THE FISHES OF RICKREALL CREEK

Prepared

In Fulfillment of Requirements for FW 441, 442 & 443
for
Department of Fisheries and Wildlife, Oregon State University
&
The Rickreall Watershed Council

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May 30, 2002
Executive Summary

Nine sites on Rickreall Creek, located from river kilometer 0.56 to 45.08 were sampled monthly from April 2001–March 2002. A relatively intact native fish fauna (16 species) was found with lower sites dominated by minnows, upper sites dominated by salmonids, and sculpins throughout. Many native species use the creek for their entire life cycle. Others spawn in or use the creek as juvenile rearing habitat. Four exotic species of sunfish/bass were also found in lower sites.

Many of our observations must be qualified based on differences in sampling gears, necessitated by seasonal and gradient changes in the creek and permit compliance:

- Relatively intact native fish fauna with few exotic fish.
- Evidence of juvenile steelhead rearing in the upper urbanized and lower forested sites.
- Abundance of cutthroat trout in the most urbanized sections of the stream.
- Evidence that transported juvenile coho survived summer in upper sites.
- Seasonal use by juvenile chinook salmon.
- Spawning and juvenile (ammonocote) habitat use by Pacific lamprey.
- Gradients in distribution along the creek possibly associated with barriers (Villwoks ford, Mercer Dam) but more commonly associated with slope and temperature.
- The most frequently encountered native species was reticulate sculpin.
- The most numerous native species was redside shiner.
- The rarest native species was sandroller.

Our observations also suggest areas for future research or monitoring:

- Villwoks ford appeared to act as a barrier or partial (seasonal) barrier to distribution of some species. Since the creek upstream of Villwoks ford is largely free of exotic species, it is not clear that this barrier is bad. Some native anadromous fish such as Pacific lamprey and steelhead can apparently negotiate the barrier. Other native freshwater fish such as largescale suckers were observed spawning below the barrier but juveniles were found above. On the other hand, young coho which might be produced below the barrier might be prevented from moving upstream.
- The prevalence of parasites on several native species could indicate a high point in a normal host-parasite cycle or an early indication of stress in the system. Better documentation of parasite incidence and long term trends might contribute to understanding if parasites are an early indication of ecosystem stress.
- The role of smaller tributaries in the life cycle of species such as cutthroat trout below Mercer Dam might be useful information.
- Further research on physical stream characteristics (water temperature, dissolved oxygen, and water chemistry) influencing seasonal fish distributional patterns.
- Further research on habitat use and long-term monitoring.
- Further mutually beneficial projects involving students.
Introduction

Rickreall Creek, a 4th order tributary of the Willamette River, was the location of a year-long collaborative sampling project between an Oregon State University student group and the Rickreall Watershed Council. The goal of the project was to investigate fish species composition and distribution throughout the Rickreall Creek mainstem. The need for a project of this type was determined based on an absence of comprehensive data on overall composition of fish species inhabiting the mainstem (Mattson and Gallagher 2001). Previous sampling data on non-salmonid fish species are limited, but indicate a high percentage of exotic fishes in the lower portion of the creek (Altman 1997).

Rickreall Creek drains a watershed area of approximately 253.82 km², and is almost completely contained within Polk County, Oregon. The mainstem is slightly longer than 40 km, and undergoes a 1,067-meter change in elevation along its course (Mattson and Gallagher 2001). Rickreall Creek joins the Willamette River several kilometers south of Salem. The cities of Dallas and Rickreall lie along the middle and lower mainstem of Rickreall Creek. Based on general patterns of land use, the Rickreall mainstem can be divided into three similarly-sized reaches (Mattson and Gallagher 2001). These reaches are: the forested (upper) reach; the urban (middle) reach; and the agricultural (lower) reach.

For the project, three physically similar sampling sites were chosen in each reach (nine sites total). Sites were located from river kilometer 0.56 to river kilometer 45.08, and were sampled monthly from April 2001-March 2002. A variety of methods were used to sample sites. Physical conditions of the creek, influenced by seasonal precipitation, altered sampling methods between sites and sampling months. Sampling methods were constrained by National Marine Fisheries Service (NMFS) permitting restrictions which did not permit electroshocking below Mercer Reservoir, the only complete barrier to anadromous fish passage on the creek.

Although permitting restrictions frequently required abandoning sites due to presence of ESA-listed fish species, sampling revealed a relatively intact native fish fauna that changed along stream gradient. Twenty fish species (16 native and 4 exotic to the system) were encountered during the project, including 5 cyprinid, 4 salmonid, and 4 sculpin species (Table 3, Appendix A). Patterns of seasonal use, abundance, and distribution among species were identified. In particular, the lower reach was cyprinid-dominated, and the upper reach was dominated by salmonids (2 species). The project is an example of a successful collaboration between a student group and a watershed council, and provides a basis for future research.
Site descriptions

Distinctive land features and land use allow Rickreall Creek to be divided into three reaches; lower (agricultural), middle (urban), and upper (forested). Three study sites were placed within each reach for a total of nine sites. At each site, approximately 60m of creek was sampled. Unless otherwise stated, the site descriptions below reflect summer water conditions. Table 1 summarizes reach classification, elevation, slope, river kilometer, and distance between sites. See Map 1 (Appendix A) for the locations of all 9 sites.

Site #1 (Picture 1) is located on Eola Bend RV Park property, adjacent to agricultural land, and consists of a large pool with rip-rap on the south bank and riffles. Aquatic algae dominate the pool in summer months. Bottom substrate is primarily silt. The lower portion of the site has a pronounced, low-lying floodplain that becomes inundated during winter months. The south bank is deeply incised.

Site #2 (Picture 2) is adjacent to Mr. Claude White’s agricultural land. The site includes a riffle and a pool with complex woody structures. Gravel dominates the substrate at this site. The north bank is heavily incised.

Site #3 (Picture 3) is located immediately below Villwoks Ford and is situated among agricultural lands. A concrete ford crosses the creek and creates two lateral scour pools, of which the substrate is gravel. The current only flows through a culvert below the ford in summer months, whereas it flows over the whole ford creating a large rapid downstream in winter months.

Site #4 (Picture 4) is located at the residence of Mr. And Mrs. Al Tschiegg (City of Dallas, owners) about 0.75 km downstream of the City of Dallas waste-water treatment plant. This site is dominated by a large, lateral scour pool with algal cover in shallow areas. Bedrock, gravel, and silt comprise the primary substrate. The south bank is heavily incised.

Site #5 (Picture 5) is located at the Dallas City Park in an urban area, consists of a large pool, a riffle, a gravel island, and a side channel. During winter months, the island becomes inundated and strong, uniform flows dominate the entire site. The substrate is dominated by gravel and cobbles.

Site #6 (Picture 6) is alongside Mr. And Mrs. Greg Nelson’s property in a semi-urban area. This site consists of a large pool dominated by bedrock substrate. There is a broad, shallow riffle upstream of the pool with gravel and cobble as the primary substrate. A small gravel island is present during summer months but becomes inundated in winter months. The south bank is highly incised.
Site #7 (Picture 7) is located upstream from the offices of the Dalton Rock Company at the boundary of forested Boise Cascade land. This site consists primarily of a riffle upstream which flows into a lateral scour pool with one large woody structure. Gravel and cobbles are the dominant substrates.

Site #8 (Picture 8) is located about 1.2 km downstream of Mercer Reservoir in the forested reach. This site consists of one pool and a riffle. The dominant substrates are gravel and cobbles with several large boulders and some bedrock.

Site #9 (Picture 9) is located in the forested reach about 0.8 km below the confluence of Laurel and Rickreall Creeks. This site consists of a long lateral scour pool, constrained on both sides by bedrock. The dominant substrates are gravel, cobbles, and bedrock.

**Table 1. Summary of topographic parameters**

<table>
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<tr>
<th>Site #</th>
<th>Reach Classification</th>
<th>Elevation (m)</th>
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<th>River km</th>
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Methods

Fish sampling was conducted once a month from April, 2001 to March, 2002. Sampling methods were continuously modified to adjust for changing water flow. From April to November, the primary sampling methods were snorkeling and seining. From December to March, 2002, the primary sampling methods were fyke nets and minnow traps baited with cat food. Specific sampling methods at each site are summarized in Table (X). Snorkel observations were conducted at Sites #1-8 in compliance with the National Marine Fisheries Service (NMFS) permit #1337. Sites were abandoned if federally listed endangered fish species were encountered. Site #9 was located above a barrier to anadromous fishes (Mercer Dam). Since there was no chance of encountering federally listed endangered fish species, electro-shocking was the primary sampling technique. All electro-shocking procedures were in accordance to the Oregon Department of Fish and Wildlife (ODFW) permits #01-096 and OR 2002-059.

Table 2. Summary of sampling methods
S= Snorkel, SN=Sein, D=Dipnet, K=Kicknet, H=Hook-and-line, E=Electroshock, F=Fyke net, M=Minnow trap and NS= No sampling.

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Electroshocking

The ODFW permits allowed electroshocking surveys at site #9, located above Mercer Reservoir—an impassible fish barrier. For our sampling procedure, one pass was made
during each sampling session. Two electroshockers started at the top of the sampling unit and worked side-by-side downstream to the block net at the lower end of the site.

Fish handling

Collected fish were identified, measured, and released in the field. Total lengths were measured for *Cottus* species, whereas fork lengths were measured for all other species. Species with over 30 catches per site, such as redside shiner (*Richardsonius balteatus*), were subsampled for length measurements, but all fish were counted. Voucher specimens of chiselmouth (*Acrocheilus alutaceus*), largescale sucker (*Catostomus macrocheilus*), riffle sculpin (*Cottus gulosus*), reticulate sculpin (*C. perplexus*), torrent sculpin (*C. rhotheus*), threespin stickleback (*Gasterosteus aculeatus*), Pacific lamprey (*Lampetra tridentata*), peamouth chub (*Mylocheilus caurinus*), cutthroat trout (*Oncorhynchus clarki*), coho salmon (*O. kisutch*), steelhead/rainbow trout (*O. mykiss*), chinook salmon (*O. tshawytscha*), northern pikeminnow (*Ptychocheilus oregonensis*), speckled dace (*Rhinichthys osculus*) and redside shiner were retained for laboratory verification and further studies. Retained fishes were placed in the fish collection museum in Nash Hall at Oregon State University.

Data analysis

Elevations (m), gradients (% slope), and river km were obtained using ArcView GIS 3.2 computer software from Environmental Systems Research Institute, Incorporated (ESRI).

Site gradients were taken from calculations using GIS. Elevations 0.25 kilometers upstream and downstream of each site were taken. Differences in elevation between the two endpoints were then divided by the distance between the sites to obtain approximate stream gradient in the proximity of each site.

Calculations:

- **Encounter rates**: calculated by dividing the number of times a species was encountered by the total possible number of encounters (9 sites sampled over 12 month’s equals 108 possible encounters).

\[
\text{(# of encounters with species Y/108) x 100 = Encounter rate}
\]

where Y= species of interest

- **Relative abundance**: calculated by dividing the total number of individuals captured of a species by the total number of individuals captured during the study (n = 6011).

\[
\text{(Total # captured (species Y)/6011)) x 100 = Relative abundance}
\]

where Y= species of interest
Results

The results are broken into two broad categories. The first category presents “General Trends” found throughout the entire creek. The second section, “Species Accounts” consist of broad overviews of geographic range, biology, and habitat. This is followed by specific observations in Rickreall Creek from April 2001-March 2002. Within the species accounts, the fish are organized by family in the following order: cyprinidae, catostomidae, cottiidae, salmonidae, petromyzontidae, gasterosteidae, percopsidae, and centrarchidae. The family organization presented here does not represent any classification scheme. Our group did not make any attempt to organize the families and the order they appear in the report does not reflect any attempt at a classification scheme. Grouping of fish species within the families is also random.

General Trends:

Stream gradient generally increases with increasing distance from the Willamette River (Figure 1a). A noticeable “dip” in gradient from 0.9% to 0.25% slope occurred between river km 12.47 and 22.26 (Site #3–5) (Figure 1a). An elevation profile shows a gradual increase in elevation from river km 0 to 15.18 (39–68m) followed by a rapid increase in elevation above river km 15.18 (68–327m) (Figure 1b).

At each study site, water temperatures increased from April–July. In July, a peak of 23.5ºC was reached at Site #6. Water temperature decreased from July through October, rose slightly until December, and was followed by a decline from December through March (Figure 1c). Maximum water temperature showed a cooling trend with increasing river km and gradient (Figures 1d and 1e). During the 12 months of sampling, water temperatures ranged from 3.1–23.5ºC.

Maximum number of fish species captured increased with increasing water temperature (Figure 1f) but decreased with increasing gradient and river km (Figures 1e and 1g). Total numbers of fish captured per site increased with increasing water temperatures, reaching a peak of 371 fish captured at Site #5 at a water temperature of 17ºC (Figure 1h). Maximum number of species captured per site generally decreased with increasing river km (Figure 1i). Notable exceptions occurred at river km 12.47 (Site #3), river km 22.26 (Site #5), and river km 25.75 (Site #6), where sharp increases in the maximum number of species captured were observed (Figure 1i). Only three species were captured where gradient exceeded 1.62% slope (Figure 1j).
Species Accounts:

Cyprinidae

Northern pikeminnow (*Ptychocheilus oregonensis*)

Geographic Range:

Northern pikeminnow occur in Pacific slope drainages, from British Columbia, to Nevada, and are found east of the continental divide in the Peace River basin in Canada (Scott and Crossman 1979; Page and Burr 1991; Nelson and Paetz 1992).

Biology:

The adult northern pikeminnow can reach 63cm in length. Young pikeminnow feed on insects and plankton, while juveniles and adults mainly feed on fish. Spawning occurs from May to July, in shallow water over gravel. Sexual maturity is reached in about six years, and life span may be as long as twenty years. Northern pikeminnow have been known to hybridize with chiselmouth, redside shiner, and peamouth (Nelson and Paetz 1992).

Habitat:

Northern pikeminnow prefer still waters. They occur in lakes, pools and sometimes runs of small to large-sized rivers. Young pikeminnow inhabit inshore waters in summer months moving offshore into deeper waters in the fall. Larger, adult pikeminnow prefer deep waters (Scott and Crossman 1979; Page and Burr 1991).

Observations from Rickreall Creek:

Northern pikeminnow were captured from Sites #1-3 (Figure 2a, Map 2). They were encountered during every sampling month at Site #1 (Figure 3a); from April to December and then in March at Site #2 (Figure 3b); and from May to November at Site #3 (Figure 3c). The greatest number of individuals captured (N=107) occurred in August at Site #1 (Figure 4a).

Northern pikeminnow were captured at sites with water temperatures ranging from 6–21ºC (Figure 4b). The number of individuals captured per site increased with increasing water temperature, and the highest number of captures occurred when water temperatures exceeded 12.5ºC (Figure 4b). Pikeminnow were only captured at sites with surrounding
stream gradients of 0.87% slope or less (Figure 4c). The relative abundance of northern pikeminnow was 8% (Figure 5a) and they had an encounter rate of 27% (Figure 6a). Fork length ranged from 16-485 mm with the smallest fish captured in July. Five fish with fork lengths 319, 450, 453, 460, and 485 mm were removed from the graph. All pikeminnow 450 mm were captured at Site #1 (Figure 7a).

**Redside shiner** (*Richardsonius balteatus*)

*Redside shiner* are widespread west of the Rocky Mountains, from the Peace River in Alberta, south to Utah. They occur in drainages throughout WA, OR, ID, NV, MT. This species was successfully introduced into the Colorado River (Scott and Crossman 1979).

**Biology:**

Redside shiners can reach a fork length of 18 cm, although the average fork length is 7-13 cm. Sexual maturity is reportedly reached in their third year of age, and spawning takes place in groups of 30-40 fish in streams or lakes from May to late July. Their diet consists of insects, algae, mollusks, fish eggs, and small fishes. This species is frequently parasitized. Redside shiners are known to hybridize with longnose dace (*Rhinichthys cataractae*), northern pikeminnow (*Ptychocheilus oregonensis*), and peamouth (*Mylocheilus caurinus*) (Scott and Crossman 1979; Nelson and Paetz 1992).

**Habitat:**

Flowing waters and standing pools in headwaters, creeks, small to medium-sized rivers, lakes, and ponds. Usually found over mud or sandy substrate, and frequently close to vegetation (Page and Burr 1991).

**Observations from Rickreall Creek:**

The distribution of redside shiners was from Sites #1-7 (Figure 2a, Map 3). From Sites #1-#6, they were primarily encountered from April to November (Figures 3a-f). At Site #7, redside shiners were only encountered in February and March (Figure 3g). The greatest numbers of individuals captured occurred from April to November (Figure 4d).
The majority of redside shiners were captured at sites where stream temperatures ranged from 11–20°C. Capture rates at each site increased with increasing water temperature and declined when temperatures exceeded 20°C (Figure 4e). Redside shiners were only captured at sites with surrounding stream gradients of 1.24% slope or less (Figure 4f). The relative abundance of redside shiners was 55% (Figure 5a) and they had an encounter rate of 56% (Figure 6a).

Fork length ranged from 7-135 mm and the smallest fish were captured in July. Over time, it is possible to observe the growth of two size classes that become noticeable in July (Figure 7b). The first size class is comprised of juvenile fish less than 20 mm and the second size class consist of fish greater than 30 mm. By November, the distinct size classes are less noticeable with fork lengths between 22 and 106 mm. With the exception of one individual at Site #7 in July, redside shiners less than 38 mm were not found at Site #6 and 7 (Figure 7b).

**Speckled dace (Rhinichthys osculus)**

![Speckled dace](image)

**Geographic Range:**


**Biology:**

This fish exhibits great differences in morphological and meristic characteristics, and may someday be separated into different species. Speckled dace can grow up to 11 cm in length (Scott and Crossman 1979; Page and Burr 1991).

**Habitat:**

Speckled dace inhabit a great diversity of habitats; including rocky riffles, runs, and pools of headwaters in creeks and small to medium-sized rivers. Rarely found in lake habitats (Scott and Crossman 1979; Page and Burr 1991).

**Observations from Rickreall Creek:**
Speckled dace were encountered from Site #1-8 (Figure 2a, Map 4) and were encountered during every month sampled (Figure 3j). Gaps in temporal distribution were observed at Site #1 with encounters in May and October (Figure 3a) and at Site #7 and 8 with random encounters in both summer and winter (Figure 3g-h). Most speckled dace were captured from June through November (Figure 4g). The number of individuals captured per site peaked in August and declined through November (Figure 4g).

Speckled dace were captured at sites with water temperature ranging from 5.5–23.5°C. Capture rates increased with increasing water temperature, and captures were most common at sites with water temperatures ranging from 15–19°C (Figure 4h). A maximum number of 175 individuals were captured at Site #4 in August with a water temperature of 19 °C (Figure 4h). Speckled dace were only captured at sites with surrounding stream gradients from 0.12–1.62% slope and were most common with stream gradients from 0.25–0.62% slope (Figure 4i). The relative abundance of speckled dace was 16% (Figure 5a) and they had an encounter rate of 48% (Figure 6a).

Speckled dace less than 28 mm appeared in July and were captured from Site #3-7. The greatest number of speckled dace under 28 mm were captured at Site #5 and the greatest number of speckled dace over 28 mm were captured at Site #4 (Figure 7c).

**Chiselmouth (Acrocheilus alutaceus)**

![Chiselmouth Image]

**Geographic Range:**

Chiselmouth occur in the Fraser and Columbia River drainages from British Columbia to Nevada. They are also found in the Harney River basin of Oregon. They are fairly common in the Columbia River drainage (Scott and Crossman 1979; Page and Burr 1991).

**Biology:**

Chiselmouth average 152-178 mm in total fork length, but may get as large as 300 mm. Adults feed by scraping their chisel-like jaw along rocks or other substrate, primarily consuming diatoms found on filamentous green algae (Scott and Crossman 1979; Page and Burr 1991).
Habitat:

Often found in pools and runs over sand and gravel, in creeks or small to medium rivers. Chielmouth are also found along margins of lakes (Page and Burr 1991).

Observations from Rickreall Creek:

Chiselmouth were only found at Site #1 (Figure 2a, Map 5). They were encountered in April, August, and October (Figure 3a). Only 19 individuals were captured therefore chiselmouth accounted for less than 1% of our total sample and had an encounter rate of 3%.

Peamouth (*Mylocheilus caurinus*)

Geographic Range:

Peamouth occupy rivers and lakes in northwestern North America, from British Columbia to Oregon; and eastward to Idaho and Montana, where they occur in the Nass, Peace River and Columbia River systems (Scott and Crossman 1979; Page and Burr 1991).

Biology:

Peamouth average 102-152 mm in fork length but may reach 360 mm. These fish tend to form schools and spawn in May or June, in groups of 50-400 fish. Peamouth are mainly insectivorous and feed on a variety of aquatic insects and macroinvertebrates (Scott and Crossman 1979; Page and Burr 1991).

Habitat:

Lakes and slow water sections of small to medium rivers. Most often found in the proximity of aquatic vegetation (Page and Burr 1991).
Observations from Rickreall Creek:

Peamouth were only found at Site #1 (Figure 2a, Map 6). They were encountered from August to October (Figure 3a). Only 8 individuals were captured therefore peamouth accounted for less than 1% of our total sample and had an encounter rate of 3%.

Catostomidae

Largescale sucker (*Catostomus macrocheilus*)

Geographic Range:

Largescale suckers are found in coastal streams from British Columbia to Oregon; they also occur in the Peace River system of Alberta, Canada (Nelson and Paetz 1992).

Biology:

Largescale suckers may grow up to 61 cm. They usually feed on or near the substrate, consuming mostly mollusks, immature insects and algae. Spawning occurs in May and June (Scott and Crossman 1979; Page and Burr 1991; Nelson and Paetz 1992).

Habitat:

Rivers and lakes. Adults prefer to stay close to the substrate, whereas young tend to occur higher in the water column (Scott and Crossman 1979).

Observations from Rickreall Creek:

Largescale suckers were encountered from Site #1–6 (Figure 2a, Map 7). Individuals were encountered from April to January (Figure 3j) however they were most commonly encountered from May to November (Figure 4j). Ninety-eight spawning adult suckers were captured in April at Site #3 (Figure 4j).

Largescale suckers were not observed at sites with surrounding gradients greater than about 1% slope (Figure 4k) and were present at sites with water temperatures from 6.5–
21.6°C (Figure 4L). The relative abundance of largescale suckers was 3% (Figure 5a) and they had an encounter rate of 25% (Figure 6a).

Largescale suckers ranged in fork length from 19-486 mm and suckers less than 40 mm were captured in July (Figure 7d). Suckers greater than 180 mm were primarily captured at Site #3 and represent those fish captured in April (Figure 7d).

**Cottidae**

**Torrent sculpin (Cottus rhotheus)**

- **Geographic Range:**
  Native to Columbia River drainages in Oregon; its range extends east into Idaho and Montana, north into British Columbia (Markle et al. 1996).

- **Biology:**
  Maximum size of this species is 200 mm. The torrent sculpin has a tan-brown background with slight mottling and three dark, forward-slanting bars on its sides; the first two extending from the second dorsal fin downward, and the third on the caudal peduncle. The head and mouth are relatively large. Spawning occurs from May-June in moderate to swift riffles with a rubble bottom. They eat aquatic invertebrates and small fish (Markle et al. 1996).

- **Habitat:**
  Prefers swift riffle habitat in medium to large-sized streams and rivers. Older individuals occasionally favor pools (Markle et al. 1996).

- **Observations from Rickreall Creek:**
  Torrent sculpin showed a disjunct distribution with captures at Site #1, 2, and Site #5-8 (Figure 2a, Map 8). With the exception of January, this species was captured during every sampling trip (Figure 3j). Torrent sculpin were most commonly encountered from
April–November (Figure 4m). Number of individuals captured per site peaked in August and then declined rapidly (Figure 4m).

A maximum of 12 individuals were captured at Site #5 in August with a water temperature of 17°C (Figure 4n). Torrent sculpin were only captured at sites with surrounding gradients of 1.62% slope or less (Figure 4o). The relative abundance of torrent sculpin in Rickreall Creek was 1.4%. This species was encountered 29% of the time (Figure 6a).

**Reticulate sculpin (Cottus perplexus)**

![Image of a reticulate sculpin](image)

**Geographic Range:**

Native to coastal streams in Oregon and Washington; occupies a variety of habitats (Markle et al. 1996).

**Biology:**

Spawning occurs in spring at water temperatures greater than 7°C; spawning habitat includes pools and riffles, but may be confined to slow side runs when other cottids are present. Maximum size of this species is 110mm. Its color is variable, usually has a tan-brown background with darker vermiculations overall, and a small, narrow head relative to other sculpin species, like prickly sculpin (C. asper) (Markle et al. 1996).

**Habitat:**

The reticulate sculpin favors riffle habitats, but may be restricted to pools and slower water when other species (such as C. rhotheus) are present (Markle et al. 1996).

**Observations from Rickreall Creek:**

Reticulate sculpin were the only species found at all nine sites (Figure 2a, Map 9). The time at which individuals were encountered varied between sites. From Sites #1–6, encounters were common but randomly distributed through the course of the study.
(Figure 3a-f). The majority of reticulate sculpin were captured from May through November with the peak of individuals captured occurring in July (Figure 4p).

Number of reticulate sculpin captured per site increased with increasing water temperature (Figure 4q). A maximum of 25 individuals were captured at Site #5 in July with a water temperature of 19°C (Figure 4q). The relative abundance of reticulate sculpin in Rickreall Creek was 6% (Figure 5a) and their encounter rate was 65% (Figure 6a).

Wide ranges in total length of reticulate sculpin were found at all sites during all sampling months with total lengths ranging from 14-91mm (Figure 7e). The smallest reticulate sculpin were captured in July and reticulate sculpin under 25 mm total length were not captured at Site #1 (Figure 7e).

**Riffle sculpin (Cottus gulosus)**

![Riffle sculpin](image)

**Geographic Range:**

Native to coastal streams of Oregon; ranges north to Puget Sound. It is also found in the Sacramento-San Joaquin Rivers of California. They are uncommon in the Willamette Valley (Markle et al. 1996).

**Biology:**

Similar in appearance to reticulate sculpin (*C. perplexus*), except for a larger head and mouth (Markle et al. 1996)

**Habitat:**

Prefers swift, cool creeks with gravel bottoms; spawns April-May in cool water (8-12°C), and moderately rapid riffles with woody or rubble bottoms (Markle et al. 1996).
Observations from Rickreall Creek:

Riffle sculpin were encountered at every site except Site #8 (Figure 2a, Map 10) but were “patchy” in terms of their temporal distribution. For example, at Site #1, riffle sculpin were only encountered in November (Figure 3a). At Site #2, they were encountered in February (Figure 3b). At Site #3, they were encountered in June and again in February (Figure 3c). This patchy pattern continues upstream at every site riffle sculpin were encountered (Figure 3d-i). Riffle sculpin had an encounter rate of 18% (Figure 6a) and were not abundant, with a relative abundance of less than 1%.

**Prickly sculpin** (*Cottus asper*)

![Prickly sculpin](image)

**Geographic Range:**

Native to coastal drainages from Alaska to California (Markle et al. 1996).

**Biology:**

Our largest native freshwater sculpin; its maximum size is 30 cm. It is mottled reddish-brown to dark brown dorsally with a white to yellowish belly color. This species has a relatively large head and mouth. It is easily distinguishable by the presence of rough, prickly scales that can be felt when a finger is rubbed backwards against the fish, from tail to head. Prickly sculpin spawn in spring (April-May in WA), in cold water; eggs do not survive in water temperatures above 64°F (Markle et al. 1996).

**Habitat:**

Prefers slower water of streams and lakes (Markle et al. 1996).

**Observations from Rickreall Creek:**

Prickly sculpin were encountered at Site #1 and 2 (Figure 2a, Map 11). At Site #1, prickly sculpin were encountered in August (Figure 3a) and at Site #2, they were encountered in August and October (Figure 3b). Their relative abundance in Rickreall Creek was less than 1% and they had an encounter rate of 3%.
**Salmonidae**

**Coho salmon (Oncorhynchus kisutch)**

![Coho salmon image]

**Geographic Range:**

Coho salmon are native to Pacific and Arctic Ocean drainages from Point Hope, AK, south to Chamalu Bay, Baja California. This species of salmon has been introduced into temperate river systems around the world (Page and Burr 1991).

**Biology:**

Coho salmon are anadromous fish that spend between 0-2 years developing in freshwater and 1-5 years growing in the ocean. Adult sizes average around 53 cm fork length, but can be up to 98 cm in length. Spawning occurs from October to March in natal home streams. Some coho never migrate to the ocean or spawn (called residuals). Young coho feed on both terrestrial and aquatic insects, while adults feed largely on other fish. Coho are known to naturally hybridize with chinook salmon (*O. tshawytscha*) (Scott and Crossman 1979; Page and Burr 1991).

**Habitat:**

Coho life stages require cool river, lake, and ocean waters. Spawning coho require rivers or streams with gravelly substrate (Scott and Crossman 1979).

**Observations from Rickreall Creek:**

Coho salmon were only encountered at Site #2, 6, and 7 (Figure 2a, Map 12). All individuals were captured from April to November (Figure 3j). Between sites, there were differences in temporal distribution. At Site #2, coho salmon were only encountered in April and May (Figure 3b). At Site #6, they were encountered from April to November (Figure 3f). At Site #7, they were encountered in October and November (Figure 3g). A maximum of 37 individuals were captured at Site #6 in April (Figure 4r). Coho salmon juveniles were captured in Rickreall Creek at Site #2 and 6, and observed snorkeling at Site #7. Low abundances (2-3 individuals) were captured at river km 10.06 (Site #2) and in moderate abundances (up to 37 individuals) at river km 25.75 (Site #6) (Figure 4s).

Coho salmon were encountered at sites with water temperatures ranging from 13–23.5°C (Figure 4t) and with surrounding stream gradients of 0.62% slope or less (Figure 4u). The relative abundance of coho salmon in Rickreall Creek was 2% (Figure 5a), and their encounter rate was 11% (Figure 6a).
Fork length of captured individuals ranged from 32-93 mm (Figure 7f). Rapid growth occurred from April to May and appears to slow down from June to November (Figure 7f).

**Chinook salmon (Oncorhynchus tshawytscha)**

**Geographic Range:**

Chinook salmon are found in Pacific and Arctic Ocean drainages from Point Hope, AK, south to San Diego, CA. Chinook have also been stocked in many temperate lake and river systems around the world (Scott and Crossman 1979; Page and Burr 1991).

**Biology:**

Chinook salmon are anadromous fish that spend 0-2 years developing in freshwater and 1-9 years growing in the ocean. Adult sizes average around 90 cm, with individuals up to 147 cm in length. Spawning of chinook occurs almost year round, with different runs of fish returning to freshwater at different times of the year. Young chinook feed on both terrestrial and aquatic insects, while adults feed mostly on other fish (Scott and Crossman 1979; Page and Burr 1991).

**Habitat:**

Chinook life stages are found in cool river and ocean waters of temperate climates. Spawning chinook require clean rivers and streams where gravel is the principle substrate (Scott and Crossman 1979).

**Observations from Rickreall Creek:**

Chinook salmon were encountered at Site #2 and 3 (Figure 2a, Map 13). At Site #2, chinook salmon were encountered during February (Figure 3b) and at Site #3 they were encountered during November and December (Figure 3c). Fork lengths of chinook salmon ranged from 112-144 mm. Their relative abundance in Rickreall Creek was less than 1% and they had an encounter rate of 3%.
**Cutthroat trout (Oncorhynchus clarki)**

![Fish Image]

**Geographic Range:**

Anadromous, or sea-run cutthroat trout are found from Prince William Sound, AK to the Eel River, CA. Freshwater cutthroat occur in many river systems, from the Mississippi River to the Pacific. Cutthroat have also been stocked widely around the world (Page and Burr 1991).

**Biology:**

Cutthroat trout possess two main life-history types: they can be either freshwater resident fish or anadromous sea-run fish. Anadromous populations spawn in freshwater in late fall and early winter. Freshwater residents spawn from November through May. Adult cutthroat feed primarily on invertebrates, but also consume other fish. Young cutthroat eat aquatic and terrestrial insects. Average fork length is approximately 34 cm but may grow up to 100 cm. Many subspecies of cutthroat trout are currently recognized (Scott and Crossman 1979; Page and Burr 1991).

**Habitat:**

Cutthroat are found in cool coastal and inland streams, lakes, small rivers, estuaries, and in the ocean. Spawning cutthroat require rivers or streams where gravel is the principle substrate (Scott and Crossman 1979).

**Observations from Rickreall Creek:**

Cutthroat trout were encountered from Sites #2-9 (Figure 2a, Map 14) and were captured during every sampling trip, with the exception of December and February (Figure 3j). From Site #2–5, encounters did not show a temporal pattern. For example, at Site #2, cutthroat trout were encountered in April and October (Figure 3b). At Site #3, cutthroat trout were encountered in April, July, and November (Figure 3c). However from Site #6 upstream to Site #9, encounters occurred primarily from May to November (Figure 3f-i). The majority of cutthroat were captured from June through November (Figure 4v). The greatest number of individuals captured per site peaked in August, declining rapidly in September (Figure 4v). Cutthroat trout were captured in greatest abundances at river km 22.26 (Site #5) and 25.75 (Site #6), infrequently at river km 15.18 (Site #4) and 12.47 (Site #3), and never below river km 12.47 (Site #3) (Figure 4w).
Cutthroat trout were captured at sites with water temperatures ranging from 4.5–23.5°C but were primarily captured at sites with water temperatures between 11–21°C (Figure 4x). The number of individual cutthroat trout captured per site increased with increasing water temperature (Figure 4x). A maximum of 70 individuals were captured in August at Site #6 with a water temperature of 23.5°C (Figure 4x). Cutthroat trout were captured at sites with a wide range of surrounding stream gradients (Figure 4y). The relative abundance of cutthroat trout was 6% (Figure 5a) and they had an encounter rate of 36% (Figure 6a).

Cutthroat trout ranged in size from 31-362 mm (Figure 7g) and a relationship showing an increase in fish size (fork length) with increasing water depth (m) is shown in Figure 4z. The smallest cutthroat were encountered at Site #9 and the largest were encountered at Sites #5 and #6 (Figure 7g).

**Steelhead/Rainbow trout (Oncorhynchus mykiss)**

*Geographic Range:*

Rainbow trout are found in Pacific and Arctic Ocean drainages, from the Kuskokwim R., AK, south to Rio Santa Domingo, Baja California. This species has also been widely introduced around the world (Page and Burr 1991).

*Biology:*

Rainbow trout are usually broken into two life history types. Anadromous, or sea-run, rainbow trout are referred to as steelhead, while populations of rainbows that spend their entire life cycle in freshwater are called either rainbow or redband trout. Rainbow trout exhibit a wide range of life history strategies. Resident rainbow trout normally spawn in the spring, and steelhead usually spawn in spring and fall. They are usually categorized into summer, fall, and winter runs even though, depending on the stock, they may return to freshwater during any time of the year. The two life history types of rainbow trout differ in adult sizes. Resident rainbows average a fork length of 39 cm. Steelhead average a fork length of 64 cm, but can exceed 114 cm. Young rainbow trout and steelhead feed on both terrestrial and aquatic insects, while adults feed largely on other fish (Scott and Crossman 1979; Page and Burr 1991; Behnke 1992).
Habitat:

Rainbow trout/steelhead are found in cool river, lake, and ocean waters in temperate regions. Spawning rainbow trout/steelhead require rivers or streams where gravel is the principle substrate (Scott and Crossman 1979).

Observations from Rickreall Creek:

Steelhead trout were encountered at Site #3 and from Site #5–8 (Figure 2a, Map 15). They were encountered every month except May, December, and January (Figure 3j). At Site #3, steelhead trout were only encountered in March (Figure 3c) and at Site #5, they were only encountered in August (Figure 3e).

Steelhead trout were captured at sites with water temperatures ranging from 5.5–23.5°C (Figure 4aa) and with surrounding stream gradients of 1.62% slope or less (Figure 4bb). Steelhead trout accounted for less than 1% of our total sample and had an encounter rate of 16% (Figure 6a). Fork length of captured steelhead trout ranged from 41-159 mm.

Petromyzontidae

Pacific lamprey (*Lampetra tridentata*)

Geographic Range:

Pacific lamprey occur in the drainages along the Pacific coast from Alaska to California. They also occur in the Pacific coast drainages of Asia (Scott and Crossman 1979; Page and Burr 1991).

Biology:

As their name implies, *L. tridentata* have three sharp ‘teeth’ within a mouth that acts as a sucking funnel. Pacific lampreys frequently reach a total length of 680 mm (Scott and Crossman 1979) but may achieve lengths up to 760 mm (Page and Burr 1991). Lampreys are anadromous and usually begin their spawning migrations between July and September. They may spend a period from October to the following March hidden under stones in creeks before spawning. Spawning occurs during spring, in sandy gravel, at the upstream edges of riffles. Adults usually die 1-14 days after spawning (Scott and Crossman 1979; Page and Burr 1991).
Habitat:

Spawning adults can be found in gravelly riffles of clear coastal streams; the feeding adult stage typically occurs in the ocean. Ammocoetes (larval lamprey) occur in silt, mud, and sandy substrates in backwaters of streams. They feed on plankton filtered from the water (Page and Burr 1991).

Observations from Rickreall Creek:

Pacific lamprey were encountered from Site #1–3 and at #5 (Figure 2a, Map 16). All lamprey were encountered between April and November however none were encountered in August and September (Figure 3j). Their relative abundance in Rickreall Creek was less than 1% and they had an encounter rate of 7% (Figure 6a).

Gasterosteidae

Threespine stickelback (*Gasterosteus aculeatus*)

Geographic Range:

Threespine stickleback are found worldwide, in habitats of the northern hemisphere (coastal, marine, and freshwater). They are common in Pacific and Atlantic drainages of Europe, Asia, and North America, below elevations of 100m. This species is also found (rarely) in the Arctic (Nelson and Paetz 1992).

Biology:

These fish may be marine, anadramous, or freshwater. Spawning generally takes place in June or July, although breeding behavior may occur throughout the summer months from April to September. Stickleback are carnivorous and consume a variety of animals as food, including insects, larvae, worms, small crustaceans, and eggs of their own species. They are highly prone to parasitic infestations (Scott and Crossman 1979; Nelson and Paetz 1992).

Habitat:

Shallow, vegetated areas of lakes, ponds and streams, usually over substrates of mud or sand (Page and Burr 1991).
Observations from Rickreall Creek:

Threespine stickleback were only found at Site #1 (Figure 2a, Map 17). Only 2 individuals were captured and they were captured in August (Figure 3a). Threespine stickleback accounted for less than 1% of our total sample and had an encounter rate of 1%.

Percopsidae

*Sandroller (Percopsis transmontana)*

Geographic Range:

Sandroller are a little-known and relatively uncommon fish. They occur in the Columbia River drainage, as well as western Idaho, southern Washington, and northwest Oregon (Page and Burr 1991).

Biology:

The sandroller has been known to reach a maximum length of 9.6 cm. Little is known about the life history of this species, but apparently its food consists of aquatic invertebrates (Page and Burr 1991; [http://www.fisheries.org/idaho/sandroller.htm](http://www.fisheries.org/idaho/sandroller.htm)).

Habitat:

These fish prefer backwater habitat and pool margins of small to large rivers, and usually occur over sandy substrate near vegetation (Page and Burr 1991).

Observations from Rickreall Creek:

Sandroller were only found at Site #1 (Figure 2a, Map 18). Only 1 individual was captured and it was captured in May (Figure 3a). Sandroller accounted for less than 1% of our total sample and had an encounter rate of 1%.
Centrarchidae

Pumpkinseed (*Lepomis gibbosus*)

Geographic Range:

Native to the eastern U.S. and southeastern Canada, but has been introduced widely across the western U.S. (Scott and Crossman 1979).

Biology:

Pumpkinseed feed primarily on aquatic and terrestrial insects, and small fishes, as well as larval amphibians, and macroinvertebrates. Spawning occurs in late spring over clean sand or gravel substrate and males guard the nests. This species reaches 230 mm in length, and has been known to hybridize with six species of sunfish, including bluegill (*L. macrochirus*) (Scott and Crossman 1979).

Habitat:

Small weedy lakes, ponds, and slow-moving streams. Prefers clear water and relatively cool water temperatures (Scott and Crossman 1979).

Observations from Rickreall Creek:

Pumpkinseed were only found at Site #3 (Figure 2a, Map 19). They were encountered from June to November (Figure 3c). Pumpkinseed accounted for less than 1% of our total sample and had an encounter rate of 6% (Figure 6a).
**Bluegill (Lepomis macrochirus)**

**Geographic Range:**

Native to St. Lawrence-Great Lakes and Mississipi River basins; Atlantic and Gulf Slope drainages from Cape Fear River, VA, to Rio Grande, TX and NM. Bluegill have been introduced over much of the United States, and are common in impoundments (Page and Burr 1991).

**Biology:**

Bluegill feed primarily on insects, crustaceans and plant material. Spawning takes place from late spring to early/mid-summer and occurs in shallow water. These fish are reported to reach a fork length of 410 mm. Bluegill are known to hybridize with seven other species of sunfish including pumpkinseed (Scott and Crossman 1979; Page and Burr 1991).

**Habitat:**

Bluegill are found mostly in shallow, warm water lakes and ponds with a large amount of vegetation. They are also found in slow-moving areas of rivers and streams (Scott and Crossman 1979; Page and Burr 1991).

**Observations from Rickreall Creek:**

Bluegill were only found at Site #3 (Figure 2a, Map 20). They were encountered from June to August (Figure 3c). Only 4 individuals were captured therefore bluegill accounted for less than 1% of our total sample and had an encounter rate of 3%.
Largemouth bass (*Micropterus salmoides*)

Geographic Range:

Native to the eastern U.S. and southeastern Canada, but has been introduced over much of the world as a sport fish (Page and Burr 1991).

Biology:

Adult largemouth bass feed primarily on fish; juveniles feed mostly on aquatic and terrestrial invertebrates. Spawning occurs from late spring to mid-summer in shallow water with sandy to muddy substrates and the male guards the nest. Largemouth bass have been recorded to reach 97 cm in length (Scott and Crossman 1979, Page and Burr 1991).

Habitat:

Clear, vegetated lakes, ponds, and slow-moving creeks or rivers. Typically found over sandy or silt substrate (Page and Burr 1991).

Observations from Rickreall Creek:

Largemouth bass were only found at Site #3 (Figure 2a, Map 21). They were encountered in September and October (Figure 3c). Only 7 individuals were captured therefore largemouth bass accounted for less than 1% of our total sample and had an encounter rate of 2%.
Discussion

Within the discussion, each fish encountered in Rickreall is organized by family and discussed in the following order: cyprinidae, catostomidae, cottidae, salmonidae, petromyzontidae, gasterosteidae, percopsidae, and centrarchidae. Similar to the results, there is no attempt at classification or organization of individual species beyond family grouping.

General trends

Fish species diversity decreased with increasing river kilometer, elevation, and gradient. This may be explained by several factors, including proximity to the Willamette River and increasing stream size at lower elevations, a pattern observed in other studies (Wooton, 1998; Waite and Carpenter, 2000). The considerable increase in the total number of fish species sampled with increased water temperatures may be a function of the total sampling effort expended per site. High stream temperatures generally corresponded to low summer flows, resulting in increasing sampling efficiency and effort per site. Low stream temperatures generally corresponded to high water flows, decreasing sampling efficiency and effort per site. Additionally, the presence of steelhead (Oncorhynchus mykiss) at many of the upper sites eliminated sampling activities at those locations.

A spike in the maximum number of species captured at Site #3 is most probably due to the influence of Villwoks ford (Site #3), a semi-impassible fish barrier at the upper limits of the site. This large concrete structure embedded in the stream channel acts as a vehicle bridge during low flows, connecting agricultural lands on the south side of the creek to a residence on the north side. The ford has two spillways on each side that are meant to act as fish ladders and a moderately sized culvert (large enough for a person to lie down and float through) located in the center of the creek channel. However, at low summer flows, the two spillways run dry, not allowing fish passage. The culvert, while draining directly into the downstream pool (step height of approximately 0.2 meters), is situated at a very steep angle creating a “rushing shoot” or high-pressure nozzle effect that may prevent certain species from being able to swim upstream. This may have acted as a fish barrier to some species resulting in a “piling up” effect of species. Support for this theory is bolstered by the fact that five species distributions appear to extend only up to this site. Additional support comes from the presence of a few hundred spawning adult suckers (Catostomus macrocheilus) directly below this ford while no adults were captured above this site. We did, however, capture juvenile suckers upstream of this site up to Site #6 sporadically until November and observed three adult suckers at Site #6 in September. It would seem apparent then that either some adult suckers are able to get past the ford, either earlier in the year when water is still flowing over the ford or through the culvert, or that some juveniles are moving upstream of the ford at some point during the year. Another alternative explanation is that Rickreall Creek may contain a resident population of largerscale suckers upstream of the ford.
Cyprinids dominated the middle and lower sections of the creek while cottids and salmonids dominated the upper reach. Cyprinids were generally observed at lower gradients, warmer stream temperatures, and larger stream systems (Waite and Carpenter, 2000), conditions observed in the middle and lower sections of Rickreall Creek. Aside from the prickly sculpin, cottid species in Rickreall Creek appear to be generalists and are found at a variety of stream gradients, water temperatures, and river kilometers, but were most abundant in the middle section of the creek, the reasons for which are unknown. Salmonids in Rickreall Creek were generally observed at sites with intermediate gradients (Figure 4u, 4y, and 4bb), cooler stream temperatures (Figure 4t, 4x, and 4aa) and higher river kilometers (Figure 4s and 4w). This may be a function of adult spawning locations and close proximity to juvenile rearing habitat.

The native fish fauna in Rickreall Creek appears to be intact, in contrast to some Willamette Basin streams (Oregon Department of Environmental Quality Agency Report, 1999). Number of exotic species captured was correlated with stream gradient, maximum water temperature, and river kilometer. Fish assemblages showed clear distinctions between sites located at high and low river kilometers, sites with high and low gradients (% slope), and varying water temperatures.

**Cyprinidae**

*Pikeminnow (Ptychocheilus oregonensis)*

Pikeminnow were only captured in the lower section of Rickreall Creek. The majority of the individuals were captured at the lowest site. This may be a function of proximity to the Willamette River, where this species is known to be abundant (Altman, Wildman). Although captures were most frequent during summer months, the largest individual fish were captured between November and March at the lowest site. The high frequency of juvenile captures (10-100mm) in summer months is consistent with late spring (April–June) spawning in the lower section of Rickreall Creek. The frequency of juvenile captures may also suggest the importance of the lowest sites as juvenile rearing habitat. The fact that the largest fish captured (300-485mm fork length) were during the winter months may be the result of two factors: high flows driving juveniles to seek refugia and sampling techniques favoring larger fish (large fyke nets) which were not used during summer months.

*Redside shiner (Richardsonius balteatus)*

Redside shiners were the most abundant species encountered in the creek, ranging from the Willamette River up to Site #7. Shiners, like the other cyprinid species encountered (with the exception of speckled dace), were observed to prefer slow water habitats. Shiners appear to be a generalist species able to adapt to a wide variety of environmental conditions at lower gradients. The majority of juveniles were captured in summer months (July–August), indicating spring spawning (April–June). It appears that juvenile shiners grow rapidly from July–September. Juveniles were captured most frequently in
the middle sites, which may be due to a variety of factors (water temperature, gradient, substrate type, predatory fish), but was also likely influenced by capture methods. Seining was the most efficient way to capture all size classes of shiners; however, this method was not used at all sites because of physical stream conditions. Most individuals were captured during spring and summer months.

**Speckled dace (Rhinichthys osculus)**

Speckled dace, along with reticulate sculpin (Cottus perplexus), exhibited a wide distribution along the creek; they were encountered from Site #1 to Site #8. Speckled dace less than 28mm appeared in July at several sites, although they were most abundant at site #5. As this size class was not observed in any other month, save August, we interpret the results to indicate March/May spawning interval. Speckled dace were most abundant in the middle section of the creek, the exact reasons for which are unknown. A high number of dace captured at site #4 during most of the year is likely the result of specific sampling methods (bailed minnow traps).

**Chiselmouth (Acrocheilus alutaceus)**

Chiselmouth were only encountered at the lowest site and only in spring and summer months (April–October). This pattern of spatial and temporal distribution is due to a) the close proximity to the Willamette River (Waite and Carpenter, 2001) and b) the non-targeting of the species during winter sampling months. However, small capture size makes interpretation difficult.

**Peamouth (Mylocheilus caurinus)**

Peamouth exhibited temporal and spatial distribution patterns similar to those of chiselmouth, encountered only at the lowest site during the summer months (August–October). It is likely that similar factors influencing chiselmouth account for these patterns.

**Catostomidae**

**Largescale sucker (Catostomus macrocheilus)**

Largescale suckers exhibited interesting patterns of spatial and temporal distribution within the creek. They were observed in lower gradient sites in the middle and lower sections of the stream. The presence of Villwoks ford at Site #3 appears to influence the distribution of this species within the creek. A group of 150-200 spawning adult suckers, suspected to have migrated from the Willamette River, was observed in March directly below this ford. With the exception of a few individuals observed at Site #6, no individuals of similar size were captured above this site. We did capture juveniles
upstream of Site #3 sporadically until November. However, juvenile suckers were abundant at sites downstream of Site #3 (as well as directly below the ford). Subsequently, the exact nature of the ford in influencing largescale sucker distribution is unclear, although it is suspected to be a partial barrier to fish passage, based on these capture data. It may be possible that some adult suckers are navigating the ford during some periods of the year (e.g. under high flows). However, there may be alternative explanations for the spatial distribution patterns observed (e.g. resident sucker population, juvenile navigation of the ford). Adult suckers were also captured in the winter months at Site #1. Although methods targeting adult size classes (baited fyke net) were only used at this site, the possibility exists that these fish were the beginning of an annual spawning migration up the creek. Our data are not extensive enough to draw growth and age conclusions.

Cottidae

Torrent sculpin (Cottus rhotheus)

Torrent sculpin were captured year round (except in January) at six of the nine sites; they were absent from Site #3 and Site #4. The higher frequency of summer captures was likely due to sampling methods and physical accessibility of habitat units within sites. The observed absence of this species from sites three and four may be due to differences in sampling methods. Gradient did not appear to be a major factor influencing the distribution of this species.

Reticulate sculpin (C. perplexus)

Reticulate sculpin were the only species captured at all nine sites (Figure 2a) and were captured every month (Figure 3j). This suggests reticulate sculpin are generalists and capable of adapting to a wide range of stream conditions. A wide range of length frequencies were observed at every site during the study period (Figure 7e), suggesting reproduction occurs throughout the system.

Riffle sculpin (C. gulosus)

Riffle sculpin were found at every site (except Site #8), however, they were captured in low abundances at all sites and do not appear to be common in Rickreall Creek. The reasons for the irregular temporal distribution of riffle sculpin captures (see Results) is unknown.

Prickly sculpin (C. asper)

Prickly sculpin were encountered only at the lowest two sites, a pattern that may be explained by proximity to the Willamette River (Waite and Carpenter, 2001). These captures are consistent with results from another study conducted on the Willamette River basin from 1993-1995 that found prickly sculpin present in low abundances in
agricultural and urban streams, similar to the Rickreall Creek (Waite and Carpenter, 2000). Prickly sculpin are known to be abundant in the Willamette River (Oregon Department of Environmental Quality Agency Report, 1999).

**Salmonidae**

**Coho salmon (Oncorhynchus kisutch)**

Coho salmon juveniles were encountered in Rickreall Creek at three sites from April–November. Moderate abundance (up to 37 individuals) of juvenile coho salmon captured at Site #2 and Site #6 may suggest that at least one pair of adult coho spawned somewhere in the vicinity of these two sites. (Natural coho spawning has been observed in Rickreall Creek and in 2001 a local citizen, at his request, was permitted to transport naturally produced coho fry/fingerling from the lower to upper reaches in order to improve their summertime survival prospects (S. Mamoyac, e-mail communication, May 2002).) The origin and history of coho salmon in Rickreall is discussed by Mattson and Gallagher in the Rickreall Watershed Assessment (Mattson and Gallagher, 2001). The Oregon Department of Fish and Wildlife (ODFW) lists Rickreall Creek as providing potential spawning and rearing habitat (Matson and Gallagher, 2001). Numerous individuals captured during the summer and fall months were covered in external parasites.

**Chinook salmon (O. tshawytscha)**

The stream type life history is exhibited by chinook native to the Upper Willamette Basin. A characteristic of this life history type is the overwintering in streams before completing their migration to the ocean. Three chinook salmon individuals were captured (112-144mm) during the winter months and were captured below Site #3 (Villwoks ford), suggesting that chinook salmon use the lower sections of Rickreall Creek as over-wintering habitat (Mattson and Gallagher, 2001) for a variety of possible reasons (refugia from cold temperatures, high water flows, or reduced suspended particulate matter in the mainstem Willamette River). Juveniles were determined to be smolts based on size and lack of parr marks. There is a possibility that chinook salmon could be spawning within Rickreall Creek and that the individuals captured were actually rearing juveniles waiting to migrate out of the system. However, one of the individuals was found dead along the stream bank and was missing its adipose fin, indicating its hatchery origin (fish retained the OSU Fish Collection Museum). Upper Willamette Basin hatcheries that raise chinook include Marion Forks Fish Hatchery, South Santiam Fish Hatchery, McKenzie Fish Hatchery, and Willamette Fish Hatchery. Concurrent to its hatchery release and subsequent smoltification, this particular individual swam 12.47 km upstream to Site #3. The possible use of the lower section of Rickreall Creek as over-wintering habitat for juvenile chinook salmon raises two interesting questions: can juvenile chinook salmon move over Villwoks ford during the winter, and if they can, how much habitat would be utilized?
Cutthroat trout (*O. clarki*)

Cutthroat trout were encountered at every site in Rickreall Creek (except Site #1), primarily from April to November. Small individuals (<100mm) were rarely captured below Site #9. Smaller cutthroat were observed by Mattson and Gallagher in the majority of the tributaries to Rickreall Creek (Mattson and Gallagher, 2001). This may explain why we didn’t capture very many smaller individuals in the mainstem. Mattson and Gallagher suggest that the status of mainstem cutthroat trout below Mercer Reservoir down to at least River Mile 19 (approximately river kilometer 32) appear to be secure but that the status below Dallas is unclear (Mattson and Gallagher, 2001). We captured cutthroat trout in greatest abundances at river kilometer 22.26 and 25.75 (River Mile 13.83 and 16.00, respectively), nearly six miles below where Mattson and Gallagher defined “secure” populations. We captured cutthroat trout infrequently at river kilometer 15.18 and 12.47, and rarely below river kilometer 12.47, suggesting either seasonal use or low densities at these lower river kilometers. Numerous individuals captured during the summer and fall months were covered in external parasites.

Steelhead/Rainbow trout (*O. mykiss*)

Steelhead/rainbow trout were captured and/or observed in all three sections of the creek. Only juveniles were encountered; their apparent high density at Sites #6, #7, and #8 suggest that these may be important rearing areas and may be close to spawning areas. Data are limited, however, because our agreement with NMFS required us to abandon sites as soon as we encountered steelhead or suspected steelhead. Thus, steelhead observations are restricted largely to summer months when snorkel surveys of sites could be performed.

*Petromyzontidae*

Pacific lamprey (*Lampetra tridentate*)

Pacific lamprey were found in two different life stages within Rickreall Creek. A 380mm spawning adult was captured at Site #2 (April) and ammocoetes from 29-136mm were captured from Site #1-3 and at Site #5. While the majority of lamprey were captured below Site #3, we did encounter individuals above this site. This indicates that Pacific lamprey, either spawning adults or rearing ammocoetes, are able to migrate past this structure. The usage of spawning habitat upstream of Villwoks ford is important because the Willamette Basin is a very important area for production of Pacific lamprey (Kostow, 2002).

*Centrarchidae*

Pumpkinseed (*Lepomis gibbosus*)
Pumpkinseed, one of four exotic species captured in Rickreall Creek, were only encountered at one site (Site #3) from June to November, and were captured in low abundances (19 individuals). The majority of the individuals captured were juveniles (<100mm). It is unclear why this species occurs only at this site, although Villwoks ford may play an undefined role. Temporal distribution may be influenced by differences in sampling methods throughout the year.

**Bluegill** (*Lepomis macrochirus*)

Bluegill, one of four exotic species captured in Rickreall Creek, were only encountered at one site (Site #3) from June to August, and were captured in low abundances (3 individuals). It is unclear why this species occurs only at this site, although Villwoks ford (Site #3) may play an undefined role. Temporal distribution may be influenced by differences in sampling methods throughout the year. All specimens were covered in external parasites.

**Largemouth bass** (*Micropterus salmoides*)

Largemouth bass, one of four exotic species captured in Rickreall Creek, were only encountered at one site (Site #3) in September and October and in low abundances (7 individuals). All of the individuals captured were juveniles (<150mm). It is unclear why this species occurs only at this site, although Villwok’s ford may play an undefined role. Temporal distribution may be influenced by differences in sampling methods throughout the year.

**Gasterosteidae**

**Threespine stickleback** (*Gasterosteus aculeatus*)

Threespine sticklebacks are thought to move into Rickreall Creek from the mainstem of the Willamette River. The two specimens found in Rickreall Creek were in the site closest to the Willamette River. This may be due to the conditions in Rickreall Creek being similar to those in the Willamette River.

**Percopsidae**

**Sandroller** (*Percopsis transmontana*)

Sandrollers are thought to move into Rickreall Creek from the mainstem of the Willamette River. The one specimen found in Rickreall Creek was encountered at the site closest to the Willamette River. This may be due to the conditions in Rickreall Creek being similar to those in the Willamette River.
Acknowledgments

Special thanks go to Donita White, who generously provided us with food and lodging throughout the project. We are also grateful to Jackie Hastings, Hugh Buchanan, and the Rickreall Watershed Council. We also thank Nancy Adams, David Anderson and Boise Cascade, Lance Campbell, the City of Dallas, Jock Dalton, Guillermo Giannico, Charlie Hazel, Chantel Jimenez, Dave Joslin, Steve Mamoyac and ODFW, Managers of Eola Bend RV Park, Doug Markle, Greg Nelson, OSU Dept. Fisheries and Wildlife, Jennifer Rogers, David Simon, Monique Szedelyi, Al Tschiegg, Claude White & Family, and Randy Wildman. Funding was made possible through the Rickreall Watershed Council and Oregon State University. Specimens were collected under scientific taking permits from NMFS (# 1337), ODFW (#01-096 and OR 2002-059), and Oregon State University Institutional Animal Care and Use Committee (CP168).
Literature Cited


Mamoyac, Steve. ODFW District Fish Biologist. E-mail communication, May 2002.


Websites:

http://www.fisheries.org/idaho/sandroller.htm
Table #3. Summary of fish species collected and observed in Rickreall Creek from April 2001-March 2002.

**Fish Species found in Rickreall creek**

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<tr>
<th>Common name</th>
<th>Family</th>
<th>Genus and species</th>
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<td>Largescale sucker</td>
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</tr>
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<td>Redside shiner</td>
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<td>Speckled dace</td>
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<td>Threespine stickleback</td>
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<td><em>Gasterosteus aculeatus</em></td>
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<td>Sandroller</td>
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<td>Steelhead/Rainbow trout</td>
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<td><em>O. mykiss</em></td>
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<tr>
<td>Chinook salmon</td>
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<td><em>O. tshawytscha</em></td>
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**Exotic fish species**

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<td>Coho salmon</td>
<td>Salmonidae</td>
<td><em>O. kisutch</em></td>
</tr>
</tbody>
</table>
Map 1. Rickreall creek catchment highlighted with sampling sites shown


Picture 1.  Looking downstream at Site #1, river km 0.56.

Picture 2.  Looking upstream at Site #2, river km 10.06.
Picture 3. Looking upstream at Site #3, river km 12.75.

Picture 4. Looking upstream at Site #4, river km 15.18.
Picture 5. Looking upstream at Site #5, river km 22.26.

Picture 6. Looking upstream at Site #6, river km 25.75.
Picture 7. Looking upstream at Site #7, river km 31.96.

Picture 8. Looking upstream at Site #8, river km 38.09.
Picture 9. Looking upstream at Site #9, river km 45.08.
Figure 1a. Relationship between gradient (% slope) and river kilometer at nine sites in Rickreall Creek from April 2001–March 2002.

Figure 1b. Relationship between elevation (m) and river kilometer at nine sites in Rickreall Creek from April 2001–March 2002.
Figure 1c. Relationship between water temperature (°C) and sampling date at nine sites in Rickreall Creek from April 2001– March 2002.

Figure 1d. Relationship between elevation (m), maximum water temperature (°C) and river kilometer in Rickreall Creek from April 2001– March 2002.
Figure 1e. Relationship between maximum water temperature (°C), maximum number of fish species captured and gradient (% slope) in Rickreall Creek from April 2001–March 2002.

Figure 1f. Relationship between maximum number of fish species captured and maximum water temperature (°C) in Rickreall Creek from April 2001–March 2002.
Figure 1g. Relationship between maximum water temperature (°C), maximum number of fish species captured and river kilometer in Rickreall Creek from April 2001– March 2002.

Figure 1h. Relationship between total number of fish captured and water temperature (°C) at nine sites in Rickreall Creek from April 2001– March 2002.
Figure 1i. Relationship between elevation (m), maximum number of fish species captured and river kilometer in Rickreall Creek from April 2001– March 2002.

Figure 1j. Relationship between total number of fish species captured and gradient (% slope) at nine sites in Rickreall Creek from April 2001– March 2002.
Figure 2a. Distribution of fish species encountered in Rickreall Creek from April 2001-March 2002 by site.
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*Figure 3a.* Temporal distribution of fish species encountered at river km 0.56 (Site #1) in Rickreall Creek from April 2001-March 2002.
Figure 3b. Temporal distribution of fish species encountered at river km 10.06 (Site #2) in Rickreall Creek from April 2001-March 2002.
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*Figure 3c.* Temporal distribution of fish species encountered at river km 12.47 (Site #3) in Rickreall Creek from April 2001-March 2002.
Figure 3d. Temporal distribution of fish species encountered at river km 15.18 (Site #4) in Rickreall Creek from April 2001-March 2002.
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<td><em>Lampetra tridentata</em></td>
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<td><em>Oncorhynchus clarki</em></td>
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<td><em>Oncorhynchus mykiss</em></td>
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<td><em>Richardsonius balteatus</em></td>
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*Figure 3e.* Temporal distribution of fish species encountered at river km 22.26 (Site #5) in Rickreall Creek from April 2001-March 2002.
<table>
<thead>
<tr>
<th>Date</th>
<th>Catostomus macrocheilus</th>
<th>Cottus gulosus</th>
<th>Cottus perplexus</th>
<th>Cottus rhotheus</th>
<th>Cottus sp.</th>
<th>Lampetra sp.</th>
<th>Oncorhynchus clarkii</th>
<th>Oncorhynchus kisutch</th>
<th>Oncorhynchus mykiss</th>
<th>Rhinichthys osculus</th>
<th>Richardsonius balteatus</th>
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*Figure 3f.* Temporal distribution of fish species encountered at river km 25.75 (Site #6) in Rickreall Creek from April 2001-March 2002.
<table>
<thead>
<tr>
<th>Fish Species</th>
<th>April 01</th>
<th>May 01</th>
<th>June 01</th>
<th>July 01</th>
<th>August 01</th>
<th>September 01</th>
<th>October 01</th>
<th>November 01</th>
<th>December 01</th>
<th>January 02</th>
<th>February 02</th>
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<td><em>Cottus rhotheus</em></td>
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<td><em>Cottus sp.</em></td>
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<td><em>Oncorhynchus clarki</em></td>
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<td><em>Oncorhynchus kisutch</em></td>
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<td><em>Oncorhynchus mykiss</em></td>
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<td><em>Oncorhynchus sp.</em></td>
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<td><em>Rhinichthys osculus</em></td>
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<td><em>Richardsonius balteatus</em></td>
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*Figure 3g.* Temporal distribution of fish species encountered at river km 31.96 (Site #7) in Rickreall Creek from April 2001-March 2002.
**Figure 3h.** Temporal distribution of fish species encountered at river km 38.09 (Site #8) in Rickreall Creek from April 2001-March 2002.

**Figure 3i.** Temporal distribution of fish species encountered at river km 45.08 (Site #9) in Rickreall Creek from April 2001-March 2002.
Figure 3j. Temporal distribution of fish species encountered in Rickreall Creek from April 2001-March 2002.
Figure 4a. Relationship between the number of northern pikeminnow (*Ptychocheilus oregonensis*) captured per site and sampling date from nine sites in Rickreall Creek from April 2001– March 2002.

Figure 4b. Relationship between the number of northern pikeminnow (*Ptychocheilus oregonensis*) captured per site and water temperature (°C) from nine sites in Rickreall Creek from April 2001– March 2002.
Figure 4c. Relationship between the number of northern pikeminnow (*Ptychocheilus oregonensis*) captured per site and gradient (% slope) from nine sites in Rickreall Creek from April 2001–March 2002.

Figure 4d. Relationship between number of redside shiners (*Richardsonius balteatus*) captured per site and sampling date from nine sites in Rickreall Creek from April 2001–March 2002.
Figure 4e. Relationship between number of redside shiners (*Richardsonius balteatus*) captured per site and water temperature (°C) from nine sites in Rickreall Creek from April 2001 – March 2002.

Figure 4f. Relationship between number of redside shiners (*Richardsonius balteatus*) captured per site and gradient (% slope) from nine sites in Rickreall Creek from April 2001 – March 2002.
Figure 4g. Relationship between number of speckled dace (*Rhinichthys osculus*) captured per site and sampling date from nine sites in Rickreall Creek from April 2001–March 2002.

Figure 4h. Relationship between number of speckled dace (*Rhinichthys osculus*) captured per site and water temperature (°C) from nine sites in Rickreall Creek from April 2001–March 2002.
Figure 4i. Relationship between number of speckled dace (*Rhinichthys osculus*) captured per site and gradient (% slope) from nine sites in Rickreall Creek from April 2001– March 2002.

Figure 4j. Relationship between number of large-scale suckers (*Catostomus macrocheilus*) captured per site and sampling date from nine sites in Rickreall Creek from April 2001– March 2002.
Figure 4k. Relationship between number of largescale suckers (*Catostomus macrocheilus*) captured per site and gradient (% slope) from nine sites in Rickreall Creek from April 2001– March 2002.

Figure 4L. Relationship between number of largescale suckers (*Catostomus macrocheilus*) captured per site and water temperature (°C) from nine sites in Rickreall Creek from April 2001– March 2002.
Figure 4m. Relationship between number of torrent sculpin (Cottus rhotheus) captured per site and sampling date from nine sites in Rickreall Creek from April 2001–March 2002.

Figure 4n. Relationship between number of torrent sculpin (Cottus rhotheus) captured per site and water temperature (°C) from nine sites in Rickreall Creek from April 2001–March 2002.
Figure 4o. Relationship between number of torrent sculpin (*Cottus rhotheus*) captured per site and gradient (% slope) from nine sites in Rickreall Creek from April 2001– March 2002.

![Graph showing relationship between number of individuals captured and gradient (slope)](image)

- 12 individuals, River kilometer 22.26, Site #5, 0.25% slope

Figure 4p. Relationship between number of reticulate sculpin (*Cottus perplexus*) captured per site and sampling date from nine sites in Rickreall Creek from April 2001– March 2002.

![Graph showing relationship between number of individuals captured and sampling date](image)

- 25 individuals, River kilometer 22.26, Site #5, July, 2001
Figure 4q. Relationship between number of reticulate sculpin (*Cottus perplexus*) captured per site and water temperature (°C) from nine sites in Rickreall Creek from April 2001–March 2002.

Figure 4r. Relationship between number of coho salmon (*Oncorhynchus kisutch*) captured per site and sampling date from nine sites in Rickreall Creek from April 2001–March 2002.
Figure 4s. Relationship between number of coho salmon (*Oncorhynchus kisutch*) captured per site and river kilometer from nine sites in Rickreall Creek from April 2001–March 2002.

Figure 4t. Relationship between number of coho salmon (*Oncorhynchus kisutch*) captured per site and water temperature (°C) from nine sites in Rickreall Creek from April 2001–March 2002.
**Figure 4u.** Relationship between number of coho salmon (*Oncorhynchus kisutch*) captured per site and gradient (% slope) from nine sites in Rickreall Creek from April 2001–March 2002.

**Figure 4v.** Relationship between number of cutthroat trout (*Oncorhynchus clarki*) captured per site and sampling date from nine sites in Rickreall Creek from April 2001–March 2002.
Figure 4w. Relationship between number of cutthroat trout (*Oncorhynchus clarki*) captured per site and river kilometer from nine sites in Rickreall Creek from April 2001–March 2002.

Figure 4x. Relationship between number of cutthroat trout (*Oncorhynchus clarki*) captured per site and water temperature (°C) from nine sites in Rickreall Creek from April 2001–March 2002.
**Figure 4y.** Relationship between number of cutthroat trout (*Oncorhynchus clarki*) captured per site and gradient (% slope) from nine sites in Rickreall Creek from April 2001– March 2002.

**Figure 4z.** Relationship between fork length (mm) of cutthroat trout (*Oncorhynchus clarki*) captured per site and maximum depth at the nine sites they were captured in Rickreall Creek from April 2001– March 2002.
Figure 4aa. Relationship between number of steelhead trout (*Oncorhynchus mykiss*) captured per site and water temperature (°C) from nine sites in Rickreall Creek from April 2001–March 2002.

Figure 4bb. Relationship between number of steelhead trout (*Oncorhynchus mykiss*) captured per site and gradient (% slope) from nine sites in Rickreall Creek from April 2001–March 2002.
Figure 5a. Relative abundance of fish species collected in Rickreall Creek from April 2001-March 2002 with a total sample size of 6011. The category "Other spp." contains 15 species that were encountered in less than 1% of the total sample.
Figure 6a. Percentage of times a fish species was encountered during 108 samples of Rickreall Creek from April 2001-March 2002. The category "Other spp." contains 9 species that were encountered in less than 5% of the samples.
Figure 7a. Length frequency measurements for northern pikeminnow (*Ptychocheilus oregonensis*) from April 2001-March 2002. Five fish with fork length >300 mm were excluded from the graph.
Figure 7b. Length frequency measurements for redside shiners (*Richardsonius balteatus*) from April 2001-March 2002. *Left graph*- length frequency by month at all study sites. *Right graph*- length frequency by study site for all months.
Figure 7c. Length frequency measurements for speckled dace (*Rhinichthys osculus*) from April 2001-March 2001. Left graph- length frequency by month at all study sites. Right graph- length frequency by study site for all months.
Figure 7d. Length frequency measurements for large scale suckers (*Catostomus macrocheilus*) from April 2001-January 2002. Left graph- length frequency by month at all study sites. Right graph- length frequency by study site for all months.
Figure 7e. Length frequency measurements for reticulate sculpin (*Cottus perplexus*) from April 2001-March 2002. *Left graph*- length frequency by month at all study sites. *Right graph*- length frequency by study site for all months.
Figure 7f. Length frequency measurements for coho salmon (*Oncorhynchus kisutch*) from April 2001- November 2001.
Figure 7g. Length frequency measurements for cutthroat trout (*Oncorhynchus clarki*). **Left**: length frequency by month at all study sites. **Right**: length frequency by study site for all months.