ASSESSMENT OF THE FISHERY IMPROVEMENT OPPORTUNITIES ON THE PEND OREILLE RIVER

1990 Annual Report

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EXECUTIVE SUMMARY

The purpose of this study was to assess the fishery improvement opportunities on the Box Canyon portion of the Pend Oreille River. This three year study was initiated as part of the Northwest Power Planning Council's 1987 Columbia River Basin Fish and Wildlife Program. This report contains the findings of the third and final year of the study.

Chinook salmon (Oncorhynchus tshawytscha [Walbaum]) and steelhead trout (Oncorhynchus *mykiss* [Richardson]) were present in the Pend Oreille River prior to construction of Grand Coulee Dam. The river also contained native cutthroat trout *(Oncorhynchus clarki* [Richardson]), bull trout *(Salvelinus confluentus* [Suckley]) and mountain whitefish *(Prosopium* williamsoni [Girard]). After construction of Grand Coulee Dam, rainbow trout were planted in the river and some grew to lengths in excess of 30 inches (760 mm). With the construction of Box Canyon Dam, in 1955, the most productive section of the river was inundated: Following the construction of the dam the trout fishery declined and the populations of spiny ray fish and rough fish increased. Currently, yellow perch *(Perca flavescens* [Mitchill]) are the predominant fish species in the river and largemouth bass *(Micropterus salmoides* [Lacepede]) are the predominant sport fish.

The objectives of the third year of the study were to determine:

1. relative abundance of each species in the river and sloughs;
2. population levels in five selected tributaries and, if possible, for fish in the river and sloughs:
3. fish growth rates;
4. feeding habits and abundance of preferred prey;
5. migration patterns; and
6. seasonal movement patterns and habitat utilization of largemouth bass.

Electrofishing surveys resulted in the capture of 9,933 fish from February through October, 1990. The catch was composed of 44.8 percent yellow perch, 10.5 percent tenth *(Tinca tinca* [Linnaeus]),l0.3 percent pumpkinseed *(Lepomis gibbosus* [Linnaeus]), 8.5 percent largemouth bass, 7.1 percent mountain whitefish *(Prosopium williamsoni* [Girard]), 5.9 percent largescale sucker

(Catostomus macrucheilus [Girard]), 3.6 percent longnose sucker *(Catostomus catostomus* [Forster]). Trout were rare with brown trout being the most abundant at 1.0 percent of the total catch.

Population estimates in the 90 km long Box Canyon Reservoir were made using the Schnabel multiple mark and recapture technique. The yellow perch population was estimated at 8,804,453 with 95 percent confidence limits ranging from 5,502,783 to 15,118,758. The pumpkinseed population was estimated at 4,431,018 with a range of 1,230,838 to 44,310,181. The population estimate for tench was 1,001,841 with a range of 527,285 to 2,254,142. The estimated population for largemouth bass was 570,098 with the 95 percent confidence limits at 288,657 to 1,341,407. The northern squawfish population was estimated at 280,663 with a range of 77,962 to 2,806,626. The population estimate for mountain whitefish was 265,893 with a range of 144,507 to 565,731. The longnose sucker estimate was 218,743 with a range of 85,781 to 874,971. The estimated population for largescale suckers was 194,551 with the 95 percent confidence limits at 108,632 to 396,307. The brown trout population was estimated at 37,198 with a range of 10,333 to 371,977.

Population estimates were made using the removal-depletion method at four sites on each of the five tributaries. The highest brown trout density was found in Cee Cee Ah Creek at 12.2 ± 0.6 fish/100m^2 (± 95% C.I.). Brook trout density was highest in the upper site of Ruby Creek at 45.1 ± 8.7 fish/100m^2. The highest cutthroat density was also found in Cee Cee Ah Creek at 6.1 ± 2.1 fish/100m^2. In general, brook trout were most abundant in the upper reaches of the tributaries while brown trout were most abundant in the lower reaches.

Growth rates for largemouth bass in the Box Canyon Reservoir were lower than bass from other locations in the northern and northwestern United States during the first four years. However, growth rates after the fourth year were comparable to other locations, and in some cases higher. This may indicate that food is limiting bass growth until they reach a size that enables them to eat fish. Although their growth rates are lower than normal, a substantial number of largemouth bass in excess of 500 mm were captured in electrofishing surveys during the spring when they are concentrated in the sloughs for spawning.

Growth rates and condition factors for yellow perch, black crappie, brown trout, cutthroat trout, and rainbow trout in the reservoir tended to be low in comparison to other locations. Growth rates for mountain whitefish were good compared to those from other locations. Growth rates of brown trout in Pend Oreille River tributaries were lower than other locations in the Pacific Northwest. Cutthroat and brook trout growth was good in relation to other streams in the region.

Mean annual invertebrate densities in the river ranged from 2,580 to 15,263 organisms/m2 at reservoir sites and ranged from 3,933 to 9,985 organisms/m2 in slough sites. Densities of macroinvertebrates in the river and sloughs were low in comparison to other systems in the Pacific Northwest. Mean annual invertebrate densities in Pend Oreille River tributaries ranged from 857 organisms/m2 in Ruby Creek to 2,193 organisms/m2 in Cee Cee Ah Creek. Mean annual densities in the drift ranged from 10 organisms/100 m^3 in Tacoma Creek to 62 organisms/100 m^3 in Cee Cee Ah Creek. Invertebrate densities were also lower in the tributaries than in other streams of comparable size in the region.

Mean copepoda and cladocera densities ranged from 5.12 organisms/l, in April, to 19.98 organisms/l, in July, in mid-channel samples. Samples taken from littoral areas had mean densities that ranged from 21.77 organisms/l, in April, to 68.81 organisms/l, in July. Bosminidae, Chydoridae and Daphnidae were the major families of cladocerans collected in both mid-channel and littoral samples. Nauplii was the major component of copepod density in both mid-channel and littoral samples. Cladoceran biomass ranged from 0.65 $\mu g/l$, in April, to 19.43 $\mu g/l$, in September, in mid-channel samples, and from 3.76 $\mu g/l$, in April, to 37.16 $\mu g/l$, in July in littoral samples. Cladoceran and copepod densities from the mid-channel of the reservoir were about average in comparison to other lakes and reservoirs in the region.

Diet analysis of river and slough fish revealed that black crappie, tench, and 0+ through 3+ largemouth bass were primarily planktivorous and yellow perch, whitefish, and brown trout fed most frequently on benthic macroinvertebrates. Older largemouth bass and northern squawfish fed upon fish. All species of fish were opportunistic in their feeding upon benthic macroinvertebrates with most electivities near zero. The planktivorous fish had high electivities for Daphnidae and Chydoridae. Diet overlaps were high between yellow perch and young bass due to their common reliance upon zooplankton as a food item. High overlaps were common between other fish species in the reservoir, in general, as a result of many species of fish utilizing Chironomidae larvae, Daphnidae and Chydoridae.

Diet analysis of fish collected from the tributaries revealed that all species within the five tributaries exhibited a high degree of variation in their individual diets. In general, Limnephilidae, Brachycentridae, Chironomidae larvae, Baetidae, Formicidae and Elmidae larvae were the primary contributors to the diet of fish in the five tributaries. Brown trout and brook trout exhibited high diet overlaps in all tributaries. Brook trout and cutthroat trout diet overlaps ranged from low to moderate in all tributaries. High diet overlaps between cutthroat and rainbow trout were observed only in Ruby Creek. Mountain whitefish had low to moderate overlaps with all salmonid species found in the tributaries.

The recapture of tagged fish showed that most remain in the same area as where they were tagged. Fish that did move tended to move only short distances. Many of the largemouth bass that moved had been caught and displaced by bass tournament anglers.

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1 .0 INTRODUCTION

In 1987, the Northwest Power Planning Council amended its Columbia River Basin Fish and Wildlife Program to include: *"An assessment of fishery improvement opportunities in the Pend Oreille River within the boundaries of the Kalispel Indian Reservation. This survey will provide: i) Baseline information about existing fish populations and habitat and ii) information on possible means of improving fisheries. When the assessments are completed, recommendations for projects will be submitted to the Council"* [Section 903(g)(l)(G)]. The Council's Five Year Action Plan stated that the Bonneville Power Administration (BPA) should commence funding of a three year assessment of the fishery improvement opportunities on the Pend Oreille River adjacent to the Kalispel Reservation starting in Fiscal Year 1988 [Section 1400(7.7)]. In 1988, BPA contracted the Kalispel Tribe to conduct this assessment. This report contains the results of the third and final year of the survey.

1.1 FISHERIES MANAGEMENT HISTORY OF THE PEND OREILLE RIVER

See Barber et *al.* (1989) for a discussion of the past history of the study area.

1.2 SUMMARY OF 1988 AND 1989 FINDINGS

Electrofishing surveys resulted in the capture of 19,931 fish from March through October, 1988 and 17,554 fish from November, 1988 through December, 1989. Fish species captured include:

Brown trout	*Salmo trutta* [Linnaeus]
Cutthroat trout	*Oncorhynchus clarki* [Richardson]
Rainbow trout	*Oncorhynchus mykiss* [Richardson]
Brook trout	*Salvelinus fontinalis* [Mitchill]
Bull trout	*Salvelinus confluentus* [Suckley]
Kokanee	*Oncorhynchus nerka* [Walbaum]
Mountain whitefish	*Prosopium williamsoni* [Girard]
Largemouth bass	*Micropterus salmoides* [Lacepede]
Black crappie	*Pomoxis nigromaculatus* [Lesueur]
Pumpkinseed	*Lepomis gibbosus* [Linnaeus]
Yellow perch	*Perca flavescens* [Mitchill]
Tench	*Tinca tinca* [Linnaeus]
Redside shiner	*Richardsonius balteatus* [Richardson]

Northern squawfish	*Ptychocheilus oregonensis* [Richardson]
Peamouth	*Mylocheilus caurinus* [Richardson]
Lake chub	*Couesius plumbeus* [Agassiz]
Longnose sucker	*Catostomus catostomus* [Forster]
Largescale sucker	*Catostomus macrocheilus* [Girard]
Brown bullhead	*Ictalurus nebulosus* [Lesueur]
Sculpin	*Cottus* spp.

In 1988, the catch was composed of 42 percent yellow perch, 19 percent pumpkinseed, 10 percent tench, 7 percent largemouth bass, 5 percent northern squawfish, 5 percent largescale sucker, and 4 percent mountain whitefish. In 1989, yellow perch composed 45 percent of the catch, followed by pumpkinseed (17%), largemouth bass (9%), tench (8%), mountain whitefish (6%), largescale sucker (5%), and northern squawfish (4%). Trout were rare during both 1988 and 1989, with brown trout being the most abundant at 0.6 and 0.7 percent of the total catch, respectively.

Population estimates in the 90 km long Box Canyon Reservoir were made using the Schnabel multiple mark and recapture technique. In 1988, the yellow perch population was estimated at 41,777,446 with 95 percent confidence limits ranging from 23,872,826 to 80,859,573. The pumpkinseed population was estimated at 16,822,372 with a range of 7,704,903 to 45,879,196. The population estimate for tench was 4,282,807 with a range of 2,081,920 to 10,707,019. The estimated population for largescale suckers was 821,863 with a range of 432,560 to 1,849,192. The longnose sucker estimate was 781,166 with a range of 357,786 to 2,130,452. The population estimate for largemouth bass was 657,549 with a range of 455,727 to 989,859. The squawfish population estimate was 580,565 with a range of 357,271 to 1,009,679. The black crappie population estimate was 579,588 with a range of 103,498 to 5,795,881. The population estimate for mountain whitefish was 164,252 with a range of 120,185 to 231,258. Trout populations could not be estimated due to their low rate of capture.

In 1989, the yellow perch population was estimated at 6,101,448 with a lower limit of 4,139,850 and an upper limit of 9,116,972. The pumpkinseed population was estimated at 3,889,758 with a lower limit of 1,969,498 and an upper limit of 9,152,371. The estimated population for tench was 1,085,921 with confidence intervals that ranged from 497,368 to 2,961,603. The population estimated for largemouth bass was 590,906 with a lower limit of 399,193 and an upper limit of 1,390,366. The northern squawfish population was estimated at 248,988 with a lower 95 percent confidence limit of 97,642 and an upper limit of 995,950. The largescale sucker population estimate of was 186,693 with a lower limit of 79,783 and an upper limit of 583,416. The population estimate for longnose sucker was 183,457 with a range of 62,542 to 917,286. The population of mountain whitefish was estimated at 163,890 with lower and upper confidence limits of 70,038 and 512,156, respectively. The brown bullhead population was estimated at 36,200 with a lower limit of 6,464 and an upper limit of 362,001. The population estimate for brown trout was 7,264 with the lower 95 percent confidence limit of 3,104 and the upper limit of 22,701.

Population estimates were made for five tributaries using either the Petersen or removal-depletion method in 1988 and only the removal-depletion method in 1989. These estimates were conducted in a different manner for both years and therefore are not comparable. In general, brown trout densities were observed to be highest in the downstream reaches while brook trout densities were highest in the upstream reaches of the study tributaries during both years. Skookum and Cee Cee Ah Creeks had the highest densities of brown trout. The highest brook trout densities were found in Ruby and Skookum Creeks. The highest cutthroat density was observed in Tacoma Creek in 1988 and in Cee Cee Ah in 1989.

Growth rates for largemouth bass were similar in 1988 and 1989. Bass in the Pend Oreille River tended to have lower growth rates in comparison to bass from other locations in the north and northwestern United States during their first four years. However, after their fourth year they were comparable to other locations, and in some cases, higher. Growth rates and condition factors calculated for yellow perch, black crappie, brown trout, brook trout, and rainbow trout in the reservoir were similar in 1988 and 1989. In comparison to other locations in the Pacific Northwest these species tended to have low growth rates. Growth rates for mountain whitefish were higher in 1988 than in 1989. In comparison to fish from other locations growth rates and condition factors for mountain whitefish were as good or better. Growth rates of brown trout in Pend Oreille River tributaries were similar for both years but tended to be lower than other locations in the Pacific Northwest. Brook trout and cutthroat trout growth rates were also similar between 1988 and 1989, however in comparison to other tributaries in the region these trout tended to have higher growth rates

Even though the growth rates of fish from the Pend Oreille River tended to be below average, a substantial number of large fish were captured in 1988 and 1989. In the late spring, when largemouth bass concentrate in the sloughs, bass over 500 mm were common in electrofishing surveys. In the late summer and fall, a fair number of brown trout greater than 600 mm and mountain whitefish over 400 mm were captured in Cee Cee Ah Slough and at the mouth of Cee Cee Ah Creek. One rainbow trout was captured in 1988 that measured 720 mm. In 1989, a 905 mm rainbow trout was captured. Three bull trout were also captured in 1989, measuring from 600 to 800 mm. One 560 mm lake trout was captured in 1990, along with 3 cutthroat trout, that were over 300 mm. Therefore, some species do attain large sizes in the reservoir, however they are typically only captured during times when they are concentrated.

Mean annual invertebrate densities in the river were greater in 1989 (13,758 organisms/m^2) than in 1988 (8,343 organisms/m^2). Mean annual invertebrate densities in sloughs samples were also greater in 1989. In comparison to other locations in the Pacific Northwest invertebrate densities for both years in the river and sloughs were lower. Mean annual benthic macroinvertebrate densities were lower in 1989 than in 1988 for all five of the Pend Oreille River tributaries sampled. The highest density of invertebrates was found in Cee Cee Ah Creek (5,921 organisms/m^2) in 1988 and in Skookum Creek (4,658 organisms/m^2) during 1989. Mean annual densities of invertebrates collected in drift samples were similar in 1988 and 1989, except for Skookum Creek which had a much higher density of drift invertebrates in 1988. The highest density of drifting invertebrates was found in Skookum Creek (282 organisms/100 ms) in 1988 and in Tacoma Creek (158 organisms/l 00m^3) during 1989. Invertebrate densities in the tributaries to the Pend Oreille River were lower than in other streams of comparable size in the region.

Zooplankton densities from mid-channel of the Pend Oreille River during 1989 were lower than 1988 for every month except June. The mean annual density was 112 organisms/liter in 1989, compared to 121 organisms/liter in 1988 Densities of major zooplankton taxa changed from 1988 to 1989. In 1988, there were 8.38 cladocerans/liter, compared to 5.35 cladocerans/liter in 1989.

Copepods decreased from 27.05 organisms/liter, in 1988, to 16.93 organisms/liter, in 1989. Rotifers increased slightly from 1988 to 1989. Total biomass for cladocerans in the Pend Oreille River was 11.3 μg/l in 1989, a decrease from 22.9 μg/l in 1988. Cladoceran and copepod densities were higher in the Pend Oreille River than most other lakes and reservoirs in the region.

Diet analysis of fish collected in the river and sloughs revealed that tench and age 0+ to age 3+ largemouth bass were primarily planktivorous during 1988 and 1989. Yellow perch and black crappie fed primarily on zooplankton in 1988 but benthic macroinvertebrates were more important to their diet in 1989. This change was probably due to a decrease in zooplankton density and an increase in benthic macroinvertebrate density in 1989. Benthic macroinvertebrates were the most frequent items consumed by mountain whitefish and brown trout in both 1988 and 1989.

Changes in diet overlaps occurred between several species of fish found in the Pend Oreille River. Most of 'the changes were from moderate overlaps in 1988 to high overlaps in 1989. In general the high diet overlaps were the result of many species of fish utilizing, to a high degree, chironomid larvae, Daphnidae, and Chydoridae. Electivities were similar for 1988 and 1989. Most fish species were opportunistic in their consumption of benthic organisms but several species of fish selected for zooplankton.

The feeding analysis of trout collected from the tributaries n 1988 revealed that Baetidae and Limnephilidae were important brown trout food organisms based on the Index of Relative Importance (IRI). Important food items for brook trout were Trichoptera pupae, Limnephilidae, Oligochaeta, and Chironomidae pupae; and important food items for cutthroat trout were Diptera adults, Elmidae, and Hymenoptera. Electivities indicated that all trout in the tributaries were relatively opportunistic with most values around zero. The feeding analysis of trout collected from the tributaries in 1989 was not complete at the time of the 1989 printing and is therefore contained in Section 3.6 of this (1990) annual report.

There was little movement or migration displayed by fish that received floy tags in 1988; most were recaptured in the same location where they were tagged. The fish that moved tended to move only short distances. Many of the largemouth bass that moved were displaced by bass anglers during a bass tournament.

From March through December of 1988, angler effort on the Pend Oreille River was estimated at 4,139 ± 467 hours. Effort decreased in 1989 to 3,029 ± 374 hours. The CPUE in 1989 for total catch, was more than twice the CPUE for total catch in 1988. Success of bass anglers during catch and release bass tournaments was not included in the CPUE calculation for either year. Estimated total catch (including fish released) was 18,171 fish in 1989 as compared to 10,082 fish in 1988. This difference was partly attributed to the fact that the 1988 drawdown of the reservoir occurred during the peak of the fishing season. The number of fish harvested by anglers was greater in 1988 than in 1989. An estimated 2,505 ± 312 fish were harvested in 1988, compared to 1,331 ± 164 in 1989. Overall estimates of fishing pressure for both boat and shore anglers were higher in 1988 than in 1989.

1.3 STUDY OBJECTIVES

The purpose of this three year study was to identify fishery improvement opportunities for the Box Canyon Reservoir of the Pend Oreille River. Species targeted in this study included all trout, mountain whitefish, largemouth bass, black crappie, and yellow perch. The objectives of the study were to collect information on:

1. Population dynamics (including relative abundance, population levels, natural and fishing mortality, and recruitment;
2. Growth rates;
3. Feeding habits;
4. Behavior patterns; and
5. Factors limiting fish production (e.g., food availability, competition, habitat availability, environmental fluctuations).

At the end of the study, the information will be combined to develop recommendations for fisheries projects, cost estimates for each alternative, and estimates for success (in terms of increasing fish production) of each alternative. The three year time period should provide enough time so that any changes in fish populations, fish growth, and fish diets due to environmental fluctuations could be observed and analyzed. Upon completion of these assessments, recommendations for fisheries enhancement projects will be submitted to the Northwest Power Planning Council.

The third year study objectives were to determine:

1. Relative abundance of each species in the river and sloughs;
2. Population levels in five selected tributaries and, if possible, for fish in the river and sloughs;
3. Fish growth rates;
4. Feeding habits and abundance of preferred prey;
5. Migration patterns; and
6. Seasonal movement patterns and habitat utilization of largemouth bass.

2.0 METHODS AND MATERIALS

The methodology used for sample collection was the same as Barber *et al.* (1989), unless otherwise noted.

2.1 DESCRIPTION OF THE STUDY AREA

The Pend Oreille River begins at the outlet from Pend Oreille Lake, ID, and flows in a westerly direction. The river turns north near Dalkena, WA, and flows into British Columbia, Canada where it enters the Columbia River. The approximate drainage area of the river at the international border in 65,300 km^2. Fig. 2.1 shows the 37 year mean monthly flows and the mean flows that occurred during the sampling months at the Newport, WA gage. The normal high flow month is June with a mean discharge of 61,858 cubic feet per second (cfs). In 1990, the high flow was in June with a mean discharge of 66,770 cfs. Normal low flow month for the Pend Oreille River is August with a mean discharge 11,897 cfs. In 1990, the lowest mean monthly flow was in August with a mean discharge of 12,790 CFS. Mean flows were above average from January through October of 1990, except during March and May.

The study area covers the 90 kilometer section of the river from Box Canyon Dam at river kilometer (RK) 55.5 to Albeni Falls Dam at RK 145 (Fig. 2.2). Within this reach, eleven river, four slough and four tributary study sites were established (Table 2.1). The tributaries studied were LeClerc Creek, Cee Cee Ah Creek, Tacoma Creek, Ruby Creek, and Skookum Creek.

2.2 SAMPLING REGIME

All the information contained in this report was collected from January through October 1990, except for the samples for the 1989 tributary feeding habits which were collected in March 1989 through October 1989.

Between 3 to 10 days were spent in the field each month. Fish in the river and sloughs were marked monthly for estimating population size; relative abundance, age, growth, and condition information were also collected at that time. Tributary populations were measured during September. Information on fish feeding habits and food availability in the river, sloughs, and tributaries was collected in April, July, and September.

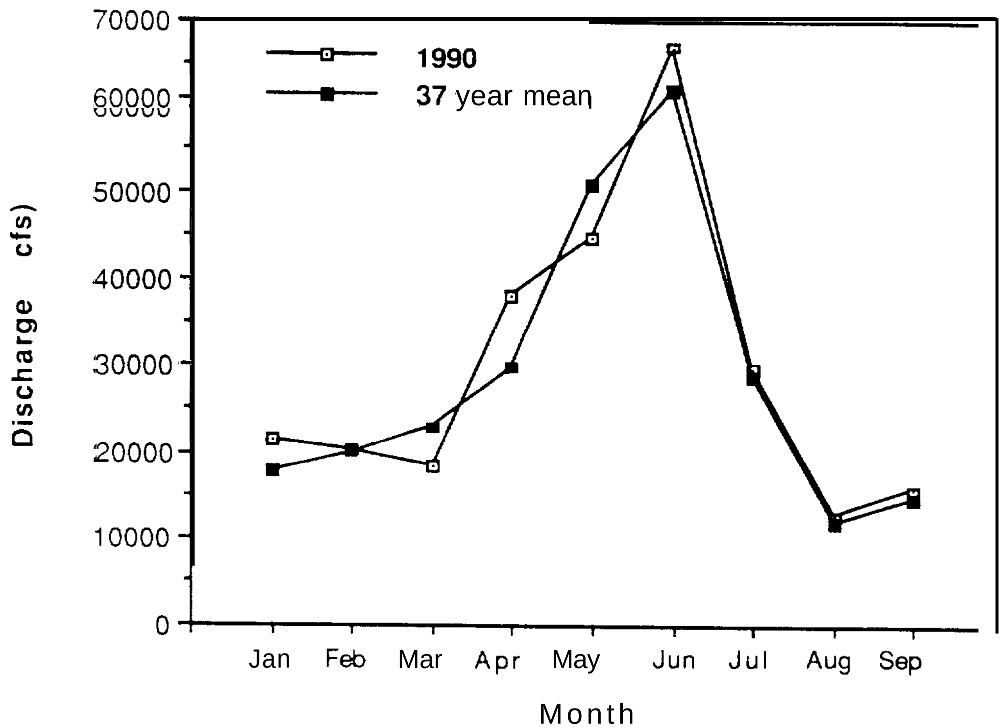

Figure 2.1. **Comparison of 37 year (1953-1990) mean monthly flows with the mean monthly flow during January through October, 1990 at Newport, WA (USGS gage 12395500). The 1953-1987 data was compiled by Soltero et *al.* (1988) and the 1988, 1989 and 1990 provisional data was obtained from the USGS, Sandpoint, ID.**

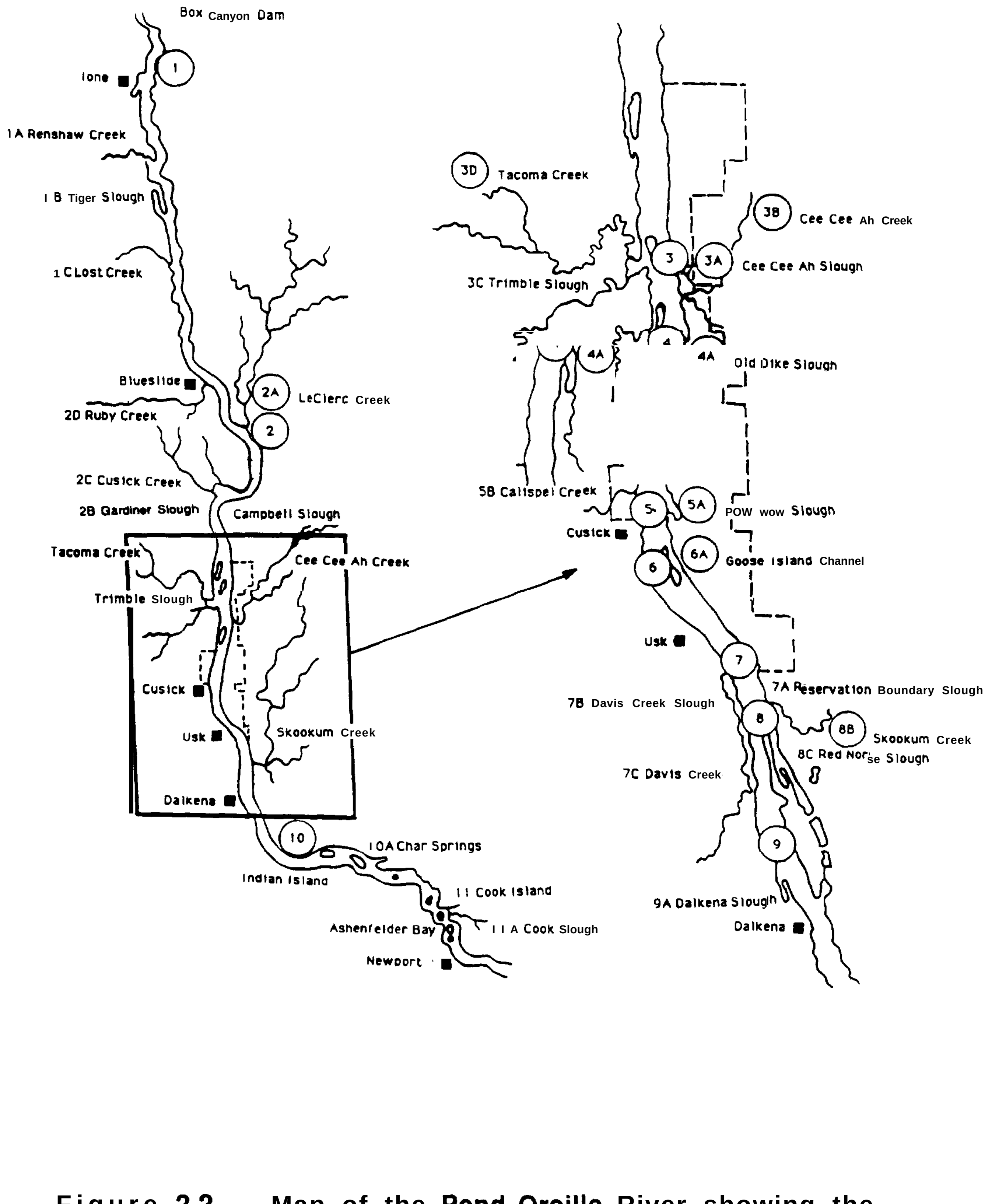

Figure 2.2. Map of the Pend Oreille River showing the location of study sites.

Table 2.1. Locations of study sites. Sites shown on Fig. 2.1 but not described here are not normal study sites but will be sampled when time and budget allows.

STUDY SITE	LOCATION
1	At RK 59.5, just north of Ione, WA
2	At RK 90.4, near the confluence with LeClerc Creek
2A	LeClerc Creek; confluence with the Pend Oreille River at RK 90.4
2D	Ruby Creek; confluence with the Pend Oreille River at RK 83.7
3	At about RK 107, near the mouth of Cee Cee Ah Slough
3A	Cee Cee Ah Slough; located at RK 107 on east bank
3B	Cee Cee Ah Creek; enters Cee Cee Ah Slough
3D	Tacoma Creek; enters Trimble Slough located on west bank at RK 107
4	At RK 108.6
4A	Dike Slough; east bank at RK 108.6
5	At RK 113, adjacent to Cusick, WA
5A	Pow Wow Slough; east bank at RK 112
6	At RK 114, adjacent to Goose Island
6A	Goose Island Slough, at RK 114
7	At RK 116.5
8	At RK 119, near mouth of Skookum Creek
8B	Skookum Creek; enters river on east bank at RK 118
9	At RK 121.5
10	At RK 130, adjacent to Indian Island
11	At RK 139.2, adjacent to Cook Island

2.3 RELATIVE ABUNDANCE

In 1990, smaller fish and non-target species were given a left ventral (or pelvic) fin clip. This was necessary to distinguish fish tagged in 1990 from those tagged in 1988 and 1989 for estimating population size.

No data were collected in January, 1990 due to the river freezing.

Since gill nets proved to be ineffective at catching fish in the mid-channel of the river in 1988 and 1989, less effort was expended setting nets in 1990.

Due to dense macrophyte growths, beach seining was not conducted at sites 8C and 9A in August; no seining was conducted in September and October.

2.4 POPULATION ESTIMATES

2.4.1 RIVER

River population estimates were made using Schnabel methods as described in Barber et *al.* (1989). The tagging period for the estimate ran from February through October in 1990, compared to March through October, 1988 and June through December, 1989.

2.4.2 TRIBUTARIES

Trout populations were estimated in LeClerc, Ruby, Cee Cee Ah, Tacoma, and Skookum in September, 1990. Four reaches (Figs. 2.3 through 2.7) ranging in size from 200 to 360 feet in length were blocked off with nets to prevent immigration and emigration during the estimate. From two to four electrofishing passes were then made depending upon the proportion of fish caught in a pass. The goal was to catch less than 50 percent of the number of fish caught in the previous pass or to make at least four passes.

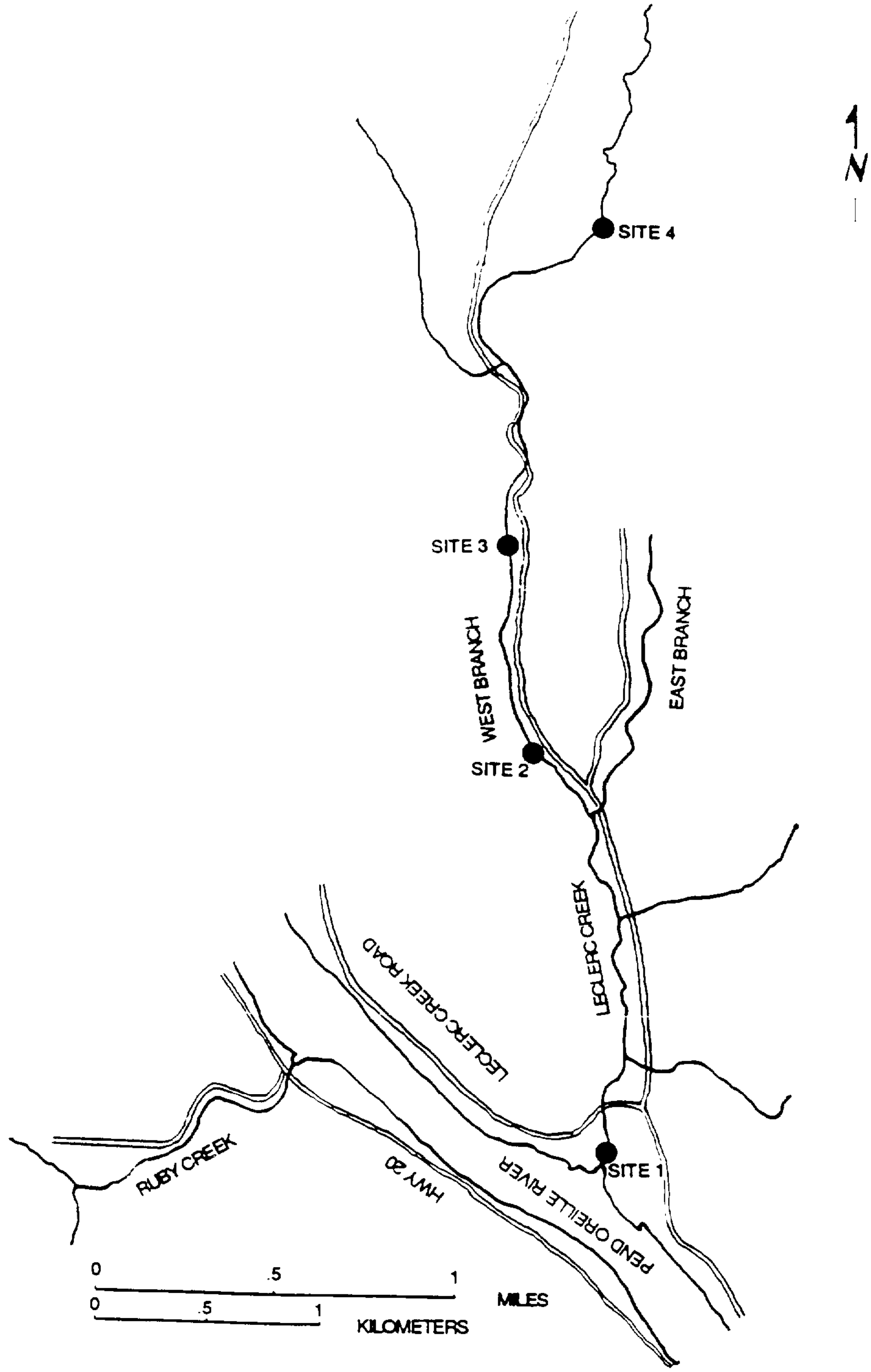

Figure 2.3. Map of LeClerc Creek showing the locations of population study sites.

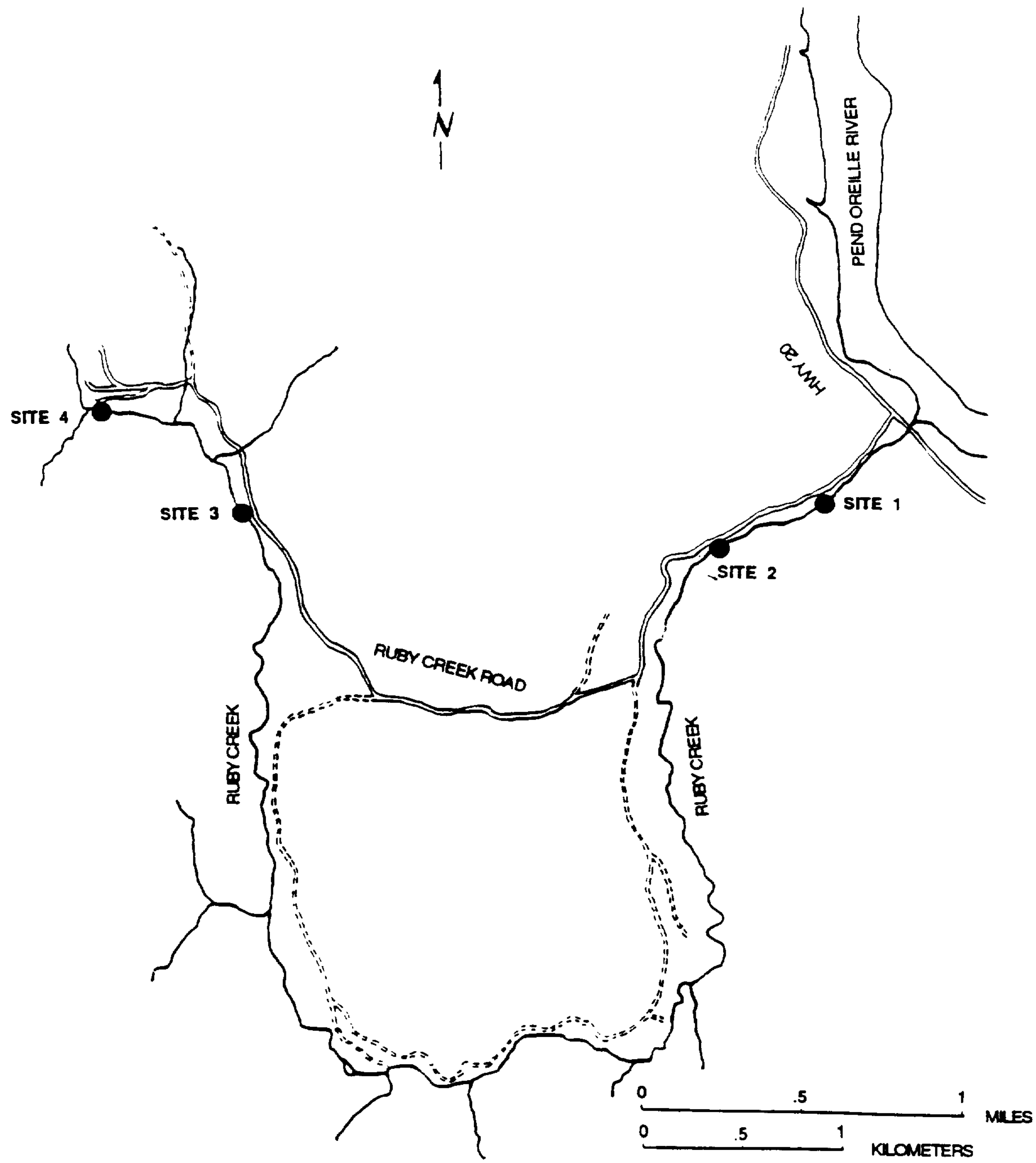

Figure 2.4. Map of Ruby Creek showing the locations of population study sites.

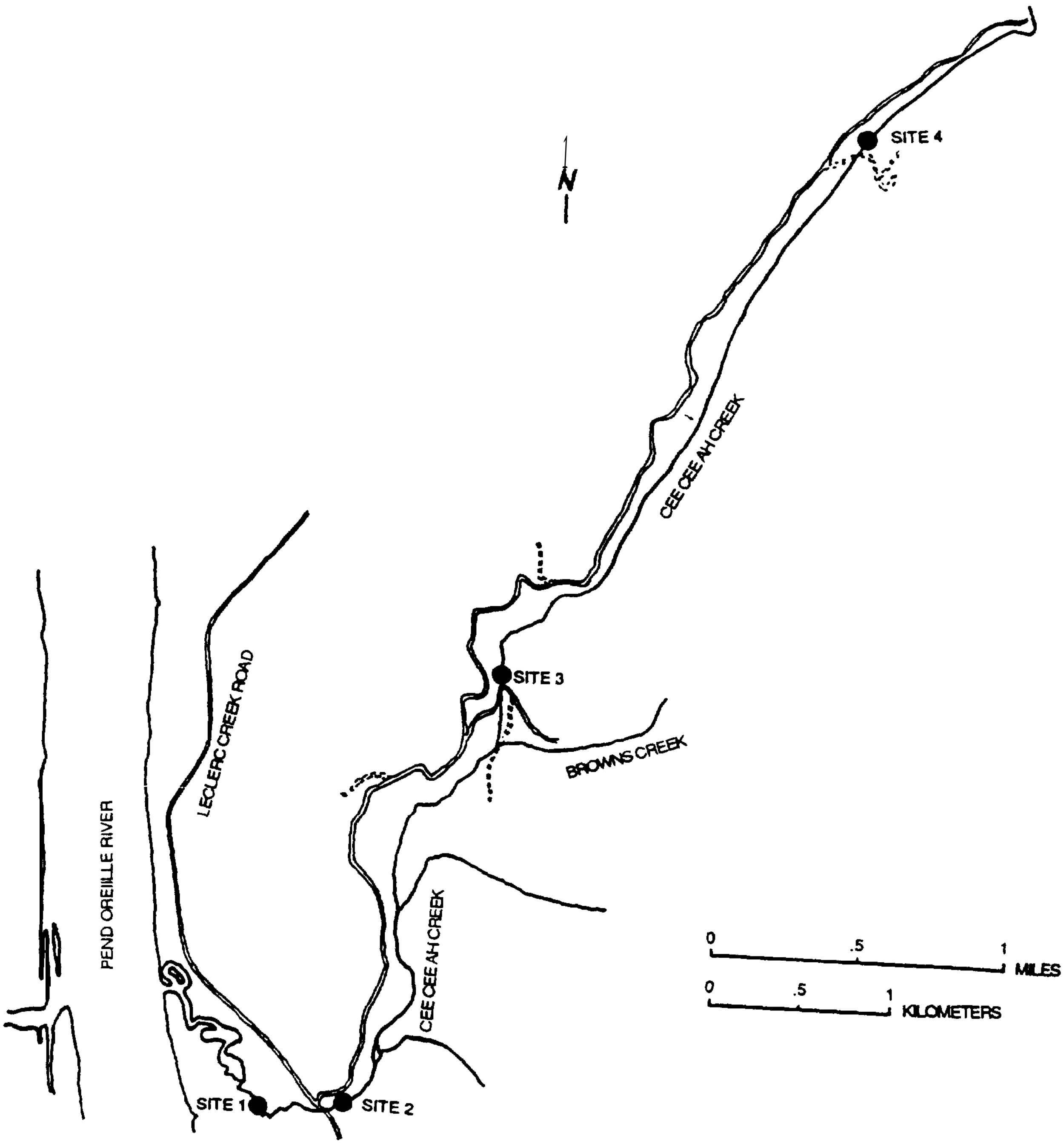

Figure 2.5. Map of Cee Cee Ah Creek showing the locations of population study sites.

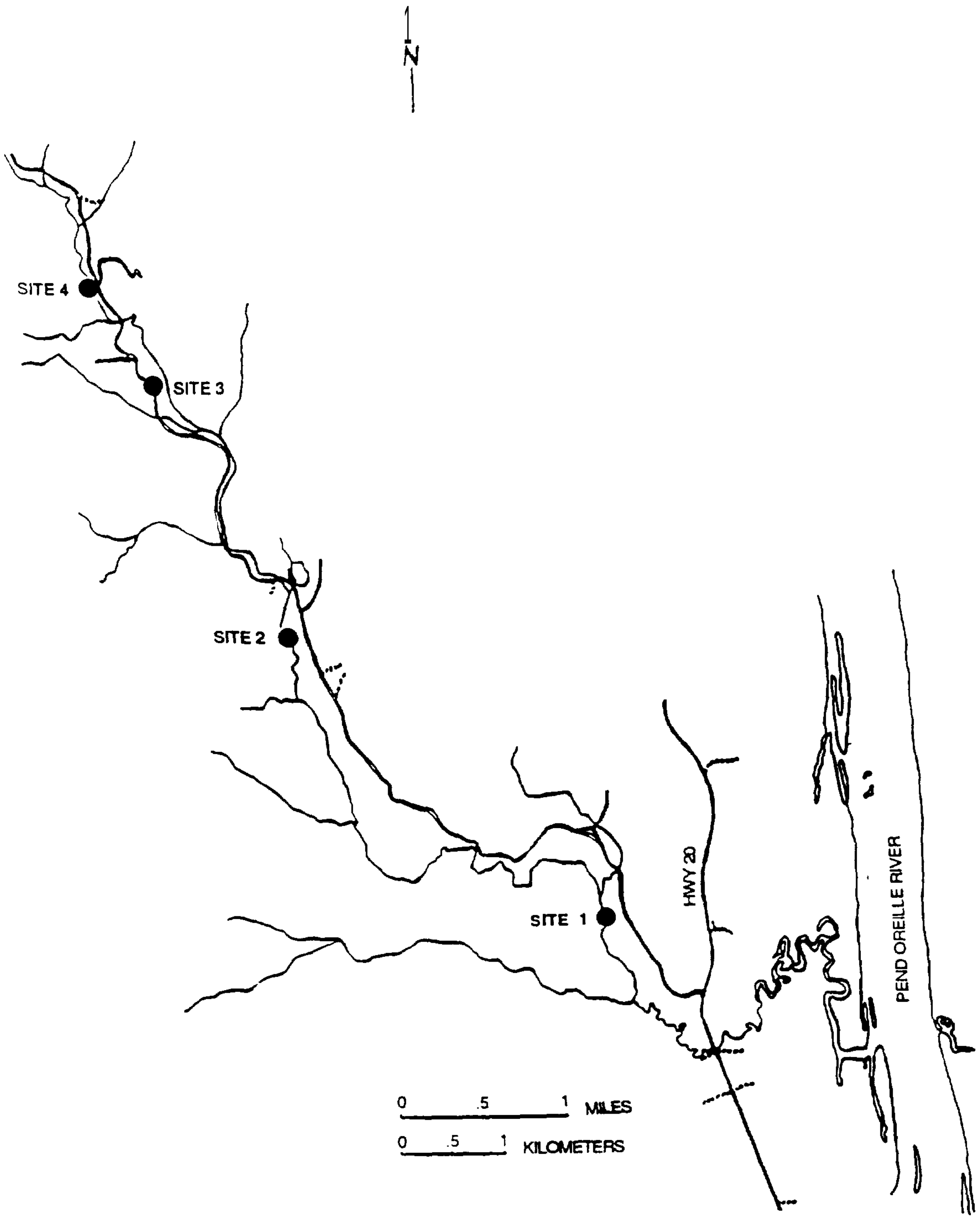

Figure 2.6. Map of Tacoma Creek showing the locations of population study sites.

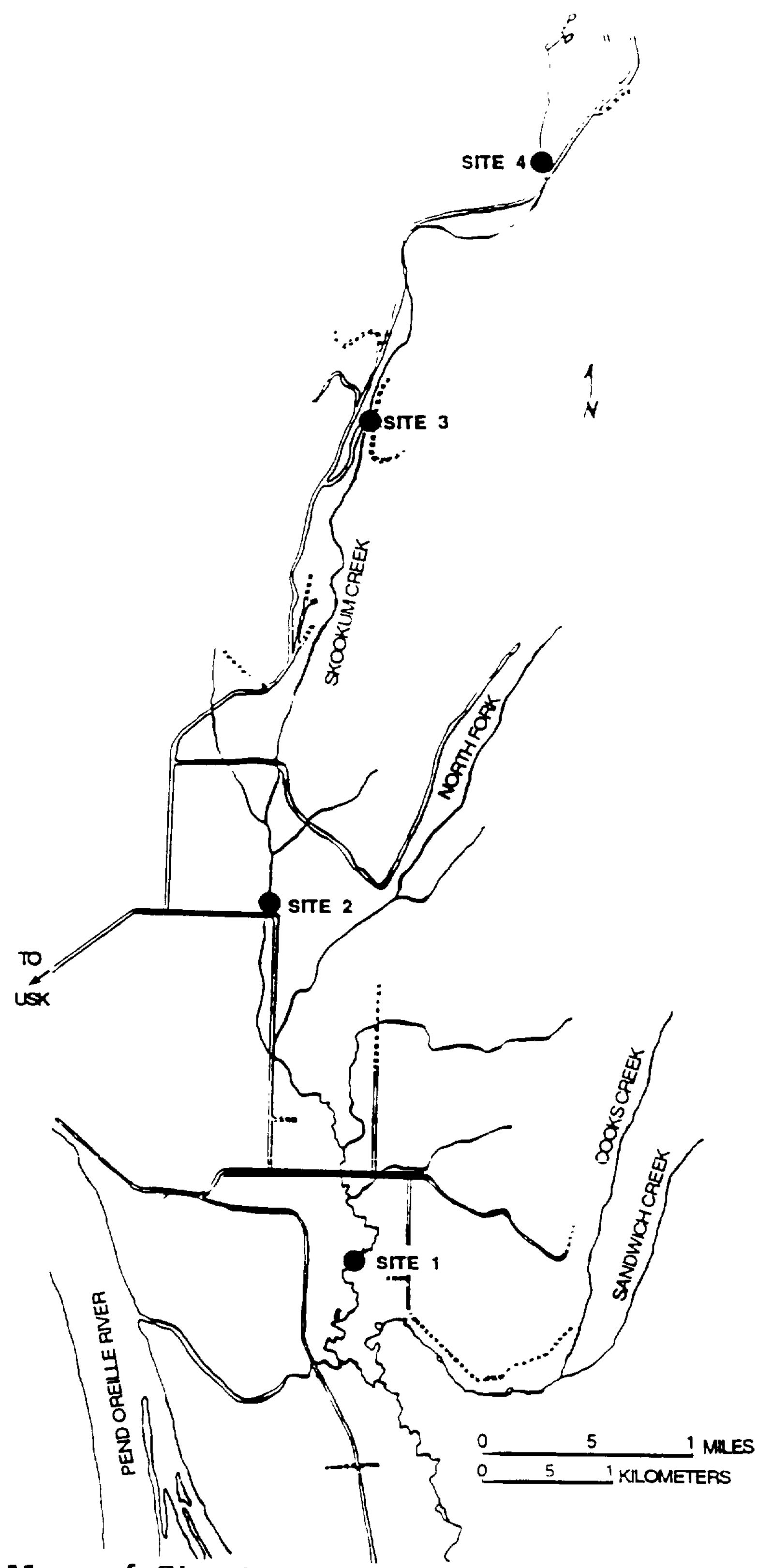

Figure 2.7. Map of Skookum Creek showing the locations of the population study sites.

For each reach in which two passes were made, the population was estimated using the following equation of Seber and LeCren (1967):

$$N = \frac{(U_1)^2}{(U_1 - U_2)},$$

where: N = estimated population size;
U_1 = number of fish collected in the first pass; and
U_2 = number of fish collected in the second pass

The standard error of the estimate was calculated by:

$$S.E.(N) = \sqrt{\frac{(U_1)^2 (U_2)^2 T}{(U_1 - U_2)^4}}$$

where: $S.E.(N)$ = standard error of the population estimates; and
T = total number of fish collected $(U_1 + U_2)$.

Ninety-five percent confidence intervals were placed around the estimate by multiplying the standard error by 1.96.

When three or more passes were made in a section, the population was estimated using the methodology of Zippen (1958). The first number needed to use this method was:

$$T = \sum_{i=1}^{n} U_i,$$

where: T = total number of fish collected;
U_i = number of fish collected in the ith removal; and
n = the number of removals.

The ratio (R) was then calculated using the equation:

$$R = \frac{\sum_{i=1}^{n}(i-1)U_i}{T}.$$

The population estimate (N) was then calculated using the equation:

$$N = \frac{T}{Q},$$

where: Q = the proportion of fish captured during all passes. Q was located by using the ratio (R) on the curve found in Fig. 22 of Platts *et al.* (1983).

The standard error of the estimate was calculated by:

$$S.E.(N) = \sqrt{\frac{N(N-T)T}{T^2 - N(N-T)\frac{(kP)^2}{1-P}}}$$

where: P = the estimated probability of capture during a single recapture as found using the ratio (R) on the curve found in Fig. 23 of Platts *et al.* (1983).

Ninety-five percent confidence intervals were placed around the estimate by multiplying the standard error by 1.96.

Width measurements were made at a distance equal to 10 percent of the length of the section. Mean width was then calculated and multiplied by the length to yield the area of the section. Fish density in each section was then calculated.

2.5 AGE, GROWTH, AND CONDITION

The only difference in methodology from Barber *et al.* (1989) was that the number of fish in each age class was equalized before the regression analysis of the body length-scale length was conducted. This was accomplished by randomly selecting an equal number of fish from each age class. If an age class was represented by only a few fish then all were used. It was felt that this method yielded a more reliable intercept value since the regression line was not biased by strong age classes.

2.6 FOOD AVAILABILITY IN THE RIVER, SLOUGHS, AND TRIBUTARIES

2.6.1 BENTHIC MACROINVERTEBRATE DENSITIES IN THE TRIBUTARIES AND INVERTEBRATE ABUNDANCE IN THE DRIFT

The sampling methods were the same as used by Barber et *al.* (1989) in September and October, 1988 where two benthic and two drift samples were collected at an upstream and downstream site. In Tacoma Creek, however, two samples were collected at only one site.

All organisms in the benthic samples were manually sorted instead of using the sugar floatation method, which was used in 1988.

2.6.2 BENTHIC MACROINVERTEBRATE DENSITIES IN THE RIVER AND SLOUGHS

Benthic grabs in the river were collected at mid-channel and near both the east and west banks instead of at one quarter, half, and three quarters across the river as in 1988. This change was made to better quantify benthic macroinvertebrate densities in the littoral areas where most fish were found.

2.6.3 ZOOPLANKTON

Zooplankton tows were taken at one mid-channel and two littoral sites at each river study site. One tow was also taken at each of the slough study sites.

Cladoceran biomass was estimated using the length-weight relationships summarized by Downing and Rigler (1984). The values used to calculate biomass are found in Table 2.2. The length-weight relationship for some cladoceran species found in this study has not been described, so their biomass was not estimated.

Table 2.2. Length-weight relationships for crustacean zooplankton (Cladocera) collected from the literature as summarized by Downing and Rigler (1984).

Species	*ln* a	b	Range
Bosmina longirostris	2.7116	2.5294	0.28-0.54
Ceriodaphnia quadrangula	2.5623	3.3380	0.30-0.71
Ceriodaphnia reticulata	3.0727	3.29	---
Chydorus sphaericus	4.5430	3.636	0.20-0.40
Daphnia ambigua	1.54	2.29	---
Daphnia galeata mendotae	1.51	2.56	---
Daphnia parvula	1.08	2.16	0.44-1.22
Daphnia pulicaria	2.30	3.10	1.00-2.50
Daphnia schødleri	2.30	3.10	1.00-2.50
Daphnia retrocurva	1.4322	3.129	0.50-2.00
Daphnia thorata	2.64	2.54	0.60-2.20
Diaphanosoma birgei	1.6242	3.0468	0.44-10.44
Diaphanosoma brachyurum	1.6242	3.0468	0.44-10.44
Leptodora kindti	-0.8220	2.670	1.00-5.00
Megafenestra aurita	2.8713	3.079	0.30-0.80
Sida crystallina	2.0539	2.189	0.80-2.30

2.7 FEEDING HABITS

Stomach samples were collected in April, July and September, 1990. Seasonal feeding habits were determined and then averaged to yield the mean annual feeding habits for each age class of each species.

Ten stomachs were collected from the predominant species at each river study site in 1988 and 1989. In July and September of 1990 collection was decreased to five stomachs. Stomachs collected from rough fish and non-target species were reduced to one per species in April, 1990. No stomachs were collected from non-target species during July and September, 1990. Stomachs collected from fish in the tributaries was decreased from twenty per species in 1989 to ten per species in 1990.

2.8 FISH MOVEMENT AND MIGRATION

In addition to getting information on fish movement from fish recaptured with numbered Floy tags, information was obtained about changes in length. Fish were grouped according to their age at tagging and the difference between their length at tagging and recapture was calculated. The monthly growth increment was calculated by dividing the length difference by the number of months between tagging and recapture. The mean monthly growth increment was calculated for all fish tagged within a particular age class. The mean annual growth increment was then calculated by multiplying the mean monthly growth increment by 12. Fish with very 'large (positive or negative) growth increments were assumed to have been incorrectly measured and not used in the mean growth increment.

All other methods were the same as in Barber et *al.* (1989).

3.0 RESULTS

3.1 RELATIVE ABUNDANCE

A total of 71.4 hours were spent collecting relative abundance information by electrofishing from February through October, 1990 resulting in the capture of 9,933 fish (Table 3.1). Yellow perch was the most abundant species making up 44.8 percent of the total catch (Table 3.2). Tench were next at 10.5 percent, followed by pumpkinseed (10.3%), largemouth bass (8.5%), mountain whitefish (7.1%), largescale sucker (5.9%), longnose sucker (3.6%), northern squawfish (2.9%), and black crappie (1.6%). Salmonids, other than mountain whitefish, were rare with brown trout being the most abundant at 1 .0 percent of the total catch.

Yellow perch was the most abundant species at all sites except at sites 1 and 2 (Table 3.2). At site 1, largescale sucker was the most abundant species, making up 27.2 percent of the catch. At site 2, mountain whitefish was the most abundant species, making up 22.7 percent of the total catch.

The number and percent of each species of fish caught each month are listed in Tables 3.3 and 3.4, respectively. Yellow perch was the most common species caught in all months, except February when pumpkinseed were most abundant making up 27.2 percent of the catch. The monthly relative abundance data can be found in Appendix A, Tables A.1-A.26.

The relative abundance of each age class for each species can be found in Table 3.5. The fish were grouped by age according to their lengths and the back-calculated lengths at annulus formation. (See section 3.3.2). Of the 842 largemouth bass captured 42 (5.0%) were age 0+, 219 (26.0%) were age 1+, 205 (24.3%) were age 2+, 135 (16.0%) were age 3+, 105 (12.5%) were age 4+, 36 (4.3%) were age 5+, 11 (1.3%) were age 6+, 6 (0.7%) were age 7+, 35 (4.2%) were age 8+, 8 (1.0%) were age 9+, 9 (1.1%) were age 10+, 6 (0.7%) were age 11+, 9 (1.1%) were age 12+, 1 (0.1%) was age 13+, and 15 (1.8%) were 14+ years old. A total of 4,453 yellow perch were captured and 166 (3.7%) of these were age 0+, 300 (6.7%) were age 1+, 380 (8.5%) were age 2+, 885 (19.9%) were age 3+, 586 (13.2%) were age 4+, 1,667 (37.4%) were age 5+, 229 (5.1%) were age 6+, 237 (5.3%) were age 7+, and 3 (0.1%) were 8+ years old. Of the 709 mountain whitefish captured 75 (10.6%) of these were age 0+, 142 (20.0%)

Table 3.1. Number of each species of fish caught during relative abundance electrofishing at each study site from February through October, 1990.

STUDY SITE	T 1	T 2	T 3	T 3A[1]	T 4	T 4A[1]	T 5	T 5A[2]	T 6	T 6A[2]	T 7	T 8	T 9	T 10	T 11	TOTAL
SHOCK TIME	322	333	335	214	333	222	331	132	350	142	332	330	332	300	277	4,285
LAKE TROUT		3														3
BULL TROUT			1													1
CUTTHROAT TROUT	1	1	1	2					2			1				8
BROWN TROUT	6	23	9	18	2		5	2	18	2	2	5	5		7	104
BROOK TROUT	1						2									3
RAINBOW TROUT	1	1	1	1							1	1	1	1	2	10
KOKANEE	2	4		3	2	11	1		1		5		1	2		32
MOUNTAIN WHITEFISH	18	96	42	63	17	1	29		75	24	53	57	90	33	111	709
LARGEMOUTH BASS	51	14	61	9	57	159	44	100	47	40	88	31	47	56	38	842
BLACK CRAPPIE	14		7	8	13	45	6	21	5	1	16	6	8	4	1	155
PUMPKINSEED	22	21	68	13	57	153	84	41	115	27	87	83	110	91	54	1,026
YELLOW PERCH	49	53	574	100	553	549	448	128	475	120	296	266	410	281	151	4,453
LONGNOSE SUCKER	5	14	23	94	20	4	19	9	28	15	22	15	23	22	49	362
LARGESCALE SUCKER	86	71	47	19	42	5	59	1	51	15	46	49	43	16	40	590
BROWN BULLHEAD	3	2	39	5	14	17	34	18	14	7	3	2	7	19	1	185
TENCH	14	56	60	47	60	83	75	79	84	42	108	70	60	166	41	1,045
NORTHERN SQUAWFISH	36	59	25	15	14	17	10	1	26	6	5	12	20	6	32	284
PEAMOUTH	5	4	18	17	12	27	4	5	8	1	3	1	7	2	4	118
REDSIDE SHINER	2															2
SCULPIN															1	1
TOTAL	316	422	976	414	863	1,071	820	405	949	300	735	599	832	699	532	9,933

[1] Sampled March through October
[2] Sampled March, April, May, June, July, and October

Table 3.2. Percent of each species of fish caught during relative abundance electrofishing at each study site from February through October, 1990.

STUDY SITE	T 1	T 2	T 3	T 3A[1]	T 4	T 4A[1]	T 5	T 5A[2]	T 6	T 6A[2]	T 7	T 8	T 9	T 10	T 11	TOTAL
SHOCK TIME	322	333	335	214	333	222	331	132	350	142	332	330	332	300	277	4,285
LAKE TROUT		0.7														< 0.1
BULL TROUT			0.1													< 0.1
CUTTHROAT TROUT	0.3	0.2	0.1	0.5					0.2			0.2				0.1
BROWN TROUT	1.9	5.5	0.9	4.3	0.2		0.6	0.5	1.9	0.7	0.3	0.8	0.6		1.3	1.0
BROOK TROUT	0.3						0.2									< 0.1
RAINBOW TROUT	0.3	0.2	0.1	0.2							0.1	0.2	0.1	0.1	0.4	0.1
KOKANEE	0.6	0.9		0.7	0.2	1.0	0.1		0.1		0.7		0.1	0.3		0.3
MOUNTAIN WHITEFISH	5.7	22.7	4.3	15.2	2.0	0.1	3.5		7.9	8.0	7.2	9.5	10.8	4.7	20.9	7.1
LARGEMOUTH BASS	16.1	3.3	6.3	2.2	6.6	14.8	5.4	24.7	5.0	13.3	12.0	5.2	5.6	8.0	7.1	8.5
BLACK CRAPPIE	4.4		0.7	1.9	1.5	4.2	0.7	5.2	0.5	0.3	2.2	1.0	1.0	0.6	0.2	1.6
PUMPKINSEED	7.0	5.0	7.0	3.1	6.6	14.3	10.2	10.1	12.1	9.0	11.8	13.9	13.2	13.0	10.2	10.3
YELLOW PERCH	15.5	12.6	58.8	24.2	64.1	51.3	54.6	31.6	50.1	40.0	40.3	44.4	49.3	40.2	28.4	44.8
LONGNOSE SUCKER	1.6	3.3	2.4	22.7	2.3	0.4	2.3	2.2	3.0	5.0	3.0	2.5	2.8	3.1	9.2	3.6
LARGESCALE SUCKER	27.2	16.8	4.8	4.6	4.9	0.5	7.2	0.2	5.4	5.0	6.3	8.2	5.2	2.3	7.5	5.9
BROWN BULLHEAD	0.9	0.5	4.0	1.2	1.6	1.6	4.1	4.4	1.5	2.3	0.4	0.3	0.8	2.7	0.2	1.9
TENCH	4.4	13.3	6.1	11.4	7.0	7.7	9.1	19.5	8.9	14.0	14.7	11.7	7.2	23.7	7.7	10.5
NORTHERN SQUAWFISH	11.4	14.0	2.6	3.6	1.6	1.6	1.2	0.2	2.7	2.0	0.7	2.0	2.4	0.9	6.0	2.9
PEAMOUTH	1.6	0.9	1.8	4.1	1.4	2.5	0.5	1.2	0.8	0.3	0.4	0.2	0.8	0.3	0.8	1.2
REDSIDE SHINER	0.6															< 0.1
SCULPIN															0.2	< 0.1

Table 3.3. **Number of each species of fish caught during relative abundance electrofishing surveys during each month of 1990.**

MONTH	February	March	April	May	June	July	August	September	October	TOTAL
SHOCK TIME	440	449	415	453	554	473	481	482	548	4,295
LAKE TROUT						2		1		3
BULL TROUT					1					1
CUTTHROAT TROUT		5					2	1		8
BROWN TROUT	2	18	9	13	14	21	14	6	7	104
BROOK TROUT	1			1	1					3
RAINBOW TROUT		2	2	3	1		1	1		10
KOKANEE	2	2	2	2	19	4			1	32
MOUNTAIN WHITEFISH	14	149	169	164	32	16	43	43	79	709
LARGEMOUTH BASS	40	21	39	50	162	172	126	84	148	842
BLACK CRAPPIE	11	6	5	20	19	14	20	36	24	155
PUMPKINSEED	88	20	28	41	78	268	194	167	142	1,026
YELLOW PERCH	23	202	553	425	313	972	686	819	460	4,453
LONGNOSE SUCKER	24	23	21	26	26	40	78	49	75	362
LARGESCALE SUCKER	31	86	96	106	114	20	46	55	36	590
BROWN BULLHEAD	5	27	33	28	24	15	6	11	36	185
TENCH	65	108	49	119	136	259	114	52	143	1,045
NORTHERN SQUAWFISH	17	31	26	33	77	13	25	26	36	284
PEAMOUTH	1	35	26	14	13	16	3	2	8	118
REDSIDE SHINER			1				1			2
SCULPIN			1							1
TOTAL	324	735	1,060	1,045	1,030	1,832	1,359	1,353	1,195	9,933

Table 3.4. Percent of each species of fish caught during relative abundance electrofishing surveys during each month of 1990.

MONTH	February	March	April	May	June	July	August	September	October	TOTAL
SHOCK TIME	440	449	415	453	554	473	481	482	548	4,295
LAKE TROUT						0.1		0.1		< 0.1
BULL TROUT					0.1					< 0.1
CUTTHROAT TROUT		0.7					0.1	0.1		0.1
BROWN TROUT	0.6	2.4	0.8	1.2	1.4	1.1	1.0	0.4	0.6	1.0
BROOK TROUT	0.3			0.1	0.1					< 0.1
RAINBOW TROUT		0.3	0.2	0.3	0.1		0.1	0.1		0.1
KOKANEE	0.6	0.3	0.2	0.2	1.8	0.2			0.1	0.3
MOUNTAIN WHITEFISH	4.3	20.3	15.9	15.7	3.1	0.9	3.2	3.2	6.6	7.1
LARGEMOUTH BASS	12.3	2.9	3.7	4.8	15.7	9.4	9.3	6.2	12.4	8.5
BLACK CRAPPIE	3.4	0.8	0.5	1.9	1.8	0.8	1.5	2.7	2.0	1.6
PUMPKINSEED	27.2	2.7	2.6	3.9	7.6	14.6	14.3	12.3	11.9	10.3
YELLOW PERCH	7.1	27.5	52.2	40.7	30.4	53.1	50.5	60.5	38.5	44.8
LONGNOSE SUCKER	7.4	3.1	2.0	2.5	2.5	2.2	5.7	3.6	6.3	3.6
LARGESCALE SUCKER	9.6	11.7	9.1	10.1	11.1	1.1	3.4	4.1	3.0	5.9
BROWN BULLHEAD	1.5	3.7	3.1	2.7	2.3	0.8	0.4	0.8	3.0	1.9
TENCH	20.1	14.7	4.6	11.4	13.2	14.1	8.4	3.8	12.0	10.5
NORTHERN SQUAWFISH	5.2	4.2	2.5	3.2	7.5	0.7	1.8	1.9	3.0	2.9
PEAMOUTH	0.3	4.8	2.5	1.3	1.3	0.9	0.2	0.1	0.7	1.2
REDSIDE SHINER			0.1				0.1			< 0.1
SCULPIN			0.1							< 0.1

were age 1+, 72 (10.2%) were age 2+, 187 (26.4%) were age 3+, 171 (24.1%) were age 4+, 57 (8.0%) were age 5+, and 5 (0.7%) were 6+ years old. Of the 155 black crappie captured 39 (25.2%) were age 0+, 27 (17.4%) were age 1+, 21 (13.5%) were age 2+, 12 (7.7%) were age 3+, 1 (0.6%) were aqe 4+, 20 (12.9%) were age 5+, 28 (18.1 %) were age 6+, and 7 (4.5%) were 7+ years old. A total of 104 brown trout were captured and 1 (1 .0%) were age 0+, 17 (16.3%) were age 1+, 17 (16.3%) were age 2+, 13 (12.5%) were age 3+, 28 (26.9%) were age 4+, 13 (12.5%) were age 5+, 2 (1.9%) were age 7+, 6 (5.8%) were age 8+, and 7 (6.7%) were 9+ years old. The 8 cutthroat trout captured, consisted of 2 (25.0%) age 3+, 1 (12.5%) age 4+, and 5 (62.5%) 5+ years old. Of the 10 rainbow trout captured 2 (20.0%) were age 1+, 3 (30.0%) were age 2+, 4 (40.0%) were age 3+, and 1 (10.0%) was 4+ years old. A total of 32 kokanee were caught and 8 (25.0%) were age 1+, 23 (71.9%) were age 2+, and 1 (3.1%) were 3+ years old.

Of 1,026 pumpkinseeds captured, 25 (2.4%) of these were age 0+, 41 (4.0%) were age 1+, 113 (11.0%) were age 2+, 152 (14.8%) were age 3+, 175 (17.1%) were age 4+, 220 (21.4%) were age 5+, 230 (22.4%) were age 6+, 54 (5.3%) were age 7+, and 16 (1.6%) were 8+ years old. Of the 1,045 tench captured, 17 (1.6%) were age 0+, 43 (4.1 %) were age 1+, 38 (3.6%) were age 2+, 49 (4.7%) were age 3+, 94 (9.0%) were age 4+ 147 (14.1%) were age 5+, 271 (25.9%) were age 6+, 301 (28.8%) were age 7+, and 85 (8.1%) were 8+ years old. A total of 284 northern squawfish were captured and 8 (2.8%) were age 0+, 5 (1.8%) were age 1+, 12 (4.2%) were age 2+, 118 (41.5%) were age 3+, 69 (24.3%) were age 4+, 43 (15.1 %) were age 5+, 8 (2.8%) were age 6+, 12 (4.2%) were age 7+, 4 (1.4%) were age 8+, 4 (1.4%) were age 9+, and 1 (0.4%) were 10+ years old. The 590 largescale suckers captured consisted of zero fish from the 0+ and 1+ age classes, 3 (0.5%) age 2+, 4 (0.7%) age 3+, 8 (1.4%) age 4+, 44 (7.5%) age 5+, 127 (21.5%) age 6+, 132 (22.4%) age 7+, 136 (23.1%) age 8+, 85 (14.4%) age 9+, 42 (7.1%) age 10+, and 9 (1.5%) 1 1+ year old fish. Of the 362 longnose suckers captured 50 (13.8%) were age 0+, 29 (8.0%) were age 1 +, 2 (0.6%) were age 2+, 6 (1.7%) were age 3+, 36 (9.9%) were age 4+, 24 (6.6%) were age 5+, 25 (6.9%) were age 6+, and 190 (52.5%) were 7+ years old. A total of 118 peamouth were captured and 20 (16.9%) were age 0+, 1 (0.8%) were age 1+, 5 (4.2%) were age 2+, 23 (19.5%) were age 3+, 37 (31.4%) were age 4+, and 32 (27.1%) were 5+ years old. The relative abundance for each age class by month can be found in Appendix A, Tables A.27 through A.56.

Table 3.5. Total number and relative abundance (%) of each age class of each species caught during electrofishing surveys on the Pend Oreille River from February through October, 1990.

Age	Largemouth bass	Yellow perch	Mountain whitefish	Black crappie	Brown trout	Cutthroat trout	Rainbow trout	Kokanee	Pumpkin-seed	Tench	Northern squawfish	Largescale sucker	Longnose sucker	Peamouth
0+	42 (5.0)	166 (3.7)	75 (10.6)	39 (25.2)	1 (1.0)				25 (2.4)	17 (1.6)	8 (2.8)		50 (13.8)	20 (16.9)
1+	219 (26.0)	300 (6.7)	142 (20.0)	27 (17.4)	17 (16.3)		2 (20.0)	8 (25.0)	41 (4.0)	43 (4.1)	5 (1.8)		29 (8.0)	1 (0.8)
2+	205 (24.3)	380 (8.5)	72 (10.2)	21 (13.5)	17 (16.3)		3 (30.0)	23 (71.9)	113 (11.0)	38 (3.6)	12 (4.2)	3 (0.5)	2 (0.6)	5 (4.2)
3+	135 (16.0)	885 (19.9)	187 (26.4)	12 (7.7)	13 (12.5)	2 (25.0)	4 (40.0)	1 (3.1)	152 (14.8)	49 (4.7)	118 (41.5)	4 (0.7)	6 (1.7)	23 (19.5)
4+	105 (12.5)	586 (13.2)	171 (24.1)	1 (0.6)	28 (26.9)	1 (12.5)	1 (10.0)		175 (17.1)	94 (9.0)	69 (24.3)	8 (1.4)	36 (9.9)	37 (31.4)
5+	36 (4.3)	1667 (37.4)	57 (8.0)	20 (12.9)	13 (12.5)	5 (62.5)			220 (21.4)	147 (14.1)	43 (15.1)	44 (7.5)	24 (6.6)	32 (27.1)
6+	11 (1.3)	229 (5.1)	5 (0.7)	28 (18.1)					230 (22.4)	271 (25.9)	8 (2.8)	127 (21.5)	25 (6.9)	
7+	6 (0.7)	237 (5.3)		7 (4.5)	2 (1.9)				54 (5.3)	301 (28.8)	12 (4.2)	132 (22.4)	190 (52.5)	
8+	35 (4.2)	3 (0.1)			6 (5.8)				16 (1.6)	85 (8.1)	4 (1.4)	136 (23.1)		
9+	8 (1.0)				7 (6.7)						4 (1.4)	85 (14.4)		
10+	9 (1.1)										1 (0.4)	42 (7.1)		
11+	6 (0.7)											9 (1.5)		
12+	9 (1.1)													
13+	1 (0.1)													
14+	15 (1.8)													

Gill netting resulted in the capture of 67 fish in 54 hours of net sets (Table 3.6). Peamouth were the most abundant species caught in the nets with 19 (28.4%), followed by northern squawfish with 18 (26.9%), yellow perch with 13 (19.4%) and pumpkinseed with 11 (16.4%). Other species caught in the nets included **2** largescale suckers (3.0%), 2 largemouth bass, 1 brown trout (1.5%) and 1 tench (1.5%).

Beach seining resulted in the capture of 507 fish in 548.7 meters (Table 3.7). Pumpkinseed was the most abundant species making up 82.1 percent of the catch, followed by largemouth bass (13.4%), yellow perch (3.0%), tench (1.2%), black crappie (0.2%), and longnose sucker (0.2%). Table 3.8 shows the breakdown of the beach seine data by age. Young-of-the year fish accounted for 100 percent of both tench and longnose sucker, 94.4 percent of the largemouth bass, 78.7 percent of the pumpkinseed and 60 percent of the yellow perch. The number and percent of each species captured each month can be found in Appendix A, Tables A.57 and A.58.

In 1.8 hours of selective electrofishing, 61 fish were captured (Table 3.9). Largemouth bass made up 80.0 percent of the **catch,** followed by mountain whitefish (18.0%) and brown trout (2.0%).

3.2 POPULATION ESTIMATES

3.2.1 RIVER AND SLOUGHS

The estimated populations for one year and older fish 'between Box Canyon and Albeni Falls Dams can be found in Table 3.10. A total of 4,287 yellow perch were captured; 3,614 were released with marks, and 17 were subsequently recaptured (Appendix B, Table B.1). The estimated population for yellow perch was 8,804,453, with **a** lower 95 percent confidence limit of 5,502,783 and an upper limit of 15,118,758. A total of 1,001 pumpkinseeds were captured; 860 were marked, and 2 recaptured (Appendix B, Table B.2). This gave an estimated population of 4,431,018, with a lower limit of 1,230,838 and an upper limit of 44,310,181. A total of 1,028 tench were captured; 872 were released with marks, and 9 recaptured (Appendix B, Table B.3). The estimated population for tench was 1,001,841, with a lower 95 percent confidence limit of 527,285 and an upper limit of 2,254,142. A total of 810 largemouth **bass were** captured; 513 were marked, and 8 recaptured (Appendix B, Table B.4). This yielded an estimated population of 570,098, with a lower limit of 288,657 and an upper limit of 1,341,407. A total of 276 northern

Table 3.6. Total number and relative abundance (%) of each species caught during gill net surveys on the Pend Oreille River from February through October, 1990.

SOAK TIME (HRS.)	February No nets set	March No nets set	April 18.8	May 22.0	June No nets set	July 3.7	August 1.2	September 5.6	October 3.0	TOTAL 54.3
BROWN TROUT				1 (2.1)						1 (1.5)
LARGEMOUTH BASS			1 (6.3)	1 (2.1)						2 (3.0)
PUMPKINSEED			2 (12.5)	9 (18.8)						11 (16.4)
YELLOW PERCH			7 (43.8)	6 (12.5)						13 (19.4)
LARGESCALE SUCKER			1 (6.3)					1 (100)		2 (3.0)
TENCH						1 (50.0)				1 (1.5)
NORTHERN SQUAWFISH			3 (18.8)	15 (31.3)						18 (26.9)
PEAMOUTH			2 (12.5)	16 (33.3)		1 (50.0)				19 (28.4)
TOTAL			16	48		2	0	1	0	67

Table 3.7. Number and percent of each species of fish caught by beach seining during July and August, 1990.

Month Distance seined (m)	July 396.2	August 152.5	Total 548.7
Largemouth bass	67 (35.6)	1 (0.3)	68 (13.4)
Black crappie	1 (0.5)		1 (0.2)
Pumpkinseed	103 (56.9)	319 (96.9)	422 (82.1)
Yellow perch	8 (4.3)	7 (2.2)	15 (3.0)
Longnose sucker	1 (0.5)		1 (0.2)
Tench	4 (2.1)	2 (0.6)	6 (1.2)
Total	184	329	513

Table 3.8 Number and percent of each age class of each species of fish collected during beach seine surveys.

		July	August	Total
Black crappie	0 +			
	1 +	1 (0.5)		1 (0.2)
Largemouth bass	0 +	67 (35.6)	1 (0.3)	68 (13.3)
	1 +	3 (1.6)		3 (0.6)
	2 +	1 (0.5)		1 (0.2)
Pumpkinseed	0 +	13 (6.9)	319 (96.9)	332 (64.7)
	1 +	11 (5.9)		11 (2.1)
	2 +	9 (4.8)		9 (1.7)
	3 +	13 (6.9)		13 (2.5)
	4 +	6 (3.2)		6 (1.2)
	5 +	25 (13.3)		25 (4.8)
	6 +	26 (13.8)		26 (5.0)
Yellow perch	0 +	2 (1.1)	7 (2.1)	9 (1.7)
	1 +	5 (2.7)		5 (1.0)
	4 +	1 (0.5)		1 (0.2)
Tench	0 +	4 (2.1)	2 (0.6)	6 (1.2)
Longnose sucker	0 +	1 (0.5)		1 (0.2)
TOTAL		184	329	513

Table 3.9 Number and percent abundance of each target species captured during selective electrofishing surveys during 1990.

Location Sample date Shock time (min.)	Gardiner Slough (2B) 6/90 24	Campbell Slough 6/90 73	Char Springs (10A) 10/90 10	Total 107
Brown trout		1 (3.3)		1 (2.0)
Mountain whitefish			11 (91.7)	11 (18.0)
Largemouth bass	19 (100)	29 (96.7)	1 (8.3)	49 (80.0)
Total	19	30	12	61

squawfish were captured; 215 released with marks, and 2 were recaptured (Appendix B, Table B.5). The estimated population for northern squawfish was 280,663, with a lower 95 percent confidence limit of 77,962 and an upper limit of 2,806,626.

Six hundred and twenty-five mountain whitefish were captured; 471 marked and released, and 10 were recaptured (Appendix B, Table B.6). The estimated population for mountain whitefish was 265,893, with a lower limit of 144,507 and an upper limit of 565,731. Of 316 longnose suckers captured, 256 were marked and released, and 4 were subsequently recaptured (Appendix B, Table B.7). This yielded a population estimate of 218,743, with a lower limit of 85,781 and an upper limit of 874,971. A total of 559 largescale suckers were captured; 533 released with marks, and 11 were recaptured (Appendix B, Table B.8). The estimated population for largescale suckers was 194,551, with a lower 95 percent confidence limit of 108,632 and an upper limit of 396,307. Of 116 black crappie captured, one was recaptured from the 65 that were marked and released (Appendix B, Table B.9). This resulted in a population estimate of 91,396, with a lower 95 percent confidence limit of 16,321 and an upper limit of 913,960. Ninety-nine peamouth were captured; 92 were marked and released, and one was recaptured (Appendix B, Table B.10). The population estimate for peamouth was 75,556, with lower and upper confidence intervals at 13,492 and 755,560, respectively. A total of 103 brown trout were captured; 78 marked and released, and 2 recaptured (Appendix B, Table B.11). The population estimate for brown trout was 37,198, with the lower 95 percent confidence limit at 10,333 and the upper limit at 371,977.

The population estimate for brown trout from Cee Cee Ah Slough can be found in Table 3.11. Nineteen brown trout were captured in Cee Cee Ah Slough; 14 of these were marked and released, and 1 was recaptured (Appendix B, Table B.12). This yielded a population estimate of 1 ,914 brown trout in the slough, with lower and upper confidence limits of 342 and 19,138, respectively.

3.2.2 TRIBUTARIES

3.2.2.1 LECLERC CREEK

Reach measurements for each site population estimates were conducted can be found in Appendix B, Table B.13. The number of fish

Table 3.10. Population estimates and 95 percent confidence limits for one year and older fish in the Pend Oreille River between Albeni Falls and Box Canyon Dams.

	ESTIMATED POPULATION	95 PERCENT CONFIDENCE LIMITS LOWER LIMIT	UPPER LIMIT
Yellow perch	8,804,453	5,502,783	15,118,758
Pumpkinseed	4,431,018	1,230,838	44,310,181
Tench	1,001,841	527,285	2,254,142
Largemouth bass	570,098	288,657	1,341,407
Northern squawfish	280,663	77,962	2,806,626
Mountain whitefish	265,893	144,507	565,731
Longnose sucker	218,743	85,781	874,971
Largescale sucker	194,551	108,632	396,307
Black crappie	91,396	16,321	913,960
Peamouth	75,556	13,492	755,560
Brown trout	37,198	10,333	371,977

Table 3.11. Population estimates and 95 percent confidence limits for one year and older fish at specific areas of the Pend Oreille River.

	LOCATION	EST. POP.	95 PERCENT CONFIDENCE LIMITS LOWER LIMIT	UPPER LIMIT
Brown trout	3A	1,914	342	19,138

captured during each pass at each site are also contained in Table B. 13. Brown trout density was highest in reach 3 at 3.6 ± 6.8 fish/1 00 m^2. The highest density of brook trout was 5.6 ± 0.9 fish/l 00 m^2 in reach 1 (Table 3.12). The highest density of cutthroat trout was 0.1 ± 0 fish/100m^2 in reach 1. Of the brown trout captured, 43.8 percent were age 1+, 18.8 percent were age 2+, 12.5 percent were age 3+, 6.2 percent were age 4+ and 8.8 percent were 5+ years old (Table 3.13). Of the brook trout caught during the population estimate, 2.7 percent were age 0+, 62.7 percent were age 1+, 28.0 percent were age 2+, 4.0 percent were age 3+, and 2.7 percent were 4+ years old. Cutthroat trout caught during the population estimate were comprised of 33.3 percent age 2+, and 66.7 percent age 3+.

3.2.2.2 RUBY CREEK

Reach measurements for each site population estimates were conducted can be found in Appendix B, Table B.14. The number of fish captured during each pass at each site are also contained in Table B. 14. The highest density of brook trout was 45.1 ± 8.7 fish/l 00 m^2 in reach 4 (Table 3.14). Brown trout, rainbow trout and mountain whitefish densities were highest in reach 1 with values of 0.2 ± 0 fish/l 00 m^2, 0.2 ± 0 fish/100 m^2, and 0.9 ± 1.5 fish/100 m^2, respectively. The highest cutthroat trout density was 0.1 ± 0 fish/100 m^2 in reach 2. Of the brook trout caught during the population estimate, 10.0 percent were age 0+, 29.0 percent were age 1+, 26.2 percent were age 2+, 20.7 percent were age 3+, and 14.0 percent were 4+ years old (Table 3.15). Mountain whitefish caught were all 1+ year olds.

3.2.2.3 CEE CEE AH CREEK

Reach measurements for each site population estimates were conducted can be found in Appendix B, Table B.15. The number of fish captured during each pass at each site are also contained in Table B. 15. Brown trout density was highest in reach 4 at 12.2 ± 0.6 fish/l 00 m^2. The highest density of brook trout was 15.3 ± 2.7 fish/l 00 m^2 in reach 2 (Table 3.16). Cutthroat density was 6.1 ± 2.1 fish/100 m^2 in reach 3. Of the brown trout captured during the population estimate, 25.4 percent were age 0+, 9.5 percent were age 1+, 23.8 percent were age 2+, 30.2 percent were age 3+, and 11.1 percent were 4+ years old (Table 3.17). The brook trout captured were composed of 8.4 percent age 0+, 4.2 percent age 1+, 42.2 percent age 2+, 28.2 percent age 3+, and 16.9 percent age 4+.

Table 3.12. Estimated population, 95% confidence intervals, and fish density for each species of fish captured in LeClerc Creek at each reach on September 11 and 19, 1990.

SPECIES	POP. EST	95% C.I.	#/100m²±95% C.I.
REACH #1 (91.5 m)			
Brown trout	6.2	1.5	0.7 ± 0.2
Brook trout	33.3	62.8	3.6 ± 6.8
Rainbow trout	≥ 1	- -	- -
REACH #2 (91.5 m)			
Brown trout	8.0	0	1.4 ± 0
Brook trout	10.7	2.8	1.8 ± 0.5
Cutthroat trout	≥ 2	- -	0.3
REACH #3 (91.5 m)			
Brown trout	≥ 1	- -	- -
Brook trout	14.1	0.7	2.0 ± 0.1
Cutthroat trout	1.0	0	0.1 ± 0
REACH #4 (91.5 m)			
Brown trout	1.0	0	0.2 ± 0
Brook trout	35.6	5.7	5.6 ± 0.9

Table 3.13. Age distribution of trout collected during population estimation in LeClerc Creek. Age/length relationship was determined by back-calculation of the length at annulus formation.

BROWN TROUT						
Age	0+	1+	2+	3+	4+	5+
Size range (mm)	≤ 52	53-92	93-165	166-195	196-216	≥ 217
Number caught	0	7	3	2	1	3
Percent caught		43.8	18.8	12.5	6.2	18.8
BROOK TROUT						
Age	0+	1+	2+	3+	4+	
Size range (mm)	≤50	51-102	103-169	170-218	≥ 219	
Number caught	2	47	21	3	2	
Percent caught	2.7	62.7	28.0	4.0	2.7	
CUTTHROAT TROUT						
Age	0+	1+	2+	3+	4+	
Size range (mm)	≤ 84	85-107	108-177	178-209	≥ 210	
Number caught	0	0	1	0	2	
Percent caught			33.3	66.7		

Table 3.14. Estimated population, 95% confidence intervals, and fish density for each species of fish captured in Ruby Creek at each reach on September 5, 1990.

SPECIES	POP. EST	95% C.I.	#/100m^2±95% C.I.
REACH #1 (91.5 m)			
Brown trout	1.0	0	0.2 ± 0
Brook trout	15.8	2.1	3.5 ± 0.5
Rainbow trout	1.0	0	0.2 ± 0
Mountain whitefish	4.0	6.8	0.9 ± 1.5
REACH #2 (91.5 m)			
Brook trout	45.6	3.7	6.1 ± 0.5
Cutthroat trout	1.0	0	0.1 ± 0
REACH #3 (91.5 m)			
Brook trout	33.9	10.5	6.0 ± 1.9
REACH #4 (91.5 m)			
Brook trout	108.3	20.8	45.1 ± 8.7

Table 3.15. Age distribution of trout collected during population estimation in Ruby Creek. Age/length relationship was determined by back-calculation of the length at annulus formation.

BROOK TROUT					
Age	0 +	1 +	2 +	3 +	4 +
Size range (mm)	≤ 67	68-105	105-142	143-183	≥184
Number caught	18	52	47	37	25
Percent caught	10.0	29.0	26.2	20.7	14.0
MOUNTAIN WHITEFISH					
Age	0 +	1 +	2 +		
Size range (mm)	≤ 84	85-131	≥ 132		
Number caught	0	3	0		
Percent caught		100.0			

Cutthroat trout were composed of 78.9 percent age 1+, 5.3 percent age 2+, and 15.8 percent 3+ year olds.

3.2.2.4 TACOMA CREEK

Reach measurements for each site population estimates were conducted can be found in Appendix B, Table B.16. The number of fish captured during each pass at each site are also contained in Table B. 16. Brook trout density was highest in reach 1 at 17.7 ± 1.9 fish/100m² (Table 3.18). The highest density of cutthroat trout was 4.0 ± 1.0 fish/100m² in reach 1. Of the brook trout caught during the population estimate, 25.1 percent were age 0+, 27.7 percent were age 1+, 24.1 percent were age 2+, and 23.0 percent were age 3+ (Table 3.19). Cutthroat trout captured were 48.4 percent age O-t, 32.2 percent age 1+, and 19.4 percent age 2+.

3.2.2.5 SKOOKUM CREEK

Reach measurements for each site population estimates were conducted can be found in Appendix B, Table B.17. The number of fish captured during each pass at each site are also contained in Table B. 17. The highest density of brown trout was highest in reach 3 at 8.1 ± 3.7 fish/100 m² (Table 3.20). Brook trout density was 30.7 ± 4.4 fish/100 m² in reach 1. Cutthroat trout density was ≥ 0.2 fish/100 m² in reach 1. Brown trout captured during the population estimate were composed of 27.3 percent age 0+, 4.5 percent age 1+, 29.5 percent age 2+, 15.9 percent age 3+, 11.4 percent age 4+, and 11.4 percent age 5+ (Table 3.21). Of the brook trout caught, 8.3 percent were age 0+, 36.3 percent were age 1+, 31.2 percent were age 2+, 15.3 percent were age 3+, and 8.9 percent were age 4+. Cutthroat trout were 33.3 percent age 1+, 33.3 percent age 2+, and 33.3 percent age 3+.

3.3. AGE, GROWTH AND CONDITION

3.3.1 RIVER AND SLOUGHS

3.3.1.1 LARGEMOUTH BASS

Scale samples were collected from 290 largemouth bass from the Pend Oreille River and sloughs for age determination and back-calculation of growth. Mean back-calculated lengths at the first annulus formation ranged from 57 to 96 mm with a grand mean of 69 mm (Table 3.22). Mean lengths after the second year of growth

Table 3.16. Estimated population, 95% confidence intervals, and fish density for each species of fish captured in Cee Cee Ah Creek at each reach on September 10 and 11, 1990.

SPECIES	POP. EST	95% C.I.	#/100m^2±95% C.I.
R E A C H **#1 (91.5 m)**			
Brown trout	50.9	2.5	12.2 ± 0.6
Brook trout	1.0	0	0.2 ± 0
R E A C H **#2 (91.5 m)**			
Brown trout	27.0	45.5	7.5 ± 12.7
Brook trout	7.2	1.2	2.0 ± 0.3
Cutthroat trout	21.a	7.4	6.1 ± 2.1
R E A C H **#3 (91.5 m)**			
Brook trout	34.7	6.0	15.3 ± 2.7
R E A C H **#4 (91.5 m)**			
Brook trout	40.0	21.5	13.0 ± 7.0

Table 3.17. Age distribution of trout collected during population estimation in Cee Cee Ah Creek. Age/length relationship was determined by back-calculation of the length at annulus formation.

BROWN TROUT					
Age	0 +	1 +	2 +	3 +	4 +
Size range (mm)	≤ 70	71-97	98-139	140-205	≥ 206
Number caught	16	6	15	19	7
Percent caught	25.4	9.5	23.8	30.2	11.1
BROOK TROUT					
Age	0 +	1 +	2 +	3 +	4 +
Size range (mm)	≤ 66	67-96	97-135	136-167	≥168
Number caught	6	3	30	20	12
Percent caught	8.4	4.2	42.2	28.2	16.9
CUTTHROAT TROUT					
Age	1 +	2 +	3 +		
Size range (mm)	75-110	111-130	≥130		
Number caught	15	1	3		
Percent caught	78.9	5.3	15.8		

Table 3.18. Estimated population, 95% confidence intervals, and fish density for each species of fish captured in Tacoma Creek at each reach on September 6, 1990.

SPECIES	POP. EST	95% C.I.	#/100m^2 $\pm$ 95% C.I.
REACH #1 (91.5 m)			
Brown trout	1	-	0.2
Brook trout	9.8	3.3	1.7 $\pm$ 0.6
REACH #2 (91.5 m)			
Brook trout	20.6	2.3	5.5 $\pm$ 0.6
Cutthroat trout	4.0	6.8	1.1 $\pm$ 1.8
REACH #3 (47.8 m)			
Brook trout	61.4	8.0	11.7 $\pm$ 1.5
Cutthroat trout	7.2	1.2	1.4 $\pm$ 0.2
REACH #4 (91.5 m)			
Brook trout	102.5	10.7	17.7 $\pm$ 1.9
Cutthroat trout	23.3	5.9	4 0 $\pm$ 1.0

Table 3.19. Age distribution of trout collected during population estimation in Tacoma Creek. Age/length relationship was determined by back-calculation of the length at annulus formation.

BROOKTROUT				
Age	0 +	1 +	2 +	3 +
Size range (mm)	$\leq$57	58-98	99-141	$\geq$142
Number caught	48	53	46	44
Percent caught	25.1	27.7	24.1	23.0
CUTTHROAT TROUT				
Age	0 +	1 +	2 +	
Size range (mm)	$\leq$91	92-155	$\geq$156	
Number caught	15	10	6	
Percent caught	48.4	32.2	19.4	

Table 3.20. Estimated population, 95% confidence intervals, and fish density for each species of fish captured in Skookum Creek at each reach on September 12, 1990.

SPECIES	POP. EST	95% C.I.	#/100m^2 ± 95% C.I.
REACH #1 (91.5 m)			
Brown trout	25.0	10.0	7.5 ± 3.0
Brook trout	1.0	0	0.3 ± 0
REACH #2 (91.5 m)			
Brown trout	28.4	13.0	8.1 ± 3.7
Brook trout			no estimate
REACH #3 (91.5 m)			
Brook trout	16.9	3.1	5.2 ± 1.0
Cutthroat trout			no estimate
REACH #4 (91.5 m)			
Brook trout	160.7	23.2	30.7 ± 4.4
Cutthroat trout	≥ 1	- -	≥ 0.2

Table 3.21. Age distribution of trout collected during population estimation in Skookum Creek. Age/length relationship was determined by back-calculation of the length at annulus formation.

BROWN TROUT						
Age	0 +	1 +	2 +	3 +	4 +	5 +
Size range (mm)	≤ 65	66-l 02	103-154	155-201	202-249	≥ 250
Number caught	12	2	13	7	5	5
Percent caught	27.3	4.5	29.5	15.9	11.4	11.4
BROOK TROUT						
Age	0 +	1 +	2 +	3 +	4 +	
Size range (mm)	≤64	65-95	96-144	145-l 72	≥ 173	
Number caught	13	57	49	24	14	
Percent caught	8.3	36.3	31.2	15.3	a.9	
CUTTHROAT TROUT						
Age	0 +	1 +	2 +	3 +		
Size range (mm)	≤ 81	82-118	119-154	≥ 155		
Number caught	0	1	1	1		
Percent caught		33.3	33.3	33.3		

averaged from 92 to 190 mm, and the grand mean was 112 mm. After three years of growth, mean lengths ranged from 118 to 234 mm with a grand mean of 150 mm. Mean lengths after the fourth year of growth ranged from 145 to 256 mm, and the grand mean was 192 mm. Mean back-calculated lengths ranged from 193 to 313 mm with a grand mean of 235 mm after five years of growth. Back-calculated lengths at the sixth annulus ranged from 229 to 337 mm, and the grand mean was 281 mm. After seven years of growth, the mean length ranged from 257 to 374 mm, and the grand mean was 323 mm. Mean lengths after the eighth year of growth ranged from 306 to 402 mm with a grand mean of 339 mm. Mean back-calculated lengths for the ninth year of growth ranged from 343 to 422 mm with a grand mean of 395 mm. Back-calculated lengths ranged from 362 to 459 mm with a grand mean of 424 mm after ten years of growth. Mean lengths after the eleventh year of growth ranged from 406 to 475 mm and the grand mean was 452 mm. Mean lengths ranged from 423 to 475 mm after the twelfth year of growth and the grand mean was 469 mm. After thirteen years of growth, mean lengths ranged from 457 to 504 mm with a grand mean of 485 mm. Mean back-calculated lengths ranged from 478 to 503 mm and the grand mean was 486 mm after the fourteenth year of growth. The mean length at the fifteenth annulus was 488 mm.

Condition factors for each age class of largemouth bass ranged from a low of 1.05 for age 0+ to a high of 2.08 for age 15+ (Table 3.23). The mean condition factor for all age classes of largemouth bass was 1.28.

3.3.1.2 YELLOW PERCH

A total of 419 scale samples were taken from yellow perch in the river and sloughs. Mean lengths for the first year of growth ranged from 75 to 80 mm, and the grand mean was 78 mm (Table 3.24). Back-calculated lengths after the second year of growth ranged from 95 to 117 mm with a grand mean of 113 mm. After the third year of growth, mean lengths ranged from 119 to 142 mm with a grand mean of 137 mm. Mean lengths ranged from 140 to 158 mm and the grand mean was 152 mm after the fourth year of growth. Mean back-calculated lengths after the fifth year of growth ranged from 154 to 170 mm with a grand mean of 159 mm. After the sixth year of growth the mean lengths ranged from 165 to 188 mm with a grand mean of 177 mm. Mean lengths ranged from 176 to 196 mm

Table 3.22. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of largemouth bass.

		MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS														
COHORT	N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1989	50	64± 8.7														
1988	55	64± 11.0	106± 20.7													
1987	53	64± 11.6	103± 21.4	138± 20.4												
1986	30	65± 14.2	103± 26.6	140± 32.6	169± 34.1											
1985	36	67± 12.1	110± 27.1	158± 32.2	191± 37.8	217± 43.8										
1984	25	64± 9.9	107± 35.1	151± 42.7	193± 41.8	228± 49.4	254± 50.5									
1983	10	70± 12.3	120± 32.4	167± 43.6	208± 45.1	263± 40.8	308± 31.2	340± 17.3								
1982	8	68± 10.7	135± 33.7	199± 50.1	236± 47.3	265± 49.4	291± 53 4	318± 58.7	330± 57.1							
1981	2	57± 8.4	92± 19.9	118± 23.9	145± 30.2	195± 28.8	282± 46.9	360± 41.2	391± 49.7	411± 48.1						
1980	7	68± 4.9	116± 23.8	163± 42.2	202± 59.6	250± 61.7	291± 62.7	328± 59.4	357± 57.4	392± 45.7	419± 37.8					
1979	4	73± 4.8	128± 14.9	175± 17.2	213± 22.5	248± 31.1	279± 48.8	310± 48.7	353± 59.5	389± 69.5	430± 60.1	455± 55.8				
1978	4	67± 6.3	102± 17.8	142± 16.8	208± 28.2	263± 23.2	309± 34.6	342± 44.1	385± 38.2	402± 40.4	433± 27.1	457± 23.4	476± 26.6			
1977	3	61.2	12.7±	24.6±	13.8±	17.9±	337± 19.0	374± 30.6	402± 36.1	422± 46.6	459± 36.4	475± 38.1	493± 35.7	504± 27.6		
1976	1	96	190	234	256	313	336	373	385	406	426	438	459	482±	503	
1975	2	69± 15.7	102± 17.4	128± 29.9	154± 16.1	193± 35.8	229± 39.1	258± 37.1	306± 40.6	343-L 8.2	362± 10.9	406± 11.9	423± 6.1	457± 9.0	478± 1.1	488± 3.3
GRAND MEAN		N=290 64± 11.3	N=240 112± 77.1	N=185 150± 38.5	N=132 192± 42.5	N=102 235± 48.5	N=66 281± 52.1	N=41 323± 67.7	N=31 339± 97.4	N=23 395± 46.3	N=21 424± 42.6	N=14 452± 39.5	N=10 469± 34.6	N=6 485± 29.4	N=3 486± 14.1	N=2 488± 3.3
MEAN ANNUAL GROWTH INCREMENT		65	47	38	42	43	46	43	16	56	29	27	17	16	2	2

Table 3.23. Mean weights, lengths, and condition factors (K_{TL}) for each age class of largemouth bass.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
0+	2	3.0 ± 2.8	47.5 ± 19.6	1.05 ± 0.48
1+	41	7.2 ± 5.9	83.6 ± 20.5	1.11 ± 0.27
2+	58	23.4 ± 13.6	123.5 ± 20.5	1.19 ± 0.18
3+	46	50.2 ± 28.2	157.1 ± 24.8	1.20 ± 0.16
4+	24	85.7 ± 44.1	188.4 ± 26.3	1.17 ± 0.15
5+	30	177.7 ± 128.4	231.1 ± 45.5	1.29 ± 0.23
6+	16	357.0 ± 232.6	269.6 ± 47.9	1.39 ± 0.21
7+	10	802.8 ± 189.2	360.1 ± 18.8	1.69 ± 0.23
8+	6	722.7 ± 370.1	333.5 ± 58.5	1.60 ± 0.31
9+	2	1325.0 ± 677.4	422.0 ± 49.5	1.67 ± 0.30
10+	7	1479.3 ± 302.6	429.7 ± 30.4	1.85 ± 0.11
11+	3	1760.3 ± 731.7	464.0 ± 49.5	1.85 ± 0.30
12+	1	1473.0	484.8 ± 26.3	1.62
13+	3	2618.7 ± 333.7	517.0 ± 19.2	1.89 ± 0.09
14+	1	2528.0	505.0	1.96
15+	2	2585.5 ± 338.7	499.0 ± 1.4	2.08 ± 0.29
TOTAL	252			1.28 ± 0.30

with a grand mean of 182 mm after the seventh year of growth. The mean length after the eighth year of growth was 211 mm.

Condition factors ranged from 0.73 for age 0+ to 1.30 for age 8+ for each age class of yellow perch (Table 3.25). Mean condition factor for all age classes was 1.18.

3.3.1.3 MOUNTAIN WHITEFISH

Scale samples were taken from 335 mountain whitefish to obtain growth data. Back-calculated mean lengths after the first year of growth ranged from 130 to 155 mm with a grand mean of 135 mm (Table 3.26). Mean lengths ranged from 182 to 212 mm with a grand mean of 201 mm after the second year of growth. The mean lengths for the third year of growth ranged from 246 to 258 mm, and the grand mean was 247 mm. Mean lengths for the fourth year of growth ranged from 277 to 297 mm with a grand mean of 278 mm. After the fifth year of growth, mean lengths ranged from 305 to 346 mm, and the grand mean was 308 mm. The mean length for the sixth year of growth was 371 mm.

Condition factors ranged from 0.73 for age 0+ to 0.92 for age 5+ for each age class of mountain whitefish (Table 3.27). Mean condition factor for all age classes was 0.87.

3.3.1.4 BLACK CRAPPIE

A total of 66 scale samples were taken from black crappie in the Pend Oreille River and sloughs. After the first year of growth, mean lengths ranged from 57 to 66 mm with a grand mean of 62 mm (Table 3.28). Back-calculated lengths ranged from 76 to 107 mm with a grand mean of 93 mm after the second year of growth. Mean lengths after the third year of growth ranged from 103 to 146 mm, and the grand mean was 130 mm. Mean lengths ranged from 123 to 170 mm with a grand mean of 156 mm after the fourth year of growth. After the fifth year of growth, mean lengths ranged from 137 to 190 mm with a grand mean of 173 mm. Back-calculated lengths after the sixth year of growth ranged from 164 to 192 mm, and the grand mean was 183 mm. The mean lengths after the seventh year of growth ranged from 174 to 180 mm with a grand mean of 178 mm. Mean length after the eighth year of growth was 188 mm.

Table 3.24. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of yellow perch.

		MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS							
COHORT	N	1	2	3	4	5	6	7	8
1989	36	76 ± 7.2							
1988	48	78 ± 10.7	106 ± 17.2						
1987	57	78 ± 8.8	112 ± 12.7	134 ± 14.1					
1986	161	79 ± 6.3	117 ± 11.2	139 ± 10.7	152 ± 14.3				
1985	96	78 ± 14.9	112 ± 14.9	137 ± 13.3	151 ± 16.7	158 ± 26.8			
1984	14	78 ± 6.9	113 ± 16.0	142 ± 10.3	158 ± 10.2	170 ± 10.3	179 ± 10.7		
1983	5	75 ± 3.9	95 ± 6.5	119 ± 9.4	140 ± 8.6	154 ± 11.5	165 ± 10.1	176 ± 8.3	
1982	2	80 ± 2.2	111 ± 20.1	135 ± 18.5	151 ± 18.9	169 ± 21.8	188 ± 26.8	196 ± 25.9	211 ± 36.5
GRAND MEAN		N=419 78 ± 7.5	N=383 113 ± 14	N=335 137 ± 12.4	N=278 152 ± 15.0	N=117 159 ± 25.1	N=21 177 ± 13.7	N=7 182 ± 15.7	N=2 211 ± 36.5
MEAN ANNUAL GROWTH INCREMENT		78	35	24	15	7	18	5	29

Table 3.25. Mean weights, lengths, and condition factors (K_{TL}) for each age class of yellow perch.

AGE	N	MEAN WEIGHT (g) (± S.D.)	MEAN LENGTH (mm) (± S.D.)	MEAN K_{TL} (± S.D.)
0+	1	2.0	63.7 ± 14.1	0.73
1+	28	9.3 ± 5.9	90.0 ± 15.7	1.19 ± 0.28
2+	30	20.6 ± 11.6	118.9 ± 20.8	1.19 ± 0.19
3+	40	38.5 ± 11.8	145.6 ± 14.9	1.16 ± 0.20
4+	134	47.1 ± 11.1	159.6 ± 12.8	1.18 ± 0.17
5+	86	55.3 ± 15.2	168.2 ± 14.1	1.17 ± 0.14
6+	11	71.1 ± 19.0	186.4 ± 12.8	1.16 ± 0.22
7+	4	77.0 ± 5.5	186.2 ± 4.8	1.19 ± 0.04
8+	2	144.5 ± 78.5	219.0 ± 36.8	1.30 ± 0.09
TOTAL	336			1.18 ± 0.18

Table 3.26. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of mountain whitefish.

COHORT	N	MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS 1	2	3	4	5	6
1989	46	134 ± 20.8					
1988	27	130 ± 15.3	182 ± 23.8				
1987	115	136 ± 11.3	203 ± 17.8	246 ± 20.4			
1986	123	136 ± 12.9	204 ± 19.9	248 ± 20.0	277 ± 21.1		
1985	22	135 ± 10.8	200 ± 14.3	246 ± 16.9	282 ± 23.3	305 ± 32.7	
1984	2	155 ± 34.7	212 ± 10.6	258 ± 25.9	297 ± 38.4	346 ± 45.1	371 ± 47.3
GRAND MEAN		N=335 135 ± 14.0	N=289 201 ± 20.1	N=262 247 ± 19.9	N=147 278 ± 21.7	N=24 308 ± 34.6	N=2 371 ± 47.3
MEAN ANNUAL GROWTH INCREMENT		135	66	46	31	30	62

Table 3.27. Mean weights, lengths, and condition factors (K_{TL}) for each age class of mountain whitefish.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
0 +	13	8.9 ± 2.1	113.9 ± 9.7	0.73 ± 0.11
1 +	23	30.8 ± 18.2	161.7 ± 29.4	0.82 ± 0.11
2 +	23	64.2 ± 31.0	197.5 ± 29.2	0.82 ± 0.09
3 +	93	165.6 ± 44.6	263.4 ± 22.7	0.89 ± 0.09
4 +	96	219.9 ± 55.4	290.3 ± 22.9	0.89 ± 0.11
5 +	17	315.3 ± 153.7	315.4 ± 39.1	0.92 ± 0.10
6 +	2	512.5 ± 113.8	387.0 ± 46.7	0.89 ± 0.12
TOTAL	267			0.87 ± 0.11

Condition factors ranged from a low of 1.27 for age 1+ to a high of 1.55 for age 3+ for the individual age classes of black crappie (Table 3.29). All age classes combined had a mean condition factor of 1.40.

3.3.1.5 BROWN TROUT

Scale samples were taken from 46 brown trout in the river and sloughs. Back-calculated lengths after the first year of growth ranged from 47 to 75 mm with a grand mean of 67 mm (Table 3.30). Mean lengths ranged from 62 to 145 mm for the second year of growth, and the grand mean was 129 mm. After the third year of growth, mean lengths ranged from 128 to 210 mm, and the grand mean was 198 mm. Mean lengths after the fourth year of growth ranged from 181 to 274 mm with a grand mean of 249 mm. The back-calculated lengths after the fifth year of growth ranged from 240 to 320 mm with a grand mean of 310 mm. Mean back-calculated lengths ranged from 258 to 342 mm with a grand mean of 300 mm after the sixth year of growth. The mean length was 383 mm after the seventh year of growth and 436 mm after the eighth year.

Condition factors for each age class of brown trout ranged between 0.76 for age 0+ and 1.04 for age 8+ (Table 3.31). Mean condition factor for all ages combined was 0.91.

3.3.1.6 CUTTHROAT TROUT

A total of seven scale samples were collected from cutthroat trout for age determination and back-calculation of growth. Because of the small sample size a good regression between fish length and scale length could not be obtained, thus back-calculations were made using the proportional method. Mean back-calculated lengths after the first annulus formation ranged from 52 to 67 mm, and the grand mean was 65 mm (Table 3.32). After the second year of growth, mean lengths ranged from 112 to 117 mm with a grand mean of 117 mm. Back-calculations for lengths at the third annulus formation ranged from 201 to 224 mm with a grand mean of 204 mm. Mean lengths ranged from 275 to 293 mm, and the grand mean was 278 mm after the fourth year of growth. The mean length after the fifth year of growth was 318 mm.

Condition factors for each age class of cutthroat trout ranged from a low of 0.77 for age 4+ to a high of 1.04 for age 5+ (Table

Table 3.28. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of black crappie.

COHORT	N	MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS 1	2	3	4	5	6	7	8
1989	22	62 ± 6.2							
1988	9	57 ± 8.1	87 ± 18.3						
1987	5	60 ± 4.0	90 ± 14.2	118 ± 12.0					
1986	7	64 ± 4.5	103 ± 17.9	146 ± 20.8	169 ± 19.9				
1985	8	66 ± 7.6	107 ± 19.8	146 ± 17.8	170 ± 10.7	190 ± 8.6			
1984	10	62 ± 8.3	89 ± 18.4	123 ± 17.9	151 ± 19.6	174 ± 15.9	192 ± 13.9		
1983	3	59 ± 6.7	76 ± 10.8	103 ± 5.4	123 ± 4.3	137 ± 5.1	165 ± 10.1	180 ± 15.7	
1982	2	60 ± 0.5	90 ± 0.9	110 ± 1.3	129 ± 8.2	154 ± 7.4	164 ± 7.5	174 ± 5.5	188 ± 6.8
GRAND MEAN		N=66 62 ± 6.9	N=44 93 ± 18.8	N=35 130 ± 21.9	N=30 156 ± 22.3	N=23 173 ± 21.2	N=15 183 ± 17.8	N=5 178 ± 11.9	N=2 188 ± 6.8
MEAN ANNUAL GROWTH INCREMENT		62	31	37	28	17	9	0	10

Table 3.29. Mean weights, lengths, and condition factors (K_{TL}) for each age class of black crappie.

AGE	N	MEAN WEIGHT (g) (± S.D.)	MEAN LENGTH (mm) (± S.D.)	MEAN K_{TL} (±S.D.)
0+	1	3.0	59.3 ± 11.5	1.32 ± 0
1+	19	7.5 ± 7.4	78.8 ± 22.4	1.27 ± 0.21
2+	9	18.1 ± 8.0	107.0 ± 14.4	1.40 ± 0.07
3+	3	38.3 ± 15.0	134.0 ± 15.9	1.55 ± 0.04
4+	6	81.7 ± 21.8	182.4 ± 17.4	1.40 ± 0.06
5+	5	109.2 ± 5.1	201.1 ± 8.3	1.46 ± 0.09
6+	9	124.3 ± 24.5	201.5 ± 14.3	1.51 ± 0.10
7+	3	116.3 ± 13.5	196.7 ± 7.2	1.53 ± 0.08
8+	2	104.5 ± 17.7	193.5 ± 0.7	1.44 ± 0.23
TOTAL	57			1.40 ± 0.17

Table 3.30. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of brown trout.

COHORT	N	MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS							
		1	2	3	4	5	6	7	8
1989	2	75 ± 0.2							
1988	7	74 ± 19.3	145 ± 25.1						
1987	9	70 ± 10.7	138 ± 20.8	207 ± 30.4					
1986	17	66 ± 12.3	124 ± 27.4	195 ± 46.3	243 ± 81.7				
1985	9	65 ± 20.3	131 ± 60.9	210 ± 92.8	274 ± 103.6	320 ± 99.5			
1984	1	50	62	136	191	240	258		
1983	0								
1982	1	47	74	128	181	282.1	342	383	436
GRAND MEAN		N=46 67 ± 15.0	N=44 129 ± 37.6	N=37 198 ± 58.1	N=28 249 ± 87.5	N=11 310 ± 92.6	N=2 300 ± 59.4	N=1 383	N=1 436
MEAN ANNUAL GROWTH INCREMENT		67	62	69	51	61	0	83	53

Table 3.31. Mean weights, lengths, and condition factors (K_{TL}) for each age class of brown trout.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
0+	5	5.6 ± 1.5	90.0 ± 4.1	0.76 ± 0.15
1+	2	12.0 ± 1.4	109.0 ± 5.7	0.93 ± 0.03
2+	5	41.0 ± 15.0	170.3 ± 25.7	0.97 ± 0.04
3+	10	154.9 ± 115.0	243.7 ± 62.1	1.00 ± 0.29
4+	17	228.2 ± 182.2	278.4 ± 56.9	0.90 ± 0.14
5+	9	489.8 ± 442.6	362.1 ± 97.5	0.80 ± 0.05
6+	1	228.0	283.0	1.01
7+	0			
8+	1	1218.0	490.0	1.04
TOTAL	50			0.91 ± 0.17

Table 3.32. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of cutthroat trout. Back-calculated lengths were obtained using the proportional method.

		MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS				
COHORT	N	1	2	3	4	5
1989	0					
1988	0					
1987	1	52	112	224		
1986	5	67 ± 10.4	117 ± 14.1	201 ± 44.9	275 ± 41.7	
1985	1	67	117	218	293	318
GRAND MEAN		N=7 65 ± 10.1	N=7 117 ± 12.6	N=7 204 ± 40.7	N=6 278 ± 38.0	N=1 318
MEAN ANNUAL GROWTH INCREMENT		65	52	87	74	40

Table 3.33. Mean weights, lengths, and condition factors (K_{TL}) for each age class of cutthroat trout.

AGE	N	MEAN WEIGHT (g) (±S.D)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
3+	1	166.0	261.0	0.93
4+	4	305.0 ± 69.1	335.0 ± 19.1	0.77 ± 0.18
5+	1	390.0	335.0	1.04
TOTAL	6			0.74 ± 0.29

3.33). For all age classes combined, the mean condition factor was 0.74.

3.3.1.7 RAINBOW TROUT

Scale samples were collected from nine rainbow trout for age determination and back-calculation of growth. Mean lengths after the first year of growth ranged from 74 to 90 mm with a grand mean of 83 mm (Table 3.34). Back-calculated mean lengths after the second annulus formation were between 140 and 178 mm, and the grand mean was 159 mm. After the third year of growth, mean lengths ranged from 213 to 447 mm with a grand mean of 282 mm. Mean lengths ranged from 306 to 528 mm with a grand mean of 351 mm after the fourth annulus formation. The mean length after the fifth year of growth was 585 mm.

Condition factors for each age class of rainbow trout ranged from 0.90 for age 4+ to 1.36 for age 5+ (Table 3.35). The mean condition factor for all age classes combined was 0.99.

3.3.1.8 LAKE TROUT

Scale samples were taken from three lake trout in the Pend Oreille River and sloughs for age determination and back-calculation of growth. Because of the small sample size a good regression could not be obtained. Back-calculations were determined using the proportional method. Mean lengths at first annulus formation ranged from 59 to 129 mm with a grand mean of 82 mm (Table 3.36). Back-calculated mean lengths for the second year of growth ranged from 163 to 250 mm with a grand mean of 192 mm. After the third year of growth, mean lengths ranged from 247 to 362 mm, and the grand mean was 285 mm. Mean lengths ranged from 321 to 439 mm with a grand mean of 360 mm after the fourth year of growth. Mean back-calculated lengths after the fifth annulus formation were between 412 and 491 mm with a grand mean of 439 mm. Mean length at the sixth annulus formation was 466 mm. The mean condition factor for 6+ year old fish was 0.69 (Table 3.37).

3.3.1.9 KOKANEE

A total of 12 scale samples were taken from kokanee in the Pend Oreille River and sloughs. Mean back-calculated lengths at first annulus formation ranged from 72 to 92 mm, and the grand mean was 83 mm (Table 3.38). Mean lengths ranged from 111 to 187

Table 3.34. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of rainbow trout.

COHORT	N	MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS 1	2	3	4	5
1989	0					
1988	2	84 ± 28.1	140 ± 62.7			
1987	2	74 ± 19.3	140 ± 27.7	213 ± 36.4		
1986	4	86 ± 31.7	178 ± 85.7	274 ± 102.4	306 ± 113.9	
1985	1	90	163	447	528	585
GRAND MEAN		N=9 83 ± 23.5	N=9 159 ± 60.9	N=7 282 ± 107.7	N=5 351 ± 139.9	N=1 585
MEAN ANNUAL GROWTH INCREMENT	8 3	76	125	70	234	

Table 3.35. Mean weights, lengths, and condition factors (K_{TL}) for each age class of rainbow trout.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
2+	1	25.0	214.5 ± 112.4	1.02
3+	2	172.0 ± 48.1	259.5 ± 27.6	0.97 ± 0.04
4+	4	366.8 ± 316.7	331.3 ± 106.0	0.90 ± 0.13
5+	1	2713.0	585.0	1.36
TOTAL	8			0.99 ± 0.18

Table 3.36. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year age class of lake trout. Back-calculated lengths were obtained using the proportional method.

		MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS					
COHORT	N	1	2	3	4	5	6
1989	0						
1988	0						
1987	0						
1986	0						
1985	1	129	250	362	439	491	
1984	2	59 ± 25.6	163 ± 59.0	247 ± 84.6	321 ± 110.7	412 ± 53.4	466 ± 20.5
GRAND MEAN		N=3 82 ± 44.4	N=3 192 ± 65.2	N=3 285 ± 89.2	N=3 360 ± 104.0	N=3 439 ± 59.0	N=2 466 ± 20.5
MEAN ANNUAL GROWTH INCREMENT		82	110	94	75	78	28

Table 3.37. Mean weights, lengths, and condition factors (K_{TL}) for each age class of lake trout.

AGE	N	MEAN WEIGHT (g) (± S.D.)	MEAN LENGTH (mm) (± S.D.)	MEAN K_{TL} (± S.D.)
5+	1		560.0	
6+	2	1024.0 ± 7.1	530.5 ± 2.1	0.69 ± 0.01
TOTAL	3			0.69 ± 0.01

mm with a grand mean of 124 mm at the second annulus formation. Mean length was 244 mm after the third year of growth.

Condition factors for each age class of kokanee ranged from 0.71 for age 1+ to 0.77 for both age 2+ and **age** 3+ (Table 3.39). The mean condition factor for all age classes combined **was** 0.74.

3.3.2 TRIBUTARIES

3.3.2.1 BROWN TROUT

Scale samples were collected from 18 brown trout in LeClerc Creek for age determination and back-calculation of growth at annulus formation. After the first years growth, **mean lengths** ranged from 59 to 98 mm, and the grand mean was 77 mm (Table 3.40). **Mean** lengths ranged from 100 to 162 mm with a grand mean of 134 after two years of growth. At the third annulus formation mean lengths ranged from 145 to 211 mm, and the grand mean was 180 mm. **Mean** lengths at the fourth annulus formation ranged from 182 to 224 mm with a grand mean of 193 mm. The length at the fifth annulus formation was 298 mm. Condition factors ranged from 0.79 for age 3+ to 1.4 for age 1+ (Table 3.41). The mean condition factor for all age classes of brown trout in LeClerc Creek combined was 1.09.

Scale samples were collected from 79 brown trout in Cee Cee Ah Creek for age determination and back-calculation of growth. Mean lengths at first annulus formation ranged from 80 to' 84 mm with a grand mean of 82 mm (Table 3.42). After two years of growth, mean lengths ranged from 119 to 127 mm, and the grand mean was 122 mm. **Mean** length for the third year of growth **was** 171 mm. Condition factors for each age class ranged from a low of 0.71 for age 3+ to a high of 1.3 for age 0+ (Table 3.43). Mean condition factor for all age classes combined was 0.96.

A total of 42 scale samples were collected from brown trout in Skookum Creek for age determination and back-calculation of growth. Mean lengths after the first year of growth ranged from 77 to 86 mm, and the grand mean was 81 mm (Table 3.44). After the second annulus formation, mean lengths ranged from 124 to 139 mm with a grand mean of 133 mm. Mean lengths at the third annulus formation ranged from 180 to 182 mm with a grand mean of 182 mm. The mean length at the end of the fourth year of growth was 215 mm. Condition factors for each age class ranged from 0.87 for age

Table 3.38. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of kokanee.

COHORT	N	MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS		
		1	2	3
1989	6	92 ± 15.0		
1988	5	75 ± 18.7	111 ± 23.8	
1987	1	72	187	244
GRAND MEAN		N=12 83 ± 17.6	N=6 124 ± 37.6	N=1 244
MEAN ANNUAL GROWTH INCREMENT		83	41	121

Table 3.39. Mean weights, lengths, and condition factors (K_{TL}) for each age class of kokanee.

AGE	N	MEAN WEIGHT (g) (± SD.)	MEAN LENGTH (mm) (± S.D.)	MEAN K_{TL} (± S.D.)
1+	6	8.3 ± 4.6	103.0 ± 10.7	0.71 ± 0.19
2+	5	21.2 ± 8.5	138.0 ± 20.6	0.77 ± 0.12
3+	1	143.0	265.0	0.77
TOTAL	12			0.74 ± 0.15

Table 3.40. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of brown trout in LeClerc Creek.

		MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS				
COHORT	N	1	2	3	4	5
1989	8	76 ± 22.4				
1988	3	80 ± 19.4	145 ± 17.4			
1987	3	98 ± 44.7	162 ± 90.2	211 ± 94.4		
1986	3	59 ± 10.9	100 ± 10.4	145 ± 15.4	182 ± 12.6	
1985	1	76	123	164	224	298
GRAND MEAN		N=18 77 ± 25.3	N=10 134 ± 50.9	N=7 180 ± 64.5	N=4 193 ± 23.3	N=1 298
MEAN ANNUAL GROWTH INCREMENT		77	57	46	13	106

Table 3.41. Mean weights, lengths, and condition factors (K_{TL}) for each age class of brown trout in LeClerc Creek.

AGE	N	MEAN WEIGHT (g) (±S.D)	MEAN LENGTH (mm) (±S.D)	MEAN K_{TL} (±S.D)
1+	5	51.0 ± 11.9	116.0 ± 40.9	1.40 ± 0.25
2+	2	78.0 ± 14.9	186.0 ± 21.5	1.02 ± 0.06
3+	1	47.0	204.0 ± 31.8	0.79
4+	2	92.0 ± 51.6	210.0 ± 15.3	0.97 ± 0.30
5+	1	344.0	345.0	0.84
TOTAL	11			1.09 ± 0.28

Table 3.42. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of brown trout in Cee Cee Ah Creek.

		MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS		
COHORT	N	1	2	3
1989	36	82 ± 12.3		
1988	31	80 ± 12.0	119 ± 18.8	
1987	12	84 ± 11.5	127 ± 25.4	171 ± 33.8
GRAND MEAN		N=79 82 ± 11.9	N=43 122 ± 21.3	N=12 171 ± 33.8
MEAN ANNUAL GROWTH INCREMENT		82	40	59

Table 3.43. Mean weights, lengths, and condition factors (K_{TL}) for each age class of brown trout Cee Cee Ah Creek.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN KTL (±S.D.)
0+	4	2.0 ± 1.4	65.0 ± 19.8	1.30 ± 0.60
1+	9	4.9 ± 2.1	108.0 ± 22.1	0.90 ± 0.20
2+	10	36.0 ± 33.4	146.0 ± 28.7	0.97 ± 0.07
3+	4	82.0 ± 80.9	194.0 ± 30.6	0.71 ± 0.31
TOTAL	27			0.96 ± 0.30

0+ to 1.21 for age 4+ (Table 3.45). The mean condition factor for all age classes combined was 1.07.

3.3.2.2 BROOK TROUT

Scale samples were collected from 53 brook trout in LeClerc Creek for age determination and back-calculation of growth. At the first annulus formation, mean lengths ranged from 63 to 79 mm with a grand mean of 66 mm (Table 3.46). After two years of growth, mean lengths ranged from 134 to 143 mm, and the grand mean was 141 mm. Mean length after the third year was 194 mm. Condition factors for each age class ranged from a low of 0.91 for age 1+ to a high of 1.46 for age 3+ (Table 3.47). The condition factor for all age classes combined was 1.02.

Scale samples were collected from 102 brook trout in Ruby Creek for age determination and back calculation of growth. Mean length at first annulus formation ranged from 78 to 86 mm with a grand mean of 81 mm (Table 3.48). At the second annulus formation, mean lengths ranged from 120 to 124 mm, and the grand mean was 124 mm. The mean length at the end of the third year of growth was 157 mm. Condition factors for each age class ranged from 0.84 for age 0+ to 0.99 for age 3+ (Table 3.49). The mean condition factor for all age classes combined was 0.94.

Scale samples were collected from 50 brook trout from Cee Cee Ah Creek for age determination and back-calculation of growth. Mean lengths at the first annulus formation ranged from 73 to 85 mm with a grand mean of 81 mm (Table 3.50). After the second year of growth, mean lengths ranged from 113 to 114 mm, and the grand mean was 114 mm. The mean length after three years of growth was 152 mm. Condition factors for each age class ranged from 0.92 for age 3+ to 1.12 for age 2+ (Table 3.51). The mean condition factor for all age classes combined was 1.03.

A total of 66 scale samples were collected from brook trout in Tacoma Creek for age determination and back calculation of growth. Mean lengths after the first year of growth ranged from 72 to 74 mm with a grand mean of 73 mm (Table 3.52). The mean length at the second annulus formation was 117 mm. Condition factors for all ages ranged from 1.12 for age 2+ to 1.13 for age 1+ (Table 3.53). Mean condition factor for all ages combined was 1.12.

Table 3.44. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of brown trout in Skookum Creek.

		MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS			
COHORT	N	1	2	3	4
1989	15	80 ± 17.7			
1988	16	82 ± 10.4	131 ± 22.6		
1987	8	86 ± 19.7	139 ± 31.2	182 ± 30.3	
1986	3	77 ± 10.3	124 ± 26.1	180 ± 32.1	215 ± 33.6
GRAND MEAN		N=42 81 ± 14.9	N=27 133 ± 25.1	N=11 182 ± 29.1	N=3 215 ± 33.6
MEAN ANNUAL GROWTH INCREMENT		81	52	49	33

Table 3.45. Mean weights, lengths, and 'condition factors (K_{TL}) for each age class of brown trout Skookum Creek.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
0+	4	1.8 ± 1.0	62.0 ± 14.1	0.87 ± 0.27
1+	10	14.0 ± 9.6	103.0 ± 22.3	1.14 ± 0.27
2+	6	53.0 ± 41.9	153.0 ± 27.3	1.09 ± 0.32
3+	3	101.0 ± 38.9	202.0 ± 27.5	1.05 ± 0.31
4+	1	103.0	234.0 ± 35.2	1.21
TOTAL	24			1.07 ± 0.28

Table 3.46. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of brook trout in LeClerc Creek.

		MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS		
COHORT	N	1	2	3
1989	42	63 ± 14.5		
1988	9	79 ± 18.5	143 ± 30.5	
1987	2	71 ± 5.2	134 ± 19.7	194 ± 24.4
GRAND MEAN		N=53 66 ± 16.0	N=11 141 ± 28.2	N=2 194 ± 24.3
MEAN ANNUAL GROWTH INCREMENT		66	75	53

Table 3.47. Mean weights, lengths, and condition factors (K_{TL}) for each age class of brook trout LeClerc Creek.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
0+	1	2.0	63.0 ± 9.6	1.42
1+	14	26.0 ± 48.6	102.0 ± 36.1	0.91 ± 0.15
2+	4	101.0 ± 39.6	184.0 ± 29.6	1.20 ± 0.05
3+	1	228.0	235.0 ± 21.2	1.46
TOTAL	20			1.02 ± 0.22

Table 3.48. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of brook trout in Ruby Creek.

COHORT	N	MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS 1	2	3
1989	51	78 ± 15.6		
1988	41	86 ± 11.9	124 ± 15.7	
1987	10	82 ± 13.1	120 ± 22.6	157 ± 26.4
GRAND MEAN		N=102 81 ± 14.3	N=51 124 ± 16.9	N=10 157 ± 26.4
MEAN ANNUAL GROWTH INCREMENT		81	43	33

Table 3.49. Mean weights, lengths, and condition factors (K_{TL}) for each age class of brook trout Ruby Creek.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
0+	1	3.0	64.0 ± 6.5	0.84
1+	12	10.0 ± 5.6	104.0 ± 23.9	0.94 ± 0.13
2+	12	53.0 ± 44.7	158.0 ± 23.2	0.95 ± 0.12
3+	1	58.0	191.0 ± 31.7	0.99
TOTAL	26			0.94 ± 0.10

Table 3.50. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of brook trout in Cee Cee Ah Creek.

		MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS		
COHORT	N	1	2	
1989	26	85 ± 14.7		
1988	21	76 ± 13.4	114 ± 17.6	
1987	3	73 ± 11.7	113 ± 5.7	152 ± 14.6
GRAND MEAN		N=50 81 ± 14.5	N=34 114 ± 16.5	N=3 152 ± 14.6
MEAN ANNUAL GROWTH INCREMENT		81	33	38

Table 3.51. Mean weights, lengths, and condition factors (K_{TL}) for each age class of brook trout Cee Cee Ah Creek.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
0+	1	4.0	75.0	0.95
1+	20	15.0 ± 11.9	110.0 ± 20.7	0.98 ± 0.35
2+	17	51.0 ± 19.7	164.0 ± 17.7	1.12 ± 0.29
3+	3	58.7 ± 27.1	182.0 ± 24.2	0.92 ± 0.07
TOTAL	41			1.03 ± 0.31

Table 3.52. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of brook trout in Tacoma Creek.

		MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS	
COHORT	N	1	2
1989	45	74 ± 16.1	
1988	21	72 ± 14.1	117 ± 18.2
GRAND MEAN		N=66 73 ± 15.4	N=21 117 ± 18.2
MEAN ANNUAL GROWTH INCREMENT		73	44

Table 3.53. Mean weights, lengths, and condition factors (K_{TL}) for each age class of brook trout Tacoma Creek.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
0+			61.0 ± 12.1	
1+	2	8.0 ± 0.7	115.0 ± 22.1	1.13 ± 0.15
2+	8	42.0 ± 17.2	157.0 ± 16.2	1.12 ± 0.16
TOTAL	10			1.12 ± 0.15

Scale samples were collected from 128 brook trout in Skookum Creek for age determination and back-calculation of growth at annulus formation. Mean lengths after the first years growth ranged from 64 to 76 mm, and the grand mean was 68 mm (Table 3.54). After the second year of growth, mean lengths ranged from 117 to 124 mm with a grand mean of 117 mm. Mean length after the third year of growth was 157 mm. Condition factors for each age class ranged from 0.97 for age 1+ to 1.24 for age 3+ (Table 3.55). The mean condition factor for all age classes combined was 1 .01.

3.3.2.3 CUTTHROAT TROUT

Scale samples were taken from seven cutthroat trout in LeClerc Creek for age determination and back calculation of growth at annulus formation. Mean lengths ranged from 88 to 95 mm with a grand mean of 91 mm after the first annulus formation (Table 3.56). At the second annulus formation, mean lengths ranged from 121 to 140 mm, and the grand mean was 131 mm. The mean length at the third annulus formation was 209 mm. Condition factors for each age class ranged from 0.83 for age 3+ to 1.82 for age 1+ (Table 3.57). The mean condition factor for all age classes was 1.12.

Scale samples were collected from 18 cutthroat trout in Cee Cee Ah Creek to determine age and back-calculation of growth. After the first year of growth, mean lengths ranged from 84 to 91 mm, and the grand mean was 85 mm (Table 3.58). The mean length after two years of growth was 121 mm. Condition factors for each age class ranged from 0.40 for age 2+ to 0.44 for age 1+ (Table 3.59). Mean condition factor for all age classes combined was 0.44.

Scale samples were taken from seven cutthroat trout in Tacoma Creek for age determination and back-calculation of growth. Mean length at the first annulus formation was 103 mm (Table 3.60). The condition factor for age 1+ cutthroat was 0.95 (Table 3.61).

A total of six scale samples were collected from cutthroat trout in Skookum Creek for age determination and back-calculation of growth. Mean lengths ranged from 89 to 110 mm with a grand mean of 96 mm after the first years growth (Table 3.62). At the second annulus formation the mean length was 140 mm. Condition factors ranged from 0.99 for age 1+ to 1.43 for age 2+ (Table 3.63). The mean condition factor for both age classes combined was 1.21.

Table 3.54. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of brook trout in Skookum Creek.

COHORT	N	MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS		
		1	2	3
1989	71	64 ± 11.8		
1988	51	72 ± 12.4	117 ± 16.6	
1987	6	76 ± 11.0	124 ± 23.0	157 ± 15.2
GRAND MEAN		N=128 68 ± 12.9	N=57 117 ± 16.4	N=6 157 ± 15.2
MEAN ANNUAL GROWTH INCREMENT		68	49	49

Table 3.55. Mean weights, lengths, and condition factors (K_{TL}) for each age class of brook trout Skookum Creek.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
0+	5	2.0 ± 1.3	65.0 ± 9.7	1.03 ± 0.64
1+	11	11.0 ± 4.6	91.0 ± 17.1	0.97 ± 0.25
2+	11	39.0 ± 21.2	148.0 ± 16.3	1.03 ± 0.33
3+	1	108.0	195.0 ± 15.8	1.24
TOTAL	28			1.01 ± 0.35

Table 3.56. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of cutthroat trout in LeClerc Creek.

		MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS		
COHORT	N	1	2	3
1989	1	88		
1988	3	88 ± 5.7	121 ± 8.4	
1987	3	95 ± 6.5	140 ± 13.0	209 ± 0.6
GRAND MEAN		N=7 91 ± 6.4	N=6 131 ± 14.6	N=3 209 ± 0.6
MEAN ANNUAL GROWTH INCREMENT		91	40	78

Table 3.57. Mean weights, lengths, and condition factors (K_{TL}) for each age class of 'cutthroat trout in LeClerc Creek.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
1+	1	33.0	122.0	1.82
2+	4	61.0 ± 39.3	178.0 ± 43.5	1.09 ± 0.38
3+	1	111.0	237.0	0.83
TOTAL	6			1.12 ± 0.43

Table 3.58. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of cutthroat trout in Cee Cee Ah Creek.

COHORT	N	MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS 1	2
1989	16	84 ± 10.0	
1988	2	91 ± 14.5	121 ± 8.0
GRAND MEAN		N=18 85 ± 10.2	N=2 121 ± 8.0
MEAN ANNUAL GROWTH INCREMENT		85	36

Table 3.59. Mean weights, lengths, and condition factors (K_{TL}) for each age class of 'cutthroat trout in Cee See Ah Creek.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
1+	16	4.8 ± 1.2	106.0 ± 14.2	0.44 ± 0.05
2+	1	14.0	144.0 ± 10.6	0.40
TOTAL	17			0.44 ± 0.05

Table 3.60. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of cutthroat trout in Tacoma Creek.

COHORT	N	MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS 1
1989	7	103 ± 10.4
GRAND MEAN		N=7 103 ± 10.4
MEAN ANNUAL GROWTH INCREMENT		103

Table 3.61. Mean weights, lengths, and condition factors (K_{TL}) for each age class of cutthroat trout in Tacoma Creek.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
1+	1	45.0	146.0 ± 18.0	0.95

Table 3.62. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of cutthroat trout in Skookum Creek.

		MEAN ± S.D. BACK-CALCULATED LENGTH AT ANNULUS	
COHORT	N	1	2
1989	6	89 ± 9.5	
1988	2	110 ± 14.2	140 ± 14.2
GRAND MEAN		N=6 96 ± 14.5	N=2 140 ± 14.2
MEANANNUAL GROWTH INCREMENT		96	44

Table 3.63. Mean weights, lengths, and condition factors (K_{TL}) for each age class of cutthroat trout in Skookum Creek.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
1+	2	14.0 ± 0.7	114.0 ± 9.1	0.99 ± 0.08
2+	2	74.0 ± 46.0	170.0 ± 14.1	1.43 ± 0.57
TOTAL	4			1.21 ± 0.40

3.3.2.4 MOUNTAIN WHITEFISH

Scale samples were collected from three mountain whitefish in Ruby Creek for age determination and back-calculation of growth. Mean length at the first annulus formation was 92 mm (Table 3.64). Mean condition factor for 1+ mountain whitefish was 0.73 (Table 3.65).

3.4 FOOD AVAILABILITY IN THE RIVER, SLOUGHS, AND TRIBUTARIES

3.4.1 BENTHIC MACROINVERTEBRATE DENSITIES IN THE RIVER AND SLOUGHS

A total of 123 samples were collected from the Pend Oreille River in 1990; 97 from river study sites and 26 from slough study sites. Mean densities of benthic macroinvertebrates in the river ranged from 2,580 organisms/m^2, at study site 11, to 15,263 organisms/m^2, at study site 3 (Table 3.66). Chironomidae larvae was the most abundant organism in the benthos of the river making up 39.2 percent of all organisms sampled, with all sites combined (Table 3.67). Talitridae (Amphipoda) was next at 25.6 percent, followed by Oligochaeta (9.9%) and Planorbidae (6.4%). The monthly densities, for each family of macroinvertebrate at each river study site can be found in Appendix D, Tables D.1 through D.3.

A total of 26 samples were collected from slough study sites in 1990. Samples were not collected from the sloughs during the month of September due to low water levels making the sloughs inaccessible. Mean annual densities of benthic macroinvertebrates ranged from 3,933 organisms/m2 at study site 5A to 9,985 organisms/m^2 at site 6A (Table 3.68). Chironomidae larvae was generally the most abundant organism in the sloughs (Table 3.69). Planorbidae was the next followed by Oligochaeta, Talitridae (Amphipoda), and Tricorythidae. The monthly densities for each family of macroinvertebrate at each slough study site can be found in Appendix D, Tables D.4 through D.6.

3.4.2 BENTHIC MACROINVERTEBRATE DENSITIES IN THE TRIBUTARIES AND INVERTEBRATE ABUNDANCE IN THE DRIFT

A total of 46 Hess samples were collected from the tributaries during 1990. LeClerc Creek, Tacoma Creek and one site

Table 3.64. Mean back-calculated lengths at the end of each years growth (annulus formation) for each year class of mountain whitefish in Ruby Creek. Back-calculated lengths were obtained using the proportional met hod.

COHORT	N	MEAN ± S.D. BACKCALCULATED LENGTH AT ANNULUS 1
1989	3	92 ± 7.0
GRAND MEAN		N=3 92 ± 7.0
MEAN ANNUAL GROWTH INCREMENT		92

Table 3.65. Mean weights, lengths, and condition factors (K_{TL}) for each age class of mountain whitefish in Ruby Creek.

AGE	N	MEAN WEIGHT (g) (±S.D.)	MEAN LENGTH (mm) (±S.D.)	MEAN K_{TL} (±S.D.)
1+	3	13.0 ± 1.2	123.0 ± 8.0	0.73 ± 0.09

Table 3.66. Mean densities of benthic macroinvertebrates (#/m^2) collected from study sites on the Pend Oreille River in 1990. Number of samples collected enclosed in parenthesis.

STUDY SITE	1	2	3	4	5	6	7	8	9	10	11
APRIL	2,642 (3)	2,329 (3)	28,429 (3)	5,095 (3)	8,744 (3)	5,786 (3)	24,340 (3)	5,471 (3)	2,392 (3)	7,233 (3)	2,454 (3)
JULY	10,441 (3)	1,511 (3)	630 (3)	1,951 (3)	2,203 (3)	5,599 (3)	4,655 (3)	2,391 (3)	2,203 (3)	2,706 (3)	1,510 (3)
SEPTEMBER	4,593 (3)	5,411 (3)	16,731 (3)	6,668 (3)	4,341 (3)	3,145 (3)	8,868 (3)	26,228 (3)	7,801 (3)	2,076 (1)	3,775 (3)
ANNUAL MEAN	**5,892 (9)**	**3,084 (9)**	**15,263 (9)**	**4,570 (9)**	**5,096 (9)**	**4,843 (9)**	**12,621 (9)**	**11,363 (9)**	**4,132 (9)**	**4,005 (7)**	**2,580 (9)**

Table 3.67. Mean annual number of benthic macroinvertebrates per square meter at each study site in the Pend Oreille River, WA, 1990.

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9	SITE 10	SITE 11	MEAN	% ABUND
TRICHOPTERA (Caddisflies)													
Hydroptilidae			21.0				21 0					3.8	0.06
Leptoceridae							21.0	63.0	42.0		21.0	13.4	0 20
Polycentropodidae	105.0		21.0				21.0					13.4	0.20
Limnephilidae		21.0										1.9	0.03
Lepidostomatidae		21.0										1.9	0.03
Rhyacophilidae				21.0								1.9	0.03
EPHEMEROPTERA (Mayflies)													
Baetidae			105.0	21.0	84.0	21.0	21.0	52.3	126.0	42.0		42 9	0 64
Ephemerellidae	84.0			21.0	42.0							13.4	0.20
Leptophlebiidae			21.0							21.0		3.8	0.06
Tricorythidae			209.7	105.0	63.0	293.7	209.7	84.0	84.0	188.7		112 5	1.69
COLEOPTERA (Beetles)													
Elmidae larvae	42.0		105.0	42.0	105.0	63.0	63.0		21.0	146 7	105.0	63.0	0.94
Elmidae adults		21.0										1.9	0 03
Haliplidae								42.0		21.0		5 7	0.09
HEMIPTERA (True bugs)													
Corixidae			21.0									1 9	0 03
DIPTERA (Midges and flies)													
Chironomidae larvae	1614.3	671.0	7526.3	1614.3	2977.0	985.3	6582.7	3993.7	880.7	1006.3	943.3	2617.7	39.23
Chironomidae pupae		63.0	42.0	42.0	146.7	314.3	629.0	409.0	105.0	272.7	167.7	199 2	2.99
Ceratopogonidae			21.0						21.0			3.8	0.06
Tipulidae		84.0										7 6	0 11
Simuliidae			21.0		21.0			63.0			21.0	11.5	0 17
Empididae				42.0								3.8	0 06
ODONATA (Damsel and dragonflies)													
Coenagrionidae		42.0	63.0	42.0		21.0	84.0	105.0	105.0			42.0	0.63
Libellulidae		21.0					21.0					3 8	0.06
Aeshneidae			42.0									3.8	0.06
NON INSECTS													
HYDRACARINA (Water mites)	21.0	125.7	733.7	167.7	21.0		42.0	639.3	209.7	168.0	188.7	210.6	3.16
AMPHIPODA (Scuds)	84.0	1090.3	4570.3	1110.0	964.7	1572.0	985.3	5125.7	1342.0	1530.3	377.7	1704.8	25.55
OLIGOCHAETA (Worms)	3794.7	356.7	713.0	650.0	168.0	482.3	209.7	440.3	335.7		126.0	661.5	9.91
PLATYHELMINTHES (Flatworms)													
Planariidae	21.0	63.0	209.7	21.0								28.6	0.43
MOLLUSCA (Snails)													
Planorbidae	21.0	231.0	712.7	168.0	147.0	566.0	1886.7	52.3	272.7	293.7	314.7	424.2	6.36
Physidae		21.0				21.0				21.0		5.7	0.09
Lymnaeidae		21.0	21.0			21.0	440 3		21.0	105.0		57.2	0.86
BIVALVIA (Clams)													
Sphaeriidae	63.0	189.0	84.0	461.3	356 7	461.7	1132.0	230 7	545 3	188.7	230.7	358 5	5.37
TERRESTRIALS AND OTHERS	42.0	42.0		42.0		21.0	251.7	63.0	21.0		84.0	47.7	0 71
TOTAL MEANS	**5,892**	**3,084**	**15,263**	**4,570**	**5,096**	**4,843**	**12,621**	**11,363**	**4,132**	**4,005**	**2,580**	**6,674**	

Table 3.68. Mean densities of benthic macroinvertebrates ($\#/m^2$) collected from sloughs of the Pend Oreille River in 1990. Number of samples enclosed in parenthesis.

STUDY SITE	SITE 3A	SITE 4A	SITE 5A	SITE 6A
APRIL	10,756 (3)	13,903 (3)	6,543 (3)	19,214 (3)
JULY	567 (2)	315 (2)	1,322 (2)	755 (2)
SEPTEMBER	3,335 (3)	8,619 (3)	*	*
ANNUAL MEAN	**4,886 (8)**	**7,612 (8)**	**3,933 (5)**	**9,985 (5)**

* No samples collected due to low water levels

Table 3.69. Mean annual number and percent composition of macroinvertebrates per square meter in sloughs of the Pend Oreille River, WA, in 1990.

	SITE 3A		SITE 4A		SITE 5A		SITE 6A	
	MEAN	% ABUND	MEAN	% ABUND	MEAN	% ABUND	MEAN	% ABUND
TRICHOPTERA (Caddisflies)								
Hydroptilidae	42.0	0.9	42.0	0.6			34.5	0 3
Psychomyiidae	21.0	0.4						
Limnephilidae			21.0	0.3				
EPHEMEROPTERA (Mayflies)								
Baetidae	105.0	2.1			31.5	0.8	94.5	0.9
Ephemerellidae								
Leptophlebiidae					31.5	0.8		
Tricorythidae			838.7	11.0	63.0	1.6	1078 5	10.8
Heptageniidae	21.0	0.4						
PLECOPTERA (Stoneflies)								
Perlodidae			21.0	0 3				
COLEOPTERA (Beetles)								
Elmidae larvae			21.0	0.3			34.5	0.3
DIPTERA (Midges and flies)								
Chironomidae larvae	2642.0	54.1	2495.3	32.8	1069.5	27.2	5160.5	51.7
Chironomidae pupae	63.0	1.3	84.0	1.1	63.0	1.6	500 0	5.0
Ceratopogonidae			126.0	1.7	94.5	2.4	94.5	0.9
Simuliidae							3.0	0.0
Chaorboridae			63.0	0.8				
ODONATA (Damsel and dragonflies)								
Coenagrioniidae	167.7	3.4	63.0	0.8	314.5	8.0	346.0	3.5
NON INSECTS								
HYDRACARINA (Water mites)	167.7	3 4	734.0	9.6	409.0	10.4	377.5	3.8
AMPHIPODA (Scuds)	419.7	8.6	189.0	2.5	409.0	10.4	1641.5	16.4
OLIGOCHAETA (Worms)	482.0	9.9	1216.0	16.0	252.0	6.4	251.5	2.5
MOLLUSCA (Snails)								
Planorbidae	692.0	14.2	1593.3	20.9	1132.0	28.8	255 0	2.6
Lymnaeidae			42.0	0.6				
BIVALVIA (Clams)								
Sphaeriidae					63.0	1.6	113.0	1.1
TERRESTRIALS AND OTHERS	63.0	1.3	63.0	0.8				
ANNUAL MEANS	**4,886**		**7,612**		**3,933**		**9,985**	

on Ruby Creek were not sampled during the month of April due to high spring runoff. Mean densities of benthic macroinvertebrates collected in Hess samples ranged from a low of 857 organisms/m* in Ruby Creek to a high of 2,193 organisms/m* in Cee Cee Ah Creek (Table 3.70). The density for Tacoma Creek was 1,320 organisms/m? LeClerc Creek had a density of 1,490 organisms/m^2 and Skookum Creek's density was 1,668 organisms/m*.

Chironomidae was the most abundant macroinvertebrate in LeClerc and Cee Cee Ah Creek and the second most abundant in Ruby Creek, making up 52.5, 22.9, and 13.8 percent of the total number of organisms, respectively (Table 3.71). The most abundant invertebrate in Tacoma Creek was Elmidae larvae, making up 26 percent of the total number. Baetidae was the most abundant invertebrate in Skookum Creek at 29.9 percent, as well as the second most abundant invertebrate in Tacoma Creek (22.7%) and the third most abundant in Tacoma Creek (11.2%) and Cee Cee Ah (7.8%). Other macroinvertebrates commonly found in all the tributaries were Heptageniidae, Ephemerellidae, Brachycentridae, Rhyacophilidae, Chloroperlidae and Sphaeriidae. The monthly densities, for each family of macroinvertebrates collected in Hess samples from each tributary can be found in Appendix D, Tables D.7 through D.9.

Forty-six drift samples were also collected from the tributaries during 1990. Drift samples were not obtained from LeClerc, Tacoma and the lower section of Ruby during the spring runoff. Mean densities of invertebrates found in drift samples ranged from 10 organisms/100m^3 in Tacoma Creek to 62 organisms/1 00m^3 in Cee Cee Ah Creek (Table 3.72). Densities for LeClerc, Skookum and Ruby Creek were 19, 32 and 50 organisms/100 m^3, respectively.

Baetidae was the most common family of invertebrates found in the drift in Skookum Creek (37.6%) and Tacoma Creek (31.1%) (Table 3.73). Chironomidae larvae was the most abundant organism found in Cee Cee Ah Creek (74.2%), Ruby Creek (29.9%) and the second most abundant organism in LeClerc Creek (16.3%) and Skookum Creek (17.3%). Other common benthic macroinvertebrates found in the drift were Chironomidae pupae, Elmidae, Heptageniidae, Ephemerellidae, Simuliidae and Brachycentridae.

Percent abundance of terrestrial insects found in the drift ranged from 2 percent in Cee Cee Ah Creek to 12 percent in Tacoma Creek. The most common terrestrial invertebrates found in the drift

Table 3.70. Mean densities of benthic macroinvertebrates ($\#/m^2$) collected in Hess samples from the Pend Oreille tributaries during 1990. Number of samples enclosed in parenthesis.

	LECLERC	RUBY	CCA	TACOMA	SKOOKUM
APRIL	•	1,395 (2)	693 (4)	•	2,845 (4)
JULY	785 (4)	677 (4)	3,375 (4)	2,020 (2)	1,408 (4)
SEPTEMBER	2,195 (4)	498 (4)	2,510 (4)	620 (2)	753 (4)
ANNUAL MEAN	**1,490** **(8)**	**857** **(10)**	**2,193** **(12)**	**1,320** **(4)**	**1,668** **(12)**

• No samples collected due to high flows

Table 3.71. Mean number and percent composition of macroinvertebrates per square meter (collected by Hess sampler) in tributaries to the Pend Oreille River, WA, 1990.

	LECLERC CREEK		RUBY CREEK		CEE CEE AH CREEK		TACOMA CREEK		SKOOKUM CREEK	
	MEAN	% ABUND	MEAN	% ABUND	MEAN	% ABUND	MEAN	% ABUND	MEAN	% ABUND
TRICHOPTERA (Caddisflies)										
Glossosomatidae	2.5	0.2	1.7	0 2	8.3	0.4	52.5	4.0	33.3	2.0
Brachycentridae	77.5	5.2	4.2	0.5	8.3	0 4	142.5	10.8	15.8	0.9
Hydropsychidae	10.0	0 7	37.5	4.4	19 2	0.9	30 0	2 3	1.7	0 1
Hydroptilidae					1 7	0.1			5.0	0 3
Limnephilidae			1.7	0.2	5 0	0.2			4 2	0 3
Rhyacophilidae	22.5	1.5	5.8	0.7	18.3	0 8	27.5	2.1	75.0	4.5
Psychomyiidae	1.3	0.1					17.5	1.3	0 8	< 0.1
Trichoptera pupae									0.8	< 0.1
EPHEMEROPTERA (Mayflies)										
Heptageniidae	75.0	5.0	28.3	3 3	205.0	9.4	85.0	6.4	96.7	5 8
Ephemerellidae	30.0	2.0	24.2	2.8	62 5	2.9	115.0	8 7	219 2	13 0
Baetidae	116 3	7.8	59.2	6.9	245.8	11.2	300 0	22.7	502.5	29.9
Leptophlebiidae	1.3	0 1	15.0	1 8	18.3	0.8			5.8	0.3
PLECOPTERA (Stoneflies)										
Chloroperlidae	40.0	2.7	19.2	2.2	88.3	4.0	30.0	2.3	80.8	4.8
Perlidae					2.5	0.1			0.8	0 0
Nemouridae	5.0	0.3	10.0	1.2	7.5	0.3	5.0	0.4	17.5	1.0
Perlodidae	15.0	1.0	13.3	1.6	21.7	1.0	2.5	0.2	20.8	1.2
Peltoperlidae					25.8	1 2				
Pteronarcyidae									4.2	0 3
Capniidae			0.8	0.1	0.8	< 0.1				
COLEOPTERA (Beetles)										
Elmidae larvae	140.0	9.4	99.2	11.6	234.2	10.7	340.0	25.8	135.8	8 1
Elmidae adults	2.5	0.2	10.0	1.2	2.5	0.1	15.0	1.1	7.5	0.4
Hydrophilidae					1.7	0.1				
Dytiscidae	2.5	0.2								
Haliplidae			1.7	0.2						
DIPTERA (Midges and flies)										
Chironomidae larvae	778.8	52.2	118.3	13.8	502.5	22.9	112.5	8 5	140.0	8.3
Chironomidae pupae	96.3	6.5			15 0	0.7	5.0	0 4	4.2	0.3
Ceratopogonidae	2.5	0.2	1.7	0 2	8 3	0.4			5.0	0.3
Tipulidae	13.8	0.9	14.2	1.7	5 0	0.2	7.5	0 6	6.7	0 4

Table 3.71. (cont.)

LECLERC CREEK	RUBY CREEK		CEE CEE AH CREEK		TACOMA CREEK		SKOOKUM CREEK			
	MEAN	% ABUND	MEAN	% ABUND	MEAN	% ABUND	MEAN	% ABUND	MEAN	% ABUND
Simuliidae	3.8	0.3	56.7	6.6	17.5	0.8	10.0	0.8	2.5	0.1
Empididae					2.5	0.1				
Psychodidae			15.0	1.8			5.0	0.4		
Chaoboridae					6.7	0.3				
Chaoboridae pupae	1.3	0.1							3.3	0.2
NON INSECTS										
HYDRACARINA (Water mites)	5.0	0.3	7.5	0.9	3.3	0.2	5.0	0.4	8.3	0.5
ANNELIDA (Worms)										
Lumbriculidae	6.3	0.4	18.2	2.1	167.5	7.6	5.0	0.4	187.5	11.2
Hirudinea					0.8	< 0.1				
PLATYHELMINTHES (Flatworms)										
Planariidae			3.3	0.4	7.5	0.3			20.0	1.2
NEMATODA			3.3	0.4	2.5	0.1				
MOLLUSCA (Snails)										
Planorbidae	11.3	0.8	5.0	0.6	4.2	0.2			5.8	0.3
Lymnaeidae					1.7	0.1			0.8	< 0.1
BIVALVIA (Clams)										
Sphaeriidae	3.8	0.3	280.8	32.8	461.7	21.1			51.7	3.1
TERRESTRIALS AND OTHERS										
TRICHOPTERA (Caddisflies)									2.5	0.1
EPHEMEROPTERA (Mayflies)										
Baetidae	7.5	0.5								
Ephemerelidae	2.5	0.2								
Heptageniidae	1.3	0.1								
PLECOPTERA (Stoneflies)										
Nemouridae									0.8	< 0.1
HEMIPTERA (True bugs)										
Reduviidae					0.8	0.0	2.5	0.2		
Corixidae	12.5	0.8								
HOMOPTERA (Leaf bugs)										
Aphididae							2.5	0.2		
Coccidae	1.3	0.1								
HYMENOPTERA (Bees and ants)										
Apidae									0.8	< 0.1
ARACHNIDS (Spiders)							2.5	0.2		
UNIDENTIFIED	1.3	0.1	0.8	0.1	7.5	0.3				
ANNUAL MEAN	1,490		857		2,193		1,320		1,668	

Table 3.72. Mean densities of benthic macroinvertebrates per 100 cubic meters collected in drift samples from the Pend Oreille tributaries during 1990. Number of samples enclosed in parenthesis.

	LECLERC	RUBY	CCA	TACOMA	SKOOKUM
APRIL	*	60 (2)	7 (4)	*	32 (4)
JULY	17 (4)	79 (4)	16 (4)	7 (2)	30 (4)
SEPTEMBER	21 (4)	11 (4)	164 (4)	14 (2)	34 (4)
ANNUAL MEAN	**19** **(8)**	**50** **(10)**	**62** **(12)**	**10** **(4)**	**32** **(12)**

* No samples collected due to high flows

Table 3.73. Mean number and percent composition of macroinvertebrates per 100 cubic meters (collected by drift sampler) in tributaries to the Pend Oreille River, WA, 1990.

	LECLERC CREEK		RUBY CREEK		CEE CEE AH CREEK		TACOMA CREEK		SKOOKUM CREEK	
	MEAN	% ABUND	MEAN	% ABUND	MEAN	% ABUND	MEAN	% ABUND	MEAN	% ABUND
TRICHOPTERA (Caddisflies)										
Glossosomatidae			0.10	0.2	0.03	0.1			0.63	2.0
Brachycentridae	0.83	4.4			0.04	0.1			0.14	0.4
Hydropsychidae					0.88	1.4			0.12	0.4
Rhyacophilidae			0.41	0.8	0.13	0.2	0.10	1.0	0.38	1.2
Lepidostomatidae			0.07	0.1						
EPHEMEROPTERA (Mayflies)										
Heptageniidae	0.54	2.9	0.20	0.4	0.52	0.8	0.28	2.7	0.86	2.7
Ephemerellidae	0.15	0.8	0 06	0.1	0.82	1.3			0.56	1.7
Baetidae	2.31	12.4	2.02	4.0	2.47	4.0	3.23	31.1	12.17	37.6
Leptophlebiidae			0.13	0.3	0.07	0.1			0.13	0.4
PLECOPTERA (Stoneflies)										
Chloroperlidae	0 11	0.6			0.28	0 4			0.65	2.0
Perlidae	0.16	0.9								
Nemouridae			0.67	1.3	0.13	0.2			0.06	0.2
Perlodidae			0.62	1.2	0.20	0.3			0.35	1.1
Pteronarcyidae									0.12	0.4
COLEOPTERA (Beetles)										
Elmidae larvae	2.98	15.9	3.33	6.7	0.93	1.5	1.60	15.4	2.12	6.6
Elmidae adults	0.72	3.8	0.10	0.2	0.10	0.2			0.06	0 2
Hydrophilidae	0.51	2.7					0 20	1.9		
Georyssidae	0.16	0.9					0.28	2.7		
LEPIDOPTERA (Moths)										
Pyralidae	0.16	0.9			0.14	0 2			0.14	0.4
DIPTERA (Midges and flies)										
Chironomidae larvae	3.04	16.3	14.99	29.9	46.24	74.2			5.61	17.3
Chironomidae pupae	3.53	18.9	5.16	10.3	2.83	4.5	0.75	7.2	3.06	9.5
Ceratopogonidae			0.17	0.3	0.43	0.7	0.10	1.0	0.35	1.1
Tipulidae	0.31	1.7	0.21	0.4						
Simuliidae	0.83	4.5	4.80	9.6	1.24	2.0	0.40	3.9	1.19	3.7
Simuliidae pupae	0.42	2.3			0.03	0.1				
Psychodidae			0.46	0.9	0.03	0 1	0.48	4.6	0.07	0.2
Chaoboridae pupae			3 03	6.1	0.11	0 2				
NON INSECTS										
HYDRACARINA (Water mites)	0.16	0.9	1.33	2.7	0.43	0.7	0.10	1.0	0.51	
ANNELIDA (Worms)										
Lumbriculidae	0.16	0 9	0.43	0 9			1 53	14.7	0 29	0 9

Table 3.73. (cont.)

	LECLERC CREEK		RUBY CREEK		CEE CEE AH CREEK		TACOMA CREEK		SKOOKUM CREEK	
'LATYHELMINTHES (Flatworms)										
Planariidae			0.41	0.8					0 43	1.3
IEMATODA			0.47	0.9					0.09	0 3
IOLLUSCA (Snails)										
Planorbidae			0.13	0.3	0.18	0.3				
Lymnaeidae									0.07	0.2
IVALVIA (Clams)										
Sphaeriidae			9.07	18.1	2.83	4.5	0.20	1.9	0.95	2.9
ERRESTRIAL INSECTS										
RICHOPTERA (Caddisflies)	0.40	2.1								
COLLEMBOLA (Snow fleas)			0.41	0.8					0.34	1.1
IPTERA (Midges and flies)										
Chironomidae					0.07	0.1				
Simuliidae	0.09	0.5			0.03	0.1			0 06	0 2
Sciaridae							0 28	2.7		
Drosophilidae	0.15	0.8								
Alydidae	0.16	0.9								
Rhagionidae	0 09	0.5								
Dixidae							0.20	1.9		
EPHEMEROPTERA (Mayflies)										
Ephemerellidae	0.18	0.9								
HEMIPTERA (True bugs)										
Reduviidae					0.04	0.1				
HOMOPTERA (Leaf bugs)										
Aphididae	0.16	0.9	0.37	0.7	0.28	0 5			0.28	0.8
Cicadellidae							0.28	2.7		
HYMENOPTERA (Bees and ants)										
Formicidae	0.10	0.5	0.55	1.1	0.13	0.2				
Eurytomidae							0.20	1.9		
RACHNIDS (Spiders)	0.10	0.5			0.10	0.2	0.20	1.9	0.36	1.1
UNIDENTIFIABLE	0.20	1.1	0.39	0.8	0.57	0.9			0.23	0.7
ANNUAL MEAN	19		50		62		10		32	

were Aphididae, Collembola, Arachnida, and Simuliidae adults. The monthly densities for each family of macroinvertebrates collected in drift samples from each tributary can be found in Appendix D, Tables D.10 through D.12.

3.4.3 ZOOPLANKTON

3.4.3.1 DENSITY

Seventy-six zooplankton samples were collected from the mid-channel and littoral areas of each of the 11 river study sites and the 4 slough study sites in 1990. The monthly mid-river zooplankton data is the mean of 11 zooplankton tows and the monthly littoral zooplankton data is the mean of 11 littoral and 4 slough samples, except in September when slough study sites 4A and 5A were inaccessible due to low water levels in the reservoir. Twenty-six species of cladocera and 6 species of copepoda were identified in both types of samples (Table 3.74).

Total combined cladocera and copepoda densities in the mid-river samples ranged from 5.12 organisms/liter in April to 19.98 organisms/liter in July with an annual mean of 12.75 organisms/liter (Table 3.75). Total cladoceran densities ranged from 0.48 organisms/liter in March to 5.89 organisms/liter in September with an annual mean of 3.42 organisms/liter. Bosminidae was the major family of cladocerans in all months except in April when Chydoridae was more abundant. Total copepod densities ranged from 4.64 organisms/liter in April to 16.22 organisms/liter in July with an annual mean of 9.33 organisms/liter. Nauplii was the major component of the total copepod density for all months sampled. Cladocerans composed 26.9% and copepods composed 73.1% of the total cladocera/copepoda density in the mid-channel samples.

Mean zooplankton densities were generally lowest at site 7 with a mean density of 1.94 cladocera/liter and 7.69 copepod/liter (Table 3.76). Site 10 had the highest mean density at 4.54 cladocera/liter and 15.00 copepoda/liter. The monthly densities for each individual species of zooplankton at each site, in the mid-river samples can be found in Appendix E, Tables E.1 through E.3.

Total cladocera and copepoda densities in the littoral samples ranged from 21.77 organisms/liter in April to 68.81 organisms/liter in July with an annual mean of 47.65 organisms/liter (Table 3.77). Total cladoceran densities ranged from 3.15 organisms/liter in April

Table 3.74. Cladocera and copepoda species observed in the Pend Oreille River, 1990.

Phylum Arthropoda
  Class Crustacea
    Subclass Brachiopoda
      Order Cladocera
        Family Daphnidae
          1. *Daphnia ambigua*
          2. *Daphnia galeata mendotae*
          3. *Daphnia parvula*
          4. *Daphnia ι ↄtrocurva*
          5. *Daphnia thorata*
          6. *Ceriodaphnia quadrangula*
          7. *Ceriodaphnia reticula*
          8. *Mega fenestra aurita*
          9. *Scapholeberis mucronata*
          10. *Simocephalus serrulatus*
          11. *Simocephalus vetulus*
        Family Cydoridae
          12. *Acroperus harpae*
          13. *Alona guttata*
          14. *Camptocercus rectirostris*
          15. *Chydorus sphaericus*
          16. *Eurycercus lamellatus*
          17. *Graptoleberis testudinaria*
          18. *Leydigia leydigi*
          19. *Pleuroxus* sp.
        Family Macrothricidae
          20. *Macrothrix* s p.
          21. *Streblocerus serricaudatus*
        Family Sididae
          22. *Diaphanosoma birgei*
          23. *Diaphanoꞇoma brachyurum*
          24. *Sida crys tallina*
        Family Bosminidae
          25. *Bosmina longirostris*
        Family Leptodoriidae
          26. *Leptodora kindti*

    Subclass Copepoda
      Order Eucopepoda
        Suborder Calanoida
          Family Diaptomidae
            27. *Leptodiaptomus ashlandi*
            28. *Skistodiaptomus oregonensis*
          Family Temoridae
            29. *Episura nevadensis*
        Suborder Cyclopoida
          Family Cyclopidae
            30. *Diicyclops bicuspidaus thomasi*
            31. *Mesocylops* sp.
        Suborder Harpacticoida
          Family Canthocamptidae
            32. *Bryocamptus* sp.

Table 3.75. Densities (#/liter) of major groups of zooplankton found in mid-river samples collected from the Pend Oreille River, 1990.

	April	July	September	Mean	% Abund.
CLADOCERA					
Daphnidae	0.02	0.45	2.09	0.86	6.72
Chydoridae	0.37	0.25	0.80	0.47	3.69
Macrothricidae					
Sididae		0.31	0.03	0.15	1.21
Bosminidae	0.09	2.70	2.97	1.92	15.07
Leptodoridae		0.05		0.02	0.14
Total Cladocera	**0.48**	**3.76**	**5.89**	**3.42**	**26.83**
COPEPODA					
Calanoida	1.32	2.93	1.56	1.94	15.19
Cyclopoida	0.63	6.03	1.92	2.86	22.44
Harpacticoida	0.34			0.34	2.64
Naupli	2.35	7.26	2.96	4.19	32.87
Total Copepoda	**4.64**	**16.22**	**6.44**	**9.33**	**73.14**
Cladocera & Copepoda	**5.12**	**19.98**	**12.33**	**12.75**	

Table 3.76. Mean densities (organisms/liter) of cladocera and copepoda densities from samples of the mid-channel of the Pend Oreille River, 1990, by sample site and by month.

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11
April											
Cladocera densities	0.67	0.77	1.16	0.39	0.41	0.41	0.39	0.13	0.25	0.38	0.33
Copepoda densities	4.77	4.44	3.65	5.10	4.29	7.06	5.29	4.70	3.19	4.09	4.46
Total	5.44	5.21	4.81	5.49	4.70	7.47	5.68	4.83	3.44	4.47	4.79
July											
Cladocera densities	3.61	3.54	2.98	2.81	4.56	4.02	2.31	2.77	4.56	7.34	2.86
Copepoda densities	15.23	13.03	12.28	12.98	16.82	16.88	12.24	12.02	18.62	32.69	15.66
Total	18.84	16.57	15.26	15.79	21.38	20.90	14.55	14.79	23.18	40.03	18.52
September											
Cladocera densities	3.42	7.45	5.55	6.04	8.90	4.08	3.13	9.28	9.03	5.91	6.14
Copepoda densities	2.57	6.36	7.14	11.97	8.02	2.63	5.55	5.39	6.80	8.21	6.32
Total	5.99	13.81	12.69	18.01	16.92	6.71	8.68	14.67	15.83	14.12	12.46
Mean annual											
Cladocera densities	2.57	3.92	3.23	3.08	4.62	2.84	1.94	4.06	4.61	4.54	3.11
Copepoda densities	7.52	7.94	7.69	10.02	9.71	8.86	7.69	7.37	9.54	15.00	8.81
Total	10.09	11.86	10.92	13.10	14.33	11.70	9.63	11.43	14.15	19.54	11.92

to 26.28 organisms/liter in September with an annual mean of 15.64 organisms/liter. Chydoridae was the most abundant family of cladocerans in April, Bosminidae was the most abundant in July, and Daphnidae was the most abundant in September. Total copepod densities ranged from 18.62 organisms/liter in April to 51.32 organisms/liter in July with an annual mean of 32.01 organisms/liter. Nauplii was the most abundant copepod instar every month. Cladocerans composed 32.8% and copepods composed 67.2% of the total cladocera/copepoda density in the littoral samples.

Mean zooplankton densities were generally lowest at site 2 with 12.49 organisms/liter and highest at site 5A with 207.81 organisms/liter (Table 3.78). The monthly densities, for each species of zooplankton at each site, in littoral samples can be found in Appendix E, Tables E.4 through E.6.

3.4.3.2 BIOMASS

Cladoceran biomass in the mid-river samples ranged from 0.65 μg/l in April to 19.43 μg/l in September (Table 3.79). The mean biomass for all months was 10.42 μg/l. *Daphnia galeata mendotae* had the highest mean annual biomass at 3.07 μg/l followed by *Daphnia thorata* (2.27 μg/l), *Bosmina longirostris* (2.41 μg/l) and *Sida crystallina* (1.24 μg/l). Monthly biomass values for selected species of cladocerans at each site, in mid-channel samples, are listed in Appendix E, Tables E.7 through E.9.

Cladoceran biomass, in the littoral samples, ranged from 3.76 μg/l in April to 37.16 μg/l in July (Table 3.80). The mean biomass for all months was 25.10 μg/l. *Ceriodaphnia* spp. had the highest biomass at 6.05 μg/l followed by *Sida crystallina* (5.99 μg/l), *Bosmina longirostris* (3.72 μg/l), *Chydorus sphaericus* (3.65 μg/l), and *Daphnia galeata mendotae* (3.32 μg/l). Monthly biomass values for selected species of cladocerans at each site, in littoral samples can be found in Appendix E, Tables E.10 through E.12.

3.5 RIVER AND SLOUGH FISH FEEDING HABITS

Results of river and slough fish stomach analysis were based on mean annual values. The index of relative importance of each prey item for each age class of each species were listed. Electivity indices for zooplankton and benthic macroinvertebrates were calculated using numerical frequency values. Diet overlaps were

Table 3.77. Densities (#/liter) of major groups of zooplankton found in littoral samples collected from the Pend Oreille River, 1990.

	April	July	September	Mean	% Abund.
CLADOCERA					
Daphnidae	0.08	3.61	12.58	5.42	11.38
Chydoridae	2.94	5.92	9.40	6.09	12.78
Macrothricidae		0.00		0.00	0.00
Sididae		1.28	0.24	0.51	1.06
Bosminidae	0.13	6.55	4.05	3.58	7.51
Leptodoridae		0.14		0.05	0.10
Total Cladocera	**3.15**	**17.50**	**26.28**	**15.64**	**32.83**
COPEPODA					
Calanoida	1.22	8.92	1.09	3.74	7.85
Cyclopoida	2.60	18.18	9.05	9.94	20.86
Harpacticoida	3.20	1.67	0.05	1.64	3.44
Naupli	11.60	22.55	15.90	16.69	35.02
Total Copepoda	**18.62**	**51.32**	**26.09**	**32.01**	**67.17**
Cladocera & Copepoda	**21.77**	**68.81**	**52.38**	**47.65**	

Table 3.78. Mean densities (organisms/liter) of cladocera and copepoda from samples of the littoral areas of the Pend Oreille River, 1990, by sample site and by month.

	Site 1	Site 2	Site 3	Site 3A	Site 4	Site 4A	Site 5	Site 5A	Site 6	Site 6A	Site 7	Site 8	Site 9	Site 10	Site 11
April															
Cladocera densities	5.54	0.40	8.96	4.48	0.48	7.18	0.83	7.26	5.05	1.81	1.30	1.56	1.51	0.43	0.41
Copepoda densities	39.00	3.33	6.31	15.56	2.49	56.04	6.51	36.68	65.96	12.05	5.10	1.55	9.92	7.25	11.56
Total	44.54	3.73	15.27	20.04	2.97	63.22	7.34	43.94	71.01	13.86	6.40	3.11	11.43	7.68	11.97
July															
Cladocera densities	3.45	2.41	3.67	1.16	14.94	26.56	12.62	79.30	16.21	22.87	7.34	4.35	13.31	32.56	21.70
Copepoda densities	12.42	12.32	15.39	10.83	54.10	86.41	10.69	292.38	56.44	67.63	28.64	15.88	57.27	20.94	28.40
Total	15.87	14.73	19.06	11.99	69.04	112.97	23.31	371.68	72.65	90.50	35.98	20.23	70.58	53.50	50.10
September															
Cladocera densities	4.85	9.06	14.95	81.66	34.75	20.22	40.89	*	8.54	*	3.14	27.54	4.87	81.36	9.85
Copepoda densities	2.13	9.95	29.74	42.41	21.59	25.50	65.22	*	13.76	*	4.90	37.82	4.81	67.73	13.65
Total	6.98	19.01	44.69	124.07	56.34	45.72	106.11	*	22.30	*	8.04	65.36	9.68	149.09	23.50
Mean annual															
Cladocera densities	4.61	3.96	9.19	29.10	16.72	17.99	18.11	43.28	9.93	12.34	3.93	11.15	6.56	38.12	10.65
Copepoda densities	17.85	8.53	17.15	22.93	26.06	55.98	27.47	164.53	45.39	39.84	12.88	18.42	24.00	31.97	17.87
Total	22.46	12.49	26.34	52.03	42.78	73.97	45.59	207.81	55.32	52.18	16.81	29.57	30.56	70.09	28.52

* No samples collected due to low water levels

Table 3.79 Biomass (μg/L) for selected cladocerans found in mid-river samples collected from the Pend Oreille River, 1990.

	April	July	September	Mean
Ceriodaphnia spp.		0.09	0.44	0.18
Daphnia galeata mendotae		1.24	7.98	3.07
Daphnia parvula	0.03	0.004		0.01
Daphnia retrocurva		0.04		0.01
Daphnia thorata		1.41	5.40	2.27
Chydorus sphaericus	0.39	0.08	0.07	0.18
Bosmina longirostris	0.23	3.17	3.82	2.41
Diaphanosoma spp.		0.36	1.42	0.59
Sida crystallina		3.41	0.30	1.24
Leptodora kindti		1.39		0.46
Total	**0.65**	**11.19**	**19.43**	**10.42**

Table 3.80 Biomass (μg/L) for selected cladocerans found in mid-river samples collected from the Pend Oreille River, 1990.

	April	July	September	Mean
Ceriodaphnia spp.		3.36	14.81	6.05
Daphnia galeata mendotae		2.54	7.41	3.32
Daphnia parvula	0.10			0.03
Daphnia retrocurva		0.02		0.007
Daphnia thorata			2.56	0.85
Chydorus sphaericus	3.54	3.74	3.68	3.65
Bosmina longirostris	0.12	6.95	4.10	3.72
Diaphanosoma spp.		0.34	1.60	0.65
Sida crystallina		17.75	0.23	5.99
Leptodora kindti		2.46		0.82
Total	**3.76**	**37.16**	**34.39**	**25.10**

calculated using IRI values. Results of number percentages, weight percentages, occurrence frequency, and seasonal feeding habits in the river and sloughs are listed in Appendix F. Seasonal feeding habit data includes: mean number (± standard deviation) and mean weight, number percentage, weight percentage, occurrence frequency and index of relative importance for each prey item consumed by each species of fish.

3.5.1 YELLOW PERCH FEEDING HABITS

In 1990, 158 yellow perch stomachs were analyzed, and 26 families of macroinvertebrates from 14 orders were identified in their stomachs. Mean annual index of relative importance values for prey items consumed by yellow perch are listed in Table 3.81. Chydoridae had the highest IRI value (45.1%) for age 0+ yellow perch, followed by Coenagriidae (14.6%) and Chironomidae larvae (13.7%.) Chironomidae larvae had the highest IRI values for age 1+ yellow perch at 21 percent, and Daphnidae had the next highest IRI value (17.5%). For age 2+ yellow perch, Daphnidae had the highest IRI value at 24.5%, followed by Chironomidae pupae (10.8%) and Talitridae (7.4%). Daphnidae had the highest IRI value for age 3+ yellow perch at 20 percent, followed by Chironomidae larvae (12.4%) and Talitridae (10.3%). Daphnidae, Chironomidae larvae, and Chironomidae pupae were the top three prey items in age 4+ yellow perch with IRI values of 18.8%, 10.3% and 9.5%, respectively. For age 5+ yellow perch, Daphnidae had the highest IRI value at 17.7%, followed by Chironomidae pupae (15.9%) and Talitridae (8.1%). For age 6+ yellow perch, Daphnidae had the highest IRI value of 47.7%, followed by Chydoridae (10.2%). The IRI values for all ages of yellow perch combined indicated that Daphnidae (20.9%) was the most important prey item in the diet.

3.5.2 LARGEMOUTH BASS FEEDING HABITS

Ninety-nine largemouth bass stomachs were analyzed in 1990. A total of 13 families of invertebrates from 9 orders were identified in their stomachs. Mean annual index of relative importance values for prey items consumed by largemouth bass are listed in Table 3.82. For age 0+ and 1+ largemouth bass, Daphnidae had the highest IRI values, at 35.4% and 25.2%, followed by Osteichthyes at 29.8% and 22.6%, respectively. Baetidae (25.4%) had the highest IRI value for age 2+ largemouth bass, followed by Osteichthyes (22.4%) and Talitridae (14.1%). Among age 3+, 4+, and 5+ largemouth bass, Osteichthyes had the highest IRI values at 29.2

Table 3.81. Mean annual index of relative importance of prey items consumed by yellow perch in Pend Orielle River, WA. for 1990.

AGE CLASS SAMPLE SIZE	0+ n=3	1+ n=22	2+ n=23	3+ n=19	4+ n=58	5+ n=31	6+ n=2	All ages n=158
AQUATIC ORGANISMS								
TRICHOPTERA (Caddisflies)								
Hydroptilidae		3.6	4.7	4.5	3.7	5.6	9.9	4.6
Polycentropidae		0.6	0.7	2.2	2.8	3.4		1.4
Leptoceridae			0.4	3.0	0.4			0.5
Limnephilidae				1.8	1.4	1.3		0.6
Phryganeidae				2.8				0.4
EPHEMEROPTERA (Mayflies)								
Baetidae	10.4	7.4	2.7	3.1	5.6	6.2	6.7	6.0
Tricorythidae		1.9	2.1	2.5	0.8	0.5		1.1
Ephemerellidae			2					<0.1
ODONATA (Damsel and dragonflies)								
Coenagriidae	14.6	10.8	4.4	4.6	8.9	3.7		6.7
COLEOPTERA (Beetles)								
Dytisicidae					0.2	1.0		0.2
HYDRACARINA (Water mites)		1.3	3.7	3.1	3.8	3.0		2.1
DIPTERA (Midges and flies)								
Chironomidae larvae	13.7	21.0	6.5	12.4	10.3	6.5	10.0	11.5
Chironomidae pupae		8.9	10.8	7.2	9.5	15.9	10.0	8.9
Ceratopogonidae		1.8	1.4	2.5	1.5	0.5		1.1
Ceratopogonidae pupae					0.6			0.1
Simuliidae larvae					1.8			0.3
Simuliidae pupae					0.5			0.1
HEMIPTERA (True bugs)								
Corixidae						0.4		0.1
COPEPODA (Copepods)								
Cyclopoida		3.9	5.1	3.8	2.1	2.0		2.4
Calanoida			3.6	2.9	4.4	2.0		1.8
CLADOCERA (Water fleas)								
Daphnidae		17.5	24.5	20	18.8	17.7	47.7	20.9
Chydoridae	45.1	9.1	4.6	1.4	4.0	2.6	10.2	11.0
AMPHIPODA								
Talitridae	8.1	10.3	7.4	10.3	7.6	8.1	5.6	8.2
OSTRACODA (Seed shrimp	8.1	1.2	2.3	2.4	1.7			2.2
MYCIDAE (Mysis shrimp)			5.3		0.7	1.5		1.1
OLIGOCHAETA (Worms)								
Lumbriculidae					0.6			0.1
Naididae						0.4		0.1
GASTROPODA (Snails)								
Planorbidae		0.6	6.3	5.8	5.7	5.8		3.5
Lymnaeidae			0.7	1.0	1.9	5.8		1.3
Physidae			0.3	2.6	0.4	2.3		0.8
OSTEICHTHYES (Fish)			0.5			3.6		0.6

percent, 65.5 percent, and 54.4 percent, respectively. Osteichthyes comprised 100 percent of prey items consumed by age 6+, 7+, 8+, 10+, 11+, and 14+ largemouth bass. For all age classes of largemouth bass combined, Osteichthyes was the major food item.

3.5.3 MOUNTAIN WHITEFISH FEEDING HABITS

Thirty-two families of invertebrates from twelve orders were identified in the one hundred mountain whitefish stomachs that were analyzed in 1990. Index of relative importance values for mountain whitefish are listed in Table 3.83. Daphnidae had the highest IRI value (64.1%) for age 0+ mountain whitefish, followed by Tricorythidae (11 .0%) and Chironomidae pupae (8.5%). For age 1+ mountain whitefish, the top three prey items were Chironomidae larvae, Chironomidae pupae and Daphnidae with IRI values of 25.3%, 16.7% and 15.2% respectively. Chironomidae larvae, Chironomidae pupae and Talitridae had the highest IRI values for age 2+ mountain whitefish with values of 31.4%, 27.4% and 11.7% respectively. For age 3+ mountain whitefish, Chironomidae larvae had the highest IRI value at 36.9% followed by Simuliidae (15.4%) and Chironomidae pupae (13.2%). The highest IRI value for age 4+ mountain whitefish was Chironomidae larvae (33.7%) followed by Chironomidae pupae (9.5%) and Talitridae (9.1%). For age 5+ mountain whitefish, Chironomidae larvae had the highest IRI value at 38.2% followed by Chironomidae pupae (13.0%) and Coenagrioniidae (7.6%). For all ages of mountain whitefish combined, Chironomidae larvae was the most important prey item with an IRI value of 28.6 percent.

3.5.4 BLACK CRAPPIE **FEEDING HABITS**

During 1990, thirty-six black crappie stomachs were analyzed. Fourteen families of invertebrates from eight orders were identified. Table 3.84 lists IRI values of prey items consumed by black crappie. For age 0+ black crappie, Daphnidae had the highest IRI value at 35.5% followed by Calanoida (13.1%) and Chironomidae larvae (12.2%). Daphnidae had the highest IRI value for age 1+ black crappie with an IRI value of 58.5% followed by Chironomidae larvae (8.1%) and Calanoida (7.3%). For age 2+ black crappie, Daphnidae also had the highest IRI value at 22.4% followed by Cyclopoida (8.5%). For age 3+ black crappie, Daphnidae had the highest IRI value at 49.6% followed by Chironomidae larvae (14.0%) and Cyclopoida (13.5%). Daphnidae had the highest IRI value for age 4+ black crappie with an IRI value of 43.4%, followed by Cyclopoida (15.1%) and Tricorythidae (10.4%). For age 5+ black crappie, Chironomidae larvae had the

Table 3.82. Mean annual index of relative importance of prey items consumed by largemouth bass in Pend Orielle River, WA. for 1990.

AGE CLASS SAMPLE SIZE	0+ n=17	1+ n=18	2+ n=17	3+ n=16	4+ n=7	5+ n=9	6+ n=5	7+ n=1	8+ n=3	10+ n=3	11+ n=2	14+ n=1	All ages n=99
AQUATIC ORGANISMS													
TRICHOPTERA (Caddisflies)													
Leptoceridae				1.5									0.1
EPHEMEROPTERA (Mayflies)													
Baetidae	5.9	5.0	25.4	12.8	10.5	3.6							5.3
Tricorythidae		0.7	2.7										0.3
ODONATA (Damsel and dragonflies)													
Coenagriidae		11.4	9.2	12.4	2.6	3.5							3.3
Aeshnidae				11.1									0.9
DIPTERA (Midges and flies)													
Chironomidae larvae	9.5	14.5	4.2	3.3	15.0								3.9
Chironomidae pupae	5.6	8.3	3.2	5.2		5.6							2.3
Ceratopogonidae			1.3	1.5									0.2
HYDRACARINA (Water mites)		0.7											0.1
TERRESTRIAL ORGANISIMS	4.1	1.2		10.3									1.3
COPEPODA (Copepods)													
Cyclopoida	1.9		0.7										0.2
Calanoida		3.8				8.4							1.0
CLADOCERA (Water fleas)													
Daphnidae	35.4	25.2	12.0	3.0	2.7	20.4							8.2
Chydoridae	6.8	2.4	4.9	2.4									1.4
AMPHIPODA (Scuds)													
Talitridae	1.0	4.3	14.1	7.2	3.5								2.5
OLIGOCHAETA (Worms)													
Lumbriculidae						4.2							0.4
OSTEICHYTHES (Fish)	29.8	22.6	22.4	29.2	65.6	54.4	100	100	100	100	100	100	68.7

Table 3.83. Mean annual index of relative importance of prey items consumed by mountain whitefish in Pend Orielle River, WA. for 1990.

AGE CLASS SAMPLE SIZE	0+ n=18	1+ n=12	2+ n=8	3+ n=18	4+ n=34	5+ n=10	All ages n=100
AQUATIC ORGANISMS							
TRICHOPTERA (Caddisflies)							
Polycentropidae		0.7	1.2		0.9		0.5
Hydroptilidae	0.3	6.9	9.7	2.8	8.4	4.3	6.7
Limnephilidae				2.2	2.4	3.0	1.3
Lepidostomatidae					0.4		<0.1
Leptoceridae			1.3	1.4	1.2	0.9	0.8
Phryganeidae		0.8			0.7		0.3
Hydropsychidae					0.5		0.1
Brachycentridae		0.7		8.0	1.4	1.7	2.0
Rhacophilidae					0.2		0.1
EPHEMEROPTERA (Mayflies)							
Baetidae		3.3	2.6	1.4	4.6	0.9	2.1
Ephemerellidae		5.2			0.7		1.0
Heptageniidae					0.2		0.1
Leptophlebiidae					1.7		0.3
Tricorythidae	11.0						1.8
ODONATA (Damsel and dragonflies)							
Coenagriidae		1.0	2.3	1.8	3.9	7.6	2.8
PLECOPTERA (Stoneflies)							
Nemouridae		1.3				0.9	0.4
Perlodidae			1.1				0.2
Chloroperlidae					0.7		0.1
COLEOPTERA (Beetles)							
Elmidae larvae					1.7	0.9	0.4
HYDRACARINA (Water mites)		5.2		3.8	2.7	2.5	2.4
DIPTERA (Midges and flies)							
Chironomidae larvae	5.9	25.3	31.5	36.9	33.7	38.2	28.6
Chironomidae pupae	8.5	16.7	27.4	13.2	9.5	13.0	14.7
Tipulidae					0.4		0.1
Ceratopogonidae					0.7	0.9	0.3
Chaorobidae				1.3	1.1		0.4
Simuliidae larvae	0.7	11.8	7.7	15.4	4.4	10.2	8.4
Simuliidae pupae	0.7			4.6	2.6	2.7	1.8
Empididae					1.7		0.3
TERRESTRIAL ORGANIISMS		0.8	1.2	2.3	1.0	3.1	1.4
CLADOCERA (Water fleas)							
Daphnidae	64.1	15.2					13.2
Chydoridae		0.7			1.7		0.3
AMPHIPODA (Scuds)							
Talitridae		2.4	11.7	[illegible]	9.1	6.0	5.5
OSTRACODA (Seed shrimp)					0.4		0.1
GASTROPODA (Snails)							
Lymnaeidae		2.0				0.9	0.5
Planorbidae			2.2	0.9	0.7	2.5	1.1
OLIGOCHAETA (Worms)							
Lumbriculidae					0.4		0.1
NEMATODA	2.3						0.4

highest IRI value at 14.7%, followed by Cyclopoida (13.0%) and Ostracoda (11.9%). Chironomidae larvae had the highest IRI value for age 6+ black crappie at 34.4%, followed by Tricorythidae (20.2%) and Ostracoda (15.1%). For all age classes of black crappie combined, Daphnidae were the most important prey item.

3.5.5 BROWN TROUT FEEDING HABITS

Thirteen brown trout stomachs were analyzed in 1990. Fourteen families of invertebrates from seven orders were identified. The IRI values for prey items consumed by age classes of brown trout are listed in Table 3.85. For age 0+ brown trout, Chironomidae larvae had the highest IRI value of 81.4 percent. For age 2+ brown trout, Baetidae had the highest IRI value at 66.0%, followed by Talitridae (18.8%) and Coenagrioniidae (15.1 %). Chironomidae pupae had the highest IRI value for age 3+ and 4+ brown trout at 93.0 percent and 44.6 percent, followed by Simuliidae pupae, for 3+ brown trout (7.0%), and Osteichthyes, for 4+ brown trout (21.4%). For all age classes combined, Chironomidae pupae was the most important prey item in the diet of brown trout.

3.5.6 RAINBOW TROUT FEEDING HABITS

Three rainbow trout stomachs were analyzed in 1990. A total of 6 families from 4 orders were identified. Mean IRI values for rainbow trout are listed in Table 3.86. Chironomidae larvae comprised 100% of the prey items in age 2+ and 4+ rainbow trout. For age 5+ rainbow trout, Coenagrioniidae had the highest IRI value at 33.4 percent followed by Libellulidae (30.4%). Chironomidae larvae was the most important prey item for all age classes of rainbow trout combined, with an IRI value of 69.7 percent.

3.5.7 KOKANEE FEEDING HABITS

In 1990, six kokanee stomachs were analyzed, and five families from three orders were identified. Table 3.87 shows IRI values for kokanee in the Pend Oreille River. Chironomidae pupae had the highest IRI value at 60 percent for age 1+ kokanee, followed by Daphnidae (27.0%). Daphnidae had the highest IRI values for age 2+ at 95.5 percent. For all age classes of kokanee combined, the highest IRI value was 61.3 percent for Daphnidae.

Table 3.84. Mean annual index of relative importance of prey items consumed by black crappie in Pend Orielle River, WA. for 1990.

AGE CLASS SAMPLE SIZE	0+ n=12	1+ n=6	2+ n=6	3+ n=2	4+ n=3	5+ n=5	6+ n=2	All ages n=36
AQUATIC ORGANISMS								
EPHEMEROPTERA (Caddisflies)								
Baetidae					3.4	4.7	20.2	4.0
Tricorythidae		2.6	4.5		10.4	2.3		2.8
Leptophlebiidae			4.6					0.7
ODONATA (Damsel and dragonflies)								
Coenagriidae			4.5		3.4	9.6		2.5
HYDRACARINA (Water mites)			4.5					0.6
DIPTERA (Midges and flies)								
Chironomidae larvae	12.2	8.1	7.1	14.0		14.7	34.4	12.9
Chironomidae pupae	6.5	2.6	7.4	6.8	6.7	5.4		5.1
Ceratopogonidae			4.5		6.7	9.2	9.1	4.2
Chaoboridae			5.0					0.7
TERRESTRIAL ORGANISMS				4.6				0.7
COPEPODA (Copepods)								
Cyclopoida	6.5	7.0	8.5	13.5	15.1	13.0		9.1
Calanoida	13.1	7.3		9.2		9.3		5.6
CLADOCERA (Water fleas)								
Daphnidae	35.5	58.5	22.4	49.6	43.4	10.0	6.5	32.3
Chydoridae	10.0	4.9	2.7	6.9		4.7		4.2
AMPHIPODA (Scuds)								
Talitridae	5.4	2.6	6.5		7.4	5.2	14.7	6.0
OSTRACODA (Seed shrimp)	5.4	6.6	7.0		3.4	11.9	15.1	7.1
OSTEICHTHYES (Fish)	5.4		6.0					1.6

Table 3.85. Mean annual index of relative importance of prey items consumed by brown trout in Pend Oreille River, WA. for 1990.

AGE CLASS SAMPLE SIZE	0+ n=5	2+ n=2	3+ n=2	4+ n=4	All ages n=13
AQUATIC ORGANISMS					
TRICOPTERA (Caddisflies)					
Limnephilidae				3.1	0.8
Phryganeidae				4.1	1.0
Brachycentridae				2.9	0.7
EPHEMEROPTERA (Mayflies)					
Baetidae	4.4	66.0			17.6
PLECOPTERA (Stoneflies)					
Nemouridae				2.8	0.7
ODONATA (Damsel and dragonflies)					
Libellulidae				11.8	3.0
Coenagriidae		15.1			3.8
DIPTERA (Midges and flies)					
Chironomidae larvae	81.4			2.9	21.1
Chironomidae pupae	9.9		93.0	44.6	36.9
Simuliidae larvae	4.4				1.1
Simuliidae pupae			7.0		1.8
AMPHIPODA (Scuds)					
Talitridae		18.8			4.7
GASTROPODA (Snails)					
Planorbidae				2.9	0.7
Lymnaeidae				3.4	0.9
OSTEICHYTHES (Fish)				21.4	5.4

Table 3.86. Mean annual index of relative importance of prey items consumed by rainbow trout in Pend Oreille River, WA. for 1990.

AGE CLASS SAMPLE SIZE	2 + n=1	4 + n=1	5 + n=1	All ages n=3
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Phryganeidae			9.9	3.3
EPHEMEROPTERA (Mayflies)				
Baetidae			8.6	2.9
ODONATA (Damsel and dragonflies)				
Coenagriidae			33.4	11.1
Libellulidae			30.4	10.1
DIPTERA (Midges and flies)				
Chironomidae larvae	100.0	100.0	9.0	69.7
Chironomidae pupae			9.0	3.0

Table 3.87. Mean annual index of relative importance of prey items consumed by kokanee in Pend Oreille River, WA. for 1990.

AGE CLASS SAMPLE SIZE	1 + n=4	2 + n=2	All ages n=6
DIPTERA (Midges and flies)			
Chironomidae larvae	6.3		3.2
Chironomidae pupae	60.0		30.0
Simuliidae		4.5	2.3
COPEPODA (Copepods)			
Cyclopoida	6.7		3.4
CLADOCERA (Water fleas)			
Daphnidae	27.0	95.5	61.3

3.5.8 DIET OVERLAPS

Diet overlaps between major fish species found in the Pend Oreille River are listed in Table 3.88. A high degree of overlap ($\geq$ 0.7) was found between: yellow perch and mountain whitefish; yellow perch and black crappie; black crappie and kokanee.

Diet overlaps between largemouth bass year classes and other fish species found in the Pend Oreille River are listed in Table 3.89. High overlaps were between: age 0+ largemouth bass and black crappie (0.734); age 1+ largemouth bass and yellow perch (0.737); and age 1+ largemouth bass and black crappie (0.760). Medium range overlaps (>0.5) were common among largemouth bass year classes and other fish species found in the Pend Oreille River.

Diet overlaps between largemouth bass year classes and yellow perch year classes are listed in Table 3.90. Moderate and high diet overlaps were common between these two species in the Pend Oreille River. High diet overlaps were between: age 0+ largemouth bass and age 6+ yellow perch (0.763); age 1+ largemouth bass and age 1+, 2+, 4+, and 5+ yellow perch at 0.736, 0.709, 0.725, and 0.701 respectively.

3.5.9. PREY SELECTION

3.5.9.1. BENTHIC MACROINVERTEBRATE ELECTIVITY

Prey selection for benthic macroinvertebrates consumed by target fish species found in the Pend Oreille River are listed in Table 3.91. Yellow perch had the highest electivities for Chironomidae pupae and Hydroptilidae at 0.18 and 0.07, respectively. Largemouth bass had the highest electivities for Baetidae, Chironomidae pupae and Coenagrioniidae at 0.23, 0.09 and 0.08, respectively. Mountain whitefish had the highest electivity for Chironomidae pupae at 0.22, followed by Chironomidae larvae (0.09) and Hydroptilidae (0.08). Black crappie selected for Chironomidae pupae most often at 0.09, followed by Baetidae (0.08). Brown trout had the highest electivities for Chironomidae pupae and Baetidae at 0.22 and 0.18, respectively. Chironomidae pupae had the highest electivity (0.47) for kokanee. Rainbow trout had the highest electivities for Chironomidae larvae and Coenagrioniidae at 0.27 and 0.25, respectively.

Table 3.88. Annual diet overlaps between fish species based on relative importance values in Pend Oreille River, WA. for 1990.

Species Sample size	Yellow perch n=158	Largemouth bass n=99	Mountain whitefish n=100	Black crappie n=36	Kokanee n=2	Rainbow trout n=3	Brown trout n=13
Yellow perch	1.000	0.127	0.729	0.855	0.562	0.303	0.450
Largemouth bass		1.000	0.093	0.156	0.123	0.066	0.078
Mountain whitefish			1.000	0.642	0.448	0.638	0.683
Black crappie				1.000	0.712	0.288	0.296
Kokanee					1.000	0.064	0.345
Rain bow trout						1.000	0.471
Brown trout							1.000

Table 3.89. Annual diet overlaps between largemouth bass (LMB) year classes and other fish species based on relative importance values in Pend Oreille River, WA. for 1990.

Species Sample size	N	Yellow perch n=158	Mountain whitefish n=99	Black crappie n=36	Kokanee n=2	Rain bow trout n=3	Brown trout n=13
0+ LMB	17	0.622	0.451	0.734	0.674	0.186	0.226
1+ LMB	18	0.737	0.625	0.760	0.584	0.350	0.395
2+ LMB	17	0.560	0.323	0.473	0.268	0.142	0.364
3+ LMB	16	0.331	0.226	0.240	0.113	0.127	0.292
4+ LMB	7	0.134	0.170	0.148	0.046	0.226	0.150
≥5+ LMB	24	0.027	0.010	0.050	0.030	0.001	0.007

Table 3.90. Annual diet overlaps between largemouth bass (LMB) year classes and yellow perch year classes based on relative importance values in Pend Oreille River, WA. for 1990.

Species Sample size	N	Yellow perch (0+) n=3	Yellow perch (1+) n=22	Yellow perch (2+) n=23	Yellow perch (3+) n=19	Yellow perch (4+) n=58	Yellow perch (5+) n=31	Yellow perch (6+) n=2
0+ LMB	17	0.201	0.553	0.631	0.561	0.554	0.0.585	0.763
1+ LMB	18	0.261	0.736	0.709	0.699	0.725	0.701	0.691
2+ LMB	17	0.367	0.569	0.462	0.477	0.529	0.55	0.431
3+ LMB	16	0.251	0.362	0.254	0.268	0.331	0.379	0.178

Table 3.91. Prey selection (electivity) for benthic macroinvertebrates by target species fish in Pend Oreille River, WA. for 1990.

SPECIES Sample size	Percent in environment n=125	Yellow perch n=158	Largemouth bass n=99	Mountain whitefish n=100	Black crappie n=36	Brownt trout n=13	Kokanee n=6	Rainbow trout n=3
TRICHOPTERA (Caddisflies)								
Hydroptilidae	0.16	0.0721	-0.0016	0.0804	-0.0016	-0.0016	-0.0016	-0.0016
Leptoceridae	0.17	0	0.0019	-0.001	-0.0017	-0.0017	-0.0017	-0.0017
Polycentropodidae	0.15	0.0092	-0.0015	-0.0011	-0.0015	-0.0015	-0.0015	-0.0015
Limnephillidae	0.02	0.0012	-0.0002	0.0038	-0.0002	0.0006	-0.0002	-0.0002
Lepidostomatidae	0.02	-0.0002	-0.0002	0.0003	-0.0002	-0.0002	-0.0002	-0.0002
Rhyacophilidae	0.02	-0.0002	-0.0002	-0.0001	-0.0002	-0.0002	-0.0002	-0.0002
Phryganeidae	0	0.0044	0	0.0002	0	0.0008	0	0.0120
Hydropsychidae	0	0	0	0.0001	0	0	0	0
Brachycentridae	0	0	0	0.0016	0	0.0008	0	0
Psychomyiidae	0.02	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
EPHEMERELLIDAE (Mayflies)								
Baetidae	0.70	0.0703	0.2327	-0.0052	0.0816	0.1765	-0.0070	-0.0033
Ephemerellidae	0.15	-0.0009	-0.0015	-0.001	-0.0015	-0.0015	-0.0015	-0.0015
Leptophlebiidae	0.07	-0.0007	-0.0007	-0.0006	0.0407	-0.0007	-0.0007	-0.0007
Heptageniidae	0.02	-0.0002	-0.0002	-0.0001	-0.0002	-0.0002	-0.0002	-0.0002
Tricorythidae	3.22	-0.0022	-0.0255	-0.0105	0.0349	-0.0322	-0.0322	-0.0322
PLECOPTERA (Stoneflies)								
Nemouridae	0	0	0	0.0003	0	0.0008	0	0
Chloroperlidae	0	0	0	0.0003	0	0	0	0
Perlodidae	0.02	-0.0002	-0.0002	0	-0.0002	-0.0002	-0.0002	-0.0002
COLEOPTERA (Beetles)								
Elmidae larvae	0.75	-0.0075	-0.0075	-0.0069	-0.0075	-0.0075	-0.0075	-0.0075
Elmidae adults	0.02	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
Dytiscidae	0.06	0	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006
Haliplidae	0.06	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006
HEMIPTERA (True bugs)								
Corixidae	0.02	-0.0001	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002

Table **3.91.** (cont.)

SPECIES Sample size	Percent in environment n=125	Yellow perch n=158	Largemouth bass n=99	Mountain whitefish n=100	Black crappie n=36	Brownt trout n=13	Kokanee n=6	Rainbow trout n=3
DIPTERA (Midges and flies)								
Chironomidae larvae	40.23	-0.0873	-0.2348	0.0912	0.0201	0.0920	-0.4005	0.2730
Chironomidae pupae	2.9	0.1829	0.0977	0.2197	0.0876	0.2167	0.4691	-0.0204
Ceratopogonidae	0.360	0.0025	0.0007	-0.0009	0.050	-0.0036	-0.0036	-0.0036
Ceratopogonidae pupae	0	0.0004	0	0.0001	0	0	0	0
Tipulidae	0.08	-0.0008	-0.0008	-0.0007	-0.0008	-0.0008	-0.0008	-0.0008
Simuliidae larvae	0.13	0.0069	-0.0013	0.0797	-0.0013	-0.0003	0.0487	-0.0013
Simuliidae pupae	0	0.0020	0	0.0160	0	0.0003	0	0
Chaoboridae	0.06	-0.0006	-0.0006	-0.0001	0.0251	-0.0006	-0.0006	-0.0006
Empididae	0.04	-0.0004	-0.0004	-0.0003	-0.0004	-0.0004	-0.0004	-0.0004
ODONATA (Damsel and dragonflies)								
Coenagrioniidae	1.36	0.0705	0.0848	-0.0046	0.0078	0.0067	-0.0136	0.2541
Libellulidae	0.040	-0.0004	-0.0004	-0.0004	-0.0004	0.0014	-0.0004	0.0326
Aeshneidae	0.040	-0.0004	0.0175	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004
NON INSECTS								
HYDRACARINA (Mites)	4.01	-0.0326	-0.0385	-0.0391	-0.0387	-0.0401	-0.0401	-0.0401
AMPHIPODA (Scuds)	21.45	-0.1136	-0.1073	-0.1853	-0.0564	-0.1673	-0.2145	-0.2145
OLIGOCHAETA (Worms)	9.49	-0.0943	-0.0655	-0.0948	-0.0949	-0.0949	-0.0949	-0.0949
PLATYHELMINTHES (Flat worms)								
Planariidae	0.320	-0.0032	-0.0032	-0.0032	-0.0032	-0.0032	-0.0032	-0.0032
MOLLUSCA (Snails)								
Planorbidae	8.35	-0.0315	-0.0835	-0.0829	-0.0835	-0.0818	-0.0835	-0.0835
Physidae	0.06	0.0034	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006
Lymnaeidae	0.67	-0.0007	-0.0067	-0.006	-0.0067	-0.005	-0.0067	-0.0067
BIVALVIA (Clams)								
Sphaeriidae	4.13	-0.0413	-0.0413	-0.0413	-0.0413	-0.0413	-0.0413	-0.0413
TERRESTRIAL ORGANISMS	0.65	-0.0063	0.0476	0.0002	-0.0051	-0.0065	-0.0065	-0.0065

3.5.9.2 ZOOPLANKTON ELECTIVITY

Prey selection for zooplankton consumed by target fish species found in the Pend Oreille River are listed in Table 3.92. Yellow perch had the highest electivities for Daphnidae (0.64) and Calanoida (0.18). Largemouth bass and mountain whitefish had positive electivities for Daphnidae at 0.30 and 0.19, respectively. Black crappie had the highest electivities for Daphnidae (0.47) and Ostracoda (0.06). Kokanee had positive electivity values for Daphnidae at 0.85, while brown trout and rainbow trout had no positive electivity values.

3.6 1989 TRIBUTARY FISH FEEDING HABITS

Tributary fish feeding habit results were based on mean annual values calculated from monthly feeding data. The monthly data listed in Appendix G include mean number and weight (± standard deviation), the number percentage, weight percentage, occurrence frequency and index of relative importance percentage for each prey item consumed by the different age classes of each fish species. Annual means were calculated separately for each tributary. Mean annual index of relative importance values for each prey item were determined for each age class of each species so that differences between age classes within a species and differences between species could be assessed. Electivity indices for prey items in the benthos and in the drift were computed for each age class of each species using mean annual percentage by number values. Diet overlaps were computed using mean annual IRI values to determine the possibility of intra-specific and inter-specific competition for food resources.

3.6.1 INDEX OF RELATIVE IMPORTANCE

3.6.1.1 LECLERC CREEK

Stomachs were collected from a total of 54 brown trout, 74 brook trout, and nine cutthroat trout for analysis in 1989. Trout food items consisted of 56 families of invertebrates representing 17 orders.

The index of relative importance (IRI) values for prey items consumed by brown trout in LeClerc Creek are listed in Table 3.93. For age 0+ brown trout, Baetidae had the highest IRI value at 15.7 percent ,followed by Chironomidae larvae (15.2%) and Heptageniidae

Table 3.92. Prey selection (electivity) for zooplankton by target species fish in Pend Oreille River, WA. for 1990.

SPECIES Sample size	Percent in environment n=125	Yellow perch n=158	Largemouth bass n=99	Mountain whitefish n=100	Black crappie n=36	Brown trout n=13	Rainbow trout n=3	Kokanee n=6
DAPHNIDAE	14.08	0.6392	0.3007	0.1924	0.4685	-0.1408	-0.1408	0.8456
CHYDORIDAE	15.82	0.0043	-0.1293	-0.0748	-0.1553	-0.1582	-0.1582	-0.1582
MACROTHRICIDAE	0	0	0	0	0	0	0	0
SIDIDAE	1.31	-0.0131	-0.0131	-0.0131	-0.0131	-0.0131	-0.0131	-0.0131
BOSMINIDAE	9.29	-0.0929	-0.0929	-0.0929	-0.0929	-0.0929	-0.0929	-0.0929
LEPTODORIDAE	0.12	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012
CALANOIDA	9.72	0.1833	-0.0733	-0.0972	-0.0118	-0.0972	-0.0972	-0.0972
CYCLOPOIDA	25.82	0.0110	-0.2549	-0.2582	-0.2144	-0.2582	-0.2582	-0.2446
HARPACTICOIDA	4.26	-0.0426	-0.0426	-0.0426	-0.0426	-0.0426	-0.0426	-0.0426
OSTRACODA	19.57	-0.2471	-0.1957	-0.1124	0.0628	-0.1957	-0.1957	-0.1957
MYCIDAE	0	0.0093	0	0	0	0	0	0

(9.1%). For age 1+ brown trout, Limnephilidae had the highest IRI value at 27.5 percent, followed by Heptageniidae (10.1%) and Brachycentridae (9.7%). Brown trout that were age 2+ had the highest IRI value for Brachycentridae (18.6%), followed by Limnephilidae (16.9%) and Ephemerellidae (9.5%). For age 3+ brown trout, the highest IRI was for Limnephilidae (41 .2%), followed by Formicidae (16.6%) and Rhyacophilidae (7.6%). Only one 4+ brown trout was captured in 1989 and Limnephilidae was the only prey it consumed so consequently it had an IRI of 100.0 percent. For all age classes combined, Limnephilidae (38.7%) had the highest IRI value, followed by Brachycentridae (7.5%) and Formicidae (6.4%).

The index of relative importance (IRI) values for prey items consumed by brook trout in LeClerc Creek are listed in Table 3.94. For age 0+ brook trout, Formicidae had the highest IRI value at 9.0 percent followed by Aphididae (8.9%) and Limnephilidae (7.8%). Brook trout that were age 1+ had the highest IRI for Brachycentridae at 17.3 percent, followed by Lepidoptera (6.3%), Limnephilidae (5.3%) and Chironomidae larvae (5.3%). For age 2+ brook trout, the highest IRI was for Limnephilidae (25.0%) followed by Cottidae (12.6%) and Formicidae (10.5%). For age 3+ brook trout, the highest value was for Limnephilidae (25.5%), followed by Ephemerellidae (11 .0%) and Formicidae (10.4%). For all age classes combined, the highest IRI was for Limnephilidae at 15.9 percent followed by Formicidae (8.5%) and Brachycentridae (6.8%).

The index of relative importance (IRI) values for prey items consumed by cutthroat trout in LeClerc Creek are listed in Table 3.95. Cutthroat trout that were age 1+ had the highest IRI value for Baetidae at 39.0 percent, followed by Plecoptera adults (9.1%) and Lepidoptera (6.9%). For age 2+ cutthroat trout, the highest IRI was for Brachycentridae at 12.0 percent, followed by Limnephilidae (7.0%) and Baetidae (6.8%). For both age classes combined the highest IRI was for Baetidae (22.9%), followed by Brachycentridae (7.6%) and Limnephilidae (6.5%).

3.6.1.2 RUBY CREEK

Stomachs were collected from nine brown trout, 122 brook trout, nine cutthroat trout, nine rainbow trout, and one mountain whitefish during 1989. Trout food items consisted of 74 families of invertebrates representing 22 orders.

Table 3.93. Mean annual index of relative importance (IRI) values of prey items consumed by brown trout in LeClerc Creek for 1989.

Age Class Sample Size	0+ n=20	1+ n=17	2+ n=10	3+ n=6	4+ n=1	All ages n=54
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	2.3	9.7	18.6	6.9		7.5
Glossosomatidae	2.8		1.6			0.9
Limnephilidae	7.9	27.5	16.9	41.2	100.0	38.7
Rhyacophilidae		3.1	4.8	7.6		3.1
Trichoptera pupae		1.3				0.3
EPHEMEROPTERA (Mayflies)						
Baetidae	15.7	8.2	5.9			6.0
Ephemerellidae	8.0	6.3	9.5			4.8
Heptageniidae	9.1	10.1	8.9			5.6
PLECOPTERA (Stoneflies)						
Chloroperlidae		0.6				0.1
Nemouridae		1.1		3.5		0.9
COLEOPTERA (Beetles)						
Elmidae adult		1.7				0.3
Elmidae larvae			2.9			0.6
Haliplidae		0.6				0.1
Hydrophilidae	0.7					0.1
HYDRACARINA (Water mite)	1.4					0.3
DIPTERA (Flies, midges)						
Ceratopogonidae	1.4					0.3
Chironomidae larvae	15.2	5.8				4.2
Chironomidae pupae	4.9	0.8				1.1
Culicidae	1.3					0.3
Simuliidae	5.1	1.2				1.3
Tipulidae	1.3					0.3
OLIGOCHAETA (Worms)						
Naididae	0.6					0.1
Lumbriculidae	1.5		8.0			1.9
OSTEICHTHYES (Fish)				5.5		1.1
TERRESTRIAL ORGANISMS						
TRICHOPTERA (Caddisflies)	2.2	1.2	4.5	2.3		2.0
PLECOPTERA (Stoneflies)	0.8	1.4				0.4
DIPTERA (Midges and flies)						
Bibionidae		0.6				0.1
Chironomidae	0.7					0.1
Empididae	0.8					0.2
Sciaridae	0.6	0.7		2.3		0.7
Simuliidae		0.7				0.1
COLEOPTERA (Beetles)						
Carabidae		0.5				0.1
Chrysomelidae				2.5		0.5
HOMOPTERA (Aphids)						
Aphididae	3.9	1.6				1.1
Cicadellidae		0.5	1.5			0.4
HYMENOPTERA (Wasps and ants)						
Formicidae		7.2	8.4	16.6		6.4
ARANEIDA (Spiders)		0.6	1.4	2.3		1.1
LEPIDOPTERA (Moths)	3.0	2.2	4.2			1.9
ORTHOPTERA (Grasshoppers)				3.7		0.7
UNIDENTIFIED TERRESTRIALS	8.7	4.6	2.8	5.5		4.3

Table 3.94. Mean annual index of relative importance (IRI) values of prey items consumed by brook trout in LeClerc Creek for 1989.

Age Class Sample Size	0+ n=22	1+ n=36	2+ n=12	3+ n=4	All ages n=74
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	3.3	17.3	6.5		6.8
Hydropsychidae		0.4	0.4		0.2
Limnephilidae	7.8	5.3	25.0	25.5	15.9
Rhyacophilidae	1.0	0.6	3.3		1.2
Trichoptera pupae	1.1	1.0	0.3	5.1	1.9
EPHEMEROPTERA (Mayflies)					
Baetidae	3.7	3.4		2.6	2.4
Ephemerellidae	2.3	4.8	2.0	11.0	5.0
Heptageniidae	2.2	3.2	5.3		2.7
PLECOPTERA (Stoneflies)					
Nemouridae	1.2				0.3
Perlodidae	0.6	1.8			0.6
COLEOPTERA (Beetles)					
Amphizoidae		0.3			0.1
Dytiscidae		1.1			0.3
Elmidae adult	1.9	3.6	0.9		1.6
Elmidae larvae	1.1				0.3
Haliplidae		2.8	2.3		1.3
Hydrophilidae		2.4	1.0		0.9
LEPIDOPTERA (Moths)					
Pyralidae	2.6	2.1	3.7	3.3	2.9
DIPTERA (Midges and flies)					
Ceratopogonidae	1.5	0.8	0.3	2.3	1.2
Chironomidae larvae	6.5	5.3	3.5		3.8
Chironomidae pupae	7.6	1.1	4.1		3.2
Culicidae	0.6	1.0			0.4
Muscidae		0.6			0.2
Simuliidae	3.2	1.2	0.5	2.5	1.9
Tipulidae		0.4	0.8		0.3
HYDRACARINA (Water mites)	3.0	5.2			2.0
OLIGOCHAETA (Worms)					
Lumbriculidae	1.0	0.3	3.2		1.1
OSTEICHTHYES (Fish)		3.4	12.6		4.1
TERRESTRIAL ORGANISMS					
TRICHOPTERA (Caddisflies)	1.7	0.3	0.3		0.6
PLECOPTERA (Stoneflies)		1.0	2.2		0.8
DIPTERA (Midges and flies)					
Chironomidae	0.6				0.2
Empididae		1.0			0.3
Mycetophilidae	1.4	0.8	0.3	3.5	1.5
Sciaridae		0.7	0.3	3.3	1.1

Table 3.94. (cont.)

Age Class Sample Size	0+ n=22	1+ n=36	2+ n=12	3+ n=4	All ages n=74
Simuliidae	2.3	0.9			0.8
COLEOPTERA (Beetles)					
Byrrhidae			0.3		0.1
Cerambycidae				3.2	0.8
Curculionidae			0.3		0.1
Elateridae		0.5			0.1
Lampyridae	1.5	0.5			0.5
Staphylinidae				3.2	0.8
HOMOPTERA (Aphids)					
Aphididae	8.9	1.9	0.4	3.3	3.6
Cercopidae		1.6	1.7		0.8
Cicadellidae	0.6	0.3	0.6		0.4
Psyllidae	3.8		0.6		1.1
HYMENOPTERA (Wasps and ants)					
Diapriidae		1.0	0.4		0.1
Formicidae	9.0	4.1	10.5	10.4	8.5
Ichneumonidae			2.0	4.5	1.6
ARANEIDA (Spiders)	1.8	1.0	0.3		0.8
LEPIDOPTERA (Moths)	3.1	6.3	0.8	2.9	3.3
ORTHOPTERA (Grasshoppers)		1.6			0.4
ODONATA (Damsel and dragonflies)					
Aeshnidae				3.3	0.8
NEUROPTERA (Lacewings)					
Chrysopidae			0.5		0.1
COLLEMBOLA (Springtails)	0.6				0.2
DIPLOPODA (Millipedes)	1.2		1.0		0.5
UNIDENTIFIED TERRESTRIAL	11.4	7.9	1.3	10.2	7.3

Table 3.95. Mean annual index of relative importance (IRI) values of prey items consumed by cutthroat trout in LeClerc Creek for 1989.

Age Class Sample Size	1+ n=5	2+ n=4	All ages n=9
AQUATIC ORGANISMS			
TRICHOPTERA (Caddisflies)			
Brachycentridae	3.2	12.0	7.6
Glossosomatidae		2.9	1.4
Hydropsychidae		4.6	2.3
Hydroptilidae		3.5	1.8
Limnephilidae	6.0	7.0	6.5
Rhyacophilidae	1.6	3.5	2.6
EPHEMEROPTERA (Mayflies)			
Baetidae	39.0	6.8	22.9
Ephemerellidae	2.6	3.6	3.1
Heptageniidae		6.2	3.1
PLECOPTERA (Stoneflies)			
Nemouridae		2.9	1.4
COLEOPTERA (Beetles)			
Dytiscidae		3.3	1.7
Elmidae adult		2.9	1.4
Elmidae larvae		6.4	3.2
Hydrophilidae	4.4		2.2
LEPIDOPTERA (Moths)			
Pyralidae		5.4	2.7
DIPTERA (Midges and flies)			
Chironomidae larvae	3.1	3.9	3.5
Chironomidae pupae	4.9		2.5
Tipulidae		6.7	3.3
OLIGOCHAETA (Worms)			
Lumbriculidae		3.5	1.8
OSTEICHTHYES (Fish)		4.4	2.2
TERRESTRIAL ORGANISMS			
PLECOPTERA (Stoneflies)	9.1		4.6
DIPTERA (Flies)			
Empididae		2.9	1.4
Mycetophilidae	4.6		2.3
HYMENOPTERA (Wasps and flies)			
Formicidae	5.0		2.5
ARANEIDA (Spiders)		2.9	1.4
LEPIDOPTERA (Moths)	6.9		3.5
COLLEMBOLA (Springtails)	4.0		2.0
UNIDENTIFIED TERRESTRIAL	5.6	4.8	5.2

Index of relative importance (IRI) values for prey items consumed by brown trout in Ruby Creek can be found in Table 3.96. For age 0+ brown trout, the highest IRI was for Baetidae (44.8%) followed by Simuliidae (17.9%) and Elmidae larvae (14.0%). Brown trout that were age 1+ had the highest IRI for Heptageniidae (22.0%) followed by Rhyacophilidae (11 .9%) and Curculionidae (10.4%). For age 2+ brown trout, Limnephilidae (36.7%) had the highest IRI followed by Perlodidae (34.0%) and Rhyacophilidae (29.3%). For age 3+ brown trout, Formicidae was the highest at 9.3 percent, followed by Limnephilidae (8.9%) and Empididae (8.4%). For all age classes combined the highest IRI was for Limnephilidae (14.9%), followed by Baetidae (13.1%) and Perlodidae (10.4%).

Index of relative importance (IRI) values for prey items consumed by brook trout in Ruby Creek are listed in Table 3.97. The highest IRI for age 0+ brook trout was Chironomidae larvae at 12.7 percent, followed by Aphididae (9.8%) and Baetidae (7.4%). Brook trout that were age 1+ had the highest IRI for Brachycentridae (11 .0%) followed by Baetidae (9.1%) and Lumbriculidae (6.7%). For age 2+ brook trout, the highest IRI was for Limnephilidae (9.5%) followed by Lumbriculidae (7.3%) and Formicidae (6.9%). For age 3+ brook trout, Formicidae (9.2%) had the highest IRI, followed by Limnephilidae (7.9%) and Lepidoptera (6.0%). For all age classes combined the highest IRI was for Limnephilidae (6.9%), followed by Chironomidae larvae (6.2%) and Brachycentridae (5.8%).

Index of relative importance (IRI) values for prey items consumed by cutthroat trout in Ruby Creek are listed in Table 3.98. Cutthroat trout that were age 0+ had the highest IRI for Brachycentridae at 21 .1 percent, followed by Nemouridae (12.2%) and Ephemerellidae (7.3%). For age 2+ cutthroat trout the highest IRI was for Baetidae (1 0.0%), followed by Psyllidae (9.3%) and Formicidae (6.9%). The highest IRI value for age 3+ cutthroat trout was for Perlodidae (26.4%), followed by Lumbriculidae (26.0%) and Rhyacophilidae (24.4%). For all age classes combined, the highest IRI was for Perlodidae (10.7%), followed by Lumbriculidae (10.0%) and Rhyacophilidae (8.1%).

Index of relative importance (IRI) values for prey items consumed by rainbow trout in Ruby Creek can be found in Table 3.99. Age 1+ rainbow trout IRI values were highest for Heptageniidae (15.0%), followed by Brachycentridae (13.9%) and Baetidae (13.5%). Rainbow trout that were age 2+ had the highest IRI for Formicidae

Table 3.96. Mean annual index of relative importance (IRI) values of prey items consumed by brown trout in Ruby Creek for 1989.

Age Class Sample Size	0+ n=3	1+ n=4	2+ n=1	3+ n=1	All ages n=9
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae		3.9			1.0
Glossosomatidae				7.0	1.8
Hydropsychidae		4.3		7.0	2.8
Limnephilidae	11.3	2.7	36.7	8.9	14.9
Rhyacophilidae		11.9	29.3		10.3
EPHEMEROPTERA (Mayflies)					
Baetidae	44.8	7.5			13.1
Heptageniidae		22.0			5.5
PLECOPTERA (Stoneflies)					
Perlodidae		7.4	34.0		10.4
COLEOPTERA (Beetles)					
Elmidae adult	12.0	2.7			3.7
Elmidae larvae	14.0				3.5
Haliplidae				7.0	1.8
DIPTERA (Midges and flies)					
Chironomidae larvae		2.7			0.7
Simuliidae	17.9	6.7			6.2
TERRESTRIAL ORGANISMS					
EPHEMEROPTERA (Mayflies)		3.1			0.8
PLECOPTERA (Stoneflies)				7.0	1.8
DIPTERA (Midges and flies)					
Empididae				8.4	2.1
COLEOPTERA (Beetles)					
Buprestidae				7.2	1.8
Cerambycidae				8.1	2.0
Chrysomelidae		7.3			1.8
Curculionidae		10.4			2.6
HOMOPTERA (Aphids)					
Cicadellidae				6.9	1.7
HYMENOPTERA (Wasps and ants)					
Formicidae		7.2		9.3	4.1
ARANEIDA (Spiders)				7.0	1.8
LEPIDOPTERA (Moths)				8.2	2.1
UNIDENTIFIED TERRESTRIALS				7.9	2.0

Table 3.97. Mean annual index of relative importance (IRI) values of prey items consumed by brook trout in Ruby Creek for 1989.

Age Class Sample Size	0+ n=31	1+ n=52	2+ n=33	3+ n=6	All ages n=122
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	4.1	11.0	5.3	2.8	5.8
Glossosomatidae		2.2	2.3	2.0	1.6
Hydropsychidae		1.6	1.6	1.7	1.2
Hydroptilidae	1.4	0.5			0.5
Limnephilidae	5.2	5.0	9.5	7.9	6.9
Rhyacophilidae	0.9	3.1	5.2	4.5	3.4
Trichoptera pupae			1.4	0.7	0.6
EPHEMEROPTERA (Mayflies)					
Ephemerellidae	3.8	4.1		0.9	2.2
Baetidae	7.4	9.1	3.5	0.9	5.2
Heptageniidae	4.7	4.1	1.0		2.5
PLECOPTERA (Stoneflies)					
Nemouridae	3.4	2 0	1.0		1.6
Perlodidae	0.7	0.3	0.2		0 3
ODONATA (Dragonflies)					
Aeshnidae				1.2	0.3
COLEOPTERA (Beetles)					
Dytiscidae		0.2	0.3		0.1
Elmidae adult	1.2	3.8	4.5	2.6	3.0
Elmidae larvae	3.2	1.0			1.0
Haliplidae		0.2			0.1
Hydrophilidae		1.2	2.0		0.8
HYDRACARINA (Water mite)	1.9	1.9	0.9		1.2
LEPIDOPTERA (Moths)					
Pyralidae	1.7	4.0	2.9		2.2
DIPTERA (Midges and flies)					
Ceratopogonidae		0.8			0.2
Chironomidae larvae	12.7	3.4	5.7	2.8	6.2
Chironomidae pupae	1.5		0.7		0 6
Muscidae	0.4	0.3			0.2
Psychodidae		0.2			0.1
Simuliidae	2.2	3.3	0.5	0.9	1.7
Tabanidae		0.3			0.1
Tipulidae		2.8	3.0	0.8	1.6
GASTROPODA (Snails)					
Lymnaeidae			2.1		0.5
BIVALVIA (Clams)					
Sphaeriidae	3.2	2.8			1.5
OLIGOCHAETA (Worms)					
Naididae	0.5	1.0			0.4
Lumbriculidae	4.4	6.7	7.3		4.6
NEMATODA (Nematodes)			0.2		0.1
OSTEICHTHYES (FISH)			1.0		0.2
HEMIPTERA (True bugs)					
Mesoveliidae	0.4				0 1
TERRESTRIAL ORGANISMS					
TRICHOPTERA (Caddisflies)	0.4		0.1	1.9	0.6
PLECOPTERA (Stoneflies)		1 2	1.9		0.8
DIPTERA (Midges and flies)					
Ceratopogonidae		0 2			0.1
Chironomidae		0.3	0.1		0 1
Empididae		0.2	0.1		0.1
Mycetophilidae			0.1	3.0	0 8
Psychodidae				2.1	0.5

Table 3.97 (cont.)

Age Class Sample Size	0+ n=31	1+ n=52	2+ n=33	3+ n=6	All ages n=122
Sciaridae			0.2		0.1
Simuliidae	3.5	0 2	0.5		1.0
Tabanidae			0.1	0.9	0.2
COLEOPTERA (Beetles)					
Buprestidae			0.1		<0.1
Cantharidae			0.3	1.7	0.5
Carabidae			0.9		0.2
Cerambycidae			0.2		0.1
Chrysomelidae			2.2	4.6	1.7
Curculionidae		0.4	0.6		0.2
Elateridae			0.7	2.1	0.7
Endomychidae				2.0	0.5
Lampyridae		0 3		1.7	0.5
Lathridiidae			0.1	3.8	1 0
Leiodidae			0.1		<0.1
Pselaphidae			0.1		<0.1
Staphylinidae	7.1		0.7		1.9
Tenebrionidae				1.0	0 2
HOMOPTERA (Aphids)					
Aphididae	9.8	2.0	2.1	2.8	4 1
Cercopidae		0.2		1.1	0.3
Cicadellidae		1.3	1.1	3.9	1.6
Delphacidae	0.4				0.1
Psyllidae		0.9	0.2		0.3
HYMENOPTERA (Wasps and ants)					
Apidae		0.5			0.1
Braconidae			0.1	2.0	0.5
Diapriidae				2.0	0.5
Eulophidae		0.2			0.1
Formicidae	2.4	3.6	6.9	9.2	5.5
Ichneumonidae		0.2	1.1	3.1	1 1
Sphecidae			0.1		<0.1
Vespidae				1.3	0 3
ARANEIDA (Spiders)	0.6	1.6	2.3	3.6	2.0
ACARINA (Ticks)				2.0	0.5
LEPIDOPTERA (Moths)	1.0	1.4	1.7	6.0	2.5
ODONATA (Damsel and dragonflies)					
Aeshnidae		0 4	3.2		0.9
NEUROPTERA (Lacewings)					
Chrysopidae			0.1		<0.1
HEMIPTERA (True bugs)					
Miridae		0 5	0.3		0 2
Nabidae			0.1		<0.1
COLLEMBOLA (Springtails)	1.4	0.6	1.6	1.9	1 4
DIPLOPODA (Millipedes)		0.8			0.2
UNIDENTIFIED TERRESTRIAL	8.7	6 3	7.1	6.6	7 2

Table 3.98. Mean annual index of relative importance (IRI) values of prey items consumed by cutthroat trout in Ruby Creek for 1989.

Age Class Sample Size	1+ n=4	2+ n=4	3+ n=1	All ages n=9
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	21.1			7.0
Limnephilidae		2.7		0.9
Rhyacophilidae			24.4	8.1
Trichoptera pupae		5.8		1.9
EPHEMEROPTERA (Mayflies)				
Baetidae	5.2	10.0		5.1
Ephemerellidae	7.3			2.4
PLECOPTERA (Stoneflies)				
Nemouridae	12.2	3.1		5.1
Perlodidae		5.8	26.4	10.7
COLEOPTERA (Beetles)				
Elmidae adult		5.9		2.0
Elmidae larvae		3.6		1.2
LEPIDOPTERA (Moths)				
Pyralidae		4.1		1.4
DIPTERA (Midges and flies)				
Ceratopogonidae		3.1		1.0
Chironomidae larvae	4.7	3.4		2.7
Muscidae		2.4		0.8
Simuliidae	4.9	2.5		1.9
Syrphidae		3.2		1.1
Tipulidae			23.3	7.8
OLIGOCHAETA (Worms)				
Lumbriculidae		3.9	26.0	10.0
TERRESTRIAL ORGANISMS				
TRICHOPTERA (Caddisflies)	4.9			1.6
DIPTERA (Midges and flies)				
Psychodidae	4.7			1.6
COLEOPTERA (Beetles)				
Carabidae	5.0			1.7
Cerambycidae	5.0	2.7		2.6
Lathridiidae	4.2			1.4
HOMOPTERA (Aphids)				
Cicadellidae		2.4		0.8
Psyllidae		9.3		3.1
HYMENOPTERA (Wasps and ants)				
Formicidae	4.8	6.9		3.9
Ichneumonidae		3.2		1.1
Vespidae	6.4			2.1
LEPIDOPTERA (Moths)		5.0		1.7
NEUROPTERA (Lacewings)				
Chrysopidae	4.6	2.4		2.3
HEMIPTERA (True bugs)				
Miridae	4.9			1.6
UNIDENTIFIED TERRESTRIALS		9.6		3.2

(16.0%), followed by Glossosomatidae (7.2%) and Lepidoptera (6.2%). For both age classes combined the highest IRI was for Heptageniidae at 10.4 percent, followed by Brachycentridae (9.2%) and Baetidae (8.8%).

Only one whitefish stomach was analyzed from Ruby Creek. This fish was age 3+ and the IRI values for food items consumed by this fish are presented in Table 3.100. The highest IRI value was for Simuliidae at 21.2 percent, followed by Ephemerellidae (12.0%) and Heptageniidae (10.0%).

3.6.1.3 CEE CEE AH CREEK

A total of 102 brown trout and 100 brook trout stomachs were collected from Cee Cee Ah Creek in 1989 for analysis. Trout food items consisted of 65 families of invertebrates representing 19 orders.

Index of relative importance (IRI) values for prey items consumed by brown trout in Cee Cee Ah Creek are listed in Table 3.101. Age 0+ brown trout had the highest IRI for Heptageniidae at 17.3 percent, followed by Baetidae (10.9%) and Ephemerellidae (10.7%). The age 1+ brown trout had the highest IRI for Nemouridae at 11.8 percent, followed by Limnephilidae (10.0%) and Heptageniidae (9.7%). Brown trout that were age 2+ had the highest IRI for Limnephilidae at 29.8 percent, followed by Formicidae and Lumbriculidae both at 6.6 percent. For age 3+ brown trout the highest IRI was for Limnephilidae at 17.2 percent followed by Lumbriculidae (9.6%) and Brachycentridae (6.8%). For age 4+ brown trout the highest IRI was for Formicidae at 15.1 percent, followed by Trichoptera adult (8.3%) and Pentatomidae (7.0%). For all age classes combined the highest IRI was for Limnephilidae at 14.1 percent followed by Heptageniidae (6.9%) and Formicidae at (5.4%).

Index of relative importance (IRI) values for prey items consumed by brook trout in Cee Cee Ah Creek can be found in Table 3.102. Brook trout that were age 0+ had the highest IRI for Chironomidae larvae at 18.9 percent, followed by Nemouridae (12.4%) and Chironomidae pupae (10.1%). For age 1+ brook trout, the highest IRI was for Chironomidae larvae at 14.9 percent, followed by Limnephilidae (9.7%) and Brachycentridae (5.4%). Age 2+ brook trout had the highest IRI for Limnephilidae (15.1%) followed by unidentified aquatic organisms (8.2%) and Chironomidae larvae (7.3%). For all age classes combined, the highest IRI was for

Table 3.99. Mean annual index of relative importance (IRI) values of prey items consumed by rainbow trout in Ruby Creek for 1989.

Age Class Sample Size	1+ n=2	2+ n=7	All ages n=9
AQUATIC ORGANISMS			
TRICHOPTERA (Caddisflies)			
Brachycentridae	13.9	4.6	9.2
Glossosomatidae		7.2	3.6
Hydropsychidae	5.8	1.5	3.7
Limnephilidae		4.1	2.1
Rhyacophilidae	6.5	5.4	5.9
Trichoptera pupae		1.3	0.6
EPHEMEROPTERA (Mayflies)			
Baetidae	13.5	4.2	8.8
Ephemerellidae		3.6	1.8
Heptageniidae	15.0	5.8	10.4
PLECOPTERA (Stoneflies)			
Nemouridae	11.7		5.8
Perlodidae		3.9	2.0
COLEOPTERA (Beetles)			
Elmidae adult	6.2	3.8	5.0
Elmidae larvae		4.1	2.1
HYDRACARINA (Water mite)		1.6	0.8
LEPIDOPTERA (Moths)			
Pyralidae	5.7	1.7	3.7
DIPTERA (Midges and flies)			
Ceratopogonidae		1.5	0.8
Chironomidae larvae		5.3	2.6
Simuliidae	8.1	1.3	4.7
Syrphidae			
TERRESTRIAL ORGANISMS			
TRICHOPTERA (Caddisflies)		2.9	1.4
DIPTERA (Midges and flies)			
Sciaridae		1.6	0.8
Unidentified		1.5	0.8
COLEOPTERA (Beetles)			
Chrysomelidae		3.9	1.9
Dermestidae		2.3	1.2
HOMOPTERA (Aphids)			
Aphididae		1.5	0.8
HYMENOPTERA (Wasps and ants)			
Formicidae		16.0	8.0
Ichneumonidae		1.7	0.9
Unidentified	6.5		3.2
ARANEIDA (Spiders)	7.1		3.5
LEPIDOPTERA (Moths)		6.2	3.1

Table 3.100. Mean annual index of relative importance (IRI) values of prey items consumed by mountain whitefish in Ruby Creek for 1989.

Age Class Sample Size	3+ n=1
AQUATIC ORGANISMS	
TRICHOPTERA (Caddisflies)	
Brachycentridae	9.3
Hydropsychidae	9.8
Limnephilidae	9.9
Rhyacophilidae	9.2
EPHEMEROPTERA (Mayflies)	
Ephemerellidae	12.0
Heptageniidae	10.0
DIPTERA (Midges and flies)	
Chironomidae larvae	9.3
Simuliidae	21.2
COLEOPTERA (Beetles)	
Hydrophilidae	9.3

Table 3.101. Mean annual index of relative importance (IRI) values of prey items consumed by brown trout in Cee Cee Ah Creek for 1989.

Age Class Sample Size	0+ n=27	1+ n=37	2+ n=18	3+ n=18	4+ n=2	All ages n=102
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	2.5	9.3	3.9	6.8		4.5
Glossosomatidae		0.8	0.6	0.5		0.4
Hydropsychidae	1.1	0.9	2.0	2.8		1.4
Hydroptilidae	1.0	1.5				0.5
Limnephilidae	7.3	10.0	29.8	17.2	6.1	14.1
Rhyacophilidae	1.2	0.6	1.7	3.1		1.3
EPHEMEROPTERA (Mayflies)						
Baetidae	10.9	4.8	1.9			3.5
Ephemerellidae	10.7	5.7	1.0	1.2	5.9	4.9
Heptageniidae	17.3	9.7	5.0	2.6		6.9
PLECOPTERA (Stoneflies)						
Nemouridae	2.0	11.8	3.7			3.5
Perlodidae	2.3	0.5	1.7	2.7		1.4
COLEOPTERA (Beetles)						
Dytiscidae		0.5				0.1
Elmidae adult	2.6	2.2	1.8			1.3
Elmidae larvae	4.8	3.2	0.7	0.6	5.6	3.0
Haliplidae		2.6	5.8	2.0		2.1
Hydrophilidae			0.7			0.1
LEPIDOPTERA (Moths)						
Pyralidae				1.0		0.2
DIPTERA (Midges and flies)						
Ceratopogonidae	0.9		1.7			0.5
Chironomidae larvae	7.9	3.3	2.3			2.7
Chironomidae pupae	5.8	1.0			5.6	2.5
Psychodidae			1.3			0.3
Simuliidae	11.3	3.4	0.7	0.5		3.2
Stratiomyidae			0.7			0.1
Tabanidae			1.3	2.0	5.8	1.8
Tipulidae	1.6			4.3		1.2
HEMIPTERA (True bugs)						
Gerridae		0.4		1.6		0.4
Mesoveliidae				3.0		0.6
GASTROPODA (Snails)						
Lymnaeidae			1.2	3.3		0.9
Physidae		0.2	1.2			0.3
Planorbidae		0.4				0.1
BIVALVIA (Clams)						
Sphaeriidae		1.7	1.3	2.1		1.0
OLIGOCHAETA (Worms)						
Lumbriculidae		9.2	6.6	9.6		5.1

Table 3.101. (cont.)

Age Class Sample Size	0+ n=27	1+ n=37	2+ n=18	3+ n=18	4+ n=2	All ages n=102
OSTEICHTHYES (Fish)		0.3		8.2		1.8
TERRESTRIAL ORGANISMS						
TRICHOPTERA (Caddisflies)	1.3	1.1		1.0	8.3	2.3
PLECOPTERA (Stoneflies)					6.2	1.2
DIPTERA (Midges and flies)						
Bibionidae				0.7		0.1
Chironomidae		0.4				0.1
Sciaridae				0.8		0.2
Simuliidae		0.8	1.7			0.5
COLEOPTERA (Beetles)						
Byrrhidae		0.4				0.1
Carabidae	0.9					0.2
Staphylinidae		0.5		0.7		0.2
HOMOPTERA (Aphids)						
Aphididae	1.1		0.5	0.7		0.5
Cercopidae	0.9	1.2	0.5	4.5	6.5	2.7
Cicadellidae		1.5	2.4	2.6		1.3
Psyllidae	1.5					0.3
HYMENOPTERA (Wasps and ants)						
Apidae				1.1		0.2
Formicidae		2.7	6.6	2.5	15.1	5.4
Ichneumonidae					5.6	1.1
ARANEIDA (Spiders)		1.7	0.7	1.8	5.4	1.9
LEPIDOPTERA (Moths)		0.9	5.1	0.8		1.4
ORTHOPTERA (Grasshoppers)			2.3			0.5
HEMIPTERA (True bugs)						
Nabidae				0.7		0.1
Pentatomidae				0.9	7.0	1.6
DIPLOPODA (Millipedes)		0.2		1.5	5.5	1.4
UNIDENTIFIED TERRESTRIALS	3.0	4.6	1.7	4.6	11.5	5.1

Table 3.102. Mean annual index of relative importance (IRI) values of prey items consumed by brook trout in Cee Cee Ah Creek for 1989.

Age Class Sample Size	0+ n=21	1+ n=53	2+ n=26	All ages n=100
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	1.2	5.4	4.2	3.6
Glossosomatidae	0.5	1.6	0.6	0.9
Hydropsychidae	3.5	0.9		1.5
Hydroptilidae	3.0	2.2		1.7
Limnephilidae	5.9	9.7	15.1	10.2
Rhyacophilidae	0.6	4.5	2.9	2.7
Trichoptera pupae			0.3	0.1
EPHEMEROPTERA (Mayflies)				
Baetidae	7.0	3.1	2.2	4.1
Ephemerellidae	3.0	3.8	1.2	2.7
Heptageniidae	1.5	4.2	2.7	2.8
PLECOPTERA (Stoneflies)				
Chloroperlidae		0.3		0.1
Nemouridae	12.4	5.3	4.7	7.5
Peltoperlidae		1.0	0.6	0.5
Perlodidae		2.9		1.0
COLEOPTERA (Beetles)				
Dytiscidae	3.8	1.2	0.3	1.8
Elmidae adult	1.8	1.2	2.6	1.9
Elmidae larvae	0.6	1.1	0.6	0.8
Hydrophilidae		1.4	1.6	1.0
LEPIDOPTERA (Moths)				
Pyralidae		0.2		0.1
HYDRACARINA (Water mites)	1.0	2.7	1.6	1.8
DIPTERA (Midges and flies)				
Ceratopogonidae	2.7	2.6	1.4	2.2
Chironomidae larvae	18.9	14.9	7.3	13.7
Chironomidae pupae	10.1	3.7	2.6	5.5
Empididae			0.7	0.2
Muscidae		0.3		0.1
Simuliidae		2.3	0.6	1.0
Tipulidae		3.0	5.7	2.9
BIVALVIA (Clams)				
Sphaeriidae	2.4	3.0	0.8	2.1
OLIGOCHAETA (Worms)				
Lumbriculidae		2.5	4.5	2.3
UNIDENTIFIED		2.0	8.2	3.4
TERRESTRIAL ORGANISMS				
TRICHOPTERA (Caddisflies)	3.1	0.5	0.6	1.4
PLECOPTERA (Stoneflies)			3.0	1.0

Table 3.102. (cont.)

Age Class Sample Size	0+ n=21	1+ n=53	2+ n=26	All ages n=100
DIPTERA (Midges and flies)				
Bibionidae		0.3	1.4	0.6
Chironomidae			0.6	0.2
Mycetophilidae		0.2	1.1	0.4
Sciaridae			0.5	0.2
Simuliidae		0.4	1.1	0.5
Tipulidae		0.2		0.1
COLEOPTERA (Beetles)				
Bruchidae			0.3	0.1
Carabidae		0.4	0.3	0.2
Cerambycidae		0.4	0.3	0.2
Curculionidae			0.8	0.3
Lampyridae		0.2		0.1
Lathridiidae			0.3	0.1
Scarabaeidae		0.2		0.1
HOMOPTERA (Aphids)				
Aphididae	1.2	0.3	0.3	0.6
Cercopidae		0.4		0.1
Cicadellidae			0.5	0.2
Psyllidae		0.2		0.1
HYMENOPTERA (Wasps and ants)				
Braconidae		0.4		0.1
Diapriidae	1.5	0.4		0.6
Formicidae	5.0	1.7	2.3	3.0
Ichneumonidae			0.3	0.1
ARANEIDA (Spiders)	0.6	1.1	0.7	0.8
LEPIDOPTERA (Moths)	0.7	0.9	2.1	1.2
ORTHOPTERA (Grasshoppers)			0.6	0.2
COLLEMBOLA (Springtails)		1.8		0.6
DIPLOPODA (Millipedes)			2.5	0.8
UNIDENTIFIED TERRESTRIALS	8.0	3.0	7.5	6.2

Chironomidae larvae at 13.7 percent, followed by Limnephilidae (10.2%) and Nemouridae (7.5%).

3.6.1.4 TACOMA CREEK

Stomachs were collected from 76 brook trout and ten cutthroat trout in Tacoma Creek during 1989. Trout food items consisted of 53 families of invertebrates representing 16 orders.

Index of relative importance (IRI) for prey items consumed by brook trout in Tacoma Creek are presented in Table 3.103. For age 0+ brook trout the highest IRI was for Chironomidae larvae at 20.8 percent, followed by Heptageniidae (7.0%) and Perlodidae (6.3%). For age 1+ brook trout, the highest IRI was for both Brachycentridae and Formicidae at 8.7 percent, followed by Chironomidae larvae (8.1%). Brook trout that were age 2+ had the highest IRI for Lepidoptera (10.4%), followed by Limnephilidae (9.5%) and Nematoda (6.8%). With all the age classes combined the highest IRI was for Chironomidae larvae (1 1.6%), followed by Brachycentridae (7.2%) and Formicidae (5.9%).

Index of relative importance (IRI) values for prey items consumed by cutthroat trout are listed in Table 3.104. Age 0+ cutthroat trout had the highest IRI for Nemouridae at 50.0 percent, followed by Lepidoptera (35.8%) and Chironomidae larvae (14.2%). For age 1+ cutthroat trout, the highest IRI was for Nematoda (37.2%), followed by Lepidoptera (17.0%) and Limnephilidae (10.5%). Cutthroat trout that were age 2+ had the highest IRI for 'Nemouridae and Perlodidae, both at 25.0 percent, followed by Lepidoptera (7.0%). For combined age classes, the highest IRI was for Nemouridae (27.8%), followed by Lepidoptera (19.9%) and Nematoda (12.4%).

3.6.1.5 SKOOKUM CREEK

Stomachs were collected from 96 brown trout, 111 brook trout, and five cutthroat trout in Skookum Creek in 1989. Trout food items consisted of 69 families of invertebrates representing 22 orders.

Index of relative importance (IRI) for prey items consumed by brown trout in Skookum Creek can be found in Table 3.105. For age 0+ brown trout, the highest IRI was for Baetidae at 18.3 percent, followed by Lumbriculidae (11.4%) and Collembola (6.8%). Brown trout that were age 1+ had the highest IRI for Baetidae at 15.3

Table 3.103. Mean annual index of relative importance (IRI) values of prey items consumed by brook trout in Tacoma Creek for 1989.

Age Class Sample Size	0+ n=20	1+ n=38	2+ n=18	All ages n=76
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	6.2	8.7	6.6	7.2
Hydropsychidae	0.7	2.6	2.3	1.9
Hydroptilidae	3.0	0.3		1.1
Limnephilidae	1.0	6.6	9.5	5.7
Lepidostomatidae		0.3	1.0	0.4
Rhyacophilidae		1.3	3.0	1.4
EPHEMEROPTERA (Mayflies)				
Baetidae	4.3	2.5	2.1	3.0
Ephemerellidae	0.8	1.7	1.8	1.4
Heptageniidae	7.0	4.1	1.8	4.3
PLECOPTERA (Stoneflies)				
Nemouridae	4.8	3.0	3.5	3.8
Perlodidae	6.3	1.8	6.7	4.9
COLEOPTERA (Beetles)				
Amphizoidae			0.5	0.2
Dytiscidae		0.5		0.2
Elmidae adult	1.3	5.5	4.0	3.6
Elmidae larvae	2.7	3.3	0.7	2.2
Hydrophilidae		0.7	1.6	0.8
LEPIDOPTERA (Moths)				
Pyralidae			1.6	0.5
HEMIPTERA (True bugs)				
Corixidae		0.5		0.2
HYDRACARINA (Water mites)	2.6	2.4	1.1	2.0
DIPTERA (Midges and flies)				
Ceratopogonidae	1.4	3.2		1.5
Chironomidae larvae	20.8	8.1	5.8	11.6
Chironomidae pupae	4.6	2.0	1.0	2.5
Muscidae	1.4		0.6	0.7
Simuliidae	2.7	2.5	1.2	2.1
Tipulidae	4.6		2.1	2.2
BIVALVIA (Clams)				
Sphaeriidae		2.6		0.9
OLIGOCHAETA (Worms)				
Lumbriculidae	1.4	3.8	2.2	2.5
NEMATODA (Nematodes)	0.6	1.5	6.8	3.0
TERRESTRIAL ORGANISMS				
TRICHOPTERA (Caddisflies)		0.9	0.6	0.5
EPHEMEROPTERA (Mayflies)		0.7		0.2
PLECOPTERA (Stoneflies)		0.5	1.2	0.6
DIPTERA (Midges and flies)				

Table 3.103. (cont.)

Age Class Sample Size	0+ n=20	1+ n=38	2+ n=18	All ages n=76
Bibionidae			0.5	0.2
Mycetophilidae	1.2			0.4
Sciaridae		0.3		0.1
COLEOPTERA (Beetles)				
Buprestidae		0.5		0.2
Byrrhidae		0.5		0.2
Carabidae	0.7		2.2	1.0
Chrysomelidae		0.6	0.5	0.4
Curculionidae		2.4		0.8
Lagriidae		1.5		0.5
Ostomidae			2.5	0.8
Staphylinidae	2.0			0.7
Tenebrionidae	0.3			0.1
HOMOPTERA (Aphids)				
Aphididae	1.4		3.2	1.5
Cicadellidae	2.0	2.3		1.4
Psyllidae	3.4	0.8	0.5	1.6
HYMENOPTERA (Wasps and ants)				
Eulophidae		0.5		0.2
Formicidae	2.5	8.7	6.4	5.9
Ichneumonidae		0.9	0.6	0.5
Mymaridae	2.4			0.8
ARANEIDA (Spiders)		3.4	1.5	1.6
LEPIDOPTERA (Moths)	2.2	3.9	10.4	5.5
HEMIPTERA (True bugs)				
Miridae		0.4		0.1
COLLEMBOLA (Springtails)	2.2			0.7
DIPLOPODA (Millipedes)	0.8			0.3
UNIDENTIFIED TERRESTRIALS	1.4	1.9	2.3	1.7

Table 3.104. Mean annual index of relative importance (IRI) values of prey items consumed by cutthroat trout in Tacoma Creek for 1989.

Age Class Sample Size	0+ n=2	1+ n=5	2+ n=3	All ages n=10
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Hydropsychidae		1.8		0.6
Limnephilidae		10.5	3.0	4.5
EPHEMEROPTERA (Mayflies)				
Baetidae		3.8		1.3
Ephemerellidae		1.9		0.6
PLECOPTERA (Stoneflies)				
Nemouridae	50.0	8.4	25.0	27.8
Perlodidae		4.3	25.0	9.8
COLEOPTERA (Beetles)				
Elmidae adult		2.6	5.6	2.7
Elmidae larvae		1.9		0.6
HYDRACARINA (Water mites)		1.8		0.6
DIPTERA (Midges and flies)				
Ceratopogonidae			2.5	0.8
Chironomidae larvae	14.2	3.6	2.7	6.8
Muscidae			2.7	0.9
Simuliidae		3.5		1.2
Tipulidae		1.8		0.6
NEMATODA (Nematodes)		37.2		12.4
TERRESTRIAL ORGANISMS				
PLECOPTERA (Stoneflies)			2.8	0.9
DIPTERA (Midges and flies)				
COLEOPTERA (Beetles)				
Buprestidae			2.7	0.9
Coccinellidae			4.0	1.3
Elateridae			2.6	0.9
HOMOPTERA (Aphids)				
Aphididae			2.6	0.9
HYMENOPTERA (Wasps and ants)				
Formicidae			6.0	2.0
ARANEIDA (Spiders)			3.2	1.1
LEPIDOPTERA (Moths)	35.8	17.0	7.0	19.9
UNIDENTIFIED TERRESTRIALS			2.6	0.9

percent, followed by Ephemerellidae (12.8%) and Heptageniidae (12.1%). For 2+ brown trout, the highest IRI was for Limnephilidae at 16.7 percent, followed by Lumbriculidae (15.6%) and Heptageniidae (8.5%). Brown trout that were age 3+ had the highest IRI for Lumbriculidae at 27.9 percent, followed by Limnephilidae (7.3%) and Formicidae (7.2%). The 4+ age class of brown trout had the highest IRI for Limnephilidae at 24.4 percent, followed by Salmonidae (13.2%) and Lumbriculidae (11.6%). For all age classes combined, the highest IRI was for Lumbriculidae at 15.1 percent, followed by Limnephilidae (12.9%) and Baetidae (8.6%).

Index of relative importance (IRI) values for prey items consumed by brook trout in Skookum Creek are presented in Table 3.106. Age 0+ brook trout had the highest IRI for both Limnephilidae and Chironomidae larvae at 11.7 percent, followed by Chironomidae pupae (10.0%). Brook trout that were age 1+ had the highest IRI for Limnephilidae at 18.3 percent, followed by Baetidae (11.2%) and Ephemerellidae (9.8%). For 2+ brook trout, the highest IRI was for Limnephilidae at 18.2 percent, followed by Baetidae (8.2%) and Formicidae (8.0%). For all age classes combined, the highest IRI was for Limnephilidae at 16.1 percent, followed by Baetidae (9.1%) and Chironomidae larvae (7.8%).

Index of relative importance for prey items consumed by cutthroat trout in Skookum Creek can be found in Table 3.107. The 0+ age class of cutthroat trout had the highest IRI for Plecoptera at 57.9 percent, followed by Limnephilidae (42.1%). For age 1+ cutthroat trout the highest IRI was for Brachycentridae at 24.1 percent, followed by Formicidae (18.5%) and Limnephilidae (16.8%). For the two age classes combined the highest IRI was for Limnephilidae at 29.4 percent, followed by Plecoptera (29.0%) and Brachycentridae (12.0%).

3.6.2 DIET OVERLAPS

Diet overlaps were determined for fish species captured in LeClerc Creek, Ruby Creek, Cee Cee Ah Creek, Tacoma Creek, and Skookum Creek. Overlaps were calculated to compare the extent of similarity in food selection between species and between the different age classes of each species. High overlaps are ≥ 0.7 and indicate a large proportion of shared food. In general, less than a quarter of the calculated diet overlaps were high. Three quarters of the overlaps in the four Pend Oreille River tributaries were moderate (0.70≤0.50) to low (≤0.50).

Table 3.105. Mean annual index of relative importance (IRI) values of prey items consumed by brown trout in Skookum Creek for 1989.

Age Classes Sample Size	0+ n=21	1+ n=34	2+ n=28	3+ n=11	4+ n=2	All ages n=96
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae			5.5	2.2		1.5
Glossosomatidae	1.1	1 7	0.9			0.7
Hydropsychidae	0.5	2.2	3.1	3.6	7.2	3.3
Limnephilidae	6.6	9.4	16.7	7.3	24.4	12.9
Rhyacophilidae	1.9	0.7	2.6	2.3		1.5
EPHEMEROPTERA (Mayflies)						
Baetidae	18.3	15.3	7.3	2.2		8.6
Ephemerellidae	4.7	12.8	3.1	1.1		4.3
Heptageniidae	2.1	12.1	8.5	5.4	6.7	7.0
PLECOPTERA (Stoneflies)						
Nemouridae	4 5	6.7	2.1	1.1		2 9
Perlodidae		5.1	4.6	4 2		2.8
Pteronarcyidae			1 8	5.8		1 5
COLEOPTERA (Beetles)						
Dytiscidae	2.0			1.0		0 6
Elmidae adult		1 0				0 2
Elmidae larvae		0.7	0.6			0 3
Haliplidae				1.2		0.2
Hydrophilidae	1.2					0 2
HYDRACARINA (Water mites)	0.6					0.1
DIPTERA (Midges and flies)						
Ceratopogonidae	0.5					0 1
Chironomidae larvae	6.0	5.9	2.6	1.2		3.1
Chironomidae pupae	2.0	0.7	1.0		7.2	2.2
SCulicidae	0 5	0 6	3.8	1.4	9 4	0.8
BIVALVIA (Clams)						
Sphaeriidae	3.0					0 6
OLIGOCHAETA (Worms)						
Lumbriculidae	11.4	8 9	15.6	27.9	11.6	15.1
OSTEICHTHYES (fish)			3.2	4 2	13.2	4 5
TERRESTRIAL **ORGANISMS**						
PLECOPTERA (Stoneflies)			0.3	3.5		0.8
DIPTERA (Midges and flies)						
Anthom iidae		0 8				0.2
Dixidae	1.2					0.2
Ephydridae	1.4					0.3
Mycetophilidae	1.6					0 1
Sciaridae		0.8				0.2
Simuliidae	0.5		0.5			0.2
COLEOPTERA (Beetles)						
Byrrhidae			2.1			0.4
Carabidae		0.9		5.3		1.2
HOMOPTERA (Aphids)						
Aphididae						
Cercopidae		0 9				0.2
Cicadellidae			1.0			0.2
HYMENOPTERA (Wasps and ants)						
Braconidae	0.6			1.0		0.3
Encyrtidae	0.6					0.1
Formicidae	1.9	3.0	5.2	7.2	9.3	5 3
ARANEIDA (Spiders)	2.1	2 3	0.3			0.9
LEPIDOPTERA (Moths)	4.5	1 6	0.5	3.3	11.0	4 2
HEMIPTERA (True bugs)						
Miridae		0 5		3.4		0 8
COLLEMBOLA (Springtails)	6.8	0 9	1.0			1 7
ISOPODA		0 7				0 1
UNIDENTIFIED TERRESTRIALS	4 5	1 0	4 8	4.2		2 9

Table 3.106. Mean annual index of relative importance (IRI) values of prey items consumed by brook trout in Skookum Creek for 1989.

Age Class Sample Size	0+ n=37	1+ n=46	2+ n=28	All ages n=111
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	0.3	0.6	1.1	0.7
Glossosomatidae	0.3	0.2	1.0	0.5
Hydropsychidae		0.2	0.7	0.3
Hydroptilidae	0.8	0.9	0.5	0.7
Limnephilidae	11.7	18.3	18.2	16.1
Rhyacophilidae	1.9	0.2	4.2	2.1
EPHEMEROPTERA (Mayflies)				
Baetidae	7.8	11.2	8.2	9.1
Ephemerellidae	6.0	9.8	7.0	7.6
Heptageniidae	2.7	5.3	4.0	4.0
PLECOPTERA (Stoneflies)				
Chloroperlidae		1.1		0.4
Nemouridae	1.0	4.4	2.1	2.5
Perlodidae		0.5	1.8	0.8
COLEOPTERA (Beetles)				
Dytiscidae	0.2	1.3	1.0	0.8
Elmidae adult			0.8	0.3
Haliplidae		0.6		0.2
Hydrophilidae	3.4			1.1
HYDRACARINA (Water mite)	1.3	2.9		1.4
DIPTERA (Midges and flies)				
Ceratopogonidae		1.0	1.3	0.8
Chironomidae larvae	11.7	6.1	5.5	7.8
Chironomidae pupae	10.0	3.7	3.5	5.7
Culicidae	0.8			0.2
Empididae		0.2	1.0	0.4
Simuliidae	3.3			1.1
Stratiomyidae		0.3		0.1
Tipulidae		0.7	0.7	0.5
GASTROPODA (Snails)				
Physidae	0.4	5.2	2.0	2.5
BIVALVIA (Clams)				
Sphaeriidae	0.7	1.6	0.5	0.9
OLIGOCHAETA (Worms)				
Lumbriculidae		7.5	4.1	3.9
TERRESTRIAL ORGANISMS				
TRICHOPTERA (Caddisflies)	1.2	1.2	1.6	1.3
EPHEMEROPTERA (Mayflies)			2.4	0.8
PLECOPTERA (Stoneflies)	1.0	2.0	2.3	1.8
DIPTERA (Midges and flies)				
Chironomidae	5.2			1.7

Table 3.106. (cont.)

Age Class Sample Size	0 + n=37	1 + n=46	2 + n=28	All ages n=111
Empididae			1.8	0.6
Mycetophilidae	1.9	0.4		0.8
Scatopsidae	0.3			0.1
Sciaridae		0.2		0.1
Simuliidae	0.5			0.2
COLEOPTERA (Beetles)				
Cantharidae			0.6	0.2
Carabidae			0.8	0.3
Cerambycidae			0.7	0.2
Chrysomelidae	0.8			0.3
Coccinellidae			0.6	0.2
Curculionidae		0.2	0.6	0.3
Dermestidae		0.2	0.6	0.3
Elateridae			0.6	0.2
Staphylinidae	1.1			0.4
Throscidae	0.5		1.1	0.5
HOMOPTERA (Aphids)				
Aphididae	1.2		0.6	0.6
Cicadellidae	1.1	0.7	0.6	0.8
HYMENOPTERA (Wasps and ants)				
Apidae		2.7		0.9
Diapriidae	0.3	0.2		0.2
Formicidae	3.1	4.1	8.0	5.1
Ichneumonidae	0.9			0.3
Tenthredinidae			0.2	0.1
ARANEIDA (Spiders)	1.7	1.7	5.1	2.8
LEPIDOPTERA (Moths)	1.2			0.4
HEMIPTERA (True bugs)				
Miridae			0.6	0.2
COLLEMBOLA (Springtails)	5.1		0.2	1.8
DIPLOPODA (Millipedes)		1.3		0.4
UNIDENTIFIED TERRESTRIALS	9.0	1.5	1.6	3.9

Table 3.107. Mean annual index of relative importance (IRI) values of prey items consumed by cutthroat trout in Skookum Creek for 1989.

Age Class Sample Size	0 + n=2	1 + n=3	All ages n=5
AQUATIC ORGANISMS			
TRICHOPTERA (Caddisflies)			
Brachycentridae		24.1	12.0
Glossosomatidae		5.6	2.8
Limnephilidae	42.1	16.8	29.4
Rhyacophilidae		8.3	4.2
EPHEMEROPTERA (Mayflies)			
Baetidae		6.2	3.1
Heptageniidae		6.2	3.1
PLECOPTERA (Stoneflies)	57.9	0	29.0
DIPTERA (Midges and flies)			
Chironomidae larvae		7.1	3.6
TERRESTRIAL ORGANISMS			
HYMENOPTERA (Wasps and ants)			
Formicidae		18.5	9.3
UNIDENTIFIED TERRESTRIALS		7.2	3.6

3.6.2.1 LECLERC CREEK

Diet overlaps calculated between brown trout, brook trout, and cutthroat trout in LeClerc Creek are listed in Table 3.108. Brown trout overlapped significantly with brook trout (0.73) but had a low overlap with cutthroat trout (0.44). Brook trout overlapped moderately with cutthroat trout (0.51).

The extent of overlaps between different age classes of brown trout, brook trout, and cutthroat trout can be found in Table 3.109. Significant overlaps between age classes of brown trout occurred between 1+ and 2+ age classes (0.84) and 1+ and 3+ age classes (0.81). The lowest overlap occurred between 0+ and 4+ age classes (0.15). Brook trout overlapped significantly between the 2+ and 3+ age classes (0.75). The lowest overlap value was 0.39 between the 1+ and 3+ age classes. No significant overlaps occurred between the two age classes of cutthroat trout captured.

3.6.2.2 RUBY CREEK

Diet overlaps between brown trout, brook trout, cutthroat trout, rainbow trout, and mountain whitefish in Ruby Creek are presented in Table 3.110. Significant overlaps occurred between brook trout and rainbow trout (0.70) and cutthroat trout and rainbow trout (0.74). The lowest overlap was 0.23 between brown trout and cutthroat trout.

The extent of overlap between age classes of brown trout, brook trout, cutthroat trout and rainbow trout are listed in Table 3.111. For the different age classes of brook trout, significant overlap occurred between 1+ and 2+ age classes (0.78). Lowest overlap was 0.37 between 0+ and 3+ trout.

The were no significant overlaps for the different age classes of brown trout, cutthroat trout, and rainbow trout. All values were in the low range. No intraspecific diet overlaps could be calculated for mountain whitefish as only one age class was captured.

3.6.2.3 CEE CEE AH CREEK

Diet overlaps calculated between brown trout and brook trout in Cee Cee Ah Creek can be found in Table 3.112. Brown trout overlapped significantly with brook trout (0.73).

Table 3.108. Annual diet overlap between trout species in LeClerc Creek, WA. Overlaps based on relative importance values for 1989.

	Brown trout	Brook trout	Cutthroat trout
Brown Trout	1.00	0.73	0.44
Brook Trout		1.00	0.51
Cutthroat Trout			1.00

Table 3.109. Annual diet overlap between age classes of trout species in LeClerc Creek, WA. Overlaps based on relative importance values for 1989.

Brown trout					
Age class	0 +	1 +	2 +	3 +	4 +
0 +	1.00	0.63	0.51	0.25	0.15
1 +		1.00	0.84	0.81	0.55
2 +			1.00	0.63	0.31
3 +				1.00	0.68
4 +					1.00
Brook trout					
Age class	0 +	1 +	2 +	3 +	
0 +	1.00	0.54	0.50	0.51	
1 +		1.00	0.47	0.38	
2 +			1.00	0.75	
3 +				1.00	
Cutthroat trout					
Age class		1 +	2 +		
1 +		1.00	0.33		
2 +			1.00		

Table 3.110. Annual diet overlap between trout species in Ruby Creek, WA. Overlaps based on relative importance values for 1989.

	Brown trout	Brook trout	Cutthroat trout	Rainbow trout	Mountain whitefish
Brown trout	1.00	0.57	0.23	0.63	0.47
Brook trout		1.00	0.58	0.70	0.41
Cutthroat trout			1.00	0.74	0.49
Rainbow trout				1.00	0.50
Mountain whitefish					1.00

Table 3.111. Annual diet overlap between age classes of trout species in Ruby Creek, WA. Overlaps based on relative importance values for 1989.

BROWN TROUT				
	0 +	1 +	2 +	3 +
0 +	1.00	0.27	0.13	0.06
1 +		1.00	0.32	0.13
2 +			1.00	0.16
3 +				1.00
BROOK TROUT				
	0 +	1 +	2 +	3 +
0 +	1.00	0.66	0.58	0.37
1 +		1.00	0.78	0.48
2 +			1.00	0.69
3 +				1.00
CUTTHROAT TROUT				
		1 +	2 +	3 +
1 +		1.00	0.24	0.00
2 +			1.00	0.17
3 +				1.00
RAINBOW TROUT				
		1 +	2 +	
1 +		1.00	0.36	
2 +			1.00	

The extent of overlap between age classes of brown trout and brook trout is shown in Table 3.113. Brown trout overlapped significantly between 2+ and 3+ age classes (0.79). The lowest overlap occurred between 0+ and 4+ age classes (0.25). For the different age classes of brook trout, significant overlap occurred between 0+ and 1+ trout (0.79) and 1+ and 2+ trout (0.79). Low value was a moderate 0.59 between 0+ and 2+ trout.

3.6.2.4 TACOMA CREEK

The diet overlap calculated between brook trout and cutthroat trout in Tacoma Creek was low at 0.48 (Table 3.114).

The extent of overlaps between age classes of brook trout and cutthroat trout can be found in Table 3.115. Brook trout experienced a significant overlap between 1+ and 2+ age classes (0.78). The lowest overlap for brook trout occurred between 0+ and 2+ age classes at a moderate 0.55. Cutthroat trout experienced no significant overlap between the different age classes. The highest overlap was 0.57 between 0+ and 2+ age classes and the lowest was 0.29 between 1+ and 2+ age classes.

3.6.2.5 SKOOKUM CREEK

Diet overlaps calculated for brown trout, brook trout, and cutthroat trout are listed in Table 3.116. Significant overlap occurred between brown trout and brook trout (0.79). Cutthroat trout had low overlaps with brown trout (0.39).and brook trout (0.48).

Table 3.117 presents the extent of diet overlap between age classes of brown trout, brook trout and cutthroat trout in Skookum Creek. Significant overlaps for the different age classes of brown trout occurred between 0+ and 1+ age classes (0.79), 1+ and 2+ age classes (0.77), 2+ and 3+ age classes (0.79), and 2+ and 4+ age classes (0.70). Lowest overlap was 0.38 between 0+ and 4+ age classes.

Brook trout overlapped significantly between all age classes. High overlap values ranged from 0.91 between 1+ and 2+ age classes to 0.74 between 0+ and 1+ age classes.

Cutthroat trout diet overlap was low (0.21) between 0+ and 1+ age classes. No other age classes of cutthroat trout were captured.

Table 3.112. Annual diet overlap between trout species in Cee Cee Ah Creek, WA. Overlaps based on relative importance values for 1989.

	Brook trout	Brown trout
Brook Trout	1.00	0.73
Brown Trout		1.00

Table 3.113. Annual diet overlap between age classes of trout species in Cee Cee Ah Creek, WA. Overlaps based on relative importance vaiues for 1989.

BROWN TROUT					
	0 +	1 +	2 +	3 +	4 +
0 +	1.00	0.67	0.40	0.33	0.25
1 +		1.00	0.64	0.64	0.28
2 +			1.00	0.79	0.33
3 +				1.00	0.37
4 +					1.00
BROOK TROUT					
	0 +	1 +	2 +		
0 +	1.00	0.79	0.59		
1 +		1.00	0.79		
2 +			1.00		

Table 3.114. Annual diet overlap between trout species in Tacoma Creek, WA. Overlaps based on relative importance values for 1989.

	Brook trout	Cutthroat trout
Brook Trout	1.00	0.48
Cutthroat Trout		1.00

Table 3.115. Annual diet overlap between age classes of trout species in Tacoma Creek, WA. Overlaps based on relative importance values for 1989.

BROOK TROUT			
	0 +	1 +	2 +
0 +	1.00	0.66	0.55
1 +		1.00 .	0.78
2 +			1.00
CUTTHROAT TROUT			
	0 +	1 +	2 +
0 +	1.00	0.36	0.57
1 +		1.00	0.29
2 +			1.00

Table 3.116. Annual diet overlap between trout species in Skookum Creek, WA. Overlaps based on relative importance values for 1989.

	Brook trout	Brown trout	Cutthroat trout
Brook Trout	1.00	0.79	0.48
Brown Trout		1.00	0.39
Cutthroat Trout			1.00

Table 3.117. Annual diet overlaps between age classes of trout species in Skookum Creek, WA. Overlaps based on relative importance values for 1989.

BROWN TROUT					
	0 +	1 +	2 +	3 +	4 +
0 +	1.00	0.79	0.67	0.52	0.38
1 +		1.00	0.77	0.53	0.44
2 +			1.00	0.79	0.70
3 +				1.00	0.55
4 +					1.00
BROOK TROUT					
	0 +		2 +		
0 +	1.00	0.74	0.76		
1 +		1.00	0.91		
2 +			1.00		
CUTTHROAT TROUT					
	0 +	1 +			
0 +	1.00	0.21			
1 +		1.00			

3.6.3 BENTHIC AND DRIFTING INVERTEBRATE ELECTIVITIES

3.6.3.1 LECLERC CREEK

The measure of prey selection (electivity) for benthic and drifting invertebrates was determined for each age class of brown trout, brook trout, and cutthroat trout in LeClerc Creek.

Brown trout electivities for benthic invertebrates are listed in Table 3.118 and electivities for drifting invertebrates are listed in Table 3.119. Limnephilidae was selected most by age 0+, 1+, 3+, 4+ and combined age classes of brown trout from both the benthos (0.076, 0.287, 0.420, 0.995, and 0.395, respectively) and the drift (0.081, 0.292, 0.245, 1 .000, and 0.400, respectively). The highest electivity by 2+ brown trout was for Brachycentridae from both the benthos (0.222) and the the drift (0.224).

Brook trout electivities for benthic invertebrates are listed in Table 3.120 and electivities for drifting invertebrate are listed in Table 3.121. The highest electivity by age 0+ brook trout from the benthos was for Chironomidae pupae (0.159) and from the drift was for Aphididae (0.135). The highest electivity by age 1+ brook trout was for Brachycentridae from both the benthos (0.219) and the drift (0.221). The highest electivity by 2+, 3+, and combined age classes from the benthos was for Limnephilidae with values of 0.327, 0.320, and 0.191, respectively. Limnephilidae was also selected for most from the drift by 2+, 3+, and combined age classes with values of 0.332, 0.325, and 0.196, respectively.

Cutthroat trout electivities for benthic invertebrates are listed in Table 3.122 and electivities for drifting invertebrates are listed in Table 3.123. The highest electivity by age 1+ cutthroat trout and combined age classes was for Limnephilidae from both the benthos (0.170 and 0.116, respectively) and the drift (0.175 and 0.121, respectively). Brachycentridae was selected for most often by age 2+ cutthroat trout from both the benthos (0.225) and the drift (0.227).

Table 3.118. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of brown trout in LeClerc Creek for 1989.

PREY ORGANISMS	% Environ	0+ n=20	1+ n=17	2+ n=10	3+ n=6	4+ n=4	All ages n=57
AQUATIC ORGANISMS							
TRICHOPTERA (Caddisflies)							
Brachycentridae	4.1	-0.034	0.086	0.222	0.085	-0.041	0.064
Glossosomatidae	1.5	-0.010	-0.015	0.003	-0.015	-0.015	-0.010
Hydropsychidae	1.3	-0.013	-0.013	-0.013	-0.013	-0.013	-0.013
Hydroptilidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Limnephilidae	0.5	0.076	0.287	0.198	0.420	0.995	0.395
Lepidostomatidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Psychomyiidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Rhyacophilidae	2.3	-0.023	0.019	0.020	0.010	-0.023	0.001
Trichoptera pupae	0.2	-0.002	0.009	-0.002	-0.002	-0.002	0
EPHEMEROPTERA (Mayflies)							
Baetidae	27.3	-0.032	-0.207	-0.213	-0.273	-0.273	-0.199
Ephemerellidae	7.2	-0.020	-0.040	-0.031	-0.072	-0.072	-0 047
Heptageniidae	7.1	0.008	0.049	0.017	-0.071	-0.071	-0.014
Leptophilibidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0 001
PLECOPTERA (Stoneflies)							
Capniidae	<0.1	0	0	0	0	0	0
Chloroperlidae	2.7	-0.027	-0.025	0.027	-0.027	-0.027	-0.027
Nemouridae	0.3	-0.003	0.002	-0.003	0.004	-0.003	-0.001
Perlodidae	0.7	-0.007	-0.007	-0.007	-0.007	-0.007	-0.007
Perlidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
ODONATA (Damsel and dragonflies)							
Coenagrioniidae	<0.1	0.000	0.000	0.000	0.000	0.000	0.000
COLEOPTERA (Beetles)							
Elmidae adult	0.3	-0.003	0.002	-0.003	-0.003	-0.003	-0.002
Elmidae larvae	4.8	-0.044	-0.048	-0.023	-0.048	-0.048	-0.042
Haliplidae	0	0	0.004	0	0	0	0.001
Hydrophilidae	0	0.005	0.000	0	0	0	0.001
HYDRACARINA (Water mites)	0.3	0.002	-0.003	-0.003	-0.003	-0.003	-0.002
DIPTERA (Midges and flies)							
Ceratopogonidae	0.2	0.004	-0.002	-0.002	-0.002	-0.002	-0.001
Chironomidae larvae	31.4	-0.101	-0.227	-0.314	-0.314	-0.314	-0.254
Chironomidae pupae	0.6	0.071	-0.013	-0.006	-0.006	-0.006	-0.013
Culicidae	0	0.005	0	0	0	0	0.001
Dolichopodidae	<0.1	0	0	0	0	0	0
Empididae	<0.1	0	0	0	0	0	0
Psychodidae	<0.1	0	0	0	0	0	0
Sciomyzidae	<0.1	0	0	0	0	0	0
Simuliidae	1.7	0.011	-0.014	-0.017	-0 017	-0 017	-0 011
Tabanidae	<0.1	0	0	0	0	0	0
Tipulidae	0 2	-0.001	-0.002	-0.002	-0.002	-0.002	-0 002
GASTROPODA (Snails)							
Planorbidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0 001
BIVALVIA (Clams)							
Sphaeriidae	<0.1	0.000	0.000	0.000	0.000	0.000	0.000
OLIGOCHAETA (Worms)							
Naididae	2.2	-0.020	-0 022	-0 022	-0 022	-0 022	-0.022

Table 3.118. (cont.)

PREY ORGANISMS	% Environ.	0+ n=20	1+ n=17	2+ n=10	3+ n=6	4+ n=4	All ages n=57
Lumbriculidae	1.5	-0.010	-0.015	0.038	-0.015	-0.015	0.012
TURBELLARIA (Flatworms)							
Planariidae	0.7	-0.007	-0.007	-0.007	-0.007	-0.007	-0.007
NEMATODA (Nematodes)	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
TERRESTRIAL ORGANISMS							
TRICHOPTERA (Caddisflies)	0	0.012	0.007	0.011	0.009	0	0.008
PLECOPTERA (Stoneflies)	0	0.004	0.005	00	0	0	0.002
DIPTERA (Midges and flies)							
Bibionidae	0	0	0.004	0	0	0	0.001
Ceratopogonidae	<0.1	0	0	0	0	0	0
Chironomidae	0	0.009	0	0	0	0	0.002
Empididae	0	0.002	0	0	0	0	0
Sciaridae	0	0.003	0.007	0	0.009	0	0.004
Simuliidae	0	0.006	0	0	0	0	0.001
COLEOPTERA (Beetles)							
Carabidae	0	0	0.002	0	0	0	0
Chrysomelidae	0	0	0	0	0.009	0	0.002
HOMOPTERA (Aphids)							
Aphididae	0.1	0.028	0.023	-0.001	-0.001	-0.001	0.010
Cicadellidae	<0.1	0	0.002	0.006	0	0	0.002
HYMENOPTERA (Wasps and ants)							
Formicidae	0	0	0.075	0.153	0.294	0	0.104
THYSANOPTERA (Thrips)							
Thripidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
ARANEIDA (Spiders)	<0.1	0	0.002	0.003	0.009	0	0.003
LEPIDOPTERA (Moths)	0	0.015	0.011	0.028	0	0	0.011
ORTHOPTERA (Grasshoppers)	0	0	0	0	0.007	0	0.001
COLLEMBOLA (Springtails)	<0.1	0	0	0	0	0	0
UNIDENTIFIED TERRESTRIALS	0	0.121	.0.034	0.006	0.063	0.000	0.045

Table 3.119. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of brown trout in LeClerc Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=20	1+ n=17	2+ n=10	3+ n=6	4+ n=4	All ages n=57
AQUATIC ORGANISMS							
TRICHOPTERA (Caddisflies)							
Brachycentridae	3.9	-0.032	0.088	0.224	0.087	-0.039	0.066
Glossosomatidae	0.5	0	-0.005	0.013	-0.005	-0.005	0
Hydropsychidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Limnephilidae	0	0.081	0.292	0.203	0.425	1.000	0.400
Polycentropodidae	<0.1	0	0	0	0	0	0
Rhyacophilidae	0.9	-0.009	0.033	0.034	0.024	-0.009	0.015
Trichoptera pupae	0	0.000	0.011	0.000	0.000	0.000	0.002
EPHEMEROPTERA (Mayflies)							
Baetidae	23.7	0.003	-0.169	-0.177	-0.237	-0.237	-0.163
Ephemerellidae	4.3	0.009	-0.011	-0.002	-0.043	-0.043	0.018
Heptageniidae	1.0	0.069	0.110	0.078	-0.010	-0.010	0.047
Leptophilibidae	0.2	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
PLECOPTERA (Stoneflies)							
Chloroperlidae	1.9	-0.019	-0.017	-0.019	-0.019	-0.019	-0.019
Nemouridae	0	-0.008	-0.003	-0.008	-0.001	-0.008	-0.006
Perlodidae	0.2	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Perlidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
COLEOPTERA (Beetles)							
Dytiscidae	0.3	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
Elmidae adult	2.1	-0.021	-0.016	-0.021	-0.021	-0.021	-0.020
Elmidae larvae	7.1	-0.067	-0.071	-0.046	-0.071	-0.071	-0.065
Georyssidae	0.5	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Haliplidae	0	0	0.004	0	0	0	0.001
Hydrophilidae	<0.1	0.005	0	0	0	0	0.001
HYDRACARINA (Mites)	2.0	-0.015	-0.020	-0.020	-0.020	-0.020	-0.019
DIPTERA (Midges and flies)							
Ceratopogonidae	<0.1	0.006	0	0	0	0	0.001
Chironomidae larvae	15.7	0.056	0.070	-0.157	-0.157	-0.157	0.097
Chironomidae pupae	13.5	-0.058	-0.116	-0.135	-0.135	-0.135	-0.116
Culicidae	0.0	0.005	0.000	0.000	0.000	0.000	0.001
Dixidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Mycetophilidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Psychodidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Simuliidae	7.6	-0.048	-0.073	-0.076	-0.076	-0.076	-0.070
Stratiomyidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Tipulidae	0.5	-0.004	-0.005	-0.005	-0.005	-0.005	-0.005
OLIGOCHAETA (Worms)							
Naididae	0	0.002	0	0	0	0	0
Lumbriculidae	0.5	0	-0.005	0.048	-0.005	-0.005	0.007
HIRUDINEA (Leeches)	0.2	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002

Table 3.119. (cont.)

PREY ORGANISMS	% Environ.	0+ n=20	1+ n=17	2+ n=10	3+ n=6	4+ n=4	All ages n=57
GASTROPODA (Planorbidae)							
Lymnaeidae	<0.1	0	0	0	0	0	0
BIVALVIA (Clams)							
Sphaeriidae	<0.1	0	0	0	0	0	0
TERRESTRIAL ORGANISMS							
TRICHOPTERA	0.6	0.006	0.001	0.005	0.003	-0.006	0.002
EPHEMEROPTERA	2.5	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025
PLECOPTERA	0	0.004	0.005	0	0	0	0.002
DIPTERA (Midges and flies)							
Bibionidae	0	0	0.004	0	0	0	0.001
Ceratopogonidae	0.5	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Chironomidae	0	0.009	0	0	0	0	0.002
Empididae	0.7	-0.007	-0.007	-0.007	-0.007	-0.007	0.007
Mycetophilidae	0.6	-0.006	-0.006	-0.006	-0.006	-0.006	-0.006
Sciaridae	<0.1	0.003	0.007	0.000	0.009	0.000	0.004
Simuliidae	1.2	-0.012	-0.006	-0.012	-0.012	-0.012	-0.011
COLEOPTERA (Beetles)							
Carabidae	0.2	-0.002	0	-0.002	-0.002	-0.002	-0.002
Chrysomelidae	0	0	0	0	0.009	0	0.002
Coccinellidae	<0.1	0	0	0	0	0	0
Curculionidae	<0.1	0	0	0	0	0	0
Dermestidae	<0.1	0	0	0	0	0	0
Staphylinidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
HOMOPTERA (Aphids)							
Aphididae	2.5	0.004	-0.001	-0.025	-0.025	-0.025	0.014
Cicadellidae	0.2	-0.002	0	0.004	-0.002	-0.002	0
HYMENOPTERA (Wasps and ants)							
Eurytomidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Formicidae	0.5	-0.005	0.070	0.148	0.289	-0.005	0.099
Ichneumonidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Pteromalidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
PSOCOPTERA (Psocids)							
Psocidae	0.4	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004
ARANEIDA (Spiders)	0.3	-0.003	-0.001	0	0.006	-0.003	0
LEPIDOPTERA (Moths)	0	0.015	0.011	0.028	0	0	.011
ORTHOPTERA (Grasshoppers)	0.0	0	0	0	0.007	0	0.001
NEUROPTERA (Lacewings)							
Chrysopidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
HEMIPTERA (True bugs)							
Lygaeidae	<0.1	0	0	0	0	0	0
COLLEMBOLA (Springtails)	0.3	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
UNIDENTIFIED TERRESTRIALS	0.5	0.116	0.029	0.001	0.058	-0.005	0.040

Table 3.120. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of brook trout in LeClerc Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=22	1+ n=36	2+ n=12	3+ n=4	All ages n=74
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	4.1	-0.004	0.219	0.034	0	0.052
Glossosomatidae	1.5	-0.015	-0.015	-0.015	-0.015	-0.015
Hydropsychidae	1.3	-0.013	-0.009	-0.011	-0.013	-0.011
Hydroptilidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Limnephilidae	0.5	0.072	0.044	0.327	0.320	0.191
Lepidostomatidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Psychomyiidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Rhyacophilidae	2.3	-0.017	-0.020	-0.013	-0.023	-0.018
Trichoptera pupae	0.2	0.002	0.002	-0.001	0.056	0.014
EPHEMEROPTERA (Mayflies)						
Baetidae	27.3	-0.245	-0.215	-0.273	-0.244	-0.244
Ephemerellidae	7.2	-0.064	-0.039	-0.058	-0.035	-0.049
Heptageniidae	7.1	-0.008	-0.047	-0.008	-0.071	-0.033
Leptophlebiidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
PLECOPTERA (Stoneflies)						
Capniidae	<0.1	0	0	0	0	0
Chloroperlidae	2.7	-0.027	-0.027	-0.027	-0.027	-0.027
Nemouridae	0.3	0.004	-0.003	-0.003	-0.003	-0.001
Perlodidae	0.7	-0.003	0.010	-0.007	-0.007	-0.002
Perlidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
ODONATA						
Coenagrionidae	<0.1	0	0	0	0	0
COLEOPTERA (Beetles)						
Amphizoidae	0	0	0.001	0	0	0
Dytiscidae	0	0	0.001	0	0	0
Elmidae adult	0.3	0.008	0.023	0.001	-0.003	0.007
Elmidae larvae	4.8	-0.041	-0.048	-0.048	-0.048	-0.046
Haliplidae	0	0	0.023	0.011	0	0.009
Hydrophilidae	0	0	0.019	0.005	0	0.006
LEPIDOPTERA (Moths)						
Pyralidae	0	0.037	0.011	0.032	0.027	0.027
HYDRACARINA (Mites)	0.3	0.026	0.041	-0.003	-0.003	-0.015
DIPTERA (Midges and flies)						
Ceratopogonidae	0.2	0.004	0.001	0.002	0.013	0.005
Chironomidae larvae	31.4	-0.266	-0.257	-0.263	-0.314	-0.275
Chironomidae pupae	0.6	0.159	0.009	0.052	-0.006	0.054
Culicidae	0	0.004	0.008	0	0	0.003
Dolichopodidae	<0.1	0	0	0	0	0
Empididae	<0.1	0	0	0	0	0
Muscidae	0	0	0	0.003	0	0.001
Psychodidae	<0.1	0	0	0	0	0
Sciomyzidae	<0.1	0	0	0	0	0
Simuliidae	1.7	0.004	-0.004	-0.015	-0.012	-0.001

Table **3.120.** (cont.)

PREY ORGANISMS	% Environ	0+ n=22	1+ n=36	2+ n=12	3+ n=4	All ages n=74
Tabanidae	<0.1	0	0	0	0	0
Tipulidae	0.2	-0.002	0.002	0.001	-0.002	0
GASTROPODA (Snails)						
Planorbidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
BIVALVIA (Clams)						
Sphaeriidae	<0.1	0	0	0	0	0
OLIGOCHAETA (Worms)						
Naididae	2.2	-0.022	-0.022	-0.022	-0.022	-0.022
Lumbriculidae	1.5	-0.010	-0.014	-0.005	-0.015	-0.011
TURBELLARIA (Flat worms)						
Planariidae	0.7	-0.007	-0.007	-0.007	-0.007	-0.007
NEMATODA	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
TERRESTRIAL ORGANISMS						
TRICHOPTERA	0	0.009	0.005	0.001	0	0.004
PLECOPTERA	0	0	0.008	0.011	0	0.005
DIPTERA (Midges and flies)						
Ceratopogonidae	<0.1	0	0	0	0	0
Chironomidae	0	0.004	0	0	0	0.001
Empididae	0	0	0.008	0	0	0.002
Mycetophilidae	0	0.008	0.014	0.002	0.040	0.016
Sciaridae	0	0	0.019	0.003	0.027	0.012
Simuliidae	0	0.018	0.010	0	0.000	0.007
COLEOPTERA (Beetles)						
Byrrhidae	0	0	0	0.001	0	0
Cerambycidae	0	0	0	0	0.015	0.004
Curculionidae	0	0	0	0.001	0	0
Elateridae	0	0	0.003	0	0	0.001
Lampyridae	0	0.008	0.003	0	0	0.003
Staphylinidae	0	0	0	0	0.013	0.003
HOMOPTERA (Aphids)						
Aphididae	0.1	0.135	0.037	0.001	0.026	0.050
Cercopidae	0	0	0.009	0.009	0	0.005
Cicadellidae	<0.1	0.004	0.001	0.011	0	0.002
Psyllidae	0	0.052	00	0.012	0	0.016
HYMENOPTERA (Wasps and ants)						
Diapriidae	0		0.008	0.002		0.003
Formicidae	0	0.067	0.040	0.148	0.153	0.102
Ichneumonidae	0			0.011	0.053	0.016
Unidentified	0		0.004			0.001
THYSANOPTERA (Thrips)						
Thripidae	0.1	0.001	0.001	0.001	0.001	0.001
ARANEIDA (Spiders)	<0.1	0.006	0.006	0.001	0.000	0.003
LEPIDOPTERA (Moths)	0	0.014	0.032	0.015	0.044	0.026
ORTHOPTERA (Grasshoppers)	0	0	0.006	0	0	0.002
ODONATA (Damsel and dragonflies)						
Aeshnidae	0	0	0	0	0.015	0.004
NEUROPTERA (Lacewings)						
Chrysopidae	0	0	0	0.002	0	0.001
COLLEMBOLA (Springtails)	<0.1	0.004	0	0	0	0.001
DIPLOPODA (Centipedes)	0	0.011	0	0.003	0	0.004

Table 3.121. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of brook trout in LeClerc Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=22	1+ n=36	2+ n=12	3+ n=4	All ages n=74
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	3.9	-0.002	0.221	0.036	-0.039	0.054
Glossosomatidae	0.5	-0.005	-0.005	-0.005	-0.005	-0.005
Hydropsychidae	0.1	-0.001	0.003	0.001	-0.001	0.001
Limnephilidae	0	0.077	0.049	0.332	0.325	0.196
Polycentropodidae	<0.1	0	0	0	0	0
Rhyacophilidae	0.9	-0.003	-0.006	0.001	-0.009	-0.004
Trichoptera pupae	0	0.004	0.002	0.001	0.058	0.016
EPHEMEROPTERA (Mayflies)						
Baetidae	23.7	-0.209	-0.180	-0.237	-0.208	-0.208
Ephemerellidae	4.3	-0.035	-0.010	-0.029	-0.006	-0.020
Heptageniidae	1.0	-0.053	0.014	0.053	-0.010	-0.028
Leptophilibidae	0.2	-0.002	-0.002	-0.002	-0.002	-0.002
PLECOPTERA (Stoneflies)						
Chloroperlidae	1.9	-0.019	-0.019	-0.019	-0.019	-0.019
Nemouridae	0	-0.001	-0.008	-0.001	-0.001	-0.006
Perlodidae	0.2	0.002	-0.015	-0.002	-0.002	0.003
Perlidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
COLEOPTERA (Beetles)						
Amphizoidae	0	0	0.001	0	0	0
Dytiscidae	0.3	-0.003	-0.002	-0.003	-0.003	-0.003
Elmidae adult	2.1	-0.010	0.005	-0.017	-0.021	-0.011
Elmidae larvae	7.1	-0.064	-0.071	-0.071	-0.071	-0.069
Georyssidae	0.5	-0.005	-0.005	-0.005	-0.005	-0.005
Haliplidae	0	0.023	0.011	0	0	0.006
Hydrophilidae	<0.1	0	0.019	0.005	0	0.006
LEPIDOPTERA (Moths)						
Pyralidae	0	0.037	0.011	0.032	0.027	0.027
HYDRACARINA (Mites)	2.0	0.009	0.022	-0.020	-0.020	-0.002
DIPTERA (Midges and flies)						
Ceratopogonidae	<0.1	0.006	0.003	0.002	0.015	0.007
Chironomidae larvae	15.7	-0.109	-0.100	-0.106	-0.157	-0.118
Chironomidae pupae	13.5	0.030	-0.120	-0.077	-0.135	-0.075
Culicidae	0	0.004	0.008	0	0	0.003
Dixidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Muscidae	0	0	0.000	0.003	0	0
Mycetophilidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Psychodidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Simuliidae	7.6	-0.055	-0.063	-0.074	-0.047	-0.060
Stratiomyidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Tipulidae	0.5	-0.005	-0.001	-0.002	-0.005	-0.003
HIRUDINEA (Leeches)	0.2	-0.002	-0.002	-0.002	-0.002	-0.002
GASTROPODA (Snails)						
Lymnaeidae	<0.1	0	0	0	0	0

Table 3.121. (cont.)

PREY ORGANISMS	% Environ.	0+ n=22	1+ n=36	2+ n=12	3+ n=4	All ages n=74
BIVALVIA (Clams)						
Sphaeriidae	<0.1	0	0	0	0	0
OLIGOCHAETA (Worms)						
Lumbriculidae	0.5	0	-0.004	0.005	-0.005	-0.001
TERRESTRIAL ORGANISMS						
TRICHOPTERA	0.6	0.003	-0.001	-0.005	-0.006	-0.002
EPHEMEROPTERA	2.5	-0.025	-0.025	-0.025	-0.025	-0.025
PLECOPTERA	0.0	0.000	0.008	0.011	0	0.005
DIPTERA (Midges and flies)						
Ceratopogonidae	0.5	-0.001	-0.005	-0.005	-0.005	-0.004
Empididae	0.7	-0.007	0.001	-0.007	-0.007	-0.005
Mycetophilidae	0.6	0.002	0.008	-0.004	0.034	0.010
Sciaridae	<0.1	0	0.019	0.003	0.027	0.012
Simuliidae	1.2	0.006	-0.002	-0.012	-0.012	-0.005
COLEOPTERA (Beetles)						
Byrrhidae	0	0	0	0.001	0	0
Carabidae	0.2	-0.002	-0.002	-0.002	-0.002	-0.002
Cerambycidae	0	0	0	-0	0.015	0.004
Chrysomelidae	<0.1	0	0	0	0	0
Curculionidae	<0.1	0	0	0.001	0	0
Dermestidae	<0.1	0	0	0	0	0
Elateridae	0	0	0.003	0	0	0.001
Lampyridae	0	0.008	0.003	0	0	0.003
Staphylinidae	0.1	-0.001	-0.001	-0.001	0.012	0.002
HOMOPTERA (Aphids)						
Aphididae	2.5	0.121	0.013	-0.023	0.002	0.026
Cercopidae	0	0	0.009	0.009	0	0.005
Cicadellidae	0.2	0.002	-0.001	0.009	-0.002	0
Psyllidae	0	0.052	0	0.012	0	0.016
HYMENOPTERA (Wasps and ants)						
Diapriidae	0	0	0.008	0.002	0	0.003
Eurytomidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Formicidae	0.5	0.062	0.035	0.143	0.149	0.097
Ichneumonidae	0.1	-0.001	-0.001	0.010	0.052	0.015
Pteromalidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
PSOCOPTERA (Psocids)						
Psocidae	0.4	-0.004	-0.004	-0.004	-0.004	-0.004
ARANEIDA (Spiders)	0.3	0.003	0.003	-0.002	-0.003	0
LEPIDOPTERA (Moths)	0	0.014	0.032	0.015	0.044	0.026
ORTHOPTERA	0	0	0.006	0.000	0.000	0.002
ODONATA (Damsel and dragonflies)						
Aeshnidae	0	0	0	0	0.015	0.004
NEUROPTERA (Lacewings)						
Chrysopidae	0.1	-0.001	-0.001	0.001	-0.001	-0.001
HEMIPTERA (True bugs)						
Lygaeidae	<0.1	0	0	0	0	0
Unidentified	0	0.006	0	0	0	0.002
COLLEMBOLA (Springtails)	0.3	0.001	-0.003	-0.003	-0.003	-0.002
DIPLOPODA (Centipedes)	0	0.011	0	0.003	0	0.004
UNIDENT. TERRESTRIALS	0.5	0.083	0.042	0.003	0.048	0.044

Table 3.122. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of cutthroat trout in LeClerc Creek for 1989.

PREY ORGANISMS	% Environ.	1+ n=5	2+ n=4	All ages n=9
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	4.1	-0.016	0.225	0.105
Glossosomatidae	1.5	-0.015	-0.007	-0.011
Hydropsychidae	1.3	-0.013	0.120	0.054
Hydroptilidae	0.1	-0.001	0.014	0.007
Limnephilidae	0.5	0.170	0.062	0.116
Lepidostomatidae	0.1	-0.001	-0.001	-0.001
Psychomyiidae	0.1	-0.001	-0.001	-0.001
Rhyacophilidae	2.3	-0.010	-0.008	-0.010
Trichoptera pupae	0.2	-0.002	-0.002	-0.002
EPHEMEROPTERA (Mayflies)				
Baetidae	27.3	0.077	-0.199	-0.061
Ephemerellidae	7.2	-0.089	-0.050	-0.054
Heptageniidae	7.1	-0.071	-0.015	-0.043
Leptophilibidae	0.1	-0.001	-0.001	-0.001
PLECOPTERA (Stoneflies)				
Capniidae	<0.1	0.0	0.000	0.000
Chloroperlidae	2.7	-0.027	-0.027	-0.027
Nemouridae	0.3	-0.003	0.005	0.001
Perlodidae	0.7	-0.007	-0.007	-0.007
Perlidae	0.1	-0.001	-0.001	-0.001
COLEOPTERA (Beetles)				
Dytiscidae	0	0.000	0.008	0.004
Elmidae adult	0.3	-0.003	0.005	0.001
Elmidae larvae	4.8	-0.048	-0.022	-0.035
Hydrophilidae	0.0	0.019	0.000	0.010
LEPIDOPTERA (Moths)				
Pyralidae	0	0.000	0.011	0.006
HYDRACARINA (Water mites)	0.3	-0.003	-0.003	-0.003
DIPTERA (Midges and flies)				
Ceratopogonidae	0.2	-0.002	-0.002	-0.002
Chironomidae larvae	31.4	-0.289	-0.027	-0.279
Chironomidae pupae	0.6	0.052	-0.006	0.023
Dolichopodidae	<0.1	0.000	0.000	0.000
Empididae	<0.1	0.000	0.000	0.000
Psychodidae	<0.1	0.000	0.000	0.000
Sciomyzidae	<0.1	0.000	0.000	0.000
Simuliidae	1.7	-0.017	-0.017	-0.017
Tabanidae	<0.1	0.000	0.000	0.000
Tipulidae	0.2	-0.002	0.028	0.013
GASTROPODA (Snails)				
Planorbidae	0.1	-0.001	-0.001	-0.001
BIVALVIA (Clams)				
Sphaeriidae	<0.1	0.000	0.000	0.000

Table 3.122. (cont.)

PREY ORGANISMS	% Environ.	1+ n=5	2+ n=4	All ages n=9
OLIGOCHAETA (Worms)				
Naididae	2.2	-0.022	-0.022	-0.022
Lumbriculidae	1.5	-0.015	-0.007	-0.011
TURBELLARIA (Flatworms)				
Planariidae	0.7	-0.007	-0.007	-0.007
NEMATODA (Nematodes)	0.1	-0.001	-0.001	-0.001
TERRESTRIAL ORGANISMS				
PLECOPTERA (Stoneflies)	0	0.057	0.000	0.029
DIPTERA (Midges and flies)				
Ceratopogonidae	<0.1	0.000	0.000	0.000
Empididae	0	0.000	0.008	0.004
Mycetophilidae	0	0.019	0.000	0.010
HOMOPTERA (Aphids)				
Aphididae	0.1	-0.001	-0.001	-0.001
Cicadellidae	<0.1	0.000	0.000	0.000
HYMENOPTERA (Wasps and ants)				
Formicidae	0	0.010	0.000	0.050
THYSANOPTERA (Thrips)				
Thripidae	0.1	-0.001	-0.001	-0.001
ARANEIDA (Spiders)	<0.1	0.001	0.008	0.004
LEPIDOPTERA (Moths)	0	0.032	0.000	0.016
COLLEMBOLA (Springtails)	<0.1	0.019	0.000	0.010
UNIDENTIFIED TERRESTRIALS	0	0.096	0.178	0.137

Table 3.123. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of cutthroat trout in LeClerc Creek for 1989.

PREY ORGANISMS	% Environ.	1+ n=5	2+ n=4	All ages n=9
AQUATIC ORGANISMS				
TRICHOPTERA (caddisflies)				
Brachycentridae	3.9	-0.014	0.227	0.107
Glossosomatidae	0.5	-0.005	0.003	-0.001
Hydropsychidae	0.1	-0.001	0.132	0.066
Hydroptilidae	0	0	0.015	0.008
Limnephilidae	0	0.175	0.067	0.121
Polycentropodidae	<0.1	0	0	0
Rhyacophilidae	0.9	0.004	0.006	0.004
EPHEMEROPTERA (Mayflies)				
Baetidae	23.7	0.113	-0.163	-0.025
Ephemerellidae	4.3	-0.030	-0.021	-0.025
Heptageniidae	1.0	-0.010	0.046	0.018
Leptophilibidae	0.2	-0.002	-0.002	-0.002
PLECOPTERA (Stoneflies)				
Chloroperlidae	1.9	-0.019	-0.019	-0.019
Nemouridae	0.8	-0.008	0	-0.004
Perlodidae	0.2	-0.002	-0.002	-0.002
Perlidae	0.1	-0.001	-0.001	-0.001
LEPIDOPTERA (Moths)				
Pyralidae	0	0	0.011	0.006
COLEOPTERA (Beetles)				
Dytiscidae	0.3	-0.003	0.005	0.001
Elmidae adult	2.1	-0.021	-0.013	-0.017
Elmidae larvae	7.1	-0.071	-0.045	-0.058
Georyssidae	0.5	-0.005	-0.005	-0.005
Hydrophilidae	<0.1	0.019	0.000	0.010
HYDRACARINA (Water mites)	2.0	-0.020	-0.020	-0.020
DIPTERA (Midges and flits)				
Anthericidae	<0.1	0	0	0
Ceratopogonidae	15.7	-0.157	-0.157	-0.157
Chironomidae larvae	13.5	-0.110	-0.091	-0.130
Chironomidae pupae	0	0.058	0	0.029
Dixidae	0.1	-0.001	-0.001	-0.001
Mycetophilidae	0.1	-0.001	-0.001	-0.001
Psychodidae	0.1	-0.001	-0.001	-0.001
Simuliidae	7.6	-0.076	-0.076	-0.076
Stratiomyidae	0.1	-0.001	-0.001	-0.001
Tipulidae	0.5	-0.005	0.025	0.010
GASTROPODA (Snails)				
Lymnaeidae	<0.1	0	0	0

Table **3.123.** (cont.)

PREY ORGANISMS	% Environ.	1+ n=5	2+ n=4	All ages n=9
BIVALVIA (Clams)				
Sphaeriidae	<0.1	0	0	0
OLIGOCHAETA (Worms)				
Lumbriculidae	0.5	-0.005	0.003	-0.001
HIRUDINEA (Leeches)	0.2	-0.002	-0.002	-0.002
TERRESTRIAL ORGANISMS				
TRICHOPTERA (Caddisflies)	0.6	-0.006	-0.006	-0.006
EPHEMEROPTERA (Mayflies)	2.5	-0.025	-0.025	-0.025
PLECOPTERA (Stonesflies)	0	0.057	0.000	0.029
DIPTERA (Midges and flies)				
Ceratopogonidae	0.5	-0.005	-0.005	-0.005
Empididae	0.7	-0.007	0.001	-0.003
Mycetophilidae	0.6	0.013	-0.006	0.004
Sciaridae	<0.1	0	0	0
Simuliidae	1.2	-0.012	-0.012	-0.012
COLEOPTERA (Beetles)				
Carabidae	0.2	-0.002	-0.002	-0.002
Coccinellidae	<0.1	0	0	0
Curculionidae	<0.1	0	0	0
Dermestidae	<0.1	0	0	0
Staphylinidae	0.1	-0.001	-0.001	-0.001
HOMOPTERA (Aphids)				
Aphididae	2.5	-0.025	-0.025	-0.025
Cicadellidae	0.2	-0.002	-0.002	-0.002
HYMENOPTERA (Wasps and ants)				
Eurytomidae	0.1	-0.001	-0.001	-0.001
Formicidae	0.5	0.095	-0.005	0.045
Ichneumonidae	0.1	-0.001	-0.001	-0.001
Pteromalidae	0.1	-0.001	-0.001	-0.001
PSOCOPTERA				
Psocidae	0.4	-0.004	-0.004	-0.004
ARANEIDA (Spiders)	0.3	-0.003	0.005	0.001
LEPIDOPTERA (Moth)	0	0.032	0.000	0.016
NEUROPTERA				
Chrysopidae	0.1	-0.001	-0.001	0.001
HEMIPTERA (True bugs)				
Lygaeidae	<0.1	0	0	0
COLLEMBOLA	0.3	0.016	-0.003	0.007
UNIDENTIFIED TERRESTRIALS	0.5	0.091	0.173	0.132

3.6.3.2 RUBY CREEK

The measure of prey selection (electivity) for benthic and drifting invertebrates was determined for each age class of brown trout, brook trout, cutthroat trout, rainbow trout, and mountain whitefish captured in Ruby Creek.

Brown trout electivities for benthic invertebrates are listed in Table 3.124 and electivities for drifting invertebrates are listed in Table 3.125. The highest electivity by age 0+ brown trout was for Baetidae from both the benthos (0.638) and the drift (0.529). The highest electivity by age I+ brown trout was for Heptageniidae from both the benthos (0.451) and the drift (0.470). The highest electivity by age 2+ brown trout was for Limnephilidae from both the benthos (0.498) and the drift (0.463). Formicidae was selected for most by age 3+ brown trout with a value of 0.230 from both the benthos and the drift. Combined age classes selected for Limnephilidae from both the benthos (0.184) and the drift (0.149).

Brook trout electivities for benthic invertebrates are listed in Table 3.126 and electivities for drifting invertebrates are listed in Table 3.127. The highest electivity by age 0+ brook trout from the benthos was for Aphididae (0.096) and from the drift was for Chironomidae larvae (0.138). The highest electivity by age I+ brook trout was for Brachycentridae from both the benthos (0.157) and the drift (0.137). Formicidae was selected for most frequently by 2+, 3+, and combined age classes of brook trout from the benthos (0.126, 0.191, and 0.094, respectively) and from the drift (0.126, 0.191, and 0.094, respectively).

Cutthroat trout electivities for benthic invertebrates are listed in Table 3.128 and electivities for drifting invertebrates are listed in Table 3.129. The highest electivity by age I+ cutthroat trout was for Brachycentridae from both the benthos (0.172) and the drift (0.162). Psyllidae was selected for the most by age 2+ cutthroat trout with a value of 0.158 from both the benthos and the drift. Rhyacophilidae was selected for by 3+ cutthroat trout and combined age classes from the benthos (0.392 and 0.125, respectively) and the drift (0.338 and 0.121, respectively).

Rainbow trout electivities for benthic invertebrates are listed in Table 3.130 and electivities for drifting invertebrates are listed in Table 3.131. The highest electivity by age I+ rainbow trout was for Heptageniidae from the benthos (0.210) and the drift (0.229).

Table 3.124. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of brown trout in Ruby Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=3	1+ n=4	2+ n=1	3+ n=1	All ages n=9
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	1.8	-0.018	-0.006	-0.018	-0.018	-0.015
Glossosomatidae	3.1	-0.031	-0.031	-0.031	0.008	-0.021
Hydropsychidae	5.0	-0.050	-0.030	-0.050	-0.011	-0.035
Hydroptilidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Limnephilidae	0.2	0.033	0.016	0.498	0.190	0.184
Leptoceridae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Psychomyiidae	0.3	-0.003	-0.003	-0.003	-0.003	-0.003
Rhyacophilidae	0.8	-0.008	0.023	0.242	-0.008	0.062
EPHEMEROPTERA (Mayflies)						
Baetidae	12.1	0.638	-0.067	-0.120	-0.121	0.083
Ephemerellidae	4.7	-0.047	-0.047	-0.047	-0.047	-0.047
Heptageniidae	5.5	-0.055	0.451	-0.055	-0.055	-0.055
Leptophilibidae	0.7	-0.007	-0.007	-0.007	-0.007	-0.007
ODONATA (Damsels and dragonflies)						
Cordulegastridae	<0.1	0	0	0	0	0
PLECOPTERA (Stone flies)						
Capniidae	5.1	-0.051	-0.051	-0.051	-0.051	-0.051
Chloroperlidae	1.2	-0.012	-0.012	-0.012	-0.012	-0.012
Nemouridae	2.0	-0.020	-0.020	-0.020	-0.020	-0.020
Perlodidae	0.6	-0.006	0.021	0.244	-0.006	0.063
Perlidae	0.7	-0.007	-0.007	-0.007	-0.007	-0.007
COLEOPTERA (Beetles)						
Elmidae adult	1.4	0.021	0.004	-0.014	-0.014	-0.001
Elmidae larvae	12.8	-0.025	-0.128	-0.128	-0.128	-0.102
Georyssidae	0.3	-0.003	-0.003	-0.003	-0.003	-0.003
Haliplidae	0	0	0	0	0.039	0.010
HYDRACARINA (Mites)	0.9	-0.009	-0.009	-0.009	-0.009	-0.009
DIPTERA (Midges and flies)						
Ceratopogonidae	2.1	-0.021	-0.021	-0.021	-0.021	-0.021
Chironomidae larvae	18.9	-0.189	-0.171	-0.189	-0.189	-0.184
Chironomidae pupae	0.5	-0.005	-0.005	-0.005	-0.005	-0.005
Dixidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Empididae	<0.1	0	0	0	0	0
Psychodidae	2.7	-0.027	-0.027	-0.027	-0.027	-0.027
Simuliidae	3.8	0.031	-0.008	-0.038	-0.038	-0.013
Tipulidae	1.2	-0.012	-0.012	-0.012	-0.012	-0.012
OLIGOCHAETA (Worms)						
Naididae	4.0	-0.040	-0.040	-0.040	-0.040	-0.040
Lumbriculidae	1.7	-0.017	-0.017	-0.017	-0.017	-0.017

Table 3.124. (cont.)

PREY ORGANISMS	% Environ.	0+ n=3	1+ n=4	2+ n=1	3+ n=1	AH ages n=9
HIRUDINEA (Leeches)	<0.1	0	0	0	0	0
NEMATODA	<0.1	0	0	0	0	0
GASTROPODA (Snails)						
Planorbidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
BIVALVIA (Clams)						
Sphaeriidae	4.5	-0.045	-0.045	-0.045	-0.045	-0.045
TERRESTRIAL ORGANISMS						
EPHEMEROPTERA	0	0	0.018	0	0	0.005
PLECOPTERA	0	0	0	0	0.039	0.010
DIPTERA (Midges and flies)						
Chironomidae	<0.1	0	0	0	0	0
Empididae	<0.1	0	0	0	0.077	0.019
Mycetophilidae	<0.1	0	0	0	0	0
Simuliidae	<0.1	0	0	0	0	0
COLEOPTERA (Beetles)						
Buprestidae	0	0	0	0	0.039	0.010
Cerambycidae	0	0	0	0	0.039	0.010
Chrysomelidae	0	0	0.083	0	0	0.021
Curculionidae	0	0	0.083	0	0	0.021
HOMOPTERA (Aphids)						
Aphididae	<0.1	0	0	0	0	0
Cicadellidae	0.2	-0.002	-0.002	-0.002	0.037	0.008
Coccidae	<0.1	0	0	0	0	0
HYMENOPTERA (Wasps and ants)						
Apidae	<0.1	-0	-0	-0	-0	-0
Eurytomidae	<0.1	0	0	0	0	0
Formicidae	0.1	-0.001	0.082	-0.001	0.230	0.078
Ichneumonidae	<0.1	0	0	0	0	0
ARANEIDA (Spiders)	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
LEPIDOPTERA	0	0	0	0	0.115	0.029
COLLEMBOLA	<0.1	0	0	0	0	0
UNIDENT. TERRESTRIALS.	0	0	0	0	0.077	0.019

Table 3.125. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of brown trout in Ruby Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=3	1+ n=4	2+ n=1	3+ n=1	All ages n=9
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	2.8	-0.028	-0.016	-0.028	-0.028	-0.025
Glossosomatidae	0.2	-0.002	-0.002	-0.002	0.037	0.008
Hydropsychidae	1.3	-0.013	0.007	-0.013	0.026	0.002
Limnephilidae	3.7	-0.002	-0.019	0.463	0.156	0.419
Lepidostomatidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Rhyacophilidae	1.2	-0.012	0.019	0.238	-0.012	0.058
EPHEMEROPTERA (Mayflies)						
Baetidae	23.0	0.529	-0.176	-0.230	-0.230	-0.027
Ephemerellidae	2.7	-0.027	-0.027	-0.027	-0.027	-0.027
Heptageniidae	3.6	-0.036	0.470	-0.036	-0.036	0.091
Leptophilibidae	1.0	-0.010	-0.010	-0.010	-0.010	-0.010
PLECOPTERA (Stoneflies)						
Capniidae	<0.1	0	0	0	0	0
Chloroperlidae	0.4	-0.004	-0.004	-0.004	-0.004	-0.004
Nemouridae	29.0	-0.290	-0.290	-0.290	-0.290	-0.290
Peltoperlidae	0.4	-0.004	-0.004	-0.004	-0.004	-0.004
Perlodidae	0	0	0.027	0.250	0	0.069
Perlidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
COLEOPTERA (Beetles)						
Dytiscidae	<0.1	0	0	0	0	0
Elmidae adult	1.4	0.021	0.004	-0.014	-0.014	-0.001
Elmidae larvae	4.5	0.059	-0.045	-0.045	-0.045	-0.019
Georyssidae	<0.1	0	0	0	0	0
Haliplidae	0	0	0	0	0.039	0.010
HYDRACARINA (Mites)	1.5	-0.015	-0.015	-0.015	0.015	-0.015
DIPTERA (Midges and flies)						
Ceratopogonidae	0.2	-0.002	-0.002	-0.002	-0.002	-0.002
Chironomidae larvae	5.7	-0.057	-0.039	-0.057	-0.057	-0.052
Chironomidae pupae	0.8	-0.008	-0.008	-0.008	-0.008	-0.008
Psychodidae	0.9	-0.009	-0.009	-0.009	-0.009	-0.009
Simuliidae	9.2	-0.023	-0.062	-0.092	-0.092	-0.067
Tipulidae	0.6	-0.006	-0.006	-0.006	-0.006	-0.006
OLIGOCHAETA (Worms)						
Naididae	0.7	-0.007	-0.007	-0.007	-0.007	-0.007
Lumbriculidae	1.3	-0.013	-0.013	-0.013	-0.013	-0.013
GASTROPODA (Snails)						
Planorbidae	co.1	0	0	0	0	0
BIVALVIA (Clams)						
Sphaeriidae	1.1	-0.011	-0.011	-0.011	-0.011	-0.011

Table 3.125. (cont.)

PREY ORGANISMS	% Environ.	0+ n=3	1+ n=4	2+ n=1	3+ n=1	All ages n=9
NEMATODA	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
TURBELLARIA (Flatworms)						
Planariidae	0.6	-0.006	-0.006	-0.006	-0.006	-0.006
TERRESTRIAL ORGANISMS						
EPHEMEROPTERA	0.2	-0.002	0.016	-0.002	-0.002	0.003
PLECOPTERA	<0.1	0	0	0	0.039	0.010
DIPTERA (Midges and flies)						
Chironomidae	0.2	-0.002	-0.002	-0.002	-0.002	-0.002
Empididae	<0.1	0	0	0	0.077	0.019
Sciaridae	<0.1	0	0	0	0	0
Simuliidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Tipulidae	<0.1	0	0	0	0	0
COLEOPTERA (Beetles)						
Buprestidae	0	0	0	0	0.039	0.010
Cerambycidae	0	0	0	0	0.039	0.010
Chrysomelidae	0	0	0.083	0	0	0.021
Curculionidae	0	0	0.083	0	0	0.021
Staphylinidae	<0.1	0	0	0	0	0
HOMOPTERA (Aphids)						
Aphididae	0.2	-0.002	-0.002	-0.002	-0.002	-0.002
Cicadellidae	0.1	-0.001	-0.001	-0.001	0.038	0.009
HYMENOPTERA (Wasps and ants)						
Formicidae	0.1	-0.001	0.082	-0.001	0.230	0.078
Ichneumonidae	<0.1	0	0	0	0	0
Mymaridae	<0.1	0	0	0	0	0
ARANEIDA (Spiders)	0.1	-0.001	-0.001	-0.001	0.038	0.009
LEPIDOPTERA	0	0	0	0	0.115	0.029
NEUROPTERA (Lace wings)						
Chrysopidae	<0.1	0	0	0	0	0
COLLEMBOLA	0.5	-0.005	-0.005	-0.005	-0.005	-0.005
UNIDENT. TERRESTRIALS	0.1	-0.001	-0.001	-0.001	0.076	0.018

Table 3.126. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of brook trout in Ruby Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=31	1+ n=52	2+ n=33	3+ n=6	All ages n=122
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	1.8	0.037	0.157	0.095	0.002	0.073
Glossosomatidae	3.1	-0.031	-0.001	-0.008	-0.013	-0.013
Hydropsychidae	5.0	-0.050	-0.038	-0.035	-0.034	-0.039
Hydroptilidae	0.1	0.030	-0.002	-0.001	-0.001	0.009
Limnephilidae	0.2	0.053	0.030	0.091	0.120	0.074
Leptoceridae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Psychomyiidae	0.3	-0.003	-0.003	-0.003	-0.003	-0.003
Rhyacophilidae	0.8	-0.004	0.009	0.044	0.012	0.015
Trichoptera pupae	0	0	0	0.004	0.004	0.002
EPHEMEROPTERA (Mayflies)						
Baetidae	12.1	-0.012	-0.012	-0.081	-0.117	-0.055
Ephemerellidae	4.7	-0.018	-0.002	-0.047	-0.039	-0.026
Heptageniidae	5.5	-0.026	-0.029	-0.044	-0.055	-0.038
Leptophilibidae	0.7	-0.007	-0.007	-0.007	-0.007	-0.007
PLECOPTERA (Stoneflies)						
Capniidae	5.1	-0.051	-0.051	-0.051	-0.051	-0.051
Chloroperlidae	1.2	-0.012	-0.012	-0.012	-0.012	-0.012
Nemouridae	2.0	0.017	-0.003	-0.003	-0.020	-0.002
Perlodidae	0.6	0.003	-0.006	-0.005	-0.005	-0.003
Perlidae	0.7	-0.007	-0.007	0.007	0.007	-0.007
COLEOPTERA (Beetles)						
Dytiscidae	0	0	0.001	0.002	0	0.001
Elmidae adult	1.4	-0.006	0.004	0.014	0.002	0.004
Elmidae larvae	12.8	-0.101	-0.121	-0.128	-0.128	-0.119
Georyssidae	0.3	-0.003	-0.003	-0.003	-0.003	-0.003
Haliplidae	0	0	0.001	0	0	0
HYDRACARINA (Mites)	0.9	0.023	0.012	-0.004	0.009	0.011
DIPTERA (Midges and flies)						
Ceratopogonidae	2.1	-0.021	-0.014	-0.021	-0.021	-0.019
Chironomidae larvae	18.9	0.006	-0.154	-0.097	-0.167	-0.102
Chironomidae pupae	0.5	-0.006	-0.005	-0.002	-0.005	-0.001
Dixidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Empididae	<0.1	0	0	0	0	0
Psychodidae	2.7	-0.027	-0.026	-0.027	-0.027	-0.027
Simuliidae	3.8	-0.018	-0.006	-0.035	-0.030	-0.022
Tabanidae	0	0	0	0.013	0.001	0.004
Tipulidae	1.2	-0.012	0.022	-0.012	-0.008	-0.002
OLIGOCHAETA (Worms)						
Lumbriculidae	1.7	-0.004	0.028	0.034	-0.017	0.020
Naididae	4.0	-0.031	-0.030	-0.040	-0.040	-0.035
HIRUDINEA (Leeches)	<0.1	0	0	0	0	0
GASTROPODA (Snails)						
Planorbidae	0.1	-0.001	-0.001	0.016	-0.001	0.003
BIVALVIA (Clams)						
Ancylidae	0	0.011	0.020	0	0	0.008
Sphaeriidae	4.5	-0.042	-0.045	-0.045	-0.045	-0.044
NEMATODA (Nematodes)	<0.1	0	0	0.001	0	0
HEMIPTERA (True bugs)						
Mesoveliidae	0	0.002	0	0	0	0.001
ODONATA (Damsel and dragonflies)						
Aeshnidae	0	0	0	0	0.004	0.001
Cordulegastridae	<0.1	0	0	0	0	0
TERRESTRIAL ORGANISMS						
TRICHOPTERA	0	0.002	0	0.001	0.009	0.003
PLECOPTERA	0	0	0.005	0.009	0	0.004
DIPTERA (Midges and flies)						
Ceratopogonidae	0	0	0.001	0	0	0
Chironomidae	<0.1	0	0.003	0.001	0	0.001

Table 3.126. (cont.)

PREY ORGANISMS	% Environ.	0+ n=31	1+ n=52	2+ n=33	3+ n=6	All ages n=122
Empididae	<0.1	0	0 001	0.004	0	0.001
Mycetophilidae	<0	0	0	0.003	0.030	0.008
Psychodidae	0	0	0	0	0.035	0.009
Sciaridae	0	0	0	0.002	0	0.001
Simuliidae	<0.1	0.032	0.001	0.004	0	0.009
Tabanidae	0	0	0	0 001	0.004	0.001
COLEOPTERA (Beetles)						
Buprestidae	0	0	0	0.001	0	0
Cantharidae	0	0	0	0.002	0.016	0.005
Carabidae	0	0	0	0.004	0	0.001
Cerambycidae	0	0	0	0.001	0	0
Chrysomelidae	0	0	0	0.012	0.028	0.010
Curculionidae	0	0	0.001	0.007	0	0.002
Elateridae	0	0	0	0.004	0.009	0.003
Endomychidae	0	0.001	0	0.016	0 004	
Lathridiidae	0	0	0	0.001	0	0
Pselaphidae	0	0	0	0.001	0	0
Staphylinidae	0	0.031	0	0.007	0	0.010
Tenebrionidae	0	0	0	0	0.004	0 001
HOMOPTERA (Aphids)						
Aphididae	<0.1	0.096	0 022	0 030	0.027	0 044
Cercopidae	0	0	0 002	0	0.004	0.002
Cicadellidae	0.2	-0.002	0 011	0.004	0.023	0.009
Coccidae	<0.1	0	0	0	0	0
Delphacidae	0	0.002	0	0	0	0.001
Psyllidae	0	0	0.012	0.001	0	0 003
HYMENOPTERA (Wasps and ants)						
Apidae	0	-	0 001	0	0	0
Braconidae	<0.1	0	0	0.002	0.018	0.005
Diapriidae	0	0	0	0.002	0.009	0.003
Eulophidae	0	0	0.001	0	0	0
Eurytomidae	<0.1	0	0	0	0	0
Formicidae	0.1	0.020	0.038	0.126	0.191	0.094
Ichneumonidae	<0.1	0	0	0	0	0
Sphecidae	0	0	0	0.001	0	0
Vespidae	0	0	0	0	0.004	0 001
ARANEIDA (Spiders)	0 1	0.004	0 010	0.014	0 016	0.011
LEPIDOPTERA (Moths)	0	0 007	0 005	0.010	0 146	0.042
ODONATA (Damsel and dragonflies)						
Aeshnidae	0	0	0 001	0 008	0	0.002
NEUROPTERA (Lace wings)						
Chrysopidae	0	0	0	0 001	0	0
HEMIPTERA (True bugs						
Miridae	0	0	0 002	0.004	0	0 002
Nabidae	0	0	0	0.001	0	0
COLLEMBOLA (Springtails)	<0.1	0.002	0	0	0	0.001
DIPLOPODA (Centipedes)	0	0	0.004	0	0	0.001
UNIDENTIFIED.TERRESTRIALS	0	0.088	0 082	0.088	0.077	0 088

Table 3.127. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of brook trout in Ruby Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=31	1+ n=52	2+ n=33	3+ n=6	All ages n=122
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	2.8	0.027	0.137	0.085	-0.008	0.063
Glossosomatidae	0.2	-0.002	-0.028	0.021	0.016	0.016
Hydropsychidae	1.3	-0.013	-0.001	0.002	0.003	-0.002
Hydroptilidae	0	0.031	0.003	0	0	0.009
Limnephilidae	3.7	0.018	-0.005	0.056	0.085	0.039
Lepidostomatidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
Rhyacophilidae	1.2	-0.008	0.005	0.040	0.016	0.011
Trichoptera pupae	0	0	0	0.004	0.004	0.002
EPHEMEROPTERA (Mayflies)						
Baetidae	23.0	-0.121	-0.121	-0.190	-0.226	-0.164
Ephemerellidae	2.7	0.002	0.018	-0.027	-0.019	-0.006
Heptageniidae	3.6	-0.007	-0.010	-0.025	-0.036	-0.019
Leptophlebiidae	1 0	-0.010	-0.010	-0.010	-0.010	-0.010
PLECOPTERA (Stoneflies)						
Capniidae	<0.1	0	0	0	0	0
Chloroperlidae	0.4	-0.004	-0.004	-0.004	-0.004	-0.004
Nemouridae	29.0	-0.253	-0.273	-0.273	-0.290	-0.272
Peltoperlidae	0.4	-0.004	-0.004	-0.004	-0.004	-0.004
Perlodidae	0.0	0.009	0	0.001	0.001	0.003
Perlidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001
ODONATA (Damsel and dragonflies)						
Aeshnidae	0	0	0	0	0.004	0.001
LEPIDOPTERA (Moths)						
Pyralidae	0	0.014	0.058	0.022	0	0.024
COLEOPTERA (Beetles)						
Dytiscidae	<0.1	0	0 001	0.002	0	0.001
Elmidae adult	1.4	-0.006	0.004	0.014	0.002	0.004
Elmidae larvae	4.5	-0.018	-0.038	-0.045	-0.045	-0.036
Georyssidae	<0.1	0	0	0	0	0
Haliplidae	0	0	0.001	0	0	0
Hydrophilidae	0	0	0.016	0.022	0	0.010
HYDRACARINA (Mites)	1.5	0.017	0.006	-0.010	-0.015	0
DIPTERA (Midges and flies)						
Ceratopogonidae	0.2	-0.002	0.005	-0.002	-0.002	0
Chironomidae larvae	5.7	0.138	-0.022	0.040	-0.035	0.030
Chironomidae pupae	0.8	0.003	-0.008	-0.005	-0.008	-0.004
Muscidae	0	0.002	0.001	0	0	0.001
Psychodidae	0.9	-0.009	-0.008	-0.009	-0.009	-0.009
Simuliidae	9.2	-0.072	-0.060	-0.089	-0.084	-0.076
Tabanidae	0	0	0	0.013	0.001	0.004
Tipulidae	0.6	-0.006	0 028	-0 009	-0.002	0 004
HEMIPTERA (True bugs)						
Mesoveliidae	0	0.002	0	0	0	0.001
GASTROPODA (Snails)						
Planorbidae	<0.1	0	0	0.017	0	0.004
BIVALVIA (Clams)						
Ancyclidae	0	0.011	0.020	0	0	0.008
Sphaeriidae	1.1	-0.008	-0.011	-0.011	-0.011	-0.010
OLIGOCHAETA (Worms)						
Lumbriculidae	1.3	0	0.032	0.038	-0.013	0.014
Naididae	0.7	0.002	0.003	-0.007	-0.007	-0.002
TURBELLARIA (Flatworms)						
Planariidae	0.6	-0.006	-0.006	-0.006	-0.006	-0 006
NEMATODA	0.1	-0.001	-0.001	0	-0.001	0
TERRESTRIAL ORGANISMS						
TRICHOPTERA	0	0.002	0	0.001	0.009	0.003
EPHEMEROPTERA	0 2	-0.002	-0.002	-0.002	-0.002	-0.002
PLECOPTERA	<0.1	0	0.005	0.009	0	0.004
DIPTERA (Midges and flies)						
Ceratopogonidae	0	0	0.001	0	0	0
Chironomidae	0.2	-0.002	0.001	-0.001	-0.002	-0 001

Table 3.127. (cont.)

PREY ORGANISMS	% Environ.	0+ n=31	1+ n=52	2+ n=33	3+ n=6	All ages n=122
Empididae	<0.1	0	0 001	0.004	0	0 001
Mycetophilidae	0	0	0	0.003	0.030	0 008
Psychodidae	0	0	0	0	0.035	0.009
Sciaridae	<0.1	0	0	0.002	0	0.001
Simuliidae	0.1	0.031	0	0.003	0	0 008
Tabanidae	0	0	0	0.001	0.004	0.001
Tipulidae	<0.1	0	0	0	0	0
COLEOPTERA (Beetles)						
Buprestidae	0	0	0	0.001	0	0
Cantharidae	0	0	0	0.002	0.016	0.005
Carabidae	0	0	0	0.004	0	0 001
Cerambycidae	0	0	0	0.001	0	0
Chrysomelidae	0	0	0	0.012	0.028	0 010
Curculionidae	0	0	0.001	0.007	0	0.002
Elateridae	0	0	0	0.004	0.009	0.003
Endomychidae	0	0	0	0	0.009	0 002
Lampyridae	0	0	0 001	0	0.016	0 004
Lathridiidae	0	0	0	0.001	0.009	0.003
Leiodidae	0	0	0	0.001	0	0
Pselaphidae	0	0	0	0.001	0	0
Staphylinidae	<0.1	0.031	0	0 007	0	0 010
Tenebrionidae	0	0	0	0	0.004	0.001
HOMOPTERA (Apids)						
Aphididae	0 2	0.094	0 020	0.028	0 025	0 042
Cercopidae	0	0	0 002	0	0.004	0.002
Cicadellidae	0 1	-0.001	0 012	0 005	0 024	0.010
Delphacidae	0	0.002	0	0	0	0.001
Psyllidae	0	0	0 012	0.001	0	0.003
HYMENOPTERA (Wasps and ants)						
Apidae	0	0	0 001	0	0	0
Braconidae	0	0	0	0.002	0 018	0.005
Diapriidae	0	0	0	0.002	0 009	0.003
Eulophidae	0	0	0 001	0	0	0
Formicidae	0.1	0.020	0.038	0.126	0.191	0 094
Ichneumonidae	<0.1	0	0.001	0.007	0.013	0.010
Mymaridae	<0.1	0	0	0	0	0
Sphecidae	0	0	0	0.001	0	0
Vespidae	0	0	0	0	0 004	0 001
ARANEIDA (Spiders)	0.1	0.004	0.010	0 014	0.016	0 011
HYDRACARINA	0	0	0	0	0.018	0.005
LEPIDOPTERA (Moths)	0	0.007	0.005	0.010	0.146	0.042
ODONATA (Damsel and dragonflies)						
Aeshnidae	0	0	0.001	0.008	0	0 002
NEUROPTERA (Lace wings)						
Chrysopidae	<0.1	0	0	0.001	0	0
HEMIPTERA (True bugs)						
Miridae	0	0	0.002	0.004	0	0.002
Nabidae	0	0	0	0.001	0	0
COLLEMBOLA (Springtails)	0.5	0.005	0.013	0.011	0.018	0.011
DIPLOPODA (Centipedes)	0	0	0.004	0	0	0.001
UNIDENTIFIED TERRESTRIALS	0.1	0.087	0.081	0.087	0.076	0.082

Table 3.128. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of cutthroat trout in Ruby Creek for 1989.

PREY ORGANISMS	% Environ.	1+ n=4	2+ n=4	3+ n=1	All ages n=9
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	1.8	0.172	-0.018	-0.018	0.045
Glossosomatidae	3.1	-0.031	-0.031	-0.031	-0.031
Hydropsychidae	5.0	-0.050	-0.050	-0.050	-0.050
Hydroptilidae	0.1	-0.001	-0.001	-0.001	-0.001
Limnephilidae	0.2	-0.002	0.024	-0.002	0.007
Leptoceridae	0.1	-0.001	-0.001	-0.001	-0.001
Psychomyiidae	0.3	-0.003	-0.003	-0.003	-0.003
Rhyacophilidae	0.8	-0.008	-0.008	0.392	0.125
Trichoptera pupae	0	0.000	0.018	0.000	0.006
EPHEMEROPTERA (Mayflies)					
Baetidae	12.1	-0.084	-0.024	-0.121	-0.076
Ephemerellidae	4.7	0.009	-0.047	-0.047	-0.028
Heptageniidae	5.5	-0.055	-0.055	-0.055	-0.055
Leptophilibidae	0.7	-0.007	-0.007	-0.007	-0.007
DIPTERA (Midges and flies)					
Ceratopogonidae	2.1	-0.021	-0.012	-0.021	-0.018
Chironomidae larvae	18.9	-0.115	-0.152	-0.189	-0.152
Chironomidae pupae	0.5	-0.005	-0.005	-0.005	-0.005
Dixidae	0.1	-0.001	-0.001	-0.001	-0.001
Empididae	<0.1	0.000	0.000	0.000	0.000
Muscidae	0	0.000	0.013	0.000	0.004
Psychodidae	2.7	-0.027	-0.027	-0.027	-0.027
Simuliidae	3.8	0.018	-0.025	-0.038	-0.015
Syrphidae	0	0.000	0.019	0.000	0.006
Tipulidae	1.2	-0.012	-0.012	0.188	0.055
PLECOPTERA (Stoneflies)					
Capniidae	5.1	-0.051	-0.051	-0.051	-0.051
Chloroperlidae	1.2	-0.012	-0.012	-0.012	-0.012
Nemouridae	2.0	0.123	-0.011	-0.002	0.031
Perlodidae	0.6	-0.006	0.003	0.194	0.064
Perlidae	0.7	-0.007	-0.007	-0.007	-0.007
COLEOPTERA (Beetles)					
Elmidae adult	1.4	-0.014	0.004	-0.014	-0.008
Elmidae larvae	12.8	-0.128	-0.072	-0.128	-0.109
Georyssidae	0.3	-0.003	-0.003	-0.003	-0.003
HYDRACARINA (Mites)	0.9	-0.009	-0.009	-0.009	-0.009
OLIGOCHAETA (Worms)					
Naididae	4.0	-0.040	-0.040	-0.040	-0.040
Lumbriculidae	1.7	-0.017	0.066	0.183	0.081
HIRUDINEA (Leeches)	<0.1	0.000	0.000	0.000	0.000

Table 3.128. (cont.)

PREY ORGANISMS	% Environ.	1+ n=4	2+ n=4	3+ n=1	All ages n=9
GASTROPODA (Snails)					
Planorbidae	0.1	-0.001	-0.001	-0.001	-0.001
BIVALVIA (Clams)					
Sphaeriidae	4.5	-0.045	-0.045	-0.045	-0.045
LEPIDOPTERA (Moths)					
Pyralidae	0	0.000	0.093	0.000	0.031
NEMATODA (Nematodes)	<0.1	0.000	0.000	0.000	0.000
ODONATA (Damsel and dragonflies)					
Cordulegastridae	<0.1	0.000	0.000	0.000	0.000
TERRESTRIAL ORGANISMS					
TRICHOPTERA	0	0.056	0.000	0.000	0.019
DIPTERA (Midges and flies)					
Chironomidae	<0.1	0.000	0.000	0.000	0.000
Empididae	<0.1	0.000	0.000	0.000	0.000
Mycetophilidae	<0.1	0.000	0.000	0.000	0.000
Psychodidae	0	0.037	0.000	0.000	0.012
Simuliidae	<0.1	0.000	0.000	0.000	0.000
COLEOPTERA (Beetles)					
Carabidae	0	0.037	0.000	0.000	0.012
Cerambycidae	0	0.056	0.013	0.000	0.023
Lathridiidae	0	0.037	0.000	0.000	0.012
HOMOPTERA (Aphids)					
Aphididae	<0.1	0.000	0.000	0.000	0.000
Cicadellidae	0.2	-0.002	0.011	-0.002	0.002
Coccidae	<0.1	0.000	0.000	0.000	0.000
Psyllidae	0	0.000	0.158	0.000	0.053
HYMENOPTERA (Wasps and ants)					
Braconidae	<0.1	0.000	0.000	0.000	0.000
Eurytomidae	<0.1	0.000	0.000	0.000	0.000
Formicidae	0.1	0.073	0.140	-0.001	0.071
Ichneumonidae	<0.1	0.000	0.013	0.000	0.004
Vespidae	0	0.056	0.000	0.000	0.019
ARANEIDA (Spiders)	0.1	-0.001	-0.001	-0.001	-0.001
LEPIDOPTERA (Moths)	0	0.000	0.077	0.000	0.026
NEUROPTERA (Lace wings)					
Chrysopidae	0	0.037	0.013	0.000	0.017
HEMIPTERA (True bugs)					
Miridae	0	0.056	0.000	0.000	0.019
COLLEMBOLA (Springtails)	<0.1	0.000	0.000	0.000	0.000
UNIDENT. TERRESTRIALS	0	0.000	0.066	0.000	0.022

Table 3.129. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of cutthroat trout in Ruby Creek for 1989.

PREY ORGANISMS	% Environ.	1+ n=4	2+ n=4	3+ n=1	All ages n=9
AQUATIC ORGANISMS					
TRICHOPTERA(Caddisflies)					
Brachycentridae	2.8	0.162	-0.028	-0.028	0.035
Glossosomatidae	0.2	-0.002	-0.002	-0.002	-0.002
Hydropsychidae	1.3	-0.013	-0.013	-0.013	-0.013
Limnephilidae	3.7	-0.037	-0.011	-0.037	-0.028
Lepidostomatidae	0.1	-0.001	-0.001	-0.001	-0.001
Rhyacophilidae	1.2	-0.012	-0.012	0.388	0.121
Trichoptera pupae	0	0.000	0.018	0.000	0.006
EPHEMEROPTERA (Mayflies)					
Baetidae	23.0	-0.193	-0.133	-0.230	-0.185
Ephemerellidae	2.7	0.029	-0.027	-0.027	0.008
Heptageniidae	3.6	-0.036	-0.036	-0.036	-0.036
Leptophilibidae	1.0	-0.010	-0.010	-0.010	-0.010
PLECOPTERA (Stoneflies)					
Capniidae	<0.1	0.000	0.000	0.000	0.000
Chloroperlidae	0.4	-0.004	-0.004	-0.004	-0.004
Nemouridae	29.0	-0.147	-0.281	-0.290	-0.239
Peltoperlidae	0.4	-0.004	-0.004	-0.004	-0.004
Perlodidae	0	0.000	0.009	0.200	0.070
Perlidae	0.1	-0.001	-0.001	-0.001	-0.001
COLEOPTERA (Beetles)					
Dytiscidae	<0.1	0.000	0.000	0.000	0.000
Elmidae adult	1.4	-0.014	0.004	-0.014	-0.008
Elmidae larvae	4.5	-0.045	0.011	-0.045	-0.026
Georyssidae	<0.1	0.000	0.000	0.000	0.000
HYDRACARINA (Mites)	1.5	-0.015	-0.015	-0.015	-0.015
DIPTERA (Midges and flies)					
Ceratopogonidae	0.2	-0.002	0.007	-0.002	0.001
Chironomidae larvae	5.7	0.017	-0.020	-0.057	-0.020
Chironomidae pupae	0.8	-0.008	-0.008	-0.008	-0.008
Muscidae	0	0.000	0.013	0.000	0.004
Psychodidae	0.9	-0.009	-0.009	-0.009	-0.009
Simuliidae	9.2	-0.036	-0.080	-0.092	-0.069
Syrphidae	0	0.000	0.019	0.000	0.006
Tipulidae	0.6	-0.006	-0.006	0.194	0.061
OLIGOCHAETA (Worms)					
Naididae	0.7	-0.007	-0.007	-0.007	-0.007
GASTROPODA (Snails)					
Planorbidae	<0.1	0.000	0.000	0.000	0.000

Table 3.129. (cont.)

PREY ORGANISMS	% Environ.	1+ n=4	2+ n=4	3+ n=1	All ages n=9
BIVALVIA (Snails)					
Sphaeriidae	1.1	-0.011	-0.011	-0.011	-0.011
LEPIDOPTERA (Moths)					
Pyralidae	0	0.000	0.093	0.000	0.031
NEMATODA (Nemtodes)	0.1	-0.001	-0.001	-0.001	-0.001
TURBELLARIA (Flatworms)					
Planariidae	0.6	-0.006	-0.006	-0.006	-0.006
TERRESTRIAL ORGANISMS					
TRICHOPTERA	0	0.056	0.000	0.000	0.019
EPHEMEROPTERA	0.2	-0.002	-0.002	-0.002	-0.002
PLECOPTERA	<0.1	0.000	0.000	0.000	0.000
DIPTERA (Midges and flies)					
Chironomidae	0.2	-0.002	-0.002	-0.002	-0.002
Empididae	<0.1	0.000	0.000	0.000	0.000
Psychodidae	0	0.037	0.000	0.000	0.000
Sciaridae	<0.1	0.000	0.000	0.000	0.000
Simuliidae	0.1	-0.001	-0.001	-0.001	-0.001
Tipulidae	<0.1	0.000	0.000	0.000	0.000
COLEOPTERA (Beetles)					
Carabidae	0	0.037	0.000	0.000	0.012
Cerambycidae	0	0.056	0.013	0.000	0.023
Lathridiidae	0	0.037	0.000	0.000	0.012
Staphylinidae	<0.1	0.000	0.000	0.000	0.000
HOMOPTERA (Aphids)					
Aphididae	0.2	-0.002	-0.002	-0.002	-0.002
Cicadellidae	0.1	-0.001	0.012	-0.001	-0.003
Psyllidae	0	0.000	0.158	0.000	0.053
HYMENOPTERA (Wasps and ants)					
Formicidae	0.1	0.073	0.140	-0.001	0.071
Ichneumonidae	<0.1	0.000	0.013	0.000	0.004
Mymaridae	<0.1	0.000	0.000	0.000	0.000
Vespidae	0	0.056	0.000	0.000	0.019
ARANEIDA (Spiders)	0.1	-0.001	-0.001	-0.001	-0.001
LEPIDOPTERA (Moths)	0	0.000	0.077	0.000	0.026
OLIGOCHAETA (Worms)					
Lumbriculidae	1.3	-0.013	0.080	0.007	0.085
NEUROPTERA (Lace wings)					
Chrysopidae	<0.1	0.037	0.013	0.000	0.017
HEMIPTERA (True bugs)					
Miridae	0	0.056	0.000	0.000	0.019
COLLEMBOLA (Springtails)	0.5	-0.005	-0.005	-0.005	-0.005
UNIDENT. TERRESTRIALS	0.1	-0.001	0.052	-0.001	0.017

Formicidae was selected for most frequently by 2+ and combined age classes from the benthos (0.299 and 0.149, respectively) and the drift (0.299 and 0.149, respectively).

Mountain whitefish electivities for benthic invertebrates are listed in Table 3.132 and electivities for drifting invertebrates in Table 3.133. A single 3+ mountain whitefish was collected which selected for Simuliidae at ,0.771 from the benthos and at 0.717 from the drift.

3.6.3.3 CEE CEE AH CREEK

The measure of prey selection (electivity) for benthic and drifting invertebrates was determined for each age class of brown trout and brook trout captured in Cee Cee Ah Creek.

Brown trout electivities for benthic invertebrates are listed in Table 3.134 and electivities for drifting invertebrates in Table 3.135. The highest electivity by age 0+ brown-trout was for Heptageniidae from the benthos (0.168) and the drift (0.204). Formicidae was selected for most by l+, 2+, 3+, and combined age classes from both the benthos (0.148, 0.296, 0.301, and 0.184, respectively) and the drift (0.149, 0.307, 0.302, and 0.185, respectively). Formicidae was selected for most by age 4+ brown trout from the benthos (0.313) and the drift (0.132).

Brook trout erectivities for benthic macroinvertebrates are listed in Table 3.136 and electivities for drifting invertebrates in Table 3.137. The highest electivity by age 0+ brook trout was for Dytiscidae with a value of 0.131 from both the benthos and the drift. The highest electivity by age I+ brook trout was for Limnephilidae from the benthos (0.077) and the drift (0.174). Limnephilidae was selected for the most by 2+ and combined age classes from both the benthos (0.245 and 0.126, respectively) and the drift (0.246 and 0.127, respectively).

3.6.3.4 TACOMA CREEK

The measure of prey selection (electivity) for benthic and drifting invertebrates was determined for each age class of brook trout and cutthroat trout captured in Tacoma Creek.

Brook trout electivities for benthic invertebrates are listed in Table 3.138 and electivities for drifting invertebrates in Table

Table 3.130. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of rainbow trout in Ruby Creek for 1989.

PREY ORGANISMS	% Environ.	1+ n=2	2+ n=7	All ages n=9
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	1.8	0.188	0.062	0.125
Glossosomatidae	3.1	-0.031	0.039	0.004
Hydropsychidae	5.0	-0.021	-0.042	-0.031
Hydroptilidae	0.1	-0.001	-0.001	-0.001
Limnephilidae	0.2	-0.002	0.027	0.013
Leptoceridae	0.1	-0.001	-0.001	-0.001
Psychomyiidae	0.3	-0.003	-0.003	-0.003
Rhyacophilidae	0.8	-0.008	-0.008	-0.008
Trichoptera pupae	0	0	0.007	0.004
EPHEMEROPTERA (Mayflies)				
Baetidae	12.1	0.026	0.008	0.017
Ephemerellidae	4.7	-0.047	-0.005	-0.025
Heptageniidae	5.5	0.210	0.005	0.108
Leptophlebiidae	0.7	-0.007	-0.007	-0.007
ODONATA (Damsel and dragonflies)				
Cordulegastridae	<0.1	0	0	0
LEPIDOPTERA (Moths)				
Pyralidae	0	0.029	0.008	0.019
PLECOPTERA (Stoneflies)				
Capniidae	5.1	-0.051	-0.051	-0.051
Chloroperlidae	1.2	-0.012	-0.012	-0.012
Nemouridae	2.0	0.039	-0.020	-0.009
Perlodidae	0.6	-0.006	0.006	0
Perlidae	0.7	-0.007	-0.007	-0.007
COLEOPTERA (Beetles)				
Elmidae adult	1.4	0.015	-0.002	0.007
Elmidae larvae	12.8	-0.128	-0.106	-0.117
Georyssidae	0.3	-0.003	-0.003	-0.003
HYDRACARINA (Mites)	0.9	-0.009	-0.001	-0.005
DIPTERA (Midges and flies)				
Ceratopogonidae	2.1	-0.021	-0.013	-0.017
Chironomidae larvae	18.9	-0.189	-0.170	-0.187
Chironomidae pupae	0.5	-0.005	-0.005	-0.005
Dixidae	0.1	-0.001	-0.001	-0.001
Empididae	<0.1	0	0	0
Psychodidae	2.7	-0.027	-0.027	-0.027
Simuliidae	3.8	0.109	-0.031	0.039
Syrphidae	0	0	0.008	0.004
Tipulidae	1.2	-0.012	-0.012	-0.012

Table 3.130. (cont.)

PREY ORGANISMS	% Environ.	I+ n=2	2+ n=7	All ages n=9
OLIGOCHAETA (Worms)				
Naididae	4.0	-0.040	-0.040	-0.040
Lumbriculidae	1.7	-0.017	-0.017	-0.017
HIRUDINEA (Leeches)	<O.l	0	0	0
GASTROPODA (Snails\				
Planorbidae	0.1	-0.001	-0.001	-0.001
BIVALVIA (Clams)				
Sphaeriidae	4.5	-0.045	-0.045	-0.045
NEMATODA	<0.1	0	0	0
TERRESTRIAL ORGANISMS				
TRICHOPTERA	0	0	0.043	0.022
DIPTERA (Midges and flies)				
Chironomidae	<0.1	0	0	0
Empididae	<0.1	0	0	0
Mycetophilidae	<0.1	0	0	0
Sciaridae	0	0	0.008	0.004
Simuliidae	<0.1	0	0	0
COLEOPTERA (Beetles)				
Chrysomelidae	0	0	0.012	0.006
Elateridae	0	0	0.008	0.004
HOMOPTERA (Aphids)				
Aphididae	<0.1	0	0.008	0.004
Cicadellidae	0.2	-0.002	-0.002	-0.002
Coccidae	<0.1	0	0	0
HYMENOPTERA (Wasps and ants)				
Braconidae	<0.1	0	0	0
Eurytomidae	<0.1	0	0	0
Formicidae	0.1	-0.001	0.299	0.149
Ichneumonidae	<0.1	0	0.007	0.007
ARANEIDA (Spiders)	0.1	0.028	-0.001	0.014
LEPIDOPTERA	0	0	0.058	0.029
OLIGOCHAETA (Worms)				
Lumbriculidae	1.7	-0.017	-0.017	-0.017
COLLEMBOLA (Springtails)	<0.1	0	0	0
UNIDENTIFIED TERRESTRIALS	0	0.029	0.008	0.019

Table 3.131. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of rainbow trout in Ruby Creek for 1989.

PREY ORGANISMS	Environ.	n=2	2+ n=7	All ages n=9
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	2.8	0.178	0.052	0.115
Glossosomatidae	0.2	-0.002	0.068	0.032
Hydropsychidae	1.3	0.016	-0.005	0.006
Limnephilidae	3.7	-0.037	-0.008	-0.022
Lepidostomatidae	0.1	-0.001	-0.001	-0.001
Rhyacophilidae	1.2	0.017	0.007	0.012
Trichoptera pupae	0	0.000	0.007	0.004
EPHEMEROPTERA (Mayflies)				
Baetidae	23.0	-0.083	-0.101	-0.092
Ephemerellidae	2.7	-0.027	0.016	-0.005
Heptageniidae	3.6	0.229	0.024	0.127
Leptophilibidae	1.0	-0.010	-0.010	-0.010
LEPIDOPTERA (Moths)				
Pyralidae	0	0.029	0.008	0.019
PLECOPTERA (Stoneflies)				
Capniidae	<0.1	0.000	0.000	0.000
Chloroperlidae	0.4	-0.004	-0.004	-0.004
Nemouridae	29.0	-0.231	-0.290	-0.260
Peltoperlidae	0.4	-0.004	-0.004	-0.004
Perlodidae	0	0.000	0.012	0.006
Perlidae	0.1	-0.001	-0.001	-0.001
COLEOPTERA (Beetles)				
Dytiscidae	<0.1	0.000	0.000	0.000
Elmidae adult	1.4	0.015	-0.002	0.007
Elmidae larvae	4.5	-0.045	-0.023	-0.034
Georyssidae	<0.1	0.000	0.000	0.000
HYDRACARINA (Water mites)	1.5	-0.015	-0.007	-0.011
DIPTERA (Midges and flies)				
Ceratopogonidae	0.2	-0.002	0.006	0.002
Chironomidae larvae	5.7	-0.057	-0.038	-0.047
Chironomidae pupae	0.8	-0.008	-0.008	-0.008
Psychodidae	0.9	-0.009	-0.009	-0.009
Simuliidae	9.2	0.055	-0.085	-0.015
Syrphidae	0	0.000	0.008	0.004
Tipulidae	0.6	-0.006	-0.006	-0.006
OLIGOCHAETA (Worms)				
Naididae	0.7	-0.007	-0.007	-0.007
Lumbriculidae	1.3	-0.013	-0.013	-0.013
GASTROPODA (Snails)				
Planorbidae	<0.1	0.000	0.000	0.000
BIVALVIA (Clams)				

Table 3.131. (cont.)

PREY ORGANISMS	% Environ.	1+ n=2	2+ n=7	All ages n=9
Sphaeriidae	1.1	-0.011	-0.011	-0.011
NEMATODA (Nematodes)	0.1	-0.001	-0.001	-0.001
TURBELLARIA (Flatworms)				
Planariidae	0.6	-0.006	-0.006	-0.006
TERRESTRIAL ORGANISMS				
TRICHOPTERA (Caddisflies)	0	0.000	0.043	0.022
EPHEMEROPTERA	0.2	-0.002	-0.002	-0.002
PLECOPTERA (Stoneflies)	<0.1	0.001	0.001	0.001
DIPTERA (Midges and flies)				
Chironomidae	0.2	-0.002	-0.002	-0.002
Empididae	<0.1	0.000	0.000	0.000
Sciaridae	<0.1	0.000	0.008	0.004
Simuliidae	0.1	-0.001	-0.001	-0.001
Tipulidae	<0.1	0.000	0.000	0.000
COLEOPTERA (Beetles)				
Chrysomelidae	0	0.000	0.012	0.006
Elateridae	0	0.000	0.008	0.004
Staphylinidae	<0.1	0.000	0.000	0.000
HOMOPTERA (Aphids)				
Aphididae	0.2	-0.002	0.006	0.002
Cicadellidae	0.1	-0.001	-0.001	-0.001
HYMENOPTERA (Wasps and ants)				
Formicidae	0.1	-0.001	0.299	0.149
Ichneumonidae	<0.1	0.000	0.007	0.004
Mymaridae	<0.1	0.000	0.000	0.000
ARANEIDA	0.1	0.028	-0.001	-0.015
LEPIDOPTERA	0	0.000	0.058	0.029
NEUROPTERA (Lace wings)				
Chrysopidae	<0.1	0.000	0.000	0.000
COLLEMBOLA (Springtails)	0.5	-0.005	-0.005	-0.005
UNIDENTIFIED TERRESTRIALS	0.1	0.028	0.007	0.018

Table 3.132. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of mountain whitefish trout in Ruby Creek for 1989.

PREY ORGANISMS	% Environ.	3+ n=1
AQUATIC ORGANISMS		
TRICHOPTERA (Caddisflies)		
Brachycentridae	1.8	-0.001
Glossosomatidae	3.1	-0.031
Hydropsychidae	5.0	-0.029
Hydroptilidae	0.1	-0.001
Limnephilidae	0.2	0.019
Leptoceridae	0.1	-0.001
Psychomyiidae	0.3	-0.003
Rhyacophilidae	0.8	-0.004
EPHEMEROPTERA (Mayflies)		
Baetidae	12.1	-0.121
Ephemerellidae	4.7	0.021
Heptageniidae	5.5	-0.055
Leptophilibidae	0.7	-0.007
DIPTERA (Midges and flies)		
Ceratopogonidae	2.1	-0.021
Chironomidae larvae	18.9	-0.168
Chironomidae pupae	0.5	-0.005
Dixidae	0.1	-0.001
Empididae	<0.1	0.000
Psychodidae	2.7	-0.027
Simuliidae	3.8	0.771
Tipulidae	1.2	-0.012
PLECOPTERA (Stoneflies)		
Capniidae	5.1	-0.051
Chloroperlidae	1.2	-0.012
Nemouridae	2.0	-0.020
Perlodidae	0.6	-0.006
Perlidae	0.7	-0.007
COLEOPTERA (Beetles)		
Elmidae adult	1.4	-0.014
Elmidae larvae	12.8	-0.128
Georyssidae	0.3	-0.003
Hydrophilidae	0	0.004
HYDRACARINA (Water mites)	0.9	-0.009
OLIGOCHAETA (Worms)		
Naididae	4.0	-0.040
Lumbriculidae	1.7	-0.017
HIRUDINEA (Leeches)	<0.1	0.000
GASTROPODA (Snails)		
Planorbidae	0.1	-0.001
BIVALVIA (Clams)		
Sphaeriidae	4.5	-0.045
NEMATODA (Nematodes)	<0.1	0.000
ODONATA (Damsel and dragonflies)		
Cordulegastridae	<0.1	0.000
DIPTERA (Midges and flies)		
Chironomidae	<0.1	0.000
Empididae	<0.1	0.000
Mycetophilidae	<0.1	0.000
Simuliidae	<0.1	0.000
HOMOPTERA (Aphids)		
Aphididae	<0.1	0.000
Cicadellidae	0.2	-0.002
Coccidae	<0.1	0.000
HYMENOPTERA (Wasps and ants)		
Braconidae	<0.1	0.000
Eurytomidae	<0.1	0.000
Formicidae	0.1	-0.001
Ichneumonidae	<0.1	0.000
ARANEIDA (Spiders)	0.1	-0.001
COLLEMBOLA (Springtails)	<0.1	0.000

Table 3.133. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of mountain whitefish in Ruby Creek for 1989.

PREY ORGANISMS	% Environ	3+ n=1
AQUATIC ORGANISMS		
TRICHOPTERA (Caddisflies)		
Brachycentridae	2.8	-0.011
Glossosomatidae	0.2	-0.002
Hydropsychidae	1.3	-0.013
Limnephilidae	2.7	-0.018
Lepidostomatidae	0.1	-0.001
Rhyacophilidae	1.2	-0.008
EPHEMEROPTERA		
Baetidae	23.0	-0.023
Ephemerellidae	2.7	0.041
Heptageniidae	3.6	-0.036
Leptophlebiidae	1.0	-0.001
PLECOPTERA (Stoneflies)		
Capniidae	<0.1	0.000
Chloroperlidae	0.4	-0.004
Nemouridae	29.0	-0.290
Peltoperlidae	0.4	-0.004
Perlidae	0.1	-0.001
COLEOPTERA (Beetles)		
Dytiscidae	<0.1	0.000
Elmidae adult	1.4	-0.014
Elmidae larvae	4.5	-0.045
Georyssidae	<0.1	0.001
Hydrophilidae	0	0.004
HYDRACARINA	1.5	-0.015
DIPTERA (Midges and flies)		
Ceratopogonidae	0.2	-0.002
Chironomidae larvae	5.7	-0.036
Chironomidae pupae	0.8	-0.008
Psychodidae	0.9	-0.009
Simuliidae	9.2	0.717
Tipulidae	0.6	-0.006
OLIGOCHAETA (Worms)		
Naididae	0.7	-0.007
GASTROPODA (Snails)		
Planorbidae	co 1	0.000
BIVALVIA (Clams)		
Sphaeriidae	1.	-0.011
NEMATODA (Nematodes)	0.1	-0.001
TURBELLARIA (Flatworms)		
Planariidae	0.6	-0.006
TERRESTRIAL ORGANISMS		
EPHEMEROPTERA (Mayflies)	0.2	-0.002
PLECOPTERA (Stoneflies)	CO.1	0.000
DIPTERA (Midges and flies)		
Chironomidae	0.2	-0.002
Empididae	<0.1	0.000
Sciaridae	<0.1	0.000
Simuliidae	0.1	-0.001
Tipulidae	CO 1	0.001
COLEOPTERA (Beetles)		
Staphylinidae	<0.1	0.000
HOMOPTERA (Aphids)		
Aphididae	0.2	-0.002
Cicadellidae	0.1	-0.001
HYMENOPTERA (Wasps and ants)		
Formicidae	0.1	-0.001
Ichneumonidae	<0.1	0.000
Mymaridae	<0.1	0.000
ARANEIDA (Spiders)		0.001
OLIGOCHAETA (Worms)		
Lumbriculidae	1.3	-0.013
NEUROPTERA		
Chrysopidae	<0.1	0.000
COLLEMBOLA (Springtails)	0.5	-0.005
UNIDENTIFIED TERRESTRIALS	0.1	0.0033

Table 3.134. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of brown trout in Cee Cee Ah Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=27	1+ n=37	2+ n=18	3+ n=18	4+ n=2	All ages n=102
AQUATIC ORGANISMS							
TRICHOPTERA (Caddisflies)							
Brachycentridae	1.8	0.002	0.087	0.059	0.023	-0.018	0.031
Glossosomatidae	1.1	-0.011	0.007	-0.003	0.006	-0.011	-0.004
Hydropsychidae	1.0	-0.003	-0.004	0.014	0.007	-0.010	0.001
Hydroptilidae	0.1	0.006	0.014	-0.001	-0.001	-0.001	0.003
Limnephilidae	0.4	0.091	0.148	0.296	0.301	0.074	0.184
Philopotamidae	<0.1	0.000	0.000	0.000	0.000	0.000	0.000
Psychomyiidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Rhyacophilidae	1.3	-0.006	-0.009	-0.005	-0.003	-0.013	-0.007
Trichoptera pupae	0.3	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
EPHEMEROPTERA (Mayflies)							
Baetidae	17.6	-0.036	-0.106	-0.153	-0.176	-0.176	-0.129
Ephemerellidae	2.5	0.098	0.020	-0.018	-0.012	0.006	0.019
Heptageniidae	7.2	0.168	0.069	0.007	-0.046	-0.072	0.028
Leptophlebiidae	0.6	-0.006	-0.006	-0.006	-0.006	-0.006	-0.006
Tricorythidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
PLECOPTERA (Stoneflies)							
Chloroperlidae	3.4	-0.034	-0.034	-0.034	-0.034	-0.034	-0.034
Leuctridae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Nemouridae	1.0	0.010	0.085	0.025	-0.010	-0.010	0.020
Peltoperlidae	3.9	-0.039	-0.039	-0.039	-0.039	-0.039	-0.039
Perlodidae	1.2	0.001	-0.008	-0.007	-0.026	-0.012	0.000
Perlidae	0.9	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
COLEOPTERA (Beetles)							
Dytiscidae	<0.1	0.000	0.003	0.000	0.000	0.000	0.001
Elmidae adult	0.3	0.013	0.010	0.005	-0.003	-0.003	0.004
Elmidae larvae	11.8	-0.081	-0.095	-0.110	-0.113	-0.102	-0.103
Georyssidae	<0.1	0.000	0.000	0.000	0.000	0.000	0.000
Haliplidae	0	0.000	0.004	0.077	0.009	0.000	0.018
Hydrophilidae	<0.1	0.000	0.000	0.000	0.000	0.000	0.000
DIPTERA (Midges and flies)							
Anthericidae	<0.1	0.000	0.000	0.000	0.000	0.000	0.000
Ceratopogonidae	0.2	0.005	-0.002	0.008	-0.002	-0.002	0.001
Chironomidae larvae	30.3	-0.256	-0.278	-0.289	-0.303	-0.303	-0.282
Chironomidae pupae	0.2	0.033	0.003	-0.002	-0.002	0.029	0.012
Empididae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Pelecorhynchidae	<0.1	0.000	0.000	0.000	0.000	0.000	0.000
Psychodidae	0.1	-0.001	-0.001	0.007	-0.001	-0.001	0.002
Simuliidae	0.7	0.096	0.084	-0.003	-0.004	-0.007	0.029
Stratiomyidae	0	0.000	0.000	0.004	0.000	0.000	0.001
Tabanidae	0	0.000	0.000	0.006	0.018	0.016	0.008
Tipulidae	0.3	0.004	-0.003	-0.003	0.016	-0.003	0.002
OLIGOCHAETA (Worms)							
Naididae	1.3	-0.013	-0.013	-0.013	-0.013	-0.013	-0.013
Lumbriculidae	3.0	-0.030	0.005	0.048	0.116	-0.030	0.022
HIRUDINEA (Leeches)	1.5	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015
GASTROPODA (Snails)							
Lymnaeidae	<0.1	0.000	0.000	0.006	0.031	0.000	0.007
Physidae	0	0.000	0.001	0.006	0.000	0.000	0.001
Planorbidae	<0.1	0.000	0.003	0.000	0.000	0.000	0.001
BIVALVIA (Clams)							
Sphaeriidae	3.1	-0.031	-0.018	-0.024	-0.024	0.031	-0.026
LEPIDOPTERA (Moths)							
Pyralidae	0	0.000	0.000	0.000	0.003	0.000	0.001
NEMATODA	0.6	-0.006	-0.006	-0.006	-0.006	-0.006	-0.006
HEMIPTERA (True bugs)							
Gerridae	0	0.000	0.002	0.000	0.005	0.000	0.001
Mesoveliidae	0	0.000	0.000	0.000	0.010	0.000	0.002
TURBELLARIA (Flatworms)							
Planariidae	0.6	-0.006	-0.006	-0.006	-0.006	-0.006	-0.006

Table 3.134. (cont.)

PREY ORGANISMS	% Environ.	0+ n=27	1+ n=37	2+ n=18	3+ n=18	4+ n=2	All ages n=102
TERRESTRIAL ORGANISMS							
TRICHOPTERA (Caddisflies)	<0.1	0.007	0.013	0.000	0.010	0.266	0.060
EPHEMEROPTERA (Mayflies)	<0 1	0.000	0.000	0.000	0.000	0.000	0.000
PLECOPTERA (Stoneflies)	0	0.000	0.000	0.000	0.000	0.047	0.009
DIPTERA (Midges and flies)							
Bibionidae	0	0.000	0.000	0.000	0.002	0.000	0.000
Chironomidae	0	0.000	0.003	0.000	0.000	0.000	0.001
Sciaridae	0	0.000	0.000	0.000	0.007	0.000	0.001
Simuliidae	0	0.000	0.007	0.009	0.000	0.000	0.003
COLEOPTERA (Beetles)							
Byrrhidae	0	0.000	0 003	0.000	0.000	0.000	0.001
Carabidae	0	0.002	0 000	0.000	0.000	0.000	0.000
Staphylinidae	0	0.000	0.004	0.000	0.002	0.000	0.001
HOMOPTERA (Aphids)							
Aphididae	0.1	0.006	-0.001	0.002	0.001	-0.001	0 001
Cercopidae	0	0.007	0.017	0.005	0.060	0.031	0 024
Cicadellidae	<0.1	0.000	0.013	0.014	0.025	0.000	0 010
Psyllidae	0	0.014	0.000	0.000	0.000	0.000	0.003
HYMENOPTERA (Wasps and ants)							
Apidae	0	0.000	0.000	0.000	0.005	0 000	0.001
Formicidae	<0.1	0.000	0 035	0.103	0.047	0.313	0.103
Ichneumonidae	0	0.000	0.000	0.000	0.000	0.016	0.003
THYSANOPTERA (Thrips)							
Thripidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
ARANEIDA (Spiders)	0.1	-0.001	0.007	0.003	0.009	0.015	0.007
LEPIDOPTERA (Moths)	0	0.000	0.004	0.030	0.002	0.000	0.007
ORTHOPTERA (Grasshoppers)	0	0.000	0.000	0.006	0.000	0.000	0.001
HEMIPTERA (True bugs)							
Nabidae	0	0.000	0.000	0.000	0.002	0.000	0.000
Pentatomidae	0	0.000	0.000	0.000	0.005	0.031	0.007
COLLEMBOLA (Springtails)	<0.1	0.000	0.000	0.000	0.000	0 000	0.000
DIPLOPODA (Centipedes)	0	0.000	0.010	0.000	0.005	0.016	0.004
URODELA (Salamander)	0	0.000	0 000	0.000	0.013	0.000	0.003
UNIDENTIFIED TERRESTRIALS	0 1	0.027	0.024	0.011	0.066	0.093	0.046

Table 3.135. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of brown trout in Cee Cee Ah Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=27	1+ n=37	2+ n=18	3+ n=18	4+ n=2	All ages n=102
AQUATIC ORGANISMS							
TRICHOPTERA (Caddisflies)							
Brachycentridae	0 6	0.014	0.099	0.071	0.035	-0.006	0.043
Glossosomatidae	0.3	-0.003	0.015	0.005	0.005	-0.003	0.004
Hydropsychidae	0.1	0.006	0.005	0.024	0.016	-0.001	0.010
Hydroptilidae	0.2	0.005	0 013	-0.002	-0.002	-0.002	0.002
Limnephilidae	0.3	0.092	0.149	0.307	0.302	0.075	0.185
Philopotamidae	0.1	-0.001	-0.001	-0.001	0.001	-0.001	-0.001
Rhyacophilidae	0.8	-0.001	-0.004	0	0.002	-0.008	-0.002
EPHEMEROPTERA (Mayflies)							
Baetidae	9.3	0.037	-0.023	-0.070	-0.093	-0.093	-0 046
Ephemerellidae	1.0	0.113	0.035	-0.003	0.003	0.021	0.034
Heptageniidae	3.6	0.204	0.105	0 043	0.002	-0.036	0.064
Leptophlebiidae	0 5	-0.005	-0 005	-0 005	-0.005	-0 005	-0 005
ODONATA (Damsel and dragonflies)							
Coenagrionidae	0 5	-0.005	-0 005	-0 005	-0.005	-0.005	-0.005
LEPIDOPTERA (Moths)							
Pyralidae	0	0	0	0	0 003	0	0.001
PLECOPTERA (Stoneflies)							
Chloroperlidae	0.3	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
Nemouridae	1.0	0.010	0.085	0.025	-0.010	-0.010	0.020
Peltoperlidae	0.1	-0.001	-0 001	-0.001	-0.001	-0.001	-0.001
Perlodidae	0.1	0.012	0.003	0.004	0.037	-0.001	0.011
COLEOPTERA (Beetles)							
Dytiscidae	0	0	0.003	0	0	0	0 001
Elmidae adult	0.5	0.011	0.008	0.003	-0.005	-0.005	0.002
Elmidae larvae	5.9	-0.022	-0.033	-0 051	-0.054	-0.043	-0.044
Georyssidae	0.2	-0.002	-0 002	-0 002	-0.002	-0.002	-0.002
Haliplidae	0	0	0.004	0.077	0.009	0	0.018
Hydrophilidae	0.5	-0.005	-0.005	-0 001	-0.005	-0.005	-0.004
HYDRACARINA (Mites)	4.2	-0.042	-0.042	-0.042	-0.042	-0.042	-0.042
DIPTERA (Midges and flies)							
Ceratopogonidae	1.4	-0.007	-0.014	-0.004	-0.014	-0.014	-0.011
Chironomidae larvae	16.2	0.095	-0 137	-0.148	-0.162	-0.162	-0.141
Chironomidae pupae	4.0	-0.005	-0.035	-0.040	-0.040	-0.009	-0.026
Dixidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Psychodidae	1.6	-0.016	-0 016	-0.008	-0.016	-0.016	-0.014
Simuliidae	3.1	0.072	0.040	-0.027	-0.028	-0.031	0 005
Stratiomyidae	1.1	-0 011	-0 011	-0.007	-0.011	-0.011	-0.001
Tabanidae	0	0	0	0.006	0.018	0.016	0.008
Tipulidae	1.4	-0.007	-0.014	-0.014	0.005	-0.014	0 009
HEMIPTERA (True bugs)							
Gerridae	0	0	0.002	0	0 005	0	0.001
Mesoveliidae	0	0	0	0	0 010	0	0 002
OLIGOCHAETA (Worms)							
Naididae	3 8	-0 038	-0 038	-0 038	-0 038	-0 038	-0 038
Lumbriculidae	1.1	-0 011	0.024	0.067	0 135	-0.011	0 041
GASTROPODA (Snails)							
Lymnaeidae	0	0	0	0.006	0 031	0	0 007
Physidae	0	0	0.001	0.006	0	0	0.001
Planorbidae	1.8	-0.018	-0 015	0.018	-0.018	-0.018	-0.017
BIVALVIA (Clams)							
Sphaeriidae	10.3	-0.103	-0 090	-0 096	-0.096	-0.103	-0.098
TURBELLARIA (Flatworms)							
Planariidae	0.6	-0.006	-0 006	-0.006	-0.006	-0 006	-0 006
NEMATODA (Nematodes)	10.9	-0.109	-0.109	-0.109	-0.109	-0 109	-0 109
TERRESTRIAL ORGANISMS							
TRICHOPTERA (Caddisflies)	0	0.007	0.013	0	0.010	0.266	0 060
PLECOPTERA (Stoneflies)	0	0	0	0	0	0.047	0.009

Table 3.135. (cont.)

PREY ORGANISMS	% Environ.	0+ n=27	1+ n=37	2+ n=18	3+ n=18	4+ n=2	All ages n=102
DIPTERA (Midges and flies)							
Bibionidae	0	0	0	0	0.002	0	0
Chironomidae	0.3	-0.003	0	-0.003	-0.003	-0.003	-0.001
Empididae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Phoridae	<0.1	0	0	0	0	0	0
Sciaridae	<0.1	0	0	0	0.007	0	0.001
Simuliidae	<0.1	0	0.007	0.009	0	0	0.003
COLEOPTERA (Beetles)							
Byrrhidae	0	0	0.003	0	0	0	0.001
Carabidae	0	0.002	0	0	0	0	0
Staphylinidae	0	0	0.004	0	0.002	0	0.001
HOMOPTERA (Aphids)							
Aphididae	1.5	-0.008	-0.015	-0.012	-0.013	-0.015	-0.013
Cercopidae	0	0.007	0.017	0.005	0.060	-0.031	0.024
Cicadellidae	0	0	0.013	0.014	0.025	0	0.010
Psyllidae	0	0.014	0	0	0	0	0.003
HYMENOPTERA (Wasps and ants)							
Apidae	0	0	0	0	0.005	0	0.001
Braconidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Cimbicidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Formicidae	0.1	-0.001	0.034	0.102	0.046	0.312	0.102
Ichneumonidae	0	0	0	0	0	0.016	0.003
Pteromalidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
PSOCOPTERA (Psocids)							
Psocidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
THYSANOPTERA (Thrips)							
Thripidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
ARANEIDA (Spiders)	4.3	-0.043	-0.035	-0.039	-0.033	-0.027	-0.035
LEPIDOPTERA (Moths)	0	0	0.004	0.030	0.002	0	0.007
ORTHOPTERA (Grasshoppers)	0	0	0	0.006	0	0	0.001
HEMIPTERA (True bugs)							
Nabidae	0	0	0	0	0.002	0	0
Pentatomidae	0	0	0	0	0.005	0.031	0.007
COLLEMBOLA (Springtails)	4.5	-0.045	-0.045	-0.045	-0.045	-0.045	-0.045
CHILOPODA (Centipedes)	0.3	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
DIPLOPODA (Millipedes)	0.2	-0.002	-0.001	-0.002	0.003	0.014	0.002
URODELA (Salamanders)	0	0	0	0	0.013	0	0.003
UNIDENTIFIED TERRESTRIALS	0.6	0.012	0.029	0.006	0.061	0.098	0.041

Table 3.136. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of brook trout in Cee Cee Ah Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=21	1+ n=53	2+ n=26	All ages n=100
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	1.8	-0.012	0.052	0.033	0.024
Glossosomatidae	1.1	-0.009	-0.001	-0.009	-0.006
Hydropsychidae	1.0	0.014	-0.007	-0.010	-0.004
Hydroptilidae	0.1	0.028	0.032	-0.001	0.017
Limnephilidae	0.4	0 054	0.077	0.245	0.126
Philopotamidae	<0.1	0	0	0	0
Psychomyiidae	0.1	-0.001	-0.001	-0.001	-0.001
Rhyacophilidae	1.3	-0.011	0.027	0.019	0.012
Trichoptera pupae	0.3	-0.003	-0 003	-0.002	0
EPHEMEROPTERA (Mayflies)					
Baetidae	17.6	-0.088	-0.152	-0.145	-0.128
Ephemerellidae	2.5	0.004	-0.008	-0.020	-0.008
Heptageniidae	7.2	-0.060	-0.060	-0.062	-0.061
Leptophlebiidae	0.6	-0 006	-0.006	-0.006	-0 006
Tricorythidae	0.1	-0 001	-0.001	-0.001	-0 001
PLECOPTERA (Stoneflies)					
Chloroperlidae	3.4	-0.034	-0.032	-0.034	-0.033
Leuctridae	0.1	-0.001	-0.001	-0.001	-0.001
Nemouridae	1.0	0.130	0.070	0.053	0.084
Peltoperlidae	3.9	-0.039	-0.038	-0.036	-0.038
Perlodidae	1.2	-0.012	0.008	-0.012	-0.012
Perlidae	0.9	-0.009	-0.009	-0.009	-0.009
COLEOPTERA (Beetles)					
Dytiscidae	<0.1	0.131	0.017	0.003	0.050
Elmidae adult	0.3	0.005	0.001	0.009	0.004
Elmidae larvae	11.8	-0.116	-0.109	-0.115	-0.113
Georyssidae	<0.1	0	0	0	0
Hydrophilidae	<0.1	0	0	0	0
LEPIDOPTERA (Moths)					
Pyralidae	0	0	0.003	0	0.001
HYDRACARINA (Mites)	1 0	-0.006	0 002	-0 001	-0 002
DIPTERA (Midges and flies)					
Anthericidae	<0.1	0	0	0	0
Ceratopogonidae	0.2	0.014	0.029	0.007	0 017
Chironomidae larvae	30.3	-0.065	0.033	-0.230	-0.087
Chironomidae pupae	0.2	0.120	0.027	0.016	0.054
Empididae	0.1	-0.001	-0.001	0.003	0
Muscidae	0	0	0.002	0	0.001
Pelecorhynchidae	<0.1	0	0	0	0
Psychodidae	0.1	0.001	0.001	0.001	0.001
Simuliidae	0.7	-0.007	0.011	-0.004	0
Tipulidae	0.3	-0.003	0.013	0.033	0.014
OLIGOCHAETA (Worms)					
Naididae	1.3	-0.013	-0.013	-0.013	-0.013
Lumbriculidae	3.0	-0.030	-0.005	0.003	-0.010
HIRUDINEA (Leeches)	1.5	-0 015	0.015	-0 015	-0.015
GASTROPODA (Snails)					
Lymnaeidae	<0.1	0	0	0	0
Planorbidae	<0.1	0	0	0	0
BIVALVIA (Clams)					
Sphaeriidae	3.1	-0.018	-0.016	-0.028	-0.021
NEMATODA (Nematodes)	0.6	-0.006	-0.006	-0 006	-0 006

Table 3.136. (cont.)

PREY ORGANISMS	% Environ.	0+ n=21	1+ n=53	2+ n=26	All ages n=100
TURBELLARIA (Flatworms)					
Planariidae	0.6	-0.006	-0.006	-0.006	-0.006
TERRESTRIAL ORGANISMS					
TRICHOPTERA (Caddisflies)	<0.1	0.023	0.003	0.005	0.010
EPHEMEROPTERA (Mayflies)	<0.1	0	0	0	0
PLECOPTERA (Stoneflies)	0	0	0	0.037	0.012
DIPTERA (Midges and flies)					
Bibionidae	0	0	0	0.008	0.003
Chironomidae	0	0	0	0.003	0.001
Mycetophilidae	0	0	0.001	0.010	0.004
Sciaridae	0	0	0.001	0.005	0.002
Simuliidae	0	0	0.001	0	0
Tipulidae	0	0	0.001	0	0
COLEOPTERA (Beetles)					
Bruchidae	0	0	0	0.001	0.001
Carabidae	0	0	0.003	0.001	0.001
Cerambycidae	0	0	0	0.002	0.001
Curculionidae	0	0	0	0.004	0.001
Lathridiidae	0	0	0.001	0	0
Scarabaeidae	0	0	0.001	0	0
HOMOPTERA (Aphids)					
Aphididae	0.1	0.005	-0.001	0	0.001
Cercopidae	0	0	0.001	0	0
Cicadellidae	<0.1	0	0	0.003	0.001
Psyllidae	0	0	0.001	0	0
HYMENOPTERA (Wasps and ants)					
Braconidae	0	0	0.003	0	0.001
Diapriidae	0	0.006	0.002	0	0.003
Formicidae	<0.1	0.026	0.013	0.021	0.020
Ichneumonidae	0	0	0	0.001	0
THYSANOPTERA (Thrips)					
Thripidae	0.1	-0.001	-0.001	-0.001	-0.001
ARANEIDA (Spiders)	0.1	0.001	0.005	0.003	0.003
LEPIDOPTERA (Moths)	0	0.004	0.004	0.010	0.006
ORTHOPTERA (Grasshoppers)	0	0	0	0.003	0.001
COLLEMBOLA (Springtails)	<0.1	0	0.011	0	0.004
DIPLOPODA (Millipedes)	0	0	0.002	0.031	0.011
UNIDENTIFIED TERRESTRIALS	0.1	0.017	0.014	0.050	0.027

Table 3.137. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of brook trout in Cee Cee Ah Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=21	1+ n=53	2+ n=26	All ages n=100
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	0.6	0	0.064	0.047	0.036
Glossosomatidae	0.3	-0.001	0.007	-0.001	0.002
Hydropsychidae	0.1	0.013	0.002	-0.001	0.005
Hydroptilidae	0.2	0.027	0.031	-0.002	0.019
Limnephilidae	0.3	0.055	0.078	0.246	0.127
Philopotamidae	0.1	-0.001	-0.001	-0.001	-0.001
Rhyacophilidae	0.8	-0.006	0.032	0.024	0.017
Trichoptera pupae	0	0	0	0.001	0
EPHEMEROPTERA (Mayflies)					
Baetidae	9.3	-0.005	-0.069	-0.062	-0.045
Ephemerellidae	1.0	0.029	0.007	-0.005	0.007
Heptageniidae	3.6	-0.024	-0.024	-0.026	-0.025
Leptophlebiidae	0.5	-0.005	-0.005	-0.005	-0.005
PLECOPTERA (Stoneflies)					
Chloroperlidae	0.3	-0.003	-0.001	-0.003	-0.002
Nemouridae	1.0	0.130	0.070	0.053	0.084
Peltoperlidae	0.1	-0.001	0	0.002	0
Perlodidae	0.1	-0.001	0.019	-0.001	0.006
ODONATA					
Coenagrioniidae	0.5	-0.005	-0.005	-0.005	-0.005
COLEOPTERA (Beetles)					
Dytiscidae	0	0.131	0.017	0.003	0.050
Elmidae adult	0.5	0.003	-0.001	0.007	0.002
Elmidae larvae	5.9	-0.057	-0.050	-0.056	-0.054
Georyssidae	0.2	-0.002	-0.002	-0.002	-0.002
Hydrophilidae	0.3	-0.003	0.007	0 004	0 003
LEPIDOPTERA (Moths)					
Pyralidae	0	0	0.003	0	0.001
HYDRACARINA (Mites)	4.2	-0.038	-0.030	-0.034	-0.035
DIPTERA (Midges and flies)					
Ceratopogonidae	1.4	0.002	0.017	-0 005	0.005
Chironomidae larvae	16.2	0.076	0.174	-0.089	0 054
Chironomidae pupae	4.0	0.082	-0.011	-0.022	0.016
Dixidae	0.1	-0.001	-0.001	-0.001	-0.001
Empididae	0	0	0	0.004	0 001
Muscidae	0	0	0.002	0	0 001
Psychodidae	1 6	-0.016	-0.016	-0.016	-0.016
Simuliidae	3.1	-0.031	-0.013	-0.028	-0.024
Stratiomyidae	1.1	-0.011	-0.011	-0.011	-0.011
Tipulidae	1.4	-0.014	0.002	0.012	0 003
OLIGOCHAETA (Worms)					
Naididae	3.8	-0.038	-0.038	-0.038	-0.038
Lumbriculidae	1.1	-0.011	0.014	0.022	0.009
GASTROPODA (Snails)					
Planorbidae	1.8	-0.018	-0.018	-0.018	-0.018
BIVALVIA (Clams)					
Sphaeriidae	10.3	-0.090	-0.088	-0 100	-0 093
NEMATODA (Nematodes)	10.9	0.109	0.109	0.109	0.109
TURBELLARIA (Flatworms)					
Planariidae	0.6	-0.005	-0.005	-0.005	-0.005
TERRESTRIAL ORGANISMS					
TRICHOPTERA (Caddisflies)	0	0 023	0 003	0.005	0 010
PLECOPTERA (Stoneflies)	0	0	0	0.037	0 012

Table 3.137. (cont.)

PREY ORGANISMS	% Environ.	0+ n=21	1+ n=53	2+ n=26	All ages n=100
DIPTERA (Midges and flies)					
Bibionidae	0	0	0	0.008	0.003
Chironomidae	0.3	-0.003	-0.003	0	-0.002
Empididae	0.1	-0.001	-0.001	0.001	-0.001
Mycetophilidae	0	0	0.001	0.010	0.004
Phoridae	<0.1	0	0	0	0
Sciaridae	<0.1	0	0	0.002	0.001
Simuliidae	<0.1	0	0.001	0.005	0.002
Tipulidae	0	0	0.001	0	0
COLEOPTERA (Beetles)					
Bruchidae	0	0	0	0.001	0
Carabidae	0	0	0.003	0.001	0.001
Cerambycidae	0	0	0	0.002	0.001
Curculionidae	0	0	0	0.004	0.001
Lathridiidae	0	0.001	0	0	0
Scarabaeidae	0	0	0.001	0	0
HOMOPTERA (Aphids)					
Aphididae	1.5	-0.009	-0.015	-0.014	-0.013
Cercopidae	0	0	0.001	0	0
Cicadellidae	0	0	0	0.003	0.001
Psyllidae	0	0	0.001	0	0
HYMENOPTERA (Wasps and ants)					
Braconidae	0.1	-0.001	0.002	-0.001	0
Cimbicidae	0.1	-0.001	-0.001	-0.001	-0.001
Diapriidae	0	0.006	0.002	0	0.003
Formicidae	0.1	0.025	0.012	0.028	0.019
Ichneumonidae	0	0	0	0.001	0
Pteromalidae	0.1	-0.001	-0.001	-0.001	-0.001
PSOCOPTERA (Psocids)					
Psocidae	0.1	-0.001	-0.001	-0.001	-0.001
THYSANOPTERA (Thrips)					
Thripidae	0.1	-0.001	-0.001	-0.001	-0.001
ARANEIDA (Spiders)	4.3	-0.041	-0.037	-0.039	-0.039
COLLEMBOLA (Springtails)	4.5	-0.045	-0.034	-0.045	-0.041
CHILOPODA(Centipedes)	0.3	-0.003	-0.033	-0.033	-0.033
DIPLOPODA (Millipedes)	0.2	-0.002	0	0.029	0.009
UNIDENTIFIED TERRESTRIALS	0.6	0.012	0.009	0.043	0.021

3.139. The highest electivity by age 0+ brook trout was for Chironomidae larvae from the benthos (0.204) and the drift (0.091). The highest electivity by age 1+ brook trout was for Formicidae from the benthos (C 099) and for Nemouridae from the drift (0.093). The highest electivity by age 2+ brook trout was for Limnephilidae from the benthos (0.136) and the drift (0.137). Combined age classes selected for Formicidae from the benthos (0.080) and for Limnephilidae from the drift (0.078).

Cutthroat trout electivities for benthic invertebrates are listed in Table 3.140 and electivities for drifting invertebrates are listed in Table 3.141. The highest electivity by age 0+ cutthroat trout was for Nemouridae from the benthos (0.476) and the drift (0.498). Nematoda was selected for most by age 1+ cutthroat trout from both the benthos (0.410) and the drift (0.41 1). The highest electivity by age 2+ cutthroat trout was for Perlodidae from the benthos (0.246) and for Nemouridae from the drift (0.248). Combined age classes selected Nemouridae most often from both the benthos (0.274) and the drift (0.296).

3.6.3.5 SKOOKUM CREEK

The measure of prey selection (electivity) for benthic and drifting invertebrates was determined for each age class of brown trout, brook trout, and cutthroat trout captured in Skookum Creek.

Brown trout electivities for benthic invertebrates are listed in Table 3.142 and electivities for drifting invertebrates in Table 3.143. Limnephilidae was selected for most often by 0+, 1+, 2+, 4+, and combined age classes of brown trout from both the benthos (0.187, 0.111, 0.212, 0.392, and 0.206, respectively) and the drift (0.183, 0.107, 0.208, 0.388, and 0.202, respectively). The highest electivity by 3+ brown trout was for Lumbriculidae from the benthos (0.275) and the drift (0.327).

Brook trout electivities for benthic invertebrates are listed in Table 3.144 and electivities for drifting invertebrates in Table 3.145. The highest electivity by 0+ brook trout was for Chironomidae pupae from the benthos (0.165) and for Chironomidae adult from the drift (0.154). Limnephilidae was selected for most often by 1+, 2+, ana combined age classes from both the benthos (0.275, 0.269, and 0.209, respectively) and the drift (0.271, 0.265, and 0.205, respectively).

Table 3.138. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of brook trout in Tacoma Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=20	1+ n=48	2+ n=18	All ages n=66
AQUATIC **ORGANISMS**					
TRICHOPTERA (Caddisflies)					
Brachycentridae	8.3	-0.057	0.061	0.037	0.014
Glossosomatidae	3.1	-0.031	-0.031	-0.031	-0.031
Hydropsychidae	1.3	-0.009	-0.003	-0.004	-0.005
Hydroptilidae	0	0.022	0.003	0	0.008
Limnephilidae	0.1	0.020	0.070	0.136	0.075
Lepidostomatidae	0	0	0.001	0.005	0.002
Leptoceridae	<0.1	0	0	0	0
Rhyacophilidae	1.3	-0.013	-0.004	-0.001	-0.006
Trichoptera pupae	0.2	-0.002	-0.002	-0.002	-0.002
EPHEMEROPTERA (Mayflies)					
Baetidae	21.9	-0.161	-0.194	-0.205	-0.187
Ephemerellidae	6.2	-0.058	-0.055	-0.046	-0.053
Heptageniidae	7.6	-0.044	-0.052	-0.069	-0.055
Leptophlebiidae	0.5	-0.005	-0.005	-0.005	-0.005
LEPIDOPTERA (Moths)					
Pyralidae	0.7	-0.007	-0.007	-0.003	-0.006
PLECOPTERA (Stoneflies)					
Capniidae	0.5	-0.005	-0.005	-0.005	-0.005
Chloroperlidae	1.2	-0.012	-0.012	-0.012	-0.012
Leuctridae	0.1	-0.001	-0.001	-0.001	-0.001
Nemouridae	2.4	0.036	0.071	0.040	0.049
Peltoperlidae	<0.1	0	0	0	0
Perlodidae	0.4	0.056	0.016	0.051	0.038
Perlidae	0.2	-0.002	-0.002	-0.002	-0.002
COLEOPTERA (Beetles)					
Amphizoidae	0	0	0	0.002	0.001
Dytiscidae	0	0	0.002	0	0.001
Elmidae adult	1.7	0.005	0.058	0.008	0.011
Elmidae larvae	25.0	-0.214	-0.236	-0.241	-0.230
Hydrophilidae	0	0	0.004	0.005	0.003
HYDRACARINA (Mites)	1.7	0.013	-0.007	-0.0[illegible]	0
DIPTERA (Midges and flies)					
Ceratopogonidae	0.2	0.011	0.014	-0.002	0.008
Chironomidae larvae	7.3	0.204	0.031	0.033	0.067
Chironomidae pupae	0.1	0.062	0.025	0.004	0.030
Empididae	0.1	-0.001	-0.001	-0.001	-0.001
Muscidae	0	0.025	0	0.003	0.009
Psychodidae	1.1	-0.011	-0.011	-0.011	-0.011
Simuliidae	3.2	-0.020	-0.015	-0.024	-0.020
Tipulidae	1.1	0.001	-0.001	-0.007	-0.002
HEMIPTERA (True bugs)					
Corixidae	0	0	0.002	0	0.001
BIVALVIA (Clams)					
Sphaeriidae	0.2	-0.002	0.009	-0.002	0.002
OLIGOCHAETA (Worms)					
Lumbriculidae	1.3	-0.009	-0.001	-0.010	-0.070
TURBELLARIA (Flatworms)					
Planariidae	0.6	-0.006	-0.006	-0.006	-0.006
NEMATODA (Nematodes)	0.1	0.003	0.003	0.121	0.042
TERRESTRIAL ORGANISMS					
TRICHOPTERA (Caddisflies)	0	0	0.007	0.007	0.005
EPHEMEROPTERA (Mayflies)	0	0	0.002	0	0.001

Table 3.138. (cont.)

PREY ORGANISMS	% Environ.	0+ n=20	1+ n=48	2+ n=18	All ages n=66
PLECOPTERA (Stoneflies)	0	0	0.003	0.004	0.002
DIPTERA (Midges and flies)					
Bibionidae	0	0	0	0.002	0.001
Chironomidae	<0.1	0	0	0	0
Mycetophilidae	<0.1	0.008	0	0	0.003
Sciaridae	0	0	0.001	0	0
COLEOPTERA (Beetles)					
Buprestidae	0	0	0.002	0	0.001
Byrrhidae	0	0	0.004	0	0.001
Carabidae	0	0.004	0	0.005	0.003
Chrysomelidae	0	0	0.002	0.005	0.002
Curculionidae	0	0	0.020	0	0.007
Lagriidae	0	0	0.021	0	0.007
Ostomidae	0	0	0	0.011	0.004
Staphylinidae	0	0.021	0.001	0	0.007
HOMOPTERA (Aphids)					
Aphididae	0.1	0.024	-0.001	0.010	0.011
Cicadellidae	co.1	0.013	0.018	0	0.010
Psyllidae	0	0.033	0.023	0.002	0.019
HYMENOPTERA (Wasps and ants)					
Apidae	0	0	0	0.003	0.001
Eulophidae	0	0	0.003	0	0.001
Formicidae	0	0.017	0.099	0.126	0.080
Ichneumonidae	0	0	0.004	0.003	0.002
Mymaridae	0	0.033	0	0	0.011
THYSANOPTERA (Thrips)					
Thripidae	0.1	-0.001	-0.001	-0.001	-0 001
ARANEIDA (Spiders)	0	0	0.017	0 007	0 008
LEPIDOPTERA (Moths)	0	0.017	0.063	0.131	0.070
HEMIPTERA (True bugs)					
Miridae	0	0	0.002	0	0.001
COLLEMBOLA (Springtails)	<0.1	0.017	0	0	0.006
DIPLOPODA (Millipedes)	0	0 004	0	0	0.001
UNIDENTIFIED TERRESTRIALS	0.1	0 024	0 016	0 018	0.019

Table 3.139. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of brook trout in Tacoma Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=20	1+ n=48	2+ n=18	All ages n=66
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	18.2	-0.156	-0.038	-0.062	-0.085
Glossosomatidae	<0.1	0	0	0	0
Hydropsychidae	<0.1	0.004	0.010	0.009	0.008
Hydroptilidae	0	0.022	0.003	0	0.008
Limnephilidae	0	0.021	0.071	0.137	0.078
Lepidostomatidae	0	0	0.001	0.005	0.002
Rhyacophilidae	0.2	-0.002	0.007	0.010	0.005
EPHEMEROPTERA (Mayflies)					
Baetidae	9.4	-0.036	-0.069	-0.080	-0.062
Ephemerellidae	10.8	-0.104	-0.101	-0.092	-0.099
Heptageniidae	5.5	-0.023	-0.031	-0.047	-0.034
Leptophilibidae	0.1	-0.001	-0.001	-0.001	-0.001
LEPIDOPTERA (Moths)					
Pyralidae	0.1	-0.001	-0.001	0.003	0
PLECOPTERA (Stoneflies)					
Nemouridae	0.2	0.058	0.093	0.062	0.071
Perlodidae	5.3	0.007	-0.033	-0.008	-0.011
COLEOPTERA (Beetles)					
Amphizoidae	0	0	0	0.002	0.001
Dytiscidae	<0.1	0	0.002	0	0.001
Elmidae adult	1.2	0.010	0.055	0.013	0.026
Elmidae larvae	4.8	-0.012	-0.034	0.039	-0.028
Georyssidae	3.0	-0.030	-0.030	-0.030	-0.030
Hydrophilidae	0	0	0.004	0.005	0.003
HEMIPTERA (True bugs)					
Corixidae	0	0	0.002	0	0.001
HYDRACARINA	2.8	0.007	-0.018	-0.023	-0.011
DIPTERA (Midges and flies)					
Ceratopogonidae	0	0.013	0.016	0	0.010
Chironomidae larvae	18.6	0.091	-0.082	-0.146	-0.046
Chironomidae pupae	0.8	0.055	0.018	-0.003	0.023
Dixidae	0.1	-0.001	-0.001	-0.001	-0.001
Muscidae	0	0.025	0	0.003	0.009
Psychodidae	5.7	-0.057	-0.057	-0.057	-0.057
Simuliidae	1.5	-0.003	0.002	-0.007	-0.003
Tipulidae	0	0.012	0.010	0.004	0.009
BIVALVIA (Clams)					
Sphaeriidae	0.3	-0.003	0.008	-0.003	0.001
OLIGOCHAETA (Worms)					
Lumbriculidae	2.6	-0.022	-0.014	-0.023	-0.020
NEMATODA (Nematodes)	0	0.004	0.004	0.122	0.043
TERRESTRIAL ORGANISMS					
TRICHOPTERA (Caddisflies)	0	0	0.007	0.007	0.005

Table 3.139. (cont.)

PREY ORGANISMS	% Environ.	0+ n=20	1+ n=48	2+ n=18	All ages n=66
EPHEMEROPTERA (Mayflies)	0.9	-0.009	-0.007	-0.009	-0.008
PLECOPTERA (Stoneflies)	0	0	0.003	0.004	0.002
DIPTERA (Midges and flies)					
Bibionidae	0	0	0	0.002	0.001
Chamaemyiidae	<0.1	0	0	0	0
Chironomidae	0.1	-0.001	-0.001	-0.001	-0.001
Empididae	0.5	-0.005	-0.005	-0.005	-0.005
Mycetophilidae	0	0.008	0	0	0.003
Sciaridae	0	0	0.001	0	0
Simuliidae	0.9	-0.009	-0.009	-0.009	-0.009
COLEOPTERA (Beetles)					
Buprestidae	0	0	0.002	0	0.001
Byrrhidae	0	0	0.004	0	0.001
Carabidae	0	0.004	0	0.005	0.003
Chrysomelidae	0	0	0.002	0.005	0.002
Crytophagidae	<0.1	0	0	0	0
Curculionidae	0	0	0.020	0	0.007
Lagriidae	0	0	0.002	0	0.001
Ostomidae	0	0	0	0.011	0.004
Staphylinidae	0	0.021	0.001	0	0.007
HOMOPTERA (Aphids)					
Aphididae	1.2	0.013	-0.012	-0.001	0
Cicadellidae	0.1	0.012	0.017	-0.001	0.009
Psyllidae	0	0.033	0.023	0.002	0.019
HYMENOPTERA (Wasps and ants)					
Apidae	0	0	0	0.003	0.001
Braconidae	0.5	-0.005	-0.005	-0.005	-0.005
Eulophidae	0	0	0.003	0	0.001
Formicidae	0.9	0.008	0.090	0.115	0.071
Ichneumonidae	0	0	0.004	0.003	0.002
Mymaridae	0	0.033	0	0	0.011
PSOCOPTERA					
Psocidae	0.3	-0.003	-0.003	-0.003	-0.003
ARANEIDA (Spiders)	0.1	-0.001	0.016	0.006	0.007
LEPIDOPTERA (Moths)	0	0.017	0.063	0.131	0.070
OLIGOCHAETA (Worms)					
Lumbriculidae	2.6	-0.022	-0.014	-0.023	-0.020
HEMIPTERA (True bugs)					
Miridae	0	0	0.002	0	0.001
COLLEMBOLA (Springtails)	0	0.017	0	0	0.006
DIPLOPODA (Millipedes)	0	0.004	0	0	0.001
UNIDENTIFIED TERRESTRIALS	1.0	0.015	0	0.009	0.008

Table 3.140. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of cutthroat trout in Tacoma Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=2	1+ n=5	2+ n=3	All ages n=10
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	8.3	-0.083	-0.083	-0.083	-0.083
Glossosomatidae	3.1	-0.031	-0.031	-0.031	-0.031
Hydropsychidae	1.3	-0.013	-0.005	-0.013	-0.010
Limnephilidae	0.1	-0.001	0.058	0.052	0.036
Leptoceridae	<0.1	0	0	0	0
Rhyacophilidae	1.3	-0.013	-0.013	-0.013	-0.013
Trichoptera pupae	0.2	-0.002	-0.002	-0.002	-0.002
EPHEMEROPTERA (Mayflies)					
Baetidae	21.9	-0.219	-0.177	-0.219	-0.205
Ephemerellidae	6.2	-0.062	-0.045	-0.062	-0.056
Heptageniidae	7.6	-0.076	-0.076	-0.076	-0.076
Leptophlebiidae	0.5	-0.005	-0.005	-0.005	-0.005
PLECOPTERA (Stoneflies)					
Capniidae	0.5	-0.005	-0.005	-0.005	-0.005
Chloroperlidae	1.2	-0.012	-0.012	-0.012	-0.012
Leuctridae	0.1	-0.001	-0.001	-0.001	-0.001
Nemouridae	2.4	0.476	0.120	0.226	0.274
Peltoperlidae	<0.1	0	0	0	0
Perlodidae	0.4	-0.004	0.072	0.246	0.105
Perlidae	0.2	-0.002	-0.002	-0.002	-0.002
COLEOPTERA (Beetles)					
Elmidae adult	1.7	-0.017	0.008	0.009	0
Elmidae larvae	25.0	-0.250	-0.242	-0.250	-0.247
HYDRACARINA (Mites)	1.7	-0.017	-0.009	-0.017	-0.014
DIPTERA (Midges and flies)					
Ceratopogonidae	0.2	-0.002	-0.002	0.011	0.002
Chironomidae larvae	7.3	-0.017	-0.056	-0.047	-0.040
Chironomidae pupae	0.1	-0.001	-0.001	-0.001	-0.001
Empididae	0.1	-0.001	-0.001	-0.001	-0.001
Muscidae	0	0	0	0.026	0.009
Psychodidae	1.1	-0.011	-0.011	-0.011	-0.011
Simuliidae	3.2	-0.032	-0.015	-0.032	-0.026
Tipulidae	1.1	-0.011	-0.003	-0.011	-0.008
BIVALVIA (Clams)					
Sphaeriidae	0.2	-0.002	-0.002	-0.002	-0.002
LEPIDOPTERA (Moths)					
Pyralidae	0.7	-0.007	0.160	-0.007	0.049
OLIGOCHAETA (Worms)					
Lumbriculidae	1.3	-0.013	-0.013	-0.013	-0.013
NEMATODA (Nematodes)	0.1	-0.001	0.410	-0.001	-0.136
TURBELLARIA (Flatworms)					
Planariidae	0.6	-0.006	-0.006	-0.006	-0.006
TERRESTRIAL ORGANISMS					
PLECOPTERA (Stoneflies)	0	0	0	0.013	0.004
DIPTERA (Midges and flies)					
Chironomidae	<0.1	0	0	0	0
Mycetophilidae	<0.1	0	0	0	0
COLEOPTERA (Beetles)					
Buprestidae	0	0	0	0.013	0.004
Coccinellidae	0	0	0	0.013	0.004
Elateridae	0	0	0	0.013	0.004
HOMOPTERA (Aphids)					
Aphididae	0.1	-0.001	-0.001	0.025	0.008
Cicadellidae	<0.1	0	0	0	0
HYMENOPTERA (Wasps and ants)					
Formicidae	0	0	0	0.079	0.026
THYSANOPTERA (Thrips)					
Thripidae	0.1	-0.001	-0.001	-0.001	-0.001
ARANEIDA (Spiders)	0	0	0	0.026	0.009
LEPIDOPTERA (Moths)	0	0.444	0	0.158	0.201
COLLEMBOLA (Springtails)	<0.1	0	0	0	0
UNIDENTIFIED TERRESTRIALS	0.1	-0.001	-0.001	0.0012	0.003

Table 3.141. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of cutthroat trout in Tacoma Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=2	1+ n=5	2+ n=3	All ages n=10
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	18.2	-0.182	-0.182	-0.182	-0.182
Glossosomatidae	<0.1	0	0	0	0
Hydropsychidae	<0.1	0	0.008	0	0.003
Limnephilidae	0	0	0.059	0.053	0.037
Rhyacophilidae	0.2	-0.002	-0.002	-0.002	-0.002
EPHEMEROPTERA (Mayflies)					
Baetidae	9.4	-0.094	-0.052	-0.094	-0.080
Ephemerellidae	10.8	-0.108	-0.091	-0.108	-0.102
Heptageniidae	5.5	-0.055	-0.055	-0.055	-0.055
Leptophlebiidae	0.1	-0.001	-0.001	-0.001	-0.001
DIPTERA (Midges and flies)					
Ceratopogonidae	0	0	0	0.013	0.004
Chironomidae larvae	18.6	-0.130	-0.169	-0.160	-0.153
Chironomidae pupae	0.8	-0.008	-0.008	-0.008	-0.008
Dixidae	0.1	-0.001	-0.001	-0.001	-0.001
Muscidae	0	0	0	0.026	0.009
Psychodidae	5.7	-0.057	-0.057	-0.057	-0.057
Simuliidae	1.5	-0.015	0.002	-0.015	-0.009
Tipulidae	0	0	0.008	0	0.003
PLECOPTERA (Stoneflies)					
Nemouridae	0.2	0.498	0.142	0.248	0.296
Perlodidae	5.3	-0.053	0.023	0.197	0.056
COLEOPTERA (Beetles)					
Dytiscidae	<0.1	0	0	0	0
Elmidae adult	1.2	-0.012	0.013	0.014	0.005
Elmidae larvae	4.8	-0.048	-0.040	-0.048	-0.045
Georyssidae	3.0	-0.030	-0.030	-0.030	-0.030
HYDRACARINA (Mites)	2.8	-0.028	-0.020	-0.028	-0.025
BIVALVIA (Clams)					
Sphaeriidae	0.3	-0.003	-0.003	-0.003	-0.003
LEPIDOPTERA (Moths)					
Pyralidae	0.1	-0.001	0.166	-0.001	0.055
OLIGOCHAETA (Worms)					
Lumbriculidae	2.6	-0.026	-0.026	-0.026	-0.026
NEMATODA (Nematodes)	0	0	0.411	0	0.137
TERRESTRIAL ORGANISMS					
EPHEMEROPTERA (Mayflies)	0.9	-0.009	-0.009	-0.009	-0.009
PLECOPTERA (Stoneflies)	0	0	0	0.013	0.004
DIPTERA (Midges and flies)					
Chamaemyiidae	<0.1	0	0	0	0
Chironomidae	0.1	-0.001	-0.001	-0.001	-0.001
Empididae	0.5	-0.005	-0.005	-0.005	-0.005
Simuliidae	0.9	-0.009	-0.009	-0.009	-0.009
COLEOPTERA (Beetles)					
Buprestidae	0	0	0	0.013	0.004
Coccinellidae	0	0	0	0.013	0.004
Crytophagidae	<0.1	0	0	0	0
Elateridae	0	0	0	0.013	0.004
HOMOPTERA (Aphids)					
Aphididae	4.2	-0.042	-0.042	-0.016	-0.033
Cicadellidae	0.1	-0.001	-0.001	-0.001	-0.001
HYMENOPTERA (Wasps and ants)					
Braconidae	0.5	-0.005	-0.005	-0.005	-0.005
Formicidae	0.9	-0.009	-0.009	0.070	0.017
PSOCOPTERA (Psocids)					
Psocidae	0.3	-0.003	-0.003	-0.003	-0.003
ARANEIDA (Spiders)	0.1	-0.001	-0.001	0.025	0.008
LEPIDOPTERA (Moths)	0	0.444	0	0.158	0.201
UNIDENTIFIED TERRESTRIALS	0.1	-0.001	-0.001	-0.001	-0.001

Table 3.142. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of brown trout in Skookum Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=22	1+ n=34	2+ n=28	3+ n=11	4+ n=2	All ages n=97
AQUATIC ORGANISMS							
TRICHOPTERA (Caddisflies)							
Brachycentridae	2.4	-0.024	-0.024	0.049	-0.011	-0.024	-0.007
Glossosomatidae	2.1	-0.014	0.004	0.015	-0.021	-0.021	-0.013
Hydropsychidae	0.7	-0.005	0.006	0.011	0.009	0.070	0.018
Hydroptilidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Limnephilidae	0.1	0.187	0.111	0.212	0.126	0.392	0.206
Leptoceridae	<0.1	0	0	0	0	0	0
Psychomyiidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Rhyacophilidae	2.9	-0.012	-0.028	0.015	-0.019	-0.029	-0.021
Trichoptera pupae	<0.1	0	0	0	0	0	0
EPHEMEROPTERA (Mayflies)							
Baetidae	14.9	0.140	0.100	-0.019	-0.138	-0.149	-0.013
Ephemerellidae	8.2	-0.058	0.025	-0.062	-0.077	-0.082	-0.051
Heptageniidae	12.7	-0.112	0.010	0.008	-0.055	-0.089	-0.048
Leptophilibidae	1.4	-0.014	-0.014	-0.014	-0.014	-0.014	-0.014
PLECOPTERA (Stone flies)							
Capniidae	0.3	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
Chloroperlidae	8.7	-0.087	-0.087	-0.087	-0.087	-0.087	-0.087
Nemouridae	1.9	0.010	0.068	-0.009	-0.016	-0.019	0.007
Peltoperlidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Perlodidae	1.5	-0.015	0.018	0.017	0.018	-0.015	0.005
Pteronarcyidae	<0.1	0	0	0.007	0.077	0	0.017
Perlidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
COLEOPTERA (Beetles)							
Dytiscidae	0	0.009	0	0	0.005	0	0.003
Elmidae adult	1.4	-0.014	-0.004	-0.014	0.014	-0.014	-0.012
Elmidae larvae	11.8	-0.118	-0.115	-0.117	-0.118	-0.118	-0.117
Haliplidae	0	0	0	0	0.011	0	0.002
Hydrophilidae	0	0.002	0	0	0	0	0
HYDRACARINA (Mites)	0.5	-0.001	-0.005	-0.005	-0.005	-0.005	-0.004
DIPTERA (Midges and flies)							
Ceratopogonidae	0.6	-0.004	-0.006	-0.006	-0.006	-0.006	-0.006
Chironomidae larvae	12.2	-0.089	-0.062	-0.106	-0.114	-0.045	-0.083
Chironomidae pupae	0.2	0.015	0.001	0.007	-0.002	-0.002	0.004
Culicidae	0	0	0.007	0	0	0	0.001
Empididae	0.2	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Psychodidae	0.4	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004
Simuliidae	1.4	0.006	-0.003	0.017	0.001	0	0.001
Tipulidae	1.6	-0.012	-0.016	0	-0.016	0.099	0.011
GASTROPODA (Snails)							
Planorbidae	0.3	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003

Table 3.142. (cont.)

PREY ORGANISMS	% Environ.	0+ n=22	1+ n=34	2+ n=28	3+ n=11	4+ n=2	All ages n=97
BIVALVIA (Clams)							
Sphaeriidae	2.2	0	-0.022	-0.022	-0.022	-0.022	-0.018
OLIGOCHAETA (Worms)							
Naididae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Lumbriculidae	5.8	-0.032	-0.029	0.079	0.275	0.019	0.062
TURBELLARIA (Flatworms)							
Planariidae	1.5	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015
NEMATODA	1.2	-0.012	-0.012	-0.012	-0.012	-0.012	-0.012
TERRESTRIAL ORGANISMS							
TRICHOPTERA	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
PLECOPTERA	<0.1	0	0	0.001	0.040	0	0.008
DIPTERA (Midges and flies)							
Anthomyiidae	0	0	0.007	0	0	0	0.001
Dixidae	0	0.015	0	0	0	0	0.003
Ephydridae	0	0.007	0	0	0	0	0.001
Mycetophilidae	0	0.007	0	0	0	0	0.001
Sciaridae	0	0	0.007	0	0	0	0.001
Simuliidae	<0.1	0.002	0	0.001	0	0	0.001
COLEOPTERA (Beetles)							
Byrrhidae	0	0	0	0.013	0	0	0.003
Carabidae	0	0	0.001	0	0.040	0	0.008
HOMOPTERA (Aphids)							
Aphididae	<0.1	0.032	0.007	0	0	0	0.008
Cercopidae	0	0	0.007	0	0	0	0.001
Cicadellidae	<0.1	0	0	0.004	0	0	0.001
HYMENOPTERA (Wasps and ants)							
Braconidae	0	0.002	0	0	0.005	0	0.001
Encyrtidae	0	0.002	0	0	0	0	0
Formicidae	<0.1	0.017	0.021	0.050	0.067	0.056	0.042
THYSANOPTERA (Thrips)							
Thripidae	<0.1	0	0	0	0	0	0
ARANEIDA (Spiders)	<0.1	0.017	0.016	0.001	0	0	0.007
LEPIDOPTERA (Moths)	0	0.021	0.005	0.002	0.013	0.111	0.030
HEMIPTERA (True bugs)							
Miridae	0	0	0.003	0	0.040	0	0.009
COLLEMBOLA (Springtails	<0.1	0.111	0.015	0.002	0	0	0.025
ISOPODA	0	0	0.004	0	0	0	0.001
UNIDENT. TERRESTRIALS	<0.1	0.059	0.022	0.049	0.040	0	0.034

Table 3.143. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of brown trout in Skookum Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=22	1+ n=34	2+ n=28	3+ n=11	4+ n=2	All ages n=97
AQUATIC ORGANISMS							
TRICHOPTERA (Caddisflies)							
Brachycentridae	3.8	-0.038	-0.038	0.035	-0.025	-0.038	-0.021
Glossosomatidae	0.4	0.003	0.021	0.002	-0.004	-0.004	0.004
Hydropsychidae	0.3	-0.001	0.010	0.015	0.013	0.074	0.022
Limnephilidae	0.5	0.183	0.107	0.208	0.122	0.388	0.202
Rhyacophilidae	1.2	0.005	-0.011	0.002	-0.002	-0.012	-0.004
EPHEMEROPTERA (Mayflies)							
Baetidae	25.4	0.045	-0.005	-0.124	-0.243	-0.254	-0.118
Ephemerellidae	3.8	-0.014	0.069	-0.018	-0.033	-0.038	-0.007
Heptageniidae	7.0	-0.055	0.067	0.065	0.002	-0.032	0.009
Leptophlebiidae	0.9	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
Tricorythidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
PLECOPTERA (Stoneflies)							
Chloroperlidae	1.7	-0.017	-0.017	-0.017	-0.017	-0.017	-0.017
Nemouridae	1.2	0.017	0.075	-0.002	-0.009	-0.012	0.014
Perlodidae	0.6	-0.006	0.027	0.026	0.027	-0.006	0.014
Pteronarcyidae	0	0	0	0.007	0.077	0	0.017
COLEOPTERA (Beetles)							
Dytiscidae	0.3	0.006	-0.003	-0.003	0.002	-0.003	0
Elmidae adult	1.2	-0.012	-0.002	-0.012	-0.012	-0.012	-0.010
Elmidae larvae	5.2	-0.052	-0.049	-0.050	-0.052	-0.052	-0.051
Georyssidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Haliplidae	0	0	0	0	0.011	0	0.002
Hydrophilidae	0.1	0.001	-0.001	-0.001	-0.001	-0.001	-0.001
HYDRACARINA (Mites)	2.5	-0.021	-0.025	-0.025	-0.025	-0.025	-0.024
DIPTERA (Midges and flies)							
Ceratopogonidae	0.1	0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Chironomidae larvae	15.1	-0.118	-0.091	-0.135	-0.143	-0.074	-0.112
Chironomidae pupae	11.3	-0.096	-0.110	-0.104	-0.113	-0.113	-0.107
Culicidae	0	0	0.007	0	0	0	0.001
Muscidae	0.2	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Psychodidae	1.0	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
Simuliidae	3.0	-0.010	-0.019	0.001	-0.015	-0.030	-0.015
Tipulidae	0.7	-0.005	-0.007	0.009	-0.007	0.108	0.020
OLIGOCHAETA (Worms)							
Lumbriculidae	1.0	0.016	0.019	0.127	0.327	0.067	0.110
BIVALVIA (Clams)							
Sphaeriidae	3.6	-0.014	-0.036	-0.036	-0.036	-0.036	-0.032
TERRESTRIAL ORGANISMS							
TRICHOPTERA	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
EPHEMEROPTERA	0.4	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004
PLECOPTERA	0	0	0	0.001	0.040	0	0.008

Table 3.143. (cont.)

PREY ORGANISMS	% Environ.	0+ n=22	1+ n=34	2+ n=28	3+ n=11	4+ n=2	All ages n=97
DIPTERA (Midges and flies)							
Anthomyiidae	0	0	0.007	0	0	0	0.001
Asilidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Bibionidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Chironomidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Dixidae	0	0.015	0	0	0	0	0.003
Ephydridae	0	0.007	0.001	0	0	0	0.001
Mycetophilidae	0	0.007	0	0	0	0	0.001
Sciaridae	0	0	0.007	0	0	0	0.001
Simuliidae	0.3	-0.001	-0.003	-0.002	-0.003	-0.003	-0.002
COLEOPTERA (Beetles)							
Byrrhidae	0	0	0	0	0.013	0	0.003
Carabidae	0	0	0.001	0	0.040	0	0.008
Salpingidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Staphylinidae	0.3	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
HOMOPTERA (Aphids)							
Aphididae	2.2	0.010	-0.015	-0.022	LO.022	-0.022	-0.014
Cercopidae	0	0	0.007	0	0	0	0.001
Cicadellidae	0.1	-0.001	-0.001	0.003	-0.001	-0.001	0.001
HYMENOPTERA (Wasps and ants)							
Braconidae	0	0.002	0	0	0.005	0	0.001
Encyrtidae	0	0.002	0	0	0	0	0
Formicidae	0.3	0.014	0.018	0.047	0.064	0.053	0.039
PSOCOPTERA (Psocids)							
Psocidae	0.1	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
THYSANOPTERA (Thrips)							
Thripidae	0.3	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
ARANEIDA (Spiders)	0.1	0.016	0.015	0	-0.001	-0.001	0.006
LEPIDOPTERA (Moths)	0	0.021	0.005	0.002	0.013	0.111	0.030
HEMIPTERA (True bugs)							
Miridae	0	0	0.003	0	0.040	0	0.009
COLLEMBOLA (Springtails	3.0	0.081	-0.015	-0.028	-0.030	-0.030	-0.005
ISOPODA	0	0	0.004	0	0	0	0.001
UNIDENT. TERRESTRIALS	0	0.059	0.022	0.049	0.040	0	0.034

Table 3.144. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of brook trout in Skookum Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=38	1+ n=46	2+ n=28	All ages n=112
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	2.4	-0.022	-0.018	-0.017	-0.019
Glossosomatidae	2.1	-0.019	-0.020	-0.019	-0.019
Hydropsychidae	0.7	-0.007	-0.006	-0.005	-0.006
Hydroptilidae	0.1	0	0.006	0.001	0.001
Limnephilidae	0.1	0.082	0.275	0.269	0.209
Leptoceridae	<0.1	0	0	0	0
Psychomyiidae	0.1	-0.001	-0.001	-0.001	-0.001
Rhyacophilidae	2.9	-0.020	-0.028	0.003	-0.014
Trichoptera pupae	<0.1	0	0	0	0
EPHEMEROPTERA (Mayflies)					
Baetidae	14.9	-0.047	0.011	-0.026	-0.011
Ephemerellidae	8.2	-0.048	-0.031	0.006	-0.004
Heptageniidae	12.7	-0.114	-0.071	-0.101	-0.095
Leptophlebiidae	1.4	-0.014	-0.014	-0.014	-0.014
Unidentified	0	0	0.005	0	0.002
DIPTERA (Midges and flies)					
Ceratopogonidae	0.6	-0.006	-0.002	0.004	-0.001
Chironomidae larvae	12.2	0.008	-0.030	-0.081	-0.034
Chironomidae pupae	0.2	0.165	0.028	0.034	0.076
Culicidae	0	0.003	0	0	0.001
Empididae	0.2	-0.002	-0.001	0.002	0
Psychodidae	0.4	-0.004	-0.004	-0.004	-0.004
Simuliidae	1.4	0	-0.014	-0.014	-0.009
Stratiomyidae	0	0	0.001	0	0
Tipulidae	1.6	-0.016	-0.013	-0.014	-0.014
PLECOPTERA (Stoneflies)					
Capniidae	0.3	-0.003	-0.003	-0.003	-0.003
Chloroperlidae	8.7	-0.087	-0.079	-0.087	-0.084
Nemouridae	1.9	-0.012	0.009	-0.005	-0.003
Peltoperlidae	0.1	-0.001	-0.001	-0.001	-0.001
Perlodidae	1.5	-0.015	-0.011	-0.008	-0.011
Pteronarcyidae	<0.1	0	0	0	0
Perlidae	0.1	-0.001	-0.001	-0.001	-0.001
COLEOPTERA (Beetles)					
Dytiscidae	0	0	0.007	0.006	0.004
Elmidae adult	1.4	-0.014	-0.014	-0.009	-0.012
Elmidae larvae	11.8	-0.118	-0.118	-0.118	-0.118
Hydrophilidae	0	0.025	0	0	0.008
HYDRACARINA (Mites)	0.5	0.007	0.016	-0.005	0.006
GASTROPODA (Snails)					
Physidae	0	0	0.020	0.011	0.010
Planorbidae	0.3	-0.003	-0.003	-0.003	-0.003

Table **3.144.** (cont.)

PREY ORGANISMS	% Environ.	0+ n=38	1+ n=46	2+ n=28	All ages n=112
BIVALVIA (Clams)					
Sphaeriidae	2.2	-0.018	-0.011	-0.018	-0.016
OLIGOCHAETA (Worms)					
Naididae	0.1	-0.001	-0.001	-0.001	-0.001
Lumbriculidae	5.8	-0.058	-0.017	0.023	-0.017
TURBELLARIA (Flatworms)					
Planariidae	1.5	-0.015	-0.015	-0.015	-0.015
NEMATODA (Nematodes)	1.2	-0.012	-0.012	-0.012	-0.012
TERRESTRIAL ORGANISMS					
TRICHOPTERA (Caddisflies)	0.1	0.014	0.007	0.010	0.010
EPHEMEROPTERA (Mayflies)	0	0	0	0.058	0.019
PLECOPTERA (Stoneflies)	<0.1	0.004	0.013	0.016	0.011
DIPTERA (Midges and flies)					
Chironomidae	0	0.155	0	0	0.052
Empididae	0	0	0	0.010	0.003
Mycetophilidae	0	0.016	0.001	0	0.006
Scatopsidae	0	0.002	0	0	0.001
Sciaridae	0	0	0.002	0	0.001
Simuliidae	<0.1	0.003	0	0	0.001
COLEOPTERA (Beetles)					
Cantharidae	0	0	0	0.002	0.001
Carabidae	0	0	0	0.002	0.001
Cerambycidae	0	0	0	0.003	0.001
Chrysomelidae	0	0.003	0	0	0.001
Coccinellidae	0	0	0	0.002	0.001
Curculionidae	0	0	0.001	0.002	0.001
Dermestidae	0	0	0.001	0.002	0.001
Elateridae	0	0	0	0.002	0.001
Staphylinidae	0	0.006	0	0	0.002
Throscidae	0	0.003	0	0	0.001
HOMOPTERA (Aphids)					
Aphididae	<0.1	0.005	0	0.002	0.002
Cicadellidae	<0.1	0.006	0.004	0.002	0.004
HYMENOPTERA (Wasps and ants)					
Apidae	0	0	0.008	0	0.003
Diapriidae	0	0.002	0.001	0	0.001
Formicidae	<0.1	0.020	0.040	0.054	0.038
Ichneumonidae	0	0.004	0	0	0
Tenthredinidae	0	0	0	0.001	0
THYSANOPTERA (Thrips)					
Thripidae	<0.1	0	0	0	0
ARANEIDA (Spiders)	<0.1	0.017	0.007	0.035	0.020
LEPIDOPTERA (Mothes)	0	0.002	0	0.002	0.001
HEMIPTERA (True bugs)					
Miridae	0	0	0	0.002	0.001
COLLEMBOLA (Springtails)	<0.1	0.072	0	0.001	0.024
DIPLOPODA (Millipedes)	0	0	0.009	0	0.003
UNIDENTIFIED TERRESTRIALS	<0.1	0.066	0.009	0.021	0.029

Table 3.145. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of brook trout in Skookum Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=38	1+ n=46	2+ n=28	All ages n=112
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	3.8	-0.036	-0.032	-0.031	-0.033
Glossosomatidae	0.4	-0.002	-0.003	-0.002	-0.002
Hydropsychidae	0.3	-0.003	-0.002	-0.001	-0.002
Hydroptilidae	0	0.001	0.007	0.002	0.002
Limnephilidae	0.5	0.078	0.271	0.265	0.205
Rhyacophilidae	1.2	-0.003	-0.011	0.020	0.003
EPHEMEROPTERA (Mayflies)					
Baetidae	25.4	-0.152	-0.094	-0.131	-0.126
Ephemerellidae	3.8	-0.004	0.075	0.050	0.040
Heptageniidae	7.0	-0.057	-0.014	-0.044	-0.038
Leptophlebiidae	0.9	-0.009	-0.009	-0.009	-0.009
Tricorythidae	0.1	-0.001	-0.001	-0.001	0.001
PLECOPTERA (Stoneflies)					
Chloroperlidae	1.7	-0.017	-0.009	-0.017	-0.014
Nemouridae	1.2	-0.005	0.016	0.002	0.004
Perlodidae	0.6	-0.006	-0.002	0.001	-0.002
COLEOPTERA (Beetles)					
Dytiscidae	0.3	-0.003	0.004	0.003	0.001
Elmidae adult	1.2	-0.012	-0.012	-0.007	-0.010
Elmidae larvae	5.2	-0.052	-0.052	-0.052	-0.052
Georyssidae	0.1	-0.001	-0.001	-0.001	-0.001
Hydrophilidae	0.1	0.024	-0.001	-0.001	0.007
HYDRACARINA (Mites)	2.5	-0.013	-0.004	-0.025	-0.014
DIPTERA (Midges and flies)					
Ceratopogonidae	0.1	-0.001	0.003	0.009	0.004
Chironomidae larvae	15.1	-0.021	-0.059	-0.110	-0.063
Chironomidae pupae	11.3	0.054	-0.083	-0.077	-0.035
Culicidae	0	0.003	0	0	0.001
Empididae	0	0	0.001	0.004	0.002
Muscidae	0.2	-0.002	-0.002	-0.002	-0.002
Psychodidae	1.0	-0.010	-0.010	-0.010	-0.010
Simuliidae	3.0	-0.016	-0.030	-0.030	-0.025
Stratiomyidae	0	0	0.001	0	0
Tipulidae	0.7	-0.007	-0.004	-0.005	-0.005
GASTROPODA (Snails)					
Physidae	0	0	0.020	0.011	0.010
BIVALVIA (Clams)					
Sphaeriidae	3.6	-0.032	-0.025	-0.032	-0.030

Table **3.145.** (cont.)

PREY ORGANISMS	% Environ.	0+ n=38	1+ n=46	2+ n=28	All ages n=112
OLIGOCHAETA (Worms)					
Lumbriculidae	1.0	-0.010	0.031	0.071	0.031
TERRESTRIAL ORGANISMS					
TRICHOPTERA	0.1	0.014	0.007	0.010	0.010
EPHEMEROPTERA	0.4	-0.004	-0.004	0.054	0.015
PLECOPTERA	0	0.004	0.013	0.016	0.011
DIPTERA (Midges and flies)					
Asilidae	0.1	-0.001	-0.001	-0.001	-0.001
Bibionidae	0.1	-0.001	-0.001	-0.001	-0.001
Chironomidae	0.1	0.154	-0.001	-0.001	0.051
Empididae	0	0	0	0.010	0.003
Mycetophilidae	0	0.016	0.001	0	0.006
Scatopsidae	0	0.002	0	0	0.001
Sciaridae	0	0	0.002	0	0.001
Simuliidae	0.3	0	-0.003	-0.003	-0.002
COLEOPTERA (Beetles)					
Cantharidae	0	0	0	0.002	0.001
Carabidae	0	0	0	0.002	0.001
Cerambycidae	0	0	0	0.003	0.001
Chrysomelidae	0	0.003	0	0	0.001
Coccinellidae	0	0	0	0.002	0.001
Curculionidae	0	0	0.001	0.002	0.001
Dermestidae	0	0	0.001	0.002	0.001
Elateridae	0	0	0	0.002	0.001
Salpingidae	0.1	-0.001	-0.001	-0.001	-0.001
Staphylinidae	0.3	0.003	-0.003	-0.003	-0.001
Throscidae	0	0.003	0	0	0.001
HOMOPTERA (Aphids)					
Aphididae	2.2	-0.017	-0.022	-0.020	-0.020
Cicadellidae	0.1	0.005	0.003	0.001	0.003
HYMENOPTERA (Wasps and ants)					
Apidae	0	0	0.008	0	0.003
Diapriidae	0	0.002	0.001	0	0.001
Formicidae	0.3	0.017	0.038	0.051	0.035
Ichneumonidae	0	0.004	0	0	0.001
Tenthredinidae	0	0	0	0.001	0
PSOCOPTERA (Psocids)					
Psocidae	0.1	-0.001	-0.001	-0.001	-0.001
THYSANOPTERA (Thrips)					
Thripidae	0.3	-0.003	-0.003	-0.003	-0.003
ARANEIDA (Spiders)	0.1	0.016	0.006	0.034	0.019
LEPIDOPTERA (Moths)	0	0.002	0	0.002	0.001
HEMIPTERA (True bugs)					
Miridae	0	0	0	0.002	0.001
COLLEMBOLA (Springtails	3.0	0.042	-0.030	-0.029	-0.006
DIPLOPODA (Millipedes)	0	0	0.009	0	0.003
UNIDENT. TERRESTRIALS	0	0.055	0.009	0.021	0.029

Cutthroat trout electivities for benthic invertebrates are listed in Table 3.146 and electivities for drifting invertebrates in Table 3.147. Limnephilidae was selected for most frequently by age 0+ and combined age classes of cutthroat trout from both the benthos (0.332 and 0.194, respectively) and the drift (0.328 and 0.190, respectively). The highest electivity by age 1+ cutthroat trout was for Formicidae from the benthos (0.282) and the drift (0.279).

3.7 1990 TRIBUTARY FISH FEEDING HABITS

Results of tributary fish feeding habits were based on mean annual values. For each tributary, the index of relative importance of each prey item, for each age class of each species were listed. Electivity indices for benthic macroinvertebrates were calculated using numerical frequency values. Diet overlaps were calculated using IRI values. Results of number percentages, weight percentages, occurrence frequency and seasonal feeding habits in the tributaries are listed in Appendix H. Seasonal 'feeding habit data includes: mean number (± standard deviation) and mean weight, number percentage, weight percentage, occurrence frequency and index of relative importance for each prey item consumed by each species of fish.

3.7.1 INDEX OF RELATIVE IMPORTANCE

3.7.1.1 LECLERC CREEK

Twelve brown trout stomachs were analyzed in 1990 for LeClerc Creek. A total of seventeen families of invertebrates in eleven orders were identified. Index of relative importance values for prey items consumed by these fish are listed in Table 3.148. Baetidae, Hydroptilidae and Simuliidae were the top three prey items for age 0+ brown trout with index of relative importance values at 34.8 %, 23.7% and 14.6%, respectively. For age 1+ brown trout, Chironomidae larvae had the highest IRI value at 18.4,% followed by Glossosomatidae (13.9%) and Dytiscidae (11.2%). Brachycentridae had the highest IRI value for age 2+ brown trout at 34.1 percent, followed by Baetidae (26.3%) and Lepidoptera (16.3%). For age 3+ brown trout, Rhyacophilidae had the highest IRI value at 51.4%, followed by Brachycentridae (48.6%). Osteichthyes had the highest IRI value at 22.3% for 4+ brown trout, followed by Brachycentridae (20.5%) and Limnephilidae (14.7%). For all age

Table 3.146. The measure of prey selection (electivity) for macroinvertebrates (from Hess samples) by each age class of cutthroat trout in Skookum Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=2	1+ n=3	All ages n=5
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	2.4	-0.024	0.279	0.128
Glossosomatidae	2.1	-0.021	0.001	-0.010
Hydropsychidae	0.7	-0.007	-0.007	-0.007
Hydroptilidae	0.1	-0.001	-0.001	-0.001
Limnephilidae	0.1	0.332	0.055	0.194
Leptoceridae	<0.1	0	0	0
Psychomyiidae	0.1	-0.001	-0.001	-0.001
Rhyacophilidae	2.9	-0.029	0.015	-0.007
Pupae	<0.1	0	0	0
EPHEMEROPTERA (Mayflies)				
Baetidae	14.9	-0.149	-0.082	-0.112
Ephemerellidae	8.2	-0.082	-0.082	-0.082
Heptageniidae	12.7	-0.127	-0.060	-0.093
Leptophlibidae	1.4	-0 014	-0.014	-0.014
PLECOPTERA (Stoneflies)				
Capniidae	0.3	-0.003	-0.003	-0.003
Chloroperlidae	8.7	-0.087	-0.087	-0.087
Nemouridae	1.9	-0.019	-0.019	-0.019
Peltoperlidae	0.1	-0.001	-0.001	-0.001
Perlidae	0.1	-0.001	-0.001	-0.001
Perlodidae	1.5	-0.015	-0.015	-0.015
Pteronarcyidae	<0.1	0	0	0
COLEOPTERA (Beetles)				
Elmidae adult	1.4	-0.014	-0.014	-0.014
Elmidae larvae	11.8	-0.118	-0.118	-0.118
HYDRACARINA (Mites)	0.5	-0.005	-0.005	-0.005
DIPTERA (Midges and flies)				
Ceratopogonidae	0.6	-0.006	-0.006	-0.006
Chironomidae larvae	12.2	-0.122	0.011	-0.055
Chironomidae pupae	0.2	-0.002	-0.002	-0 002
Empididae	0.2	-0.002	-0.002	-0.002
Psychodidae	0.4	-0.004	-0.004	-0.004
Simuliidae	1.4	-0.014	-0.014	-0.014
Tipulidae	1.6	-0.016	-0.016	-0.016
GASTROPODA (Snails)				
Planorbidae	0.3	-0.003	-0.003	-0.003
BIVALVIA (Clams)				
Sphaeriidae	2.2	-0.022	-0.022	-0.022
OLIGOCHAETA (Worms)				
Naididae	0.1	-0.001	-0.001	-0.001
Lumbriculidae	5.8	-0.058	-0.058	-0.058
TURBELLARIA(Flatworms)				
Planariidae	1.5	-0.015	-0.015	-0.015
NEMATODA (Nematodes)	1.2	-0 012	-0.012	-0.012
TERRESTRIAL ORGANISMS				
TRICHOPTERA (Caddisflies)	0.1	-0.001	-0.001	-0.001
PLECOPTERA (Stoneflies)	<0.1	0	0	0
DIPTERA (Midges and flies)				
Simuliidae	<0.1	0	0	0
HOMOPTERA (Aphids)				
Aphididae	<0.1	0	0	0
Cicadellidae	<0.1	0	0	0
HYMENOPTERA (Wasps and ants)				
Formicidae	<0.1	0	0.282	0.141
THYSANOPTERA (Thrips)				
Thripidae	<0.1	0	0	0
ARANEIDA (Spiders)	<0.1	0	0	0
OLIGOCHAETA (Worms)				
Lumbriculidae	5.8	-0 058	-0.058	-0.058
COLLEMBOLA (Springtails)	<0.1	0	0	0
UNIDENTIFIED TERRESTRIALS	<0.1	0..667	0.026	0.317

Table 3.147. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by each age class of cutthroat trout in Skookum Creek for 1989.

PREY ORGANISMS	% Environ.	0+ n=2	1+ n=3	All ages n=5
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	3.8	-0.038	0.265	0.114
Glossosomatidae	0.4	-0.004	0.018	0.007
Hydropsychidae	0.3	-0.003	-0.003	-0.003
Limnephilidae	0.5	0.328	0.051	0.190
Rhyacophilidae	1.2	-0.012	0.032	0 010
EPHEMEROPTERA (Mayflies)				
Baetidae	25.4	-0.254	-0.187	-0.220
Ephemerellidae	3.8	-0.038	-0.038	-0.038
Heptageniidae	7.0	-0.070	0.003	-0.036
Leptophlibidae	0.9	-0.009	-0.009	-0.009
Tricorythidae	0.1	-0.001	-0.001	-0.001
PLECOPTERA (Stoneflies)				
Chloroperlidae	1 7	-0.017	-0.017	-0.017
Nemouridae	1.2	-0 012	-0.012	-0.012
Perlodidae	0.6	-0.006	-0.006	-0.006
COLEOPTERA (Beetles)				
Dytiscidae	0.3	-0.003	-0.003	-0.003
Elmidae adult	1.2	-0.012	-0.012	-0.012
Elmidae larvae	5.2	-0.052	-0.052	-0.052
Georyssidae	0.1	-0.001	-0.001	-0.001
Hydrophilidae	0.1	-0.001	-0.001	-0.001
HYDRACARINA (Mites)	2.5	-0.025	-0.025	-0.025
DIPTERA (Midges and flies)				
Ceratopogonidae	0.1	-0.001	-0.001	-0.001
Chironomidae larvae	15.1	-0.151	-0.018	-0.084
Chironomidae pupae	11.3	-0.113	-0.113	-0.113
Muscidae	0.2	-0.002	-0.002	-0.002
Psychodidae	1.0	-0.010	-0.010	-0.010
Simuliidae	3.0	-0.030	-0.030	-0.030
Tipulidae	0.7	-0.007	-0.007	-0.007
BIVALVIA (Clams)				
Sphaeriidae	3.6	-0.036	-0.036	-0.036
OLIGOCHAETA (Worms)				
Lumbriculidae	1.0	-0.010	-0.010	-0.010
TERRESTRIAL ORGANISMS				
TRICHOPTERA (Caddisflies)	0.1	-0.001	-0.001	-0.001
EPHEMEROPTERA (Mayflies)	0.4	-0.004	-0.004	-0.004
DIPTERA (Midges and flies)				
Asilidae	0.1	-0.001	-0.001	-0 001
Bibionidae	0.1	-0.001	-0.001	-0 001
Chironomidae	0.1	-0.001	-0.001	-0.001
Simuliidae	0.3	-0.003	-0.003	-0.003
COLEOPTERA (Beetles)				
Salpingidae	0.1	-0 001	-0.001	-0.001
Staphylinidae	0.3	-0 003	-0.003	-0.003
HOMOPTERA (Aphid)				
Aphididae	2.2	-0.022	-0.022	-0.022
Cicadellidae	0.1	-0.001	-0.001	-0.001
HYMENOPTERA (Wasps and ants)				
Formicidae	0.3	-0.003	0.279	0.138
PSOCOPTERA (Psocids)				
Psocidae	0.1	-0 001	-0.001	-0.001
THYSANOPTERA (Thrips)				
Thripidae	0.3	-0.003	-0.003	-0.003
ARANEIDA (Spiders)	0.1	-0.001	-0.001	-0.001
COLLEMBOLA (Springtails)	3.0	-0.030	-0.030	-0.030
UNIDENTIFIED TERRESTRIALS	0	0.667	0.026	0.347

Table 3.148. Mean annual index of relative importance of prey items consumed by brown trout in LeClerc Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	0+ n=2	1+ n=5	2+ n=3	3+ n=1	4+ n=1	All ages n=12
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Hydroptilidae	23.7					4.7
Leptoceridae			13.3			2.7
Limnephilidae					14.7	2.9
Glossosomatidae		13.9				2.8
Rhacophylidae				51.4		10.3
Brachycentridae		3.1	34.1	48.6	20.5	21.3
EPHEMEROPTERA (Mayflies)						
Baetidae	34.8	3.1	26.3			12.8
PLECOPTERA (Stoneflies)						
Perlodidae		7.6				1.5
COLEOPTERA (Beetles)					6.7	1.3
Elmidae larva	12.8					2.6
Dytiscidae larvae		11.2				2.2
Dytiscidae adult		5.2				1.0
DIPTERA (Midges and flies)						
Chironomidae larva	14.1	18.4			5.3	7.6
Chironomidae pupae					4.2	0.8
Tipulidae					4.2	0.8
Simulidae	14.6				4.1	3.7
LEPIDOPTERA (Moths)			16.3			3.3
NEMATODA (Nematodes)					18	3.6
OSTEICHTHYES (Fish)					22.3	4.5
TERRESTRIAL ORGANISMS						
COLLEMBOLA (Springtails)		10.4				2.1
CHILOPODA (Centipedes)		6				1.2
COLEOPTERA (Beetles)						
Staphylinidae		6				1.2
HOMOPTERA (Aphids)						
Cicadidae		4.8				1.0
HYMENOPTERA (Wasps and ants)						
Formicidae			9.8			2.0
ARANEIDA (Spiders)		10.4				2.1

classes of brown trout in LeClerc Creek, Brachycentridae was the most important prey item with an IRI value of 21.3 percent.

Twenty-two eastern brook trout stomachs were examined from LeClerc Creek in 1990. Twenty-six families of invertebrates in twelve orders were identified. Index of relative importance values for prey items consumed by brook trout are listed in Table 3.149. For age 1+ brook trout, Elmidae larvae, Chironomidae larvae, and Dytiscidae were the three most important prey items with IRI values of 12.4%, 11.2% and 8.7%, respectively. Lepidoptera, Ephemerellidae, and Lepidostomatidae were the top three prey items for 2+ brook trout at 15.5%, 13.9%, and 13.2%, respectively. Elmidae larvae had the highest IRI value for age 3+ brook trout at 43.6 percent, followed by Brachycentridae (38.8%) and Glossosomatidae (17.6%). For all age classes of brook trout, Elmidae larvae was the most important prey item with an IRI value of 19.8 percent.

For cutthroat trout in LeClerc Creek, six stomachs were analyzed, and eighteen families of invertebrates 'in twelve orders were identified. Index of relative importance values for food items consumed by cutthroat trout are listed in Table 3.150. Highest IRI values for age 1+ cutthroat trout included Chironomidae larvae at 38.3 percent, Simuliidae larvae (22.9%) and Brachycentridae (20.3%). For age 2+ cutthroat, trout, Brachycentridae was the most important food item at 26.2%, followed by Psychomyiidae (22.6%) and Lepidoptera (12.4%). For age 3+ cutthroat trout, Lepidoptera had the highest IRI value at 16.4 percent. Baetidae had the second highest IRI value 'at 7.2 percent, followed by Chironomidae larvae at 6.8 percent. The most important prey item for all age classes of cutthroat trout was Brachycentridae at 17.0%.

3.7.1.2 RUBY CREEK

Twenty-four eastern brook trout stomachs were collected from Ruby Creek during 1990. A total of 32 invertebrate families in 16 orders were identified Index of relative importance values for prey items consumed by brook trout can be found in Table 3.151. For age 0+ brook trout, Chironomidae larvae had the highest IRI value at 18.3%, followed by Tipulidae (14.3%) and Simuliidae (12.4%). For age 1+ brook trout, Chironomidae larvae, Formicidae and Heptageniidae had the highest IRI values at 19.7%, 12.4% and 6.7%, respectively. Chironomidae larvae, Lumbriculidae, and Heptageniidae had the highest IRI values for age 2+ brook trout at 12.5 percent, 12.1 percent, and 11 .0 percent, respectively. For age 3+ brook trout,

Table 3.149. Mean annual index of relative importance of prey items consumed by brook trout in LeClerc Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	1+ n=15	2+ n=6	3+ n=1	All ages n=22
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	4.3		38.8	14.4
Glossosomatidae			17.6	5.9
Lepidostomatidae		13.2		4.4
Psychomyidae	1.7			0.6
EPHEMEROPTERA (Mayflies)				
Baetidae	7.2			2.4
Ephemerellidae		13.9		4.6
PLECOPTERA (Stoneflies)				
Chloroperlidae	3.0			1.0
Perlodidae	1.3			0.4
COLEOPTERA (Beetles)				
Amphizoidae		3.0		1.0
Dytiscidae adult	2.1			0.7
Dytiscidae larvae	8.7	2.3		3.7
Elmidae adult	3.2			1.1
Elmidae larva	12.4	3.4	43.6	19.8
LEPIDOPTERA (Moths)	7.3	15.5		7.6
DIPTERA (Midges and flies)				
Chironomidae larvae	11.2			3.7
Chironomidae pupae	7.9	9.5		5.8
Sciomyzidae		2.4		0.8
Simulidae larvae		2.2		0.7
Simulidae pupae	2.0			0.7
Tipulidae	3.3	3.1		2.1
OLIGOCHAETA (Worms)				
Lumbriculidae	4			1.3
TERRESTRIAL ORGANISMS				
TRICHOPTERA (Caddisflies)	2.9	9.6		4.2
DIPTERA (Midges and flies)				
Simuliidae	4.1			1.4
Asilidae	1.6			0.5
HYMENOPTERA (Wasps and ants)				
Formicidae	6	11.9		6.0
HOMOPTERA (Aphids)				
Cicadidae		7.6		2.5
Aphipidae		2.3		0.8
COLEOPTERA (Beetles)				
Haplipidae	4.1			1.4
ARANEIDA (Spiders)	1.7			0.6

Table 3.150. Mean annual index of relative importance of prey items consumed by cutthroat trout in LeClerc Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	1+ n=1	2+ n=3	3+ n=2	All ages n=6
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Rhyacophilidae		8		2.7
Psychomidae		22.6	3.4	8.7
Brachycentridae	20.3	26.2	4.4	17.0
Trichoptera pupae			3.2	1.1
EPHEMEROPTERA (Mayflies)				
Baetidae	18.5	11.5	7.2	12.4
Ephemerellidae			3.4	1.1
Heptageniidae			3.2	1.1
PLECOPTERA (Stoneflies)				
Perlodidae			3.2	1.1
ODONATA (Damsels and dragonflies)				
Libelluidae			5.9	2.0
COLEOPTERA (Beetles)				
Elmidae larvae			3.2	1.1
LEPIDOPTERA (Moths)		12.4	16.4	9.6
DIPTERA (Midges and flies)				
Chironomidae larvae	38.3		6.8	15.0
Chironomidae pupae			3.7	1.2
Simuliidae larvae	22.9	9.5	3.2	11.9
Simuliidae pupae			3.1	1.0
Tipulidae			4.9	1.6
OLIGOCHAETA (Worms)				
Lumbriculidae			3.5	1.2
TERRESTRIAL ORGANISMS				
TRICOPTERA (Caddisflies)			4.9	1.6
COLLEMBOLA			3.2	1.1
DIPTERA (Midges and flies)				
Chironomidae			3.2	1.1
HYMENOPTERA (Wasps and ants)				
Formicidae			3.6	1.2
ARANEIDA (Spiders)			3.3	1.1
GASTROPODA (Snails)				
Planorbidae			3.2	1.1
UNIDENTIFIED TERRESTRIALS		9.8		3.3

Formicidae had the highest IRI value at 58.5 percent, followed by unidentified trichoptera (18.0%) and Arachnida (13.3%). For all age classes of brook trout, Chironomidae larvae (12.6%) was the most important prey item in the diet.

A total of two cutthroat trout stomachs were examined in 1990 for Ruby Creek. A total of four families of invertebrates in five orders were identified. Index of relative importance values for food items consumed by cutthroat trout are listed in Table 3.152. For age 1+ cutthroat trout, Formicidae had the highest IRI value at 55%, while Baetidae and Simuliidae both had IRI values of 22.5%. For age 2+ cutthroat trout, Formicidae had the highest IRI value at 63.6%, followed by Lepidoptera and Psychomyiidae at 22.4% and 14.0%, respectively. For all age classes combined, Formicidae was the most important prey item in the diet of cutthroat trout with an IRI value of 59.3%..

Table 3.153 lists the index of relative importance values for the single rainbow trout stomach collected in 1990. One family in one order was identified. For age 1+ rainbow trout, Formicidae consisted of 100% of the prey item.

Three mountain whitefish stomachs were analyzed in 1990. Ten families in six orders were identified. Index of relative importance values for these food items consumed can be found in Table 3.154. For age 1+ mountain whitefish, Baetidae consisted of 41.3% of the preferred prey item, followed by Simuliidae larvae with an IRI value of 23.4%.

3.7.1.3 CEE CEE AH CREEK

A total of 25 brown trout stomachs from Cee Cee Ah Creek were analyzed 1990. A total of 30 families of invertebrates in 14 orders were identified. The index of relative importance values for prey items consumed by brown trout are listed in Table 3.155. For age 0+ brown trout, Baetidae had the highest index of relative importance at 29.5%, followed by Ostracoda (17.5%) and Psychomyiidae(16.6%). Terrestrial insects were the preferred prey item for age 1+ brown trout with an IRI value of 22.9%, followed by Chironomidae pupae (19.7%) and Baetidae (12.1%). Osteichthyes had the highest IRI value for age 2+ brown trout at 23.4%, followed by Glossosomatidae (11.8%) and Lumbriculidae (9.4%). For age 3+ brown trout, Osteichthyes also had the highest IRI value at 28.4%, followed by Lepidoptera (15.8%) and Brachycentridae (11.7%). For age 4+

Table 3.151. Mean annual index of relative importance of prey items consumed by brook trout for 1990 in Ruby Creek, WA.

AGE CLASS SAMPLE SIZE	0+ n=2	1+ n=11	2+ n=9	3+ n=2	All ages n=24
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae		3.4	1.1		3.6
Glossosomatidae		2.8	2.6		1.4
Hydropsychidae			4.5		1.1
Hydroptilidae	10.2	3.3			3.4
Limnephilidae			0.6		0 2
Phryganeidae			1.7		0.4
Psychomyiidae		4.2			1.1
EPHEMEROPTERA (Mayflies)					
Baetidae		6.1	11.0		4.3
Ephemerellidae	10.2	6 7	4 5		2.8
Leptohphlebiidae	10 2				2.6
PLECOPTERA (Stoneflies)					
Chloroperlidae			6.2		1.6
Perlodidae			2.1		0.5
Nemouridae		3 4			0 9
COLEOPTERA (Beetles)					
Elmidae larvae		3.3	0.5		1.0
Hydrophilidae			5.1		1.3
Amphizoidae			0.5		0.1
HYDRACARINA (Mites)			3.3		0.8
LEPIDOPTERA (Moths)			1.0		0.3
DIPTERA (Midges and flies)					
Ceratopogonidae		1 3	3.1		4.0
Chironomidae larvae	18.3	19.7	12.5		12.6
Chironomidae pupae		5.5	3.4		2.2
Empididae			0.5		0.1
Simuliidae	12 4	3 4	2.1		4 5
Tipulidae	14 3	3 1	4.5		5 5
OLIGOCHAETA (Worms)					
Lumbriculidae			12.1		3.0
NEMATODA (Nematodes)		2 1	0.5		0.7
TERRESTRIAL ORGANISMS					
TRICHOPTERA (Caddisflies)				18.0	4.5
COLEOPTERA (Beetles)					
Canthridae	10.2				2.6
DIPTERA (Midges and flies)					
Asilidae	14				3.5
Bupresitidae			0.5		0.1
HYMENOPTERA (Wasps and ants)					
Formicidae		12.4	8.1	58.5	19 8
Ichneumadae		4 1			1.0
Pteromalidae		3.4			0.9
HEMIPTERA (True bugs)					
Corixidae				10.4	2.6
DIPLOPODA (Millipedes)			0.5		0.1
ARANEIDA (Spiders)				13.3	3.3
OSTEICHTHYES (Fish)			3.7		0.9

Table 3.152. Mean annual index of relative importance of prey items consumed by cutthroat trout in Ruby Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	1+ n=1	2+ n=1	All ages n=2
AQUATIC ORGANISMS			
TRICHOPTERA (Caddisflies)			
Psychomyiidae		14.0	7.0
EPHEMEROPTERA (Mayflies)			
Baetidae	22.5		11.3
DIPTERA (Midges and flies)			
Simuliidae	22.5		11.3
LEPIDOPTERA (Moths)		22.4	11.2
TERRESTRIAL ORGANISMS			
HYMENOPTERA (Wasps and ants)			
Formicidae	55.0	63.6	59.3

Table 3.153. Mean annual index of relative importance of prey items consumed by rainbow trout in Ruby Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	1+	All ages
TERRESTRIAL ORGANISMS		
HYMENOPTERA (Wasps and ants)		
Formicidae	100.0	100.0

Table 3.154. Mean annual index of relative importance of prey items consumed by mountain whitefish in Ruby Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	1+ n=3	All ages n=3
AQUATIC ORGANISMS		
TRICHOPTERA (Caddisflies)		
Hydropsychidae	5.1	5.1
EPHEMEROPTERA (Mayflies)		
Baetidae	41.3	41.3
Heptageniidae	3.2	3.2
COLEOPTERA (Beetles)		
Elmidae larvae	3.2	3.2
DIPTERA (Midges and flies)		
Chironomidae larvae	6.6	6.6
Chironomidae pupae	3.3	3.3
Simuliidae larvae	23.4	23.4
Simuliidae pupae	3.2	3.2
CLADOCERA (Water fleas)		
Daphnidae	7.5	7.5
TERRESTRIAL ORGANISMS		
HYMENOPTERA (Wasps and ants)		
Formicidae	3.2	3.2

brown trout, Lumbriculidae had the highest IRI value at 35.3%, followed by Lygaeidae (18.1%) and Formicidae at 9.6%. For all age classes of brown trout combined, Osteichthyes was the most important prey item.

In 1990, twenty-six brook trout stomachs were analyzed and 29 families of invertebrates in 14 orders were identified. Index of relative importance values for prey items consumed by all age classes of brook trout can be found in Table 3.156. For age 0+ brook trout, Brachycentridae had the highest IRI value at 56.4%, followed by Tipulidae (9.0%) and Elmidae adult (8.3%). Chironomidae larvae had the highest IRI value for age 1+ brook trout at 12.6%, followed by Ostracoda (11.6%) and Hydracarina (10.6%). For age 2+ brook trout, Planorbidae had the highest IRI value at 17.1%, followed by Chironomidae larvae (11.6%) and Bivalvia at (9.1%). Age 3+ brook trout had the highest IRI value for Chironomidae adult at 20.6%, followed by Bivalvia (15.2%) and Ceratopogonidae (15.2%). For all age classes of brook trout in Cee Cee Ah Creek, Chironomidae larvae was the most important prey item.

During 1990, 8 cutthroat trout stomachs were collected in Cee Cee Ah Creek. Thirteen families of invertebrates in nine orders were identified. Table 3.157 lists the index of relative importance values for prey items consumed by all ages of cutthroat trout in Cee Cee Ah Creek. For age 1+ cutthroat trout, Lepidoptera was the most important prey item with an IRI value of 24.6%, followed by Formicidae (8.8%). For age 2+ cutthroat trout, Formicidae was the only prey item of importance with a value of 100%. For all age classes of cutthroat trout, Formicidae was the most important prey item at a value of 54.4%.

3.7.1.4 TACOMA CREEK

One brown trout stomach was analyzed in 1990 from Tacoma Creek. Three families of invertebrates from three orders were identified. Table 3.158 lists the index of relative importance values for prey items consumed by the single brown trout caught in Tacoma Creek. For age 4+ brown trout, Polycentropodidae had the highest IRI value at 20.1%, followed by Lepidoptera (19.2%) and Formicidae (17.1%).

A total of 17 brook trout stomachs were collected from Tacoma Creek in 1990. Twenty-two families of invertebrates from ten orders were identified. Table 3.159 lists the index of relative

Table 3.155. Mean annual index of relative importance of prey items consumed by brown trout in Cee Cee Ah Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	0+ n=3	1+ n=7	2+ n=7	3+ n=6	4+ n=2	All ages n=25
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae				11.7		2.3
Glossosomatidae	9.9		11.8	14		7.1
Leptoceridae				5.8		1 2
Limnephilidae		2.4				0.5
Polycentropidae					9.1	1 8
Psychomyiidae	16 6					3.3
Rhyacophilidae				3.4		0.7
EPHEMEROPTERA (Mayflies)						
Baetidae	29.5	12.1		6.1		9 5
Heptageniidae	8.3					1 7
PLECOPTERA (Stoneflies)						
Perlodidae			3.9			0 8
Perlidae			3.9			0 8
Pteranarcydae			3.4			0 7
COLEOPTERA (Beetles)						
Elmidae larvae		5.8	3.9			1 9
Elmidae adult			3.9			0 8
Haplididae			3 2			0 6
Hydrophilidae larvae		2.4				0 5
Hydrophilidae adult		6.9	4 2			2.2
DIPTERA (Midges and flies)						
Chironomidae larvae		2.4	3.2			1 1
Chironomidae pupae		19.7		3.3		4 6
Ceratopogonidae		2.4	3.9			1 3
Ptychopterdiae		5.6				1.1
Simuliidae larvae		5.6				1.1
Simuliidae pupae				4.4		0.9
LEPIDOPTERA (Moths)			3 4	15.8	9.2	5.7
GASTROPODA (Snails)						
Planorbidae		11.5				2.3
OLIGOCHAETA (Worms)						
Lumbriculidae			9.4		35.3	8.9
NEMATODA (Nematodes)				4 5		0.9
OSTRACODA (Seed shrimp)	17.5					3.5
OSTEICHTHYES (Fish)			23 4	28.4	9.2	12.2
TERRESTRIAL ORGANISMS						
DIPTERA (Midges and flies)						
Chironomidae	9.9					2.0
Simuliidae			4 2			0.8
Mycetophilidae				3.9		0 8
Scatopsidae	8.3					1.7
Psychodidae			3.9			0.8
COLEOPTERA (Beetles)						
Buprestidae			3 2			0 6
HYMENOPTERA (Wasps and ants)						
Formicidae			8.7		9 6	3.7
HEMIPTERA (True bugs)						
Lygaeidae					18.1	3.6
HOMOPTERA (Aphids)						
Cicadidillidae					9 5	1.9
UNIDENTIFIED TERRESTRIALS		22.9				4 6

Table 3.156. Mean annual index of relative importance of prey items consumed by brook trout in Cee Cee Ah Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	0+ n=3	1+ n=13	2+ N=9	3+ n=1	All ages n=26
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	56.4	4.1			15.1
Glossosomatidae			6.1		1.5
Hydroptilidae			3.6		0.9
Lepidostomatidae		2.6			0.7
Limnephilidae	5.1	7.9	5.6		4.7
Rhyacophilidae			1.9		0.5
EPHEMEROPTERA (Mayflies)					
Baetidae		5.5	5.1		2.7
Heptageniidae		4.9	1.9		1.7
Ephemerellidae			4		1.0
Leptophlebiidae		5			1.3
PLECOPTERA (Stoneflies)					
Chloroperlidae		2	1.6		0.9
Nemouridae	7.7	2	3.3		3.3
Perlodidae		2.3			0.6
COLEOPTERA (Beetles)					
Elmidae larvae			1.5		0.4
Elmidae adult	8.3				2.1
Amphizoidae				11.5	2.9
Staphyliinidae			2.1		0.5
DIPTERA (Midges and flies)					
Chironomidae larvae		12.6	11.6	13.8	9.5
Chironomidae pupae	3.6	2.1	7.9	11.5	6.3
Tipulidae	9.0	2.8			3.0
Ceratopogonidae	3.4	3.3		15.2	5.5
LEPIDOPTERA (Moths)		8.8		12.1	5.2
HYDRACARINA (Mites)	6.4	10.6	5.5		5.6
GASTROPODA (Snails)					
Planorbidae		2.9	17.1		5.0
BIVALVIA (Clams)		3.1	9.1	15.2	6.9
OSTRACODA (Seed shrimp)		11.6	6.6		4.6
NEMATODA (Nematodes)		1.8	2.4		1.1
TERRESTRIAL ORGANISMS					
EPHEMEROPTERA (Mayflies)					
Ephemerellidae			2		0.5
DIPTERA (Midges and flies)					
Chironomidae				20.6	5.2
HYMENOPTERA (Wasps and ants)					
Formicidae			1.6		0.4
HOMOPTERA (Aphids)					
Aphididae		2.2			0.6
HEMIPTERA (True bugs)					
Lygaeidae		2			0.5

Table 3.157. Mean annual index of relative importance of prey items consumed by cutthroat trout in Cee Cee Ah Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	1+ n=7	2+ n=1	All Ages n=8
AQUATIC ORGANISMS			
TRICHOPTERA (Caddisflies)			
Brachycentridae	4.6		2.3
Glossosomatidae	3.8		1.9
Hydropsychidae	5.4		2.7
Psychomyiidae	4.5		2.3
PLECOPTERA (Stoneflies)			
Perlodidae	3.3		1.7
Chloroperlidae	4.6		2.3
Nemouridae	4.6		2.3
COLEOPTERA (Beetles)			
Elmidae adult	4.6		2.3
Georyssidae	3.1		1.6
Hydrophilidae	3.2		1.6
DIPTERA (Midges and flies)			
Chironomidae larvae	3.1		1.6
Chironomidae pupae	3.1		1.6
LEPIDOPTERA (Moths)	24.6		12.3
OSTRACODA (Seed shrimp)	3.1		1.6
TERRESTRIAL ORGANISMS			
COLLEMBOLA (Springtails)	4.6		2.3
DIPTERA (Midges and flies)			
Spaeraceridae	3.2		1.6
Simuliidae	4.6		2.3
HYMENOPTERA (Wasps and flies)			
Formicidae	8.8	100.0	54.4
PSCOPTERA (Psocids)			
Psocidae	3.1		1.6

Table 3.158. Mean annual index of relative importance of prey items consumed by brown trout in Tacoma Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	4+ n=1	All ages n=1
AQUATIC ORGANISMS		
TRICHOPTERA (Caddisflies)		
Brachycentridae	12.2	12.2
Polycentropidae	20.1	20.1
LEPIDOPTERA (Moths)	19.2	19.2
NEMATODA (Nematodes)	16.2	16.2
TERRESTRIAL ORGANISMS		
HYMENOPTERA (Wasps and ants)		
Formicidae	17.1	17.1
ARANEIDA (Spiders)	15.2	15.2

importance values for food items consumed by all ages of brook trout from Tacoma Creek. For age 0+ brook trout the highest IRI value was for Elmidae adults (33.9%) followed by Formicidae (29.5%). For age 1+ brook trout, Cossidae and Chironomidae larvae were the two top prey items with IRI values of 26.6% and 25.7%, respectively. The next most important prey item was Tabanidae at (6.8%). Lumbriculidae, Chironomidae larvae, and Formicidae were the top three prey items for age 2+ brook trout with IRI values of 25.4%, 15.9% and 12.5%, respectively. For all age classes of brook trout in Tacoma Creek, Chironomidae larvae was the most important prey item.

A total of six cutthroat trout stomachs were collected in 1990. Thirteen families of invertebrates in eight orders were represented. The index of relative importance values for prey items consumed by cutthroat trout are listed in Table 3.160. For age 0+ cutthroat trout in Tacoma Creek, Formicidae was the most important prey item with an IRI value of 34.0% followed by Nematoda (18.3%) and Baetidae (11.6%). Baetidae (19.3%), Psychomyiidae (17.8%), and Formicidae (9.5%) were the top three prey items for age 1+ cutthroat trout. For age 2+ cutthroat trout, Formicidae was the most important prey item with an IRI value of 31.3%, followed by Psychomyiidae (17.4%) and Lepidoptera (16.7%). For all age classes of cutthroat trout in Tacoma Creek, Formicidae was the most important prey item in the diet.

3.7.1.5 SKOOKUM CREEK

Twenty-six brown trout stomachs were collected from Skookum Creek in 1990. A total of 20 families in 12 orders were identified. Table 3.161 lists the index of relative importance (IRI) values for food items consumed by brown trout in Skookum Creek. For age 0+ brown trout, Baetidae had the highest IRI value at 41.8%, followed by Chironomidae larvae and Collembola at 18.3% and 12.6%, respectively. For age 1+ brown trout, Baetidae had the highest IRI at 31.2%, followed by Lumbriculidae (30.2%). Glossosomatidae had the highest IRI value for age 2+ brown trout at 33.9%, while Baetidae (14.3%) and Brachycentridae (13.2%). For age 3+ brown trout, Chironomidae larvae had the highest IRI value at 37.3%, followed by Brachycentridae (34.6%) and Glossosomatidae (28.1%). Diplopoda, Stratiomyidae and Miridae had the highest IRI values for age 4+ brown trout at 34.1%, 23.7% and 21.6%, respectively.

Table 3.159. Mean annual index of relative importance of prey items consumed by brook trout in Tacoma Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	0+ N=2	1+ N=7	2+ N=8	All ages N=17
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae		2.8		0.9
Rhyacophilidae			2.5	0.8
EPHEMEROPTERA (Mayflies)				
Baetidae			1.3	0.4
Ephemerellidae			4.9	1.6
Heptageniidae			1.3	0.4
PLECOPTERA (Stoneflies)				
Chloroperlidae			1.3	0.4
Nemouridae	18.3			6.1
COLEOPTERA (Beetles)				
Elmidae larvae	18.3	2.8		7.0
Elmidae adult	33.9			11.3
Dytiscidae		6.6	1.3	2.6
HYDRACARINA (Water mites)			1.3	0.4
LEPIDOPTERA (Moths)		3.0	3.7	2.2
DIPTERA (Midges and flies)				
Chironomidae larvae		25.7	15.9	13.9
Chironomidae pupae			6.4	2.1
Tipulidae		2.8		0.9
Ceratopogonidae		6.5	4.2	3.6
Tabanidae		6.8		2.3
Simuliidae		2.7	3.7	2.1
OLIGOCHAETA (Worms)				
Lumbriculidae			25.4	8.5
NEMATODA (Nematodes)			2.8	0.9
OSTEICHTHYES (Fish)		5.0		1.7
TERRESTRIAL ORGANISMS				
DIPTERA (Midges and flies)				
Asilidae			3.7	1.2
LEPIDOPTERA (Moths)				
Cossidae		26.6		8.9
HYMENOPTERA (Wasps and ants)				
Formicidae	29.5	2.9	12.5	15.0
Sphecidae			3.7	1.2
HEMIPTERA (True bugs)				
Nabididae		3.0	3.7	2.2
Corixidae		2.7		0.9

Table 3.160. Mean annual index of relative importance of prey items consumed by cutthroat trout in Tacoma Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	0+ n=3	1+ n=2	2+ n=1	All ages n=6
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae		4.3		1.4
Glossosomatidae		7.2	8.4	5.2
Psychomyiidae		17.8	17.4	11.7
EPHEMEROPTERA (Mayflies)				
Baetidae	11.6	19.3	9.4	13.4
PLECOPTERA (Stoneflies)				
Perlodidae		5		1.7
Capniidae		4.3	8.4	4.2
COLEOPTERA (Beetles)				
Scaraboadae		5.3		1.8
DIPTERA (Midges and flies)				
Chironomidae larvae		4.3		1.4
Chironimidae pupae	7.5	4.3		3.9
Chaoboridae	7.5			2.5
Simuliidae pupae	9.9			3.3
LEPIDOPTERA (Moths)	11.0		16.7	9.2
NEMATODA (Nematodes)	18.3	4.8		7.6
TERRESTRIAL ORGANISMS				
LEPIDOPTERA (Moths)				
Cossidae		5.4		1.8
HYMENOPTERA (Wasps and ants)				
Formicidae	34.0	9.5	31.3	24.9
HOMOPTERA (Aphids)				
Cicadellidae			8.4	2.8
ARANEIDA (Spiders)		4.3		1.4
UNIDENTIFIED TERRESTRIALS		4.3		1.4

Table 3.161. Mean annual index of relative importance of prey items consumed by brown trout in Skookum Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	0+ n=3	1+ n=14	2+ n=6	3+ N=2	4+ N=1	All Ages n=26
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae		1.9	13.2	34.6		9.9
Glossosomatidae	12.0		33.9	28.1		14.8
Hydropsychidae		3.4				0.7
Lepidostomatidae			4.6			0.9
Psychomyiidae	7.6					1.5
Rhyacophilidae			6.9			1.4
EPHEMEROPTERA (Mayflies)						
Baetidae	41.8	31.2	14.3			17.5
Ephemerellidae			4.8			1.0
Heptageniidae		3.9				0.8
PLECOPTERA (Stoneflies)						
Perlodidae		3				0.6
COLEOPTERA (Beetles)						
Amphizoida adult		3.4	7.0			2.1
Hydrophilidae			5.6			1.1
DIPTERA (Midges and flies)						
Chironomidae larvae	18.3	2.9	3.9	37.3		12.5
Chironomidae pupae		1.9				0.4
Tipulidae		3.0				0.6
Psychodidae		2.9				0.6
Simuliidae		1.9			20.6	4.5
Stratiomyidae					23.7	4.7
LEPIDOPTERA (Moths)		4.4				0.9
OLIGOCHAETA (Worms)						
Lumbriculidae		30.2				6.1
NEMATODA (Nematodes)		2.0			0.4	
TERRESTRIAL ORGANISMS						
HOMOPTERA (Aphids)						
Aphipidae	7.6	2.9				2.1
HEMIPTERA (True bugs)						
Miridae					21.6	4.3
CHILIPODA		3.0				0.6
DIPLOPODA					34.1	6.8
COLLEMBOLA	12.6					2.5
UNIDENT. TERRESTRIALS			3.7			0.7

Twenty-six brook trout stomachs were collected from Skookum Creek in 1990. A total of nineteen families of invertebrates in ten orders were identified. Table 3.162 lists the relative importance values for prey items consumed by all ages of brook trout in Skookum Creek. For age 0+ brook trout, Chironomidae larvae had the highest IRI value at 29.6% followed by Dytiscidae (16.4%) and Hydroptilidae (14.7%). For age 1+ brook trout Chironomidae larvae had the highest IRI at 30.9%, followed by Baetidae (12.7%) and Lepidoptera (12.2%). For age 2+ brook trout, Baetidae had the highest IRI at 21.3%, followed by Osteichthyes (12.2%) and Chilopoda (12.0%). For age 3+ brook trout, Osteichthyes had the highest IRI value at 48.2%, followed by Baetidae (29.4%) and Chironomidae larvae (22.4%). For all age classes of brook trout Chironomidae larvae was the most important prey item in the diet.

A total of three cutthroat trout were collected from Skookum Creek in 1990. Table 3.163 lists the relative importance values for all ages of cutthroat trout in Skookum Creek. For age 1+ cutthroat trout Elmidae larvae had the highest IRI value at 39.1%, followed by Brachycentridae (32.2%) and Tricorythidae (28.7%). Ephemerellidae had the highest IRI value for age 2+ cutthroat trout at 31.7%, followed by Psychomyiidae (21.4%) and Baetidae (18.1%). For all age classes of cutthroat trout, Elmidae larvae was the most important prey item in the diet'.

3.7.2 DIET OVERLAPS

Diet overlaps were determined for fish species captured in LeClerc Creek, Ruby Creek, Cee Cee Ah Creek, Tacoma Creek, and Skookum Creek. Interspecific and intraspecific diet overlaps were determined to compare the extent of similarity in food selection. High overlaps are ≥ 0.7 while moderate overlaps are $0.5 \geq 0.7$.

3.7.2.1 LECLERC CREEK

The calculated diet overlaps between brown trout, brook trout and cutthroat trout in LeClerc Creek are listed in Table 3.164. Brown trout and cutthroat trout had high overlaps (0.77), while brown trout and brook trout had moderate overlaps (0.55). Brook trout also had a moderate overlap (0.50) with cutthroat trout.

The intraspecific overlaps for brown trout, brook trout and cutthroat trout in LeClerc Creek are listed in Table 3.165. No

Table 3.162. Mean annual index of relative importance of prey items comsumed by brook trout in Skookum Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	0+ N=6	1+ N=8	2+ N=10	3+ N=2	All ages N=26
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	11.3		1.5		3.2
Glossosomatidae			1.6		0.4
Hydroptilidae	14.7				3.7
Limnephilidae		6.2	7.4		3.4
Philopotamidae		5.1			1.3
Psychomyiidae			6.1		1.5
EPHEMEROPTERA (Mayflies)					
Baetidae	13.1	12.7	21.3	29.4	19.1
Ephemerellidae		3.7	6.6		2.6
Heptageniidae			3.0		0.8
Leptophlebidae			1.6		0.4
PLECOPTERA (Stoneflies)					
Perlodidae		4.9	2.7		1.9
COLEOPTERA (Beetles)					
Dytiscidae	16.4	2.7	2.5		5.4
Amphizoidae		5.0			1.3
DIPTERA (Midges and flies)					
Chironomidae larvae	29.6	30.9	7.5	22.4	22.6
Chironomidae pupae		6.0	6.2		3.1
Simuliidae	6.0		2.4		2.1
LEPIDOPTERA (Moths)		12.2			3.1
BIVALVIA (Clams)		2.6			0.7
OLIGOCHAETA (Worms)					
Lumbriculidae		5.3			1.3
NEMATODA (Nematodes)	8.9				4.5
OSTEICHTHYES (Fish)			12.2	48.2	15.1
TERRESTRIAL ORGANISMS					
DIPTERA (Midges and flies)					
Simuliidae			1.4		0.4
HYMENOPTERA (Wasps and ants)					
Formicidae			1.4		0.4
CHILOPODA			12.0		3.0
ARANEIDA (Spiders)		2.6			0.7
UNIDENT. TERRESTRIALS			2.7		0.7

Table 3.163. Mean annual index of relative importance of prey items consumed by cutthroat trout in Skookum Creek, WA. for 1990.

AGE CLASS SAMPLE SIZE	1+ n=2	2+ n=1	All ages n=3
AQUATIC ORGANISMS			
TRICHOPTERA (Caddisflies)			
Brachycentridae	32.2		16.1
Psychomyiidae		21.4	10.7
EPHEMEROPTERA (Mayflies)			
Baetidae		18.1	9.1
Ephemerellidae		31.7	15.9
Tricorythidae	28.7		14.4
PLECOPTERA (Stoneflies)			
Nemouridae		9.6	4.8
COLEOPTERA (Beetles)			
Elmidae larvae	39.1		19.6
DIPTERA (Midges and flies)			
Chironomidae pupae		9.6	4.8
Simuliidae		9.6	4.8

significant overlaps were found between age classes of brown trout, brook trout or cutthroat trout in LeClerc Creek.

3.7.2.2 RUBY CHEEK

Diet overlaps between brook trout, cutthroat trout, rainbow trout and mountain whitefish in Ruby Creek can be found in Table 3.166. High diet overlaps (0.85) were observed between cutthroat trout and rainbow trout. Moderate overlaps (0.54) existed between brook trout and cutthroat trout.

The extent of diet overlap between age classes of brook trout and cutthroat trout can be found in Table 3.167. High overlaps (0.80) existed between age 1+ and 2+ cutthroat trout, while moderate (0.65) overlaps existed between 1+ and 2+ brook trout in Ruby Creek. No intraspecific diet overlaps could be calculated for rainbow trout and mountain whitefish as only one age class was captured.

3.7.2.3 CEE CEE AH CREEK

Annual diet overlaps between brown trout, brook trout, and cutthroat trout are fisted in table 3.168. No significant interspecific overlaps occurred in Cee Cee Ah Creek.

The extent of diet overlap between age classes of brown trout, brook trout and cutthroat trout in Cee Cee Ah Creek can be found in Table 3.169. Moderate overlap (0.69) existed between age 2+ and 3+ brown trout in Cee Cee Ah Creek. High overlap (0.77) existed between age 1+ and 3+ brook trout. Moderate overlap (0.53) existed between age 2+ and 3+ brook trout. No significant overlaps occurred between age classes of cutthroat trout.

3.7.2.4 TACOMA CREEK

Diet overlaps calculated between brown trout, brook trout and cutthroat trout in Tacoma Creek are presented in Table 3.170. No significant overlaps existed. Moderate overlaps occurred between brown trout and cutthroat trout.

The extent of diet overlap between brook trout and cutthroat trout in Tacoma Creek can be found in Table 3.171. No significant overlaps were observed between age classes of brook trout. Age 0+ and 2+ cutthroat trout exhibited a high overlap at 0.71 , while a moderate overlap (0.61) was noted between age 1+ and 2+ cutthroat

Table 3.164. Annual diet overlaps between trout species in LeClerc Creek, WA. Overlaps based on index of relative importance (IRI) values for 1990.

	Brown trout	Brook trout	Cutthroat trout
Brown trout	1.00	0.55	0.77
Brook trout		1.00	0.50
Cutthroat trout			1.00

Table 3.165. Annual diet overlaps between age classes of trout species in LeClerc Creek, WA. Overlaps based on index of relative importance (IRI) values for 1990.

Brown trout

Age classes	0 +	1 +	2 +	3 +	4 +
0 +	1.00	0.21	0.39	0.00	0.07
1 +		1.00	0.11	0.05	0.01
2 +			1.00	0.45	0.04
3 +				1.00	0.30
4 +					1.00

Brook trout

Age classes		1 +	2 +	3 +	
1 +		1.00	0.42	0.32	
2 +			1.00	0.06	
3 +				1.00	

Cutthroat trout

Age classes		1 +	2 +	3 +	
1 +		1.00	0.44	0.33	
2 +			1.00	0.30	
3 +				1.00	

Table 3.166. Annual diet overlaps between trout species in Ruby Creek, WA. Overlaps based on index of relative importance (IRI) values for 1990.

	Brook trout	Cutthroat trout	Rainbow trout	Mountain whitefish
Brook trout	1.00	0.54	0.37	0.28
Cutthroat trout		1.00	0.85	0.29
Rainbow trout			1.00	0.05
Mountain whitefish				1.00

Table 3.167. Annual diet overlaps between age classes of trout species in Ruby Creek, WA. Overlaps based on index of relative importance (IRI) values for 1990.

Brook trout				
Age classes	0 +	1 +	2 +	3 +
0 +	1.00	0.43	0.36	0
1 +		1.00	0.65	0.29
2 +			1.00	0.20
3 +				1.00
Cutthroat trout				
Age classes	1 +	2 +		
1 +	1.00	0.80		
2 +		1.00		

Table 3.168. Annual diet overlaps between trout species in Cee Cee Ah Creek, WA. Overlaps based on index of relative importance (IRI) values for 1990.

	Brown trout	Brook trout	Cutthroat trout
Brown trout	1.00	0.31	0.17
Brook trout		1.00	0.09
Cutthroat trout			1.00

Table 3.169. Annual diet overlaps between age classes of trout species in Cee Cee Ah Creek, WA. Overlaps based on index of relative importance (IRI) values for 1990.

Brown trout

Age classes	0 +	1 +	2 +	3 +	4 +
0 +	1.00	0.24	0.11	0.19	0
1 +		1.00	0.08	0.10	0
2 +			1.00	0.69	0.44
3 +				1.00	0.23
4 +					1.00

Brook trout

Age classes	0 +	1 +	2 +	3 +	
0 + 1	.00	0.19	0.05	0.05	
1 +		1.00	0.62	0.77	
2 +			1.00	0.69	
3 +				1.00	

Cutthroat trout

Age classes		1 +	2 +		
1 +		1.00	0.16		
2 +			1.00		

Table 3.170. **Annual diet overlaps between trout species in Tacoma Creek, WA. Overlaps based on index of relative importance (IRI) values for 1990.**

	Brown trout	Brook trout	Cutthroat trout
Brown trout	1.00	0.25	0.53
Brook trout		1.00	0.45
Cutthroat trout			1.00

Table 3.171. **Annual diet overlaps between age classes of trout species in Tacoma Creek, WA. Overlaps based on index of relative importance (IRI) values 'for 1990.**

Brook trout

Age classes	0 +	1 +	2 +
0 +			
1 +			
2 +			
1 +	1.00	0.00	0.0036

Cutthroat trout

Age classes	0 +	1 +	2 +
0 +	1.00	0.44	0.71
1 +		1.00	0.61
2 +			1.00

trout in Tacoma Creek. No intraspecific diet overlaps could be calculated for brown trout since only one age class was captured.

3.7.2.5 SKOOKUM CREEK

Moderate overlaps (0.63) existed between brown trout and brook trout in Skookum Creek. No other significant overlaps occurred (Table 3.172).

Table 3.173 lists the diet overlaps between age classes of trout species in Skookum Creek. Moderate overlaps existed between age; 0+ and 1+, 0+ and 2+, and 2+ and 3+ brown trout (0.61, 0.51 and 0.61, respectively). Moderate overlaps existed between age; 0+ and 1+, 1+ and 2+, and 2+ and 3+ brook trout (0.69, 0.50 and 0.59, respectively). No overlaps existed between age classes of cutthroat trout in Skookum Creek.

3.7.3. BENTHIC AND DRIFTING INVERTEBRATE ELECTIVITIES

3.7.3.1 LECLERC CREEK

The measure of prey selection (electivity) for benthic and drifting invertebrates was determined for each age class of brown trout, brook trout, and cutthroat trout in LeClerc Creek.

Brown trout electivities for benthic invertebrates are listed in Table 3.174 and electivities for drifting invertebrates are listed in Table 3.175. The highest electivity for age 0+ brown trout was for Hydroptilidae from both the benthos (0.52) and drift (0.52). For age 1+ brown trout, the highest electivity from the benthos and drift, was Glossosomatidae (0.143 and 0.141, respectively). For age 2+ brown trout, Brachycentridae had the highest electivity in benthos and drift (0.562 and 0.554, respectively). For age 3+ brown trout, Rhyacophilidae had the highest electivity for the benthos (0.485) and Brachycentridae had the highest electivity in the drift (0.456). Age 4+ brown trout had the highest electivity for Nematoda in both the benthos (0.323) and drift (0.323). For all age classes combined, Brachycentridae had the highest electivity for both the benthos and drift at 0.355 and 0.247, respectively.

Brook trout electivities for benthic invertebrates are listed in Table 3.176 and electivities for drifting invertebrates are listed in Table 3.177. The highest electivity for age 1+ brook trout in LeClerc Creek was for Dytiscidae in both benthos (0.080) and drift (0.082).

Table 3.172. Annual diet overlaps between trout species in Skookum Creek, WA. Overlaps based on index of relative importance (IRI) values for 1990.

	Brown trout	Brook trout	Cutthroat trout
Brown trout	1.00	0.63	0.32
Brook trout		1.00	0.24
Cutthroat trout			1.00

Table 3.173. Annual diet overlaps between age classes of trout species in Skookum Creek, WA. Overlaps based on relative importance (IRI) values for 1990.

(Brown trout

Age classes	0 +	1 +	2 +	3 +	4 +
0 +	1.00	0.61	0.51	0.35	0
1 +		1.00	0.27	0.06	0.02
2 +			1.00	0.61	0
3 +				1.00	0
4 +					1.00

Brook trout

Age classes	0 +	1 +	2 +	3 +	
0 +	1.00	0.69	0.41	0.38	
1 +		1.00	0.50	0.41	
2 +			1.00	0.59	
3 +				1.00	

Cutthroat trout

Age classes	0 +	1 +			
0 +	1.00	0			
1 +		1.00			

Table 3.174. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age class of brown trout in LeClerc Creek, Wa. for 1990.

PREY ORGANISMS	% Environ.	0+ n=2	1+ n=5	2+ n=3	3+ n=1	4+ n=4	All ages n=15
AQUATIC ORGANISMS							
TRICHOPTERA (Caddisflies)							
Brachycentridae	0.052	-0.052	-0.016	0.554	0.448	0.303	0.2474
Glossosomatidae	0.002	-0.002	0.141	-0.002	-0.002	-0.002	0.0266
Hydropsychidae	0.007	-0.007	-0.007	-0.007	-0.007	-0.007	-0.007
Hydroptilidae	0	0.52	0	0	0	0	0.104
Lepidostomatidae	0	0	0	0	0	0	0
Leptoceridae	0	0	0	0.061	0	0	0.0122
Limnephilidae	0	0	0	0	0	0.097	0.0194
Psycomyiidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Rhyacophilidae	0.015	-0.015	-0.015	-0.015	0.485	-0.015	0.085
EPHEMEROPTERA (Mayflies)							
Baetidae	0.078	0.042	-0.042	0.134	-0.078	-0.078	-0.0044
Ephemerellidae	0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Heptageniidae	0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
Leptophlebiidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
PLECOPTERA (Stoneflies)							
Chloroperlidae	0.027	-0.027	-0.027	-0.027	-0.027	-0.027	-0.027
Nemouridae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
Perlidae	0	0	0	0	0	0	0
Perlodidae	0.01	-0.01	0.026	-0.01	-0.01	-0.01	-0.0028
COLEOPTERA (Beetles)	0	0	0	0	0	0.032	0.0064
Elmidae larvae	0.094	0.026	-0.094	-0.094	-0.094	-0.094	-0.07
Elmidae adult	0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Hydrophilidae	0	0	0	0	0	0	0
Staphylinidae adult	0	0	0.036	0	0	0	0.0072
Dytiscidae larvae	0.002	-0.002	0.105	-0.002	-0.002	-0.002	0.0194
Dytiscidae adult	0	0	0.036	0	0	0	0.0072
Georyssidae	0	0	0	0	0	0	0
DIPTERA (Midges and flies)							
Chironomidae larvae	0.523	-0.403	-0.237	-0.523	-0.523	-0.458	-0.4288
Chironomidae pupae	0.65	-0.65	-0.65	-0.65	-0.65	-0.618	-0.6436
Ceratopogonidae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Tipulidae	0.009	-0.009	-0.009	-0.009	-0.009	0.023	-0.0026
Simuliidae larvae	0.003	0.117	-0.003	-0.003	-0.003	-0.003	0.021
Simuliidae pupae	0	0	0	0	0	0	0
Chaoboridae pupae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
HYDRACARINA (Mites)	0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
LEPIDOPTERA (Moths)							
Pyralidae	0	0	0	0.061	0	0	0.0122

Table 3.174. (cont.)

PREY ORGANISMS	% Environ.	0+ n=2	1+ n=5	2+ n=3	3+ n=1	4+ n=4	All ages n=15
GASTROPODA (Snails)							
Planorbidae	0.008	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008
BIVALVIA (Clams)							
Sphaeriidae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
OLIGOCHEATA (Worms)							
Lumbriculidae	0.004	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004
NEMATODA	0	0	0	0	0	0.323	0.0646
TERRESTRIAL ORGANISMS							
EMPHEMEROPTERA (Mayflies)							0
Baetidae	0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Ephemerelidae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Heptageniidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
HEMIPTERA (True bugs)							
Corixidae	0.008	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008
HOMOPTERA (Aphids)							
Coccidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
HYMNENOPTERA (Wasps and ants)							
Formicidae	0	0	0	0.061	0	0	0.0122
ARANEIDA (Spiders)	0	0	0.107	0	0	0	0.0214
COLLEMBOLA	0	0	0.107	0	0	0	0.0214
CICADIDAE	0	0	0.036	0	0	0	0.0072
CHILIPODA	0	0	0.036	0	0	0	0.0072
UNIDENTIFIED	0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001

Table 3.175. The measure of prey select ion (electivity) for macroinvertebrates (from drift samples) by age class of brown trout in LeClerc Creek, WA. for 1990.

PREY ORGANISMS	% Environ.	0+ n=2	1+ n=5	2+ n=3	3+ n=1	4+ n=4	All ages n=15
AQUATIC ORGANISMS							
TRICHOPTERA (Caddisflies)							
Brachycentridae	0.044	-0.044	-0.008	0.562	0.456	0.311	0.2554
Glossosomatidae		0	0.143	0	0	0	0.0286
Hydroptilidae		0.52	0	0	0	0	0.104
Lepidostomatidae		0	0	0	0	0	0
Leptocerdiae		0	0	0.061	0	0	0.0122
Limnephilidae		0	0	0	0	0.097	0.0194
Rhyacophilidae		0	0	0	0.5	0	0.1
EPHEMEROPTERA (Mayflies)							
Baetidae	0.124	-0.004	-0.088	0.088	-0.124	-0.124	-0.050
Ephemerellidae	0.008	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008
Heptageniidae	0.029	-0.029	-0.029	-0.029	-0.029	-0.029	-0.029
PLECOPTERA (Stoneflies)							
Chloroperlidae	0.006	-0.006	-0.006	-0.006	-0.006	-0 006	-0.006
Perlidae	0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
Perlodidae		0	0.036	0	0	0	0.0072
COLEOPTERA (Beetles)		0	0	0	0	0.032	0.0064
Elmidae larvae	0.159	-0.039	-0.159	-0.159	-0.159	-0.159	-0.135
Elmidae adult	0.038	-0.038	-0.038	-0.038	-0.038	-0.038	-0.038
Hydrophillidae	0.027	-0.027	-0.027	-0.027	-0.027	-0.027	-0.027
Staphylinidae adult		0	0.036	0	0	0	0.0072
Dytiscidae larvae		0	0.107	0	0	0	0.0214
Dytiscidae adult		0	0.036	0	0	0	0.0072
Georyssidae	0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
DIPTERA (Midges and flies)							
Chironomidae larvae	0.163	-0.043	0.123	-0.163	-0.163	-0.098	-0.069
Chironomidae pupae	0.189	-0.189	-0.189	-0.189	-0.189	-0.157	-0.183
Tipulidae	0.017	-0.017	-0.017	-0.017	-0.017	0.015	-0.011
Simuliidae larvae	0.045	0.075	-0.045	-0.045	-0.045	-0.045	-0.021
Simuliiae pupae	0.023	-0.023	-0 023	-0.023	-0.023	-0.023	-0.023
LEPIDOPTERA (Moths)							
Pyralidae	0.009	-0 009	-0 009	0.052	-0.009	-0.009	0.003
HYDRACARINA (Miles)	0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0 009
OLIGOCHAETA (Worms)							
Lumbriculidae	0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
NEMATODA (Nematodes)	0	0	0	0	0	0.323	0.0646
TERRESTRIAL ORGANISMS							
TRICHOPTERA (Caddisflies)	0.021	-0.021	-0.021	-0.021	-0.021	-0.021	-0.021
EMPHEMEROPTERA (Mayflies)							
Ephemerelidae	0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
DIPTERA (Midges and flies)							
Alydidae	0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
Drosophilidae	0.008	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008
Rhagionidae	0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Simuliidae	0.005	-0 005	-0 005	-0.005	-0.005	-0.005	-0.005
HOMOPTERA (Aphids)							
Aphididae	0 009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
HYMNENOPTERA (Wasps and ants)							
Formicidae	0.005	-0.005	-0.005	0.056	-0.005	-0.005	0.007
ARANEIDA(Spiders)	0.005	-0.005	0 102	-0.005	-0.005	-0.005	0.016
COLLEMBOLA	0	0	0.107	0	0	0	0.021
CICADIDAE	0	0	0 036	0	0	0	0.007
CHILIPODA	0	0	0.036	0	0	0	0.007
UNIDENTIFIED	0 011	-0.011	-0 011	-0.011	-0 011	-0.011	-0 011

For age 2+ brook trout, Pyralidae had the highest electivity for both benthos (0.214) and drift (0.205). Brachycentridae had the highest electivity value in both benthos and drift in for age 3+ and combined age classes of brook trout at 0.632, 0.643, 0.190 and 0.198, respectively.

Cutthroat trout electivities benthic invertebrates are listed in Table 3.178. and electivities for drifting invertebrates are listed in Table 3.179. For age 1+ cutthroat trout, Simuliidae had the highest electivity in the benthos (0.133) and Chironomidae larvae had the highest electivity in the drift (0.428). Psychomyiidae had the highest electivity in both the benthos (0.363) and the drift (0.364) for age 2+ cutthroat trout. For age 3+ cutthroat trout, adult Trichoptera had the highest electivity in both the benthos (0.133) and drift (0.1 12). For all ages of cutthroat trout Psychomyiidae had the highest electivity in the benthos (0.131) and Brachycentridae in the drift (0.134).

3.7.3.2 RUBY CREEK

The measure of prey selection (electivity) for benthic and drifting invertebrates was determined for each age class of brook trout, cutthroat trout, rainbow trout and mountain whitefish for Ruby Creek.

Brook trout electivities for benthic invertebrates are listed in Table 3.180 and electivities for drifting invertebrates are listed in Table 3.181. The highest electivity for age 0+ brook trout in both the benthos and drift was for Asilidae (0.256 and 0.256, respectively). For age 1+ brook trout, the highest electivity in the benthos was for Chironomidae larvae (0.234) and Ceratopogonidae in the drift (0.1 12). Chironomidae larvae had the highest electivity in both the benthos and drift for age 2+ brook trout (0.402 and 0.241, respectively). Formicidae had the highest electivity in both the benthos and drift for age 3+ and combined age classes of brook trout (0.750. 0.739, 0.232 and 0.221, respectively).

Cutthroat trout electivities for benthic invertebrates are listed in Table 3.182 and electivities for drifting invertebrates can be found in Table 3.183. Formicidae had the highest electivity values for age 1+ and 2+ cutthroat trout in both the benthos and the drift.(0.330, 0.322, 0.833 and 0.822, respectively). For both age classes combined Formicidae had the highest electivities for both benthos (0.583) and drift (0.572).

Table 3.176. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age class of brook trout in LeClerc Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	1+ n=15	2+ n=6	3+ n=1	All ages n=22
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	0.052	-0.011	-0.052	0.632	0.19
Glossosomatidae	0.002	-0.002	-0.002	0.156	0.051
Hydropsychidae	0.007	-0.007	-0.007	-0.007	-0.007
Lepidostomatidae	0	0	0.095	0	0.032
Psychomyiidae	0.001	0.019	-0.001	-0.001	0.006
Rhyacophilidae	0.015	-0.015	-0.015	-0.015	-0.015
EPHEMEROPTERA (Mayflies)					
Baetidae	0.078	-0.017	-0.078	-0.078	-0.058
Ephemerellidae	0.02	-0.02	0.147	-0.02	0.036
Heptageniidae	0.05	-0.05	-0.05	-0.05	-0.05
Leptophlebiidae	0.001	-0.001	-0.001	-0.001	-0.001
PLECOPTERA (Stoneflies)					
Chloroperlidae	0.027	-0.007	-0.027	-0.027	-0.02
Nemouridae	0.003	-0.003	-0.003	-0.003	-0.003
Perlodidae	0.01	0.01	-0.01	-0.01	-0.003
COLEOPTERA (Beetles)					
Elmidae larvae	0.094	0.069	-0.023	0.064	0.037
Elmidae adults	0.002	0.018	-0.002	-0.002	0.005
Amphizoidae adult	0	0	0.024	0	0.008
Dytiscidae larvae	0.002	0.08	0.022	-0.002	0.033
Dytiscidae adult	0	0.02	0	0	0.007
Hapliplidae	0	0.041	0	0	0.014
HYDRACARINA (Mites)	0.003	-0.003	-0.003	-0.003	-0.003
DIPTERA (Midges and flies)					
Chironomidae larvae	0.523	-0.38	-0.523	-0.523	-0.475
Chironomidae pupae	0.65	-0.507	-0.579	-0.65	-0.579
Ceratopogonidae	0.002	-0.002	-0.002	-0.002	-0.002
Tipulidae	0.009	0.011	0.015	-0.009	0.006
Simuliidae larvae	0.003	-0.003	0.021	-0.003	0.005
Simulidae pupae	0	0.02	0	0	0.007
Sciomyzidae	0	0	0.024	0	0.008
Chaoboridae pupae	0.001	-0.001	-0.001	-0.001	-0.001
LEPIDOPTERA (Moths)					
Pyralidae	0	0.02	0.214	0	0.078
GASTROPODA (Snails)					
Planorbidae	0.008	-0.008	-0.008	-0.008	-0.008
BIVALVIA (Snails)					
Sphaeriidae	0.003	-0.003	-0.003	-0.003	-0.003

Table 3.176. (cont.)

PREY ORGANISMS	% in Environ.	1+ n=15	2+ n=6	3+ n=1	All ages n=22
OLIGOCHAETA (Worms)					
Lumbriculidae	0.004	0.016	-0.004	-0.004	0.003
TERRESTRIAL ORGANISMS					
TRICHOPTERA (Caddisflies)	0	0.02	0.071	0	0.03
EMPHEMEROPTERA (Mayflies)					
Baetidae	0.005	-0.005	-0.005	-0.005	-0.005
Ephemerelidae	0.002	-0.002	-0.002	-0.002	-0.002
Heptageniidae	0.001	-0.001	-0.001	-0.001	-0.001
DIPTERA (Midges and flies)					
Simuliidae	0	0.02	0	0	0.007
Asilidae	0	0.02	0	0	0.007
HEMIPTERA (True bugs)					
Corixidae	0.008	-0.008	-0.008	-0.008	-0.008
Coccidae	0.001	-0.001	-0.001	-0.001	-0.001
HOMOPTERA (Aphids)					
Aphididae	0	0	0.024	0	0.008
Cicadidae		0	0.024	0	0.008
HYMNENOPTERA (Wasps and ants)					
Formicidae	0	0.061	0.143	0	0.068
ARANEIDA	0	0.02	0	0	0.007
UNIDENTIFIED	0.001	-0.001	-0.001	-0.001	-0.001

Table 3.177. The measure of prey slection (electivity) for macroinvertebates (from drift samples) by age class of brook trout in LeClerc Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	1+ n=15	2+ n=6	3+ n=1	All ages n=22
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	0.044	-0.003	-0.044	0.643	0.198
Glossosomatidae	0	0	0	0.158	0.053
Lepidostomatidae	0	0	0.095	0	0.032
Phryganeidae	0	0	0	0	0
Psychomyiidae	0	0.02	0	-0.02	0.007
EPHEMEROPTERA (Mayflies)					
Baetidae	0.124	-0.063	-0.124	-0.061	-0.104
Ephemerellidae	0.008	-0.008	0.159	0	0.048
Heptageniidae	0.029	-0.029	-0.029	0	-0.029
PLECOPTERA (Stoneflies)					
Chloroperlidae	0.006	0.014	-0.006	-0.02	0.001
Perlidae	0.009	-0.009	-0.009	0	-0.009
Perlodidae	0	0.02	0	-0.02	0.007
COLEOPTERA (Beetles)					
Elmidae larvae	0.159	0.004	-0.088	-0.005	-0.028
Elmidae adults	0.038	-0.018	-0.038	-0.02	-0.031
Hydrophilidae	0.027	-0.027	-0.027	0	-0.027
Amphizoidae adult	0	0	0.024	0	0.008
Dytiscidae larvae	0	0.082	0.024	-0.082	0.035
Georyssidae	0.009	-0.009	-0.00	-0.02	0.007
			9	0	-0.009
Hapliplidae	0	0.041	0	-0.041	0.014
DIPTERA (Midges and flies)					
Chironomidae larvae	0.163	-0.02	-0.163	-0.143	-0.115
Tipulidae	0.017	-0.003	-0.118	-0.143	-0.118
			0.007	-0.02	-0.002
Simuliidae larvae	0.045	-0.045	-0.021	0	-0.037
Simulidae pupae	0.023	-0.003	-0.023	-0.02	-0.016
Sciomyzidae	0	0	0.024	0	0.008
LEPIDOPTERA (Moths)					
Pyralidae	0.009	0.011	0.205	-0.02	0.069
HYDRACARINA	0.009	-0.009	-0.009	0	-0.009
OLIGOCHAETA (Worms)					
Lumbriculidae	0.009	0.011	-0.009	-0.02	-0.002

Table 3.177. (cont.)

PREY ORGANISMS	% in Environ.	1+ n=15	2+ n=6	3+ n=1	All ages n=22
TERRESTRIAL ORGANISMS					
TRICHOPTERA (Caddisflies)	0.021	-0.001	0.05	-0.02	0.009
EPHEMEROPTERA (Mayflies)	0.009	-0.009	-0.009	0	-0.009
DIPTERA (Midges and flies)					
Alydidae	0.009	-0.009	-0.009	0	-0.009
Assilidae		0.02	0	-0.02	0.007
Drosophilidae	0.008	-0.008	-0.008	0	-0.008
Rhagionidae	0.005	-0.005	-0.005	0	-0.005
Simuliidae	0.005	0.015	-0.005	-0.02	0.002
HOMOPTERA (Aphids)					
Aphididae	0.009	-0.009	0.015	0	-0.001
Cicadidae		0	0.024	0	0.008
HYMNENOPTERA (Wasps and ants)					
Formicidae	0.005	0.056	0.138	-0.061	0.063
ARANEIDA	0.005	0.015	-0.005	-0.02	0.002
UNIDENTIFIED	0.011	-0.011	-0.011	0	-0.011

Table 3.178. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age class of cutthroat trout in LeClerc Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	1+ n=1	2+ n=3	3+ n=2	All ages n=6
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	0.052	0.084	0.257	0.037	0.126
Glossosomatidae	0.002	-0.002	-0.002	-0.002	-0.002
Hydropsychidae	0.007	-0.007	-0.007	-0.007	-0.007
Psychomyiidae	0.001	-0.001	0.363	0.032	0.131
Rhyacophilidae	0.015	-0.015	0.021	-0.015	-0.003
EPEMEROPTERA (Mayflies)					
Baetidae	0.078	0.058	0.049	0.011	0.039
Ephemerellidae	0.02	-0.02	-0.02	0.002	-0.013
Heptageniidae	0.05	-0.05	-0.05	-0.028	-0.043
Leptophlebiidae	0.001	-0.001	-0.001	-0.001	-0.001
PLECOPTERA (Stoneflies)					
Chloroperlidae	0.027	-0.027	-0.027	-0.027	-0.027
Nemouridae	0.003	-0.003	-0.003	-0.003	-0.003
Perlodidae	0.01	-0.01	-0.01	0.012	-0.003
COLEOPTERA (Beetles)					
Elmidae larvae	0.094	-0.094	-0.094	-0.072	-0.087
Elmidae adult	0.002	-0.002	-0.002	-0.002	-0.002
Dytisicidae	0.002	-0.002	-0.002	-0.002	-0.002
ODONATA (Damsels and dragonflies)					
Libelluidae	0	0	0	0.022	0.007
DIPTERA (Midges and flies)					
Chironomidae larvae	0.523	0.068	-0.523	-0.445	-0.3
Chironomidae pupae	0.065	-0.065	-0.065	-0.009	-0.046
Ceratopogonidae	0.002	-0.002	-0.002	-0.002	-0.002
Tipulidae	0.009	-0.009	-0.009	0.102	0.028
Simuliidae larvae	0.003	0.133	0.052	0.019	0.068
Simuliidae pupae		0	0	0.022	0.007
Chaoboridae pupae	0.001	-0.001	-0.001	-0.001	-0.001
LEPIDOPTERA (Moths)					
Pyralidae		0	0.055	0.111	0.055
HYDRACARINA (Water mites)	0.003	-0.003	-0.003	-0.003	-0.003
GASTROPODA (Snails)					
Planorbidae	0.008	-0.008	-0.008	0.014	-0.001
BIVALVIA (Clams)					
Sphaeriidae	0.003	-0.003	-0.003	-0.003	-0.003
OLIGOCHAETA (Worms)					
Lumbriculidae	0.004	-0.004	-0.004	0.018	0.003

Table 3.178. (cont.)

PREY ORGANISMS	% in Environ.	1+ n=1	2+ n=3	3+ n=2	All ages n=6
TERRESTRIAL ORGANISMS					
TRICHOPTERA (Caddisflies)		0	0	0.133	0.044
EPHEMEROPTERA (Mayflies)					
Baetidae	0.005	-0.005	-0.005	-0.005	-0.005
Ephemerellidae	0.002	-0.002	-0.002	-0.002	-0.002
Heptageniidae	0.001	-0.001	-0.001	-0.001	-0.001
DIPTERA (Midges and flies)					
Chironomidae	0	0	0	0.022	0.007
COLLEMBOLA	0	0	0	0.022	0.007
HEMIPTERA (True bugs)					
Corixidae	0.008	-0.008	-0.008	-0.008	-0.008
HOMOPTERA (Aphids)					
Coccidae	0.001	-0.001	-0.001	-0.001	-0.001
HYMENOPTERA (Wasps and ants)					
Formicidae	0	0	0	0.033	0.011
ARANEIDA (Spiders)	0	0	0	0.022	0.007
UNIDENTIFIED	0.001	-0.001	0.054	-0.001	0.017

Table 3.179. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age class of cutthroat trout in LeClerc Creek, WA. for 1990.

PREY ORGANISMS	% in Eviron.	1+ n=1	2+ n=3	3+ n=2	All ages n=6
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	0.044	0.092	0.265	0.045	0.134
Rhyacophilidae	0	0	0.036	0	0.012
Psychomyiidae	0	0	0.364	0.033	0.132
EPEMEROPTERA (Mayflies)					
Baetidae	0.124	0.012	0.003	-0.035	-0.007
Ephemerellidae	0.008	-0.008	-0.008	0.014	-0.001
Heptageniidae	0.029	-0.029	-0.029	-0.007	-0.022
PLECOPTERA (Stoneflies)					
Chloroperlidae	0.006	-0.006	-0.006	-0.006	-0.006
Perlidae	0.009	-0.009	-0.009	-0.009	-0.009
Perlodidae	0	0	0	0.022	0.007
COLEOPTERA (Beetles)					
Elmidae larvae	0.159	-0.159	-0.159	-0.137	-0.152
Elmidae adult	0.038	-0.038	-0.038	-0.038	-0.038
Hydrophilidae	0.027	-0.027	-0.027	-0.027	-0.027
Georyssidae	0.009	-0.009	-0.009	-0.009	-0.009
ODONATA (Damsel and dragonflies)					
Libelluidae	0	0	0	0.022	0.007
DIPTERA (Midges and flies)					
Chironomidae larvae	0.163	0.428	-0.163	-0.085	0.06
Chironomidae pupae	0.189	-0.189	-0.189	-0.133	-0.17
Tipulidae	0.017	-0.017	-0.017	0.094	0.02
Simuliidae larvae	0.045	0.091	0.01	-0.023	0.026
Simuliidae pupa	0.023	-0.023	-0.023	-0.001	-0.016
LEPIDOPTERA (Moths)					
Pyralidae	0.009	-0.009	0.046	0.102	0.046
HYDRACARINA (Water mites)	0.009	-0.009	-0.009	-0.009	-0.009
OLIGOCHAETA (Worms)					
Lumbriculidae	0.009	-0.009	-0.009	0.013	-0.002
GASTROPODA (Snails)					
Planorbidae	0	0	0	0.022	0.007
TERRESTRIAL ORGANISMS					
TRICHOPTERA (Caddisflies)	0.021	-0.021	-0.021	0.112	0.023
EPHEMEROPTERA (Mayflies)					
Ephemerellidae	0.009	-0.009	-0.009	-0.009	-0.009
DIPTERA (Midges and flies)					
Alydidae	0.009	-0.009	-0.009	-0.009	-0.009
Chironomidae	0	0	0	0.022	0.007
Drosophilidae	0.008	-0.008	-0.008	-0.008	-0.008
Rhagionidae	0.005	-0.005	-0.005	-0.005	-0.005
Simuliidae	0.005	-0.005	-0.005	-0.005	-0.005
COLLEMBOLA	0	0	0	0.022	0.007
HOMOPTERA (Aphids)					
Aphidiae	0.009	-0.009	-0.009	-0.009	-0.009
HYMENOPTERA (Wasps and ants)					
Formicidae	0.005	-0.005	-0.005	0.028	0.006
ARANEIDA (Spiders)	0.005	-0.005	-0.005	0.017	0.002
UNIDENTIFIED	0.011	-0.011	0.044	-0.011	0.007

Table 3.180. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age class of brook trout in Ruby Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	0+ n=2	1+ n=11	2+ n=9	3+ n=2	All ages n=24
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	0.005	-0.005	0.024	-0.002	-0.005	0.003
Glossosomatidae	0.002	-0.002	0.018	0.01	-0.002	0.006
Hydropsychidae	0.044	-0.044	-0.044	-0.032	-0.044	-0.041
Hydroptilidae	0	0.077	0.02	0	0	0.024
Lepidostomatidae	0	0	0	0	0	0
Limnephilidae	0.002	-0.002	-0.002	0.001	-0.002	-0.001
Phryganeidae	0	0	0	0.012	0	0.003
Psychomyiidae	0	0	0.029	0	0	0.007
Rhyacophilidae	0.007	-0.007	-0.007	-0.007	-0.007	-0.007
EPEMEROPTERA (Mayflies)						
Baetidae	0.069	-0.069	-0.02	-0.041	-0.069	-0.05
Ephemerellidae	0.028	0.049	-0.028	0.008	-0.028	0
Heptageniidae	0.033	-0.033	0.024	-0.021	-0.033	-0.016
Leptophlebiidae	0.018	0.059	-0.018	-0.018	-0.018	0.001
PLECOPTERA (Stoneflies)						
Capniidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Chloroperlidae	0.022	-0.022	-0.022	0.002	-0.022	-0.016
Nemouridae	0.012	-0.012	0.017	-0.012	-0.012	-0.005
Perlodidae	0.016	-0.016	-0.016	0.028	-0.016	-0.005
COLEOPTERA (Beetles)						
Elmidae larvae	0.116	-0.116	-0.059	-0.115	-0.116	-0.102
Elmidae adult	0.012	-0.012	-0.012	-0.012	-0.012	-0.012
Hydrophilidae	0	0	0	0.016	0	0.004
Hapliplidae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Amphizoidae adult	0	0	0	0.001	0	0
Canthridae	0	0.077	0	0	0	0.019
LEPIDOPTERA (Moths)						
Pyralidae	0	0	0	0.003	0	0.001
DIPTERA (Midges and flies)						
Chironomidae larvae	0.138	-0.061	0.234	0.402	-0.138	0.109
Chironomidae pupae	0	0	0.057	0.036	0	0.023
Ceratopogonidae	0.002	-0.002	0.113	0.014	-0.002	0.031
Tipulidae	0.017	0.162	0.003	-0.005	-0.017	0.036
Simuliidae	0.066	0.113	-0.046	-0.054	-0.066	-0.013
Empididae	0	0	0	0.001	0	0
Psychodidae	0.018	-0.018	-0.018	-0.018	-0.018	-0.018
HYDRACARINA (Water mites)	0.009	-0.009	-0.009	0.019	-0.009	-0.002
OLIGOCHAETA (Worms)						
Lumbriculidae	0.011	-0.011	-0.011	0.017	-0.011	-0.004

Table 3.180. (cont.)

PREY ORGANISMS	% in Environ.	0+ n=2	1+ n=11	2+ n=9	3+ n=2	All ages n=24
Naididae	0.011	-0.011	-0.011	-0.011	-0.011	-0.011
PLATHELMINTHES (Flatworms)						
Planariidae	0.004	-0.004	-0.004	-0.004	-0.004	-0.004
NEMATODA	0.004	-0.004	0.016	-0.003	-0.004	0.001
GASTROPODA (Snails)						
Planorbidae	0.006	-0.006	-0.006	-0.006	-0.006	-0.006
BIVALVIA (Clams)						
Sphaeriidae	0.328	-0.328	-0.328	-0.328	-0.328	-0.328
TERRESTRIAL ORGANISMS						
TRICHOPTERA (Caddisflies)	0	0	0	0	0.083	0.021
DIPTERA (Midges and flies)						
Asilidae	0	0.256	0	0	0	0.064
COLEOPTERA (Beetles)						
Bupresitidae	0	0	0	0.001	0	0
HEMIPTERA (True bugs)						
Corixidae		0	0	0	0.083	0.021
HYMENOPTERA (Wasps and ants)						
Eurtomidae	0	0	0	0	0	0
Formicidae	0	0	0.057	0.12	0.75	0.232
Ichneumadae	0	0	0.029	0	0	0.007
Pteromalidae	0	0	0.02	0	0	0.005
DIPLOPODA	0	0	0	0.001	0	0
ARANEIDA (Spiders)	0	0	0	0	0.083	0.021
UNIDENTIFIED	0.001	-0.001	-0.001	-0.001	-0.001	-0.001

Table 3.181. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age class of brook trout in Ruby Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	0+ n=2	1+ n=11	2+ n=9	3+ n=2	All ages n=24
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	0	0	0.029	0.003	0	0.008
Glossosomatidae	0.002	-0.002	0.018	0.01	-0.002	0.006
Hydropsychidae	0	0	0	0.012	0	0.003
Hydroptilidae	0	0.077	0.02	0	0	0.024
Lepidostomatidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Limnephilidae	0	0	0	0.003	0	0.001
Phryganeidae	0	0	0	0.012	0	0.003
Psychomyiidae	0	0	0.029	0	0	0.007
Rhyacophilidae	0.008	-0.008	-0.008	-0.008	-0.008	-0.008
EPEMEROPTERA (Mayflies)						
Baetidae	0.04	-0.04	0.009	-0.012	-0.04	-0.021
Ephemerellidae	0.001	0.076	-0.001	0.035	-0.001	0.027
Heptageniidae	0.004	-0.004	0.053	0.008	-0.004	0.013
Leptophlebiidae	0.003	0.074	-0.003	-0.003	-0.003	0.016
PLECOPTERA (Stoneflies)						
Chloroperlidae	0	0	0	0.024	0	0.006
Nemouridae	0.013	-0.013	0.016	-0.013	-0.013	-0.006
Perlodidae	0.012	-0.012	-0.012	0.032	-0.012	-0.001
COLEOPTERA (Beetles)						
Elmidae larvae	0.067	-0.067	-0.01	-0.066	-0.067	-0.053
Elmidae adult	0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Hydrophilidae	0	0	0	0.016	0	0.004
Amphizoidae adult	0	0	0	0.001	0	0
Canthridae	0	0.077	0	0	0	0.019
DIPTERA (Midges and flies)						
Chironomidae larvae	0.299	-0.222	0.073	0.241	-0.299	-0.052
Chironomidae pupae	0.103	-0.103	-0.046	-0.067	-0.103	-0.08
Ceratopogonidae	0.003	-0.003	0.112	0.013	-0.003	0.03
Tipulidae	0.004	0.175	0.016	0.008	-0.004	0.049
Simuliidae	0.096	0.083	-0.076	-0.084	-0.096	-0.043
Empididae	0	0	0	0.001	0	0
Psychodidae	0.009	-0.009	-0.009	-0.009	-0.009	-0.009
Chaoboridae pupae	0.061	-0.061	-0.061	-0.061	-0.061	-0.061
LEPIDOPTERA (Moths)						
Pyralidae	0	0	0	0.003	0	0.001
HYDRACARINA (Water mites)	0.027	-0.027	-0.027	0.001	-0.027	-0.02
OLIGOCHAETA (Worms)						
Lumbriculidae	0.009	-0.009	-0.009	0.019	-0.009	-0.002
NEMATODA	0.009	-0.009	0.011	-0.008	-0.009	-0.004

Table 3.181. (cont.)

PREY ORGANISMS	% in Environ.	0+ n=2	1+ n=11	2+ n=9	3+ n=2	All ages n=24
PLATHELMINTHES (Flatworms)						
Planariidae	0.008	-0.008	-0.008	-0.008	-0.008	-0.008
GASTROPODA (Snails)						
Planorbidae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003
BIVALVIA (Clams)						
Sphaeriidae	0.181	-0.181	-0.181	-0.181	-0.181	-0.181
TERRESTRIAL ORGANISMS						
TRICHOPTERA (Caddisflies)	0	0	0	0	0.083	0.021
DIPTERA (Midges and flies)						
Asilidae		0.256	0	0	0	0.064
COLEOPTERA (Beetles)						
Bupresitidae	0	0	0	0.001	0	0
HEMIPTERA (True bugs)						
Corixidae		0	0	0	0.083	0.021
HOMOPTERA (Aphids)						
Aphidiae	0.007	-0.007	-0.007	-0.007	-0.007	-0.007
HYMENOPTERA (Wasps and ants)						
Formicidae	0.011	-0.011	0.046	0.109	0.739	0.221
Pteromalidae	0	0	0.02	0	0	0.005
Ichneumonidae	0	0	0.029	0	0	0.007
COLLEMBOLA (Springtails)	0.008	-0.008	-0.008	-0.008	-0.008	-0.008
DIPLOPODA	0	0	0	0.001	0	0
ARANEIDA (Spiders)	0	0	0	0	0.083	0.021
UNIDENTIFIED	0.008	-0.008	-0.008	-0.008	-0.008	-0.008

Table 3.182. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age class of cutthroat trout in Ruby Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	1+ n=1	2+ n=1	All ages n=2
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	0.005	-0.005	-0.005	-0.005
Glossosomatidae	0.002	-0.002	-0.002	-0.002
Hydropsychidae	0.044	-0.044	-0.044	-0.044
Limnephilidae	0.002	-0.002	-0.002	-0.002
Psychomyiidae	0	0	0.05	0.025
Rhyacophilidae	0.007	-0.007	-0.007	-0.007
EPEMEROPTERA (Mayflies)				
Baetidae	0.069	0.264	-0.069	0.098
Ephemerellidae	0.028	-0.028	-0.028	-0.028
Heptageniidae	0.033	-0.033	-0.033	-0.033
Leptophlebiidae	0.018	-0.018	-0.018	-0.018
PLECOPTERA (Stoneflies)				
Capniidae	0.001	-0.001	-0.001	-0.001
Chloroperlidae	0.022	-0.022	-0.022	-0.022
Nemouridae	0.012	-0.012	-0.012	-0.012
Perlodidae	0.016	-0.016	-0.016	-0.016
COLEOPTERA (Beetles)				
Elmidae larvae	0.116	-0.116	-0.116	-0.116
Elmidae adults	0.012	-0.012	-0.012	-0.012
Hapliplidae	0.002	-0.002	-0.002	-0.002
LEPIDOPTERA (Moths)				
Pyralidae		0	0.117	0.059
DIPTERA (Midges and flies)				
Chironomidae larvae	0.138	-0.138	-0.138	-0.138
Ceratopogonidae	0.002	-0.002	-0.002	-0.002
Tipulidae	0.017	-0.017	-0.017	-0.017
Simuliidae	0.066	0.267	-0.066	0.101
Psychodidae	0.018	-0.018	-0.018	-0.018
HYDRACARINA (Water mites)	0.009	-0.009	-0.009	-0.009
OLIGOCHEATA (Worms)				
Lumbriculidae	0.011	-0.011	-0.011	-0.011
Naididae	0.011	-0.011	-0.011	-0.011
PLATHELMINTHES (Flatworms)				
Planariidae	0.004	-0.004	-0.004	-0.004
NEMATODA (Nematodes)	0.004	-0.004	-0.004	-0.004
GASTROPODA (Snails)				
Planorbidae	0.006	-0.006	-0.006	-0.006
BIVALVIA (Clams)				
Sphaeriidae	0.328	-0.328	-0.328	-0.328
TERRESTRIAL ORGANISMS				
HYMENOPTERA (Wasps and ants)				
Formicidae		0.333	0.833	0.583
UNIDENTIFIED	0.001	-0.001	-0.001	-0.001

Table 3.183. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age class of cutthroat trout in Ruby Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	1+ n=1	2+ n=1	All ages n=2
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Glossosomatidae	0.002	-0.002	-0.002	-0.002
Lepidostomatidae	0.001	-0.001	-0.001	-0.001
Psychomyiidae		0	0.05	0.025
Rhyacophilidae	0.008	-0.008	-0.008	-0.008
EPEMEROPTERA (Mayflies)				
Baetidae	0.04	0.293	-0.04	0.127
Ephemerellidae	0.001	-0.001	-0.001	-0.001
Heptageniidae	0.004	-0.004	-0.004	-0.004
Leptophlebiidae	0.003	-0.003	-0.003	-0.003
PLECOPTERA (Stoneflies)				
Nemouridae	0.013	-0.013	-0.013	-0.013
Perlodidae	0.012	-0.012	-0.012	-0.012
COLEOPTERA (Beetles)				
Elmidae larvae	0.067	-0.067	-0.067	-0.067
Elmidae adult	0.002	-0.002	-0.002	-0.002
DIPTERA (Midges and flies)				
Chironomidae larvae	0.299	-0.299	-0.299	-0.299
Chironomidae pupae	0.103	-0.103	-0.103	-0.103
Ceratopogonidae	0.003	-0.003	-0.003	-0.003
Tipulidae	0.004	-0.004	-0.004	-0.004
Simuliidae	0.096	0.237	-0.096	0.071
Psychodidae	0.009	-0.009	-0.009	-0.009
Chaoboridae pupae	0.061	-0.061	-0.061	-0.061
LEPIDOPTERA (Moths)				
Pyralidae	0	0	0.117	0.059
HYDRACARINA (Water mites)	0.027	-0.027	-0.027	-0.027
OLIGOCHAETA (Worms)				
Lumbriculidae	0.009	-0.009	-0.009	-0.009
PLATHELMINTHES (Flatworms)				
Planariidae	0.008	-0.008	-0.008	-0.008
NEMATODA (Nematodes)	0.009	-0.009	-0.009	-0.009
GASTROPODA (Snails)				
Planorbidae	0.003	-0.003	-0.003	-0.003
BIVALVIA (Clams)				
Sphaeriidae	0.181	-0.181	-0.181	-0.181
TERRESTRIAL ORGANISMS				
HOMOPTERA (Aphids)				
Aphidiae	0.007	-0.007	-0.007	-0.007
HYMENOPTERA (Wasps and ants)				
Formicidae	0.011	0.322	0.822	0.572
COLLEMBOLA (Springtails)	0.008	-0.008	-0.008	-0.008
UNIDENTIFIED	0.008	-0.008	-0.008	-0.008

Table 3.184 lists the electivities for benthic invertebrates and Table 3.185 lists electivities for drifting invertebrates for rainbow trout in Ruby Creek. For age 1+ rainbow trout in both benthos and drift Formicidae had the highest electivity (1 .00).

Mountain whitefish electivities for benthic invertebrates are listed in Table 3.186 and electivities for drifting invertebrates are listed in Table 3.187. For age 1+ mountain whitefish in Ruby Creek Baetidae had the highest electivity in the benthos and drift (0.612 and 0.641, respectively).

3.7.3.3 CEE CEE AH CREEK

The measure of prey selection (electivity) for benthic and drifting invertebrates was determined for each age class of brown trout, brook trout and cutthroat trout in Cee Cee Ah Creek.

Brown trout electivities for benthic invertebrates are listed in Table 3.188 and electivities for drifting invertebrate are listed in Table 3.189. For age 0+ brown trout, Baetidae had the highest electivity value in both the benthos (0.451) and drift (0.523). For age 1+ brown trout, Chironomidae pupae had the highest electivity value in both benthos and drift (0.595 and 0.557, respectively). Formicidae had the highest electivity value in both benthos (0.154) and drift (0.152) for age 2+ brown trout. Age 3+ brown trout had the highest electivity for Glossosomatidae in the benthos (0.386) and in the drift (0.389). Formicidae had the highest electivity value in both the benthos (0.365) and drift (0.363) for 4+ brown trout. For all age classes of brown trout in Cee Cee Ah Creek, Chironomidae pupae had the highest electivity value in the benthos (0.118) and Glossosomatidae had the highest electivity value in the drift (0.113).

Brook trout electivities for benthic invertebrates are listed in Table 3.190 and electivities for drifting invertebrates can be found in Table 3.191. For age 0+ brook trout, Brachycentridae had the highest electivity value in both benthos (0.496) and drift (0.499). Hydracarina was most selected for by age 1+ brook trout from both the benthos (0.136) and drift (0.131). Planorbidae was the most selected for by age 2+ brook trout from the benthos (0.109) and drift (0.108). For age 3+ brook trout, Chironomidae adult was most selected for in the benthos (0.390) and drift (0.389). For all age classes of brook trout combined, Brachycentridae was most selected for in the benthos (0.131) and drift (0.134).

Table 3.184. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age class of rainbow trout in Ruby Creek, WA. for 1990.

PREY ORGANISMS	% in Environment	1+ n=1
AQUATIC ORGANISMS		
TRICHOPTERA (Caddisflies)		0
Brachycentridae	0.005	-0.005
Glossosomatidae	0.002	-0.002
Hydropsychidae	0.044	-0.044
Limnephilidae	0.002	-0.002
Rhyacophilidae	0.007	-0.007
EPEMEROPTERA (Mayflies)		
Baetidae	0.069	-0.069
Ephemerellidae	0.028	-0.028
Heptageniidae	0.033	-0.033
Leptophlebiidae	0.018	-0.018
PLECOPTERA (Stoneflies)		
Capniidae	0.001	-0.001
Chloroperlidae	0.022	-0.022
Nemouridae	0.012	-0.012
Perlodidae	0.016	-0.016
COLEOPTERA (Beetles)		
Elmidae larvae	0.116	-0.116
Elmidae adults	0.012	-0.012
Hapliplidae	0.002	-0.002
DIPTERA (Midges and flies)		
Chironomidae larvae	0.138	-0.138
Ceratopogonidae	0.002	-0.002
Tipulidae	0.017	-0.017
Simuliidae	0.066	-0.066
Psychodidae	0.018	-0.018
HYDRACARINA (Water mites)	0.009	-0.009
OLIGOCHEATA (Worms)		
Lumbriculidae	0.011	-0.011
Naididae	0.011	-0.011
NEMATODA (Nematodes)	0.004	-0.004
PLATHELMINTHES (Flatworms)		
Planariidae	0.004	-0.004
GASTROPODA (Snails)		
Planorbidae	0.006	-0.006
BIVALVIA (Clams)		
Sphaeriidae	0.328	-0.328
TERRESTRIAL ORGANISMS		
HYMENOPTERA (Wasps and ants)		
Formicidae	0	1
UNIDENTIFIED	0.001	-0.001

Table 3.185. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age class of rainbow trout in Ruby Creek, WA. for 1990.

PREY ORGANISMS	% in Environment	1+ RBT
AQUATIC ORGANISMS		
TRICHOPTERA (Caddisflies)		
Glossosomatidae	0.002	-0.002
Lepidostomatidae	0.001	-0.001
Rhyacophilidae	0.008	-0.008
EPEMEROPTERA (Mayflies)		
Baetidae	0.04	-0.04
Ephemerellidae	0.001	-0.001
Heptageniidae	0.004	-0.004
Leptophlebiidae	0.003	-0.003
PLECOPTERA (Stoneflies)		
Nemouridae	0.013	-0.013
Perlodidae	0.012	-0.012
COLEOPTERA (Beetles)		
Elmidae larvae	0.067	-0.067
Elmidae adult	0.002	-0.002
DIPTERA (Midges and flies)		
Chironomidae larvae	0.299	-0.299
Chironomidae pupae	0.103	-0.103
Ceratopogonidae	0.003	-0.003
Tipulidae	0.004	-0.004
Simuliidae	0.096	-0.096
Psychodidae	0.009	-0.009
Chaoboridae pupae	0.061	-0.061
HYDRACARINA (Water mites)	0.027	-0.027
OLIGOCHAETA (Worms)		
Lumbriculidae	0.009	-0.009
NEMATODA	0.009	-0.009
PLATHELMINTHES (Flatworms)		
Planariidae	0.008	-0.008
GASTROPODA (Snails)		
Planorbidae	0.003	-0.003
BIVALVIA (Clams)		
Sphaeriidae	0.181	-0.181
TERRESTRIAL ORGANISMS		
HOMOPTERA (Aphids)		
Aphidiae	0.007	-0.007
HYMENOPTERA (Wasps and ants)		
Formicidae	0.011	0.989
COLLEMBOLA (Springtails)	0.008	-0.008
UNIDENTIFIED	0.008	-0.008

Table 3.186. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age class of mountain whitefish in Ruby Creek, WA. for 1990.

PREY ORGANISMS	% in Environment	1+ n=3
AQUATIC ORGANISMS		
TRICHOPTERA (Caddisflies)		
Brachycentridae	0.005	-0.005
Glossosomatidae	0.002	-0.002
Hydropsychidae	0.044	-0.036
Limnephilidae	0.002	-0.002
Rhyacophilidae	0.007	-0.007
EPEMEROPTERA (Mayflies)		
Baetidae	0.069	0.612
Ephemerellidae	0.028	-0.028
Heptageniidae	0.033	-0.03
Leptophlebiidae	0.018	-0.018
PLECOPTERA (Stoneflies)		
Capniidae	0.001	-0.001
Chloroperlidae	0.022	-0.022
Nemouridae	0.012	-0.012
Perlodidae	0.016	-0.016
COLEOPTERA (Beetles)		
Elmidae larvae	0.116	-0.113
Elmidae adults	0.012	-0.012
Hapliplidae	0.002	-0.002
DIPTERA (Midges and flies)		
Chironomidae larvae	0.138	-0.119
Chironomidae pupae	0	0.005
Ceratopogonidae	0.002	-0.002
Tipulidae	0.017	-0.017
Simuliidae larvae	0.066	0.154
Simuliidae pupae	0	0.003
Psychodidae	0.018	-0.018
HYDRACARINA (Water mites)	0.009	-0.009
OLIGOCHAETA (Worms)		
Lumbriculidae	0.011	-0.011
Naididae	0.011	-0.011
NEMATODA	0.004	-0.004
PLATHELMINTHES (Flatworms)		
Planariidae	0.004	-0.004
GASTROPODA (Snails)		
Planorbidae	0.006	-0.006
BIVALVIA (Clams)		
Sphaeriidae	0.328	-0.328
TERRESTRIAL ORGANISMS		
HYMENOPTERA (Wasps and ants)		
Formicidae		0.003
UNIDENTIFIED	0.001	-0.001

Table 3.187. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age class of mountain whitefish in Ruby Creek, WA. for 1990.

PREY ORGANISMS	% in Environment	1+ n=3
AQUATIC ORGANISMS		
TRICHOPTERA (Caddisflies)		
Glossosomatidae	0.002	-0.002
Hydropsychidae	0	0.008
Lepidostomatidae	0.001	-0.001
Rhyacophilidae	0.008	-0.008
EPEMEROPTERA (Mayflies)		
Baetidae	0.04	0.641
Ephemerellidae	0.001	-0.001
Heptageniidae	0.004	-0.001
Leptophlebiidae	0.003	-0.003
PLECOPTERA (Stoneflies)		
Nemouridae	0.013	-0.013
Perlodidae	0.012	-0.012
COLEOPTERA (Beetles)		
Elmidae larvae	0.067	-0.064
Elmidae adults	0.002	-0.002
DIPTERA (Midges and flies)		
Chironomidae larvae	0.299	-0.28
Chironomidae pupae	0.103	-0.098
Ceratopogonidae	0.003	-0.003
Tipulidae	0.004	-0.004
Simuliidae larvae	0.096	0.124
Simuliidae pupae	0	0.003
Psychodidae	0.009	-0.009
Chaoboridae pupae	0.061	-0.061
HYDRACARINA (Water mites)	0.027	-0.027
OLIGOCHAETA (Worms)		
Lumbriculidae	0.009	-0.009
NEMATODA	0.009	-0.009
PLATHELMINTHES (Flatworms)		
Planariidae	0.008	-0.008
GASTROPODA (Snails)		
Planorbidae	0.003	-0.003
BIVALVIA (Clams)		
Sphaeriidae	0.181	-0.181
HOMOPTERA (Aphids)		
Aphidiae	0.007	-0.007
HYMENOPTERA (Wasps and ants)		
Formicidae	0.011	-0.008
COLLEMBOLA (Springtails)	0.008	-0.008
UNIDENTIFIED	0.008	-0.008

Table 3.188. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age class of brown trout in Cee Cee Ah Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=7	2+ n=7	3+ n=6	4+ n=2	All ages n=25
TRICHOPTERA (Caddisflies)							
Brachycentridae	0.004	-0.004	-0.004	-0.004	0.126	-0.004	0.022
Glossosomatidae	0.004	0.059	-0.004	0.111	0.386	-0.004	0.1096
Hydropsychidae	0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
Hydroptilidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Leptoceridae	0	0	0	0	0.043	0	0.0086
Limnephilidae	0.002	-0.002	0.006	-0.002	-0.002	-0.002	-0.0004
Polycentropididae	0	0	0	0	0	0.111	0.0222
Psychomidae	0	0.125	0	0	0	0	0.025
Rhyacophilidae	0.008	-0.008	-0.008	-0.008	0.014	-0.008	-0.0036
EPEMEROPTERA (Mayflies)							
Baetidae	0.112	0.451	-0.057	-0.112	0.018	-0.112	0.0376
Ephemerellidae	0.029	-0.029	-0.029	-0.029	-0.029	-0.029	-0.029
Heptageniidae	0.094	-0.031	-0.094	-0.094	-0.094	-0.094	-0.0814
Leptophlebiidae	0.008	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008
PLECOPTERA (Stoneflies)							
Chloroperlidae	0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
Nemouridae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
Peltoperlidae	0.012	-0.012	-0.012	-0.012	-0.012	-0.012	-0.012
Perlidae	0.001	-0.001	-0.001	0.037	-0.001	-0.001	0.0066
Perlodidae	0.01	-0.01	-0.01	0.028	-0.01	-0.01	-0.0024
COLEOPTERA (Beetles)							
Elmidae larvae	0.107	-0.107	-0.091	-0.069	-0.107	-0.107	-0.0962
Elmidae adults	0.001	-0.001	-0.001	0.037	-0.001	-0.001	0.0066
Hydrophilidae	0.001	-0.001	0.007	-0.001	-0.001	-0.001	0.0006
Hydrophilidae adult	0	0	0.016	0.077	0	0	0.0186
Pteranarcydae	0	0	0	0.038	0	0	0.0076
Haplididae	0	0	0	0.038	0	0	0.0076
DIPTERA (Midges and flies)							
Chironomidae larvae	0.229	-0.229	-0.221	-0.191	-0.229	-0.229	-0.2198
Chironomidae pupae	0.007	-0.007	0.595	-0.007	0.015	-0.007	0.1178
Ceratopogonidae	0.004	-0.004	0.004	0.034	-0.004	-0.004	0.0052
Ptychopteridae	0	0	0.008	0	0	0	0.0016
Tipulidae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Simuliidae larvae	0.008	-0.008	0.008	-0.008	-0.008	-0.008	-0.0048
Simuliidae pupae	0	0	0	0	0.022	0	0.0044
Empididae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Psychodidae	0	0	0	0.038	0	0	0.0076
Chaoboridae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
LEPIDOPTERA (Moths)							
Pyralidae	0	0	0	0.038	0.109	0.01	0.0314

Table 3.188. (cont.)

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=7	2+ n=7	3+ n=6	4+ n=2	All ages n=25
HYDRACARINA (Mites)	0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
OLIGOCHAETA (Worms)							
Lumbriculidae	0.058	-0.058	-0.058	0.057	-0.058	-0.01	-0.0254
Naididae	0.018	-0.018	-0.018	-0.018	-0.018	-0.018	-0.018
NEMATODA	0.001	-0.001	-0.001	-0.001	0.064	-0.001	0.012
PLATHELMINTHES (Flatworms)							
Planariidae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
GASTROPODA (Snails)							
Planorbidae	0.002	-0.002	0.006	-0.002	-0.002	-0.002	-0.0004
Lymnaeidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
BIVALVIA (Clams)							
Sphaeriidae	0.211	-0.211	-0.211	-0.211	-0.211	-0.211	-0.211
TERRESTRIAL ORGANISMS							
DIPTERA (Midges and flies)							
Chironomidae	0	0.063	0	0	0	0	0.0126
Simuliidae	0	0	0	0.077	0	0	0.0154
Scatopsidae	0	0.063	0	0	0	0	0.0126
Mycetophilidae	0	0	0	0	0.043	0	0.0086
COLEOPTERA (Beetles)							
Buprestidae	0	0	0	0.038	0	0	0.0076
HEMIPTERA (True bugs)							
Lygaeidae		0	0	0	0	0.111	0.0222
HOMOPTERA (Aphids)							
Cicadellidae		0	0	0	0	0.159	0.0318
HYMENOPTERA (Wasps and ants)							
Formicidae	0	0	0	0.154	0	0.365	0.1038
UNIDENTIFIED	0.003	-0.003	0.247	-0.003	-0.003	-0.003	0.047

Table 3.189. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age class of brown trout in Cee Cee Ah Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=7	2+ n=7	3+ n=6	4+ n=2	All ages n=25
AQUATIC ORGANISMS							
TRICHOPTERA (Caddisflies)							
Brachycentridae	0.001	-0.001	-0.001	-0.001	0.129	-0.001	0.025
Glossosomatidae	0.001	0.062	-0.001	0.114	0.389	-0.001	0.113
Hydropsychidae	0.014	-0.014	-0.014	-0.014	-0.014	-0.014	-0.014
Hydroptilidae	0	0	0	0	0	0	0
Leptoceridae	0	0	0	0	0.043	0	0.009
Limnephilidae	0	0	0.008	0	0	0	0.002
Polycentropididae	0	0	0	0	0	0.111	0.022
Psychomidae	0	0.125	0	0	0	0	0.025
Rhyacophilidae	0.002	-0.002	-0.002	-0.002	0.02	-0.002	0.002
EPEMEROPTERA (Mayflies)							
Baetidae	0.040	0.523	0.015	-0.04	0.09	-0.04	0.11
Ephemerellidae	0.013	-0.013	-0.013	-0.013	-0.013	-0.013	-0.013
Heptageniidae	0.008	0.055	-0.008	-0.008	-0.008	-0.008	0.005
Leptophlebiidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
PLECOPTERA (Stoneflies)							
Chloroperlidae	0.004	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004
Nemouridae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Perlidae	0	0	0	0.038	0	0	0.008
Perlodidae	0.003	-0.003	-0.003	0.035	-0.003	-0.003	0.005
COLEOPTERA (Beetles)							
Elmidae larvae	0.015	-0.015	0.001	0.023	-0.015	-0.015	-0.004
Elmidae adult	0.002	-0.002	-0.002	0.036	-0.002	-0.002	0.006
Hydrophilidae larvae	0	0	0.008	0	0	0	0.002
Hydrophilidae adult	0	0	0.016	0.077	0	0	0.019
Pteranarcyidae	0	0	0	0.038	0	0	0.008
Haplididae	0	0	0	0.038	0	0	0.008
Stapylinidae	0	0	0	0	0	0	0
DIPTERA (Midges and flies)							
Chironomidae larvae	0.742	-0.742	-0.734	-0.704	-0.742	-0.742	-0.733
Chironomidae pupae	0.045	-0.045	0.557	-0.045	-0.023	-0.045	0.08
Ceratopogonidae	0.007	-0.007	0.001	0.031	-0.007	-0.007	0.002
Ptychopteridae	0	0	0.008	0	0	0	0.002
Simuliidae larvae	0.02	-0.02	-0.004	-0.02	-0.02	-0.02	-0.017
Simuliidae pupae	0.001	-0.001	-0.001	-0.001	0.021	-0.001	0.003
Psychodidae	0.001	-0.001	-0.001	0.037	-0.001	-0.001	0.007
Chaoboridae pupae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
HYDRACARINA (mites)	0.007	-0.007	-0.007	-0.007	-0.007	-0.007	-0.007
LEPIDOPTERA (Moths)							
Pyralidae	0.002	-0.002	-0.002	0.036	0.107	0.008	0.00.008

Table 3.189. (cont.)

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=7	2+ n=7	3+ n=6	4+ n=2	All ages n=25
OLIGOCHAETA (Worms)							
Lumbriculidae	0	0	0	0.115	0	0.048	0.033
NEMATODA	0	0	0	0	0.065	0	0.013
GASTROPODA (Snails)							
Planorbidae	0.003	-0.003	0.005	-0.003	-0.003	-0.003	-0.001
BIVALVIA (Clams)							
Sphaeriidae	0.045	-0.045	-0.045	-0.045	-0.045	-0.045	-0.045
TERRESTRIAL ORGANISMS							
DIPTERA (Midges and flies)							
Chironomidae	0.001	0.062	-0.001	-0.001	-0.001	-0.001	0.012
Simuliidae	0.001	-0.001	-0.001	0.076	-0.001	-0.001	0.014
Scatopsidae	0	0.063	0	0	0	0	0.013
Mycetophilidae	0	0	0	0	0.043	0	0.009
COLEOPTERA (Beetles)							
Buprestidae	0	0	0	0.038	0	0	0.008
HEMIPTERA (True bugs)							
Reduviidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Lygaeidae	0	0	0	0	0	0.111	0.022
HOMOPTERA (Aphids)							
Aphidiae	0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Cicadellidae	0	0	0	0	0	0.159	0.032
HYMENOPTERA (Wasps and ants)							
Formicidae	0.002	-0.002	-0.002	0.152	-0.002	0.363	0.102
ARANEIDA (Spiders)	0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
UNIDENTIFIED	0.009	-0.009	0.241	-0.009	-0.009	-0.009	0.041

Table 3.190. **The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age class of brook trout in Cee Cee Ah Creek, WA. for 1990.**

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=13	2+ n=9	3+ n=1	All ages n=26
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	0.004	0.496	0.037	-0.004	-0.004	0.13125
Glossosomatidae	0.004	-0.004	-0.004	0.038	-0.004	0.0065
Hydropsychidae	0.009	-0.009	-0.009	-0.009	-0.009	-0.009
Hydroptilidae	0.001	-0.001	-0.001	0.027	-0.001	0.006
Lepidostomatidae	0	0	0.011	0	0	0.00275
Limnephilidae	0.002	0.054	0.044	0.026	-0.002	0.0305
Rhyacophilidae	0.008	-0.008	-0.008	0.006	-0.008	-0.0045
EPEMEROPTERA (Mayflies)						
Baetidae	0.112	-0.112	-0.081	-0.029	-0.112	-0.0835
Ephemerellidae	0.029	-0.029	-0.029	0.013	-0.029	-0.0185
Heptageniidae	0.094	-0.094	0.029	-0.084	-0.094	-0.06075
Leptophlebiidae	0.008	-0.008	0.023	-0.008	-0.008	-0.00025
PLECOPTERA (Stoneflies)						
Chloroperlidae	0.04	-0.04	-0.029	-0.03	-0.04	-0.03475
Perlidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Nemouridae	0.003	0.107	0.008	0.011	-0.003	0.03075
Perlodidae	0.01	-0.01	0.01	-0.01	-0.01	-0.005
Peltoperlidae	0.012	-0.012	-0.012	-0.012	-0.012	-0.012
COLEOPTERA (Beetles)						
Elmidae larvae	0.107	-0.107	-0.107	-0.097	-0.107	-0.1045
Elmidae adults	0.001	0.109	-0.001	-0.001	-0.001	0.0265
Hydrophilidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Stapyliinidae	0	0	0	0.01	0	0.0025
Amphizoidae	0	0	0	0	0.117	0.02925
DIPTERA (Midges and flies)						
Chironomidae larvae	0.229	-0.229	-0.061	0.035	-0.112	-0.09175
Chironomidae pupae	0.007	0.049	0.004	0.049	0.11	0.053
Ceratopogonidae	0.004	0.052	0.011	-0.004	0.113	0.043
Tipulidae	0.002	0.054	0.013	-0.002	-0.002	0.01575
Simuliidae	0.008	-0.008	-0.008	-0.008	-0.008	-0.008
Empididae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Chaoboridae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003
LEPIDOPTERA (Moths)						
Pyralidae	0	0	0.011	0	0.027	0.0095
HYDRACARINA (mites)	0.002	0.054	0.136	0.054	-0.002	0.0605
OLIGOCHAETA (Worms)						
Lumbriculidae	0.058	-0.058	-0.058	-0.058	-0.058	-0.058
Naididae	0.018	-0.018	-0.018	-0.018	-0.018	-0.018
NEMATODA	0.001	-0.001	0.01	0.009	-0.001	0.00425

Table 3.190. (cont.)

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=13	2+ n=9	3+ n=1	All ages n=26
PLATHELMINTHES (Flatworms)						
Planariidae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003
GASTROPODA (Snails)						
Planorbidae	0.002	-0.002	0.009	0.109	-0.002	0.0285
Lymnaeidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001
BIVALVIA (Clams)						
Sphaeriidae	0.211	-0.211	-0.161	-0.086	-0.094	-0.138
TERRESTRIAL ORGANISMS						
EPHEMEROPTERA (Mayflies)						
Ephemerellidae	0	0	0	0.01	0	0.0025
DIPTERA (Midges and flies)						
Chironomidae	0	0	0	0	0.39	0.0975
HEMIPTERA (True bugs)						
Lygaeidae	0	0	0.011	0	0	0.00275
HOMOPTERA (Aphids)						
Aphidiae	0	0	0.011	0	0	0.00275
HYMENOPTERA (Wasps and ants)						
Formicidae	0	0	0	0.01	0	0.0025
UNIDENTIFIED	0.003	-0.003	-0.003	-0.003	-0.003	-0.003

Table 3.191. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age class of brook trout in Cee Cee Ah Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=13	2+ n=9	3+ n=1	All ages n=26
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	0.001	0.499	0.04	-0.001	-0.001	0.134
Glossosomatidae	0.001	-0.001	-0.001	0.041	-0.001	0.009
Hydropsychidae	0.014	-0.014	-0.014	-0.014	-0.014	-0.014
Hydroptilidae	0	0	0	0.028	0	0.007
Lepidostomatidae	0	0	0.011	0	0	0.003
Limnephilidae	0	0.056	0.046	0.028	0	0.033
Rhyacophilidae	0.002	-0.002	-0.002	0.012	-0.002	0.002
EPEMEROPTERA (Mayflies)						
Baetidae	0.04	-0.04	-0.009	0.043	-0.04	-0.012
Ephemerellidae	0.013	-0.013	-0.013	0.029	-0.013	-0.003
Heptageniidae	0.008	-0.008	0.115	0.002	-0.008	0.025
Leptophlebiidae	0.001	-0.001	0.03	-0.001	-0.001	0.007
PLECOPTERA (Stoneflies)						
Chloroperlidae	0.004	-0.004	0.007	0.006	-0.004	0.002
Nemouridae	0.002	0.108	0.009	0.012	-0.002	0.032
Perlodidae	0.003	-0.003	0.017	-0.003	-0.003	0.002
COLEOPTERA (Beetles)						
Elmidae larvae	0.015	-0.015	-0.015	-0.005	-0.015	-0.013
Elmidae adults	0.002	0.108	-0.002	-0.002	-0.002	0.026
Staphylinidae	0	0	0	0.01	0	0.003
Amphizoidae	0	0	0	0	0.117	0.029
DIPTERA (Midges and flies)						
Chironomidae larvae	0.742	-0.742	-0.574	-0.478	-0.625	-0.605
Chironomidae pupae	0.045	0.011	-0.034	0.011	0.072	0.015
Ceratopogonidae	0.007	0.049	0.008	-0.007	0.11	0.040
Tipulidae	0	0.056	0.015	0	0	0.018
Simuliidae larvae	0.02	-0.02	-0.02	-0.02	-0.02	-0.020
Simuliidae pupae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Psychodidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.002
Chaoboridae pupae	0.002	-0.002	-0.002	-0.002	-0.002	0
LEPIDOPTERA (Moths)						
Pyralidae	0.002	-0.002	0.009	-0.002	0.025	0.008
HYDRACARINA (Water mites)	0.007	0.049	0.131	0.049	-0.007	0.056
NEMATODA (Nematodes)	0	0	0.011	0.01	0	0.005
GASTROPODA (Snails)						
Planorbidae	0.003	-0.003	0.008	0.108	-0.003	0.028
BIVALVIA (Clams)						
Sphaeriidae	0.045	-0.045	0.005	0.08	0.072	0.028

Table 3.191. (cont.)

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=13	2+ n=9	3+ n=1	All ages n=26
TERRESTRIAL ORGANISMS						
EPHEMEROPTERA (Mayflies)						
Ephemerellidae	0	0	0	0.01	0	0.003
DIPTERA (Midges and flies)						
Chironomidae	0.001	-0.001	-0.001	-0.001	0.389	0.097
Simuliidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001
HEMIPTERA (True bugs)						
Reduviidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Lygaeidae	0	0	0.011	0	0	0.003
HOMOPTERA (Aphids)						
Aphidiae	0.005	-0.005	0.006	-0.005	-0.005	-0.002
HYMENOPTERA (Wasps and ants)						
Formicidae	0.002	-0.002	-0.002	0.008	-0.002	0.001
ARANEIDA (Spiders)	0.002	-0.002	-0.002	-0.002	-0.002	-0.002
UNIDENTIFIED	0.009	-0.009	-0.009	-0.009	-0.009	-0.009

Cutthroat trout electivities for benthic invertebrates are listed in Table 3.192 and electivities for drifting invertebrates are listed in Table 3.193 for Cee Cee Ah Creek. In the l+ age class of cutthroat trout in Cee Cee Ah Creek there were no significant electivities for any family of invertebrate. For 2+ and combined age classes of cutthroat trout Formicidae was selected for most often in both benthos and drift (1 .0, 0.998, 0.527, and 0.525, respectively).

3.7.3.4 TACOMA CREEK

The measure of prey selection (electivity) for benthic and drifting invertebrates was determined for each age class of brown trout, brook trout and cutthroat trout in Tacoma Creek.

Brown trout electivities for benthic invertebrates are listed in Table 3.194 and electivities ,for drifting invertebrates are listed in Table 3.195. For age 4+ brown trout Polycentropodidae and Formicidae were selected for equally from both benthos and drift samples at 0.269.

Electivities for benthic invertebrates by brook trout in Tacoma Creek can be found in Table 3.196 and the electivities for drifting invertebrates are listed in Table 3.197. For age 0+ brook trout, Elmidae adults had the highest electivity value in both benthos (0.527) and drift (0.538). Chironomidae larvae had the highest electivity values in the benthos for age l+, 2+ and all age classes of brook trout combined (0.494, 0.284 and 0.231, respectively). Chironomidae larvae also had the highest electivity values in the drift for age l+, 2+ and all age classes of brook trout combined (0.579, 0.369 and 0.316, respectively).

Cutthroat trout electivities for benthic invertebrates are listed in Table 3.198 and electivities for drifting invertebrates are listed in Table 3.199. For age 0+ cutthroat trout in Tacoma Creek, Nematoda was most selected for in the benthos (0.300) and the drift (0.300). Baetidae had the highest electivity value in the benthos and drift for l+ cutthroat trout (0.331 and 0.247, respectively). Formicidae had equal electivities in the benthos (0.236) and drift (0.236) for 2+ cutthroat trout and for all ages of cutthroat trout combined.

Table 3.192. The measure of prey selection (electivity) for macroinverterbrates (from hess samples) by age class of cutthroat trout in Cee Cee Ah Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	1+ n=7	2+ n=1	All ages n=8
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	0.004	-0.004	-0.004	-0.004
Glossosomatidae	0.004	0.049	-0.004	0.023
Hydropsychidae	0.009	-0.009	-0.009	-0.009
Hydroptilidae	0.001	-0.001	-0.001	-0.001
Limnephilidae	0.002	-0.002	-0.002	-0.002
Psychomidae	0	0.053	0	0.027
Rhyacophilidae	0.008	-0.008	-0.008	-0.008
EPEMEROPTERA (Mayflies)				
Baetidae	0.112	-0.112	-0.112	-0.112
Ephemerellidae	0.029	-0.029	-0.029	-0.029
Heptageniidae	0.094	-0.094	-0.094	-0.094
Leptophlebiidae	0.008	-0.008	-0.008	-0.008
PLECOPTERA (Stoneflies)				
Chloroperlidae	0.040	0.013	-0.040	-0.0135
Nemouridae	0.003	0.05	-0.003	0.024
Peltoperlidae	0.012	-0.012	-0.012	-0.012
Perlidae	0.001	-0.001	-0.001	-0.001
Perlodidae	0.010	0.043	-0.010	0.0165
COLEOPTERA (Beetles)				
Elmidae larvae	0.107	-0.107	-0.107	-0.107
Elmidae adults	0.001	0.052	-0.001	0.026
Hydrophilidae	0.001	0.052	-0.001	0.026
Georyssidae	0	0.053	0	0.027
DIPTERA (Midges and flies)				
Chironomidae larvae	0.229	-0.176	-0.229	-0.203
Chironomidae pupae	0.007	0.046	-0.007	0.020
Ceratopogonidae	0.004	-0.004	-0.004	-0.004
Tipulidae	0.002	-0.002	-0.002	-0.002
Simuliidae	0.008	-0.008	-0.008	-0.008
Empididae	0.001	-0.001	-0.001	-0.001
Chaoboridae	0.003	-0.003	-0.003	-0.003
LEPIDOPTERA (Moths)				
Pyralidae	0	0.053	0	0.027
HYDRACARINA (Water mites)	0.002	-0.002	-0.002	-0.002
OLIGOCHAETA (Worms)				
Lumbriculidae	0.058	-0.058	-0.058	-0.058
Naididae	0.018	-0.018	-0.018	-0.018
NEMATODA	0.001	-0.001	-0.001	-0.001

Table 3.192. (cont.)

PREY ORGANISMS	% in Environ.	1+ n=7	2+ n=1	All ages n=8
PLATHELMINTHES (Flatworms)				
Planariidae	0.003	-0.003	-0.003	-0.003
GASTROPODA (Snails)				
Planorbidae	0.002	-0.002	-0.002	-0.002
Lymnaeidae	0.001	-0.001	-0.001	-0.001
BIVALVIA (Clams)				
Sphaeriidae	0.211	-0.211	-0.211	-0.211
TERRESTRIAL ORGANISMS				
DIPTERA (Midges and flies)				
Simuliidae	0	0.053	0	0.027
Spaeroceridae	0	0.053	0	0.027
PSCOPTERA (Psocids)				
Pscodidae	0	0.053	0	0.027
HYMENOPTERA (Wasps and ants)				
Formicidae	0	0.053	1	0.527
COLLEMBOLA (Springtails)	0	0.053	0	0.027
UNIDENTIFIED	0.003	-0.003	-0.003	-0.003

Table 3.193. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age classes of cutthroat trout in Cee Cee Ah Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	1+ n=7	2+ n=1	All ages n=8
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	0.001	-0.001	-0.001	-0.001
Glossosomatidae	0.001	0.052	-0.001	0.026
Hydropsychidae	0.014	-0.014	-0.014	-0.014
Psychomyiidae	0	0.053	0	0.027
Rhyacophilidae	0.002	-0.002	-0.002	-0.002
EPEMEROPTERA (Mayflies)				
Baetidae	0.04	-0.04	-0.04	-0.04
Ephemerellidae	0.013	-0.013	-0.013	-0.013
Heptageniidae	0.008	-0.008	-0.008	-0.008
Leptophlebiidae	0.001	-0.001	-0.001	-0.001
PLECOPTERA (Stoneflies)				
Chloroperlidae	0.004	0.049	-0.004	0.023
Nemouridae	0.002	0.051	-0.002	0.025
Perlodidae	0.003	0.05	-0.003	0.024
COLEOPTERA (Beetles)				
Elmidae larvae	0.015	-0.015	-0.015	-0.015
Elmidae adults	0.002	0.051	-0.002	0.025
Hydrophilidae	0	0.053	0	0.027
Georyssidae	0	0.053	0	0.027
DIPTERA (Midges and flies)				
Chironomidae larvae	0.742	-0.689	-0.742	-0.716
Chironomidae pupae	0.045	0.008	-0.045	-0.019
Ceratopogonidae	0.007	-0.007	-0.007	-0.007
Simuliidae larvae	0.02	-0.02	-0.02	-0.02
Simuliidae pupae	0.001	-0.001	-0.001	-0.001
Psychodidae	0.001	-0.001	-0.001	-0.001
Chaoboridae pupae	0.002	-0.002	-0.002	-0.002
LEPIDOPTERA (Moths)				
Pyralidae	0.002	0.051	-0.002	0.025
HYDRACARINA (Water mites)	0.007	-0.007	-0.007	-0.007
GASTROPODA (Snails)				
Planorbidae	0.003	-0.003	-0.003	-0.003
BIVALVIA (Clams)				
Sphaeriidae	0.045	-0.045	-0.045	-0.045
TERRESTRIAL ORGANISMS				
DIPTERA (Midges and flies)				
Chironomidae	0.001	-0.001	-0.001	-0.001
Simuliidae	0.001	0.052	-0.001	0.026
Spaeroceridae	0	0.053	0	0.027
PSCOPTERA (Psocids)				
Pscodidae	0	0.053	0	0.027
HEMIPTERA (True bugs)				
Reduviidae	0.001	-0.001	-0.001	-0.001
HOMOPTERA (Aphids)				
Aphidiae	0.005	-0.005	-0.005	-0.005
HYMENOPTERA (Wasps and ants)				
Formicidae	0.002	0.051	0.998	0.525
ARANEIDA (Spiders)	0.002	-0.002	-0.002	-0.002
COLLEMBOLA (Springtails)	0	0.053	0	0.027
UNIDENTIFIED	0.009	-0.009	-0.009	-0.009

Table 3.194. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age classes of brown trout in Tacoma Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	4+ n=1
AQUATIC ORGANISMS		
TRICHOPTERA (Caddisflies)		
Brachycentridae	0.108	0.007
Glossosomatidae	0.040	-0.040
Hydropsychidae	0.023	-0.023
Polycentropidae	0	0.269
Psychomyiidae	0.013	-0.013
Rhyacophilidae	0.021	-0.021
EPEMEROPTERA (Mayflies)		
Baetidae	0.227	-0.227
Ephemerellidae	0.087	-0.087
Heptageniidae	0.064	-0.064
PLECOPTERA (Stoneflies)		
Chloroperlidae	0.023	-0.023
Nemouridae	0.004	-0.004
Perlodidae	0.002	-0.002
COLEOPTERA (Beetles)		
Elmidae larvae	0.258	-0.258
Elmidae adult	0.011	-0.011
EPIDOPTERA (Moths)		
Pyralidae	0	0.115
DIPTERA (Midges and flies)		
Chironomidae larvae	0.085	-0.085
Chironomidae pupae	0.004	-0.004
Tipulidae	0.006	-0.006
Simuliidae	0.008	-0.008
Psychodidae	0.004	-0.004
HYDRACARINA (Water mites)	0.004	-0.004
OLIGOCHAETA (Worms)		
Lumbriculidae	0.004	-0.004
NEMATODA	0	0.115
TERRESTRIAL ORGANISMS		
HEMIPTERA (True bugs)		
Reduviidae	0.002	-0.002
HOMOPTERA (Aphids)		
Aphidiae	0.002	-0.002
HYMENOPTERA (Wasps and ants)		
Formicidae	0	0.269
ARANEIDA (Spiders)	0.002	0.113

Table 3.195. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age classes of brown trout in Tacoma Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	4+ n=1
AQUATIC ORGANISMS		
TRICHOPTERA (Caddisflies)		
Brachycentridae		0.115
Polycentropidae		0.269
Rhyacophilidae	0.010	-0.010
EPEMEROPTERA (Mayflies)		
Baetidae	0.311	-0.311
Heptageniidae	0.027	-0.027
COLEOPTERA (Beetles)		
Elmidae larvae	0.154	-0.154
Hydrophilidae	0.019	-0.019
Georyssidae	0.027	-0.027
DIPTERA (Midges and flies)		
Chironomidae pupae	0.072	-0.072
Ceratopogonidae	0.01	-0.01
Simuliidae	0.039	-0.039
Psychodidae	0.046	-0.046
LEPIDOPTERA (Moths)		
Pyralidae	0	0.115
HYDRACARINA (Water mites)	0.01	-0.01
OLIGOCHAETA (Worms)		
Lumbriculidae	0.147	-0.147
NEMATODA		0.115
BIVALVIA (Clams)		
Sphaeriidae	0.019	-0.019
TERRESTRIAL ORGANISMS		
DIPTERA (Midges and flies)		
Simuliidae	0.027	-0.027
Dixidae	0.019	-0.019
HOMOPTERA (Aphids)		
Cicadellidae	0.027	-0.027
HYMENOPTERA (Wasps and ants)		
Formicidae	0	0.269
Eurtomidae	0.019	-0.019
ARANEIDA (Spiders)	0.019	0.096

Table 3.196. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age classes of brook trout in Tacoma Creek, WA. for 1990.

PREY ORGANISMS	% in Envrion.	0+ n=2	1+	2+ n=8	All ages n=17
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	0.108	-0.108	-0.082	-0.108	-0.099
Glossosomatidae	0.04	-0.04	-0.04	-0.04	-0.04
Hydropsychidae	0.023	-0.023	-0.023	-0.023	-0.023
Psychomyiidae	0.013	-0.013	-0.013	-0.013	-0.013
Rhyacophilidae	0.021	-0.021	-0.021	-0.009	-0.017
EPEMEROPTERA (Mayflies)					
Baetidae	0.227	-0.227	-0.227	-0.215	-0.223
Ephemerellidae	0.087	-0.087	-0.087	-0.063	-0.079
Heptageniidae	0.064	-0.064	-0.064	-0.052	-0.06
PLECOPTERA (Stoneflies)					
Chloroperlidae	0.023	-0.023	-0.023	-0.011	-0.019
Nemouridae	0.004	0.15	-0.004	-0.004	0.047
Perlodidae	0.002	-0.002	-0.002	-0.002	-0.002
COLEOPTERA (Beetles)					
Elmidae larvae	0.258	-0.104	-0.232	-0.258	-0.198
ElmDytiscadults	0.010	0.527	-0.053	-0.012	0.022
DIPTERA (Midges and flies)					
Chironomidae larvae	0.085	-0.085	0.494	0.284	0.231
Chironomidae pupae	0.004	-0.004	-0.004	0.044	0.012
Ceratopogonidae	0	0	0.053	0.048	0.034
Tipulidae	0.006	-0.006	0.02	-0.006	0.003
Simuliidae	0.008	-0.008	0.018	0.016	0.009
Psychodidae	0.004	-0.004	-0.004	-0.004	-0.004
Tabanidae	0	0	0.053	0	0.018
LEPIDOPTERA (Moths)					
Pyralidae	0	0	0.026	0.024	0.017
HYDRACARINA (Water mites)	0.004	-0.004	-0.004	0.008	0
OLIGOCHAETA (Worms)					
Lumbriculidae	0.004	-0.004	-0.004	0.103	0.032
NEMATODA	0	0	0	0.024	0.008
TERRESTRIAL ORGANISMS					
DIPTERA (Midges and flies)					
Aidae	0	0	0	0.024	0.008
HEMIPTERA (True bugs)					
Reduviidae	0.002	-0.002	-0.002	-0.002	-0.002
Nabididae	0	0	0.026	0.024	0.017
Corixidae	0	0	0.026	0	0.009
HOMOPTERA (Aphids)					
Aphidiae	0.002	-0.002	-0.002	-0.002	-0.002
HYMENOPTERA (Wasps and ants)					
Formicidae	0	0.154	0.026	0.19	0.123
Sphecidae	0	0	0	0.024	0.008
LEPIDOPTERA (Moths)					
Cossidae	0	0	0.026	0	0.009
ARANEIDA (Spiders)	0.002	-0.002	-0.002	-0.002	-0.002

Table 3.197. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age classes of brook trout in Tacoma Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	0+ n=2	1+ n=7	2+ n=8	All ages n=17
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	0	0	0.026	0	0.009
Rhyacophilidae	0.01	-0.01	-0.01	0.002	-0.006
EPEMEROPTERA (Mayflies)					
Baetidae	0.311	-0.311	-0.311	-0.299	-0.307
Ephemerellidae	0	0	0	0.024	0.008
Heptageniidae	0.027	-0.027	-0.027	-0.015	-0.023
PLECOPTERA (Stoneflies)					
Chloroperlidae	0	0	0	0.012	0.004
Nemouridae	0	0.154	0	0	0.051
COLEOPTERA (Beetles)					
Elmidae larvae	0.154	0	-0.128	-0.154	-0.094
Elmidae adults	0	0.538	0	0	0.179
Hydrophilidae	0.019	-0.019	-0.019	-0.019	-0.019
Dytiscidae	0	0	0.053	0.012	0.022
Georyssidae	0.027	-0.027	-0.027	-0.027	-0.027
DIPTERA (Midges and flies)					
Chironomidae larvae	0	0	0.579	0.369	0.316
Chironomidae pupae	0.072	-0.072	-0.072	-0.024	-0.056
Ceratopogonidae	0.01	-0.01	0.043	0.038	0.024
Tipulidae	0	0	0.026	0	0.009
Simuliidae	0.039	-0.039	-0.013	-0.015	-0.022
Psychodidae	0.046	-0.046	-0.046	-0.046	-0.046
Tabanidae	0	0	0.053	0	0.018
LEPIDOPTERA (Moths)					
Pyralidae	0	0	0.026	0.024	0.017
HYDRACARINA (Water mites)	0.01	-0.01	-0.01	0.002	-0.006
OLIGOCHAETA (Worms)					
Lumbriculidae	0.147	-0.147	-0.147	-0.04	-0.111
NEMATODA	0	0	0	0.024	0.008
BIVALVIA (Clams)					
Sphaeriidae	0.019	-0.019	-0.019	-0.019	-0.019
TERRESTRIAL ORGANISMS					
DIPTERA (Midges and flies)					
Simuliidae	0.027	-0.027	-0.027	-0.027	-0.027
Asilidae		0	0	0.024	0.008
Dixidae	0.019	-0.019	-0.019	-0.019	-0.019
HEMIPTERA (True bugs)					
Nabididae	0	0	0.026	0.024	0.017
Corixidae	0	0	0.026	0	0.009
HOMOPTERA (Aphids)					
Cicadellidae	0.027	-0.027	-0.027	-0.027	-0.027
HYMENOPTERA (Wasps and ants)					
Formicidae	0	0.154	0.026	0.19	0.123
Sphecidae	0	0	0	0.024	0.008
Eurtomidae	0.019	-0.019	-0.019	-0.019	-0.019
LEPIDOPTERA (Moths)					
Cossidae	0	0	0.026	0	0.009
ARANEIDA (Spiders)	0.019	-0.019	-0.019	-0.019	-0.019

Table 3.198. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age classes of cutthroat trout in Tacoma Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=2	2+ n=1	All ages n=6
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	0.108	-0.108	-0.082	-0.108	-0.099
Glossosomatidae	0.04	-0.04	-0.014	-0.013	-0.022
Hydropsychidae	0.023	-0.023	-0.023	-0.023	-0.023
Psychomyiidae	0.013	-0.013	0.026	0.226	0.08
Rhyacophilidae	0.021	-0.021	-0.021	-0.021	-0.021
EPEMEROPTERA (Mayflies)					
Baetidae	0.227	-0.127	0.331	-0.165	0.013
Ephemerellidae	0.087	-0.087	-0.087	-0.087	-0.087
Heptageniidae	0.064	-0.064	-0.064	-0.064	-0.064
PLECOPTERA (Stoneflies)					
Capniidae	0	0	0.026	0.027	0.018
Chloroperlidae	0.023	-0.023	-0.023	-0.023	-0.023
Nemouridae	0.004	-0.004	-0.004	-0.004	-0.004
Perlodidae	0.002	-0.002	0.024	-0.002	0.007
COLEOPTERA (Beetles)					
Elmidae larvae	0.258	-0.258	-0.258	-0.258	-0.258
Elmidae adults	0.011	-0.011	-0.011	-0.011	-0.011
Scaraboadae	0	0	0.026	0	0.009
DIPTERA (Midges and flies)					
Chironomidae larvae	0.085	-0.085	-0.059	-0.085	-0.076
Chironomidae pupae	0.004	0.096	0.022	-0.004	0.038
Tipulidae	0.006	-0.006	-0.006	-0.006	-0.006
Simuliidae larvae	0.008	-0.008	-0.008	-0.008	-0.008
Simuliidae pupae	0	0.1	0	0	0.033
Psychodidae	0.004	-0.004	-0.004	-0.004	-0.004
Chaoboridae	0	0.01	0	0	0.003
LEPIDOPTERA (Moths)					
Pyralidae	0	0.2	0	0.115	0.105
HYDRACARINA (Water mites)	0.004	-0.004	-0.004	-0.004	-0.004
OLIGOCHAETA (Worms)					
Lumbriculidae	0.004	-0.004	-0.004	-0.004	-0.004
NEMATODA	0	0.3	0.039	0	0.113
TERRESTRIAL ORGANISMS					
HEMIPTERA (True bugs)					
Reduviidae	0.002	-0.002	-0.002	-0.002	-0.002
HOMOPTERA (Aphids)					
Aphidiae	0.002	-0.002	-0.002	-0.002	-0.002
Cicadellidae	0	0	0	0.027	0.009
HYMENOPTERA (Wasps and ants)					
Formicidae	0	0.1	0.104	0.504	0.236
LEPIDOPTERA (Moths)					
Cossidae	0	0	0.026	0	0.009
ARANEIDA (Spiders)	0.002	-0.002	0.024	-0.002	0.007

Table 3.199. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age classes of cutthroat trout in Tacoma Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=2	2+ n=1	All ages n=6
AQUATIC ORGANISMS					
TRICHOPTERA (Caddisflies)					
Brachycentridae	0	0	0.026	0	0.009
Glossosomatidae	0	0	0.026	0.027	0.018
Psychomyiidae	0	0	0.039	0.239	0.093
Rhyacophilidae	0.01	-0.01	-0.01	-0.01	-0.01
EPEMEROPTERA (Mayflies)					
Baetidae	0.311	-0.211	0.247	-0.249	-0.071
Heptageniidae	0.027	-0.027	-0.027	-0.027	-0.027
PLECOPTERA (Stoneflies)					
Capniidae	0	0	0.026	0.027	0.018
Perlodidae	0	0	0.026	0	0.009
COLEOPTERA (Beetles)					
Elmidae larvae	0.154	-0.154	-0.154	-0.154	-0.154
Hydrophilidae	0.019	-0.019	-0.019	-0.019	-0.019
Scaraboadae	0	0	0.026	0	0.009
Georyssidae	0.027	-0.027	-0.027	-0.027	-0.027
DIPTERA (Midges and flies)					
Chironomidae larvae	0	0	0.026	0	0.009
Chironomidae pupae	0.072	0.028	-0.046	-0.072	-0.03
Ceratopogonidae	0.01	-0.01	-0.01	-0.01	-0.01
Simuliidae larvae	0.039	-0.039	-0.039	-0.039	-0.039
Simuliidae pupae	0	0.1	0	0	0.033
Psychodidae	0.046	-0.046	-0.046	-0.046	-0.046
Chaoboridae	0	0.01	0	0	0.003
LEPIDOPTERA (Moths)					
Pyralidae	0	0.2	0	0.115	0.105
HYDRACARINA (Water mites)	0.01	-0.01	-0.01	-0.01	-0.01
OLIGOCHAETA (Worms)					
Lumbriculidae	0.147	-0.147	-0.147	-0.147	-0.147
NEMATODA	0	0.3	0.039	0	0.113
BIVALVIA (Clams)					
Sphaeriidae	0.019	-0.019	-0.019	-0.019	-0.019
TERRESTRIAL ORGANISMS					
DIPTERA (Midges and flies)					
Simuliidae	0.027	-0.027	-0.027	-0.027	-0.027
Dixidae	0.019	-0.019	-0.019	-0.019	-0.019
HOMOPTERA (Aphids)					
Cicadellidae	0.027	-0.027	-0.027	0	-0.018
HYMENOPTERA (Wasps and ants)					
Formicidae	0	0.1	0.104	0.504	0.236
Eurtomidae	0.019	-0.019	-0.019	-0.019	-0.019
LEPIDOPTERA (Moths)					
Cossidae	0	0	0.026	0	0.009
ARANEIDA (Spiders)	0.019	-0.019	0.007	-0.019	-0.01

3.7.3.5 SKOOKUM CREEK

The measure of prey selection (electivity) for benthic and drifting invertebrates was determined for each age class of brown trout, brook trout and cutthroat trout in Skookum Creek during 1990.

Brown trout electivities for benthic invertebrates are listed in Table 3.200 and electivities for drifting invertebrates are listed in Table 3.201. For age 0+ brown trout in Skookum Creek, Collembola had the highest electivity value in the benthos (0.200) and drift (0.189). For age l+ brown trout, Baetidae (0.120) had the highest electivity value in the benthos and Lumbriculidae (0.149) had the highest electivity value in the drift. The highest electivity of age . 2+ brown trout was for Glossosomatidae in the benthos (0.342) and drift (0.342). For 3+ brown trout, Brachycentridae had the highest electivity value in both the benthos and drift (0.403 and 0.408). For 4+ brown trout, Simuliidae adult, Stratiomyidae and Miridae had the highest benthic electivity values (0.250 each). The highest electivity value of age 4+ brown trout from‘ the drift was for Stratiomyidae and Miridae (0.250 each). For all age classes of brown trout combined Glossosomatidae had the highest electivity value in both the benthos (0.121) and drift (0.121).

Table 3.202 and Table 3.203 list the electivities for benthic invertebrates and for drifting invertebrates of brook trout in Skookum Creek for 1990. For age 0+ and l+ brook trout, Chironomidae larvae had the highest electivity value in both the benthos and drift (0.374 and 0.285 and 0.647 and 0.558, respectively). For 2+ brook trout, Baetidae had the highest electivity value in both the benthos (0.171) and drift (0.096). The highest electivities of 3+ brook trout were for Chironomidae larvae in both the benthos (0.216) and drift (0.127). For all age classes combined Chironomidae larvae had the highest electivity value for both the benthos (0.323) and drift (0.234).

Cutthroat trout electivities for benthic invertebrates are listed in Table 3.204 and electivities for drifting invertebrates are listed in Table 3.205. For age l+ cutthroat trout in Skookum Creek, Tricorythidae was most selected for in the benthos (0.333) and drift (0.333). For age 2+ cutthroat trout, Ephemerellidae was most selected for from the benthos (0.357) and the drift (0.471). For all age classes of cutthroat trout, Tricorythidae was most selected for from the benthos (0.167) and the drift (0.227).

Table 3.200. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age classes of brown trout in Skookum Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=14	2+ n=6	3+ n=2	4+ n=1	All ages n=26
AQUATIC ORGANISMS							
TRICHOPTERA (Caddisflies)							
Brachycentridae	0.009	-0.009	0.017	0.129	0.403	-0.009	0.106
Glossosomatidae	0.020	0.030	-0.020	0.342	0.274	-0.020	0.121
Hydropsychidae	0.001	-0.001	0.025	-0.001	-0.001	-0.001	0.004
Hydroptilidae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
Lepidostomatidae	0.000	0.000	0.000	0.025	0.000	0.000	0.005
Limnephilidae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Psychomyiidae	0.000	0.050	0.000	0.000	0.000	0.000	0.010
Rhyacophilidae	0.045	-0.045	-0.045	-0.007	-0.045	-0.045	-0.037
EPEMEROPTERA (Mayflies)							
Baetidae	0.301	0.199	0.120	-0.063	-0.301	-0.301	-0.069
Ephemerellidae	0.131	-0.131	-0.131	-0.106	-0.131	-0.131	-0.126
Heptageniidae	0.058	-0.058	-0.005	-0.058	-0.058	-0.058	-0.047
Leptophlebiidae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
PLECOPTERA (Stoneflies)							
Chloroperlidae	0.048	-0.048	-0.048	-0.048	-0.048	-0.048	-0.048
Nemouridae	0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
Perlodidae	0.012	-0.012	0.014	-0.012	-0.012	-0.012	-0.007
Pteronarcyidae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
COLEOPTERA (Beetles)							
Elmidae larvae	0.081	-0.081	-0.081	-0.081	-0.081	-0.081	-0.081
Elmidae adults	0.004	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004
Hydrophilidae	0.000	0.000	0.000	0.038	0.000	0.000	0.008
Amphizoida adult	0.000	0.000	0.026	0.038	0.000	0.000	0.013
DIPTERA (Midges and flies)							
Chironomidae larvae	0.084	0.066	-0.058	-0.059	0.210	-0.084	0.015
Chironomidae pupae	0.002	-0.002	0.024	-0.002	-0.002	-0.002	0.003
Ceratopogonidae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
Tipulidae	0.004	-0.004	0.022	-0.004	-0.004	-0.004	0.001
Simuliidae	0.001	-0.001	0.025	-0.001	-0.001	-0.001	0.004
Psychodidae	0.000	0.000	0.026	0.000	0.000	0.000	0.005
Chaoboridae pupae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
HYDRACARINA (mites)	0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
LEPIDOPTERA (Moths)							
Pyralidae	0.000	0.000	0.079	0.000	0.000	0.000	0.016
OLIGOCHAETA (Worms)							
Lumbriculidae	0.112	-0.112	0.046	-0.112	-0.112	-0.112	-0.080
NEMATODA	0.000	0.000	0.000	0.025	0.000	0.000	0.005
GASTROPODA (Snails)							
Planorbidae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003

Table 3.200. (cont.)

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=14	2+ n=6	3+ n=2	4+ n=1	All ages n=26
BIVALVIA (Clams)							
Sphaeriidae	0.031	-0.031	-0.031	-0.031	-0.031	-0.031	-0.031
PLATHELMINTHES (Flatworms)							
Planariidae	0.012	-0.012	-0.012	-0.012	-0.012	-0.012	-0.012
TERRESTRIAL ORGANISMS							
TRICHOPTERA	0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
DIPTERA (Midges and flies)							
Simuliidae	0.000	0.000	0.000	0.000	0.000	0.250	0.050
Stratiomydiae	0.000	0.000	0.000	0.000	0.000	0.250	0.050
HEMIPTERA (True bugs)							
Miridae	0.000	0.000	0.000	0.000	0.000	0.250	0.050
HOMOPTERA (Aphids)							
Aphidiae	0.000	0.050	0.026	0.000	0.000	0.000	0.015
COLLEMBOLA	0.000	0.200	0.000	0.000	0.000	0.000	0.040
CHILIPODA	0.000	0.000	0.026	0.000	0.000	0.000	0.005
UNIDENTIFIED	0.000	0.000	0.000	0.050	0.000	0.000	0.010

Table 3.201. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age classes of brown trout in Skookum Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=14	2+ n=6	3+ n=2	4+ n=1	All ages n=26
AQUATIC ORGANISMS							
TRICHOPTERA (Caddisflies)							
Brachycentridae	0.004	-0.004	0.022	0.134	0.408	-0.004	0.111
Glossosomatidae	0.020	0.030	-0.020	0.342	0.274	-0.020	0.121
Hydropsychidae	0.004	-0.004	0.022	-0.004	-0.004	-0.004	0.001
Lepidostomatidae	0.000	0.000	0.000	0.025	0.000	0.000	0.005
Psychomyiidae	0.000	0.050	0.000	0.000	0.000	0.000	0.010
Rhyacophilidae	0.012	-0.012	-0.012	0.026	-0.012	-0.012	-0.004
EPEMEROPTERA (Mayflies)							
Baetidae	0.376	0.124	0.045	-0.138	-0.376	-0.376	-0.144
Ephemerellidae	0.017	-0.017	-0.017	0.008	-0.017	-0.017	-0.012
Heptageniidae	0.027	-0.027	0.026	-0.027	-0.027	-0.027	-0.016
Leptophlebiidae	0.004	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004
PLECOPTERA (Stoneflies)							
Chloroperlidae	0.020	-0.020	-0.020	-0.020	-0.020	-0.020	-0.020
Nemouridae	0.020	-0.020	-0.020	-0.020	-0.020	-0.020	-0.020
Perlodidae	0.011	-0.011	0.015	-0.011	-0.011	-0.011	-0.006
Pteronarcyidae	0.004	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004
COLEOPTERA (Beetles)							
Elmidae larvae	0.066	-0.066	-0.066	-0.066	-0.066	-0.066	-0.066
Elmidae adults	0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Hydrophilidae	0.000	0.000	0.000	0.038	0.000	0.000	0.008
Amphizoida adult	0.000	0.000	0.026	0.038	0.000	0.000	0.013
DIPTERA (Midges and flies)							
Chironomidae larvae	0.173	-0.023	-0.147	-0.148	0.121	-0.173	-0.074
Chironomidae pupae	0.095	-0.095	-0.069	-0.095	-0.095	-0.095	-0.090
Ceratopogonidae	0.011	-0.011	-0.011	-0.011	-0.011	-0.011	-0.011
Tipulidae	0.000	0.000	0.026	0.000	0.000	0.000	0.005
Simuliidae	0.037	-0.037	-0.011	-0.037	-0.037	-0.037	-0.032
Psychodidae	0.002	-0.002	0.024	-0.002	-0.002	-0.002	0.003
LEPIDOPTERA (Moths)							
Pyralidae	0.004	-0.004	0.075	-0.004	-0.004	-0.004	0.012
OLIGOCHAETA (Worms)							
Lumbriculidae	0.009	-0.009	0.149	-0.009	-0.009	-0.009	0.023
NEMATODA	0.003	-0.003	-0.003	0.022	-0.003	-0.003	0.002
GASTROPODA (Snails)							
Lymnaeidae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
BIVALVIA (Clams)							
Sphaeriidae	0.029	-0.029	-0.029	-0.029	-0.029	-0.029	-0.029

Table 3.201. (cont.)

PREY ORGANISMS	% in Environ.	0+ n=3	1+ n=14	2+ n=6	3+ n=2	4+ n=1	All ages n=26
PLATYHELMINTHES (Flatworms)							
Planariidae	0.013	-0.013	-0.013	-0.013	-0.013	-0.013	-0.013
TERRESTRIAL ORGANISMS							
DIPTERA (Midges and flies)							
Simuliidae	0.002	-0.002	-0.002	-0.002	-0.002	0.248	0.048
Stratiomydiae	0.000	0.000	0.000	0.000	0.000	0.250	0.050
HEMIPTERA (True bugs)							
Miridae	0.000	0.000	0.000	0.000	0.000	0.250	0.050
HOMOPTERA (Aphids)							
Aphidiae	0.008	0.042	0.018	-0.008	-0.008	-0.008	0.007
ARANEIDA (Spiders)	0.011	-0.011	-0.011	-0.011	-0.011	-0.011	-0.011
COLLEMBOLA	0.011	0.189	-0.011	-0.011	-0.011	-0.011	0.029
CHILIPODA	0.000	0.000	0.026	0.000	0.000	0.000	0.005
UNIDENTIFIED	0.007	-0.007	-0.007	0.043	-0.007	-0.007	0.003

Table 3.202. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age class of brook trout in Skookum Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	0+ n=6	1+ n=8	2+ n=10	3+ n=2	All ages n=26
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	0.009	0.074	-0.009	-0.001	-0.009	0.014
Glossosomatidae	0.02	-0.02	-0.02	-0.004	-0.02	-0.016
Hydropsychidae	0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Hydroptilidae	0.003	0.122	-0.003	-0.003	-0.003	0.028
Limnephilidae	0.002	-0.002	0.01	0.022	-0.002	0.007
Philopotamidae	0	0	0.012	0	0	0.003
Psychomyiidae	0	0	0	0.057	0	0.014
Rhyacophilidae	0.045	-0.045	-0.045	-0.045	-0.045	-0.045
EPEMEROPTERA (Mayflies)						
Baetidae	0.301	-0.176	-0.248	0.171	0.199	-0.014
Ephemerellidae	0.131	-0.131	-0.125	-0.098	-0.131	-0.121
Heptageniidae	0.058	-0.058	-0.058	-0.025	-0.058	-0.05
Leptophlebiidae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003
PLECOPTERA (Stoneflies)						
Chloroperlidae	0.048	-0.048	-0.048	-0.048	-0.048	-0.048
Nemouridae	0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Perlodidae	0.012	-0.012	0.006	0.004	-0.012	-0.004
Pteronarcyidae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002
COLEOPTERA (Beetles)						
Elmidae larvae	0.081	-0.081	-0.081	-0.081	-0.081	-0.081
Elmidae adults	0.004	-0.004	-0.004	-0.004	-0.004	-0.004
Dytiscidae		0.125	0.018	0.008	0	0.038
Amphizoida adult		0	0.012	0	0	0.003
DIPTERA (Midges and flies)						
Chironomidae larvae	0.084	0.374	0.647	0.054	0.216	0.323
Chironomidae pupae	0.002	-0.002	0.103	0.022	-0.002	0.03
Ceratopogonidae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003
Tipulidae	0.004	-0.004	-0.004	-0.004	-0.004	-0.004
Simuliidae	0.001	0.041	-0.001	0.007	-0.001	0.012
Chaoboridae pupae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002
LEPIDOPTERA (Moths)						
Pyralidae	0	0	0.012	0	0	0.003
HYDRACARINA (Water mites)	0.005	-0.005	-0.005	-0.005	-0.005	-0.005
OLIGOCHAETA (Worms)						
Lumbriculidae	0.112	-0.112	-0.1	-0.112	-0.112	-0.109
NEMATODA	0	0.042	0.042	0	0	0.021
PLATHELMINTHES (Flatworms)						
Planariidae	0.012	-0.012	-0.012	-0.012	-0.012	-0.012

Table 3.202. (cont.)

PREY ORGANISMS	% in Environ.	0+ n=6	1+ n=8	2+ n=10	3+ n=2	All ages n=26
GASTROPODA (Snails)						
Planorbidae	0.003	-0.003	-0.003	-0.003	-0.003	-0.003
BIVALVIA (Clams)						
Sphaeriidae	0.031	-0.031	-0.025	-0.031	-0.031	-0.03
TERRESTRIAL ORGANISMS						
TRICHOPTERA (Caddisflies)	0.001	-0.001	-0.001	-0.001	-0.001	-0.001
DIPTERA (Midges and flies)						
Simuliidae	0	0	0	0.008	0	0.002
HYMENOPTERA (Wasps and ants)						
Formicidae		0	0	0.008	0	0.002
ARANEIDA (Spiders)	0	0	0.006	0	0	0.002
CHILIPODA	0	0	0	0.057	0	0.014
UNIDENTIFIED	0	0	0	0.073	0	0.018

Table 3.203. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age class of brook trout in Skookum Creek, Wa. for 1990.

PREY ORGANISMS	% in Environ.	0+ n=6	1+ n=8	2+ n=10	3+ n=2	All ages n=26
AQUATIC ORGANISMS						
TRICHOPTERA (Caddisflies)						
Brachycentridae	0.004	0.079	-0.004	0.004	-0.004	0.019
Glossosomatidae	0.02	-0.02	-0.02	-0.004	-0.02	-0.016
Hydropsychidae	0.004	-0.004	-0.004	-0.004	-0.004	-0.004
Hydroptilidae	0	0.125	0	0	0	0.031
Limnephilidae	0	0	0.012	0.024	0	0.009
Philopotamidae	0	0	0.012	0	0	0.003
Psychomyiidae	0	0	0	0.057	0	0.014
Rhyacophilidae	0.012	-0.012	-0.012	-0.012	-0.012	-0.012
EPEMEROPTERA (Mayflies)						
Baetidae	0.376	-0.251	-0.323	0.096	0.124	-0.089
Ephemerellidae	0.017	-0.017	-0.011	0.016	-0.017	-0.007
Heptageniidae	0.027	-0.027	-0.027	0.006	-0.027	-0.019
Leptophlebiidae	0.004	-0.004	-0.004	-0.004	-0.004	-0.004
PLECOPTERA (Stoneflies)						
Chloroperlidae	0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Nemouridae	0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Perlodidae	0.011	-0.011	0.007	0.005	-0.011	-0.003
Pteronarcyidae	0.004	-0.004	-0.004	-0.004	-0.004	-0.004
COLEOPTERA (Beetles)						
Elmidae larvae	0.066	-0.066	-0.066	-0.066	-0.066	-0.066
Elmidae adult	0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Dytiscidae		0.125	0.018	0.008	0	0.038
Amphizoida adult		0	0.012	0	0	0.003
DIPTERA (Midges and flies)						
Chironomidae larvae	0.173	0.285	0.558	-0.035	0.127	0.234
Chironomidae pupae	0.095	-0.095	0.01	-0.071	-0.095	-0.063
Ceratopogonidae	0.011	-0.011	-0.011	-0.011	-0.011	-0.011
Simuliidae	0.037	0.005	-0.037	-0.029	-0.037	-0.025
Psychodidae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002
LEPIDOPTERA (Moths)						
Pyralidae	0.004	-0.004	0.008	-0.004	-0.004	-0.001
OLIGOCHAETA (Worms)						
Lumbriculidae	0.009	-0.009	0.003	-0.009	-0.009	-0.006
NEMATODA	0.003	0.039	0.039	-0.003	-0.003	0.018
PLATHELMINTES (Flatworms)						
Planariidae	0.013	-0.013	-0.013	-0.013	-0.013	-0.013
GASTROPODA (Snails)						
Lymnaeidae	0.002	-0.002	-0.002	-0.002	-0.002	-0.002
BIVALVIA (Clams)						
Sphaeriidae	0.029	-0.029	-0.023	-0.029	-0.029	-0.028
TERRESTRIALS ORGANISMS						
DIPTERA (Midges and flies)						
Simuliidae	0.002	-0.002	-0.002	0.006	-0.002	0
HOMOPTERA (Aphids)						
Aphidiae	0.008	-0.008	-0.008	-0.008	-0.008	-0.008
HYMENOPTERA (Wasps and ants)						
Formicidae	0	0	0	0.008	0	0.002
ARANEIDA (Spiders)	0.011	-0.011	-0.005	-0.011	-0.011	-0.01
COLLEMBOLA	0.011	-0.011	-0.011	-0.011	-0.011	-0.011
CHILIPODA	0	0	0	0.057	0	0.014
UNIDENTIFIED	0.007	-0.007	-0.007	0.066	-0.007	0.011

Table 3.204. The measure of prey selection (electivity) for macroinvertebrates (from hess samples) by age class of cutthroat trout in Skookum Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	1+ n=2	2+ n=1	All ages n=3
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	0.009	0.324	-0.009	0.158
Glossosomatidae	0.02	-0.02	-0.02	-0.02
Hydropsychidae	0.001	-0.001	-0.001	-0.001
Hydroptilidae	0.003	-0.003	-0.003	-0.003
Limnephilidae	0.002	-0.002	-0.002	-0.002
Psychomyiidae	0	0	0.159	0.080
Rhyacophilidae	0.045	-0.045	-0.045	-0.045
EPEMEROPTERA (Mayflies)				
Baetidae	0.301	-0.301	-0.057	-0.179
Ephemerellidae	0.131	-0.131	0.357	0.113
Heptageniidae	0.058	-0.058	-0.058	-0.058
Leptophlebiidae	0.003	-0.003	-0.003	-0.003
Tricorythidae		0.333	0	0.167
PLECOPTERA (Stoneflies)				
Chloroperlidae	0.048	-0.048	-0.048	-0.048
Nemouridae	0.01	-0.01	0.027	0.009
Perlodidae	0.012	-0.012	-0.012	-0.012
Pteronarcyidae	0.002	-0.002	-0.002	-0.002
COLEOPTERA (Beetles)				
Elmidae larvae	0.081	0.252	-0.081	0.086
Elmidae adults	0.004	-0.004	-0.004	-0.004
DIPTERA (Midges and flies)				
Chironomidae larvae	0.084	-0.084	-0.084	-0.084
Chironomidae pupae	0.002	-0.002	0.035	0.017
Ceratopogonidae	0.003	-0.003	-0.003	-0.003
Tipulidae	0.004	-0.004	-0.004	-0.004
Simuliidae	0.001	-0.001	0.036	0.018
Chaoboridae pupae	0.002	-0.002	-0.002	-0.002
HYDRACARINA (Water mites)	0.005	-0.005	-0.005	-0.005
OLIGOCHAETA (Worms)				
Lumbriculidae	0.112	-0.112	-0.112	-0.112
PLATHELMINTHES (Flatworms)				
Planariidae	0.012	-0.012	-0.012	-0.012
GASTROPODA (Snails)				
Planorbidae	0.003	-0.003	-0.003	-0.003
BIVALVIA (Clams)				
Sphaeriidae	0.031	-0.031	-0.031	-0.031
TERRESTRIAL ORGANISMS				
TRICHOPTERA (Caddisflies)	0.001	-0.001	-0.001	-0.001

Table 3.205. The measure of prey selection (electivity) for macroinvertebrates (from drift samples) by age class of cutthroat trout in Skookum Creek, WA. for 1990.

PREY ORGANISMS	% in Environ.	1+ n=2	2+ n=1	All ages n=3
AQUATIC ORGANISMS				
TRICHOPTERA (Caddisflies)				
Brachycentridae	0.004	0.329	-0.004	0.1625
Glossosomatidae	0.02	-0.02	-0.02	-0.02
Hydropsychidae	0.004	-0.004	-0.004	-0.004
Psychomyiidae		0	0.159	0.0795
Rhyacophilidae	0.012	-0.012	-0.012	-0.012
EPEMEROPTERA (Mayflies)				
Baetidae	0.376	-0.376	-0.132	-0.254
Ephemerellidae	0.017	-0.017	0.471	0.227
Heptageniidae	0.027	-0.027	-0.027	-0.027
Leptophlebiidae	0.004	-0.004	-0.004	-0.004
Tricorythidae		0.333	0	0.1665
PLECOPTERA (Stoneflies)				
Chloroperlidae	0.02	-0.02	-0.02	-0.02
Nemouridae	0.02	-0.02	0.017	-0.0015
Perlodidae	0.011	-0.011	-0.011	-0.011
Pteronarcyidae	0.004	-0.004	-0.004	-0.004
COLEOPTERA (Beetles)				
Elmidae larvae	0.066	0.267	-0.066	0.1005
Elmidae adults	0.002	-0.002	-0.002	-0.002
DIPTERA (Midges and flies)				
Chironomidae larvae	0.173	-0.173	-0.173	-0.173
Chironomidae pupae	0.095	-0.095	-0.058	-0.0765
Ceratopogonidae	0.011	-0.011	-0.011	-0.011
Simuliidae	0.037	-0.037	0	-0.0185
Psychodidae	0.002	-0.002	-0.002	-0.002
LEPIDOPTERA (Moths)				
Pyralidae	0.004	-0.004	-0.004	-0.004
OLIGOCHAETA (Worms)				
Lumbriculidae	0.009	-0.009	-0.009	-0.009
NEMATODA	0.003	-0.003	-0.003	-0.003
PLATHELMINTHES (Flatworms)				
Planariidae	0.013	-0.013	-0.013	-0.013
GASTROPODA (Snails)				
Lymnaeidae	0.002	-0.002	-0.002	-0.002
BIVALVIA (Clams)				
Sphaeriidae	0.029	-0.029	-0.029	-0.029
TERRESTRIAL ORGANISMS				
DIPTERA (Midges and flies)				
Simuliidae	0.002	-0.002	-0.002	-0.002
HOMOPTERA (Aphids)				
Aphidiae	0.008	-0.008	-0.008	-0.008
ARANEIDA (Spiders)	0.011	-0.011	-0.011	-0.011
COLLEMBOLA (Springtails)	0.011	-0.011	-0.011	-0.011
UNIDENTIFIED	0.007	-0.007	-0.007	-0.007

3.8 MOVEMENT AND MIGRATION

Fish that moved from the site where they were tagged to an adjacent slough or vice versa were not counted as having moved. Largemouth bass caught in a bass tournament and noted as having been released at BT-2B were released in the river adjacent to site 2B and Campbell Slough. Recaptures of these bass in 2B or Campbell Slough were not included as fish movement.

A brown bullhead caught during electrofishing had not moved from the location where it was tagged in 1988 (Tables 3.206 and 3.207). The brown trout caught during electroshocking surveys was tagged in transect 4 and recaptured in transect 3A; movement of 1 km. Eighteen of the 58 largemouth bass recaptured by anglers or during electrofishing and gillnetting surveys had moved. The furthest distance moved was 48 km by a largemouth bass caught during a bass tournament. The fish was tagged and released in May, 1990 at site 2B and was recaptured in June at site 11. Eleven of the 18 largemouth bass that showed movement had been displaced by bass fishermen participating in bass tournaments.

One of the seven longnose suckers that were recaptured moved from the transect where it was tagged. This fish was tagged at transect 3 in 1988 and moved 27 km to transect 10 where it was recaptured in September, 1990. Five largescale suckers, out of the 23 recaptured, were caught in transects other than where they had been tagged. One fish traveled 31 km from transect 1 (tagging site) to transect 2 (recapture site); another fish moved a similar distance from transect 3 to transect 11. Two largescale suckers moved a distance of 6 km, one moving from transect 6 to transect 9 and the other from transect 3 to transect 5. Of the twenty-two mountain whitefish which were recaptured, three had moved to sites other than their original tagging site. Two of the fish traveled a distance of 2.5 km. The third fish moved 17 km from transect 2 (tagging site) to transect 3A (recapture site). None of the squawfish which were recaptured moved from the site where they has been tagged. Out of the eight tench that were recaptured, two had moved from where they had been tagged. Both tench were tagged in 1988. One had moved from transect 2 to transect 4A, a distance of 18 km. The other fish moved a distance of 4.4 km from transect 4 to 5. Five tagged yellow perch were recaptured in 1990; two showed movement from the transect where they had been tagged. One fish moved a

Table 3.206. Tagging and recapture information on fish recaptured during electrofishing and gill netting surveys from January through December, 1990. Recaptured fish marked with colored tags were reported as having been tagged at a river site even though they may have been tagged in an adjacent slough (e.g., sites 4, 4A, and 4B all received lavender tags). The location BT-2B indicates the fish was captured at an unknown location during a bass tournament and was released at site 2B.

SPECIES	LOCATION TAGGED	DATE TAGGED	LENGTH AT TAGGING (mm)	TAG#/COLOR	LOCATION RECAPTURED	DATE RECAPTURED	LENGTH AT RECAPTURE
Brown bullhead	4	1988	-	LAVENDER	4A	Oct-90	248
Brown trout	4	Jun-90	360	OR37989	3A	Aug-90	355
Largemouth bass	BT-2B	Jun-89	376	BR 21796	3	May-90	394
Largemouth bass	BT-2B	Sep-89	376	BR 21632	3	Jun-90	401
Largemouth bass	BT-2B	Jun-89	475	BR 12510	11	Jun-90	485
Largemouth bass	BT-2B	May-89	465	YL 18031	2B	Jun-90	476
Largemouth bass	4A	Jun-89	267	YL 12234	4A	Apr-90	313
Largemouth bass	5B	Aug-88	254	OR 05114	4A	Jun-90	334
Largemouth bass	5	Dec-88	490	OR 10124	4A	Jun-90	505
Largemouth bass	BT-2B	Jun-89	325	BR 21757	6	May-90	342
Largemouth bass	5A	Apr-89	372	OR 09878	5A	May-90	390
Largemouth bass	BT-2B	May-90	455	YL 36340	7	Jun-90	445
Largemouth bass	3	Nov-89	495	OR 17982	3	Sep-90	507
Largemouth bass	4	1988	-	LAVENDER	5	Sep-90	510
Largemouth bass	4	1988	-	LAVENDER	4A	Aug-90	230
Largemouth bass	4	1988	-	LAVENDER	4A	Aug-90	263
Largemouth bass	BT-2B	May-90	355	YL 36090	2B	Jun-90	355
Longnose sucker	3	1988	-	YELLOW	3A	May-90	462
Longnose sucker	3	1988	-	YELLOW	10	Sep-90	450
Longnose sucker	11	Apr-90	557	YL 41748	11	Sep-90	552
Longnose sucker	3	1988	-	YELLOW	3A	Sep-90	324
Longnose sucker	3	1988	-	YELLOW	3A	Aug-90	380
Longnose sucker	8	1988	-	GREEN	3A	Oct-90	412
Largescale sucker	1	1988	-	BLUE	1	May-90	432
Largescale sucker	1	1988	-	BLUE	1	May-90	490
Largescale sucker	1	1988	-	BLUE	1	Feb-90	499
Largescale sucker	1	1988	-	BLUE	1	Mar-90	432
Largescale sucker	1	1988	-	BLUE	1	Jun-90	454
Largescale sucker	1	1988	-	BLUE	1	Jul-90	463
Largescale sucker	10	1988	-	ORANGE	10	May-90	486
Largescale sucker	10	1988	-	ORANGE	11	Jul-90	497
Largescale sucker	2	1988	-	SALMON	2	May-90	445
Largescale sucker	2	1988	-	SALMON	2	Mar-90	410
Largescale sucker	3	Aug-89	502	OR 10308	3	Mar-90	496
Largescale sucker	3	Jul-89	526	OR 09798	3	Mar-90	526
Largescale sucker	4	May-89	520	OR 24133	4	May-90	509
Largescale sucker	4	Oct-89	530	OR 17976	4A	Jun-90	515
Largescale sucker	5	1988	-	RED	5	Mar-90	496
Largescale sucker	3	Mar-90	504	OR 16644	5	Jun-90	505
Largescale sucker	6	1988	-	CLEAR	6	Mar-90	495
Largescale sucker	8	Mar-90	524	OR 16628	7	May-90	526
Largescale sucker	6	Mar-89	270	OR 09318	9	Jun-90	299
Largescale sucker	1	1988	-	BLUE	2	Sep-90	394
Largescale sucker	1	1988	-	BLUE	2	Sep-90	460
Largescale sucker	1	1988	-	BLUE	1	Aug-90	390
Largescale sucker	3	1988	-	YELLOW	11	Aug-90	500
Mountain whitefish	1	1988	-	BLUE	1	May-90	241
Mountain whitefish	10	Mar-90	270	YL 19023	10	Apr-90	276

Table 3.206. (cont.)

SPECIES	LOCATION TAGGED	DATE TAGGED	LENGTH AT TAGGING (mm)	TAG#/COLOR	LOCATION RECAPTURED	DATE RECAPTURED	LENGTH AT RECAPTURE
Mountain whitefish	11	Nov-89	233	YL 32014	11	Apr.90	240
Mountain whitefish	11	Dec-89	258	YL 32031	11	Apr-90	269
Mountain whitefish	11	May-89	266	YL 13805	11	Apr-90	270
Mountain whitefish	11	Apr-89	257	YL 13696	11	Apr-90	272
Mountain whitefish	11	Apr-89	262	YL 13699	11	Apr.90	277
Mountain whitefish	2	1988		SALMON	2	May-90	270
Mountain whitefish	2	Apr-88	266	YL 06913	2	May-90	285
Mountain whitefish	7	Apr-89	270	YL 13664	2	May-90	290
Mountain whitefish	3A	Aug-88	323	OR 09582/	3A	Jul-90	358
Mountain whitefish				OR 16553			
Mountain whitefish	3A	Sep-88	280	OR 09694	3A	Mar-90	308
Mountain whitefish	7	May-90	288	OR 37977	7	Jun-90	290
Mountain whitefish	9	Mar-90	275	YL 32101	8	May-90	280
Mountain whitefish	7	Dec-89	245	OR 16527	a	Mar-90	252
Mountain whitefish	2	Jul-89	298	YL 12198	3A	Sep-90	310
Mountain whitefish	3A	Aug.88	278	OR 10208	3A	Sep-90	314
Mountain whitefish	11	Apr-89	229	YL 13690	11	Oct-90	261
Mountain whitefish	11	Apr-90	256	YL 41747	11	Aug-90	275
Mountain whitefish	3A	Sep-88	278	OR 09693	3A	Aug-90	285
Mountain whitefish	3A	Mar-88	268	OR 04992	3A	Oct-90	308
Mountain whitefish	,			YL 21418	3A	Oct-90	352
Squawfish	1	1988		BLUE	1	Jul-90	231
Squawfish	1	1988		BLUE	1	Aug-90	224
Tench	1	1988	-	BLUE	1	Mar-90	276
Tench	2	1988	-	SALMON	2	Feb-90	320
Tench	2	1988	-	SALMON	4A	Mar-90	410
Tench	5	1988	-	RED	5	Jul-90	290
Tench	4	1988	-	LAVENDER	5	Feb-90	339
Tench	5	1988	-	RED	5	Jun-90	432
Tench	7	1988	-	BRONW	7	Feb-90	173
Tench	5	1988		RED	5	Sep-90	260
Yellow perch	3	1988		YELLOW	3	Mar-90	147
Yellow perch	3	1988		YELLOW	4A	May-90	172
Yellow perch	7	1988		BROWN	7	Jul-90	160
Yellow perch	8	1988		GREEN	9	Jul-90	175
Yellow perch	4	1988		LAVENDER	4A	Sep.90	169

Table 3.207. Tagging and recapture information of tagged fish caught by anglers. The location BT-2B indicates the fish was captured at an unknown location during a bass tournament and was released at site 2B.

SPECIES	LOCATION TAGGED	DATE TAGGED	LENGTH AT TAGGING (mm)	TAG#/COLOR	LOCATION RECAPTURED	DATE RECAPTURED	LENGTH AT RECAPTURE
Largemouth bass	BT-2B	Jun-89	316	BR 21704	2B	May-90	305
Largemouth bass	BT-2B	Jun-89	364	BR 21728	2B	Jul-90	
Largemouth bass	BT-2B	Jun-89	465	RR 21740	5	May-90	495
Largemouth bass	BT-2B	Jun-89	407	BR 21809	1	Aug-90	431
	2B	Jun-89	384	YL 07869	4	May-90	457
Largemouth bass	9A	May-89	379	YL 13879	10	Jun-90	457
Largemouth bass	BT-2B	May-89	339	YL 18441	5	May-90	368
Largemouth bass	BT-2B	May-90	410	YL 36086	11	Jun-90	432
Largemouth bass	BT-2B	May-90	370	YL 36323	6	Sep-90	413
Largemouth bass	BT-2B	Jun-89	365		4	Jun-90	
Largemouth bass	BT-2B	Jun-89	486		4	Jun-90	
Largemouth bass	BT-2B	Jun-89	325			Apr-90	
Largemouth bass	BT-2B	Jun-89	305	BR 21509	BT	May-90	360
Largemouth bass	BT-2B	Jun-89	338	BR 21520	BT	May-90	350
Largemouth bass	BT-2B	Jun-89	329	BR 21541	BT	May-90	390
Largemouth bass	BT-2B	Jun-89	331	BR 21568	BT	Jun-90	-
Largemouth bass	BT-2B	Jun-89	381	BR 21571	BT	May-90	390
Largemouth bass	BT-2B	Jun-89	421	BR 21634	BT	Jun-90	421
Largemouth bass	BT-2B	Jun-89	426	BR 21756	BT	Jun-90	-
Largemouth bass	BT-2B	Jun-89	311	BR 21765	BT	Jun-90	-
Largemouth bass	BT-2B	Jun-89	332	BR 21788	BT	Jun-90	-
Largemouth bass	BT-2B	Jun-89	460	BR 21813	BT	Jun-90	-
Largemouth bass	4B	Apr-89	348	OR 09726	BT	May-90	370
Largemouth bass	2B	Jun-89	290	YL 07216	BT	Jun-90	-
Largemouth bass	2B	Jun-89	273	YL 07257	BT	Jun-90	-
Largemouth bass	2B(Campbell)	Jun-89	334	YL 07870	BT	May-90	350
Largemouth bass	2B	Jun-89	256	YL 08270	BT	Jun-90	-
Largemouth bass	2B(Campbell)	Jun-89	301	YL 12212	BT	May-90	460
Largemouth bass	2B(Tiger)	May-89	426	YL 13704	BT	Jun-89	-
Largemouth bass	9A	May-89	264	YL 13896	BT	Jun-90	-
Largemouth bass	BT-2B	May-89	390	YL 18006	BT	May-90	400
Largemouth bass	BT-2B	May-89	455	YL 18016	BT	May-90	460
Largemouth bass	BT-2B	May-89	39[illegible]	YL 18054	BT	Jun-90	
Largemouth bass	BT-2B	May-89	392	YL 18155	BT	Jun-90	
Largemouth bass	BT-2B	May-89	358	YL 18418	BT	Jun-90	
Largemouth bass	BT-2B	May-90	455	YL 36340	BT	Jun-90	
Largemouth bass	BT-2B	May-90	500	YL 36325	BT	Jun-90	

distance of 2.5 km from transect 3 to 4A and the other fish moved 4.4 km from transect 8 to 9.

Mean monthly and mean annual growth increments for each age class of largemouth bass and mountain whitefish were determined from differences in length between time tagged to time recaptured (Table 3.208). Largemouth bass growth ranged from 9.6 mm at age 11+ to 66.0 mm at age 6+. Growth for mountain whitefish ranged from 16.8 mm at age 4+ to 19.2 mm at age 3+.

Table 3.208. Growth increments of tagged fish based upon the difference in length at tagging and recapture.

	N	AGE AT TAGGING	MEAN MONTHLY GROWTH INCR. (mm)	MEAN ANNUAL GROWTH INCR. (mm)
Largemouth bass	4	5 +	4.1	49.2
	1	6 +	5.5	66.0
	4	7 +	2.2	26.4
	6	8 +	1.8	21.6
	2	9 +	1.2	14.4
	4	11 +	0.8	9.6
	1	15 +	1.2	14.4
Mountain whitefish	11	3 +	1.6	19.2
	7	4 +	1.4	16.8
	1	5 +	1.5	18.0

4.0 DISCUSSION

The first year of this study (1988) was atypical in that it had abnormally low flows. In addition, a mechanical malfunction at Box Canyon Dam resulted in a drop in the water level of the reservoir in excess of 20 feet. Fortunately, 1989 was much closer to an average year and 1990 was above average with respect to flow and reservoir elevations (Figure 4.1).

4.1 RELATIVE ABUNDANCE

The relative abundance of fish species in the river during 1990 was not appreciably different from relative abundance in 1988 and 1989 (Table 4.1). The relative abundance of yellow perch, largemouth bass and pumpkinseed decreased slightly from 1989, while mountain whitefish, black crappie and tench increased slightly. Relative abundance of brown trout and rainbow trout was greater in 1990 than either 1988 or 1989. The-total number of fish captured in 1990 was 50 percent less than the 1988 total and 43 percent less than the 1989 total. The electrofishing effort in 1990 was 17 hours more than that of 1988 and 19 hours less than that of 1989. The CPUE was 6.12 fish/min of electrofishing in 1988, 3.23 fish/min of electrofishing in 1989, and 2.32 fish/min of electrofishing in 1990. The higher water levels during the later two years helps to account for the reduced catch-per-unit-effort (CPUE). Generally, in months with high water levels fewer fish were caught than in months with lower water levels.

4.2 POPULATION ESTIMATES

4.2.1 RIVER AND SLOUGHS

The minimum number of recaptures required to estimate a population using a multiple census method is four (Ricker 1975). This was not met for black crappie and peamouth with only one recapture each, pumpkinseed and northern squawfish with two recaptures each, brown trout in site 3A with one recapture, and brown trout in the river study sites with only two recaptures.

Recruitment and mortality should be “approximately” zero during the period of the estimate (Ricker 1975). Mortality was not determined and the degree it influenced the estimates is unknown. Recruitment of the young-of-the-year fish was eliminated by

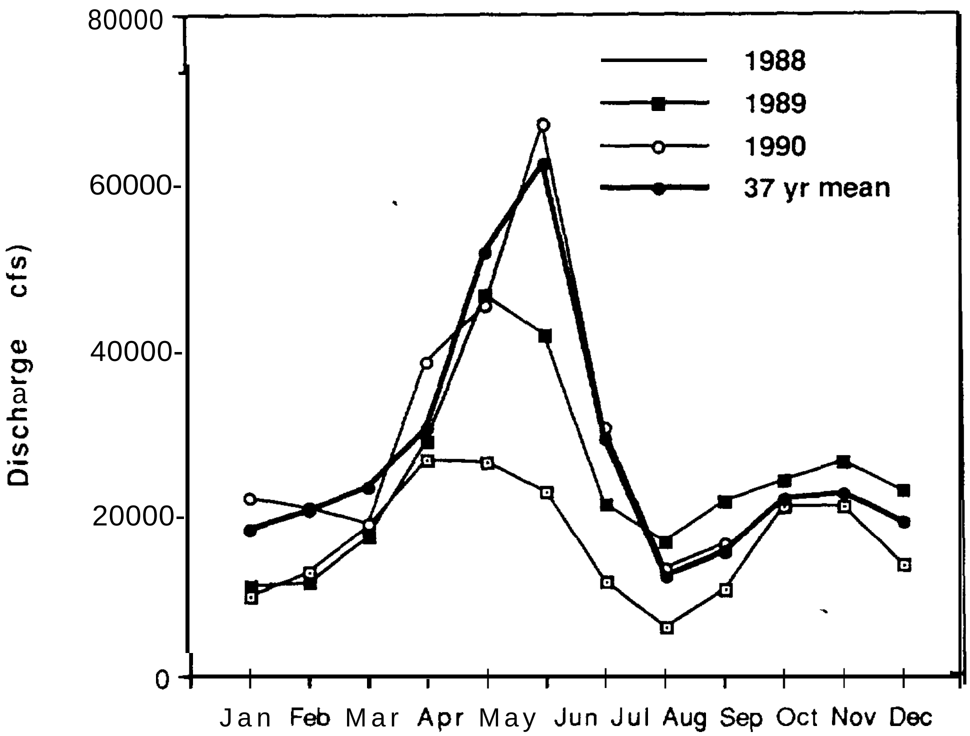

Figure 4.1. Comparison of 37 year (1953-1989) mean monthly flows with the mean monthly flows during 1988, 1989 and 1990 at Newport, WA (USGS gage 12395500). The 1953-1987 data was compiled by Soltero et al. (1988) and the 1988, 1989 and 1990 provisional data was obtained from the USGS, Sandpoint, ID.

Table 4.1. **Comparison of total numbers of fish (and relative abundance) of fish captured by electrofishing in 1988 (Barber et *al.* 1989) 1989 (Barber et *al.* 1990) and 1990.**

Year Shock time (min)	1988 3,256	1989 5,432	1990 4,285
Yellow perch	8,390 (42.1)	7,917 (45.1)	4,453 (44.8)
Pumpkinseed	3,791 (19.0)	2,897 (16.5)	1,026 (10.3)
Tench	1,920 (9.6)	1,465 (8.3)	1,045 (10.5)
Largemouth bass	1,434 (7.2)	1,589 (9.1)	842 (8.5)
Northern squawfish	1,057 (5.3)	620 (3.5)	284 (2.9)
Largescale sucker	949 (4.8)	789 (4.5)	590 (5.9)
Mountain whitefish	860 (4.3)	1,054 (6.0)	709 (7.1)
Longnose sucker	723 (3.6)	530 (3.0)	362 (3.6)
Brown bullhead	268 (1.3)	219 (1.2)	185 (1.9)
Black crappie	262 (1.3)	233 (1 .3)	155 (1.6)
Peamouth	127 (0.6)	62 (0.4)	118 (1.2)
Brown trout	114 (0.6)	117 (0.7)	104 (1.0)
Cutthroat trout	11 (0.05)	15 (0.1)	8 (0.1)
Redside shiner	11 (0.05)	2 (0.01)	2 (0.01)
Rainbow trout	6 (0.03)	13 (0.01)	10 (0.1)
Sculpin	6 (0.03)	11 (0.1)	1 (0.01)
Brook trout	1 (0.01)	2 (0.01)	3 (0.03)
Bull trout	1 (0.01)	2 (0.01)	1 (0.01)
Kokanee		12 (0.1)	32 (0.3)
Lake trout		2 (0.01)	3 (0.03)
TOTAL	19,931	17,554	9,933

estimating the population for one year and older fish. There was no movement of tagged fish between sites during the estimate. However, only larger individuals of a target species were given a numbered Floy tag; all other fish were fin clipped, therefore movement could not be determined.

In general, the population estimates in 1990 were very similar to those in 1989 but typically lower than those in 1988 (Table 4.2). The yellow perch estimate increased from 6.1 million in 1989 to 8.8 million in 1990. The pumpkinseed estimate went from 3.9 million in 1989 to 4.4 million in 1990. The estimates for yellow perch and pumpkinseed in 1988 were 41.8 million and 16.8 million, respectively. The tench and largemouth bass estimate decreased slightly in 1990 compared to 1989. The tench went from 1 .1 million in 1989 to 1 .0 million in 1990. The largemouth bass population decreased from 591,000 to 570,000 during the same years. Both the largemouth bass and tench estimates were lower than those calculated in 1988. There was a high degree of overlap within the 95 percent confidence intervals for the estimates in 1989 and 1990 while the confidence intervals for estimates in 1988 have a lesser degree of overlap or no overlap at all. This leads to the conclusion that the 1988 estimates were inflated or that there was a tremendous reduction in certain species of the fish population during that year.

Evidence that populations of certain species of fish were overestimated in 1988 includes possible differential mortality owing to size. In 1988, captured fish were given a Floy FD-67F anchor tag with the paddle removed. Yellow perch and pumpkinseed were tagged as small as a 100 mm. It is possible that this resulted in a high mortality of smaller fish or at least a poor tag retention since the anchor was positioned near the surface. For this reason, and the fact that there were more yellow perch and pumpkinseed recaptures in 1989 and 1990 it is believed that the population estimates from the latter two years are more reliable.

There is however, some evidence that there was a reduction in population sizes in 1988. The younger age classes of fish in the reservoir showed relative abundance declines in 1989 over 1988. The most pronounced declines were exhibited by the yellow perch. The relative abundance of age 2+ and 3+ yellow perch respectively decreased from 9.2 and 24.1 percent in 1988 (Barber et al. 1989), to 1 .0 and 9.2 percent, in 1989 (Barber et *al.* 1990). This indicates the

Table 4.2. Comparison of river population estimates and 95% confidence limits from 1990 with those of 1988 (Barber et *al.* 1989) and 1989 (Barber et *al.* 1990).

	1988			1989			1990		
	Estimate	Lower limit	Upper limit	Estimate	Lower limit	Upper limit	Estimate	Lower limit	Upper limit
Yellow perch	41,777,446	23,872,826	80,859,573	6,101,448	4,139,850	9,116,972	8,804,453	5,502,783	15,118,758
Pumpkinseed	16,822,372	7,704,903	45,879,573	3,889,758	1,969,498	9,152,371	4,431,018	1,230,838	14,310,181
Tench	4,282,807	2,081,920	10,707,019	1,085,921	497,368	2,961,603	1,001,841	527,285	2,254,142
Largescale sucker	821,863	432,560	1,849,192	186,693	79,783	583,416	194,551	108,632	396,307
Longnose sucker	781,166	357,786	2,130,452	183,457	62,542	917,286	218,743	85,781	874,971
Largemouth bass	657,549	455,727	989,859	590,906	299,193	1,390,366	570,098	288,657	1,341,407
Northern squawfish	580,565	359,271	1,009,679	248,988	97,642	995,950	280,663	77,962	2,806,626
Mountain whitefish	164,252	120,185	231,258	163,890	70,038	512,156	265,893	144,507	565,731

possibility that the younger age classes of yellow perch were affected by density independent mortality. It was not possible to determine if there was a decrease in the age 0+ and 1+ perch densities due to the low numbers captured each year. However, the populations of nearly all species were reduced in 1989 which indicates the possibility of a reservoir wide impact in 1988. The population decline observed in 1989 could be a result of a density independent mortality of all species in the reservoir. It's possible these declines were due to an extreme drawdown of the reservoir in 1988.

On May 19, 1988, a crane that was used to operate the gates at Box Canyon Dam malfunctioned, resulting in the gates at the dam being left open. Water levels in the reservoir dropped more than 20 feet near lone and 6 to 8 feet near Cusick before the crane was repaired and gates closed on June 2. In addition to the drawdown, the flows of the river in 1988 were lower than normal (Figure 4.1). Either of these factors or a combination of the two may have been responsible for density independent mortality in 1988 since they impacted the entire reservoir.

In order to better evaluate the estimates, the percent composition from the population estimates was compared to the electrofishing relative abundance (Table 4.3). During all three years of the study, yellow perch and pumpkinseed were more abundant in the population data than the relative abundance data. This suggests that the population estimates, especially that of 1988, were high. In contrast, tench, largemouth bass, northern squawfish, mountain whitefish, longnose and largescale sucker, and brown trout were represented by higher numbers in the relative abundance data than in the population data, suggesting their populations may be higher than were estimated. Given the size of the study area and the techniques available for population estimation, the estimates reported are probably as close as can be expected.

4.2.2 TRIBUTARIES

Three assumptions should be met for a removal depletion estimate: (1) no fish can move in or out of the sample area; (2) each fish has an equal chance of being captured; and (3) the probability of capture is constant over all removal occasions. These assumptions were met by: (1) placing blocknets at the upstream and downstream ends of the study reach; (2) keeping the shocking time as close as

Table 4.3. Comparison of the percent composition for each species from population estimates and electrofishing relative abundance for 1988 (Barber et *al.* 1989), 1989 (Barber et *al.* 1990) and 1990.

	1988		1989		1990	
Species	Percent composition from population estimates	Percent composition from electrofishing relative abundance	Percent composition from population estimates	Percent composition from electrofishing relative abundance	Percent composition from population estimates	Percent composition from electrofishing relative abundance
Yellow perch	62.9	42.1	48.8	45.1	55.1	44.8
Pumpkinseed	25.3	19.0	31.1	16.5	27.7	10.3
Tench	6.4	9.6	8.7	8.3	6.3	10.5
Largemouth bass	1.0	7.2	4.7	9.1	3.6	8.5
Northern squawfish	0.9	5.3	2.0	3.5	1.8	2.9
Mountain whitefish	0.2	4.3	1.3	6.0	1.7	7.1
Longnose sucker	1.2	3.6	1.5	3.0	1.4	3.6
Largescale sucker	1.2	4.8	1.5	4.5	1.2	5.9
Brown trout			0.05	0.7	0.23	1.0

possible on each pass; and (3) keeping the same crew for each pass to insure consistency in effort between passes.

Brown trout densities (fish/100m^2) estimated in the Pend Oreille study tributaries are compared to densities from other streams in the region in Table 4.4. Brown trout densities were highest in the downstream reaches (Reach 1 and 2) of the study tributaries during both 1989 and 1990. The highest densities of brown trout were observed in Cee Cee Ah and Skookum Creeks for both years however, densities estimated in 1990 were much lower than the estimates of 1989. This was probably due to the high runoff conditions in 1990 caused by an extended rainy period. Even with the lower density estimates, the Pend Oreille tributaries contained brown trout densities which exceeded those from other locations.

Brook trout densities (fish/100m^2) estimated in the Pend Oreille study tributaries are compared to densities from other streams in the region in Table 4.5. Brook trout densities were generally highest in the upstream reaches (Reach 3 and 4) of the study tributaries. The highest densities of brook trout were observed in Ruby and Skookum Creek during both 1989 and 1990, although the densities estimated in 1990 were much lower than those observed in 1989. The Pend Oreille River tributaries tended to have higher brook trout densities than did most of the other streams recorded in the literature for the region.

Cutthroat densities in the Pend Oreille River tributaries, like the brown and brook trout densities decreased in 1990 over 1989 (Table 4.6). The highest density of cutthroat trout was found in Cee Cee Ah Creek during both years. In comparison to other streams in the region, the Pend Oreille tributaries tended to have low densities of cutthroat trout, which is probably due to the high densities of brook trout. Although cutthroat trout are known to be more aggressive than brook trout they are still displaced by the less aggressive species (Griffith 1972). Brook trout maintain a size advantage over equal-aged cutthroat trout as they emerge several months earlier than the cutthroat trout. Griffith (1972) reported that underyearling brook trout dominated in experiments over the underyearling cutthroat trout with which they lived sympatrically. Stream gradient and available habitat may also limit cutthroat densities in the tributaries to the Pend Oreille River.

Table 4.4. Comparison of brown trout densities (fish/100m²) in Pend Oreille tributaries during 1989 (Barber et al. 1990) and 1990. Densities from other streams in the region are also listed.

Location	1989 Density (#/100m²)	1990 Density (#/100m²)
LeClerc Creek, WA		
Reach 1	6.0	0.7
Reach 2	0.7	1.4
Reach 3	1.5	no estimate
Reach 4	0	0.2
Ruby Creek, WA		
Reach 1	no estimate	0.2
Cee Cee Ah Creek, WA		
Reach 1	25.7	12.2
Reach 2	35.6	7.5
Reach 3	4.1	0
Tacoma Creek, WA		
Reach 1	0	0.2
Skookum Creek, WA		
Reach 1	2.8	7.5
Reach 2	80.9	8.1
Reach 3	3.0	0

Location	Density (#/100m²)	Reference
S. Fork Snake River, ID	0.4	(Luken 1988)
Willow Creek, ID	0.2	(Corsi and Elle 1989)
Henrys Fork, Snake River, ID	0.07	(Luken 1988)

Table 4.5. Comparison of brook trout densities ($fish/100m^2$) in Pend Oreille tributaries during 1989 (Barber et *al.* 1990) and 1990. Densities from other streams in the region are also listed.

Location	1989 Density ($\#/100m^2$)	1990 Density ($\#/100m^2$)
LeClerc Creek, WA		
Reach 1	4.5	3.6
Reach 2	2.6	1.8
Reach 3	10.2	2.0
Reach 4	9.0	5.6
Ruby Creek, WA		
Reach 1	8.6	3.5
Reach 2	10.9	6.1
Reach 3	31.6	6.0
Reach 4	102.2	45.1
Cee Cee Ah Creek, WA		
Reach 1	0	0.2
Reach 2	no estimate	2.0
Reach 3	12.0	15.3
Reach 4	34.0	13.0
Tacoma Creek, WA		
Reach 1	21.a	1.7
Reach 2	26.3	5.5
Reach 3	20.7	11.7
Reach 4	9.0	17.7
Skookum Creek, WA		
Reach 1	0	0.3
Reach 2	10.7	no estimate
Reach 3	11.0	5.2
Reach 4	50.7	30.7

Location	Density ($\#/100m^2$)	Reference
Homer Creek, ID	31.3	(Corsi and Elle 1989)
N. Fork Grouse Creek, ID	7.7	(Hoelscher and Bjornn 1989)
S. Fork Grouse Creek, ID	0.3	(Hoelscher and Bjornn 1989)
Twin Creek, ID	4.8	(Hoelscher and Bjornn 1989)
Bear Creek, ID	77.8	(Cowley 1987)
Kalispell Creek, ID	11.6	(Cowley 1987)
E. Fork Hayden Creek, ID	2.1	(Gamblin 1987)
Copper Creek, ID	3.6	(Gamblin 1987)
Skookum Creek, ID	0.5	(Gamblin 1987)

Table 4.6. Comparison of cutthoat trout densities (fish/100m²) in Pend Oreille tributaries during 1989 (Barber et al. 1990) and 1990. Densities from other streams in the region are also listed.

Location	1989 Density (#/100m²)	1990 Density (#/100m²)
LeClerc Creek, WA		
Reach 2	1.1	0
Reach 3	0.3	0.3
Reach 4	0.4	0.1
Ruby Creek, WA		
Reach 2	0.2	0.1
Reach 3	≥ 0.5	0
Cee Cee Ah Creek, WA		
Reach 2	0	6.1
Reach 3	13.2	0
Tacoma Creek, WA		
Reach 1	3.3	0
Reach 2	4.3	1.1
Reach 3	3.6	1.4
Reach 4	4.5	4.0
Skookum Creek, WA		
Reach 3	2.1	no estimate
Reach 4	0.4	≥ 0.2

Location	Density (#/100m²)	Reference
Homer Creek, ID	21.6	(Corsi and Elle 1989)
Preuss Creek, ID	8.0	(Schill and Heimer 1988)
Badger Creek, ID	19.9	(Maiolie and Cochnauer 1988)
Post Office Creek, ID	5.2	(Maiolie and Cochnauer 1988)
Wier Creek, ID	4.4	(Maiolie and Cochnauer 1988)
Lochsa River, ID	3.7	(Maiolie and Cochnauer 1988)
N. Fork Hayden Creek, ID	46.7	(Gamblin 1987)
E. Fork Hayden Creek, ID	24.5	(Gamblin 1987)
Black Canyon Creek, ID	10.3	(Gamblin 1987)
Scott Creek, ID	10.2	(Gamblin 1987)
Copper Creek, ID	8.9	(Gamblin 1987)
Omaha Creek, ID	7.9	(Gamblin 1987)
Hudlow Creek, ID	8.1	(Gamblin 1987)
Leiberg Creek, ID	8.0	(Gamblin 1987)
Tie Creek, ID	5.8	(Gamblin 1987)
Picnic Creek, ID	7.5	(Gamblin 1987)
S. Fork Snake River, ID	0.7	(Luken 1988)

4.3 AGE, GROWTH, AND CONDITION

4.3.1 RIVER AND SLOUGHS

Back-calculated growth for yellow perch was very similar for all three years of the study (Table 4.7). It was determined that a check mark found on the perch scales between the actual first and second annuli was being counted as an extra year during 1988 and 1989, therefore the back-calculated growth increments reported by Barber et *al.* (1989) and Barber et *al.* (1990) are different than those cited in this report. Back-calculated lengths for yellow perch from the reservoir reported by Bennett et al. (1990) were slightly larger at every annulus except at age six (Table 4.7). Nevertheless, yellow perch from the Pend Oreille River were smaller at every annulus than at other locations in the northern and northwestern United States. The mean condition factor for yellow perch in 1990 increased over both the previous years and was good in comparison to condition factors from other water bodies in the region. Mean weights and lengths for each age class of yellow perch were very similar during all three years of the study (Table 4.8). In 1990, both mean weights and lengths tended to be lower than those reported for 1988 and 1989 but this may be due to the smaller sample size during the third year of the study.

The mean length of largemouth bass at annulus formation calculated in 1990 was very similar to the back-calculations from 1988 and 1989 (Table 4.9). Back-calculated lengths for the first three age classes of largemouth bass were lower in 1988 than the following years owing, in part, to the use of a different intercept value in the back-calculation equation used in 1988 (See section 2.5). Bennett et *al.* (1990) reported back-calculations for largemouth bass in 1989 from the Pend Oreille River were slightly higher at each annulus than reported by Barber et al. (1989, 1990) and the present study (Table 4.9). Largemouth bass from the Pend Oreille River tend to have low growth rates, in comparison to other locations in the northern and northwestern United States. Mean weights and lengths for each age class of bass were very similar during all three years of the study (Table 4.10). During the course of the study, largemouth bass seemed to display a marked weight gain after they reached 6 years of age. At this age and larger size, the dietary preference of largemouth bass changes to include sizable perch and pumpkinseed, which would account for the marked increase in weight.

Table 4.7. Comparison of mean back-calculated lengths at annulus formation and mean annual condition factors for yellow perch.

	LENGTH AT ANNULUS FORMATION							
	1	2	3	4	5	6	7	8
Lake Roosevelt, WA (Beckman et *al.* 1985)	87	168	213	242	267	288	304	--
Lake Washington, WA (Wydoski and Whitney 1979)	98	173	227	262	284	301	312	--
Lake Michigan (Schaefer 1977)	97	137	178	204	230	251	262	--
Loon Lake, WA' (Scholz et *a/.* 1988)	--	--	111	165	199	198	228	--
Lake Mendota, WI (Wydoski and Whitney 1979)	140	197	227	239	--	--	--	--
Deer Lake, WA' (Scholz et *a/.* 1988)	--	--	150	161	182	190	232	--
Cascade Reservoir, ID (Griswold and Bjornn 1989)	70	129	178	211	237	255	251	272
Box Canyon Reservoir** Pend Oreille River, WA (Barber et *al.* 1989)	77	114	134	150	166	206	--	--
Box Canyon Reservoir** (Barber et *al.* 1990)	70	114	133	150	166	200	211	--
Box Canyon Reservoir (Bennett et a/. 1990)	81	127	155	174	186	198	_-	--
Box Canyon Reservoir (present study)	78	113	137	152	159	177	182	211

'Based on mean annual total lengths.
*'Corrected values

CONDITION FACTORS

Location	Age Class	Mean Condition Factor	Range	Reference Cited
Loon Lake, WA	II-VI	K_{TL} 0.98	0.91-1.01	(Scholz et a/. 1988)
Deer Lake, WA	II-VII	K_{TL} 1.19	1.08-1.32	(Scholz *et al.* 1988)
Lake Roosevelt, WA	I-V	K_{TL} 1.11	0.72-1.58	(Peone and Scholz 1988)
Box Canyon Reservoir	I-VII	K_{TL} 1.04	0.97-1.12	(Barber et *al.* 1989)
Box Canyon Reservoir	I-VIII	K_{TL} 1.08	1.05-1.16	(Barber *et al.* 1990)
Box Canyon Reservoir	I-VIII	K_{TL} 1.18	0.73-1.30	(present study)

Table 4.8. Comparison of mean weight (g ± standard deviation) and mean length (mm ± standard deviation) for each age class of yellow perch in the Pend Oreille River from 1988 (Barber et al. 1989), 1989 (Barber et al. 1990) and 1990.

Age Class	N	Mean Weight 1988	N	Mean Weight 1989	N	Mean Weight 1990
0 +					1	2.0
1 +	40	10.6 ± 3.8	56	10.4 ± 7.9	28	9.3 ± 5.9
2 +	142	20.6 ± 5.8	144	27.7 ± a.1	30	20.6 ± 11.6
3 +	229	33.8 ± 9.0	300	36.0 ± 9.2	40	38.5 ± 11.8
4 +	200	41.5 ± 8.6	367	43.7 ± 10.2	134	47.1 ± 11.1
5 +	117	52.5 ± 13.2	208	55.3 ± 12.1	86	55.3 ± 15.2
6 +	3	89.7 ± 18.0	5	97.6 ± 19.0	11	71.1 ± 19.0
7 +					4	77.0 ± 5.5
8 +					2	144.5 ± 78.5

Age Class	N	Mean Length 1988	N	Mean Length 1989	N	Mean Length 1990
0 +					1	73.0
1 +	40	95.25 ± 10.4	56	92.3 ± 21.7	28	90.0 ± 15.7
2 +	142	122.3 ± 9.9	144	134.0 ± 11.8	30	118.9 ± 20.8
3 +	229	144.7 ± 12.9	300	146.9 ± 10.4	40	145.6 ± 14.9
4 +	200	160.7 ± 9.7	367	160.2 ± 10.0	134	159.6 ± 12.8
5 +	117	175.0 ± 11.3	208	173.4 ± 9.6	86	168.2 ± 14.1
6 +	3	208.0 ± 16.1	5	210.6 ± 19.1	11	186.4 ± 12.8
7 +					4	186.2 ± 4.8
8 +					2	219.0 ± 36.8

Table 4.9. Comparison of mean back-calculated lengths at annulus formation and mean annual condition factors for largemouth bass.

	LENGTH AT ANNULUS FORMATION														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Potholes Reservoir, WA (Wydoski and Whitney 1979)	71	135	213	257	302	343	381	419	--	--	--	—	—	—	—
Sprague Lake, WA (Willms *et al.* 1989)	103	137	192	247	292	326	390	--	--	--	--	--	--	--	--
Washington State (Min Ave.) (Wydoski and Whitney 1979)	68	89	152	170	183	216	241	356	356	432	--	--	--	--	--
Washington State (Max Ave.) (Wydoski and Whitney 1979)	74	229	267	343	411	457	457	483	--	508	--	--	--	--	-
Lake Washington (Wydoski and Whitney 1979)	107	213	290	343	376	429	450	485	—	--	--	--	—		-
N. Idaho (6 lakes) (Reiman 1983)	68	136	213	279	336	386	405	440	463	484	--	--	--	--	-
Montana Lakes (Carlander 1977)	56	130	190	236	272	320	358	378	384	396	455	--	--	--	--
Oregon (96 waters) (Carlander 1977)	76	175	259	318	361	401	439	470	498	523	531	--	-	--	
Box Canyon Reservoir Pend Oreille River, WA (Barber et *al.* 1989)	66	102	142	198	241	280	317	355	387	412	427	461	467	473	
Box Canyon Reservoir (Barber et *al.* 1990)	80	120	159	203	243	279	313	343	369	392	414	437	463	482	512
Box Canyon Reservoir (Bennett et *al.* 1990)	86	153	217	291	326	349	372	395	421	435	458	519	--	--	--
Box Canyon Reservoir (present study)	65	112	150	192	235	281	323	339	395	424	452	469	485	486	488

Table 4.9. (cont.)

CONDITION FACTORS

Location	Age Class	Mean Condition Factor		Range	Reference Cited
Michigan Average	- -	K_{TL}	0.98	0.09-1.01	(Carlander 1977)
Wintergreen Lake, MI	- -	K_{TL}	1.33	- -	(Carlander 1977)
Pennsylvania Average	- -	K_{TL}	- -	1.05-1.55	(Carlander 1977)
Sprague Lake, WA	I-VI	K_{TL}	1.57	- -	(Willms et *al.* 1989)
Loon Lake, WA	II-XIV	K_{TL}	1.41	- -	(Scholz et *al.* 1988)
Deer Lake, WA	III-IX	K_{TL}	1.27	- -	(Scholz et *al.* 1988)
Box Canyon Reservoir, WA	I-XIV	K_{TL}	1.30	1.14-1.a2	(Barber et *al.* 1989)
Box Canyon Reservoir, WA	VII-XIV	K_{TL}	1.61	1.61-1.a2	(Barber et *al.* 1989)
Box Canyon Reservoir, WA	I-XV	K_{TL}	1.30	1.16-1.83	(Barber et *al.* 1990)
Box Canyon Reservoir, WA	I-XV	K_{TL}	1.28	1.05-2.08	(present study)

Table 4.10. Comparison of mean weights (g ± standard deviation) and mean lengths (mm ± standard deviation) for each age of largemouth bass from 1988 (Barber et *al.* 1989), 1989 (Barber et *al.* 1990)and 1990.

Age Class	N	Mean Weight 1988	N	Mean Weight 1989	N	Mean Weight 1990
0 +	12	2.8 ± 0.7	62	3.3 ± 1.5	2	3.0 ± 2.8
1 +	55	7.2 ± 2.4	179	7.0 ±3.8	41	7.2 ± 5.9
2 +	79	la.6 ± 7.2	130	22.5 ± 8.6	58	23.4 ± 13.6
3 +	195	34.8 ± 15.0	249	57.3 ± 20.8	46	50.2 ± 28.2
4 +	59	109.5 ± 46.7	47	108.0 ± 27.9	24	85.7 ± 44.1
5 +	51	252.3 ± 636	23	251.4 ± 144.4	30	177.7 ± 128.4
6 +	a5	417.7 ± 110.7	26	413.6 ± 145.7	16	357.0 ± 232.6
7 +	50	625.7 ± 148.0	35	577.9 ± 115.6	6	722.7 ± 370.1
a+	14	994.2 ± 288.2	46	778.4 ± 165.5	10	802.8 ± 189.2
9 +	17	1320.6 ± 384.7	28	1024.9 ± 169.9	2	1325.0 ± 677.4
10 +	11	1495.8 ± 221.5	9	1304.4 ± 240.9	7	1479.3 ± 302.6
11 +	10	1608.8 ± 445.0	9	1437.9 ± 233.2	3	1760.3 ± 731.7
12 +	7	2144.0 ± 352.7	6	1746.3 ± 195.4	1	1473.0
13 +	1	2433.0	4	2065.3 ± 499.2	3	2618.7 ± 333.7
14 +	2	2150.5 ± 29.0	3	2524.7 ± 278.6	1	2528.0
15 +						2585.5 ± 338.7

Table 4.10. (cont.)

Age Class	N	Mean Length 1988	N	Mean Length 1989	N	Mean Length 1990
0 +	12	57.2 ± 4.1	62	59.8 ± 10.4	2	47.5 ± 19.6
1 +	55	al.0 ± 7.9	179	80.8 ± 12.5	41	83.6 ± 20.5
2 +	79	116.0 ± 15.9	130	120.8 ± 16.2	58	123.5 ± 20.5
3 +	195	142.7 ± 17.9	249	168.0 ± la.4	46	157.1 ± 24.8
4 +	59	203.7 ± 28.9	47	207.1 ± 12.8	24	188.4 ± 26.3
5 +	51	265.6 ± 17.6	23	263.1 ± 28.7	30	231.1 ± 45.5
6 +	a5	306.7 ± 21.6	26	303.4 ± 20.1	16	269.6 ± 47.9
7 +	50	344.5 ± 22.7	35	339.3 ± 15.9	6	333.5 ± 58.5
8 +	14	387.7 ± 29.1	46	367.1 ± 16.6	10	360.1 ± 18.8
9 +	17	427.4 ± 30.1	28	398.4 ± 13.1	2	422.0 ± 49.5
10 +	11	443.4 ± 22.5	9	433.3 ± 15.6	7	429.7 ± 30.4
11 +	10	451.6 ± 29.4	9	438.4 ± 9.3	3	464.0 ± 49.5
12 +	7	489.3 ± 15.9	6	455.3 ± 14.4	1	484.8 ± 26.3
13 +	1	523.0	4	487.8 ± 28.7	3	517.0 ± 19.2
14 +	2	489.5 ± 7.8	3	494.4 ± 16.4	1	505.0
15 +						499.0 ± 1.4

Mean annual growth increments calculated for largemouth bass recaptures (Table 4.11) were larger than the growth increments from the back-calculations for age 5+, 6+, 8+, and 15+. Growth increments for age 7+, 9+ and 1 1+ were smaller for recaptured fish than the growth increments from back-calculations. The difference between growth increments from back-calculations and from recaptures is probably due to sample size. It is not possible to know how much the anchored floy tags affect largemouth bass growth and survival, but according to this data, it seems there is little or no effect.

The mean length of mountain whitefish at annulus formation for 1990 was very similar to the back-calculated values of 1989 (Table 4.12). The mean lengths from 1988 were higher than both the latter two years, but as with largemouth bass, this difference was due to the different intercept used in the regression equation. Mountain whitefish growth was good in comparison to other water bodies in the western United States and Canada. The mean condition factor was highest in 1990. This could be attributed to a smaller sample size in 1990. The higher condition factor could also be caused by reduced intra and interspecific competition that would have resulted from density dependent mortality during the water drawdown of 1988. The mean lengths and weights of each age class of mountain whitefish were similar for all three years of the study (Table 4.13). Although they varied from year to year they stayed within the ranges of the standard deviation. Mean annual growth increments calculated for recaptured, tagged mountain whitefish (Table 4.11) were smaller than the increments from the back-calculations. It is possible that the tags interfered with fish behavior (as mountain whitefish are a small streamlined fish) and resulted in reduced growth.

The mean back-calculated lengths of black crappie were lower in 1990 than both 1988 and 1989 (Table 4.14). They were also lower than lengths that Bennett et al. (1990) reported for 1989. Black crappie lengths at annulus formation tended to be smaller than those found in other bodies of water in the region. The mean condition factor for crappie in 1990 was almost identical to the two previous years. Mean weights and lengths for each age class of black crappie were generally lower in 1990, when compared to 1988 and 1989 (Table 4.15). Again this may be the result of a smaller sample size and the subjectivity of the scale reader.

Table 4.11. Comparison of mean annual growth increments based on mean back-calculated age (at annulus) from scale data and difference in length at tagging and recapture.

	AGE	MEAN ANNUAL GROWTH INCR. (mm) (SCALE DATA)	MEAN ANNUAL GROWTH INCR. (mm) (TAG AND RECAP)
Largemouth bass	5+	43.0	49.2
	6+	46.0	66.0
	7+	43.0	26.4
	8+	16.0	21.6
	9+	56.0	14.4
	11+	27.0	9.6
	15+	2.0	14.4
Mountain whitefish	3+	46.0	19.2
	4+	31.0	16.8
	5+	30.0	18.0

Table 4.12. Comparison of mean back-calculated lengths at annulus formation and mean annual condition factors for mountain whitefish.

LENGTH AT ANNULUS FORMATION

	1	2	3	4	5	6	7	8
Montana Lakes (Carlander 1969)	91	190	241	272	300	325	356	--
Montana Reservoir (Carlander 1969)	86	183	246	290	312	335	351	371
Montana Rivers (Carlander 1969)	86	180	246	292	328	353	368	419
Phelps Lake, MT (Carlander 1969)	160	193	229	251	269	290	307	318
Doctor Lake, MT (Carlander 1969)	46	84	119	157	193	226	254	282
Kootenai River, MT (May *et al.* 1983)	140	254	312	351	--	--	--	--
Madison River, WY (Carlander 1969)	130	226	305	348	388	429	--	--
Logan River, UT (Carlander 1969)	117	206	259	295	325	358	391	417
Box Canyon Reservoir Pend Oreille River, WA (Barber *et al.* 1989)	174	219	259	299	360	390	413	435
Box Canyon Reservoir (Barber *et al.* 1990)	138	199	244	279	355	--	--	--
Box Canyon Reservoir (present study)	135	201	247	278	308	371		

CONDITION FACTORS

Location	Age Class	Mean Condition Factor		Range	Reference Cited
Logan River, UT		K_{SL}	1.57	--	(Carlander 1969)
Carter Creek, UT		K_{SL}	1.50		(Carlander 1969)
Pend Oreille River, WA	I-VII	K_{TL}	0.71	0.69-0.81	
		K_{SL}	1.15	1.10-1.26	(Barber et al. 1989)
Pend Oreille River, WA	I-V	K_{TL}	0.74	0.69-0.81	
		K_{SL}	1.19	1.12-1.31	(Barber *et* al. 1990)
Pend Oreille River, WA	I-VI	K_{TL}	0.87	0.73-0.92	
		K_{SL}	1.40	1.18-1.48	(present study)

Table 4.13. Comparison of mean weights (g ± standard deviation) and mean lengths (mm ± standard deviation) for each age class of mountain whitefish in the Pend Oreille River from 1988 (Barber et *al.* 1989), 1989 (Barber *et al.* 1990) and 1990.

Age Class	N	Mean Weight 1988	N	Mean Weight 1989	N	Mean Weight 1990
0 +					13	a.9 ± 2.1
1 +	38	20.0 ± a.5	61	47.2 ± 20.4	23	30.8 ± Ia.2
2 +	37	64.2 ± 33.1	111	93.1 ± 25.4	23	64.2 ± 31.0
3 +	113	141.2 ± 37.1	265	138.4 ± 34.7	93	165.6 ± 44.6
4 +	51	186.1 ± 39.8	125	180.8 ± 45.2	96	219.9 ± 55.4
5 +	15	488.1 ± 188.6	7	478.4 ± 265.8	17	315.3 ± 153.7
6 +					2	512.5 ± 113.8

Age Class	N	Mean Length 1988	N	Mean Length 1989	N	Mean Length 1990
0 +					13	113.9 ± 9.7
1 +	38	140.5 ± 22.1	61	183.0 ± 25.6	23	161.7 ± 29.4
2 +	37	201.8 ± 34.4	111	230.5 ± Ia.5	23	197.5 ± 29.2
3 +	113	268.5 ± 23.2	265	265.2 ± 16.3	93	263.4 ± 22.7
4 +	51	295.6 ± 21.3	125	292.1 ± 16.0	96	290.3 ± 22.9
5 +	15	406.7 ± 40.2	7	376.1 ± 56.7	17	315.4 ± 39.1
6 +					2	387.0 ± 46.7

Table 4.14. Comparison of mean back-calculated lengths at annulus formation and mean annual condition factors for black crappie.

LENGTH AT ANNULUS FORMATION

Lake Washington, WA (Wydoski and Whitney 1979)	79	152	203	231	251	269	300	--
Lake St. Clair, WA (Wydoski and Whitney 1979)	--	--	236	249	269	--	--	--
Montana Lakes (Carlander 1977)	84	135	170	198	213	211	206	--
Montana Streams (Carlander 1977)	56	117	165	221	218	--	--	--
Oregon (28 waters) (Carlander 1977)	53	135	183	211	231	224	--	--
Minnesota Waters (Carlander 1977)	61	122	173	211	241	267	295	--
Box Canyon Reservoir Pend Oreille River, WA (Barber *et al.* 1989)	72	104	136	170	209	228	241	--
Box Canyon Reservoir (Barber *et al.* 1990)	74	109	142	168	180	207	226	237
Box Canyon Reservoir (Bennet *et al.* 1990)	67	119	162	186	200	--	--	--
Box Canyon Reservoir (present study)	62	93	130	156	173	183	178	188

CONDITION FACTORS

Location	Age Class	Mean Condition Factor		Range	Reference Cited
Chetek Lake, WI	--	K_{TL}	1.68	1.42-1.88	(Carlander 1977)
Minnesota Average	--	K_{TL}	--	1.22-1.50	(Carlander 1977)
Loon Lake, WA	--	K_{TL}	1.38	--	(Scholz *et al.* 1988)
Deer Lake, WA	--	K_{TL}	1.40	--	(Scholz *et al.* 1988)
Box Canyon Reservoir	--	K_{TL}	1.39	1.34-1.68	(Barber *et al.* 1989)
Box Canyon Reservoir	I-VIII	K_{TL}	1.36	1.21-1.42	(Barber *et al.* 1990)
Box Canyon Reservoir	I-VIII	K_{TL}	1.40	1.27-1.55	(present study)

Table 4.15. Comparison of mean weight (g ± standard deviation) and mean length (mm ± standard deviation) for each age class of black crappie in the Pend Oreille River from 1988 (Barber et *al*. 1989), 1989 (Barber et *al.* 1990) and 1990.

Age Class	N	Mean Weight 1988	N	Mean Weight 1989	N	Mean Weight 1990
0 +					1	3.0
1 +	3	3.7 ± 1.5	6	9.7 ± 6.9	19	7.5 ± 7.4
2 +	10	24.3 ± 6.5	4	23.5 ± 3.5	9	la.1 ± a.0
3 +	54	44.8 ± 16.1	55	60.1 ± 13.4	3	38.3 ± 15.0
4 +	35	88.6 ± 20.4	90	85.6 ± 19.2	6	81.7 ± 21.8
5 +	13	169.0 ± 29.1	10	82.4 ± 42.3	5	109.2 ± 5.1
6 +	2	231.5 ± 96.9	12	134.3 ± 27.8	9	124.3 ± 24.5
7 +	1	428	3	195.3 ± 81.0	3	116.3 ± 13.5
a+					2	104.5 ± 17.7

Age Class	N	Mean Length 1988	N	Mean Length 1989	N	Mean Length 1990
0 +					1	59.3
1 +	3	62.3 ± 10.5	6	86.6 ± 16.5	19	78.8 ± 22.4
2 +	10	121.3 ± 9.8	4	123.6 ± 4.3	9	107.0 ± 14.4
3 +	54	146.8 ± 17.7	55	163.3 ± 10.4	3	134.0 ± 15.9
4 +	35	183.1 ± 13.0	90	183.4 ± 13.6	6	182.4 ± 17.4
5 +	13	229.7 ± 10.2	10	175.7 ± 24.4	5	201.1 ± a.3
6 +	2	252.0 ± 38.2	12	212.6 ± 14.7	9	201.5 ± 14.3
7 +	1	294	3	236.3 ± 28.4	3	196.7 ± 7.2
8 +					2	193.5 ± 0.7

The mean lengths of brown trout at annulus formation were lower in 1990 than both 1988 and 1989 (Table 4.16). These differences are more than likely due to the smaller sample size. Pend Oreille River brown trout were smaller than at other locations in the United States at every annulus. The mean condition factor for brown trout in 1990 was similar to those recorded in 1988 and 1989, and still lower than at other locations in the western United States. Mean weights and lengths for each age class of brown trout captured in 1990 were more similar to those of 1988 than 1989 (Table 4.17).

The mean back-calculated lengths for cutthroat trout from the Pend Oreille River in 1990 were lower at every annulus when compared to 1988 and 1989 (Table 4.18). The condition factor for cutthroat trout in 1990 was also lower than in the two previous years of the study. As with the brown trout, this is probably due to sample size; the 1990 values were based on only 7 scale samples.

Back-calculated lengths for rainbow trout in 1990 were determined from only 9 scale samples, which accounts for the difference between the lengths reported in Table 4.19. The mean condition factor for 1990 was higher than those reported for 1988 and 1989, but still lower than most of those reported in other literature.

4.3.2 TRIBUTARIES

The mean back-calculated lengths for brown trout captured in the tributaries were similar for all three years of the study (Table 4.20). The brown trout from Cee Cee Ah and Skookum Creeks had the best growth rates when comparing the Pend Oreille tributaries. It appears that brown trout in Tacoma Creek (Table 4.20) have high growth rates. However, brown trout were only captured in Tacoma Creek during 1988 and the growth rates were determined from only 6 fish. Brown trout lengths from Pend Oreille River tributaries tended to be smaller at each annulus than those of other streams in the northwest.

Mean back-calculated lengths for brook trout captured in the tributaries in 1990 were generally lower at almost every annulus than lengths calculated in 1988 and 1989 (Table 4.21). The mean lengths were comparable between tributaries and tended to be comparable or larger than other streams in the northwest.

Table 4.16. Comparison of mean back-calculated lengths at annulus formation and mean annual condition factors for brown trout.

LENGTH AT ANNULUS FORMATION

	1	2	3	4	5	6	7	8	9
Average U.S. streams (Wydoski and Whitney 1979)	96	203	282	348	444	495	551	--	
Average U.S. lakes (Wydoski and Whitney 1979)	107	216	333	394	513	584	604	--	
Loon Lake, WA* (Scholz *et al.* 1988)	--	--	205	290	419	539	--	--	
Spokane River, WA (Baily and Saltes 1982)	89	196	274	368	419	470	--	--	
Chamokane Creek, WA (Uehara *et al.* 1988)	120	194	283	342	410	--	--	--	
Henry's Fork, ID (Brostrom and Spateholts 1985)	129	211	297	369	458	555	--	--	
Kootenai River, MT (May and Huston 1983)	104	216	295	365	--	--	--	--	
Box Canyon Reservoir Pend Oreille River, WA (Barber *et al.* 1989)	98	167	249	341	411	468	507	--	
Box Canyon Reservoir (Barber et al. 1990)	101	170	240	311	375	423	472	519	517
Box Canyon Reservoir (present study)	67	129	198	249	310	300	383	436	

*Based on mean annual total lengths.

CONDITION FACTORS

Location	Age Class	Mean Condition Factor		Range	Reference Cited
Montana Streams	I-V	K_{TL}	0.99	0.94-1.11	(Bishop 1955; Purkett 1951)
Missouri River, MT	II-V	K_{TL}	0.96	--	(Kathrein 1951)
Chamokane Creek, WA	I-V	K_{TL}	1.05	0.97-1.11	(Uehara *et al.* 1988)
Loon Lake, WA	II-V	K_{TL}	1.01	--	(Scholz *et al.* 1988)
Box Canyon Reservoir	I-VII	K_{TL}	0.95	0.78-1.09	(Barber *et al.* 1989)
Box Canyon Reservoir	I-IX	K_{TL}	0.90	0.87-1.04	(Barber *et al.* 1990)
Box Canyon Reservoir	I-VIII	K_{TL}	0.91	0.73-1.04	(present study)

Table 4.17. Comparison of mean weight (g ± standard deviation) and mean length (mm ± standard deviation) for each age class of brown trout in the Pend Oreille River from 1988 (Barber et *al.* 1989), 1989 (Barber et *al.* 1990) and 1990.

Age Class	N	Mean Weight 1988	N	Mean Weight 1989	N	Mean Weight 1990
0 +					5	5.6 ± 1.5
1 +	4	10.8 ± 8.5	18	19.1 ± 7.5	2	12.0 ± 1.4
2 +	13	43.0 ± 28.2	17	92.7 ± 35.9	5	41.0 ± 15.0
3 +	12	120.1 ± 50.8	27	193.5 ± 90.5	10	154.9 ± 115.0
4 +	8	438.4 ± 123.1	4	520.8 ± 112.6	17	228.2 ± 182.2
5 +	12	883.2 ± 278.9	3	876.7 ± 263.5	9	489.8 ± 442.6
6 +	13	1298.2 ± 227.5	7	1101.6 ± 110.9	1	228.0
7 +	18	1890.7 ± 480.1	8	1317.5 ± 532.4	0	
8 +					1	1218.0

Age Class	N	Mean Length 1988	N	Mean Length 1989	N	Mean Length 1990
0 +					5	90.0 ± 4.1
1 +	4	101.2 ± 25.8	18	128.8 ± 15.2	2	109.0 ± 5.7
2 +	13	164.7 ± 36.4	17	218.0 ± 36.2	5	170.3 ± 25.7
3 +	12	244.2 ± 33.5	27	271.5 ± 52.5	10	243.7 ± 62.1
4 +	8	366.1 ± 26.3	4	387.8 ± 15.4	17	278.4 ± 56.9
5 +	12	450.8 ± 29.2	3	479.9 ± 35.8	9	362.1 ± 97.5
6 +	13	497.4 ± 30.6	7	484.2 ± 40.9	1	283.0
7 +	18	555.0 ± 34.6	8	512.9 ± 51.1	0	
8 +					1	490.0

Table 4.18. Comparison of mean back-calculated lengths at annulus formation and mean annual condition factors for cutthroat trout.

	LENGTH AT ANNULUS FORMATION				
	1	2	3	4	5
Flathead Lake, MT (Leathe and Graham 1981)	57	109	173	247	--
North Fork Flathead River, MT (Fraley *et al.* 1981)	64	108	150	180	--
Priest Lake, ID (Wydoski and Whitney 1979)	81	135	211	300	--
Upper Priest Lake, ID (Carlander 1969)	94	142	216	292	--
Salmon River, ID (Carlander 1969)	107	150	213	279	--
Yellowstone Lake, WY (Wydoski and Whitney 1979)	46	130	224	312	--
Box Canyon Reservoir Pend Oreille River, WA (Barber *et al.* 1989)	102	176	239	287	--
Box Canyon Reservoir Pend Oreille River, WA (Barber et al. 1990)	87	141	222	290	324
Box Canyon Reservoir Pend Oreille River, WA (present study)	65	117	204	278	318

CONDITION FACTORS

Location	Age Class	Mean Condition Factor		Range	Reference Cited
W. Gallatin River, MT	--	K_{TL}	0.99	0.72-1.05	(Carlander 1969)
Pathfinder River, WY	--	K_{TL}	1.06	0.97-1.19	(Carlander 1969)
Salmon River, ID	--	K_{FL}	1.30	--	(Carlander 1969)
St. Joe River, ID	--	K_{FL}	1.09	--	(Carlander 1969)
Box Canyon Reservoir	II-V	K_{TL}	0.91	0.89-1.05	(Barber *et al.* 1989)
		K_{FL}	1.10	1.03-1.21	
Box Canyon Reservoir	I-V	K_{TL}	0.90	0.83-0.95	(Barber *et al.* 1990)
Box Canyon Reservoir	III-V	K_{TL}	0.74	0.77-1.04	(present study)

Table 4.19. Comparison of mean back-calculated lengths at annulus formation and mean annual condition factors for rainbow trout.

LENGTH AT ANNULUS FORMATION

	1	2	3	4	5	6
Sprague Lake, WA[1] (Willms et *al.* 1989)	179	328	468	544	--	--
Ross Lake, WA (Wydoski and Whitney 1979)	122	266	345	383	406	--
Pend Oreille Lake, ID (Pratt 1985)	78	170	334	460	510	--
Spokane River, ID (Bennett and Underwood 1987)	147	232	319	386	--	--
Snake River, ID (Wydoski and Whitney 1979)	130	262	351	467	488	- -
Kootanai River, MT (May and Huston 1983)	97	262	353	406	- -	- -
Box Canyon Reservoir Pend Oreille River, WA (Barber et *al.* 1989)	105	154	233	321	387	- -
Box Canyon Reservoir (Barber et *al.* 1990)	99	156	252	434	641	817
Box Canyon Reservoir (present study)	83	159	282	351	585	--

[1]Based on mean annual total lengths

CONDITION FACTORS

Location	Age Class	Mean Condition Factor		Range	Reference Cited
Sprague Lake, WA	I-III	K_{TL}	1.15	- -	(Willms et *al.* 1989)
Loon Lake, WA	I-V	K_{TL}	0.91	0.88-1 .07	(Scholz et *al.* 1988)
Deer Lake, WA	I-V	K_{TL}	1.07	1.04-1.11	(Scholz *et al.* 1988)
Chamokane Creek, WA	I-V	K_{TL}	1.04	1.00-1 .10	(Uehara *et al.*1988)
N. American Range	- -	K_{TL}	- -	1.00-1 .35	(Carlander 1969)
Box Canyon Reservoir	II,V	K_{TL}	0.90	0.86-1.03	(Barber et *al.* 1989)
Box Canyon Reservoir	I-VI	K_{TL}	0.91	0.84-0.99	(Barber *et al.* 1990)
Box Canyon Reservoir	II-V	K_{TL}	0.99	0.9-1 .36	(present study)

Table 4.20. Comparison of mean back-calculated lengths at annulus formation for Pend Oreille River tributary brown trout with other streams in the region.

		LENGTH AT ANNULUS FORMATION					
East River, Priest River Drainage (Horner et *al.* 1987)		80	118	138	--	--	--
Chamokane Creek, WA (Uehara *et al.* 1988)		104	195	285	373	424	686
Little Deschutes River, OR (Lorz 1974)		76	124	172	219	287	357
Lower Willow Creek, ID (Corsi 1984)		100	271	255	334	402	459
Robinson Creek, ID (Brostrum and Spateholts 1985)		107	171	245	295	318	321
Wyoming Creek, ID (Brostrum and Spateholts 1985)		115	212	269	--	--	--
LeClerc Creek							
(Barber et *al.* 1989)	1988	78	141	206	271	--	--
(Barber et *al.* 1990)	1989	72	132	225	300	392	--
(present study)	1990	77	134	180	193	298	--
Ruby Creek							
(present study)	1990	78	125	183	--	--	--
Cee Cee Ah Creek							
(Barber et *al.* 1989)	1988	81	135	198	251	--	--
(Barber et *al.* 1990)	1989	68	121	177	240	--	--
(present study)	1990	82	122	171	--	--	--
Tacoma Creek							
(Barber et *al.* 1989)	1988	93	164	212	--	--	--
Skookum Creek							
(Barber et *al.* 1989)	1988	80	132	192	264	--	--
(Barber et *al.* 1990)	1989	77	134	179	205	219	--
(present study)	1990		133	182	215	--	--

Table 4.21. Comparison of mean back-calculated lengths at annulus formation for Pend Oreille River tributary brook trout with other streams in the region.

		LENGTH AT ANNULUS FORMATION		
East River, Priest River Drainage (Horner *et al.* 1987)		84	124	158
Big Creek, Pend Oreille Drainage (Horner *et al.* 1987)		83	122	171
Dinarch Creek, Priest River Drainage, (Horner et *al.* 1987)		84	121	152
LeClerc Creek				
(Barber et *al.* 1989)	1988	89	121	188
(present study)	1989	88	140	202
(present study)	1990	66	141	194
Ruby Creek				
(Barber et *al.* 1989)	1988	88	147	--
(Barber *et al.* 1990)	1989	84	130	181
(present study)	1990	81	124	157
Cee Cee Ah Creek				
(Barber et *al.* 1989)	1988	92	134	195
(Barber *et al.* 1990)	1989	87	144	--
(present study)	1990	81	114	152
Tacoma Creek				
(Barber *et al.* 1989)	1988	80	122	198
(Barber et al. 1990)	1989	80	129	--
(present study)	1990	73	117	--
Skookum Creek				
(Barber et *al.* 1989)	1988	86	128	199
(Barber et al. 1990)	1989	89	137	154
(present study)	1990	68		157

Cutthroat growth in the Pend Oreille River tributaries was similar for all three years of the study (Table 4.22). In relation to other streams in the Pacific Northwest, cutthroat growth in Pend Oreille tributaries was better than any other recorded in literature.

4.4 FOOD AVAILABILITY IN THE RIVER, SLOUGHS, AND TRIBUTARIES

4.4.1 BENTHIC MACROINVERTEBRATE DENSITIES IN THE RIVER AND SLOUGHS

Mean annual densities of benthic macroinvertebrates collected from the Pend Oreille River during 1990 were less at virtually every site than densities in 1988 and 1989 (Table 4.23). The mean density for all sites combined was 6,677 organisms/m^2 in 1990 compared to 8,343 organisms/m2 in 1988, and 13,758 organisms/m^2 in 1989. It is believed that the greater macroinvertebrate densities in 1989 over 1988 were partly due to changes in the sampling scheme. Two of the three benthic samples were collected from the littoral zone in 1989, instead of the limnetic zone, as in 1988. This change was made since fish predominantly are found in the littoral areas. It is also possible that the drawdown of the reservoir in May of 1988, resulted in reduced populations of invertebrates as several sloughs and most of the littoral areas were dewatered. Also during this time the reservoir was more riverine and the higher water velocities may have caused increased drifting of benthic macroinvertebrates. The sampling scheme in 1990 was the same as that used in 1989, however half the amount of samples were collected during the latter year. It's possible that the lower densities in 1990 were due to a smaller sample size. In addition, the abnormally high flows and water levels in 1990 flooded land that was not submerged in 1988 and 1989. Possibly, samples that were collected in July and September when water levels were higher than normal were taken in areas that had not yet been colonized by benthic invertebrates.

Chironomidae larvae was the most abundant organism collected in benthic samples during all three years of the study (Table 4.24). Oligochaeta, Talitridae, and Sphaeriidae were also prominent organisms in the benthos during the study. Benthic macroinvertebrate densities in the Pend Oreille River were comparable to densities from similar systems in the Pacific Northwest (Table 4.25).

Table 4.22. Comparison of mean back-calculated lengths at annulus formation for Pend Oreille River tributary cutthroat trout with other streams in the region.

		LENGTH AT ANNULUS FORMATION					
North Fork Flathead Tributaries (Fraley *et al.* 1981)		54	96	135	166	202	--
Middle Fork Flathead Tributaries (Fraley et *al.* 1981)		51	95	139	193	251	--
East River, Priest River Drainage (Horner et *al.* 1987)		95	136	171	--	--	--
Big. Creek, Priest River Drainage (Horner et al. 1987)		81	121	154	177	--	--
Kelly Creek, ID (Johnson and Bjornn 1978)		66	101	153	212	251	305
Upper St. Joe River, ID (Johnson and Bjornn 1978)		67	104	161	222	287	307
Salmon River, ID (Mallet 1963)		57	95	165	241	305	352
Skookum Creek							
(Barber et *al.* 1990)	1989	101	136	--	--	--	--
(present study)	1990	96	140	--	--	--	--
Cee Cee Ah Creek							
(Barber *et al.* 1989)	1988	96	135	--	--	--	--
(Barber *et al.* 1990)	1989	95	134	--	--	--	--
(present study)	1990	85	121	--	--	--	--
Tacoma Creek							
(Barber et *al.* 1989)	1988	113	170	233	276	--	--
(Barber et al. 1990)	1989	101	140	182	--	--	--
(present study)	1990	103	--	--	--	--	--
LeClerc Creek							
(Barber et al. 1990)	1989	93	137	178	--	--	--
(present study)	1990	91	131	209	--	--	--
Ruby Creek							
(Barber et *al.* 1989)	1988	97	157	--	--	--	--
(present study)	1990	104	158	223	--	--	--

Table 4.23. Comparison of mean annual densities of benthic macroinvertebrates (#/m^2) collected from study sites on the Pend Oreille River during 1988, 1989 and 1990. Number of samples enclosed in parentheses.

STUDY SITE	1988		1989		1990	
1	4,508	(11)	7,568	(18)	5,892	(9)
2	9,191	(9)	5,715	(18)	3,084	(9)
3	5,124	(14)	16,773	(18)	15,263	(9)
4	10,775	(13)	13,828	(18)	4,570	(9)
5	12,499	(15)	16,489	(18)	5,096	(9)
6	5,709	(14)	24,005	(18)	4,843	(9)
7	17,234	(13)	14,763	(18)	12,621	(9)
8	9,976	(14)	11,835	(18)	11,363	(9)
9	9,353	(15)	9,852	(18)	4,132	(9)
10	4,576	(14)	19,463	(18)	4,005	(7)
11	8,013	(8)	11,049	(18)	2,580	(9)
All sites combined	8,343	(140)	13,758	(198)	6,677	(97)

Table 4.24. Comparison of the top benthic macroinvertebrates, by percent abundance, from samples collected from the Pend Oreille River during 1988, 1989 and 1990.

1988		1989	
Chironomidae larvae	32.3	Chironomidae larvae	23.4
Oligochaeta	31.1	Talitridae	14.6
Sphaeriidae	7.8	Oligochaeta	12.1
Talitridae	2.4	Sphaeriidae	8.5

1990	
Chironomidae larvae	39.2
Talitridae	25.6
Oligochaeta	9.9
Planorbidae	6.4

Table 4.25. Comparison of benthic macroinvertebrate densities and diversity indices from the Pend Oreille River with other reservoirs and rivers in the region.

Location	Density #/m[2]	)iversity	Sampling Device	Reference
Kootenai River, MT				
Dunn Creek Station	28,112	1.64	Hess	(Perry and Huston 1983)
Elkhorn Station	18,486	2.38	Hess	(Perry and Huston 1983)
Pipe Creek Station	19,606	2.44	Kicknet	(Perry and Huston 1983)
Fisher River, MT	10,676	3.6	Hess	(Perry and Huston 1983)
Lake Roosevelt, WA				
Sanpoil Station	3,241	- -	Unknown	(Beckman et *al.* 1985)
Porcupine Bay Station	5,897	- -	Unknown	(Beckman et *al.* 1985)
Gifford Station	6,302	- -	Unknown	(Beckman *et al.* 1985)
Colville Station	9,352	- -	Unknown	(Beckman et *al.* 1985)
Flathead River, MT	6,412	3.05	Kicknet	(Perry and Graham 1982)
Libby Reservoir, MT				
Tenmile Area	639	- -	Peterson	(Chisholm and Fraley 1985)
Rexford Area	1,074	- -	Peterson	(Chisholm and Fraley 1985)
Pend Oreille River, WA	8,343	3.072	Ponar	(Barber et *al.* 1989)
Pend Oreille River, WA	13,758	- -	Ponar	(Barber et *al.* 1990)
Pend Oreille River, WA	6.677	- -	Ponar	(Present study)

Mean densities of benthic macroinvertebrates collected from sloughs of the Pend Oreille River during 1990 were less than densities recorded in 1988 and 1989 (Table 4.26). Again, this may be owing to the smaller sample size and the differences in water levels during the year. Also, the macrophyte abundance was so great in September that samples were not collected from study site 5A and 6A. Invertebrate densities are typically greater in the fall than any other time during the year; an exclusion of these samples may have decreased the annual mean densities. Chironomidae larvae, Oligochaeta, and Planorbidae composed a major percent of the invertebrates collected from the sloughs at every site during all three years (Table 4.27).

4.4.2 BENTHIC MACROINVERTEBRATE DENSITIES IN THE TRIBUTARIES AND INVERTEBRATE ABUNDANCE IN THE DRIFT

Benthic macroinvertebrate densities were lower in 1990 than in 1988 and 1989 for all five of the Pend Oreille tributaries sampled (Table 4.28). These lower densities may be due to the smaller sample sizes, and to the extreme runoff condition of the tributaries during the fall sampling. In September when the fall samples were collected the flow in the tributaries was similar to that of spring runoff. For this reason it was difficult, and in some cases impossible, to obtain benthic samples from the creeks. Despite the low densities, the percent abundance of the most prevalent invertebrates in 1990 was very similar to the most prevalent invertebrate abundance of 1988 and 1989 (Table 4.29). When compared with other streams in the region the benthic macroinvertebrate densities tended to be low (Table 4.30).

Densities of macroinvertebrates collected in drift samples in the Pend Oreille tributaries were substantially lower in 1990, when compared with 1988 and 1989 (Table 4.31). The only tributary that was comparable in respect to drift densities throughout the three years of the study was Cee Cee Ah Creek. These lower densities again may be a result of the smaller sample size and the high flows observed during fall sampling. When samples were collected in September, it was often hard to keep the samplers in place against the force of the current. At some sites, water depth and current strength made it impossible to collect samples from the main channel of the tributary. Drift nets were set along side the stream as far into the current as possible, however, in some cases these

Table 4.26. Comparison of mean annual densities of benthic macroinvertebrates (#/m^2) collected from sloughs of the Pend Oreille River during 1988, 1989 and 1990. Number of samples enclosed in parentheses.

STUDY SITE	1988	1989	1990
3A	7,276 (14)	8,387 (15)	4,886 (8)
4A	6,415 (11)	22,642 (15)	7,612 (8)
5A	13,354 (15)	29,006 (15)	3,933 (5)
6A	12,095 (11)	38,629 (15)	9,985 (5)

Table 4.27. Comparison of the top benthic macroinvertebrates, by percent abundance, found in the sloughs of the Pend Oreille River during 1988, 1989 and 1990.

1988		1989		1990	
SITE 3A					
Oligochaeta	62.9	Chironomidae larvae	29.8	Chironomidae larvae	54.1
Chironomidae larvae	10.9	Oligochaeta	22.5	Planorbidae	14.2
Planariidae	8.5	Talitridae	8.7	Oligochaeta	9.9
SITE 4A					
Chironomidae larvae	30.6	Chironomidae larvae	27.4	Chirnomidae larvae	32.8
Planorbidae	28.9	Oligochaeta	25.2	Planorbidae	20.9
Oligochaeta	21.6	Nematoda	8.9	Oligochaeta	16.0
SITE 5A					
Oligochaeta	34.4	Nematoda	37.3	Planorbidae	28.8
Chironomidae larvae	24.8	Chironomidae larvae	27.6	Chironomidae larvae	27.2
Ceratopogonidae	9.3	Oligochaeta	12.2	Oligochaeta	10.4
SITE 6A					
Oligochaeta	37.9	Talitridae	21.5	Chironomidae larvae	51.7
Planorbidae	15.5	Tricorythidae	17.7	Talitridae	16.4
Chironomidae larvae	13.3	Chironomidae larvae	14.4	Tricorythidae	10.8

Table 4.28. Comparison of mean annual densities of bent hic macroinvertebrates ($\#/m^2$) collected from tributaries of the Pend Oreille River during 1988, 1989 and 1990. Number of samples enclosed in parentheses.

STUDY SITE	1988		1989		1990	
LeClerc Creek	4823	(17)	4453	(20)	1,490	(8)
Ruby Creek	- -	- -	1,738	(20)	857	(10)
Cee Cee Ah Creek	5921	(17)	3343	(23)	2,193	(12)
Tacoma Creek	4907	(13)	3608	(9)	1,320	(4)
Skookum Creek	4972	(14)	4658	(24)	1,668	(12)

Table 4.29. Comparison of the top benthic macroinvertebrates, by percent abundance, from samples collected from the Pend Oreille River during 1988, 1989 and 1990.

1988		1989		1990	
		LECLERC CREEK			
Chironomidae larvae	15.9	Chironomidae larvae	31.4	Chironomidae larvae	52.2
Baetidae	15.3	Baetidae	27.3	Elmidae larvae	9.4
Naididae	14.8	Ephemerellidae	7.2	Beatidae	7.8
		RUBY CREEK			
		Chironomidae larvae	18.9	Sphaeriidae	32.8
No samples collected		Elmidae larvae	12.8	Chironomidae larvae	13.8
		Baetidae	12.1	Elmidae larvae	11.6
		CEE CEE AH CREEK			
Elmidae larvae	20.2	Chironomidae larvae	30.3	Chironomidae larvae	22.9
Chironomidae larvae	15.8	Baetidae	17.6	Sphaeriidae	21.1
Heptageniidae	14.6	Elmidae	11.8	Baetidae	11.2
Baetidae	11.5	Heptageniidae	7.2	Elmidae larvae	10.7
		TACOMA CREEK			
Chironomidae larvae	26.7	Elmidae larvae	25.0	Elmidae larvae	25.8
Elmidae larvae	18.6	Baetidae	21.9	Baetidae	22.7
Baetidae	9.7	Brachycentridae	8.3	Brachycentridae	10.8
		SKOOKUM CREEK			
Chironomidae larvae	25.1	Baetidae	14.9	Baetidae	29.9
Baetidae	9.8	Heptageniidae	12.7	Ephemerellidae	13.0
Heptageniidae	8.9	Chironomidae larvae	12.2	Lumbriculidae	11.2

Table 4.30. Comparison of benthic macroinvertebrate densities and diversity indices from the Pend Oreille tributaries with other streams of similar stream order.

Location	Stream Order	Density #/m^2	Diversity	Sampling Device	Reference
Firehole River, WY	- -	940	- -	Hess	(Armitage 1958)
Chamokane Creek, WA	3	53,569	3.27	Hess	(O'Laughlin 1988)
Upper Blue Creek, WA	2	18,122	3.6	Hess	(Cairns et al.1 988)
Middle Blue Creek, WA	2	2,738	2.83	Hess	(Cairns et al.1 988)
Lower Blue Creek, WA	2	7,879	3.23	Hess	(Cairns et al.1 988)
Oyachen Creek, WA	1	5,010	3.1	l-less	(Cairns et al.1 988)
Mink Creek, ID (1968)	3	6,900	- -	Hess	(Minshall 1981)
Mink Creek, ID (1969)	3	21,000	3.7	Hess	(Minshall 1981)
Strawberry River, UT	- -	8,800	- -	Basket	(Payne 1979)
LeClerc Creek, WA	3	4,823	3.644	Hess	(Barber et *a/.* 1989)
		4,453	- -	Hess	(Barber et *al.* 1990)
		1,490	- -	Hess	(Present study)
Ruby Creek, WA	3	1,738	- -	Hess	(Barber *et al.* 1990)
		857	- -	Hess	(Present study)
Cee Cee Ah Creek, WA	2	5,921	3.683	Hess	(Barber et *a/.* 1989)
		3,343	- -	Hess	(Barber et *a/.* 1990)
		2,193	- -	Hess	(Present study)
Tacoma Creek, WA	3	4,907	3.476	Hess	(Barber et *al.* 1989)
		3,608	-	Hess	(Barber et *al.* 1990)
		1,320	- -	Hess	(Present study)
Skookum Creek, WA	1	4,972	3.908	Hess	(Barber et *al.* 1989)
		4,658	-	Hess	(Barber *et a/.* 1990)
		1,668	- -	Hess	(Present study)

areas were backwater areas. Percent composition of major invertebrate families in the drift of each tributary was generally the same for both years, except in Ruby and Tacoma Creeks (Table 4.32). Drift densities for other streams in the region were not found in the literature so no comparisons were made.

It is believed that the densities of macroinvertebrates collected from the tributaries during 1989 were the most reliable of the three study years; conditions in the tributaries and sampling techniques were most consistent that year. These densities were considered low and possibly limit the potential for improving trout populations. The poor growth of the brown trout (Table 4.20) may be attributed to these low invertebrate densities. Most of the Pend Oreille tributaries are high gradient, low order streams which are typically unproductive.

4.4.3 ZOOPLANKTON

Cladocera and copepod densities from mid-channel samples during April and July of 1990 were less than samples collected during those two months of 1988 and 1989 (Table 4.33). Densities in samples collected in September of 1990 were higher than those for the same month in 1989 but lower than in 1988. The mean annual cladocera and copepoda density in 1990 was 12.8 organisms/liter, compared to 35.6 and 19.8 organisms/liter in 1988 and 1989, respectively. Reasons for the lower density in 1990 may be attributed to the fewer number of samples taken and also the higher than average flow observed in the river in 1990 (Figure 4.1). These increased flows may have flushed the zooplankton in the mid-channel of the reservoir through the system.

Densities of cladocerans and copepods in littoral samples taken in 1989 and 1990 were almost identical (Table 4.33). Again fewer samples were collected from the littoral zone in 1990, which adds weight to the theory that the mid-channel zooplankton densities were affected by the increased flow of the reservoir.

Densities of cladocerans in the mid-channel zooplankton samples decreased from a high in 1988 of 8.38 cladocera/liter to a low in 1990 of 3.42 cladocera/liter (Table 4.34). Copepods decreased in the same manner, from a high of 27.05 copepods/liter in 1988 to a low of 9.33 copepods/liter in 1990. Rotifers were not enumerated in 1990, so it is not known if they increased or

Table 4.31. Comparison of mean annual densities of macroinvertebrates (#/100 m^3) collected from drift samples in tributaries of the Pend Oreille River during 1988, 1989 and 1990. Number of samples enclosed in parentheses.

STUDY SITE	1988		1989		1990	
LeClerc Creek	126	(12)	127	(12)	19	(8)
Ruby Creek	- -	- -	420	(22)	50	(10)
Cee Cee Ah Creek	68	(12)	103	(24)	62	(12)
Tacoma Creek	111	(8)	158	(10)	10	(4)
Skookum Creek	282	(10)	97	(24)	32	(12)

Table 4.32. Comparison of the top invertebrates, by percent composition, in drift samples collected in tributaries of the Pend Oreille River during 1988 and 1989.

1988		1989		1990	
LECLERC CREEK					
Chironomidae larvae	16.7	Baetidae	23.7	Chironomidae pupae	18.9
Baetidae	8.8	Chironomidae larvae	15.7	Chironomidae larvae	16.3
Nemouridae	8.8	Chironomidae pupae	13.5	Elmidae larvae	15.9
RUBY CREEK					
		Nemouridae	29.9	Chironomidae larvae	29.9
No samples collected		Baetidae	23.0	Sphaeriidae	18.1
		Simuliidae pupae	9.2	Chironomidae pupae	10.3
CEE CEE AH CREEK					
Chironomidae larvae	10.0	Chironomidae larvae	16.2	Chironomidae larvae	74.2
Brachycentridae	9.6	Nematoda	10.9	Chironomidae pupae	4.5
Elmidae larvae	9.1	Baetidae	9.3	Sphaeriidae	4.5
TACOMA CREEK					
Elmidae adult	24.7	Chironomidae larvae	18.6	Baetidae	31.1
Chironomidae pupae	17.6	Brachycentridae	18.2	Elmidae larvae	15.4
Elmidae larvae	9.2	Ephemerellidae	10.8	Lumbriculidae	14.7
SKOOKUM CREEK					
Chironomidae larvae	63.0	Baetidae	25.4	Baetidae	37.6
Baetidae	10.2	Chironomidae larvae	15.1	Chironomidae larvae	17.3
Chronomidae pupae	5.7	Chironomidae pupae	11.3	Chironomidae pupae	9.5

Table 4.33. Comparison of cladocera and copepoda density (organisms/liter) in samples collected from mid-channel and littoral sites of the Pend Oreille River in 1988, 1989, and 1990.

	1988 Mid-channel	1989 Mid-channel	1990 Mid-channel
MARCH	--	8	--
APRIL	27	27	5
JUNE	48	33	--
JULY	50	33	20
SEPTEMBER	31	9	12
OCTOBER	22	9	--
ANNUAL MEAN	35.6	19.8	12.8

	1988 Littoral	1989 Littoral	1990 Littoral
MARCH	No samples collected from the littoral area in 1988	16	--
APRIL		39	22
JUNE		55	--
JULY		95	69
SEPTEMBER		47	52
OCTOBER		32	--
ANNUAL MEAN		47.3	47.7

Table 4.34. Comparison of the densities of major zooplankton taxa (organisms/liter) in samples collected from mid-channel and littoral sites of the Pend Oreille River 1988, 1989 and 1990.

	1988 Mid-channel	1989 Mid-channel	1990 Mid-channel
CLADOCERA	8.38	4.58	3.42
COPEPODA	27.05	16.93	9.33
ROTIFERA	85.11	89.95	*
TOTAL	120.54	112.23	12.75*

	1988 Littoral	1989 Littoral	1990 Littoral
CLADOCERA	No samples collected in 1988	20.34	15.64
COPEPODA		27.20	32.01
ROTIFERA		72.94	*
TOTAL		120.48	47.65*

* Rotifers were not enumerated in 1990

decreased. Zooplankton samples from littoral areas showed a decrease of cladoceran densities in 1990.

Total biomass for cladocerans in the mid-channel of the Pend Oreille River was 10.4 μg/l in 1990, a decrease from 22.9 μg/l in 1988 and 11.3 μg/l in 1989 (Table 4.35). Biomass of cladocerans in the littoral samples was also lower in 1990, at 25.1 μg/l, compared to 35.8 μg/l in 1989 (Table 4.35). It's possible that these lower cladoceran biomass values were also due to the increased flow regime of the river in 1990. At higher flows, zooplankton densities in the river would reflect the density and biomass of zooplankton in Lake Pend Oreille, which was very low (Bowles et *al.* 1989).

A comparison of the densities of cladocerans and copepods found in lakes and reservoirs in the region with the mean number found in the Pend Oreille River can be found in Table 4.36. Densities in 1988 and 1989 from the Pend Oreille River were about average in comparison to other lakes and reservoirs in the region. Densities observed in 1990, however, tended to be lower-than densities from most locations.

4.5 RIVER AND SLOUGH FISH FEEDING HABITS

In 1990, zooplankton were more important in the yellow perch diet than macroinvertebrates (Table 4.37). During this year both the cladoceran densities and the macroinvertebrate densities were lower than in 1989 and in 1988 (Table 4.22 and Table 4.32). This may be attributed to lower benthic macroinvertebrate densities and higher water levels in 1990 which increased zooplankton availability within the water column allowing for greater utilization by yellow perch in 1990. There were no major changes in the diet of largemouth bass (Table 4.38) or mountain whitefish (Table 4.39), although both species relied more heavily on Daphnidae in 1990 instead of Chydoridae. Zooplankton were more important to black crappie (Table 4.40) relative to macroinvertebrates in 1990. This again may be attributed to the lower invertebrate densities in 1990. Brown trout fed primarily on benthic organisms during 1988, 1989, and 1990 (Table 4.41).

Changes in diet overlaps occurred between several species of fish found in the Pend Oreille River (Table 4.42). Most of the overlap changes were either from low or moderate in 1989 to high in 1990. In general the high diet overlaps were the result of many species of fish utilizing, to a high degree, Chironomidae larvae and Daphnidae.

Table 4.35. Comparison of total cladoceran biomass ($\mu g/l$) in samples collected from mid-channel, in 1988, 1989 and 1990 of the Pend Oreille River.

	1988 Mid-channel	1989 Mid-channel	1990 Mid-channel
April	5.8	2.8	0.7
June	20.7	13.7	--
July	53.3	22.7	11.2
September	12.7	11.6	19.4
October	22.1	5.9	--
Mean	22.9	11.3	10.4

	1988 Littoral	1989 Littoral	1990 Littoral
April	No samples collected from the littoral area in 1988	2.5	3.8
June		34.5	--
July		110.2	37.2
September		24.4	34.4
October		7.5	--
Mean		35.8	25.1

Table 4.36. Comparison of zooplankton densities from the Pend Oreille River with other lakes and reservoirs in the region.

Location	Cladocera Mean #/l	Copepoda Mean #/l	Sampling Device	Reference Cited
Coeur d'Alene Lake, ID	10.76	56.36	Miller	(Minter 1971)
Coeur d'Alene River Delta	10.46	46.03	Miller	(Minter 1971)
Libby Reservoir, MT				
Tenmile Area	3.69	10.35	Wisconsin	(Chisholm and Fraley 1985)
Rexford Area	3.6	8.96	Wisconsin	(Chisholm and Fraley 1985)
Canada Area	4.23	4.05	Wisconsin	(Chisholm and Fraley 1985)
Flathead Lake, MT	3.73	7.17	Wisconsin	(Beattie *et al.* 1985)
Lake Roosevelt, WA	6.87	8.66	Clarke-Bumpus	(Beckman *et al.* 1985)
Lake Roosevelt, WA				
Kettle Falls	3.98	0.80	Clarke-Bumpus	(Peone *et al.* 1990)
Gifford	5.12	1.20	Clarke-Bumpus	(Peone *et al.* 1990)
Hunters	7.12	0.88	Clarke-Bumpus	(Peone *et al.* 1990)
Porcupine Bay	12.13	15.20	Clarke-Bumpus	(Peone *et al.* 1990)
Little Falls	2.96	9.65	Clarke-Bumpus	(Peone *et al.* 1990)
Seven Bays	3.40	5.74	Clarke-Bumpus	(Peone *et al.* 1990)
Keller Ferry	0.96	8.32	Clarke-Bumpus	(Peone *et al.* 1990)
San Poil	2.29	9.24	Clarke-Bumpus	(Peone *et al.* 1990)
Spring Canyon	1.63	6.28	Clarke-Bumpus	(Peone *et al.* 1990)
Pend Oreille Lake, ID (1974)	8.8	18.45	Miller	(Reiman 1976)
Pend Oreille Lake, ID (1975)	6.02	6.53	Miller	(Reiman 1976)
Pend Oreille Lake, ID (1978)	1.71	13.96	Miller	(Reiman and Bowler 1980)
Pend Oreille Lake, ID (1985)	1.00	13.00	Miller	(Bowles *et al.* 1989)
Pend Oreille Lake, ID (1986)	1.26	12.92	Miller	(Bowles *et al.* 1989)
Pend Oreille Lake, ID (1987)	1.67	14.83	Miller	(Bowles *et al.* 1989)
Pend Oreille Lake, ID (1988)	1.00	21.67	Miller	(Bowles *et al.* 1989)
Pend Oreille River, WA	8.38	27.05	Wisconsin	(Barber *et al.* 1989)
Pend Oreille River, WA	4.58	15.38	Wisconsin	(Barber *et al.* 1990)
Pend Oreille River, WA	3.42	9.33	Wisconsin	(Present study)

Table 4.37. Comparison of prey items with the highest Index of Relative Importance (IRI) values for yellow perch (for all age classes combined) in the Pend Oreille River in 1988, 1989 and 1990.

1988	N=565	1989	N=609	1990	N=158
Prey item		Prey item		Prey item	
Chydoridae	9.9	Chironomidae larvae	16.5	Daphnidae	20.9
Daphnidae	9.3	Baetidae	14.2	Chironomidae larvae	11.5
Chironomidae larvae	8.4	Daphnidae	9.5	Chydoridae	11.0
Baetidae	8.0	Chironomidae pupae	8.4	Chironomidae pupae	8.9
Planorbidae	6.7	Chydoridae	6.7	Talitridae	8.2

Table 4.38. Comparison of prey items with the highest Index of Relative Importance (IRI) values for largemouth bass (for all age classes combined) in the Pend Oreille River in 1988, 1989 and 1990.

1988	N=321	1989	N=336	1990	N=99
Prey item		Prey item		Prey item	
Osteichthyes	59.0	Osteichthyes	54.7	Osteichthyes	68.7
Baetidae	8.5	Baetidae	14.6	Daphnidae	8.2
Chydoridae	6.2	Chydoridae	4.6	Baetidae	5.3
Chironomidae pupae	4.3	Chironomidae larvae	4.6	Chironomidae larvae	3.9
Daphnidae	4.0	Coenagrionidae	4.6	Coenagrionidae	3.3

Table 4.39. Comparison of prey items with the highest Index of Relative Importance (IRI) values for mountain whitefish (for all age classes combined) in the Pend Oreille River in 1988, 1989 and 1990.

1988	N=208	1989	N=279	1990	N=100
Prey item		Prey item		Prey item	
Chironomidae larvae	42.5	Chironomidae larvae	37.8	Chironomidae larvae	28.6
Chironomidae pupae	13.0	Hydroptilidae	11.1	Chironomidae pupae	14.7
Coenagrionidae	6.1	Chironomidae pupae	6.8	Daphnidae	13.2
Hydracarina	4.8	Simuliidae larvae	5.8	Simuliidae larvae	8.4
Hydroptilidae	4.1	Chydoridae	5.0	Hydroptilidae	6.7

Table 4.40. Comparison of prey items with the highest Index of Relative Importance (IRI) values for black crappie (for all age classes combined) in the Pend Oreille River in 1988, 1989 and 1990.

1988	N=103	1989	N=82	1990	N=36
Prey item		Prey item		Prey item	
Daphnidae	28.8	Chironomidae larvae	16.3	Daphnidae	32.3
Chydoridae	8.9	Cyclopoida	14.0	Chironomidae larvae	12.9
Cyclopoida	8.7	Ceratopogonidae	13.0	Cyclopoida	9.1
Chironomidae larvae	7.7	Chironomidae pupae	11.4	Ostracoda	7.1
Chironomidae pupae	7.5	Chydoridae	10.7	Talitridae	6.0

Table 4.41. Comparison of prey items with the highest Index of Relative Importance (IRI) values for brown trout (for all age classes combined) in the Pend Oreille River in 1988, 1989 and 1990.

1988	N=28	1989	N=18	1990	N=13
Prey item		Prey item		Prey item	
Baetidae	18.9	Coenagrionidae	21.3	Chironomidae pupae	36.9
Elmidae	14.7	Chironomidae pupae	20.1	Chironomidae larvae	211
Chironomidae	11.9	Ephemerellidae	20.0	Baetidae	17.6
Terrestrial insects	9.6	Baetidae	10.8	Osteichthyes	5.4
Coenagrionidae	8.9	Oligochaeta	7.6	Coenagrionidae	3.8

Table 4.43. Comparison of mean annual Index of Relative Importance values for top three prey items consumed by fish species in LeClerc Creek, WA.

Brook trout					
1988 (n=35)		1989 (n=74)		1990 (n=22)	
Prey item	IRI	Prey item	IRI	Prey item	IRI
Chironomidae larvae	17.9	Limnephilidae	15.9	Elmidae larvae	19.8
Limnephilidae	17.4	Formicidae	8.5	Brachycentridae	14.4
Brachycentridae	14.9	Brachycentridae	6.8	Lepidoptera	7.6
Brown trout					
1988 (n=32)		1989(n=54)		1990(n=15)	
Prey item	IRI	Prey item	IRI	Prey item	IRI
Limnephilidae	12.7	Limnephilidae	38.7	Brachycentridae	21.3
Ephemereliidae	10.3	Brachycentridae	7.5	Baetidae	12.8
Brachycentridae	7.9	Formicidae	6.4	Rhyachophilidae	10.3
Cutthroat trout					
1988 (n=1)		1989 (n=9)		1990 (n=6)	
Prey item	IRI	Prey item	IRI	Prey item	IRI
Empididae adult	7.4	Baetidae	22.9	Brachycentridae	17.0
Formicidae	7.1	Brachycentridae	7.6	Chironomidae larvae	15.0
Ephemerellidae	6.4	Limnephilidae	6.5	Baetidae	12.4

Electivities were similar for 1988, 1989, and 1990. Most fish species were opportunistic in their consumption of benthic organisms, but several species of fish selected for zooplankton.

4.6 TRIBUTARY FISH FEEDING HABITS

Comparison of mean annual index of relative importance (IRI) values for LeClerc Creek, Ruby Creek, Cee Cee Ah Creek, Tacoma Creek, and Skookum Creek are listed in Tables 4.43 through 4.47. All species within the five tributaries exhibited a high degree of variation in the individual diet components. In general, Limnephilidae, Brachycentridae, Chironomidae larvae, Baetidae, Formicidae, and Elmidae larvae were the primary contributors to the diet of fish in the five tributaries.

Table 4.48 summarizes the diet overlaps between fish species in the tributaries of the Pend Oreille River. Brown trout and brook trout exhibited moderate to high overlaps in all tributaries, except in Cee Cee Ah Creek during 1990. The high overlaps between brown trout and brook trout are of little concern since they tend to be spatially segregated within the stream. Brook trout and cutthroat trout diet overlaps ranged from low to moderate in all tributaries for all three years of the study. Cutthroat trout and rainbow trout had high overlaps for 1989 and 1990 in Ruby Creek. This is probably the result of both species utilizing to a high degree Formicidae which comprised 59% of the prey item in 1990 and 100% of the prey item in 1989. Mountain whitefish had low to moderate overlaps with all salmonid species found in the tributaries.

The primary prey items selected by salmonids in the tributaries during 1988, 1989, and 1990 are listed in Tables 4.49 through 4.53. Limnephilidae was the prey item with highest electivities in 1988 and 1989, while Formicidae and Baetidae had the highest electivities in 1990. Since it was not possible to determine whether fish were selecting aquatic prey items from the water column or the bottom, electivities were computed using invertebrate percentages from both the drift and benthos. Normally, with few exceptions, the primary prey item for both benthos and drift were the same.

According to Waters (1972) trout tend to feed heavier on aquatic invertebrates with higher drift tendencies such as Ephemeroptera, Simuliidae, Trichoptera, and Plecoptera. All primary aquatic prey items selected by trout in Pend Oreille River

Table 4.43. Comparison of mean annual Index of Relative Importance values for top three prey items consumed by fish species in LeClerc Creek, WA.

Brook trout					
1988 (n=35)		1989 (n=74)		1990 (n=22)	
Prey item	IRI	Prey item	IRI	Prey item	IRI
Chironomidae larvae	17.9	Limnephilidae	15.9	Elmidae larvae	19.8
Limnephilidae	17.4	Formicidae	8.5	Brachycentridae	14.4
Brachycentridae	14.9	Brachycentridae	6.8	Lepidoptera	7.6
Brown trout					
1988 (n=32)		1989(n=54)		1990(n=15)	
Prey item	IRI	Prey item	IRI	Prey item	IRI
Limnephilidae	12.7	Limnephilidae	38.7	Brachycentridae	21.3
Ephemerellidae	10.3	Brachycentridae	7.5	Baetidae	12.8
Brachycentridae	7.9	Formicidae	6.4	Rhyachophilidae	10.3
Cutthroat trout					
1988 (n=1)		1989 (n=9)		1990 (n=6)	
Prey item	IRI	Prey item	IRI	Prey item	IRI
Empididae adult	7.4	Baetidae	22.9	Brachycentridae	17.0
Formicidae	7.1	Brachycentridae	7.6	Chironomidae larvae	15.0
Ephemerellidae	6.4	Limnephilidae	6.5	Baetidae	12.4

Table 4.44. Comparison of mean annual Index of Relative Importance values for three top prey items consumed by fish species in Ruby Creek, WA.

Brown trout			
1989 (n=9)		1990 (n=0)	
Prey item	IRI		
Limnephilidae	14.9		
Baetidae	13.1		
Perlodidae	10.4		
Brook trout			
1989 (n=122)		1990 (n=24)	
Prey item	IRI	Prey item	IRI
Limnephilidae	6.9	Formicidae	19.8
Chironomidae larvae	6.2	Chironomidae larvae	12.6
Brachycentridae	5.8	Tipulidae	5.5
Cutthroat trout			
1989 (n=9)		1990 (n=2)	
Prey item	IRI	Prey item	IRI
Perlodidae	10.7	Formicidae	59.3
Lumbriculidae	10.	Simullidae	11.3
Rhyacophilidae	8.1	Baetidae	11.3
Rainbow trout			
1989 (n=9)		1990 (n=1)	
Prey item	IRI	Prey item	IRI
Heptageniidae	10.4	Formicidae	100.0
Brachycentridae	9.2		
Baetidae	8.8		
Mountain whitefish			
1989 (n=1)		1990 (n=3)	
Prey item	IRI	Prey item	IRI
Simuliidae	21.2	Baetidae	41.3
Ephemerellidae	12.0	Simuliidae	23.4
Heptageniidae	10.0	Daphnidae	7.5

Table 4.45 Comparison of mean annual Index of Relative Importance values for three top prey items consumed by fish species in Cee Cee Ah Creek, WA.

Brook trout					
1988 (n=27)		1989 (n=100)		1990 (n=26)	
Prey item	IRI	Prey item	IRI	Prey item	IRI
Limnephilidae	40.2	Chironomidae larvae	13.7	Brachycentridae	15.1
Brachycentridae	7.9	Limnephilidae	10.2	Chironomidae larvae	9.5
Baetidae	5.9	Nemouridae	7.5	Sphaeriidae	6.9
Brown trout					
1988 (n=48)		1989 (n=102)		1990 (n=25)	
Prey item	IRI	Prey item	IRI	Prey item	IRI
Limnephilidae	34.2	Limnephilidae	14.1	Osteichthyes	12.2
Lumbriculidae	6.0	Heptageniidae	6.9	Baetidae	9.5
Formicidae	5.7	Formicidae	5.4		

Table 4.46. Comparison of mean annual Index of Relative Importance values for three top prey items consumed by fish species in Tacoma Creek, WA.

Brook trout					
1988 (n=51)		1989 (n=76)		1990 (n=17)	
Prey item	IRI	Prey item	IRI	Prey item	IRI
Lumbriculidae	8.4	Chironomidae larvae	11.6	Formicidae	15.0
Chironomidae larvae	7.7	Brachycentridae	7.2	Chironomidae larvae	13.9
Limnephilidae	6.9	Formicidae	5.9	Elmidae adult	11.3
Cutthroat trout					
1988 (n=11)		1989 (n=10)		1990 (n=6)	
Prey item	IRI	Prey item	IRI	Prey item	IRI
Elmidae larvae	15.2	Nemouridae	27.8	Formicidae	24.9
Chironomidae larvae	13.2	Lepidoptera	19.9	Baetidae	13.4
Hydropsychidae	10.2	Nematoda	12.4	Psychomyiidae	11.7

Table 4.47. Comparison of mean annual Index of Relative Importance values for three top prey items consumed by fish species in Skookum Creek, WA.

Brook trout					
1988 (n=45)		1989 (n=111)		1990 (n=26)	
Prey item	IRI	Prey item	IRI	Prey item	IRI
Trichoptera pupae	7.4	Limnephilidae	16.1	Chironomidae larvae	22.6
Ephemerellidae	7.2	Baetidae	9.1	Baetidae	19.1
Chironomidae larvae	7.0	Chironomidae larvae	7.8	Dytiscidae	5.4
Brown trout					
1988 (n=234)		1989 (n=96)		1990 (n=26)	
Prey item	IRI	Prey item	IRI	Prey item	IRI
Baetidae	12.4	Lumbriculidae	15.1	Baetidae	17.5
Limnephilidae	10.3	Limnephilidae	12.9	Glossosomatidae	14.8
Trichoptera adult	8.2	Baetidae	8.6	Chironomidae larvae	12.5
Cutthroat trout					
1988 (n=8)		1989 (n=5)		1990 (n=3)	
Prey item	IRI	Prey item	IRI	Prey item	IRI
Empididae adult	10.9	Limnephilidae	29.4	Elmidae larvae	19.6
Chironomidae larvae	7.1	Plecoptera	29.0	Brachycentridae	16.1
Araneida	7.0	Brachycentridae	12.0	Ephemerellidae	15.9

Table 4.48. Comparison of the annual diet overlaps for different species of trout from five tributaries of the Pend Oreille River, WA.

	1988	1989	1990
LeClerc Creek			
Brown trout x brook trout	0.68	0.73	0.55
Brown trout x cutthroat trout	0.20	0.44	0.50
Brook trout x cutthroat trout	0.27	0.51	0.50
Ruby Creek			
Brook trout x cutthroat trout		0.58	0.54
Brook trout x rainbow trout		0.70	0.37
Brook trout x mountain whitefish		0.41	0.28
Cutthroat trout x rainbow trout		0.74	0.85
Cutthroat trout x mountain whitefish		0.49	0.29
Rainbow trout x mountain whitefish		0.50	0.05
Cee Cee Ah Creek			
Brown trout x brook trout	0.91	0.73	0.31
Tacoma Creek			
Brook trout x cutthroat trout	0.55	0.48	0.45
Skookum Creek			
Brown trout x brook trout	0.63	0.79	0.63
Brown trout x cutthroat trout	0.39	0.39	0.32
Brook trout x cutthroat trout	0.63	0.48	0.24

Table 4.49. Comparison of the top prey items selected by each species of trout from LeClerc Creek, WA. Electivity values were calculated using Strauss (1979).

	1988		1989		1990	
	Prey Item	value	Prey Item	value	Prey Item	value
Brook trout						
Benthos	Limnephilidae	0.243	Limnephilidae	0.191	Brachycentridae	0.190
Drift	Limnephilidae	0.235	Limnephilidae	0.196	Brachycentridae	0.190
Brown trout						
Benthos	Limnephilidae	0.162	Limnephilidae	0.395	Brachycentridae	0.255
Drift	Limnephilidae	0.154	Linnephilidae	0.400	Brachycentridae	0.247
Cutthroat trout						
Benthos	Empididae adult	0.220	Limnephilidae			
Drift	Empididae adult	0.218	Limnephilidae	0.116	Brachycentridae	0.131

Table 4.50. Comparison of the top prey items selected by each species of trout from Ruby Creek, WA. Electivity values were calculated using Strauss (1979).

	1989		1990	
	Prey Item	value	Prey Item	value
Brook trout				
Benthos	Formicidae	0.094	Formicidae	0.232
Drift	Formicidae	0.094	Formicidae	0.221
Cutthroat trout				
Benthos	Rhyacophilidae	0.125	Formicidae	0.583
Drift	Rhyacophilidae	0.121	Formicidae	0.572
Rainbow trout				
Benthos	Formicidae	0.149	Formicidae	1.0
Drift	Formicidae	0.149	Formicidae	1.0
Mountain whitefish				
Benthos	Simuliidae	0.771	Baetidae	0.612
Drift	Simuliidae	0.717	Baetidae	0.641

Table 4.51. Comparison of the top prey items selected by each species of trout from Cee Cee Ah Creek, WA. Electivity values were calculated using Strauss (1979).

	1988		1989		1990	
	Prey Item	value	Prey Item	value	Prey item	value
Brook trout						
Benthos	Limnephilidae	0.464	Limnephilidae	0.126	Brachycentridae	0.131
Drift	Limnephilidae	0.440	Limnephilidae	0.127	Brachycentridae	0.134
Brown trout						
Benthos	Limnephilidae	0.404	Formicidae	0.313	Chironomidae p.	0.118
Drift	Limnephilidae	0.380	Formicidae	0.132	Glossosomatidae	0.113

Table 4.52. Comparison of the top prey items selected by each species of trout from Tacoma Creek, WA. Electivity values were calculated using Strauss (1979).

	1988		1989		1990	
	Prey Item	value	Prey Item	value	Prey item	value
Brook trout						
Benthos	Nemouridae	0.073	Formicidae	0.080	Chironomidae ad.	0.231
Drift	Nemouridae	0.077	Limnephilidae	0.078	Chironomidae	0.316
Cutthroat trout						
Benthos	Empididae adult	0.114	Nemouridae	0.274	Formicidae	0.236
Drift	Empididae adult	0.114	Nemouridae	0.296	Formicidae	0.236

Table 4.53. Comparison of the top prey items selected by each species of trout from Skookum Creek, WA. Electivity values were calculated using Strauss (1979).

	1988		1989		1990	
	Prey Item	value	Prey Item	value	Prey Item	value
Brook trout						
Benthos	Trichop. pupae	0.098	Limnephilidae	0.209	Chironomidae l.	0.323
Drift	Trichop. pupae	0.098	Limnephilidae	0.205	Chironomidae l.	0.234
Brown trout						
Benthos	Limnephilidae	0.121	Limnephilidae	0.206	Glossosomatidae	0.121
Drift	Limnephilidae	0.124	Linnephilidae	0.202	Glossosomatidae	0.121
Cutthroat trout						
Benthos	Empididae adult	0.327	Limnephilidae	0.194	Tricorythidae	0.167
Drift	Empididae adult	0.327	Limnephilidae	0.190	Ephemerellidae	0.227

tributaries in 1988, 1989 and most in 1990 fell into these groups of organisms.

4.7 FISH MOVEMENT AND MIGRATION

Most fish in the Pend Oreille River were recaptured in the same location as they were tagged and fish that had moved tended to move only short distances. Many of the largemouth bass that had moved were displaced by bass anglers during a bass tournament. The results of a sonic and radio tracking study currently in progress will be included in the completion report of this study.

4.8 CONCLUSIONS

It appears that the habitat of the Pend Oreille River is not suitable for the production of trout. The Box Canyon reach of the Pend Oreille River lacks the habitat diversity that trout require. It also appears that the tributaries to the Box Canyon Reservoir have only limited potential to produce large numbers of trout that could be recruited into the fishery in the reservoir. Most of the tributaries are low order, high gradient streams, which are typically unproductive. It might be advisable to manage the streams for native species, such as cutthroat trout and bull trout. One way to accomplish this would be to discontinue stocking of brook trout and actively remove the existing stocks which compete with the native species. Cutthroat trout and/or bull trout could then be planted in order to restore the tributary fishery to its original composition. This type of restoration has been done during recent years in Idaho and Montana streams (McMullin 1979 and Cowley 1987).

Efforts aimed at habitat improvement or fish population enhancement on the Pend Oreille River would best be directed towards largemouth bass. Largemouth bass are the only sport species in the reservoir with a large enough population, of individuals of sufficient size, to attract anglers. Most of the angler pressure, for anglers who had a preference was for largemouth bass in both 1988 and 1989. In addition, several bass tournaments are held on the river each year. The sport catch of largemouth bass nearly tripled in 1989 over 1988, even though the angler pressure went down. The drawdown of the reservoir caused by a malfunction at Box Canyon Dam in 1988 was partly responsible for the lower total catch numbers in 1988; drawdown occurred during the normal peak of bass angling. According to anglers the bass fishery on the Pend Oreille River is increasing in popularity.

Concern has been expressed that bass populations may be negatively impacted by being harvested by anglers. In 1988, the estimated population for largemouth bass was 657,549 with confidence limits of 455,727 and 989,859; estimated harvest was 389 ± 40 for a rate of 0.06% of the population harvested. In 1989, the population estimate was 590,906 with confidence limits of 299,193 and 1,390,366; estimated harvest was 103 ± 12 for a rate of 0.02% of the population harvested. It appears overharvest was not a problem in either year. Most of the bass anglers on the Pend Oreille River practice catch and release fishing. One concern is the scheduling of bass tournaments during the peak spawning season. These tournaments result in taking bass from their nests to a central location for weigh in and then releasing the entire tournament catch at one location on the river. This more than likely reduces spawning success. Of the 31 largemouth bass that were tagged at a bass tournament in 1989, 16 were later recaptured in different areas than they were released. Of the 37 largemouth bass that were tagged during electrofishing surveys, only 10 were recaptured in different areas than they were released. In 1990, five of the seven largemouth bass that were tagged at a bass tournament were recaptured in areas other than they were released.

According to Stuber et *al.* (1982) optimal riverine habitat for largemouth bass is characterized by large, slow moving rivers with soft bottoms, aquatic vegetation, and relatively clear water. The Pend Oreille River appears to have optimal microhabitat for bass production, however, low water temperatures and water level fluctuations of the reservoir may limit reproduction, recruitment and growth. To what extent will be better understood with the conclusion of a habitat suitability study currently under way.

It appears that bass growth and possibly recruitment are also limited due to competition with yellow perch for zooplankton during the first few years of life. At about age 4 bass become piscivorous and at this time yellow perch are the primary food item in their diet. Even with a lower population than first estimated, yellow perch are abundant in sufficient numbers to sustain a larger bass population. The habitat needs of largemouth bass will be better understood after completion of a sonic and radio tracking study currently under way.

The goal of the habitat suitability study is to determine if the Pend Oreille River contains sufficient habitat for an expanded largemouth bass population, or if the habitat could be improved to accommodate a larger population. If the foregoing proves true then increasing bass production and recruitment would be the next step. Artificial reef structures have been used in many reservoirs to increase spawning success, growth, and survival (Brouha and von Geldern 1979, Prince and Maughan 1979, Wege and Anderson 1979). These structures along with control of water level fluctuations of the reservoir have the potential to increase bass production.

Further consideration would be to construct a hatchery to raise largemouth bass for release in the reservoir. Since bass growth tends to be depressed until they reach a size that enables them to eat fish, they could be reared in ponds, if economically feasible, until they reach a size near 200 mm. A more economical method may be to release large numbers of bass larvae, but this may result in the depletion of the food supply and high density dependent mortality. The creation of the wetland reserve at Riverbend may result in the flooding of some areas that could be used as rearing ponds for largemouth bass. It may be economically feasible to build a small facility to hatch largemouth bass and then utilize the wetland rearing ponds to raise the fish until they are of a size which they could be released into the reservoir.

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