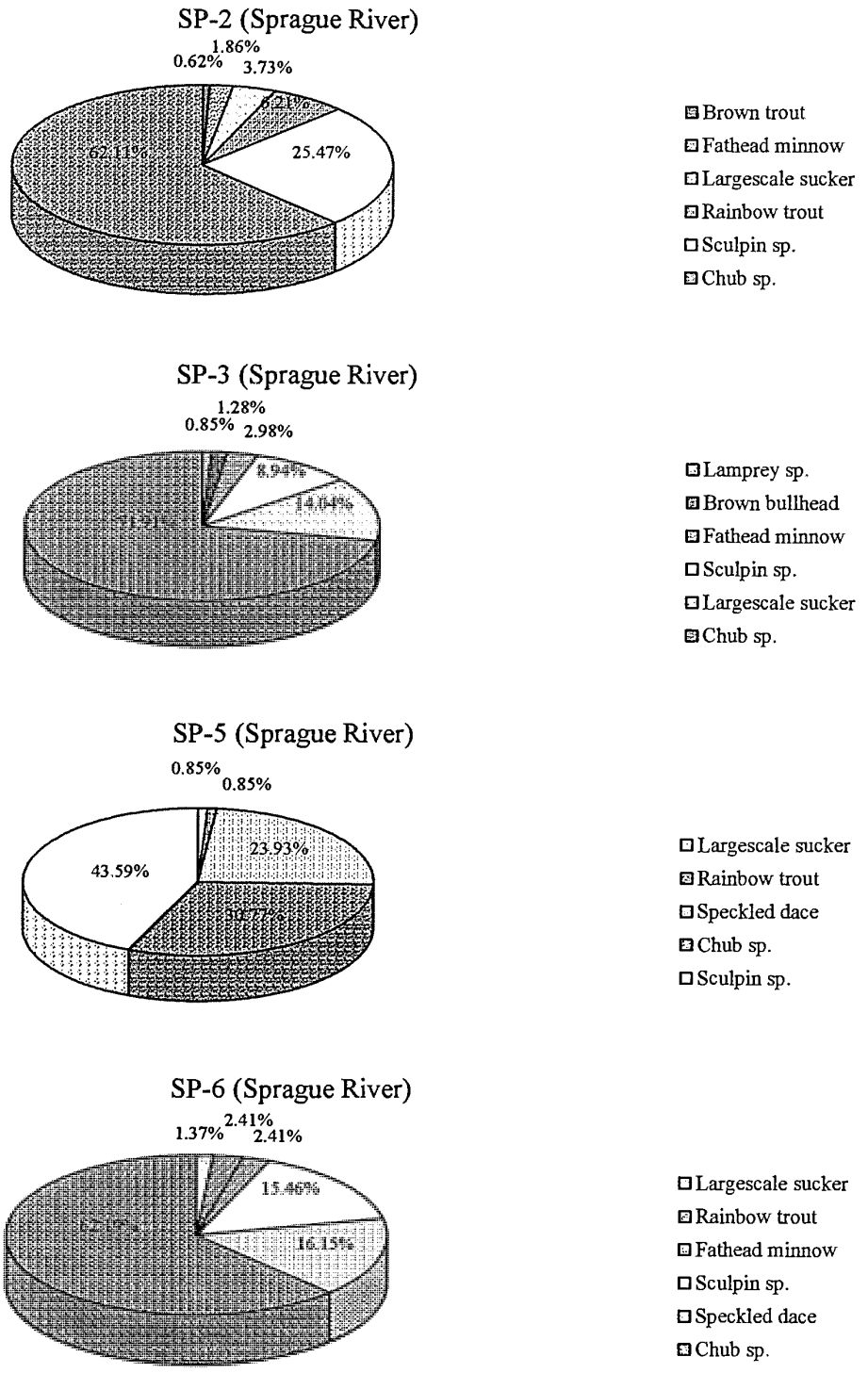
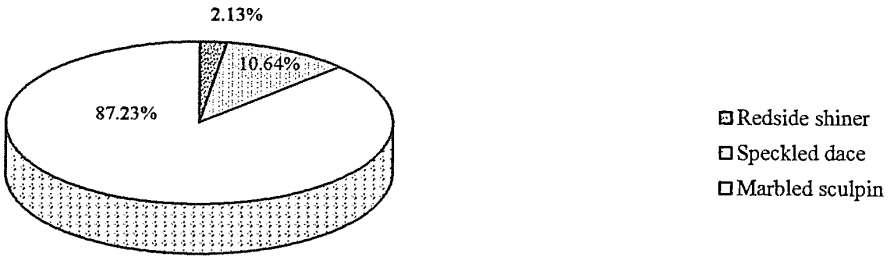
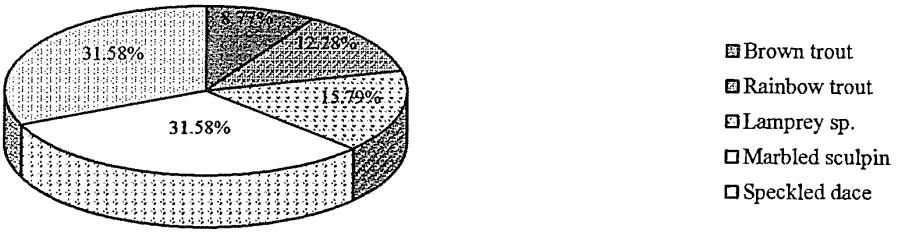


Figure 5. Fish composition by percent for the Sprague River sites

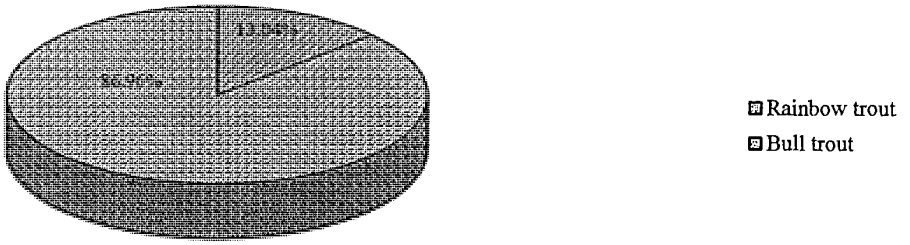
SP-13 (Fivemile Creek)



SP-16 (South Fork Sprague)

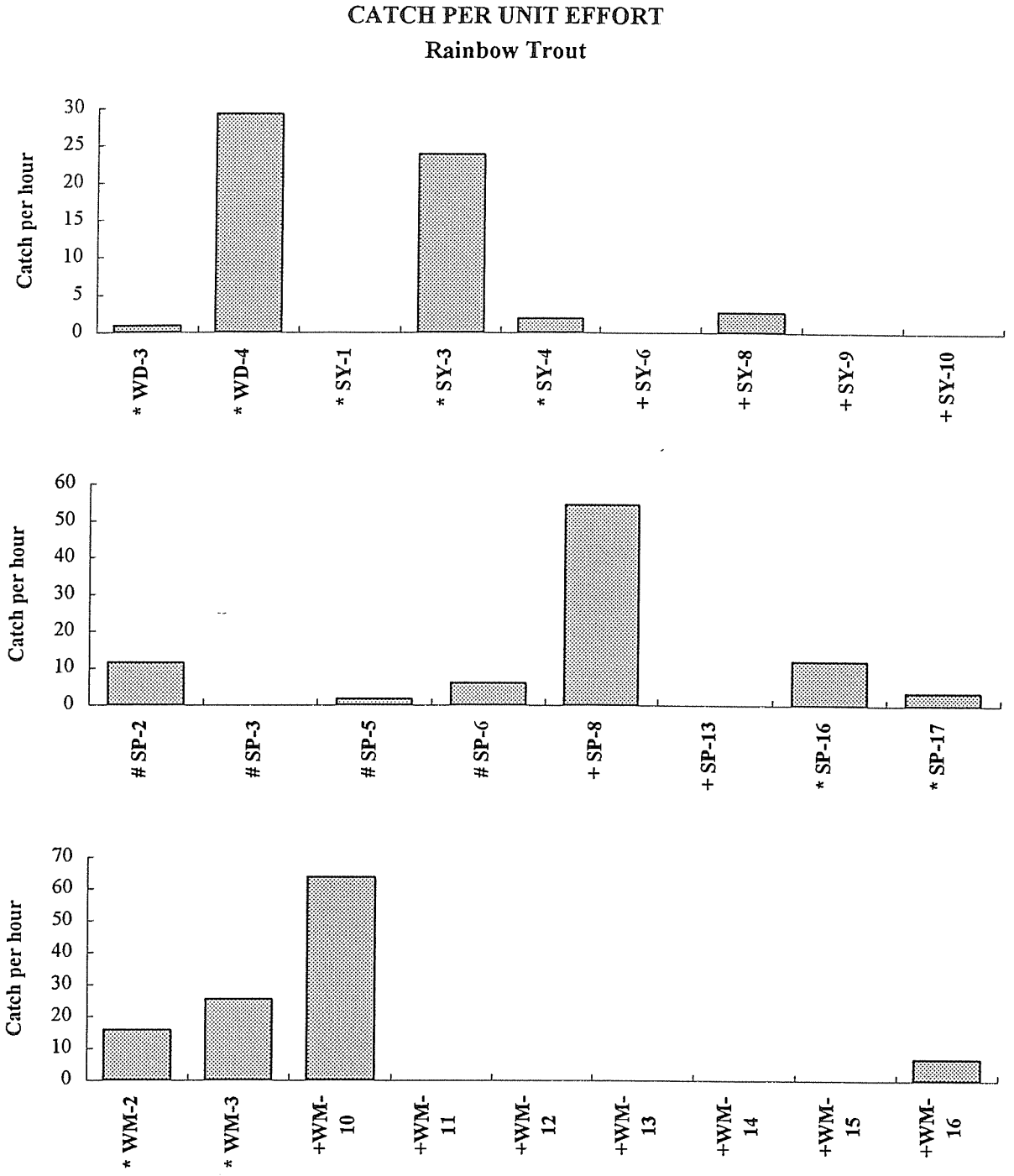


SP-17 (Deming Creek)



SP-8 (Trout Creek) **100% Rainbow trout**

Figure 5 (cont). Fish composition by percent for the Sprague River sites



* backpack electrofishing sites
\# barge electrofishing sites
\+ snorkel sites

Figure 6. Catch per hour for rainbow trout in the Klamath Basin.

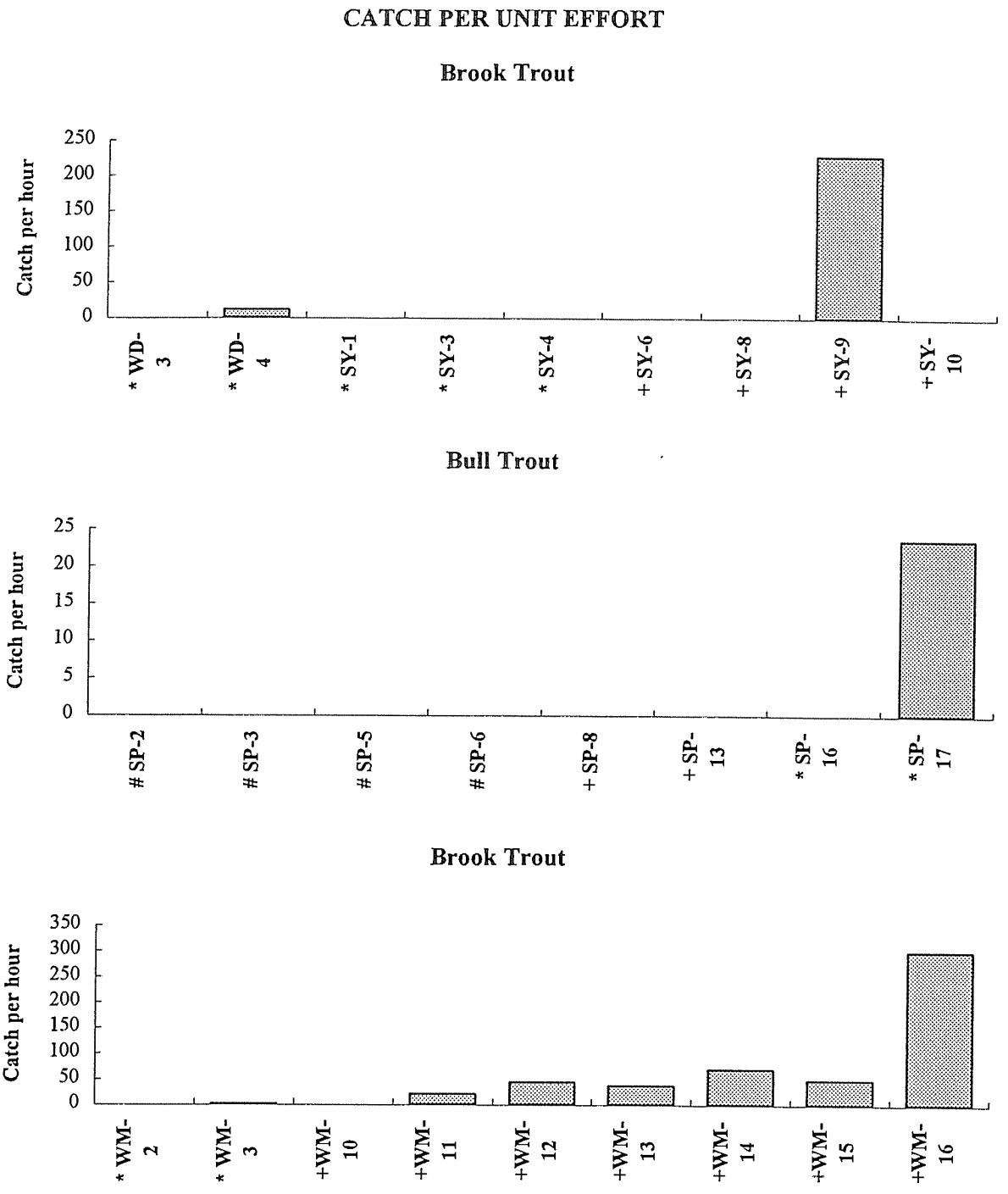


Figure 7. Catch per hour for brook trout and bull trout in the Klamath Basin.

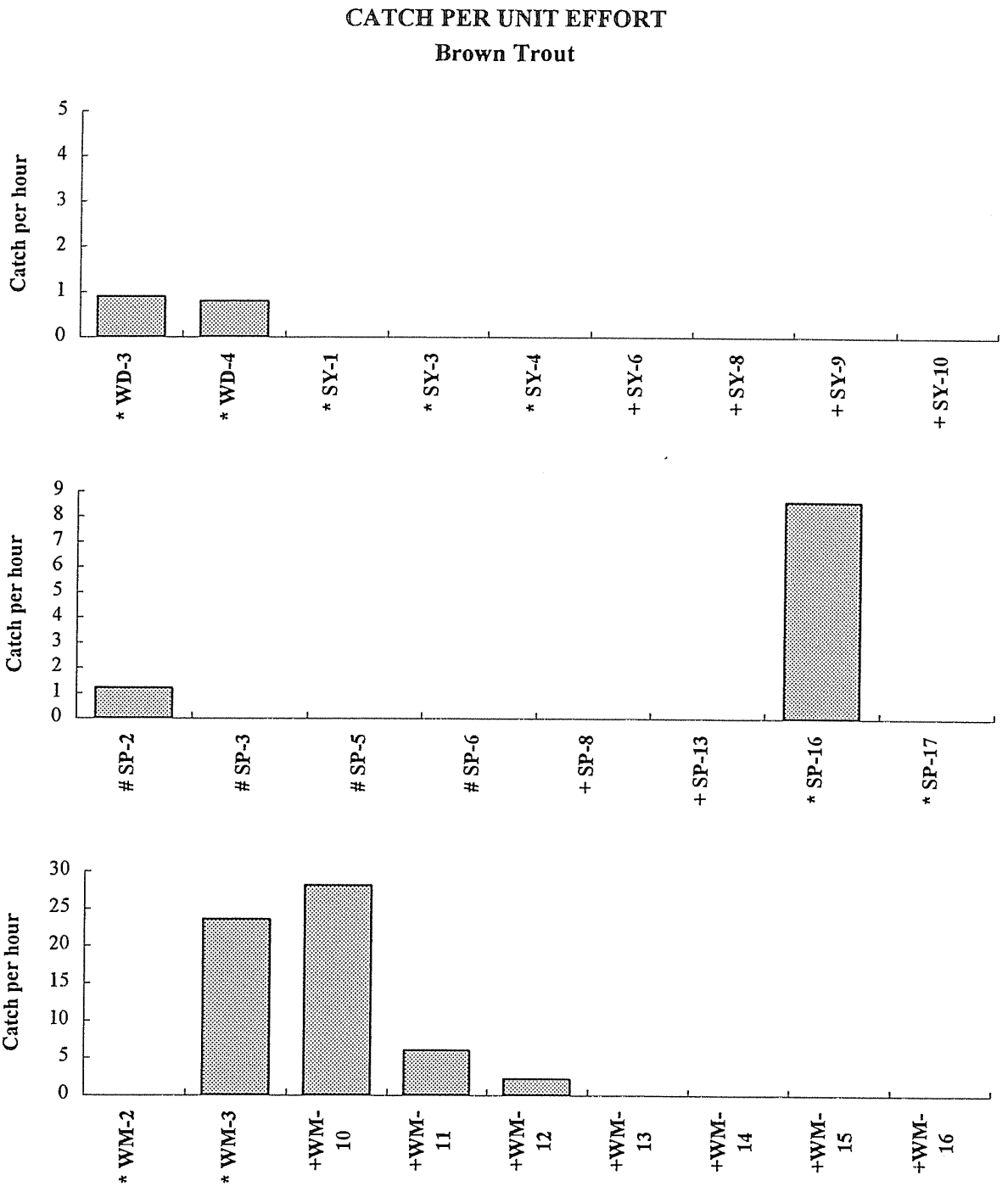


Figure 8. Catch per hour for brown trout in the Klamath Basin.

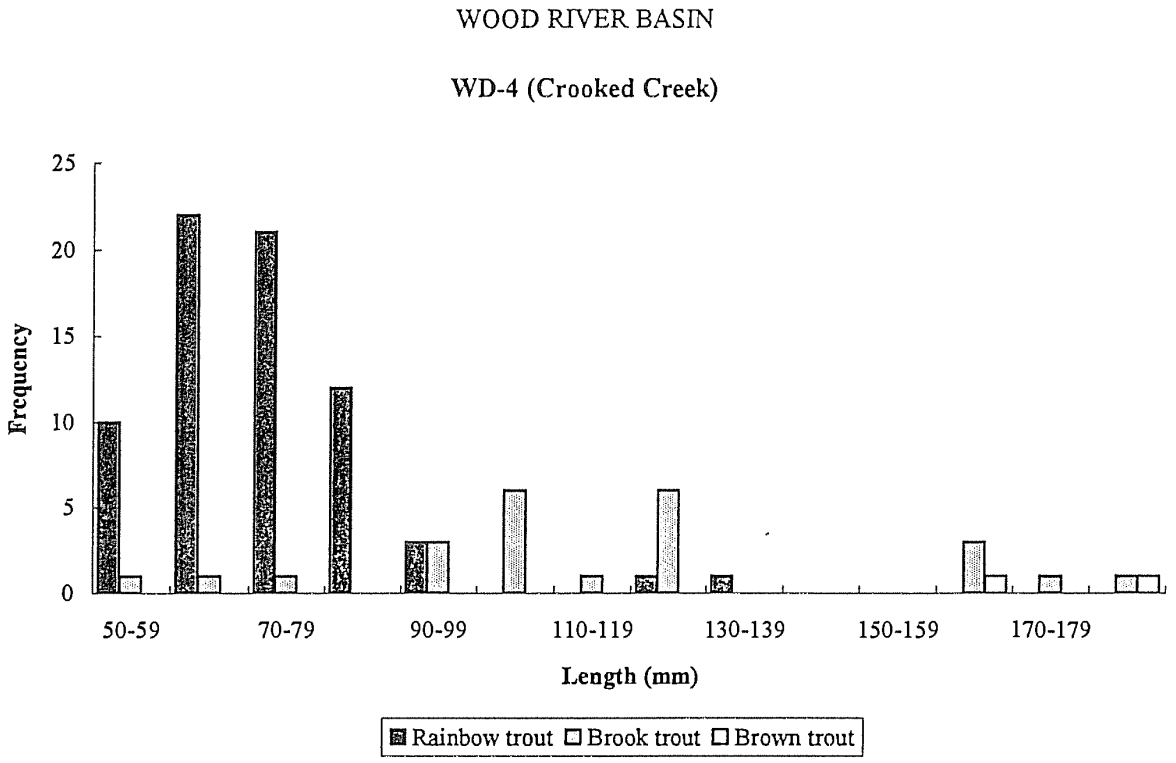


Figure 9. Frequency histograms for fish species in the Wood River Basin

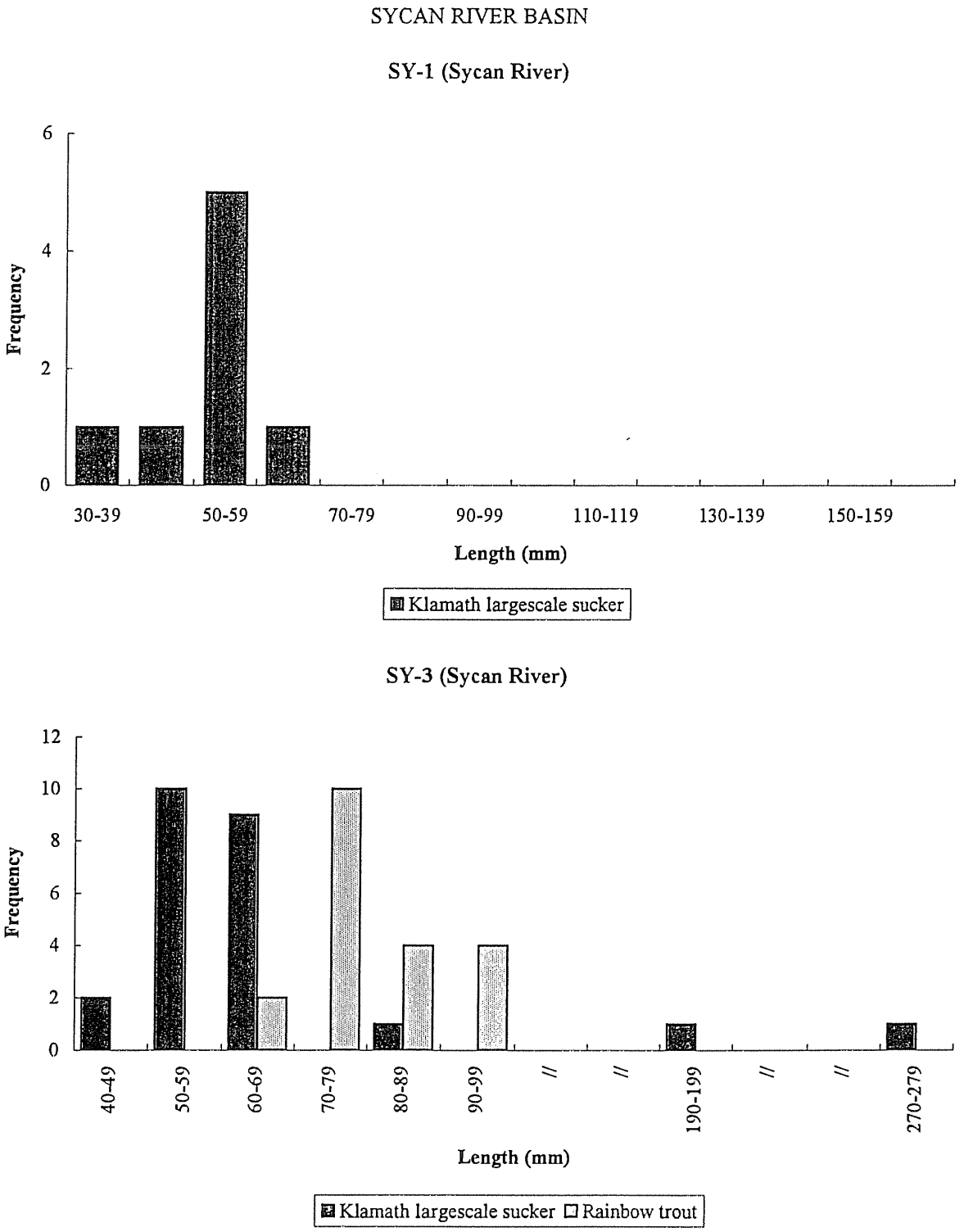


Figure 10. Frequency histograms for fish species in the Sycan River Basin

SYCAN RIVER BASIN (CONT.)

SY-9 (Calahan Creek)

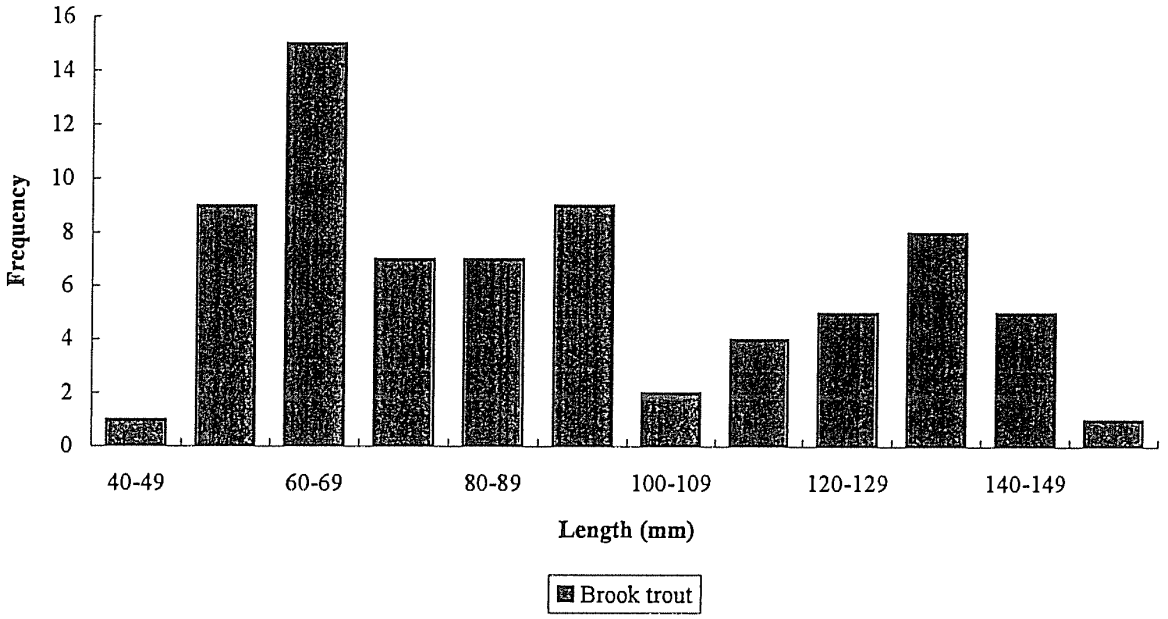


Figure 10. (cont.)

SPRAGUE RIVER BASIN

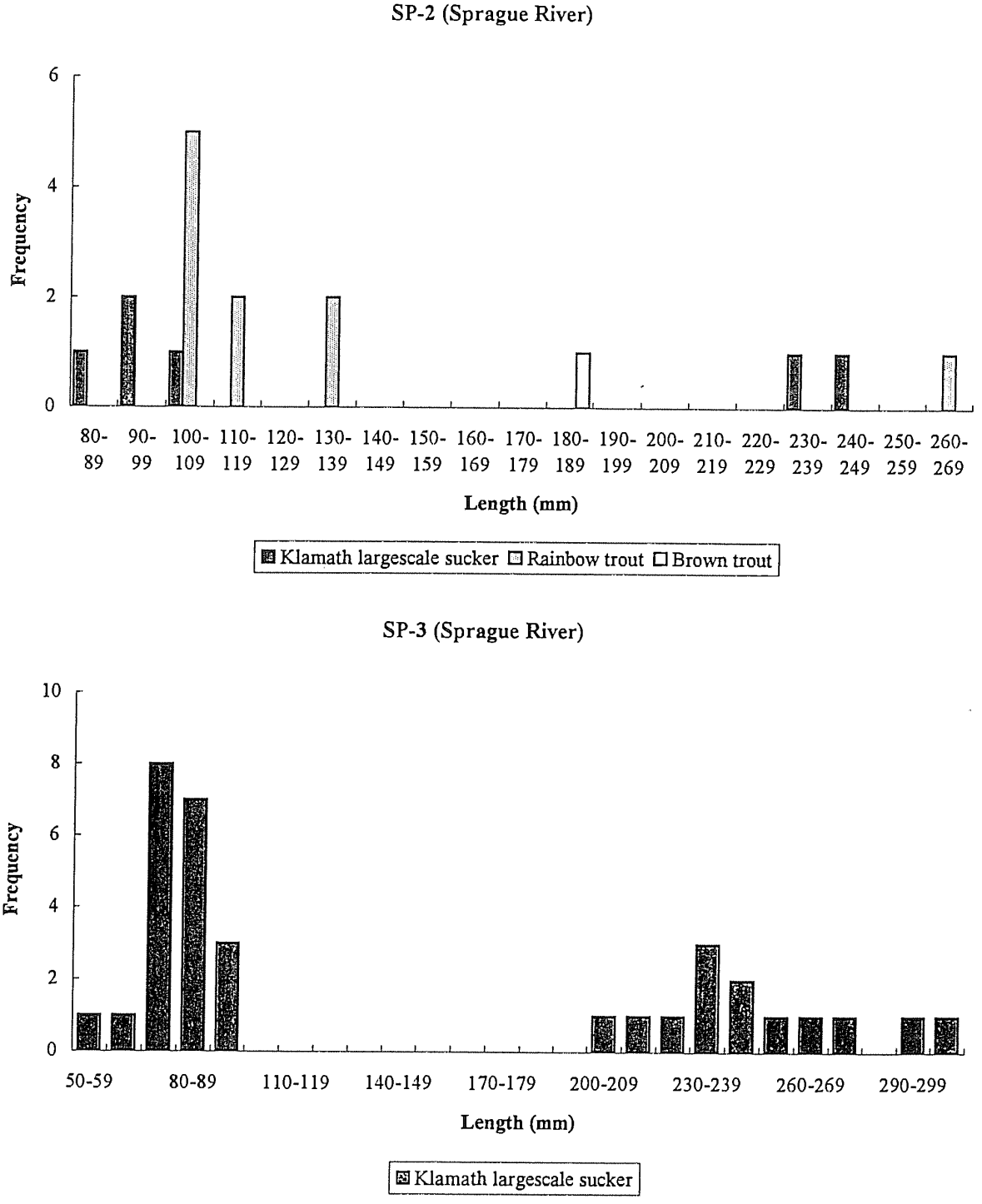


Figure 11. Frequency histograms for fish species in the Sprague River Basin

SPRAGUE RIVER (CONT.)

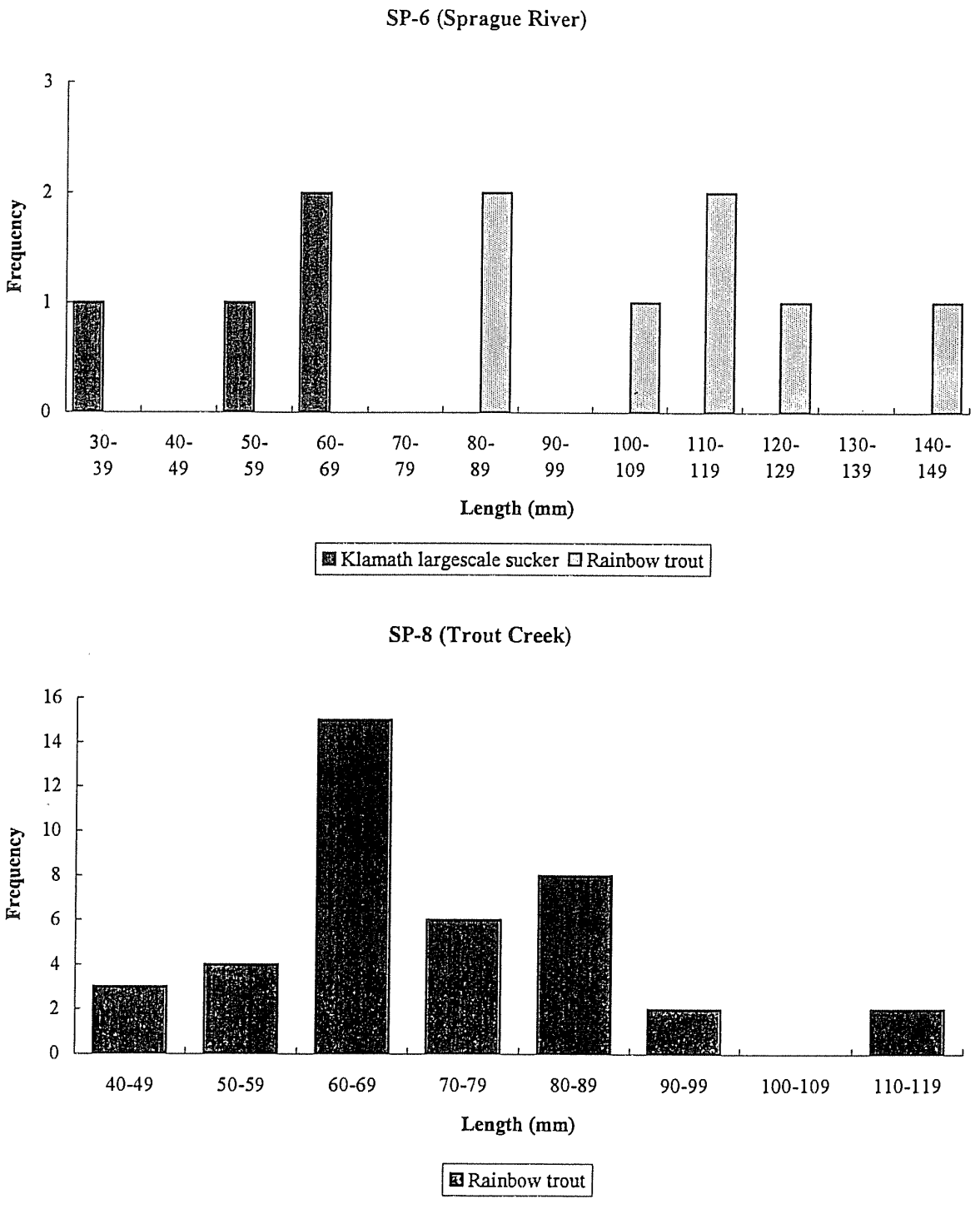
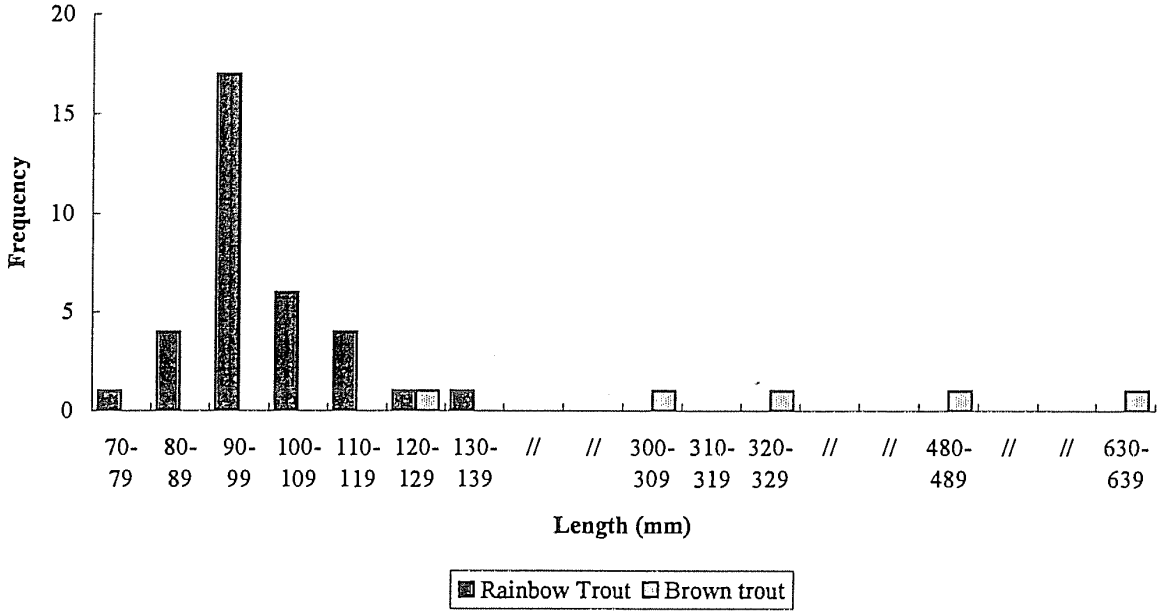


Figure 11. (cont.)

WILLIAMSON RIVER BASIN (CONT.)

WM-4 (Williamson River)



WM-10 (Larkin Creek)

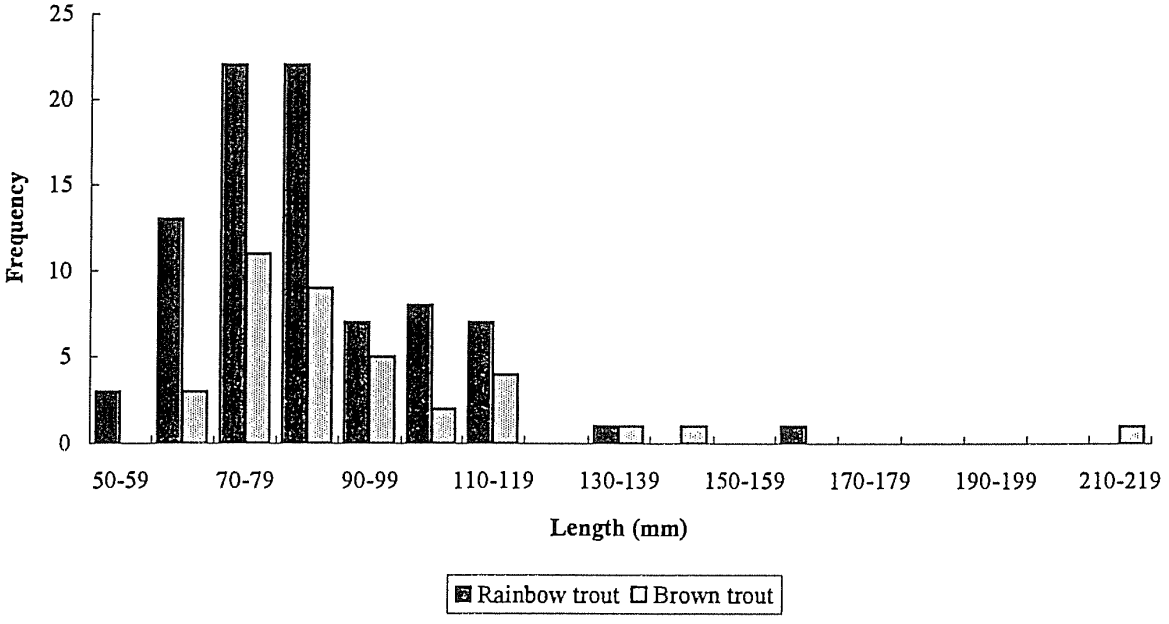
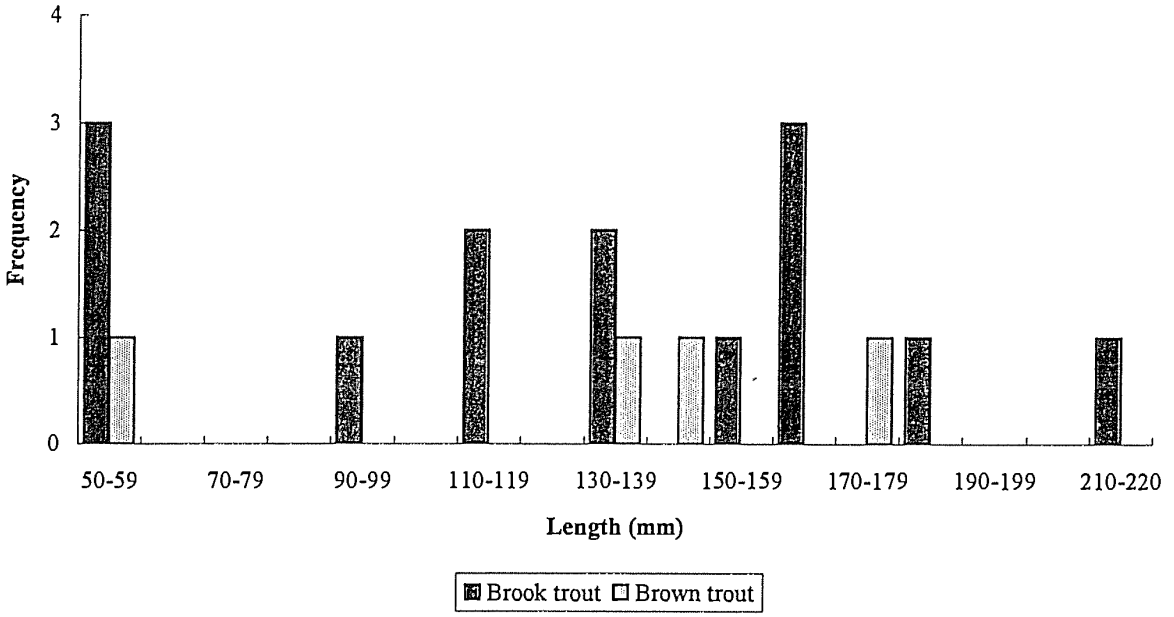


Figure 12. (cont.)

WILLIAMSON RIVER BASIN (CONT.)

WM-11 (Sand Creek)



WM-12 (Scott Creek)

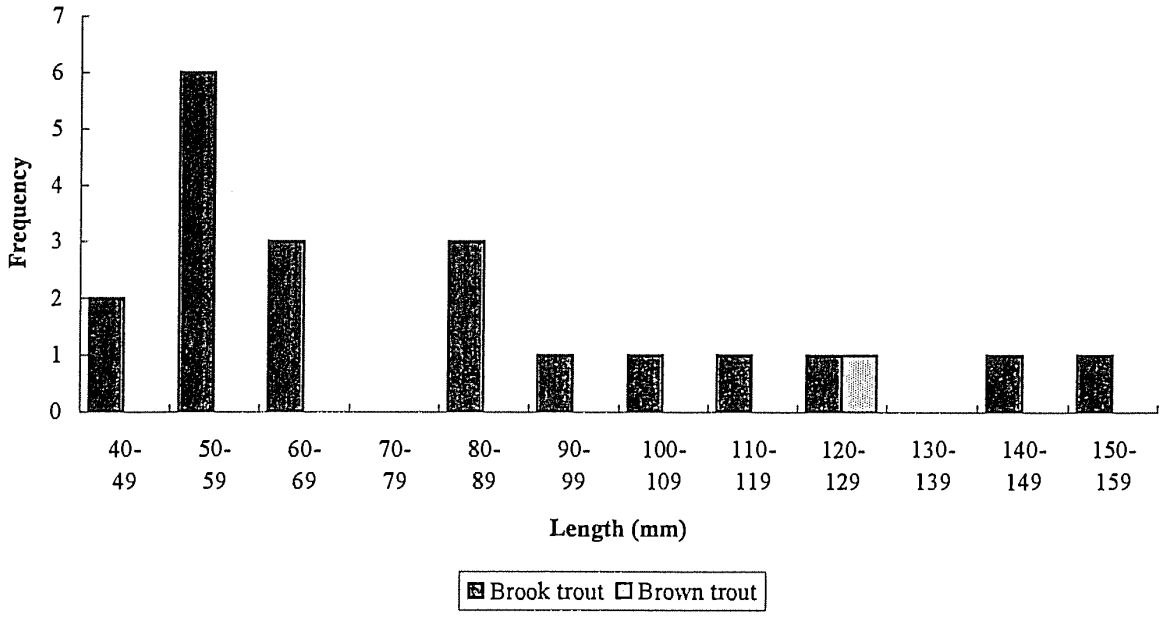
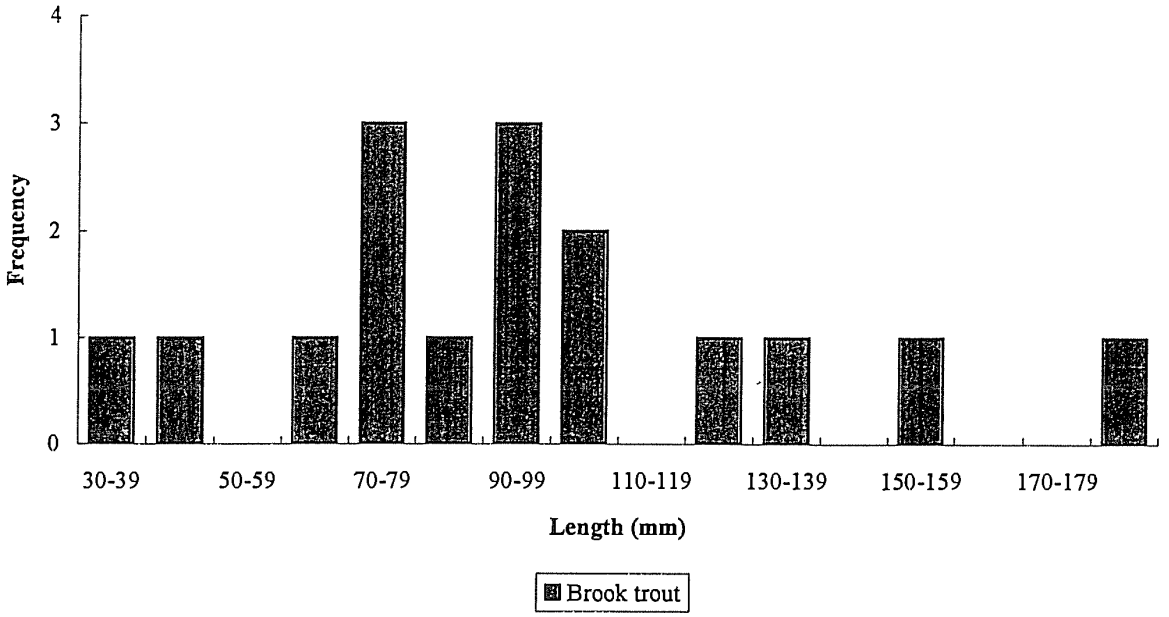


Figure 12. (cont.)

WILLIAMSON RIVER BASIN (CONT.)

WM-13 (Cottonwood Creek)



WM-14 (Jackson Creek)

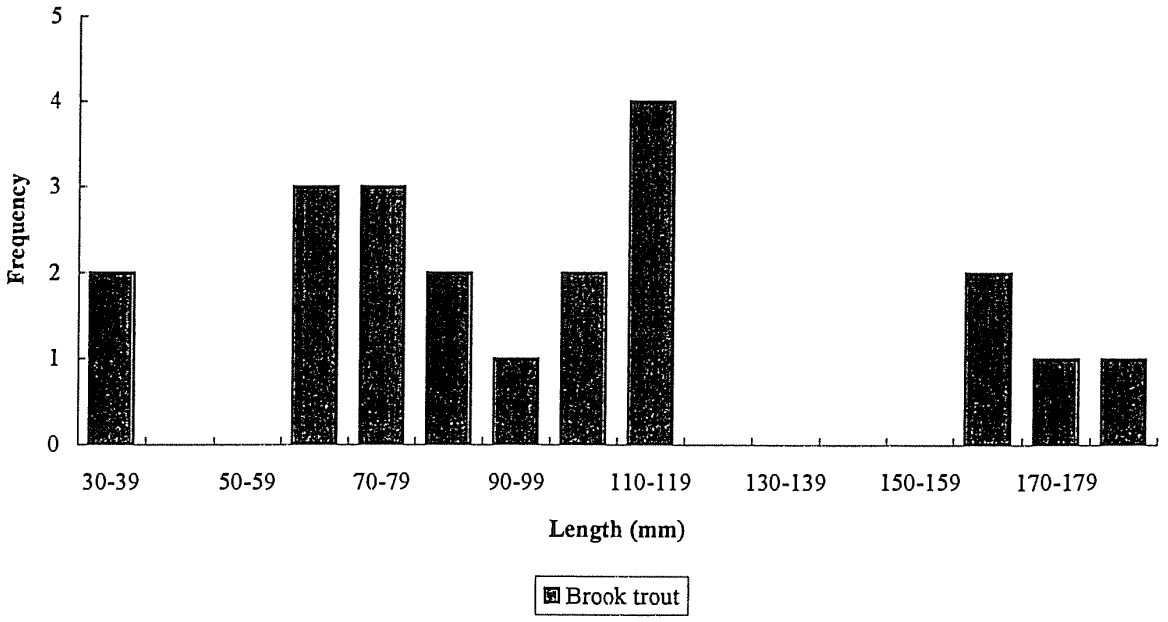
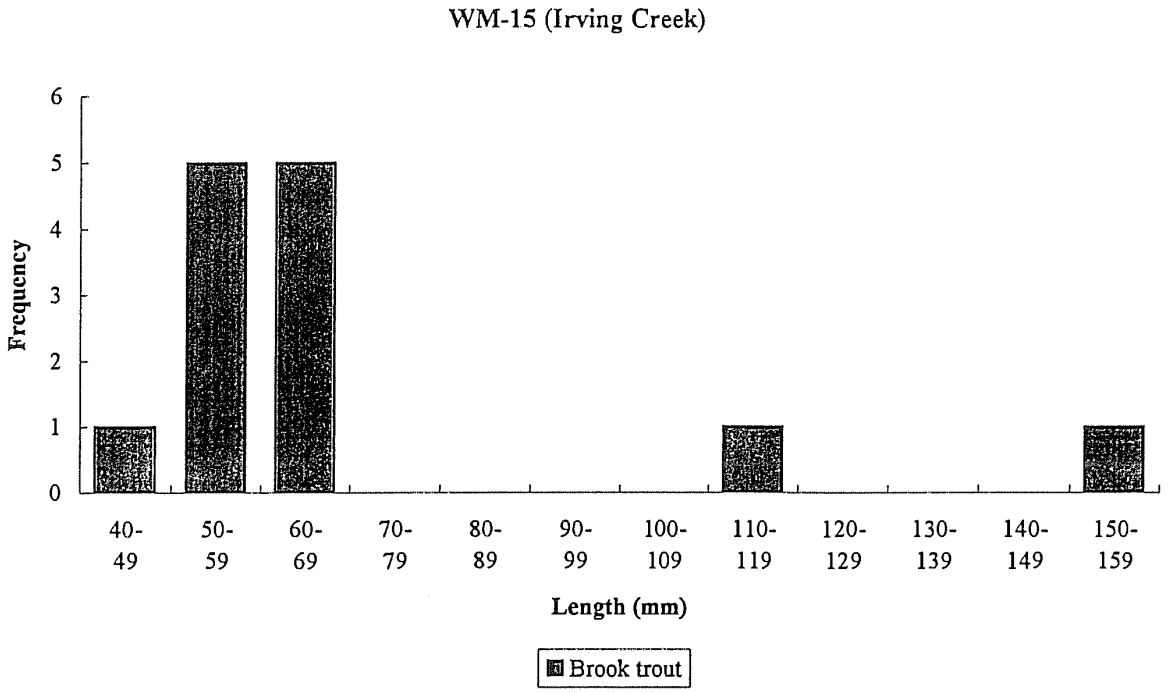


Figure 12. (cont.)



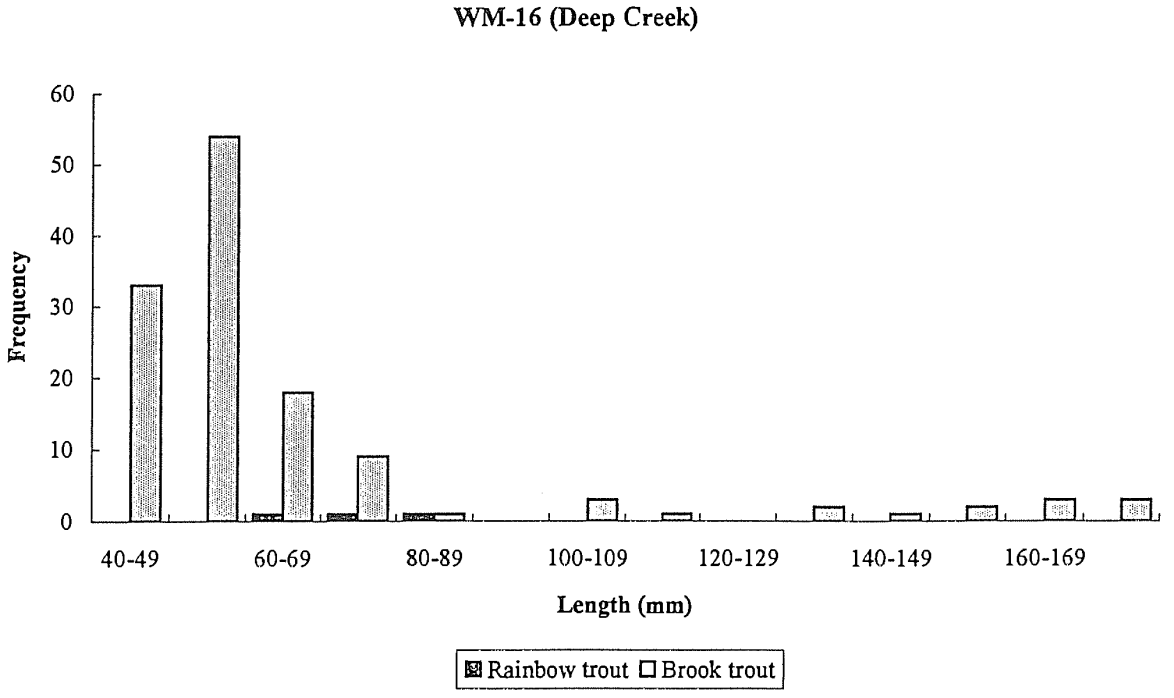


Figure 12. (cont.)

Tables

TABLE 1 FISH SPECIES OF THE UPPER KLAMATH RIVER BASIN

Species	Status
Pacific lamprey (*Lampetra tridentata*)	Native
Pit-Klamath brook lamprey (*Lampetra lethophaga*)	Native, endemic
Klamath River lamprey (*Lampetra similis*)	Native, endemic
White sturgeon (*Acipenser transmontanus*)	(?)Native
Brook trout (*Salvelinus fontinalis*)	Introduced
Brown trout (*Salmo trutta*)	Introduced
Redband trout (*Oncorhynchus mykiss subsp.*)	Native
Rainbow trout (*Oncorhynchus mykiss*)	Native
Sockeye salmon (*Oncorhynchus nerka*)	Introduced
Klamath tui chub (*Gila bicolor subsp.*)	Native, endemic
Blue chub (*Gila coerulea*)	Native, endemic
Golden shiner (*Notemigonus crysoleucas*)	Introduced
Redside shiner (*Richardsonius balteatus*)	(?)Introduced
Fathead minnow (*Pimephales promelas*)	Introduced
Speckled dace (*Rhinichthys osculus*)	Native
Lost River sucker (*Deltistes luxatus*)	Native, endemic, rare
Klamath largescale sucker (*Catostomus snyderi*)	Native, endemic
Shortnose sucker (*Chasmistes brevirostris*)	Native, endemic, rare
Brown bullhead (*Ictalurus nebulosus*)	Introduced
Mosquitofish (*Gambusia affinis*)	Introduced
Sacramento Perch (*Archoplites interruptus*)	Introduced
Green sunfish (*Lepomis cyanellus*)	Introduced
Pumpkinseed (*Lepomis gibbosus*)	Introduced
Bluegill (*Lepomis macrochirus*)	Introduced
Largemouth bass (*Micropterus salmoides*)	Introduced
White crappie (*Pomoxis annularis*)	Introduced
Black crappie (*Pomoxis nigromaculatus*)	Introduced
Yellow perch (*Perca flavescens*)	Introduced
Marbled sculpin (*Cottus klamathensis*)	Native, endemic
Klamath Lake sculpin (*Cottus princeps*)	Native, endemic
Slender sculpin (*Cottus tenuis*)	Native, endemic

TABLE 2 UPPER KLAMATH BASIN INSTREAM FLOW STUDY SAMPLING REACHES AND FISHERIES SAMPLING SITES (HIGHLIGHTED IN GREY)

Reach No.	Reach	Site Description	Quad S-T-R	Habitats Sampled	Date Sampled	Survey Type
WM-1	Williamson River (Hwy 97 to Upper Klamath Lake)	Site begins at Waterwheel Campground. Site length = 4,517'	Agency Lake S20-T35S-R7E SE1/4 SE1/4 NE1/4	Run		
WM-2	Williamson River (Sprague River to Hwy 97)	Site begins 3 miles upstream from Hwy 97. Site length = 4,325'	Agency Lake S4-T35S-R7E NE1/4 SE1/4 SE1/4	Run	9-10-93	Backpack Electrofisher
WM-3	Williamson River (Spring Creek to Sprague River)	Site begins at mouth of Spring Cr. at Collier State Park. Site length = 4,070'	Fort Klamath S9-T34S-R7E SW1/4 SE1/4 NE1/4	Run	9-11-93	Backpack Electrofisher
WM-4	Williamson River (Lower end of Kirk Canyon to Spring Creek)	Site beings immediately downstream from bridge just past Williamson River campground. Site length = 1,672'	Soloman Butte S35-T33S-R7E SE1/4 SW1/4 SE1/4	Run Riffle	9-11-93	Backpack Electrofisher
WM-5	Williamson River (Kirk to Lower end of Kirk Canyon)	Site begins immediately downstream from bridge crossing Williamson River on Kirk Rd. Site Length = 860'	Soloman Butte S1-T33S-R7E NE1/4 NW1/4 SW1/4	Run Cascade		
WM-6	Williamson River (Klamath Marsh to Kirk)	Site begins immediately upstream from R.R. trestle crossing Williamson River. Site length = 1,818'	Fuego S36-T32S-R7E SE1/4 NE1/4 NW1/4	Pool		
WM-7	Williamson River (Deep Creek to Klamath Marsh)	Site begins immediately upstream from end of F.S. Rd. 070. Site length = 1,010'	Gordon Lake S12-T31S-R10E SE1/4 SE1/4 NE1/4	Run	9-11-93	Tow-Barge Electrofisher
WM-8	Williamson River (Wickiup Spring to Deep Creek)	F.S. Rd. 490 to Williamson River Site begins immediately upstream from private land F.S. boundary. Site length = 1,235'	The Bull Pasture S31-T31S-R11E NE1/4 NW1/4 SW1/4	Run		
WM-9	Williamson River (Campground Springs to Wickiup Spring)	No access.				
WM-10	Larkin Creek	Hwy 97 N to Collier Park Camping sign. Pull into parking area where road first comes adjacent to creek. Site starts upstream of 2nd backwater slough. Site length = 305'	Soloman Butte S2-T34S-R7E SE1/4 SE1/4 SW1/4	Run	9-8-93	Underwater Observation
WM-11	Sand Creek	Located off F.S. on 2300. When you cross over the bridge, move downstream approx. 100' to lower end of site. Site length = 369'	Sun Pass S29-T31S-R7E SW1/4 SE1/4 NE1/4	Run	9-11-93	Underwater Observation

TABLE 2 (continued)

Reach No.	Reach	Site Description	Quad S-T-R	Habitats Sampled	Date Sampled	Survey Type
WM-12	Scott Creek	2.5 miles past Sand Creek; park at the junction heading for 97N. Site starts 200 m downstream of road crossing. Site length = 192'	Pothole Butte S16-T31S-R7E NE1/4 NE1/4 SW1/4	Run	9-10-93	Underwater Observation
WM-13	Cottonwood Creek	Located 4.1 mi in on FS Road 1370, off Hwy 138. Site length = 100'	Miller Lake S25/36-T28S-R6E	Run	9-8-93	Underwater Observation
WM-14	Jackson Creek	97 N to Silver Lake Hwy to 49. Drive through Jackson Creek USFS campground. The 1st time you see the creek approx. 10' from road site begins. Site length = 282'	Gordon Lake S8-T30S-R11E NE1/4 SW1/4 NW1/4	Cascade	9-10-93	Underwater Observation
WM-15	Irving Creek	Site begins approx. 25' upstream from where F.S. Rd 49 crosses Irving Creek Site length = 98'	Gordon Lake S19-T30S-R11E NE1/4 SE1/4 SW1/4	Run	9-10-93	Underwater Observation
WM-16	Deep Creek	Site is within mosaic cattle guard approx. 125 m. upstream of 1st fenceline beyond cattle guard. Site length = 172'	The Bull Pasture S28-T31S-R11E NE1/4 NW1/4 NW1/4	Run	9-10-93	Underwater Observation
WD-1	Wood River (Fort Creek to Agency Lake)	Combined with WD-2				
WD-2	Wood River (near Ft. Klamath) (Annie Creek to Fort Creek)	Located 2,000' downstream of Wood River picnic area. Site length = 1,130'	Fort Klamath S15-T33S-R7.5E SE1/4 SW1/4 SW1/4	Riffle		
WD-3	Crooked Creek	Located 160' downstream of Hwy 62 crossing. Site Length = 632'	Fort Klamath S12-T34S-R7.5E SW1/4 NW1/4 NE1/4	Run	9-8-93	Backpack Electrofisher
WD-4	Fort Creek	From Klamath Falls, right on FS 990. Approximately 0.5 miles then left on FS 995. ≈ 0.2 miles. Site is 100' dounstream. Site length = 1702.5'			9-8-93	Backpack Electrofisher
SP-1	Sprague River (Chiloquin Dam to Williamson River)	Site beings approx. 1/4 mile below Chiloquin Dam. Site length = 2,930	Chiloquin S3-T35S-R7E SE1/4 SW1/4 NE1/4	Run Riffle		
SP-2	Sprague River (Braymil to Chiloquin Dam)	Just upstream of powerline intertie 1.2 miles out of Chiloquin on the Sprague River Hwy. Site length = 3,040'	Chiloquin S35-T34S-R7E SE1/4 NE1/4 NE1/4	Run Riffle	9-8-93	Tow–Barge Electrofisher

TABLE 2 (continued)

Reach No.	Reach	Site Description	Quad S-T-R	Habitats Sampled	Date Sampled	Survey Type
SP-3	Sprague River (S'Ocholis Canyon to Braymil)	On highway, turn left at mile marker 13 into camping area. Site starts approx. 700' downstream. Site length = 2,617.5'	S'Ocholis Canyon S9-T35S-R9E NW1/4 NE1/4 NE1/4	Run	9-8-93	Tow–Barge Electrofisher
SP-4	Sprague River (Trout Creek to Upper end of S'Ocholis Canyon)	Site begins 1/4 to 1/2 mile downstream of 5850 Bridge. Site length = 2,047.5'	S'Ocholis Canyon S10-T35S-R9E NW1/4 SE1/4 NE1/4	Run		
SP-5	Sprague River (Sycan River to Trout Creek)	Just before the Sprague River train tracks (just west of Beatty), turn right and follow road to locked fence. Site starts there. Site length = 2,920'	Sprague River West S8-T36S-R10E NW1/4 NE1/4 NE1/4	Run	9-9-93	Tow–Barge Electrofisher
SP-6	Sprague River (1.5 miles upstream of Beatty)	None found in field notes. Site length = 2,462.5'		Run	9-9-93	Tow–Barge Electrofisher
SP-7	Sprague River (NF/SF Sprague River to Kirk Spring)	No access.				
SP-8	Trout Creek	Located 2,500' downstream of Middle/South Forks confluence off F.S. Rd. 5850 on F.S. land. Site length = 196'	Sprague River West S35-T35S-R9E NW1/4 SW1/4 SE1/4	Run Riffle	9-11-93	Underwater Observation
SP-9	Whisky Creek	No sample site established.				
SP-10	NF Sprague River (Balley Flats to NF/SF)	Located on Rocking AC Ranch, 600' downstream of Ranch Road Bridge. Site length = 500'	Bly S6-T36S-R14E SE1/4 NW1/4 NE1/4	Run		
SP-11	NF Sprague River (Boulder Creek to Balley Flats)	Located 0.2 mi upstream of FS boundary at Upper FS boundary. Site length = 500'	Bly S35-T35S-R14E SW1/4 SW1/4 NE1/4	Pool		
SP-12	Fivemile Creek (Lower Forest Service boundary to NF Sprague River)	Located 1.5 mi upstream of confluence w/NF Sprague River, 1/4 mi downstream of Ranch Road crossing. Site length = 250'	Bly S1-T36S-R13E SW1/4 SE1/4 NE1/4	Run		

TABLE 2 (continued)

Reach No.	Reach	Site Description	Quad S-T-R	Habitats Sampled	Date Sampled	Survey Type
SP-13	Fivemile Creek (Headwaters to lower Forest Service boundary)	Located at Northern F.S. boundary, just upstream of Swamp Creek. Site length = 451'	Rodeo Butte S1-T35S-R13E SW1/4 SE1/4 SE1/4	Run Riffle	9-11-93	Underwater Observation
SP-14	SF Sprague River (Fishhole Creek to NF/SF)	No access.				
SP-15	SF Sprague River (Ish Tish Creek to Fishhole Creek)	Out of Bly, 1st left on 4350, then a right on Highway 34. Cross 2 bridges. Site is just upstream of 2nd bridge. Site length = 627'	Campbell Reservoir S31-T36S-R15E SW1/4 SE1/4 SW1/4	Run		
SP-16	SF Sprague River (Brownswoth Creek to Ish Tish Creek)	Out of Bly approximately 8 miles on Highway 140, turn at mile marker 62 left up gravel road (1st left) after (015) Picnic Area. Turn left on 037 (14), pass 1 gate right up Creek Bed Road until trail, hike 400 m down to site. Site length = 815'	Campbell Res. S3-T37S-R15E SE1/4 NW1/4 NE1/4	Pocket Water	9-10-93	Backpack Electrofisher
SP-17	Deming Creek	Located 4.5 miles up F.S. Road 018. Site length = 200'	Campbell Reservoir S11-T36S-R15E SW1/4 NW1/4 SW1/4	Run	9-10-93	Backpack Electrofisher
SY-1	Sycan River Upstream of Snake Creek (Blue Creek to Snake Creek)	Drive up Sycan S River Ranch Rd marked private. Go through 5 gates to locked gate. Turn left and wind your way to the stream. Site length = 1,170'	Spodue Mountain S16-T35S-R12E NE1/4 NW1/4 SW1/4	Run	9-10-93	Backpack Electrofisher
SY-2	Sycan River in canyon (Teddy Powers Meadow to Blue Creek)	Take 130 to river, then continue downstream approx. 0.4 miles. Site starts where road heads up hill. Site length = 1,245'	Spodue Mountain S24-T34S-R11E NE1/4 SE1/4 NE1/4	Run		
SY-3	Sycan River (Torrent Springs to Teddy Powers Meadow)	Located 1/2 mile upstream of Sycan Ford. Site length = 486'	Silver Dollar Flat S27-T33S-R12E NE1/4 SW1/4 SW1/4	Run	9-9-93	Backpack Electrofisher
SY-4	Sycan River above Torrent Springs (Merrit Creek to Torrent Springs)	Located 1.5 miles upstream of Torrent Springs on F.S. Rd. 4672. Site length = 1,150'	Riverbed Butte Spring S25-T33S-R12E SE1/4 SW1/4 NW1/4	Riffle Run	9-9-93	Backpack Electrofisher
SY-5	Sycan River below Marsh (Guard Station to Merrit Creek)	Located 100' upstream of F.S. Road 3207 crossing. Site length = 1,000'	Riverbed Butte Spring S16-T33S-R13E NW1/4 SE1/4 NW1/4	Run Riffle		

TABLE 2 (continued)

Reach No.	Reach	Site Description	Quad S-T-R	Habitats Sampled	Date Sampled	Survey Type
SY-6	Sycan River above ZX Ranch (Long Creek to Guard Station)	Located at high voltage transmission line crossing approximately 1 mi upstream from FS boundary. Site length = 625'	Sycan Marsh East S22-T32S-R14E NE1/4 NE1/4 SE1/4	Run	9-9-93	Underwater Observation
SY-7	Sycan River (Paradise Creek to Long Creek)	Located 1,000' downstream from main FS road crossing; near Pines Crossing. Site length = 555'	Shake Butte S22-T33S-R15E NW1/4 NE1/4 NW1/4	Run		
SY-8	Long Creek	Williamson Hwy, left on 46, left on 27 on main gravel road, come to where road crosses stream. Site is downstream approx. 200 m. Site length = 460'	Sycan Marsh West S4-T32S-R13E NW1/4 SW1/4 NE1/4	Riffle Run Pool	9-9-93	Underwater Observation
SY-9	Calahan Creek	East on Sprague River Hwy, left on Williamson River Road to Long Creek, left at Long Creek Bridge Cinder Rd. 7 mi to Campground. 300' downstream of Campground. Site length = 205'	Carlton Butte S26-T31S-R12E NW1/4 SE1/4 NW1/4	Run	9-9-93	Underwater Observation
SY-10	Coyote Creek	Site begins just upstream of road crossing the Creek. Site length = 162'	Sycan Marsh West S27-T31S-R13E SE1/4 SW1/4 NE1/4	Run	9-9-93	Underwater Observation
SPWNG #1	Williamson River	@ Ken's Place. 5 transects (partials) placed over spawning areas.		Riffle		
SPWNG #2	Williamson River	@ Wagon Wheel Campground; riffle immediately downstream of Hwy 97 Bridge. Two transects placed over spawning area.	Agency Lake S21-T35S-R7E NW1/4 SW1/4 NE1/4	Riffle		

TABLE 3 IFIM SITES STRATIFIED FOR FISH SURVEY SITE SELECTION

Main Stem	Small River	Tributary
WM-2	WM-4	WM-10
WM-3	WM-7	WM-12
SP-1	WM-8	WM-13
SP-2	WM-11	WM-14
SP-3	WD-2	WM-15
SP-4	WD-3	WM-16
	WD-4	SP-8
	SP-5	SP-12
	SP-6	SP-17
	SP-10	SY-8
	SP-11	SY-9
	SP-13	SY-10
	SP-15	
	SP-16	
	SY-1	
	SY-2	
	SY-3	
	SY-4	
	SY-5	
	SY-6	
	SY-7	
	SS-1: Not sampled	
	SS-2: Not sampled	

Appendix

Field Data