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Relative Abundance, Distribution, and Life Histories of Fish Species in the Colville River Watershed, Stevens County, Washington.

A Thesis

Presented to

Eastern Washington University

Cheney, Washington

In Partial Fulfillment of the Requirements

for the Degree

Masters of Science

in

Biology

Aaron J. Mettler

Spring 2014

THESIS OF AARON J. METTLER APPROVED BY

Dr. Allan Scholz, Graduate Study Professor	Date
Dr. Camille McNeely, Graduate Study Committee	Date
Dr. Stacy Warren, Graduate Study Committee	Date

MASTER'S THESIS

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Abstract

This was the first study to report on the fish assemblage of the Colville River watershed, Stevens County, Washington. Sixty-nine sites were sampled from May – November of 2013, 19 in the Colville River and 50 in its tributaries: Blue Creek (n=2), Chewelah Creek (n=6), Cottonwood Creek (n=2), Deer Creek (n=2), Gold Creek (n=3),Haller Creek (n=2), Huckleberry Creek (n=3), Jump Off Joe Creek (n=2), Little Pend Oreille River (n=11), Mill Creek (n=8), Paye Creek (n=1), Sheep Creek (n=2), Sherwood Creek (n=2), Stensgar Creek (n=2), Stranger Creek (n=1), and Thomason Creek (n=1).

Sites were sampled using backpack electrofishing, seine nets, and minnow traps. A total of 4,314 fish were captured representing six families and 28 species. The species (relative abundance) were: carp (3.5%), peamouth (>0.1%), northern pikeminnow (0.3 %), longnose dace (3.4 %), Umatilla dace (3.8 %), speckled dace (14.7%), redside shiner (13.7%), tench (0.3 %), longnose sucker (1.7 %), bridgelip sucker (>0.1%), largescale sucker (1.2%), lake whitefish (>0.1%), mountain whitefish (0.3 %), westslope cutthroat trout (>0.1%), coastal rainbow trout (8.0%), interior rainbow trout (14.1%), brown trout (8.0%), brook trout (11.0%), prickly sculpin (2.9%), mottled sculpin (2.6%), slimy sculpin (>0.1%), shorthead sculpin (1.1%), torrent sculpin (7.6%), green sunfish (>0.1%), pumpkinseed (1.1%), bluegill (>0.1%), largemouth bass (>0.1%), and yellow perch (0.5%).

The stocking record, water quality, and barrier falls were examined to assess the effects they potentially have on species distribution. Stocking was found to aid the distribution of non native trout (salmonids), sunfish (centrachids), and perch (percidae).

Two water quality parameters were examined, water temperature (°C) and dissolved oxygen (mg/L). Neither was found to effect distribution. However, water temperature appeared to affect relative abundance, with different species relative abundances in the warmer Colville River compared to its cooler tributaries. Tributaries were cooler (average summer temperature= 12.8°C) and contained more salmonids (RA=73.4%) while the maintstem Colville had higher temperatures (average summer temperature= 17.7°C) and contained predominatly cyprinids (RA=71.2%).Waterfalls were examined to test the hypothesis that they were barrier falls to fish migration. I found that total numbers of fish species decreased above each waterfall, however stream size was more of a factor when comparing the average number of species found at each site ($p<0.001$).

Life history data collected include age, diet, and fecundity. Fishes grew similar to that reported by many of the local lakes and streams however species that have a condition factor were found to grow at the average rate reported by Carlander (1969; 1977; 1997). Diet was consistent with reported diets by species. Fecundity of cyprinid species was within the ranged reported for each species.

This study documented the presence of Umatilla dace in this watershed and reported on their growth, diet, and fecundity. Growth was found to be faster than reported by COSEWIC (2010) in British Columbia. Diet consisted primarily of trichopterans and detritus. Fecundity ranged from 474 to 2,134 eggs in females 86 to 115 mm in total length and 5 to 15 g in weight.

Acknowledgments

I would like to thank Dr. Allan Scholz for providing me the opportunity to study the Colville River Watershed and for all of his guidance and advice he has provided for me throughout my undergraduate and graduate career. I would also like to thank my committee members Dr. Camille McNeely and Dr. Stacy Warren for their input and advice as well.

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Lastly I would like to specially thank all of the land owners who graciously gave me and my sampling crew permission to sample sites located on their property, without which sampling would have been limited.

Fish were collected under a Washington State scientific collector permit (No. 13-020) issued to Dr. Allan Scholz and under IACUC approval from Eastern Washington University.

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Introduction

Stevens County is located in northeast Washington. The major watershed in Stevens County is the Colville River and its suite of tributaries. This is the first study to report on the fish assemblage of the CRW, Steven County, Washington. Initially I examined the stocking records and previous stream surveys conducted by the Water Resource Inventory Area 59 (WRIA 59) planning team, Washington Department of Fish and Wildlife (WDFW), and United States Forest Service (USFS).

The goal of this study was to conduct a comprehensive baseline fisheries survey of the CRW. This goal was accomplished by conducting fish surveys using backpack electrofishing, boat electrofishing, seine netting, and minnow traps at a variety of sites throughout the entire watershed from May- November of 2013. Data was collected to assess relative abundance, distribution, and life history traits of native and nonnative fishes. Known barrier waterfalls and previously reported water quality information was compared to the collected data to assess their impacts on distribution.

Stocking History

Historically wild populations of Chinook salmon spawned in the Colville River upstream to Meyers Falls (8 river km), which is a natural barrier fall to anadromous fish migration. (Fulton 1968:1970). Stocking hatchery reared trout has maintained a recreational fishery above Meyers Falls (WDFW 2006; Honeycutt 2008; Divens and Phillips 1999).

Table 1 shows the stocking history of the CRW since 1933. From 1933-2011 there have been over 10 million fish stocked. Four species comprise the majority of the

stocking effort; rainbow trout, eastern brook trout, kokanee, and cutthroat. Brown trout were stocked in relatively low numbers but have established one or more natural spawning populations in this watershed.

Table 1. Stocking history of the Colville River Watershed

Species	Number stocked	Years stocked
cutthroat	1,067,436	1933-1938, 1941, 1943-1945, 1952-1957, 1960, 1961, 1978, 1995, 1998-2004, 2007
rainbow trout	4,408,048	1933-1980, 1982-2011
steelhead	197,248	1933-1936, 1995-1998
kokanee	1,271,855	1933-1940, 1949
brown trout	248,302	1952, 1953, 1977, 1978, 1980-1982, 1986, 1988, 1996, 1997, 1999-2011
eastern brook trout	2,906,038	1933-1945, 1947, 1950, 1954, 1955, 1957-1964, 1966, 1967, 1970-1982, 1984-1992, 1995-2000
tiger trout	54,500	2005-2008
arctic grayling	100,000	1936
bass	2,000	1937
yellow perch	11,379	1939
	10,266,806	

Previous Research

Washington Department of Fish and Wildlife (WDFW)

WDFW sampled 12 sites in the CRW; 6 sites sampled in 1973 and 6 sites sampled in 1970 by the WDOE (Nielsen 1975). Sites were restricted to the Colville River; however four of the sites were at the mouths of the Little Pond Oreille River, Chewelah Creek, Cottonwood Creek, and the confluence of Deer Creek and Sheep Creek (Nielsen 1975). Most sites (9 of 12) sampled were up stream of the town of Addy. Sampling methods include electrofishing and gill netting (Nielsen 1975). A total of 13 rainbow trout, 33 brown trout and 650 unidentified fish (denoted as an aggregate in the report) were caught in the 12 sites (Nielsen 1975). Relative abundance of rainbow trout was 2% and brown trout was 5%.

United States Forest Service (USFS)

The USFS samples the Colville National Forest on a yearly basis. Streams located within the forest are sampled on a 10 year rotational basis (Honeycutt 2008). Sampling crews focused on the presence/absence of trout species, however they did identify other species encounter while sampling (Honeycutt 2008). Sampling methods include snorkeling and electrofishing (Honeycutt 2008). Fish species encountered throughout their sampling include chiselmouth, redside shiner, tench, unidentified dace, largescale sucker, unidentified suckers, unidentified bullhead, mountain whitefish, cutthroat trout, rainbow trout, steelhead, kokanee, brown trout, brook trout, unidentified trout, unidentified sculpin, pumpkinseed, largemouth bass, and black crappie (Honeycutt 2008).

Water Resource Inventory Area 59 (WRIA 59)

The WRIA 59-Colville River Watershed instream flow study report (WRIA 59 2006) provided recommended minimum instream flow needs to protect fish and aquatic life (HDR 2007). Watershed quality assessment teams sampled for relative abundance of fish species, in particular the presence of two species of salmonids; rainbow trout and brook trout (HDR 2007). These two species were selected to represent trout species because they have unique habitat requirements and provide recreational benefits (HDR 2007). These two species have similar spawning seasons as the other two trout species found in this watershed; cutthroat trout and brown trout (HDR 2007). Rainbow and cutthroat both spawn in the spring while brook and brown both spawn in the fall (HDR 2007).

Sampling occurred during July and August of 2006 (HDR 2007). A total of 948 fish where collected during this sampling period, species captured include northern pikeminnow, longnose dace, speckled dace, redside shiner, sucker species, rainbow trout, brown trout, brook trout, sculpin species, and unidentified fishes (Table 2) (HDR 2007).

Sampling included 24 sites in 18 streams (Table 2) (WDFW 2006; HDR 2007). Fish were collected by backpack electrofishing and were identified to species and lengths were recorded, however lengths were not recorded for each specimen caught (WDFW 2006; HDR 2007). Rainbow trout had the highest relative abundance at 24%, followed by redside shiner at 22%, then sculpin at 19%, brown trout at 16 %, brook trout at 9% and the rest were at 5% or lower (Table 2) (WDFW 2006; HDR 2007).

As a part of the WRIA 59 2006 report WDFW compiled a known fish distribution chart. The chart was a compilation of data from multiple agencies and reports dating back to 1985. Agencies include the United States Forest Service (USFS), WDFW, United States Fish and Wildlife Service (USFWS), and Washington Department of Natural Resources (WDNR) (HDR 2007). Reports include Northeastern Washington fish distribution list and WRIA 59 2006 report (HDR 2007). The chart includes 41 rivers and creeks, 18 of which were sampled during the WRIA 59 2006 report, that comprise the WRIA 59 watershed (HDR 2007). The report did not include information regarding numbers of species caught (Appendix E) (HDR 2007).

Summary of previous investigations

The majority of the CRW is located on private land, which makes sampling the river difficult because access to the river must be granted before any sampling can occur. Previous studies that have sampled on the Colville River and its tributaries focused on federal and public lands (Honeycutt 2008) with few sampling sites or the sites were clustered together. Thus, these studies did not paint an adequate picture for abundance or distribution of fish within the watershed (HDR 2007; WDFW 2006). This was the first study to select sites that comprehensively covered the entire watershed, including private, federal, and public lands.

Table 2. Fish Species found in 18 sampled streams for the WRIA 59 report; total number found at each stream and Relative Abundance of each species found in the watershed

Sampled Site	northern pikeminnow	longnose dace	speckled Dace	redside shiner	sucker sp	rainbow trout	brown trout	eastern brook trout	sculpin sp	unidentified	Total
Gold Creek						13		4			17
Mill Creek					1	24	17	10	16		68
Colville River	2	22	5	73	12	10	8		14		146
Haller Creek						16		26	15		57
Little Pend Oreille River		6			5	13	5		19	1	49
Stranger Creek						1			3		4
Stensgar Creek		16	9	49		7	1		1		83
Blue Creek		6	2	69		5	4		3		89
Chewelah Creek						28	59	2	8	2	99
Thomason Creek						1	3	2	3	1	10
Sherwood Creek						6	2	19			27
Cottonwood Creek				17	4	6	23	1	14		65
Huckleberry Creek						41	3	1	7		52
Waitts Creek						3	3	4		8	18
Bulldog Creek							16		5		21
Deer Creek						27	5	4	20		56
Sheep creek						21		1	17		39
Grouse Creek						5		12	31		48
Relative Abundance	**0.2%**	**5%**	**2%**	**22%**	**2%**	**24%**	**16%**	**9%**	**18%**	**1%**	**948**

Objectives

1. Compile the stocking record for the CRW from 1933 to present.
2. Conduct a baseline fish survey of the watershed using three different sampling methods; electrofishing, seine netting, and setting minnow traps.
3. Compile water quality data throughout the watershed. Water quality data was compared to distribution data to assess its affect on species distribution throughout the watershed.
4. Assess age/growth, survival/ mortality rates, and condition factor of species.
5. Assess food habits of minnow species, brown trout, and sculpin species in the watershed. Food habits were assessed by either a) taking the stomach or b) gastric lavage of the individual. Contents were identified as far as taxonomically possible.
6. Asses fecundity of minnow species.
7. Collected genetic samples of rainbow trout for WDFW to determine the presence/ abundance of the subspecies interior rainbow (redband) trout.

Materials & Methods

Watershed

Located in northeastern Washington State, the CRW lies between the Pend Oreille River and the Columbia River. Headwater streams start in the area 19 miles north of Spokane, while the mouth is 30 miles from the Canadian border (Golder 2006).The Colville River begins at the confluence of Sheep Creek and Deer Creek in southern Stevens County, and flows northwest for 85 river km. Along its course, the river passes near the cities of Chewelah and Colville, eventually discharging near the city of Kettle Falls into the Columbia River (Franklin D. Roosevelt Lake) (Figure 1) (Golder 2006).

The majority of the tributaries to the Colville River are small. The three largest tributaries, the Little Pend Oreille River, Mill Creek, and Chewelah Creek account for just over half of the Colville River discharge. The only other tributary accounting for more than 5 percent of the river volume is Sheep Creek, a headwater stream at about 5.9 percent (Golder 2006).The other tributaries include, from headwaters to mouth, Deer Creek, Jumpoff Joe Creek, Bulldog Creek, Waitts Creek, Huckleberry Creek, Cottonwood Creek, Sherwood Creek, Thomason Creek, Paye Creek, Blue Creek, Stensgar Creek, Addy Creek, Stranger Creek, Haller Creek, and Gold Creek.

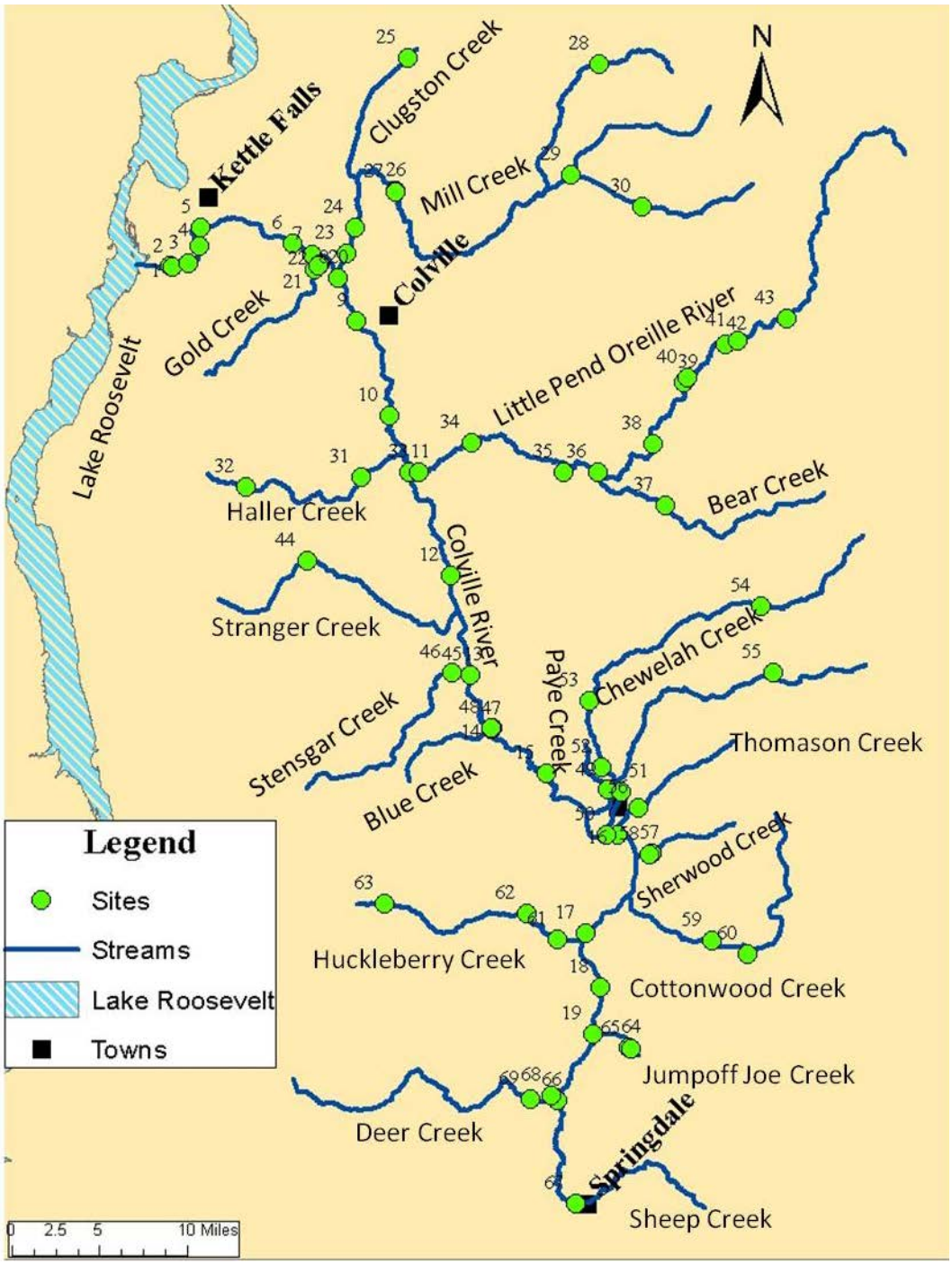

Figure 1. Colville River Watershed in Stevens County, WA

Methods

Fieldwork involved sampling 69 sites; 19 on the Colville River and 50 on its tributaries: Gold Creek (n=3), Mill Creek (n=7), Clugston Creek (n=1), Haller Creek (n=1),Spratt Creek (n=1), Little Pend Oreille River (n=10), Bear Creek (n=1), Stranger Creek (n=1), Stensgar Creek (n=2),Blue Creek (n=2), Paye Creek (n=1), Chewelah Creek (n=6), Thomason Creek (n=1), Sherwood Creek (n=2), Cottonwood Creek (n=2), Huckleberry Creek (n=3), Jump Off Joe Creek (n=2), Sheep Creek (n=2), and Deer Creek (n=2). Site length and effort varied based on stream attributes and permission; however sites were at least 100 meters in length (Thompson & Rahel 1996; Rosenberger & Dunham 2003). Sites were selected to comprehensively encompass the entire watershed; sites were located on public, state, federal, and private lands. Sites ranged from high elevation, small stream, with dense riparian zones to low elevation, large stream, meandering through agricultural fields. Landowners information was obtained through the mapsifter program located on the Stevens County government website.

This project consisted of three different sampling methods, two active and one passive sampling method. The first method was backpack electrofishing. A Smith-Root LR-20B fishing unit was used. Smith-Root safety procedures and protocols were followed while using this device (Reynolds & Harlan 2011). Backpack electrofishing requires a backpack frame with a computer board, a battery to run it, a cathode tail and an anode rod (Murphy and Willis 1996; ASIH 1988). The current runs between the anode and cathode and causes the fish to be attracted to the anode. Settings for attracting the fish ranged from 0.1-0.4 amps, 300-350 volts, 15-25 Hz, and 15-25% duty cycle. Advantages include non-species specific and relatively high CPUE. Disadvantages

include trauma to fish due to electricity and human bias for larger fish (Murphy and Willis 1996; ASIH 1988). Sampling protocols were similar to those described by Murphy and Willis (1996).

The second method was the combination of backpack electrofishing and seine netting, henceforth termed electroseining. Electroseining eliminates many of the flaws of the two sampling methods. It eliminates the chance of the net getting caught on the coarse substrate and reduces human bias for larger fish (Murphy and Willis 1996; ASIH 1988). The seine net was set up ten meters downstream of the electrofishing unit, fish were then shocked down towards the net. The dimensions of the net used was ¼" mesh x 4 feet deep x 30 feet long and the net funneled into a holding pen. Each site was broken up into at least ten segments.

The last method was baited minnows traps. Baited minnow traps are a passive sampling technique. Minnow traps have two opposite facing conical funnels. The fish swim in to eat the bait but cannot swim back out (Murphy and Willis 1996). A study by Diana et al (2006) found the most advantageous minnow traps are baited and uncovered. This method is used to catch smaller, bottom dwelling fishes due to its effectiveness (He 1990).

A subsample of females of native cyprinids (minnows) were collected to determine fecundity. Fecundity was determined by counting the number of eggs in each female; eggs were collected while still in the skein. Specimens were euthanized using 80 mg/L of MS-222, Upon reaching level 6 of loss of consciousness specimens received a blow to the head and a spinal transection (Popovic et al 2011; AVMA 2013; Nickum et al

2004; Close et al 1997). Skeins were collected by dissecting the specimen in the field and preserved in 70% ethanol.

A subsample of each species of minnow, sucker, brown trout, and sculpin were collected to determine diet. Stomach contents were collected in two ways; either by gastric lavage or removal of the stomach. Stomach contents were preserved in 70% ethanol. To reduce number of fatalities specimens euthanized to collect egg skeins also had their stomachs removed.

All individuals caught were identified to species, weighed (in grams), and measured (in millimeters); a subsample had scales collected for aging (Murphy and Willis 1996). Upon encountering rainbow trout I collected a genetic sample by paper hole punching a fin. Tissue samples were delivered to WDFW for genetic testing. Genetic samples were gathered from rainbow trout to identify if they were the subspecies redband trout which is a threatened species that is currently gathering interest from fishery managers in the Pacific Northwest.

Sampling Effort

Sampling occurred from May- November of 2013. Sampling of each site was dependent on flow conditions to minimize danger levels for the crew. Effort varied at each site depending on stream size, access limitations, riparian zone, and sampling method. Effort for electrofishing and seine net were record in seconds while minnow traps effort was recorded in set nights.

Target Species

Minnows

Minnows are part of the family Cyprinidae. Cyprinids are cool to warm water fishes. Nine native species and six introduced species are found in Washington State (Scholz and McLellan 2009, 2010). Species include chiselmouth, goldfish, lake chub, common carp, tui chub, peamouth, golden shiner, fathead minnow, northern pikeminnow, longnose dace, leopard dace, speckled dace, reside shiner and tench (Scholz and McLellan 2009). Known cyprinid fish in the CRW are northern pikeminnow,longnose dace, speckled dace, and redside shiner.

Suckers

Suckers are part of the family Catostomidae. Catostomids are cool to warm water fishes. Four of these species are native to Eastern Washington (Scholz and McLellan 2009, 2010) and include longnose sucker, bridgelip sucker, largescale sucker, and mountain sucker. Largescale suckers are the only known species in the CRW.

Salmonidae

Trout and char are part of the family Salmonidae. Salmonids are cold water fishes. Sixteen species are known in eastern Washington (Scholz and McLellan 2009, 2010). Known species in the CRW include westslope cutthroat trout, rainbow trout, redband trout, kokanee, brown trout, and eastern brook trout.

Sculpin

Sculpin are part of the family Cottidae. Cottids are cool water fishes. Seven species are found in eastern Washington and include prickly sculpin, mottled sculpin, paiute sculpin, slimy sculpin, shorthead sculpin, margined sculpin, and torrent sculpin (Scholz and McLellan 2009,2010). This is the first study to report on the species found in the CRW.

Hypotheses

1. Meyers Falls (on the Colville River), Douglas Falls (on Mill Creek), and Crystal Falls (on the Little Pend Oreille River) are reported as impassable barrier water falls to fish.
    a. I hypothesize that the species above and below each of these falls will be similar.
    b. My alternative hypothesis is that progressively fewer species will be found above each fall, i.e. the number below Meyers Falls will be greater than above Meyers Falls which will be greater than the number above Douglass or Crystal Falls.
2. I hypothesize that stream temperature and dissolved oxygen (DO) will have no affect on distribution and relative abundance of fishes.
        i. Alternatively I hypothesize that stream temperatures and DO will affect fish relative abundance. As temperature increases and DO decreases fewer salmonids will be found and greater numbers of cyprinids will be found.
3. I will also test the relationship between total length (TL) (in mm) and weight (in g) and fecundity for longnose dace, Umatilla dace, speckled dace, and redside shiner.

Data Analysis

Every fish captured was identified to species using Scholz and McLellan (2009; 2010) and relative abundance and catch per unit effort (CPUE) were calculated as follows:

(Eq. 1)

$$\text{Relative Abundance} = (\#\text{ of species A} / \text{total } \#\text{ of fish}) \times 100$$

(Eq. 2)

$$\text{CPUE} = (\#\text{ collected} / \text{unit of time})$$

Length, Growth, and Condition Factor

Total fish length was measured to the nearest millimeter and weight was measured to the nearest gram. Condition factors were calculated to indicate growth pattern and overall conditioning. Mean length, weight, and condition factor (± standard deviation) were obtained for each cohort. A Fulton-type condition factor (K_{TL}) was calculated to determine how the fish were. Mean condition factors were compared to averages reported by Carlander (1969, 1977, and 1997) to evaluate health. Factors were calculated using the equation (Anderson and Neuman 1996):

(Eq. 3)

$$K_{(TL)} = W/L^3(10^5)$$

where:

$K_{(TL)}$= condition factor using total length
W= weight of fish (g)
L= total length of fish (mm)

Age and Growth Analysis

Scales were read using an Eyecom Model 3000 microfiche reader. The numbers of annuli were counted and measured (Lux 1971, Jerald 1983; Devries and Frie 1996).

Back Calculation of Annual Growth from Scales

After aging each fish, annulus scale measurements were used to back calculate lengths of each age class. Lengths of the fish at formation of each annulus were backcalculated from scales using the Direct Proportions method (Le Cren 1947). For the fish where no scales were evaluated, lengths at each age were calculated using an age/length key (Murphy and Willis 1996).

(Eq. 4)

$$Li=(Si/Sc)Lc$$

where:

L_i = length at each annulus
L_c =length of fish at capture
S_i = scale measurement to each annulus
S_c = distance from focus to edge of scale

Mortality

Age frequency distributions from the age/length key for each species were used to calculate instantaneous mortality. Catch curves were constructed from the age frequency distributions. Age classes to the left of the dominant age class (or dome) were converted to the log10 number, which was used in estimating mortality. The slope of the regression line was multiplied by 2.3026 to calculate instantaneous mortality (Ricker 1975). Mean annual survival rate was calculated using the equation:

(Eq. 5)

$$S=e^{-z}$$

Where:

S= mean annual survival
e=natural log constant
z= instantaneous rate of mortality
The mean annual mortality was calculated using the equation:

(Eq. 6)

$$A=1-S$$

Where:

A= annual mortality
S= annual survival

Food Habits

Stomachs of minnows, suckers, and sculpin were surgically removed in the field. Brown trout stomachs were lavaged in the field. Stomachs were preserved in 70 % ethanol and placed in jars labeled with the fish ID #, species, length, weight, location, and date. In the lab, stomachs were cut open and numbers of each type of prey organism in each the predators' stomach was identified using a Nikon SMZ–10 stereozoom dissecting microscope (8-35x). The weights were recorded to the nearest 0.001 g. Aquatic vertebrate prey was identified according to Hansel et al. (1988), and the EWU Bone Collection. Aquatic invertebrate prey was identified according to Merritt et al (2008).

Diet Analysis

Fish diets were analyzed by frequency of occurrence, percent by number, and percent by weight, and index of relative importance. Relative importance values range from 0, which are less important, to 100, which are more important prey items.

(Eq. 7)

Frequency of occurrence= (# of stomachs prey item A occurs in/ total # of stomachs)

(Eq. 8)

Percent by number= (# of prey item A/ total # of prey items)

(Eq. 9)

Percent by weight= (weight of prey item A/ total weight of all prey items)

(Eq. 10)

$$\text{Relative importance}_a = 100\ AI_a / \sum AI_a$$

where:

RI=relative importance of food item a
AI= absolute importance of food item a (i.e., frequency of occurrence + numerical frequency + weight frequency of food item a)
n = number of different food types

Diet Overlap

Diet overlap shows food sources that various species have in common. A range of 1 (total overlap) to 0 (no overlap) can be found. Values less than .3 are low, and values over .7 are considered high. High diet overlap may point to competition. The diet overlap indices were calculated using Horn's formula (1966):

(Eq. 11)

$$Cx = \frac{2\sum_{i=1}^{n}(Pxi \; x \; Pyi)}{\sum_{i=1}^{n} Pxi^2 + \sum_{i=1}^{n} Pyi^2}$$

where:

Cx=the overlap coefficient
Pxi= the proportion of food category i in the diet of species x
Pyi= the proportion of food category i in the diet of species y
n= the number of food categories

Fecundity Analysis

In the lab, skeins were cut open and numbers of eggs in each skein were counted. A linear regression was run comparing total length (mm) vs. the total number of eggs and weight (g) vs. the total number of eggs using excel and systat.

Results

Relative abundance

Table 3 presents a synoptic list of fish collected during the CRW survey summarized by family, common name, and scientific name. A total of 4,314 fish were collected representing six families and 28 species (Table 3,4). The most abundant family by abundance and weight was the Salmonids (41.6% by number and 87.3% by weight), followed by Cyprinidae (39.6% by number and 6.2% by weight). The most abundant species by number was the speckled dace (14.67%), and the most abundant species by weight was the brown trout (38.32%) (Table 4).

Catch per unit effort (CPUE)

Electrofishing

Total number, relative abundance, and CPUE of each species captured by electrofishing are summarized in Table 5. Electrofishing encountered the most species (n=25), caught the most fish (n=2889), and had the highest CPUE (321 fish/ hr). Total shocking effort was 9 hours and 5 minutes spread over 68 sites. The most abundant family was Salmonidae at 42.4%, followed by Cyprinidae at 38.4%. These two families also had the highest CPUE at 135 and 123 fish per hour respectively. The species with the highest relative abundance and CPUE was speckled dace at 14.0% and 45 fish per hour (Table 5).

Seine Netting

Total number, relative abundance, and CPUE of each species captured by seine netting are summarized in Table 6. Seine netting encounter the fewest species (n=17), caught the fewest fish (n=666), but had the second highest CPUE (224 fish/ hr). Total effort was 2 hours and 59 minutes spread over 22 sites. The most abundant family was Salmonidae at 64.1%, followed by Cottidae at 18%. These two families also had the highest CPUE at 143 and 40 fish per hour respectively. The species with the highest relative abundance and CPUE was the redband trout at 28.1 % and 62 fish per hour (Table 6).

Minnow traps

Total number, relative abundance, and CPUE of each species captured by minnow traps are summarized in Table 7. Minnow traps encountered the second most species (n=19), caught the second most fish (n=75) but had the lowest CPUE (1.9 fish/ set night). Total effort was 393 set nights spread over 56 sites. The most abundant family was Cyprinidae at 64.4%, followed by Salmonidae at 19.2%. These two families also had the highest CPUE at 1 and 0.4 fish per set night respectively. The species with the highest relative abundance and CPUE was speckled dace at 29.0% and 0.6 fish per set night (Table 7).

Table 3. Synoptic list of species collected in the Colville River Watershed, Stevens County, Washington. 2013.

Family	Common Name	Scientific Name
Cyprinidae	Carp	*Cyprinus carpio*
	Peamouth	*Mylocheilus caurinus*
	Northern pikeminnow	*Ptychocheilus oregonensis*
	Longnose dace	*Rhinichthys cataractae*
	Umatilla dace	*Rhinichthys umatilla*
	Speckled dace	*Rhinichthys osculus*
	Redside shiner	*Richardsonius balteatus*
	Tench	*Tinca tinca*
Catostomidae	Longnose sucker	*Catostomus catostomus*
	Bridgelip sucker	*Catostomus columbianus*
	Largescale sucker	*Catostomus macrocheilus*
Salmonidae	Lake whitefish	*Coregonus clupeaformis*
	Mountain whitefish	*Prosopium williamsoni*
	Westslope cutthroat trout	*Oncorhynchus clarkii* var. *lewisi*
	Rainbow trout	*Oncorhynchus mykiss* var. *irideus*
	Redband trout	*Oncorhynchus mykiss* var. *gairdneri*
	Brown trout	*Salmo trutta*
	Brook trout	*Salvelinus fontinalis*
Cottidae	Prickly sculpin	*Cottus asper*
	Mottled sculpin	*Cottus bairdi*
	Slimy sculpin	*Cottus cognatus*
	Shorthead sculpin	*Cottus confusus*
	Torrent sculpin	*Cottus rhotheus*
Centrarchidae	Green sunfish	*Lepomis cyanellus*
	Pumpkinseed	*Lepomis gibbosus*
Centrarchidae	Bluegill	*Lepomis macrochirus*
	Largemouth bass	*Micropterus salmoides*
Percidae	Yellow perch	*Perca flavescens*

Table 4. Number (#), relative abundance (RA), weight (g), relative weight (RW), and mean condition factor (k (TL)) for each species captured in the Colville River Watershed, Stevens County, Washington. 2013.

	By Number		By weight		
Species	**#**	**% RA**	**(g)**	**% RW**	**Mean k(TL) ± (SD)**
Common carp	149	3.45	683	0.60	1.53 ± (0.22)
Peamouth	1	0.02	5	0.00	0.87 ± (N/A)
Northern pikeminnow	11	0.25	58	0.05	1.04 ± (0.15)
Longnose dace	145	3.36	640	0.56	0.95 ± (0.13)
Umatilla dace	163	3.78	1,000	0.88	1.01 ± (0.14)
Speckled dace	633	14.67	1,651	1.46	1.21 ± (0.26)
Redside shiner	592	13.72	2,679	2.36	0.97 ± (0.19)
Tench	12	0.28	341	0.30	1.44 ± (0.14)
Longnose sucker	74	1.72	708	0.62	1.01 ± (0.30)
Bridgelip sucker	4	0.09	187	0.17	1.05 ± (0.13)
Largescale sucker	52	1.21	2,265	2.00	1.02 ± (0.16)
Lake whitefish	1	0.02	1,134	1.00	1.28 ± (N/A)
Mountain whitefish	12	0.28	3,159	2.79	0.93 ± (0.19)
Westslope cutthroat trout	2	0.05	423	0.37	0.91 ± (0.14)
Rainbow trout	346	8.02	30,425	26.85	0.99 ± (0.18)
Redband trout	610	14.14	11,354	10.02	0.98 ± (0.16)
Brown trout	346	8.02	43,433	38.32	0.99 ± (0.15)
Eastern brook trout	476	11.03	8,951	7.90	0.94 ± (0.17)
Prickly sculpin	124	2.87	511	0.45	1.28 ± (0.20)
Mottled sculpin	110	2.55	638	0.56	1.30 ± (0.19)
Slimy sculpin	3	0.07	20	0.02	1.34 ± (0.04)
Shorthead sculpin	46	1.07	103	0.09	1.64 ± (0.44)
Torrent sculpin	328	7.60	2,392	2.11	1.44 ± (0.31)
Green sunfish	1	0.02	7	0.01	1.18 ± (N/A)
Pumpkinseed	48	1.11	259	0.23	1.72 ± (0.26)
Bluegill	3	0.07	20	0.02	1.97 ± (0.15)
Largemouth bass	1	0.02	219	0.19	1.38 ± (N/A)
Yellow perch	21	0.49	66	0.06	1.40 ± (0.41)
Total	**4,314**	**100.00**	**113,331**	**100.00**	

Table 5. Total number, relative abundance (%), and CPUE (#/hr) by electrofishing in the Colville River Watershed, Stevens County, WA. 2013

Family	Species	Total Number	Relative Abundance (%)	CPUE (#/hr)
Cyprinidae	Common carp	119	4.1	13.2
	Peamouth	0	0.0	0.0
	Northern pikeminnow	12	0.4	1.3
	Longnose dace	114	3.9	12.7
	Umatilla dace	118	4.1	13.1
	Speckled dace	405	14.0	45.1
	Redside shiner	335	11.6	37.3
	Tench	6	0.2	0.7
Catostomidae	Longnose sucker	43	1.5	4.8
	Bridgelip sucker	2	0.1	0.2
	Largescale sucker	46	1.6	5.1
Salmonidae	Lake whitefish	1	0.0	0.1
	Mountain whitefish	12	0.4	1.3
	Westslope cutthroat trout	1	0.0	0.1
	Rainbow trout	278	9.6	30.9
	Redband trout	361	12.5	40.2
	Brown trout	202	7.0	22.5
	Brook trout	365	12.6	40.6
Cottidae	Prickly sculpin	107	3.7	11.9
	Mottled sculpin	72	2.5	8.0
	Slimy sculpin	2	0.1	0.2
	Shorthead sculpin	46	1.6	5.1
	Torrent sculpin	219	7.6	24.4
Centrarchidae	Green sunfish	0	0.0	0.0
	Pumpkinseed	19	0.7	2.1
	Bluegill	0	0.0	0.0
	Largemouth bass	1	0.0	0.1
Percidae	Yellow perch	3	0.1	0.3
Total		**2889**	**100.0**	**321.4**

Table 6. Total number, relative abundance (%), and CPUE (#/hr) by seine netting in the Colville River Watershed, Stevens County, WA. 2013

Family	Species	Total Number	Relative Abundance (%)	CPUE (#/hr)
Cyprinidae	Common carp	0	0.0	0.0
	Peamouth	0	0.0	0.0
	Northern pikeminnow	0	0.0	0.0
	Longnose dace	28	4.2	9.4
	Umatilla dace	11	1.7	3.7
	Speckled dace	9	1.4	3.0
	Redside shiner	57	8.6	19.1
	Tench	4	0.6	1.3
Catostomidae	Longnose sucker	0	0.0	0.0
	Bridgelip sucker	2	0.3	0.7
	Largescale sucker	6	0.9	2.0
Salmonidae	Lake whitefish	0	0.0	0.0
	Mountain whitefish	0	0.0	0.0
	Westslope cutthroat trout	1	0.2	0.3
	Rainbow trout	58	8.7	19.5
	Redband trout	187	28.1	62.8
	Brown trout	134	20.1	45.0
	Brook trout	47	7.1	15.8
Cottidae	Prickly sculpin	7	1.1	2.4
	Mottled sculpin	28	4.2	9.4
	Slimy sculpin	1	0.2	0.3
	Shorthead sculpin	0	0.0	0.0
	Torrent sculpin	84	12.6	28.2
Centrarchidae	Green sunfish	0	0.0	0.0
	Pumpkinseed	2	0.3	0.7
	Bluegill	0	0.0	0.0
	Largemouth bass	0	0.0	0.0
Percidae	Yellow perch	0	0.0	0.0
Total		**666**	**100.0**	**223.6**

Table 7. Total number, relative abundance (%), and CPUE (#/hr) by minnow trapping in the Colville River Watershed, Stevens County, WA. 2013

Family	Species	Total Number	Relative Abundance (%)	CPUE (#/hr)
Cyprinidae	Common carp	30	4.0	0.1
	Peamouth	1	0.1	0.0
	Northern pikeminnow	0	0.0	0.0
	Longnose dace	3	0.4	0.0
	Umatilla dace	33	4.3	0.1
	Speckled dace	220	29.0	0.6
	Redside shiner	200	26.4	0.5
	Tench	2	0.3	0.0
Catostomidae	Longnose sucker	31	4.1	0.1
	Bridgelip sucker	0	0.0	0.0
	Largescale sucker	0	0.0	0.0
Salmonidae	Lake whitefish	0	0.0	0.0
	Mountain whitefish	0	0.0	0.0
	Westslope cutthroat trout	0	0.0	0.0
	Rainbow trout	10	1.3	0.0
	Redband trout	62	8.2	0.2
	Brown trout	10	1.3	0.0
	Brook trout	64	8.4	0.2
Cottidae	Prickly sculpin	9	1.2	0.0
	Mottled sculpin	10	1.3	0.0
	Slimy sculpin	0	0.0	0.0
	Shorthead sculpin	0	0.0	0.0
	Torrent sculpin	25	3.3	0.1
Centrarchidae	Green sunfish	1	0.1	0.0
	Pumpkinseed	27	3.6	0.1
	Bluegill	3	0.4	0.0
	Largemouth bass	0	0.0	0.0
Percidae	Yellow perch	18	2.4	0.0
Total		**759**	**100**	**1.9**

Distribution

Common carp

Figure 2 summarizes the distribution of carp in the CRW. Carp were found at three sites, all located on the Colville River and all below Meyers Falls.

Peamouth

Figure 3 summarizes the distribution of peamouth in the CRW. Peamouth were found at one site located on the Colville River below Meyers Falls.

Northern pikeminnow

Figure 4 summarizes the distribution of northern pikeminnow in the CRW. Northern pikeminnow were found at two sites. One site was on the Colville River above Meyers Falls and the other site was on the Little Pend Oreille River below Crystal Falls.

Longnose dace

Figure 5 summarizes the distribution of longnose dace in the CRW. Longnose dace were found at 12 sites. Six sites were located on the Colville River, all above Meyers Falls, two were on Mill Creek, both below Douglas Falls, two were on the Little Pend Oreille River, both below Crystal Falls, one was Gold Creek, and one was on Chewelah Creek.

Umatilla dace

Figure 6 summarizes the distribution of Umatilla dace in the CRW. Umatilla dace were found at three sites, all on the Colville River and all below Meyers Falls.

Speckled dace

Figure 7 summarizes the distribution of speckled dace in the CRW. Speckled dace were found at 22 sites. 17 sites were on the Colville River, three below Meyers Falls and 14 above, three sites were on the Little Pend Oreille River, all above Crystal Falls, one site was on Sherwood Creek, and one site was on Stensgar Creek.

Redside shiner

Figure 8 summarizes the distribution of redside shiner in the CRW. Redside shiners were found at 22 sites. 17 sites were on the Colville River, four below Meyers Falls and 13 above, three sites were on the Little Pend Oreille River, one below Crystal and two above, one site was on Sherwood Creek, and one site was on Sheep Creek.

Tench

Figure 9 summarizes the distribution of tench in the CRW. Tench were found at six sites. Four sites were on the Colville River, one below Meyers Falls and three above, one site was on Blue Creek, and one site was on Sheep Creek.

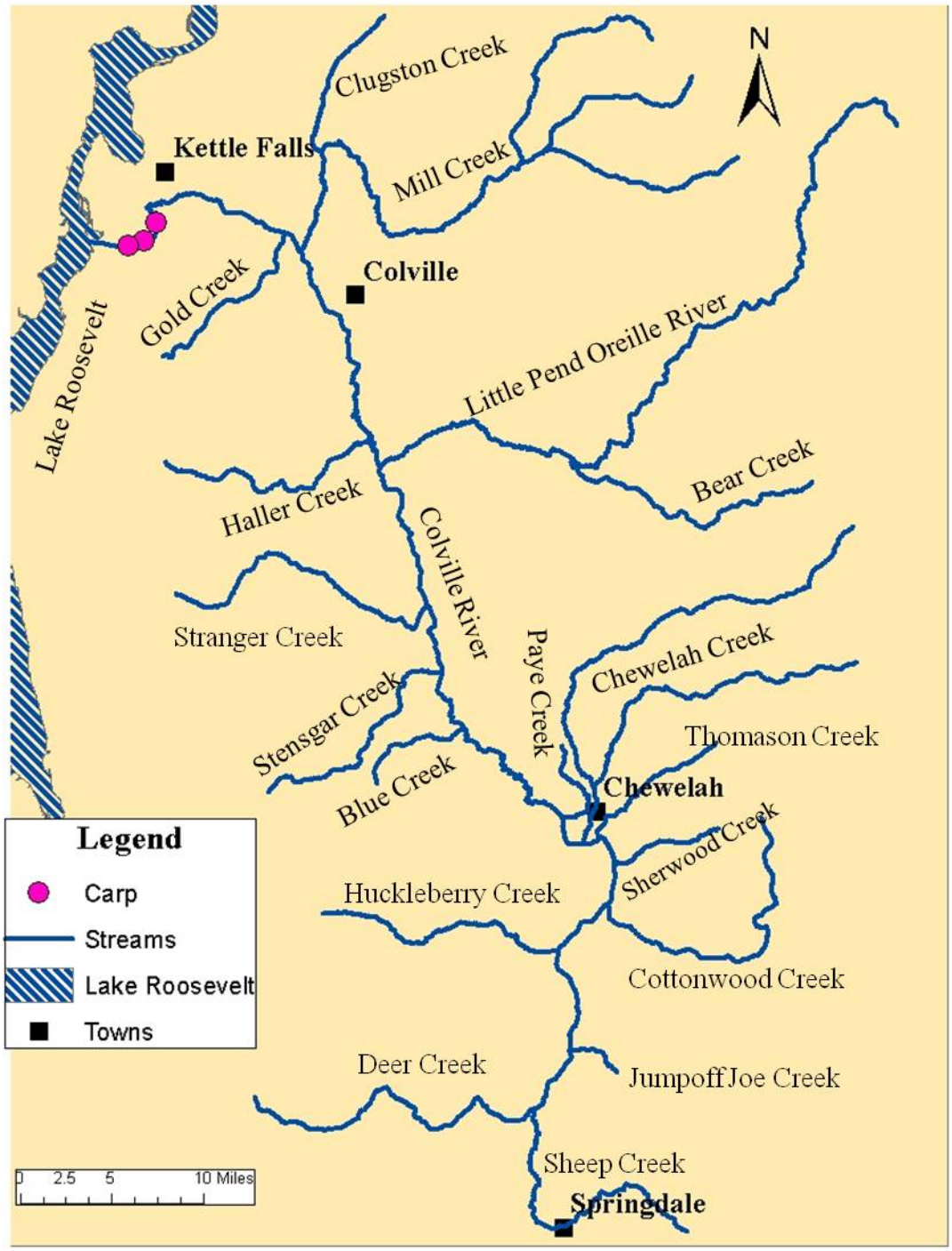

Figure 2. Distribution of carp in the Colville River Watershed, Stevens County, WA. 2013.

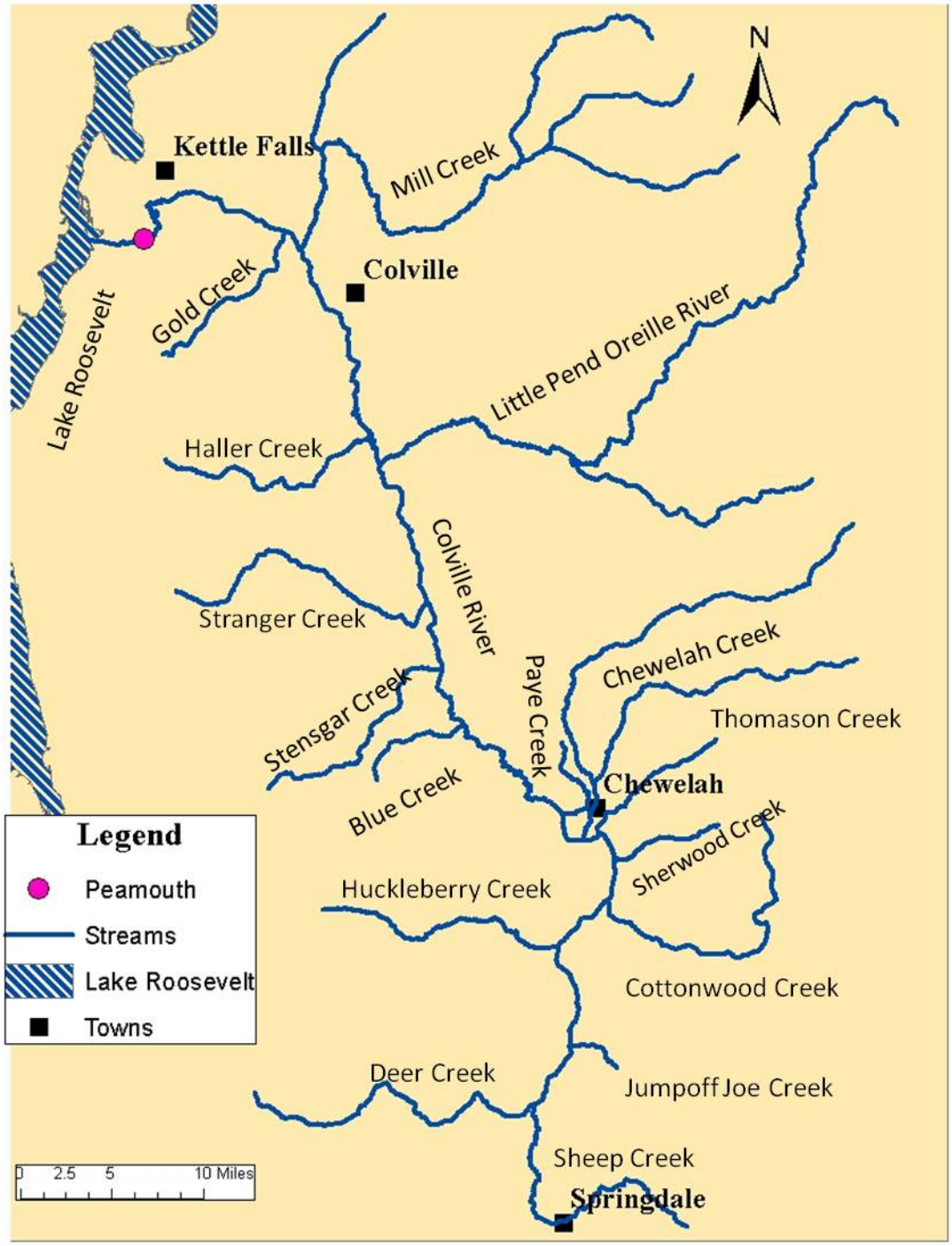

Figure 3. Distribution of peamouth in the Colville River Watershed, Stevens County, WA. 2013

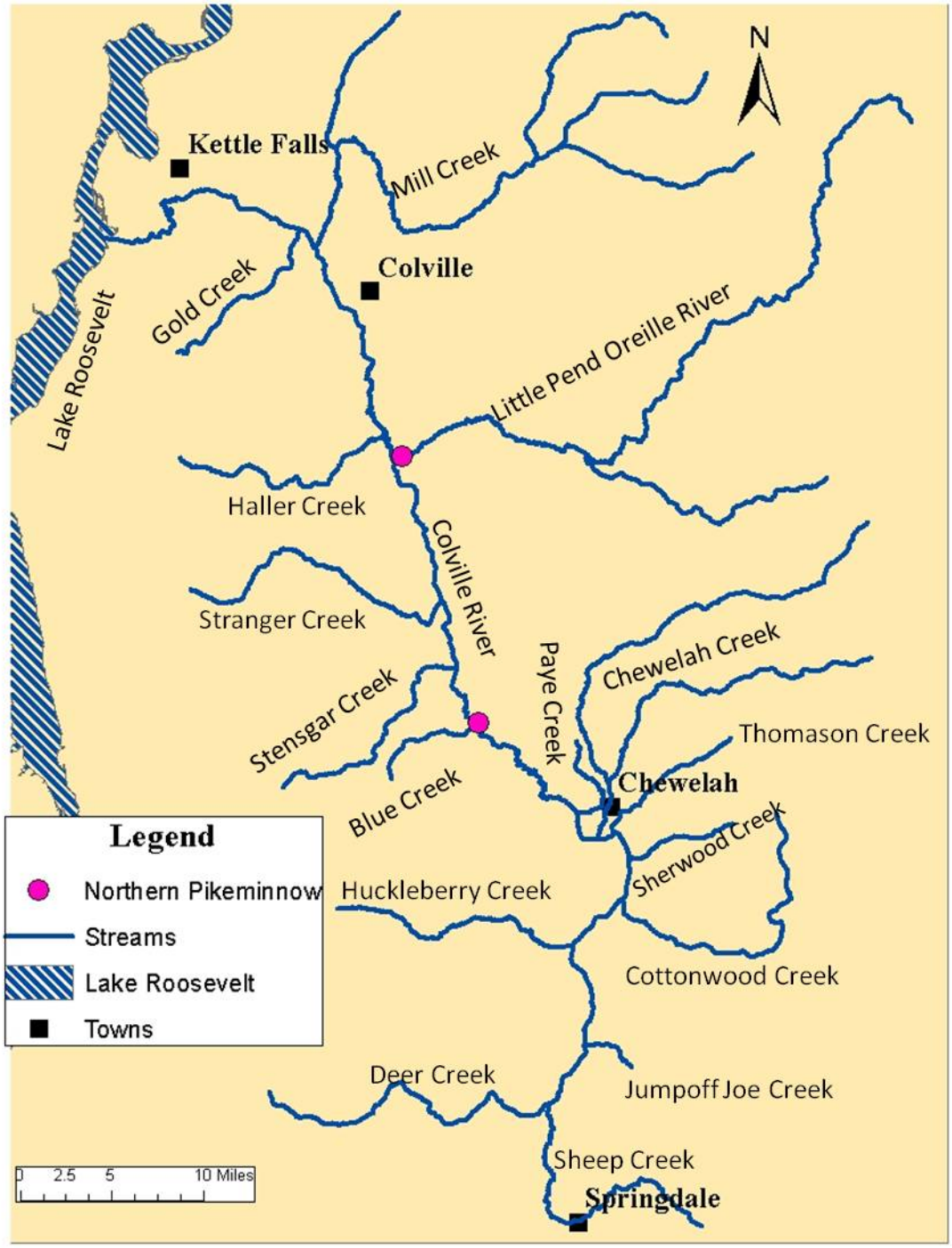

Figure 4. Distribution of northern pikeminnow in the Colville River Watershed, Stevens County, WA. 2013

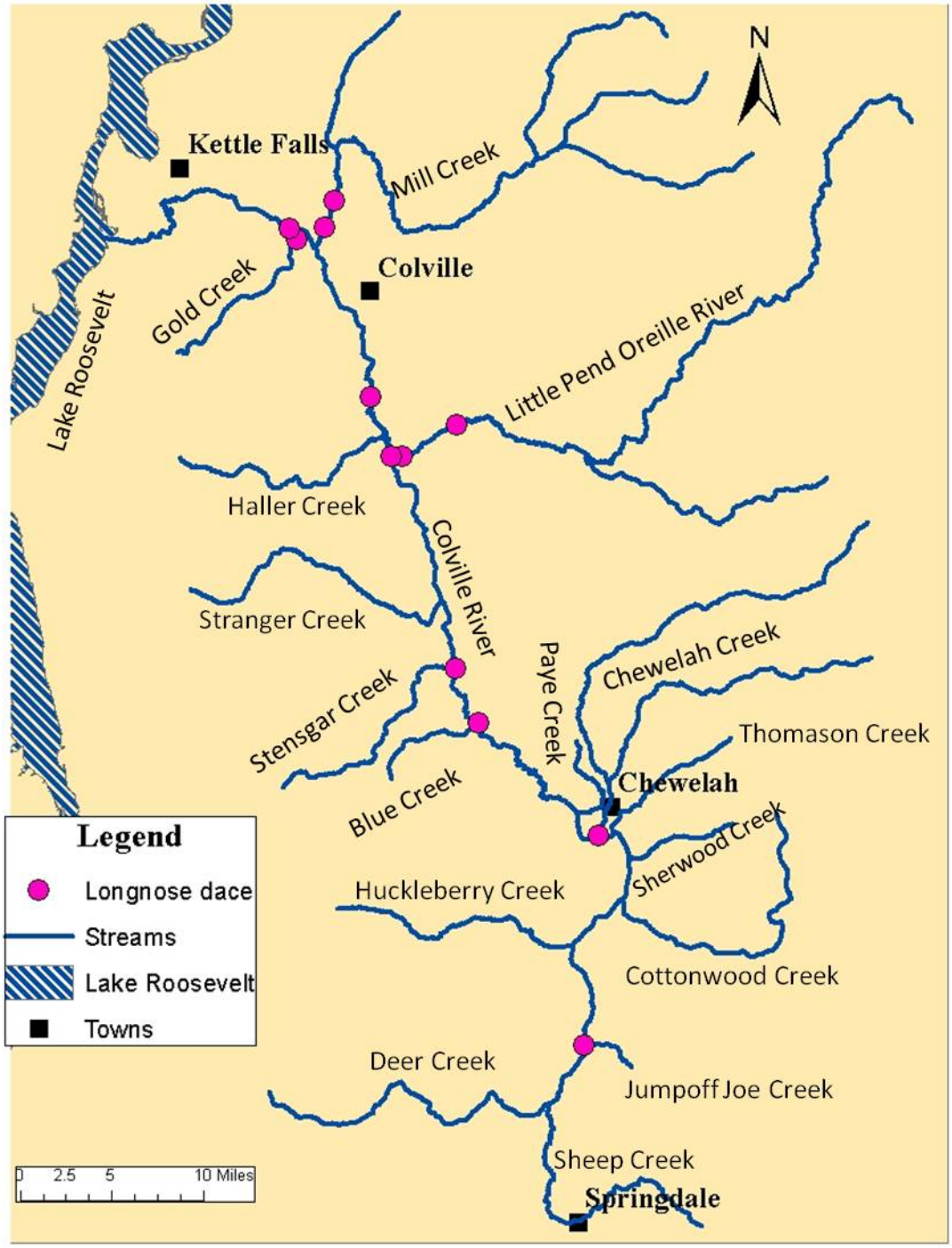

Figure 5. Distribution of longnose dace in the Colville River Watershed, Stevens County, WA. 2013.

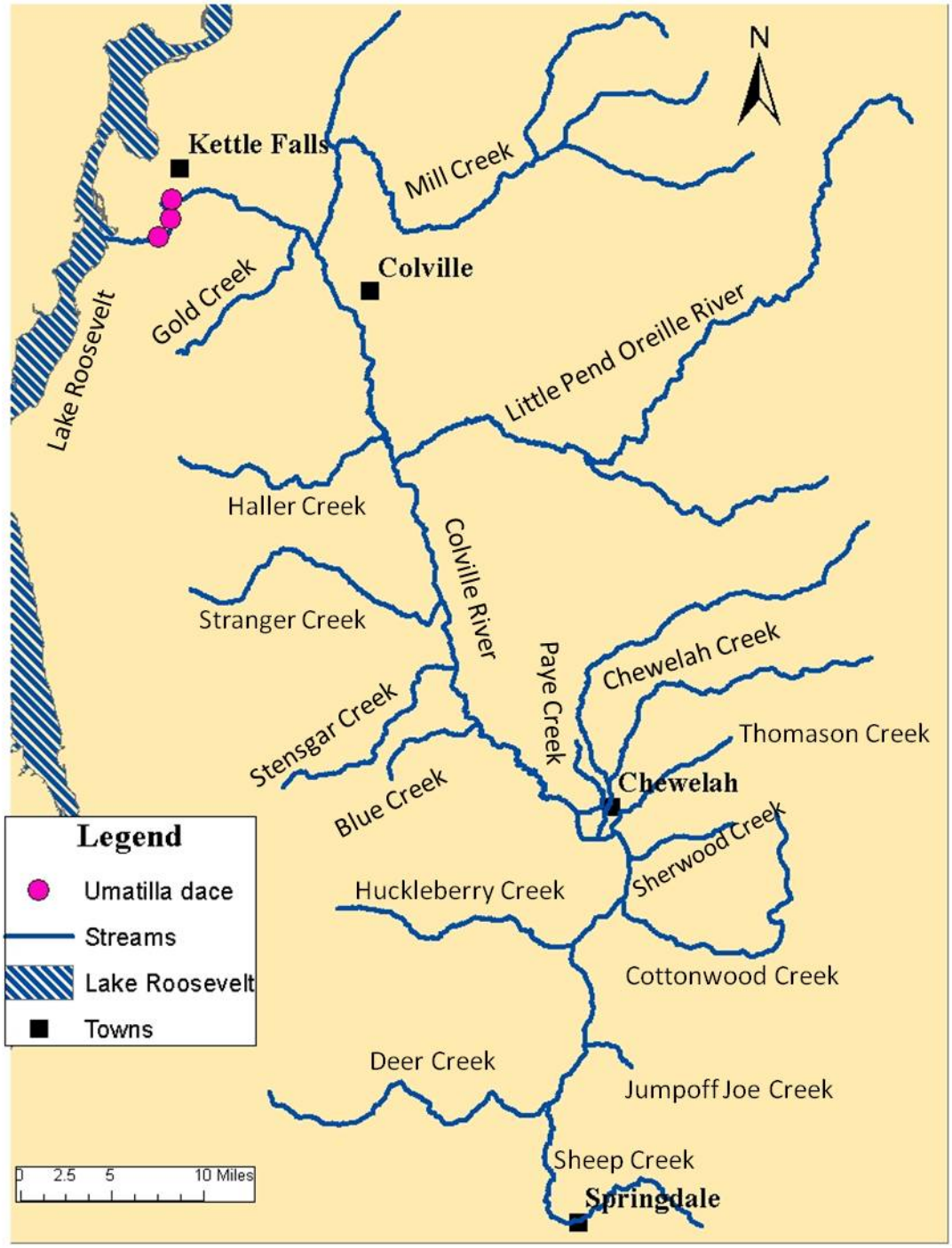

Figure 6. Distribution of Umatilla dace in the Colville River Watershed, Stevens County, WA. 2013.

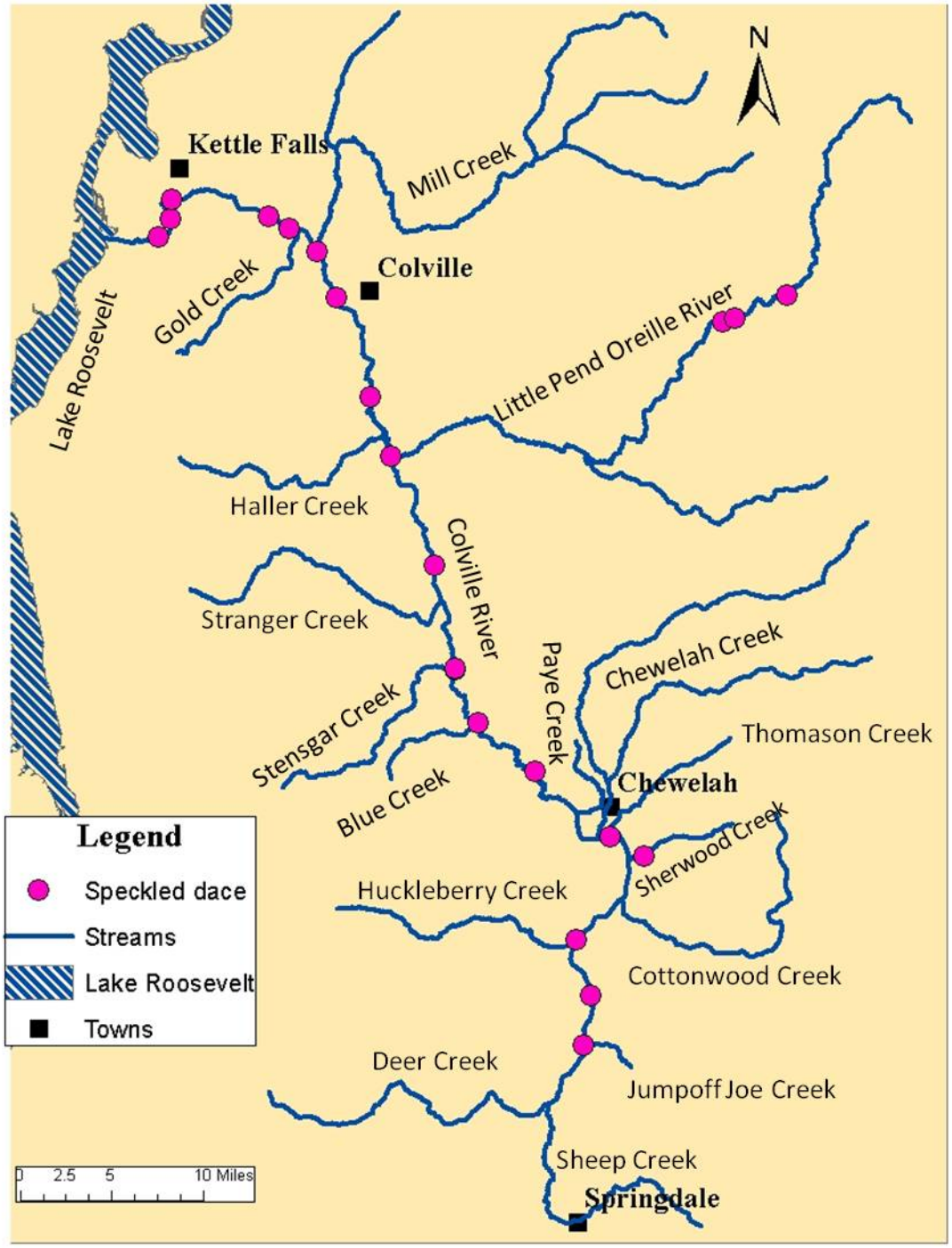

Figure 7. Distribution of speckled dace in the Colville River Watershed, Stevens County, WA. 2013.

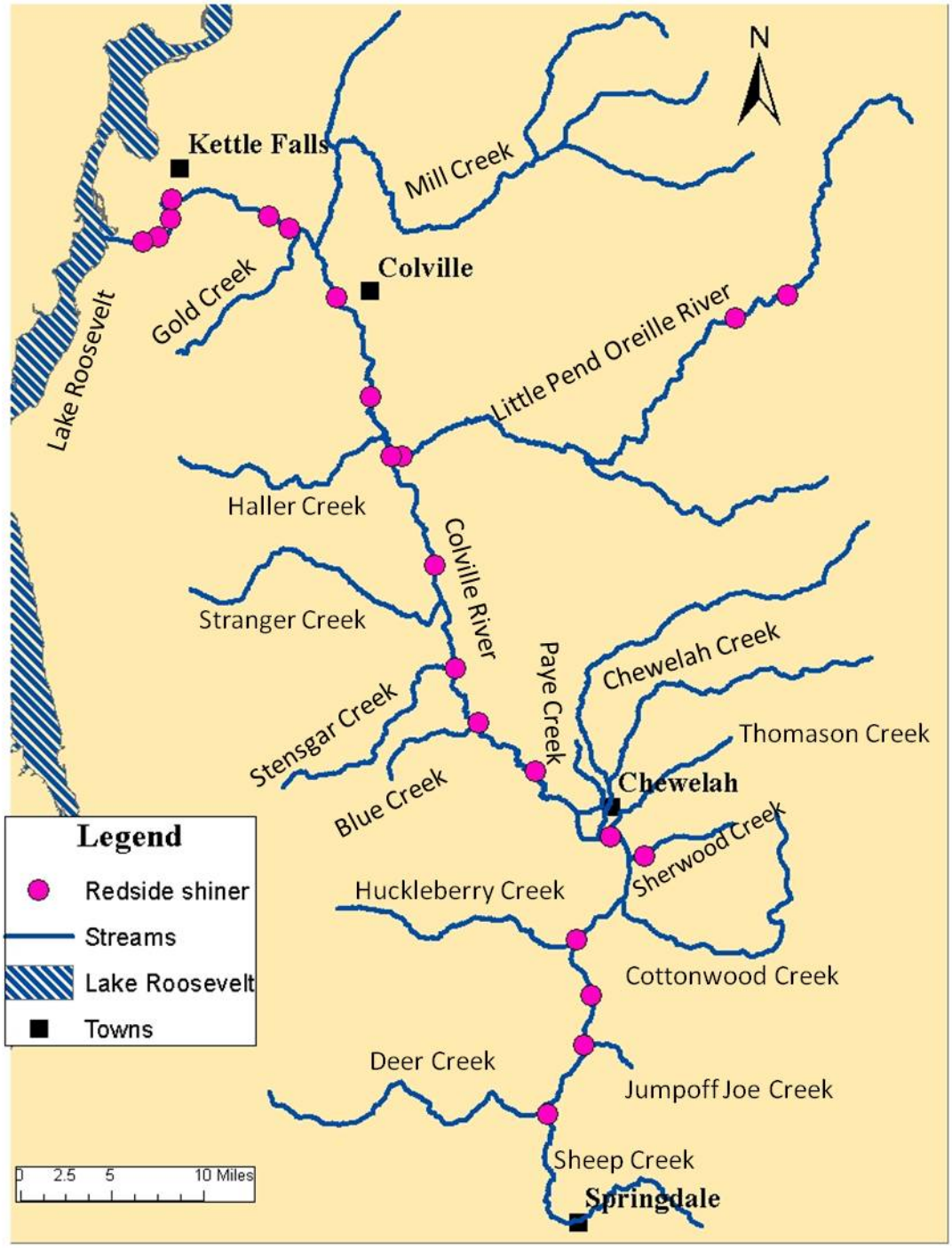

Figure 8. Distribution of redside shiner in the Colville River Watershed, Stevens County, WA. 2013

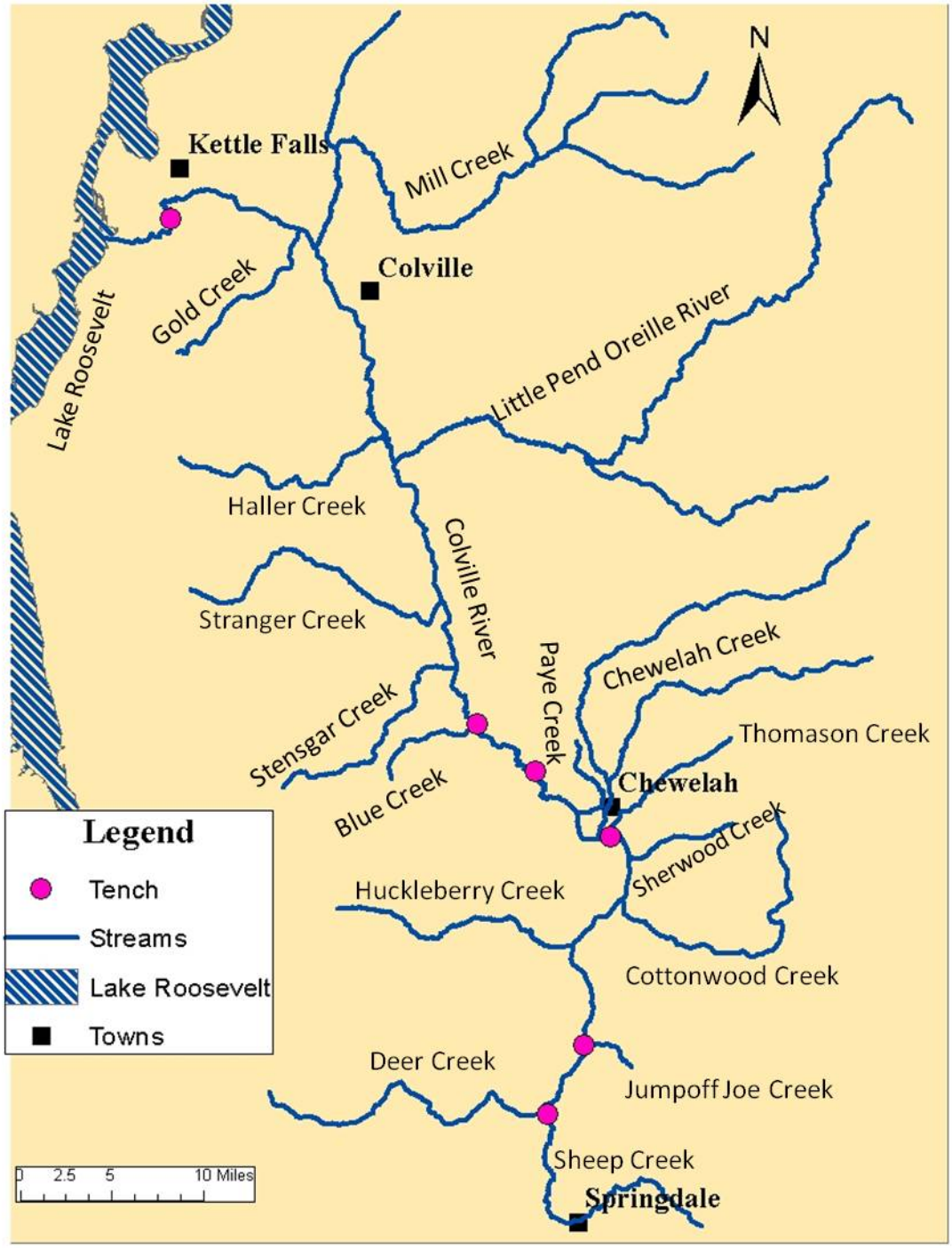

Figure 9 Distribution of tench in the Colville River Watershed, Stevens County, WA. 2013

Longnose sucker

Figure 10 summarizes the distribution of longnose suckers in the CRW.Longnose suckers were found at 10 sites, all were on the Colville River, five below Meyers Falls and five above

Bridgelip sucker

Figure 11 shows the distribution of bridgelip suckers in the CRW. Bridgelip suckers were found at four sites. Three sites were on the Colville River, one site was below Meyers Falls and two sites were above, and one site was located on Stensgar Creek

Largescale sucker

Figure 12 summarizes the distribution of largescales suckers in the CRW. Largescale suckers were found at 10 sites. Eight sites were on the Colville River, all above Meyers Falls, one site was on Stensgar Creek, and one site was on Deer Creek.

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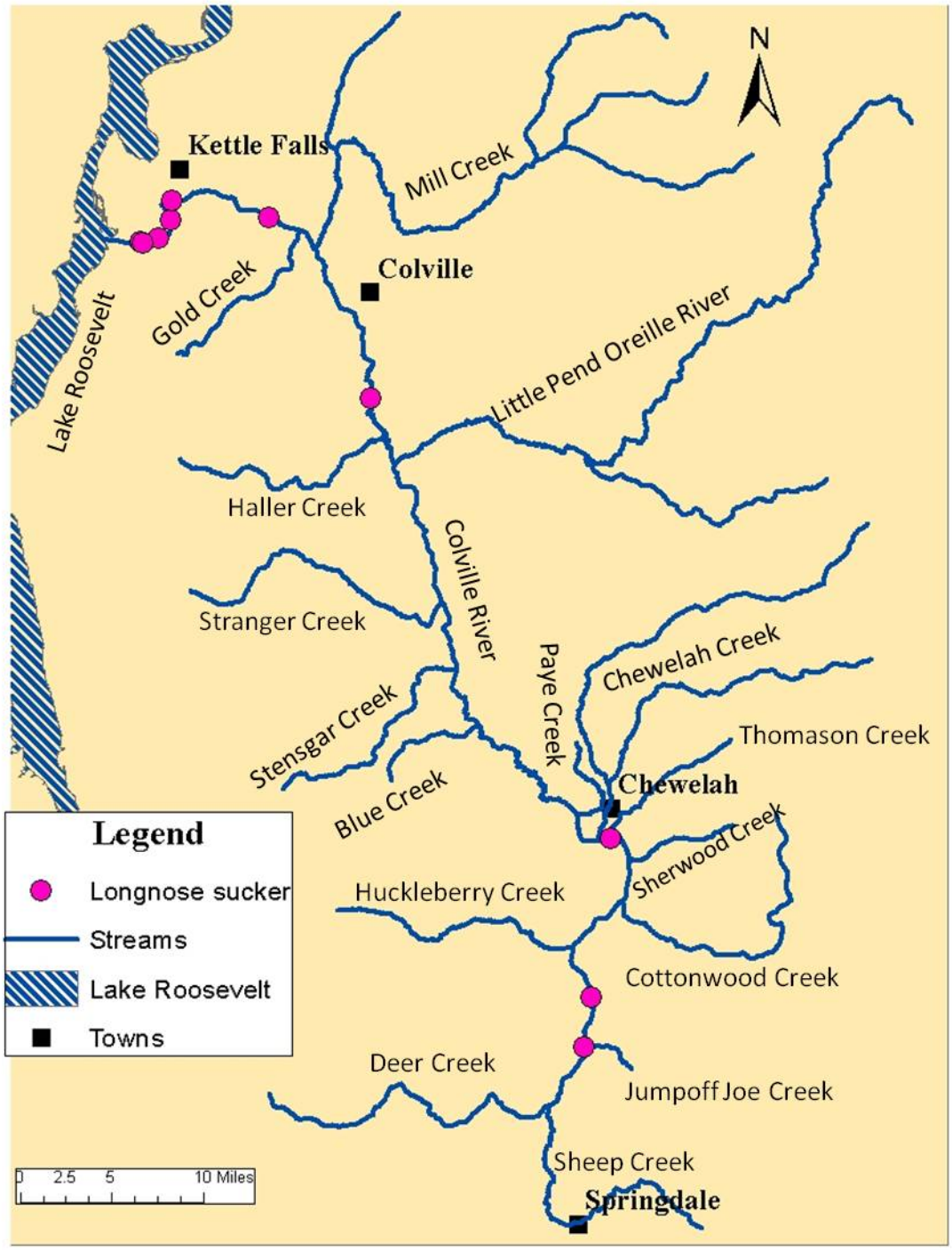

Figure 10. Distribution of longnose suckers in the Colville River Watershed, Stevens County, WA. 2013.

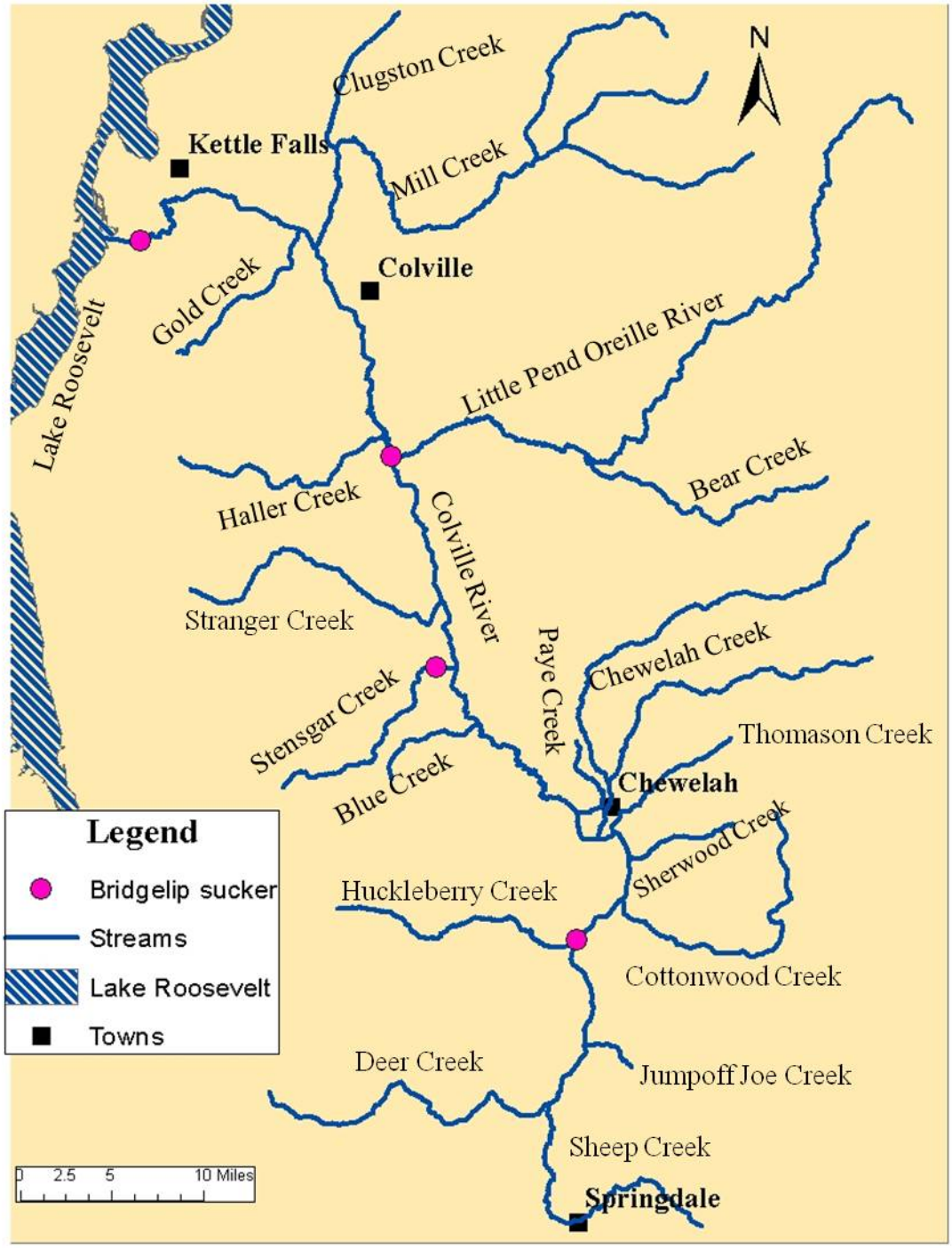

Figure 11. Distribution of bridgelip suckers in the Colville River Watershed, Stevens County, WA. 2013.

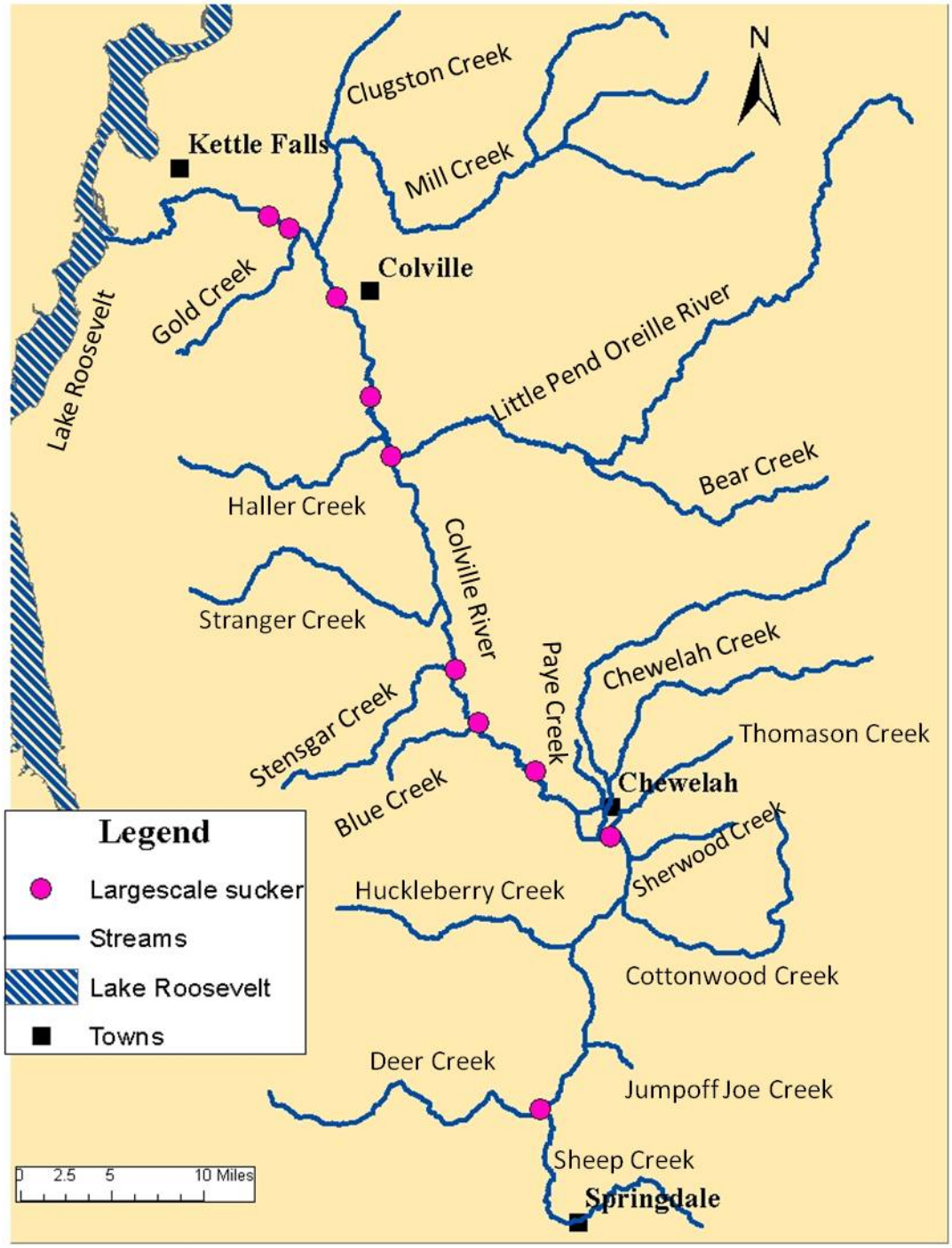

Figure 12. Distribution of largescale suckers in the Colville River Watershed, Stevens County, WA. 2013.

Lake whitefish

Figure 13 summarizes the distribution of lake whitefish in the CRW. Lake whitefish were found at one site located on the Colville River below Meyers Falls

Mountain whitefish

Figure 14 summarizes the distribution of mountain whitefish in the CRW. Mountain whitefish were found at two sites, both on the Colville River and below Meyers Falls.

Westslope cutthroat trout

Figure 15 summarizes the distribution of westslope cutthroat trout in the CRW. Westslope cutthroat trout were found at two sites. One site was on the Colville River below Meyers Falls and the other site was one the Little Pend Oreille River below Crystal Falls.

Rainbow trout

Figure 16 summarizes the distribution of rainbow trout in the CRW. Rainbow trout were found at 43 sites. Six sites were on the Colville River, three below Meyers Falls and three above, seven sites were on the Little Pend Oreille River, four below Crystal Falls and three above, four sites were on Mill Creek, three below Douglass Falls and one above, five sites were located on Chewelah Creek, three sites were located on Gold Creek, thee on Huckleberry Creek, two site were on Stensgar Creek, two sites were on Blue Creek, two sites were on Sherwood Creek, two sites were on Cottonwood Creek, two sites were on Deer Creek, one site was on Haller Creek, one site was on Stranger

Creek, one site was on Paye Creek, oen site was on Thomason Creek, and one site was on Sheep Creek.

Redband trout

Figure 17 summarizes the distribution of redband trout in the CRW. Redband trout were found at 44 sites. Nine sites were located on the Colville River, all above Meyers Falls, six sites were located on the Little Pend Oreille River, four sites below Crystal Falls and two above, four sites located on Mill Creek, three below and one above, four sites on Chewelah Creek, three on Gold Creek, three on Huckleberry Creek, two sites were located on Blue Creek, two sites were located on Sherwood Creek, two sites were located on Cottonwood Creek, two sites were located on Sheep Creek, two sites were located on Deer Creek, one site was located on Haller Creek, one site was located on Stranger Creek, one site was located on Stensgar Creek, one site was located on Paye Creek, and one site was located on Thomason Creek.

Brown trout

Figure 18 summarizes the distribution of brown trout in the CRW. Brown trout were found at 29 sites. Seven sites were on the Colville River, three below Meyers Falls and four above, three sites on Mill Creek, all below Douglas Falls, two sites on the Little Pend Oreille River, both below Crystal Falls, five sites on Chewelah Creek, two sites on Sherwood Creek, two sites on Cottonwood Creek, two sites on Sheep Creek, one site on Gold Creek, one sites on Stranger Creek, one site on Stensgar Creek, one site on Blue Creek, one site on Jumpoff Joe Creek, and one site on Deer Creek.

Eastern brook trout

Figure 19 summarizes the distribution of eastern brook trout in the CRW. Eastern brook trout were found at 40 sites. Four sites were on the Colville River, one below Meyers Falls and three above, nine sites on the Little Pend Oreille River, five below Crystal Falls and four above, six sites on Mill Creek, two below Douglas Falls and four above, two sites on Chewelah Creek, three sites on Gold Creek, two sites on Sherwood, two sites on Cottonwood Creek, two sites on Huckleberry Creek, two sites on Sheep Creek, one site on Clugston Creek, one site on Haller Creek, one site on Spatt Creek (tributary to Haller Creek), one site on Bear Creek, one site on Stranger Creek, one site on Stranger Creek, one site on Thomason Creek, and one site on Deer Creek.

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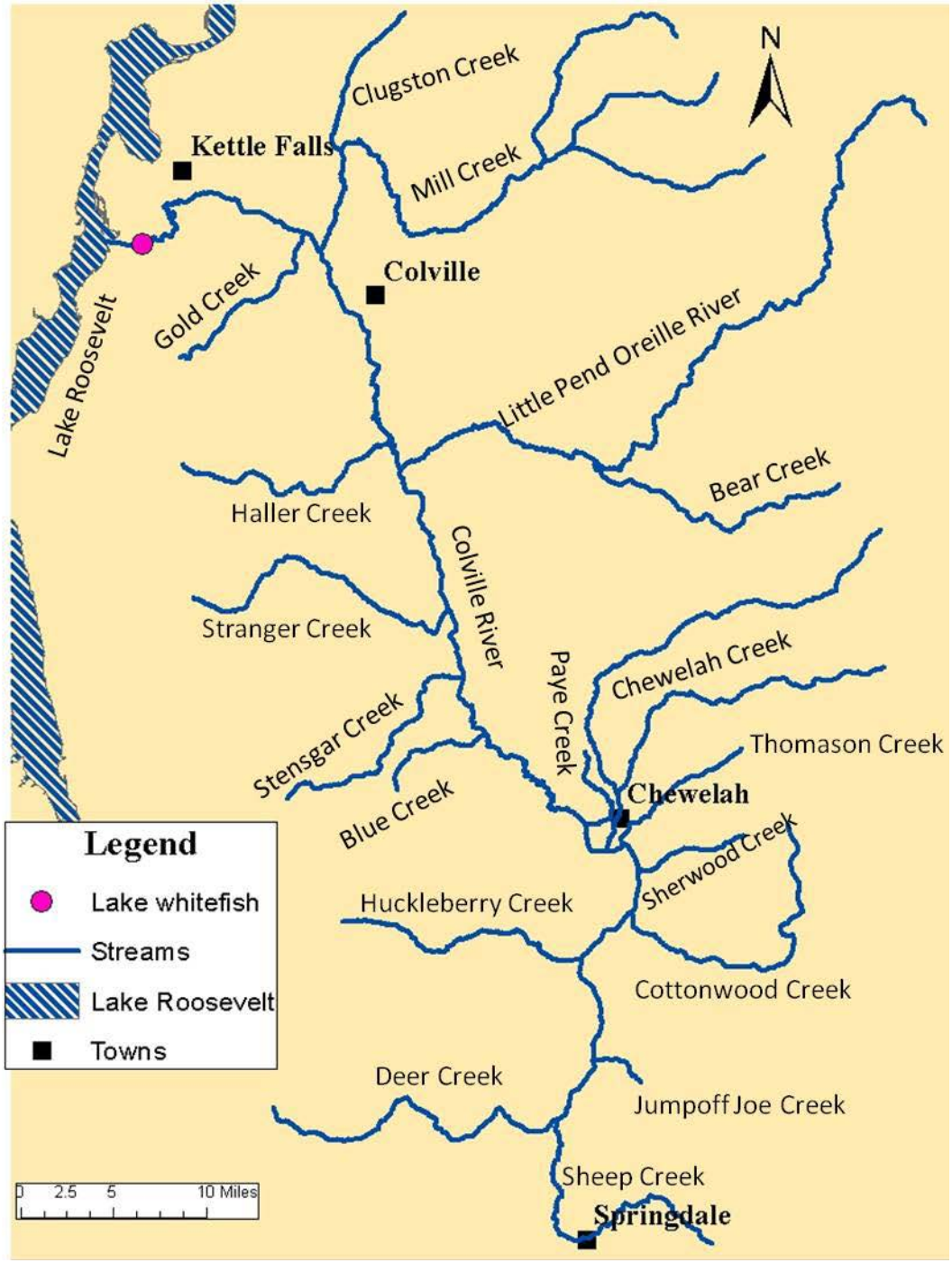

Figure 13 Distribution of lake whitefish in the Colville River Watershed, Stevens County, WA. 2013.

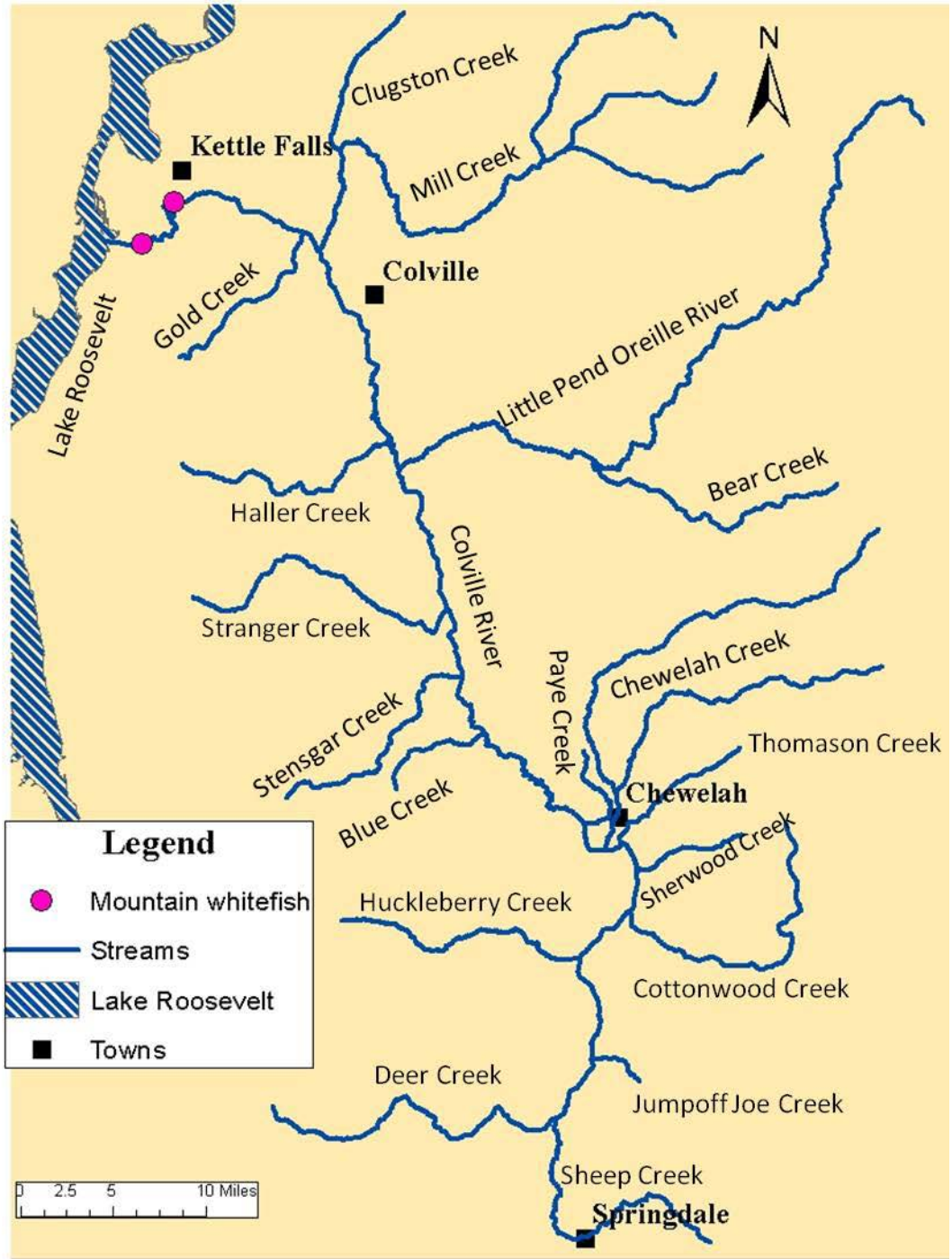

Figure 14. Distribution of mountain whitefish in the Colville River Watershed, Stevens County, WA. 2013

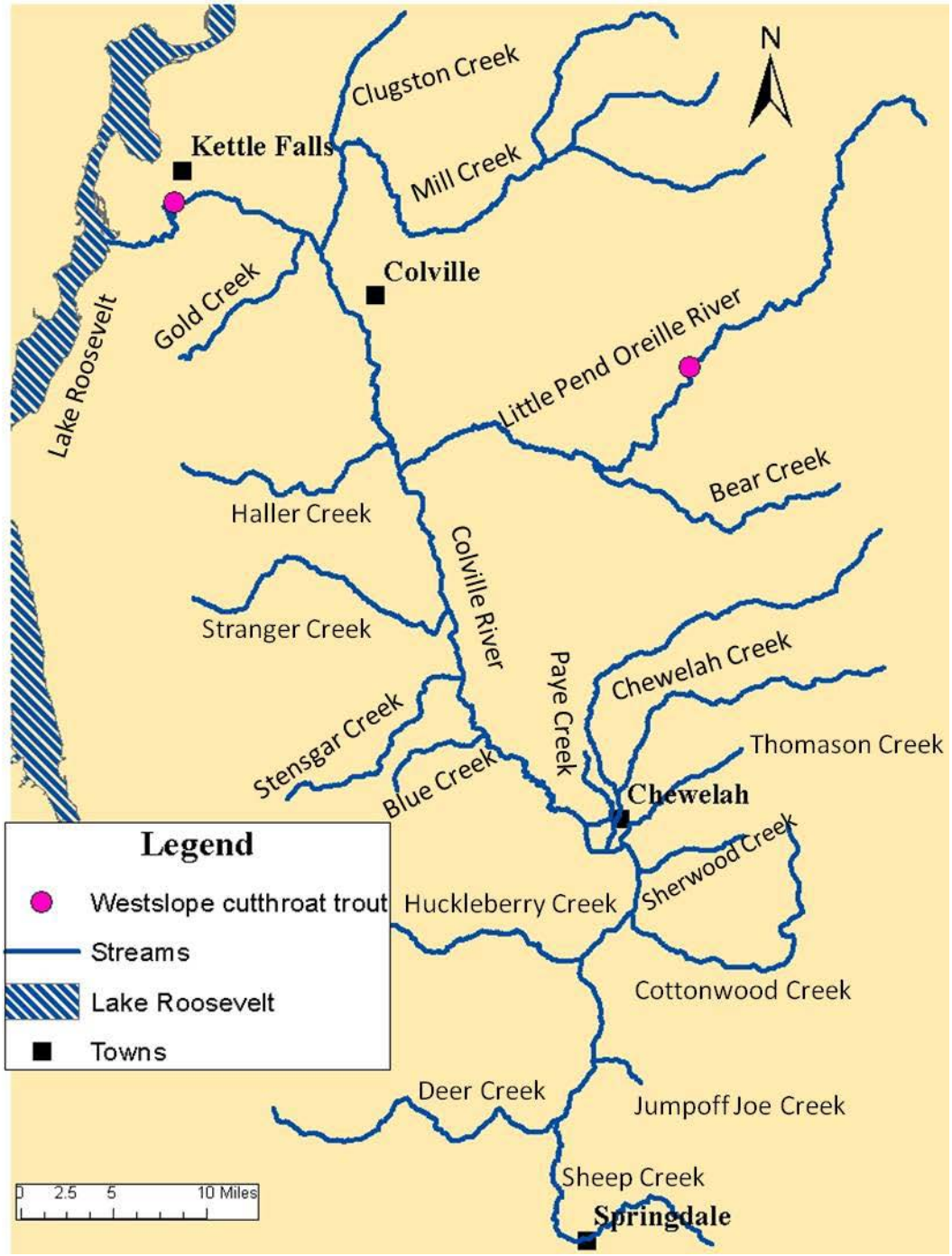

Figure 15. Distribution of westslope cutthroat trout in the Colville River Watershed, Stevens County, WA. 2013.

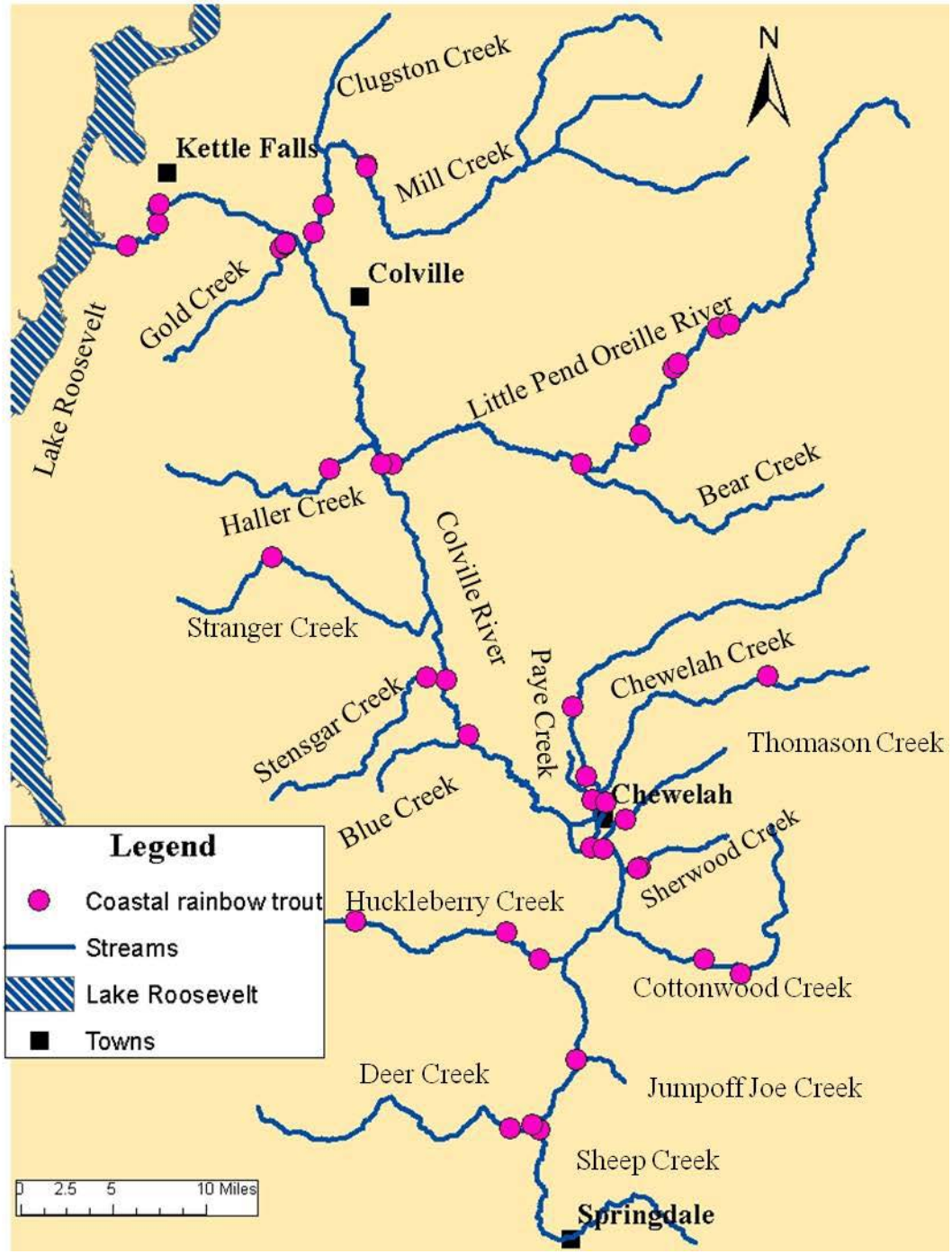

Figure 16. Distribution of rainbow trout in the Colville River Watershed, Stevens County, WA. 2013

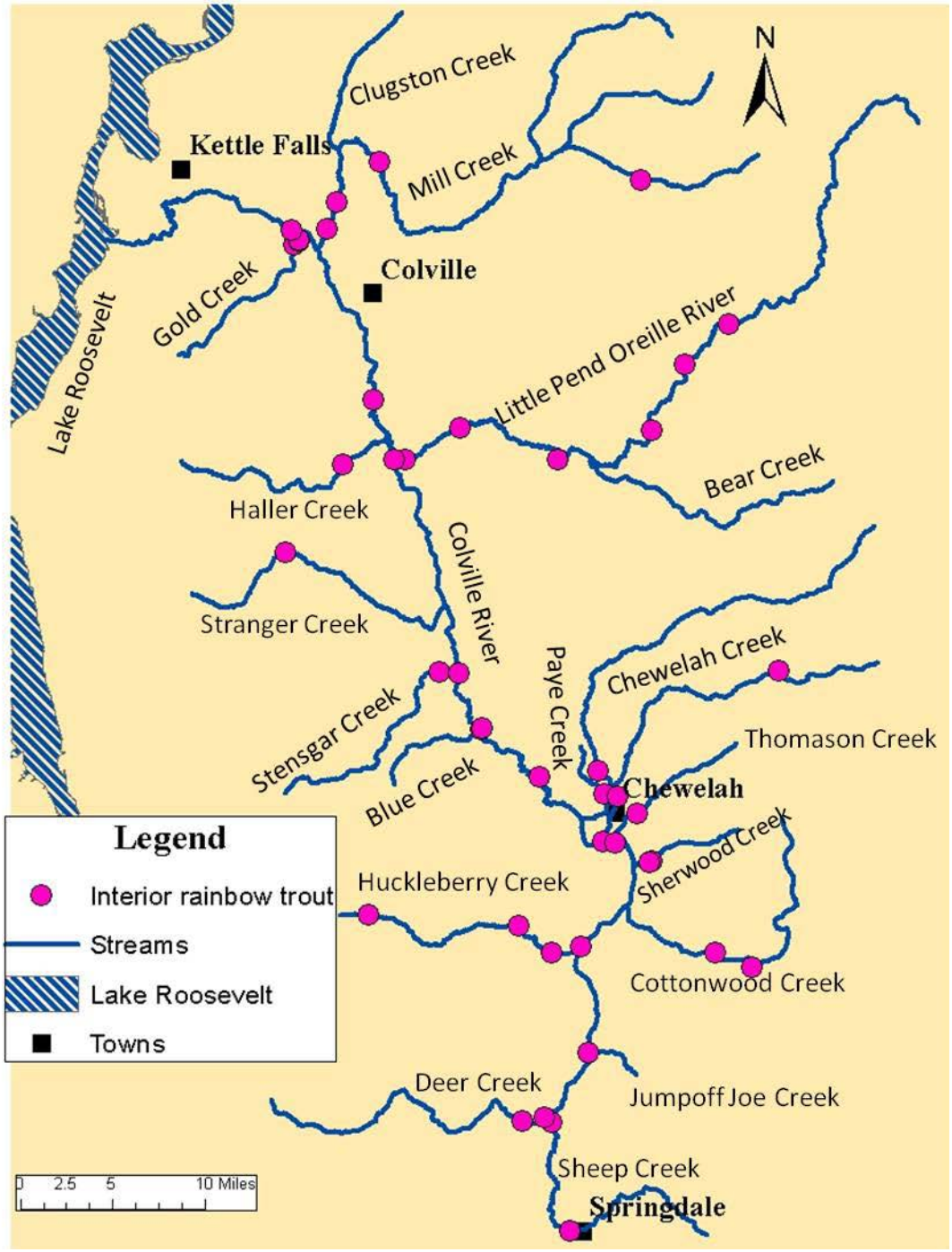

Figure 17. Distribution of redband trout in the Colville River Watershed, Stevens County, WA. 2013.

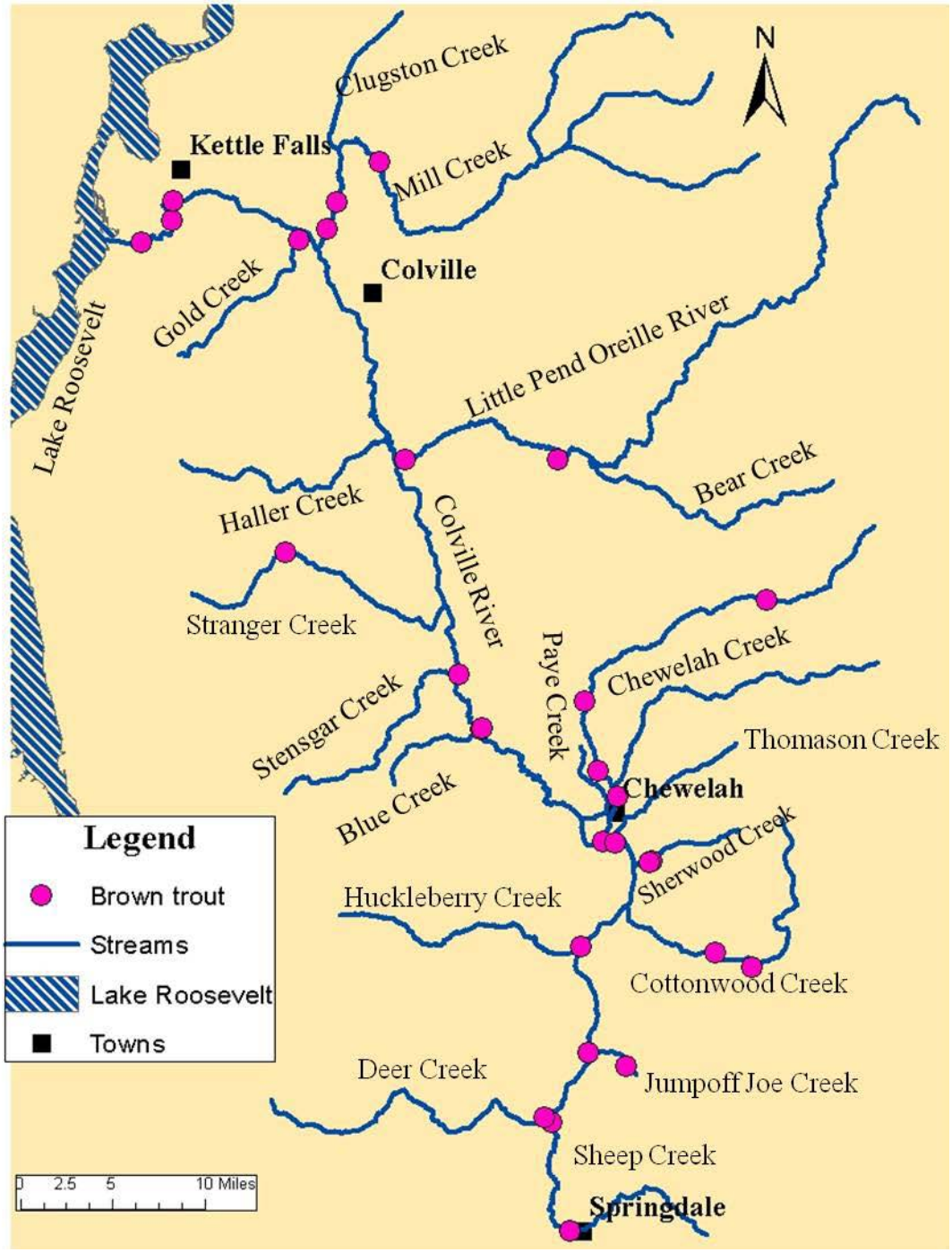

Figure 18. Distribution of brown trout in the Colville River Watershed, Stevens County, WA. 2013

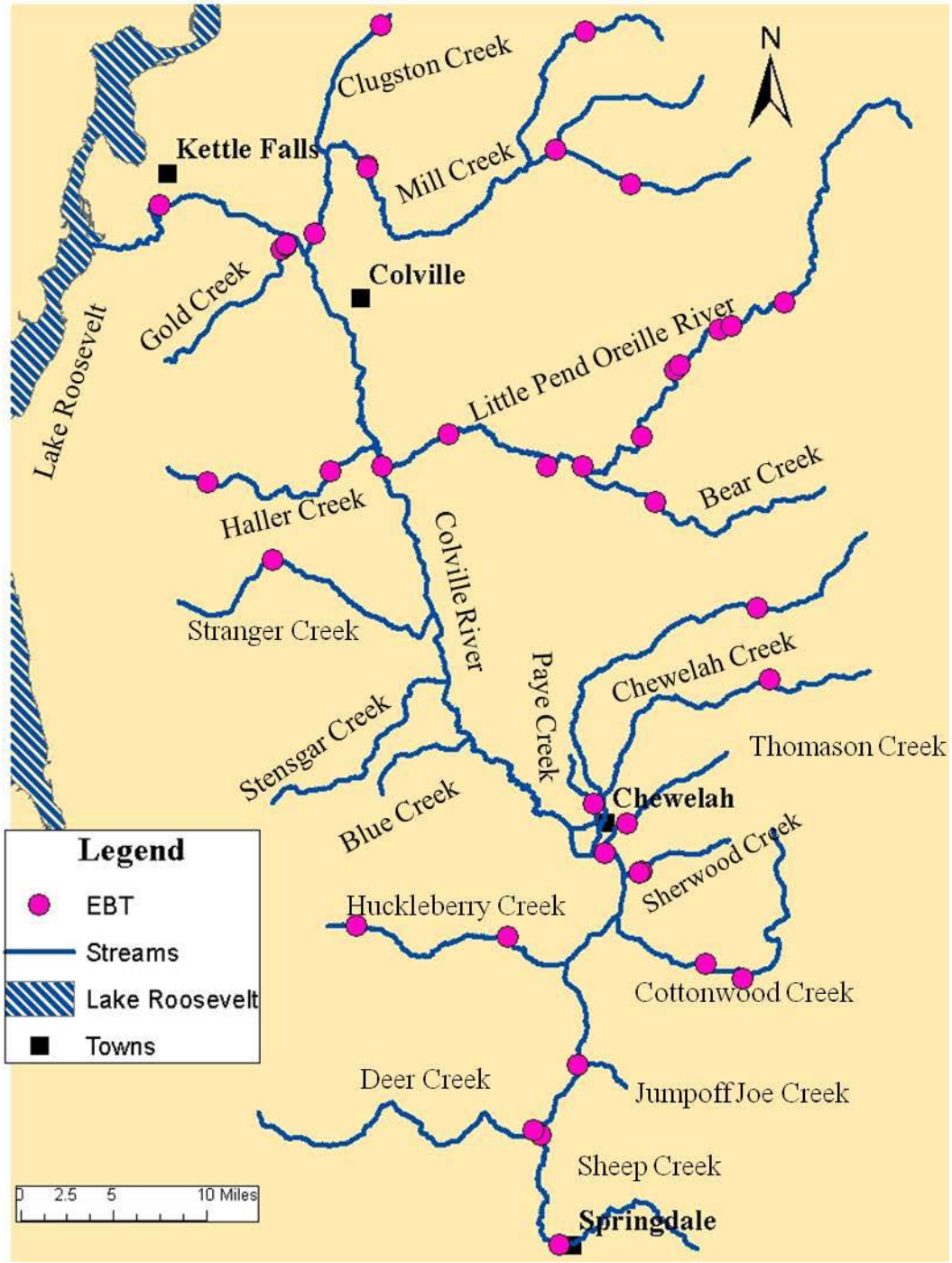

Figure 19. Distribution of eastern brook trout in the Colville River Watershed, Stevens County, WA. 2013.

Prickly sculpin

Figure 20 summarizes the distribution of prickly sculpin the CRW. Prickly sculpin were found at 15 sites. 11 sites on the Colville River, four below Meyers Falls and seven above, one site on the Little Pend Oreille River, one site on Chewelah Creek, one site on Cottonwood Creek, and one site on Sheep Creek.

Mottled Sculpin

Figure 21 summarizes the distribution of mottled sculpin the CRW. Mottled sculpin were found at 25 sites. Eight sites on the Colville River, three below Meyers Falls and five above, four sites on the Little Pend Oreille River, three below Crystal Falls and one above, four sites on Mill Creek, 3 below Douglass Falls and one above, five sites on Chewelah Creek, two sites on Deer Creek, one site on Cottonwood Creek, and one site on Sheep Creek.

Slimy sculpin

Figure 22 summarizes the distribution of slimy sculpin in the CRW. Slimy sculpin were found at three sites. Two sites on the Colville River below Meyers Falls and one site one the Little Pend Oreille River below Crystal Falls.

Shorthead sculpin

Figure 23 summarizes the distribution of shorthead sculpin the CRW. Shorthead sculpin were found at three sites all on the Colville River below Meyers Falls.

Torrent sculpin

Figure 24 summarizes the distribution of torrent sculpin in the CRW. Torrent sculpin were found at 36 sites. 13 sites were on the Colville River, three below Meyers Falls and ten above, four sites on Mill Creek, three below Douglas Fall and one above, two sites on the Little Pend Oreille River, both below Crystal Falls, three sites on Chewelah Creek, two sites on Stensgar Creek, two sites on Blue Creek, two sites on Cottonwood Creek, two sites on Sheep Creek, two sites on Deer Creek, one site on Haller Creek, one site on Paye Creek, one site on Sherwood Creek, and one site on Huckleberry Creek.

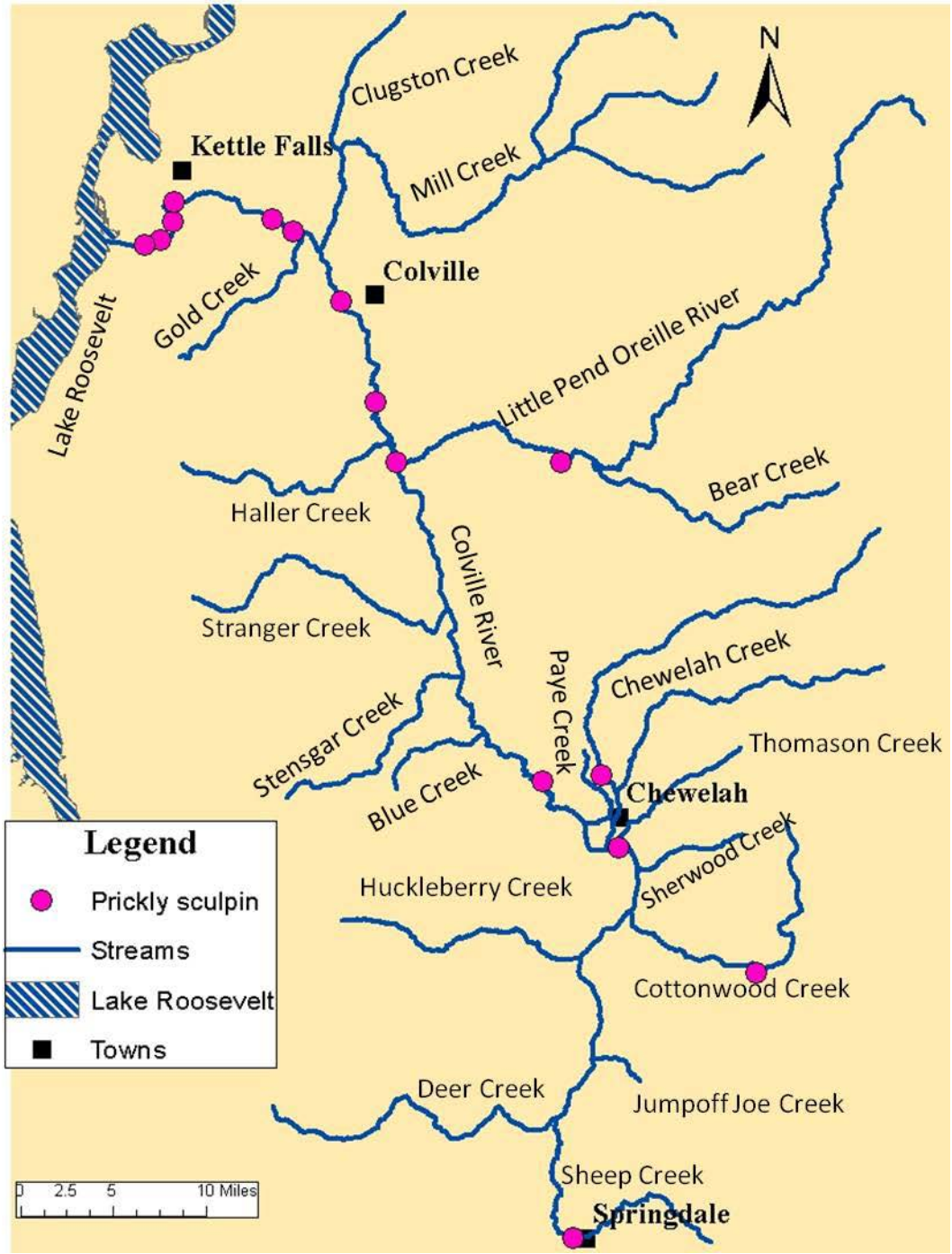

Figure 20. Distribution of prickly sculpin in the Colville River Watershed, Stevens County, WA. 2013.

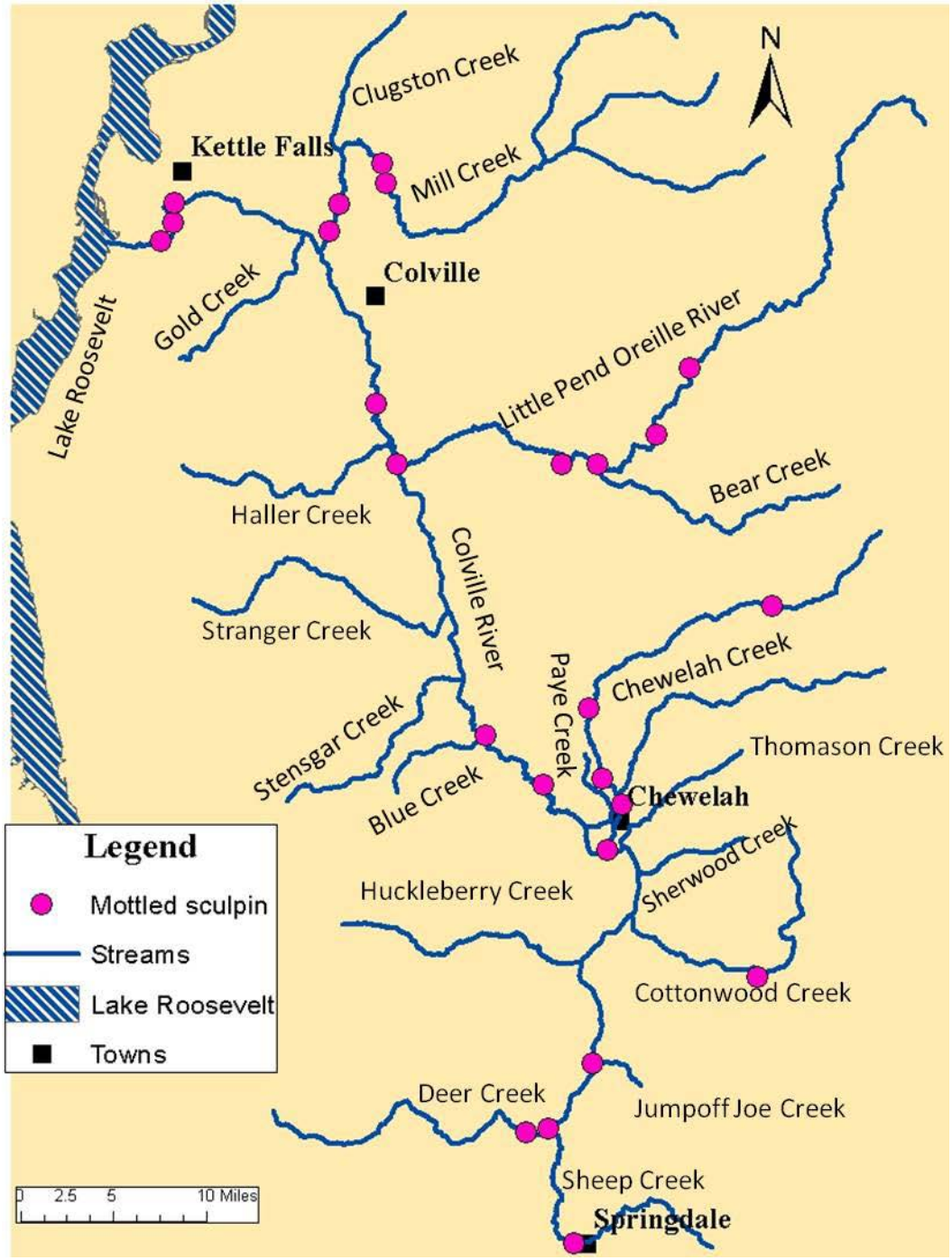

Figure 21. Distribution of mottled sculpin in the Colville River Watershed, Stevens County, WA. 2013

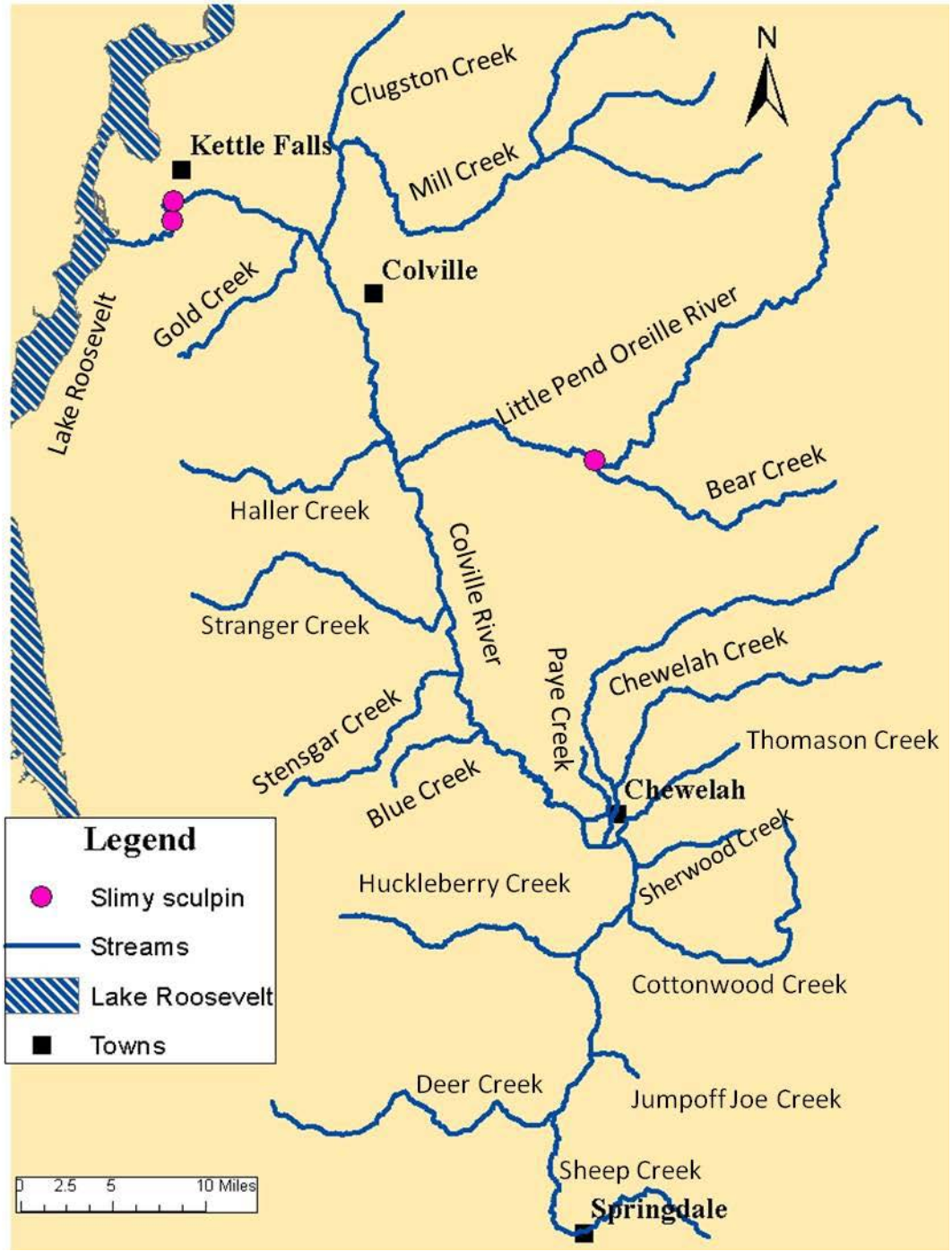

Figure 22. Distribution of slimy sculpin in the Colville River Watershed, Stevens County, WA. 2013.

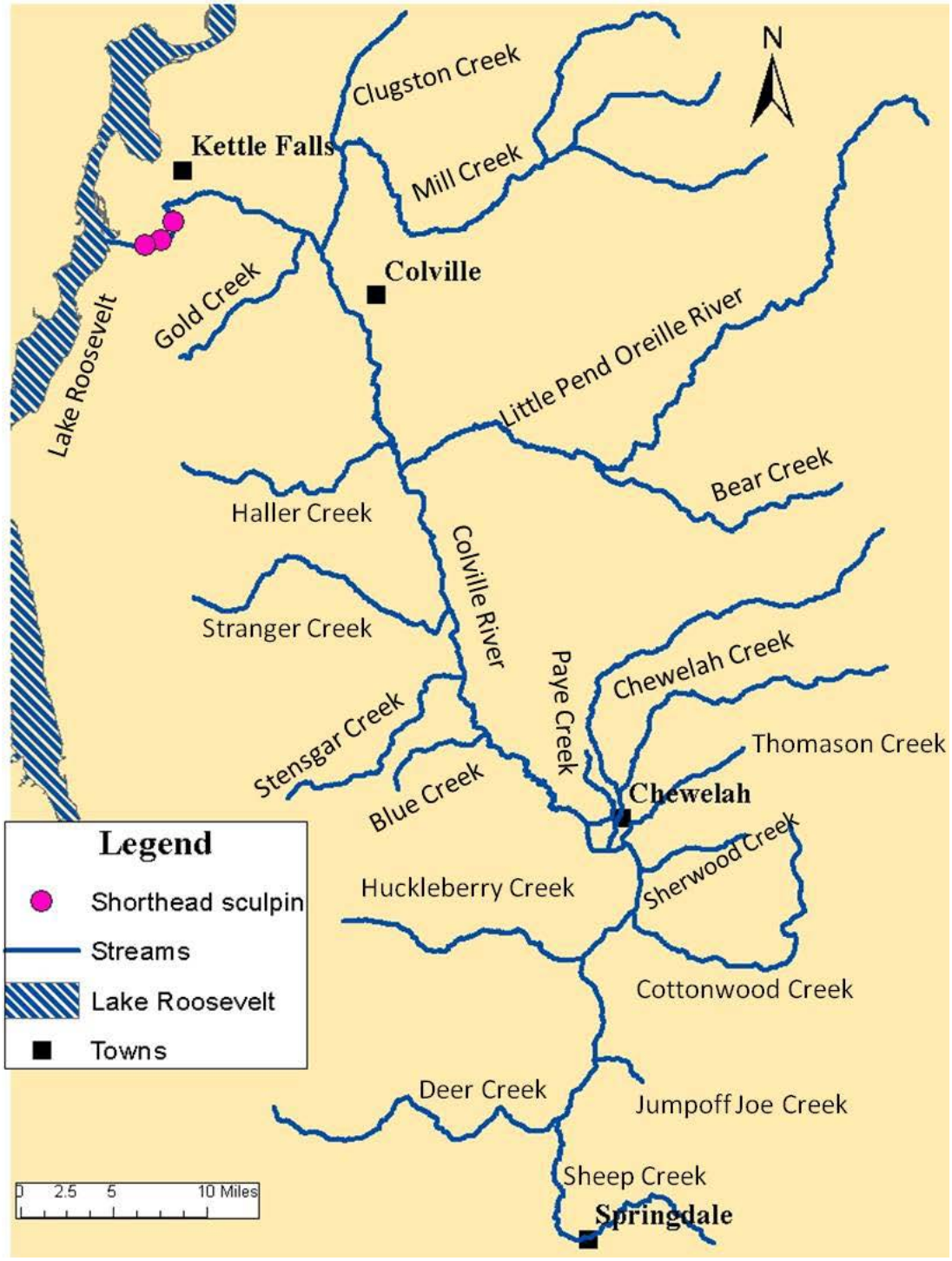

Figure 23 Distribution of shorthead sculpin in the Colville River Watershed, Stevens County, WA. 2013.

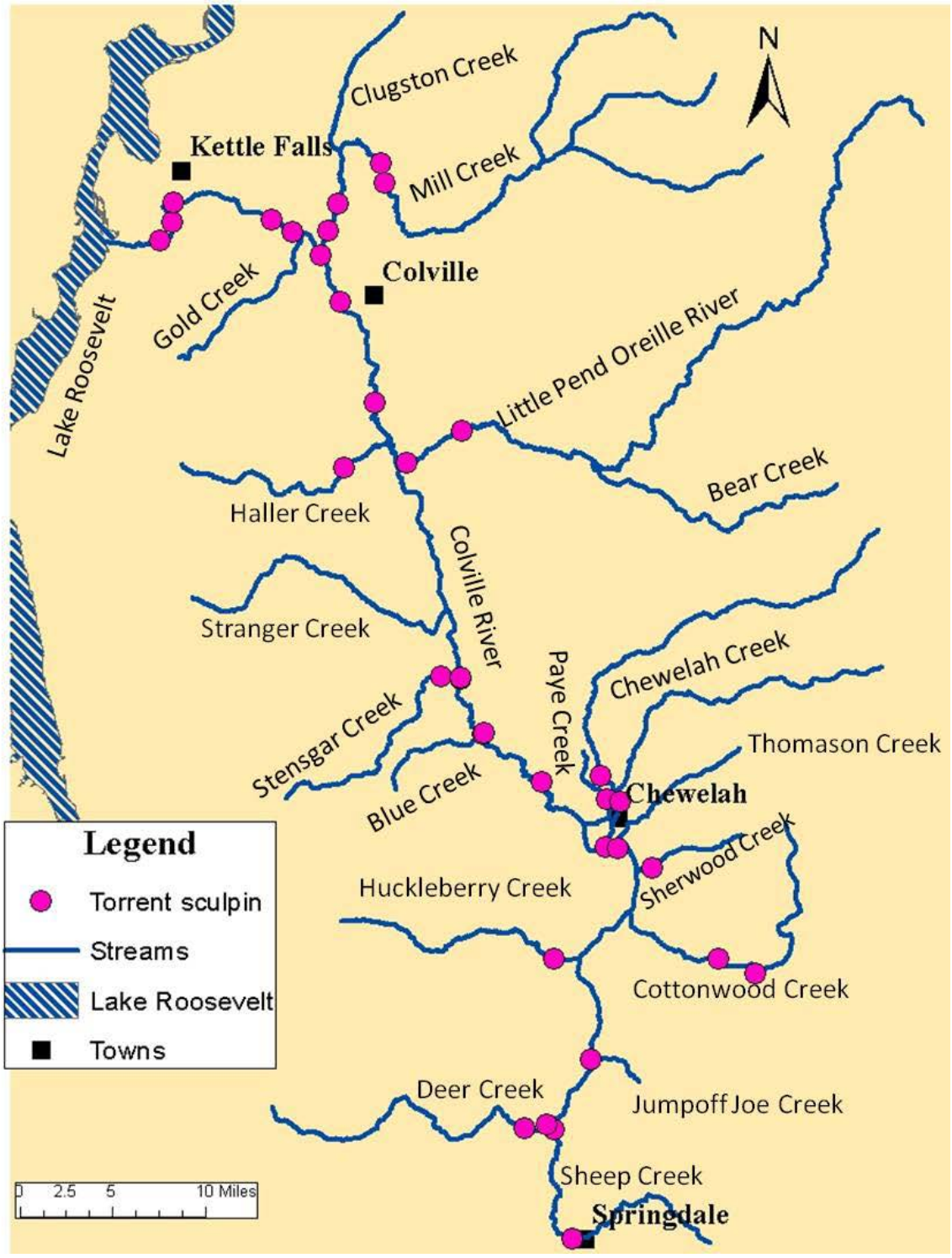

Figure 24. Distribution of torrent sculpin in the Colville River Watershed, Stevens County, WA. 2013

Green sunfish

Figure 25summarizes the distribution of green sunfish in the CRW. Green sunfish were found at one site on the Colville River below Meyers Falls.

Pumpkinseed

Figure 26summarizes the distribution of pumpkinseed in the CRW. Pumpkinseeds were found at 14 sites. Eight sites on the Colville River, one below Meyers Falls and seven above, three sites on the Little Pend Oreille River, all below Crystal Falls, one site on Sherwood Creek, one site on Jumpoff Joe Creek, and one site on Sheep Creek.

Bluegill

Figure 27summarizes the distribution of bluegill in the CRW. Bluegills were found at two sites. One site was on the Colville River above Meyers Falls and one site was on Jumpoff Joe Creek.

Largemouth bass

Figure 28 summarizes the distribution of largemouth bass in the CRW. Largemouth bass were found at one site on the Colville River below Meyers Falls.

Yellow perch

Figure 29 summarizes the distribution of yellow perch in the CRW. Yellow perch were found at four sites. Two sites were on the Colville River, both below Meyers Falls, and two sites on Jumpoff Joe Creek.

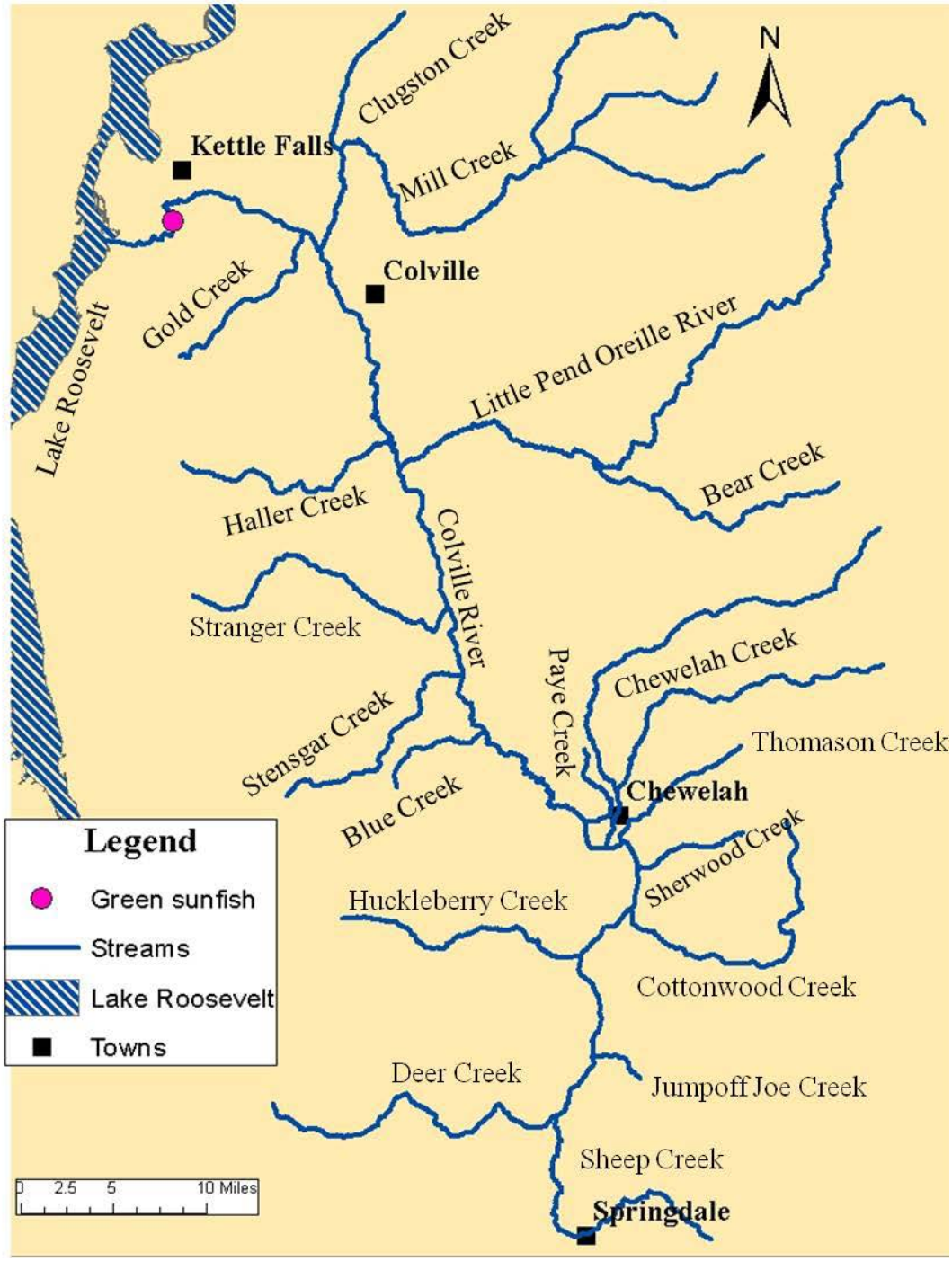

Figure 25. Distribution of green sunfish in the Colville River Watershed, Stevens County, WA. 2013.

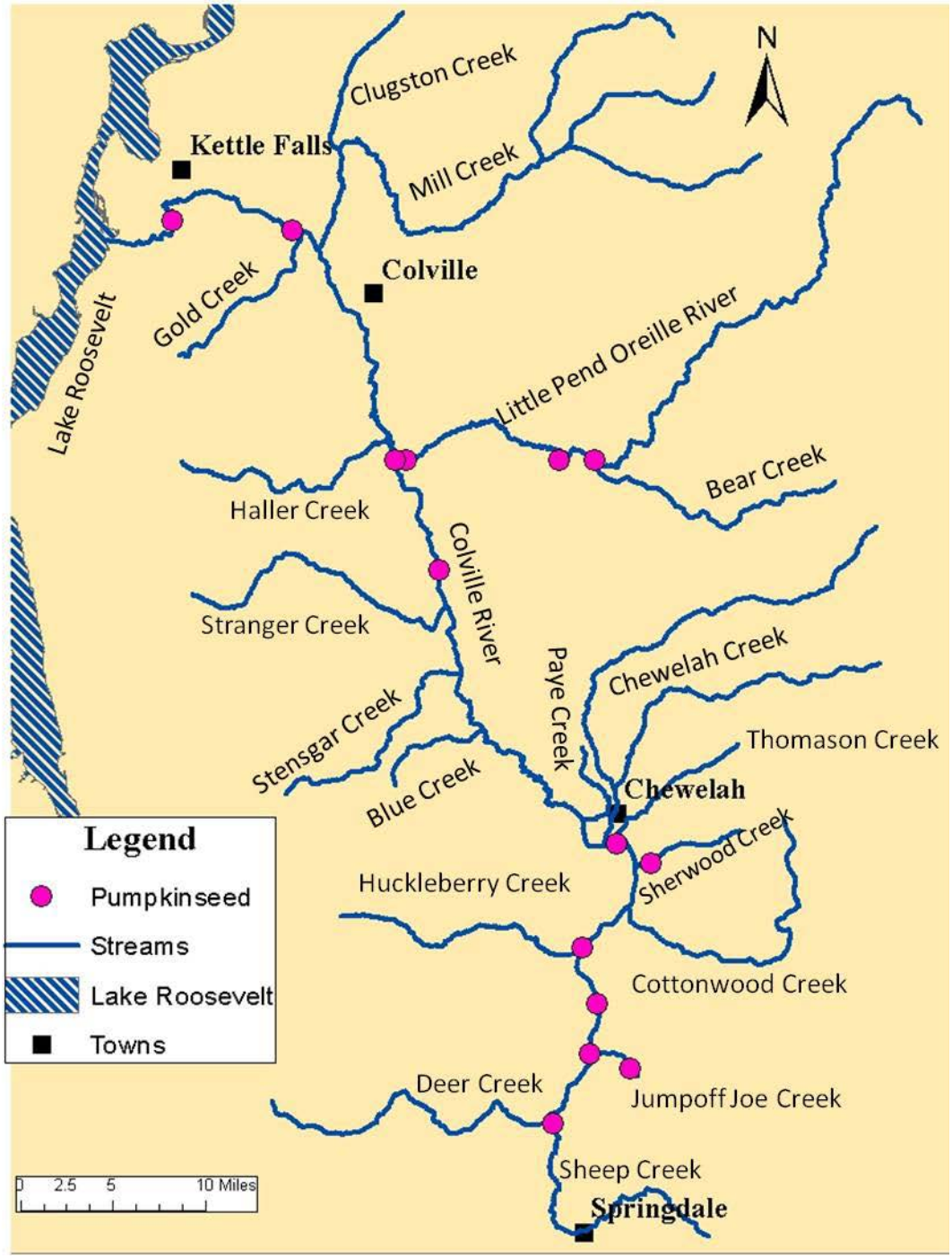

Figure 26. Distribution of pumpkinseed in the Colville River Watershed, Stevens County, WA. 2013.

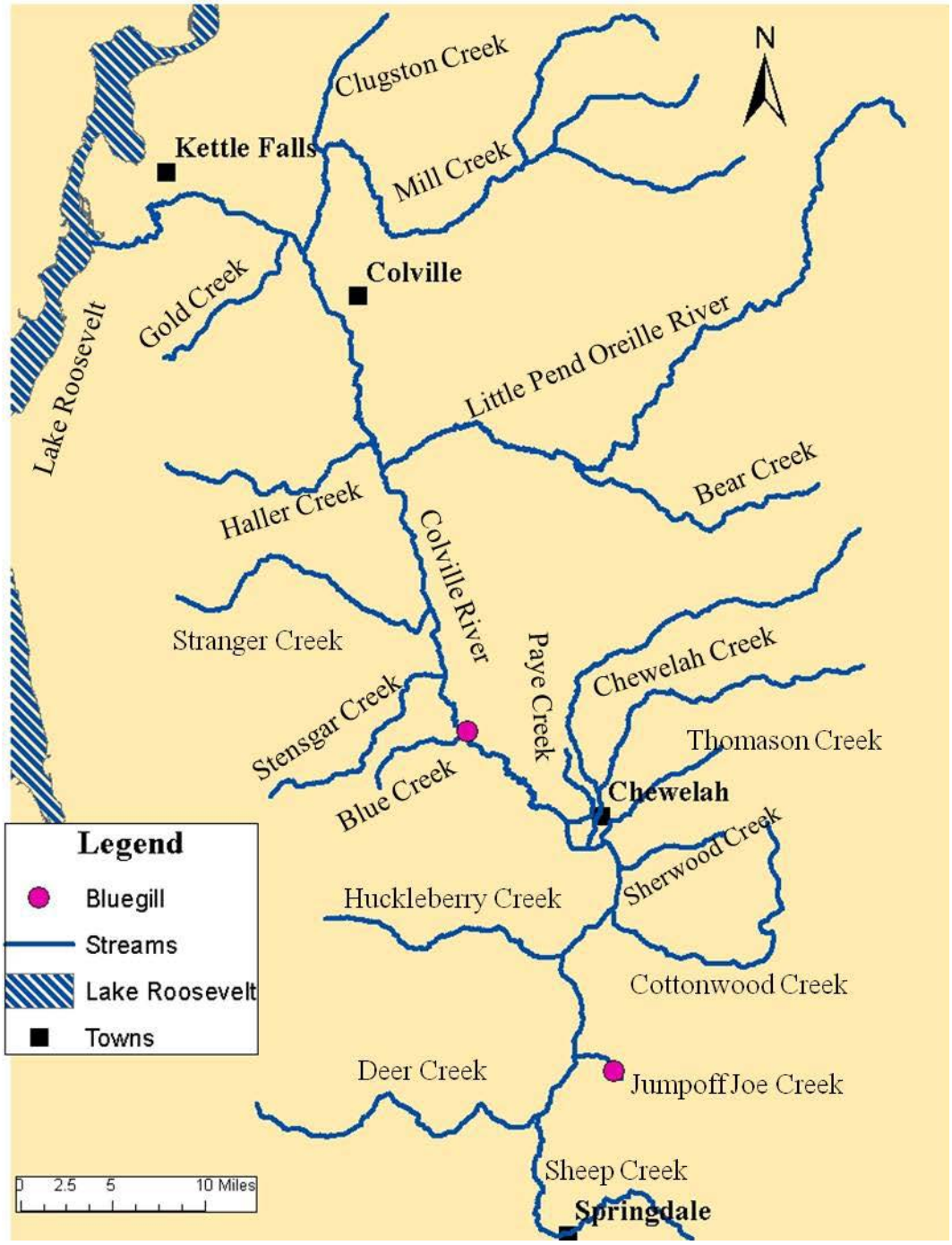

Figure 27. Distribution of bluegill in the Colville River Watershed, Stevens County, WA. 2013.

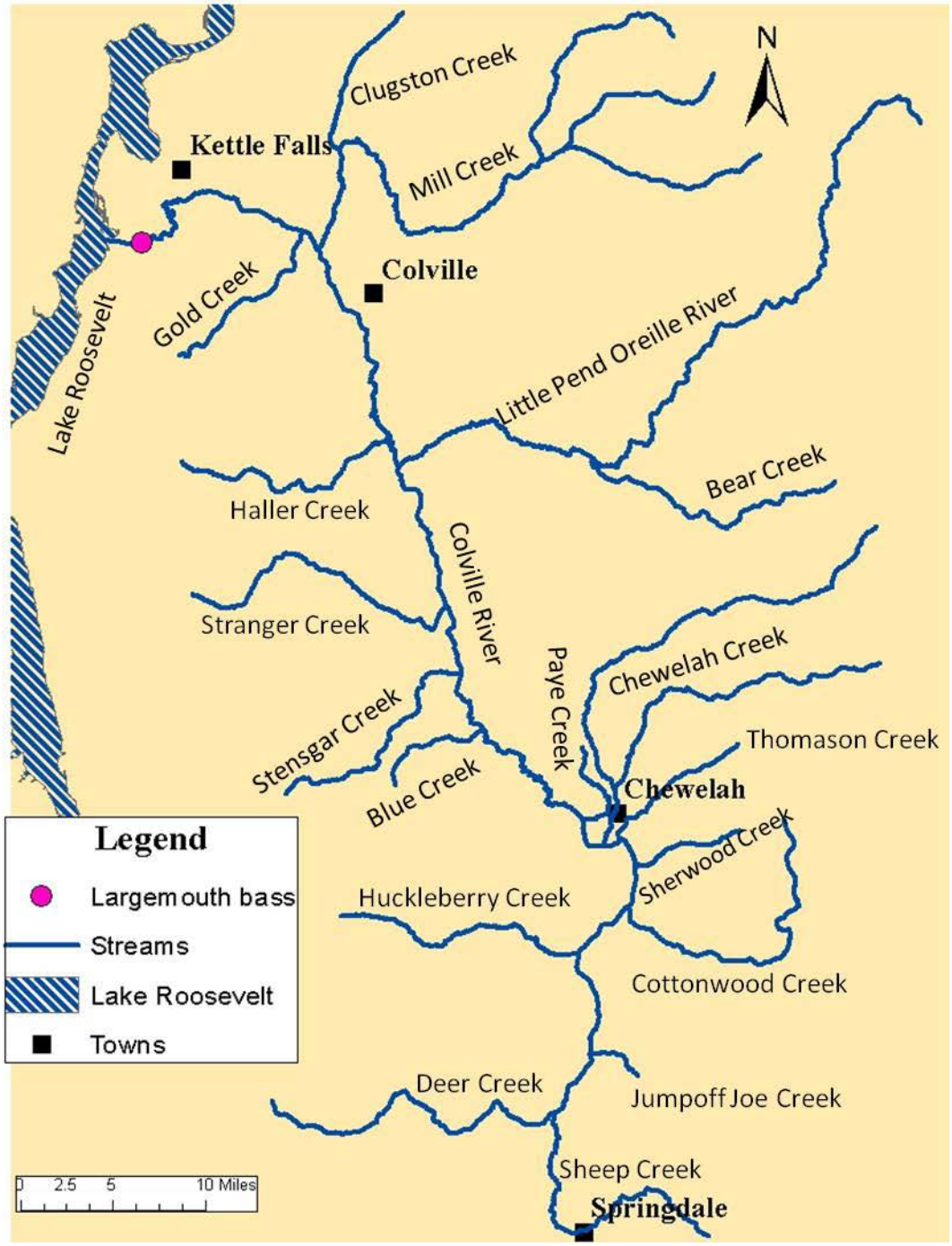

Figure 28. Distribution of largemouth bass in the Colville River Watershed, Stevens County, WA. 2013.

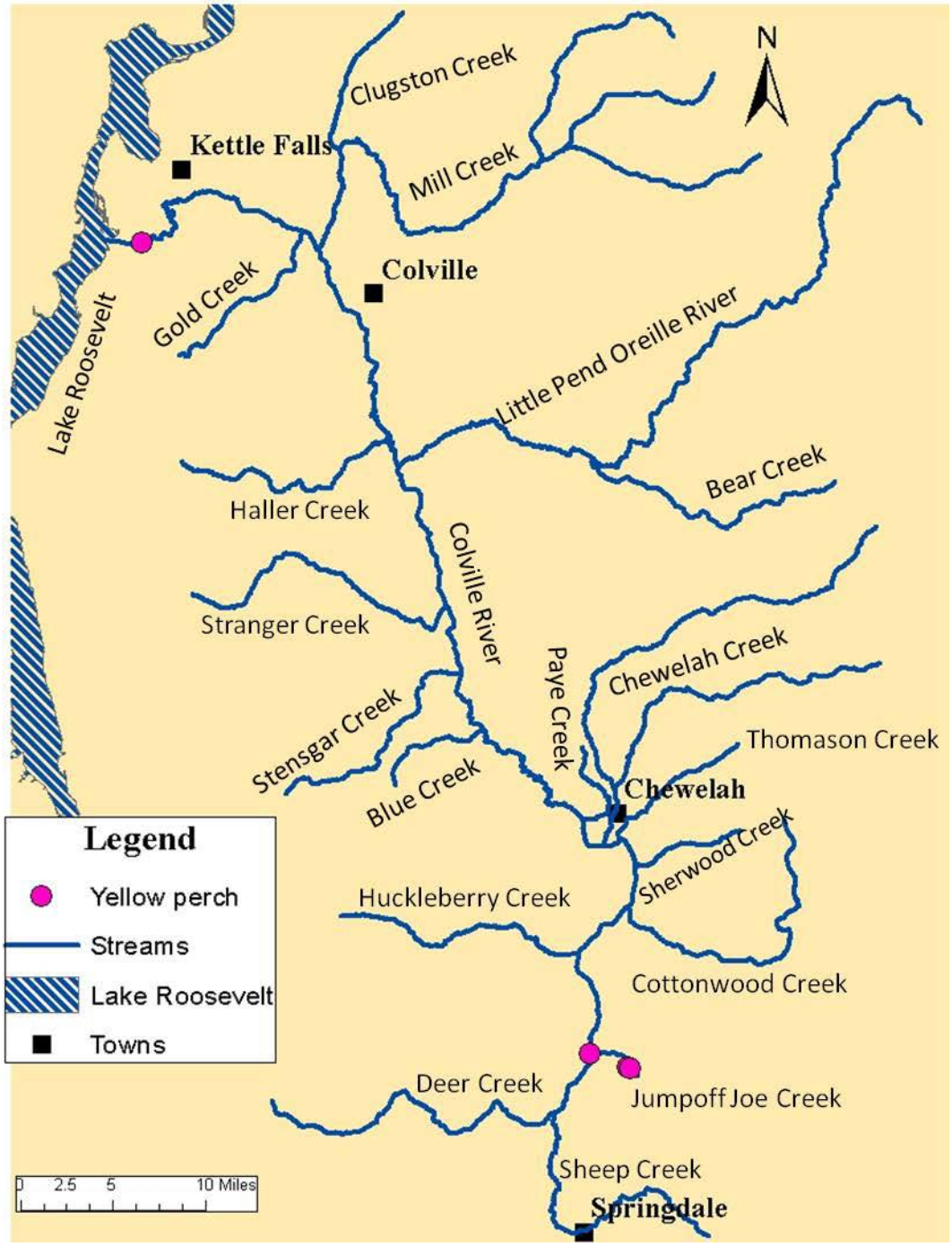

Figure 29. Distribution of Yellow Perch in the Colville River Watershed, Stevens County, WA. 2013.

Barrier Falls

The three major waterfalls in this watershed are Meyers Falls, Douglas Falls, and Crystal Falls. All three potentially are barriers to fish migration. To test this, I broke the watershed up into five regions (Figure 30).

Initially I examined species abundance per region (Table 8). Below Meyers Falls, I found 23 species, 8 of which were unique to below Meyers Falls; carp, peamouth, Umatilla dace, lake whitefish, mountain whitefish, shorthead sculpin, green sunfish, largemouth bass. Above Meyers Falls on the Colville River I found 18 species and on the tributaries I found 19 species, in these two regions there are four species only found here; northern pikeminnow, longnose dace, largescale sucker, and bluegill. Above Crystal Falls I found six species and above Douglas Falls I found five species. In regions 2-5 one species found ubiquitously throughout, but not in region 1, was the interior rainbow (redband) trout.

Next I tested the hypothesis that barrier waterfalls will have no effect on species distribution. To do so, I ran a one way ANOVA examining the average number of species per site per region. Table 9 shows the average number of species per site per region ($p<0.001$, $F=11.9$). A tukeys test revealed that regions 1 and 2 ($p=0.139$) were not significantly different from one another and regions 3, 4, and 5 ($p=0.297$-$.0945$) were not significantly differ from one another either, however 1 was significantly different from 3 ($p<0.001$), 4 ($p<0.001$), and 5 ($p<0.001$) and 2 was significantly different from 3 ($p=0.002$), 4 ($p=0.03$), and 5 ($p=0.002$).

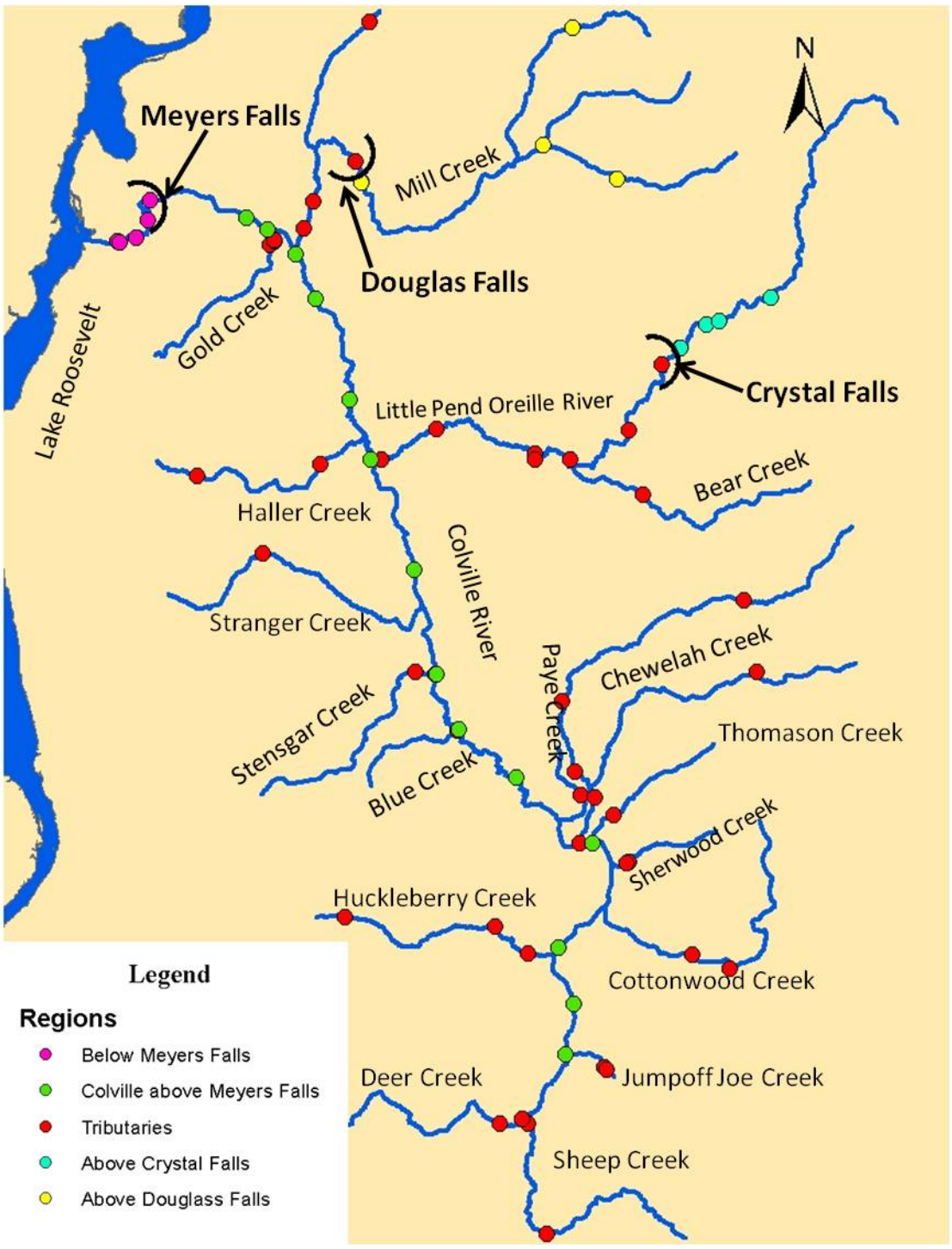

Figure 30. The five regions of the Colville River Watershed, Stevens County, WA 2013.

Table 8. List of the species associated with each of the five regions of the Colville River Watershed, Stevens County, WA. 2013. Bold and italicized indicates species unique to these regions.

Regions				
Below Meyers	**Above Meyers**	**Tributaries**	**Above Crystal**	**Above Douglas**
Bridgelip sucker	***Bluegill***	***Bluegill***	Eastern brook trout	Eastern brook trout
Brown trout	Bridgelip sucker	Bridgelip sucker	Mottled sculpin	Mottled sculpin
Carp	Brown trout	Brown trout	Rainbow trout	Rainbow trout
Eastern brook trout	Eastern brook trout	Eastern brook trout	***Redband trout***	***Redband trout***
Green sunfish	***Largescale sucker***	***Largescale sucker***	Redside shiner	Torrent sculpin
Lake whitefish	***Longnose dace***	***Longnose dace***	Speckled dace	
Largemouth bass	Longnose sucker	Mottled sculpin		
Longnose sucker	Mottled sculpin	***Northern pikeminnow***		
Mottled sculpin	***Northern pikeminnow***	Prickly sculpin		
Mountain whitefish	Prickly sculpin	Pumpkinseed		
Peamouth	Pumpkinseed	Rainbow trout		
Prickly sculpin	Rainbow trout	***Redband trout***		
Pumpkinseed	***Redband trout***	Redside shiner		
Rainbow trout	Redside shiner	Slimy sculpin		
Redside shiner	Speckled dace	Speckled dace		
Shorthead sculpin	Tench	Tench		
Slimy sculpin	Torrent sculpin	Torrent sculpin		
Speckled dace	Yellow perch	Westslope cutthroat trout		
Tench		Yellow perch		
Torrent sculpin				
Umatilla dace				
Westslope cutthroat trout				
Yellow perch				

Table 9. Average number of species per site per region in the Colville River Watersehd, Stevens County, WA. 2013. (the star and arrow indicate regions that are not significantly different from one another)

Region	Location	Average number of species
1	Below Meyers Falls	10.2 ☆
2	Colville above Meyers Falls	7.3 ☆
3	Tributaries	4.4 ⇦
4	Above Crystal Falls	3.3 ⇦
5	Above Douglass Falls	2.0 ⇦

Age, growth, condition factor, and mortality

Mean length, mean weight, and condition factor, including standard deviations were calculated for each species and each age class represented in the sample. Length-weight relationships were calculated for all eligible species (n=23). Scales were collected from a subset of each species and analyzed to determine fish age at time of capture. Age and growth analysis were conducted on all eligible species (n=22) of fish collected during the 2013 survey of the CRW. Condition factors were compared to those published by Carlander (1969, 1977, and 1997). Mortality was calculated from age frequency distribution tables.

Common Carp

149 carp were captured that ranged in length between 46 to 103 mm, in weight between 1 g and 17 g, and in condition factor, based on total length, between 0.73 and 2.28 with a mean condition factor of 1.51 (Table 10). Mean condition falls in the good range reported by Carlander (1969).Figure 31 shows the linear relationship between length and weight for common carp (R^2=0.90).The length at each annulus was was 42 mm at age 1+ (Table 11). Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 12).

Peamouth

One peamouth was captured that was 83 mm in length, 5 g in weight, and had a condition factor of 0.87. The length at annulus formation was found to be 78 mm for age class 1+ (Table 13).

Table 10. Mean length, weight, and condition factor (± standard deviation) of carp in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ±SD	Mean weight (g) ±SD	Condition Factor ±SD
1+	149	66±11	5±2	1.51±.23

Table 11. Backcalculated length [mm (±SD)] at annulus formation for carp in the Colville River Watershed, Stevens County, WA 2013.

Mean total length (mm) at each annulus		
Cohort	n	1
1+	19	42 (4)
Mean	19	42 (4)

Table 12. Age/Length key for carp in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class.

			Age		
mm	**# captured**	**# Scaled**	**0**	**1**	**Total**
40	149	0	***4***		4
50	145	3 (0)	39		39
60	106	11 (0)	57		57
70	49	3 (0), 6 (1)	11	23	34
80	15	10 (1)		12	12
90	3	1 (1)		1	1
100	2	2 (1)		2	2
Total	**149**		**111**	**38**	**149**

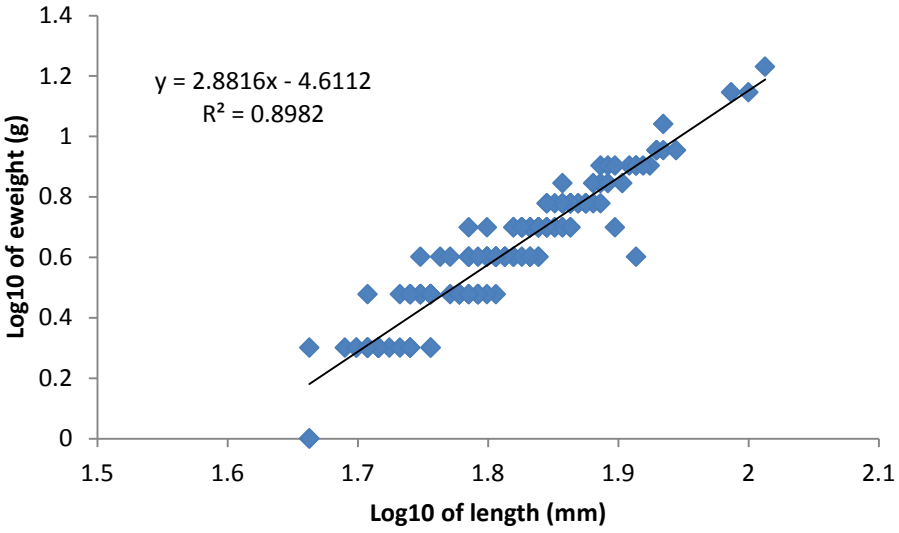

Figure 31. Total length (mm) to weight (g) of carp in the Colville River Watershed, Stevens County, WA 2013.

Table 13. Backcalculated length [mm (± SD)] at annulus formation for peamouth in the Colville River Watershed, Stevens County, WA 2013.

Mean total length (mm) at each annulus		
Cohort	**n**	**1**
1+	1	78 (nc)
Mean	1	**78 (nc)**

Northern pikeminnow

A total of 11 northern pikeminnow were captured that ranged in length between 39 to 131 mm, in weight between 2 g and 20 g, and in condition factor, based on total length, between 0.87 and 1.29, with a mean condition factor of 1.03 (Table 14). Figure 32 shows the linear relationship between length and weight for northern pikeminnow (R^2=0.95).The length at each annulus was determined for a subset of carp collected from the CRW (Table 15). The grand means were 55 mm at age 1+ and 112 mm at age 2+.Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 16). There were 1 fish in age class 0+, 9 fish in age class 1+, and 1 fish in age class 2+.

Longnose dace

A total of 145 longnose dace were captured that ranged in length between 30 to 131 mm, in weight between 1 g and 23 g, and in condition factor, based on total length, between 0.60 and 3.70, with a mean condition factor of 1.18 (Table 17). Figure 33 shows the linear relationship between length and weight for longnose dace (R^2=0.88).The length at each annulus was determined for a subset of longnose dace collected from the CRW (Table 18). The grand means were 48 mm at age 1+, 64 at age 2+, 77 at age 3 +, 89 at age 4+, and 104 at age 5 +.Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 19). There were 66 fish in age class 1+, 28 fish in age class 2+, 21 fish in age class 3+, 20 fish in age class 4 +, and 10 fish in age class 5 +.

Table 14. Mean length, weight, and condition factor (± standard deviation) of northern pikeminnow in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
0+	1	39	-	-
1+	9	73±7	4±2	1.05±.14
2+	1	131	20	0.89

Table 15. Backcalculated length [mm (±SD)] at annulus formation of northern pikeminnow in the Colville River Watershed, Stevens County, WA 2013.

Mean total length (mm) at each annulus			
Cohort	n	1	2
1+	9	55 (3)	
2+	1	56 (nc)	112 (nc)
Mean	9	55 (3)	112 (nc)

Table 16. Age/Length key for northern pikeminnow in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class.

			Age			
mm	**# captured**	**# Scaled**	**0**	**1**	**2**	**Total**
30	1	0	***1***			1
40	0	0				0
50	1	0		***1***		1
60	1	1 (1)		1		1
70	6	6 (1)		6		6
80	1	1 (1)		1		1
90	0			0		0
100	0			0		0
110	0			0		0
120	0			0		0
130	1	1 (2)			1	1
Total	**11**		**1**	**9**	**1**	**11**

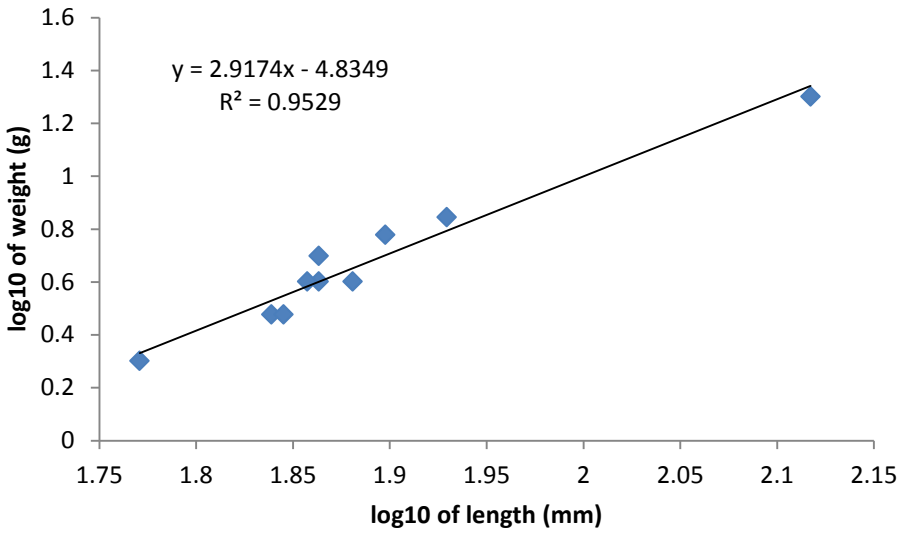

Figure 32. Total length (mm) to weight (g) of northern pikeminnow in the Colville River Watershed, Stevens County, WA 2013.

Table 17. Mean length, weight, and condition factor (± standard deviation) of longnose dace in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
0+	39	39±4	1±.2	1.85±.55
1+	12	55±5	2±1	0.95±.27
2+	40	71±4	4±1	0.95±.15
3+	20	81±3	5±1	0.91±.11
4+	19	96±5	8±1	0.92±.08
5+	15	112±7	13±3	0.90±.12

Table 18. Backcalculated length [mm(±SD)] at annulus formation of longnose dace in the Colville River Watershed, Stevens County, WA 2013.

		Mean total length (mm) at each annulus				
Cohort	n	1	2	3	4	5
1+	59	55 (4)				
2+	48	47 (4)	67 (3)			
3+	39	46 (2)	64 (3)	76 (4)		
4+	28	47 (4)	63 (4)	76 (5)	89 (4)	
5+	9	47 (6)	63 (5)	77 (6)	90 (6)	104 (5)
Mean	59	48 (5)	64 (4)	77 (5)	89 (5)	104 (5)

Table 19. Age/Length key for longnose dace in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class.

			Age					
mm	# captured	# Scaled	1	2	3	4	5	Total
30	23	0	*23*					23
40	17	0	*17*					17
50	8	1 (1)	8					8
60	18	10 (1)	18					18
70	31	9 (2), 1 (3)		28	3			31
80	18	10 (3)			18			18
90	11	10 (4)				11		11
100	10	9 (4), 1 (5)				9	1	10
110	7	6 (5)					7	7
120	1	1 (5)					1	1
130	1	1 (5)					1	1
Total	145		66	28	21	20	10	145

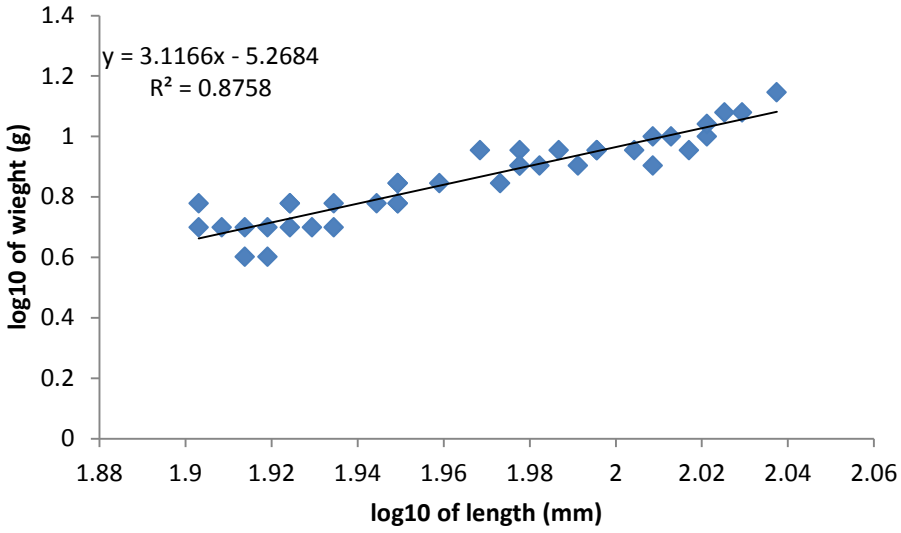

Figure 33. Total length (mm) to weight (g) of longnose dace in the Colville River Watershed, Stevens County, WA 2013.

Umatilla dace

A total of 163 Umatilla dace were captured that ranged in length between 29 to 115 mm, in weight between 1 g and 15 g, and in condition factor, based on total length, between 0.49 and 2.54, with a mean condition factor of 1.06 (Table 20). Figure 34 shows the linear relationship between length and weight for Umatilla dace (R^2=0.93).The length at each annulus was determined for a subset of Umatilla dace collected from the CRW The grand means were 45 mm at age 1+, 64 at age 2+, 84 at age 3 +, and 101 at age 4+ (Table 21).Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 22).

Speckled dace

A total of 633 speckled dace were captured that ranged in length between 16 to 96 mm, in weight between 1 g and 11 g, and in condition factor, based on total length, between 0.63 and 2.31 with a mean condition factor of 1.18 (Table 23). Figure 35 shows the linear relationship between length and weight for speckled dace (R^2=0.78). Backcalculated lengths at age were 35 mm at age 1+, 55 at age 2+, 70 at age 3 +, and 84 at age 4+ (Table 24). Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 25). Figure 36 represents the age frequency distribution of age 0+, 1+, 2+, 3+ and 4+ speckled dace. The slope of the descending limb, between ages 2-4, was used to determine a mean instantaneous mortality rate of 1.33% (Figure 37). Annual mortality was calculated to be 73.6%. Age classes YOY and 1 were not fully recruited.

Table 20. Mean length, weight, and condition factor (± standard deviation) of Umatilla dace in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
0+	21	45±8	1±0	1.23±.65
1+	25	56±3	2±.28	1.19±.18
2+	32	74±7	4±1	1.03±.20
3+	57	92±5	8±1	0.98±.10
4+	28	107±4	12±2	1.00±.09

Table 21. Backcalculated length [mm (±SD)] at annulus formation for Umatilla dace in the Colville River Watershed, Stevens County, WA 2013.

		Mean total length (mm) at each annulus			
Cohort	n	1	2	3	4
1+	45	50 (3)			
2+	39	45 (4)	67 (4)		
3+	24	44 (4)	63 (5)	86 (5)	
4+	9	42 (3)	62 (4)	80 (3)	101 (2)
average	45	45 (4)	64 (5)	84 (5)	101 (2)

Table 22. Age/Length key for Umatilla dace in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class.

			Age					
mm	# captured	# Scaled	0	1	2	3	4	Total
20	1		*1*					1
30	4		*4*					4
40	9		*9*					9
50	29	3 (0)	29					29
60	11	2 (1)		11				11
70	14	4 (1), 6 (2)		6	8			14
80	31	8 (2), 2 (3)			25	6		31
90	34	1 (2), 9 (3)			3	31		34
100	21	4 (3), 6 (4)				8	13	21
110	8	3 (4)					8	8
Total	162		43	17	37	45	21	162

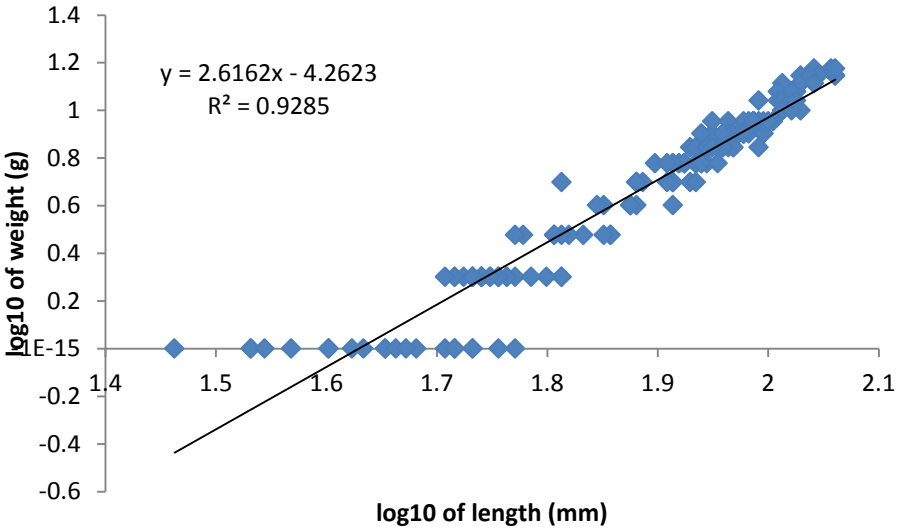

Figure 34. Total length (mm) to weight (g) for Umatilla dace in the Colville River Watershed, Stevens County, WA 2013.

Table 23. Mean length, weight, and condition factor (± standard deviation) of speckled dace in the Colville River Watershed, Stevens County, WA. 2013

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
0+	105	26±5	-	-
1+	160	43±6	1.17± .38	1.19±.45
2+	163	63±4	3±.86	1.16±.28
3+	182	75±4	5±1	1.16±.20
4+	23	88±4	8±1	1.11±.15

Table 24. Backcalculated length [mm (±SD)] at annulus formation for speckled dace in the Colville River Watershed, Stevens County, WA 2013.

		Mean total length (mm) at each annulus			
Cohort	n	1	2	3	4
1+	32	38 (4)			
2+	28	34 (4)	56 (5)		
3+	13	35 (3)	55 (5)	71 (5)	
4+	4	36 (3)	52 (5)	68 (5)	84 (3)
Mean	32	35 (4)	55 (5)	70 (5)	84 (3)

Table 25. Age/Length key for speckled dace in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class.

			Age					
mm	# captured	# Scaled	0	1	2	3	4	Total
10	8	0	*8*					8
20	68	0	*68*					68
30	79	1 (0)	79					79
40	75	1 (1)		75				75
50	70	1 (1)		70				70
60	128	2 (1), 8 (2)		26	102			128
70	147	7 (2), 3 (3)			103	44		147
80	51	6 (3), 1 (4)				44	7	51
90	7	3 (4)					7	7
Total	633		155	171	205	88	14	633

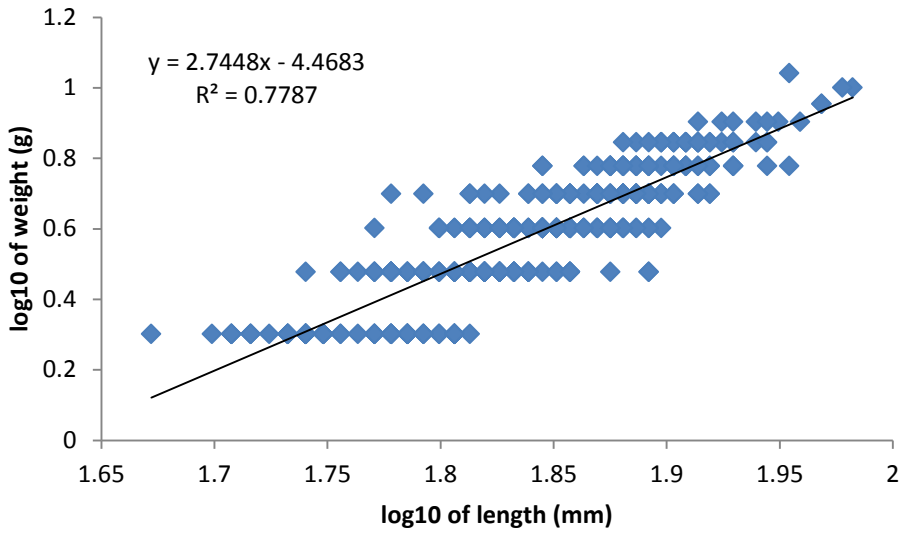

Figure 35. Total length (mm) to weight (g) for speckled dace in the Colville River Watershed, Stevens County, WA 2013.

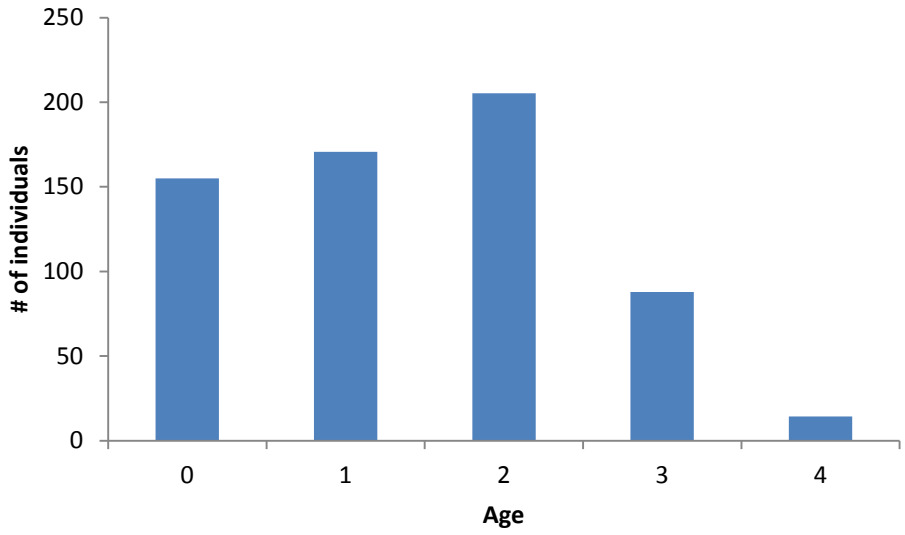

Figure 36. Age frequency distribution for speckled dace in the Colville River Watershed, Stevens County, WA. 2013 (n=633).

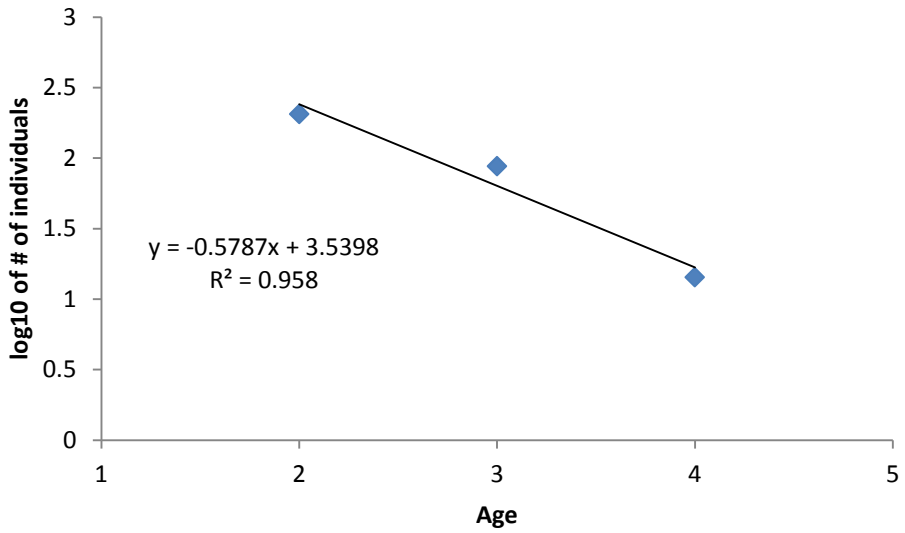

Figure 37. Log10 plot of the catch curve for speckled dace ages 2-4 in the Colville River Watershed, Stevens County, WA. 2013.

Redside Shiner

A total of 592 redside shiner were captured that ranged in length between 19 to 125 mm, in weight between 1 g and 21 g, and in condition factor, based on total length, between 0.47 and 2.78, with a mean condition factor of 0.96 (Table 26) . Figure 38 shows the linear relationship between length and weight for redside shiner (R^2=0.86).The length at each annulus was determined for a subset of redside shiner collected from the CRW (Table 27). The grand means were 55 mm at age 1+, 85 at age 2+, and 109 at age 3 +.Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 28). There were 161 fish in age class 0+, 233 fish in age class 1+, 182 fish in age class 2+, and 15 fish in age class 3 +.

Tench

A total of 12 tench were captured that ranged in length between 67 to 182 mm, in weight between 4 g and 96 g, and in condition factor, based on total length, between 1.22 and 1.69, with a mean condition factor of 1.44 (Table 29). Figure 39 shows the linear relationship between length and weight for tench (R^2=1.00).The length at each annulus was determined for a subset of tench collected from the CRW (Table 30). The grand means were 85 mm at age 1+, 144 at age 2+, and 185 at age 3 +.Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 31). There were 51 fish in age class 0+, 14 fish in age class 1+, 0 fish in age class 2+, and 3 fish in age class 3 +.

Table 26. Mean length, weight, and condition factor (± standard deviation) of redside shiner in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
0+	164	32±8	-	-
1+	218	73±8	4±1	0.98
2+	183	93±6	8±2	0.94
3+	27	116±6	14±3	0.87

Table 27 Backcalculated length [mm (±SD)] at annulus formation for redside shiner in the Colville River Watershed, Stevens County, WA 2013.

		Mean total length (mm) at each annulus		
Cohort	n	1	2	3
1+	63	58 (4)		
2+	37	54 (4)	85 (6)	
3+	8	50 (3)	82 (3)	109 (4)
Mean	63	55 (5)	85 (6)	109 (4)

Table 28. Age/Length key for redside shiner in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class.

			Age				
mm	# captured	# Scaled	0	1	2	3	Total
10	2	0	*2*				2
20	64	0	*64*				64
30	69	0	*69*				69
40	19	0	*19*				19
50	23	0	*7*	*16*			23
60	60	10 (1)		60			60
70	89	10 (1)		89			89
80	114	6 (1), 4 (2)		68	46		114
90	88	10 (2)			88		88
100	39	9 (2)			39		39
110	16	6 (2), 4 (3)			10	6	16
120	9	4 (3)				9	9
Total	592		161	233	182	15	592

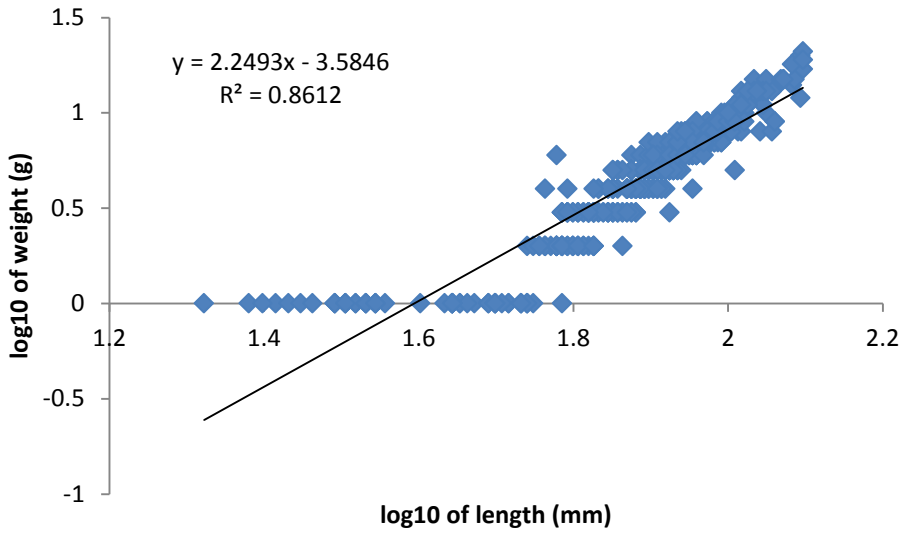

Figure 38. Total length (mm) to weight (g) for redside shiner in the Colville River Watershed, Stevens County, WA 2013

Table 29. Mean length, weight, and condition factor (± standard deviation) of tench in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
0+	3	72±8	6±3	1.41±.25
1+	6	101±12	15±6	1.40±.09
2+	1	150	53	1.57
3+	2	182±1	91±7	1.52±.14

Table 30. Backcalculated length [mm (±SD)] at annulus formation for tench in the Colville River Watershed, Stevens County, WA 2013.

		Mean total length (mm) at each annulus		
Cohort	n	1	2	3
1+	6	84 (6)		
2+	4	90 (0)	116 (6)	
3+	2	96 (7)	139 (3)	164 (4)
Mean	6	90 (7)	127 (14)	164 (4)

Table 31. Age/Length key for tench in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class.

			Age				
mm	# captured	# Scaled	0	1	2	3	Total
60	2	0	*2*				2
70	0	0					0
80	1	0	*1*				1
90	3	1 (0), 1 (1)	2	1			3
100	2	1 (1)		2			2
110	0	0					0
120	1	1 (2)			1		1
130	0	0					0
140	0	0					0
150	1	1 (2)			1		1
160	0	0					0
170	0	0					0
180	2	2 (3)				2	2
Total	12		5	3	2	2	12

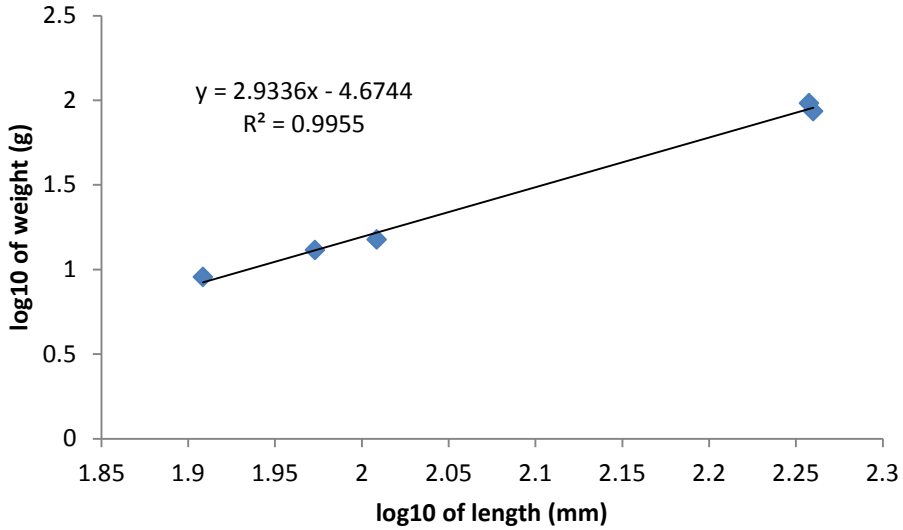

Figure 39. Total length (mm) to weight (g) for tench in the Colville River Watershed, Stevens County, WA 2013

Longnose sucker

A total of 74 longnose suckers were captured that ranged in length between 38 to 205 mm, in weight between 1 g and 170 g, and in condition factor, based on total length, between 0.59 and 2.09, with a mean condition factor of 0.99 (Table 32). Figure 40 shows the linear relationship between length and weight for longnose sucker (R^2=0.95) The grand means were 85 mm at age 1+, 144 at age 2+, and 185 at age 3 + (Table 33).Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 34).

Bridgelip sucker

A total of 4 bridgelip suckers were captured that ranged in length between 114 to 192 mm, in weight between 14 g and 79 g, and in condition factor, based on total length, between 0.94 and 1.23, with a mean condition factor of 1.05 (Table 35). Figure 41 shows the linear relationship between length and weight for bridgelip sucker (R^2=0.95). The length at annulus formation was found to be 90 mm for age class 1+ (Table 36).

Largescale sucker

A total of 52 largescale suckers were captured that ranged in length between 34 to 432 mm, in weight between 1 g and 1026 g, and in condition factor, based on total length, between 0.73 and 2.35, with a mean condition factor 1.18 (Table 37). Figure 42 shows the linear relationship between length and weight for largescale sucker (R^2=0.99). The grand means were 85 mm at age 1+, 144 at age 2+, and 185 at age 3 + (Table 38).Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 39).

Table 32. Mean length, weight, and condition factor (± standard deviation) of longnose sucker in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
0+	52	70±10	3±1	-
1+	19	97±11	11±6	1.14±.42
3+	3	199±8	112±51	1.41±.59

Table 33. Backcalculated length [mm (±SD)] at annulus formation for longnose sucker in the Colville River Watershed, Stevens County, WA 2013.

Mean total length (mm) at each annulus				
Cohort	n	1	2	3
1+	13	85 (5)		
3+	2	83 (0)	144 (5)	185 (10)
Mean	13	85 (5)	144 (5)	185 (10)

Table 34. Age/Length key for longnose sucker in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class.

			Age				
mm	# captured	# Scaled	0	1	2	3	Total
30	1	0	*1*				1
40	3	0	*3*				3
50	2	0	*2*				2
60	15	8 (0)	15				15
70	24	10 (0)	24				24
80	14	7 (0), 2 (1)	11	3			14
90	6	1 (0), 4 (1)	1	5			6
100	2	2 (1)		2			2
110	4	3 (1)		4			4
120	0	0					0
130	0	0					0
140	0	0					0
150	0	0					0
160	0	0					0
170	0	0					0
180	0	0					0
190	1	1 (3)				1	1
200	2	1 (3)				2	2
Total	74		51	14	0	3	74

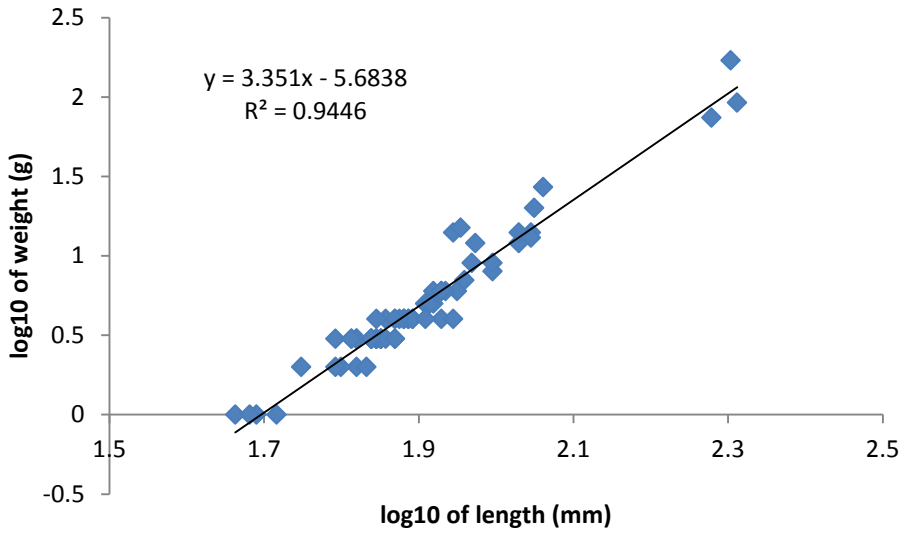

Figure 40. Total length (mm) to weight (g) for longnose sucker in the Colville River Watershed, Stevens County, WA 2013

Table 35. Mean length, weight, and condition factor (± standard deviation) of bridgelip sucker in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
1+	2	120±8	17±4	.95±.02
2+	2	189±4	77±3	1.14±.12

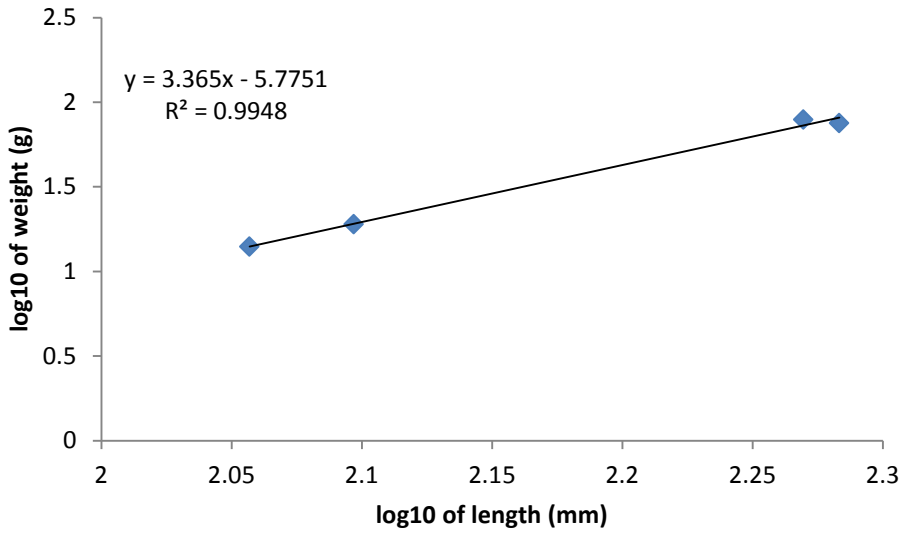

Figure 41. Total length (mm) to weight (g) for bridgelip sucker in the Colville River Watershed, Stevens County, WA 2013

Table 36. Backcalculated length [mm (±SD)] at annulus formation for bridgelip sucker in the Colville River Watershed, Stevens County, WA 2013.

Mean total length (mm) at each annulus			
Cohort	n	1	2
1+	1	90 (nc)	
2+	1	86 (nc)	150 (nc)
Mean	2	88 (3)	150 (nc)

Table 37. Mean length, weight, and condition factor (± standard deviation) of largescale sucker in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
0+	**36**	**49±10**	**2±1**	**-**
1+	**10**	**130±11**	**21±5**	**0.94±.08**
2+	**4**	**215±15**	**105±29**	**1.04±.16**
4+	**1**	**340**	**560**	**1.42**
5+	**1**	**432**	**1026**	**1.27**

Table 38. Backcalculated length [mm (±SD)] at annulus formation for largescale sucker in the Colville River Watershed, Stevens County, WA 2013

		Mean total length (mm) at each annulus				
Cohort	**n**	**1**	**2**	**3**	**4**	**5**
1+	10	78 (2)				
2+	5	90 (7)	159 (14)			
3+	3	76 (nc)	151 (nc)	220 (nc)		
4+	2	73 (nc)	162 (nc)	235 (nc)	303 (nc)	
5+	1	98 (nc)	172 (nc)	255 (nc)	344 (nc)	403 (nc)
Mean	10	**82 (8)**	**160 (10)**	**237 (18)**	**324 (28)**	**403 (nc)**

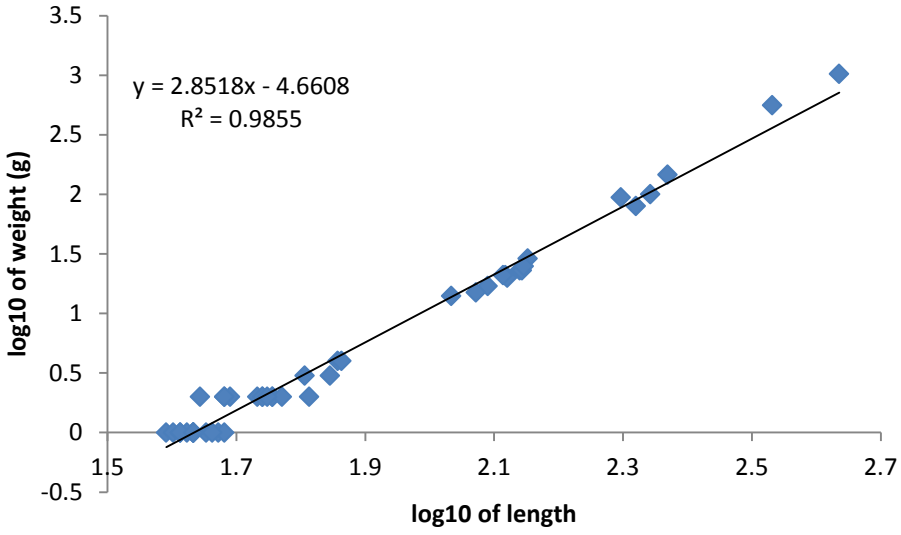

Figure 42. Total length (mm) to weight (g) for largescale sucker in the Colville River Watershed, Stevens County, WA 2013

Table 39. Age/Length key for largescale sucker in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class.

			Age						
mm	# captured	# Scaled	0	1	2	3	4	5	Total
30	5		*5*						5
40	19		*19*						19
50	7		*7*						7
60	2	1 (0)	2						2
70	3	3 (0)	3						3
80	0								0
90	0								0
100	1	1 (1)		1					1
110	1	1 (1)		1					1
120	1			*1*					1
130	5	2 (1)		5					5
140	2	1 (1)		2					2
150	0								0
160	0								0
170	0								0
180	0								0
190	1	1 (2)			1				1
200	1	1 (2)			1				1
210	0								0
220	1				*1*				1
230	1	1 (3)				1			1
340	1	1 (4)					1		1
430	1	1 (5)						1	1
Total	52		36	9	2	1	1	1	52

Lake Whitefish

One Lake Whitefish was captured that was 446 mm in length, 1134 g in weight, and had a condition factor of 1.28 (Table 40).The length at annulus formation was found to be 195 mm for age class 1+, 311 for age class 2+, 401 for age class 3+, and 435 for age class 4+ (Table 41).

Mountain Whitefish

A total of 12 mountain whitefish were captured that ranged in length between 180 to 488 mm, in weight between 44 g and 645 g, and in condition factor, based on total length, between 0.56 and 1.24, with a mean condition factor of 0.93 (Table 42). Mean condition factor is lower than mean condition factor of 1.49 reported by Carlander (1969).Figure 43 shows the linear relationship between length and weight for mountain whitefish (R^2=0.81).The length at each annulus was determined for a subset of mountain whitefish collected from the CRW (Table 43). There were 5 fish in age class 2+, 2 fish in age class 3+, 1 fish in age class 4+, 1 fish in age class 5 +, 1 fish in age class 6+, 0 fish in age class 7+, and 1 fish in age class 8+.

Westslope cutthroat trout

A total of two westslope cutthroat trout were captured that ranged in length between 274 to 294 mm, in weight between 166 g and 257 g, and in condition factor, based on total length, between 0.81 and 1.01, with a mean condition factor of 0.91 (Table 45). Mean condition factor is less then mean condition factor of 1.25 reported by Carlander (1969).The length at annulus formation was found to be 108 mm for age class 1+, 170 for age class 2+, 201 for age class 3+, and 248 for age class 4+ (Table 46).

Table 40. Mean length, weight, and condition factor (± standard deviation) of lake whitefish in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
4+	1	446	1134	1.28

Table 41. Backcalculated length [mm (±SD)] at annulus formation for Lake Whitefish in the Colville River Watershed, Stevens County, WA 2013

		Mean total length (mm) at each annulus			
Cohort	n	1	2	3	4
1+	1	195 (nc)	311 (nc)	401 (nc)	435 (nc)
Mean	1	195 (nc)	311 (nc)	401 (nc)	435 (nc)

Table 42. Mean length, weight, and condition factor (± standard deviation) of mountain whitefish in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
2+	4	182±2	48±5	0.80±.07
3+	2	279±1	208±18	0.96±.09
4+	1	300	282	1.04
5+	1	335	466	1.24
6+	2	367±11	546±55	1.11±.02
8+	1	488	645	0.56

Table 43. Backcalculated length [mm (±SD)] at annulus formation for mountain whitefish in the Colville River Watershed, Stevens County, WA 2013

		Mean total length (mm) at each annulus							
Cohort	**n**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
2+	5	96 (3)	164 (2)						
3+	2	102 (1)	170 (10)	237 (10)					
4+	1	94 (nc)	166 (nc)	219 (nc)	269 (nc)				
5+	1	100 (nc)	170 (nc)	225 (nc)	275 (nc)	305 (nc)			
6+	2	113 (0)	190 (11)	247 (22)	295 (7)	323 (2)	349 (8)		
8+	1	111 (nc)	176 (nc)	241 (nc)	280 (nc)	319 (nc)	364 (nc)	410 (nc)	462 (nc)
Mean	12	**101 (7)**	**172 (11)**	**237 (15)**	**283 (12)**	**318 (9)**	**354 (11)**	**410 (nc)**	**462 (nc)**

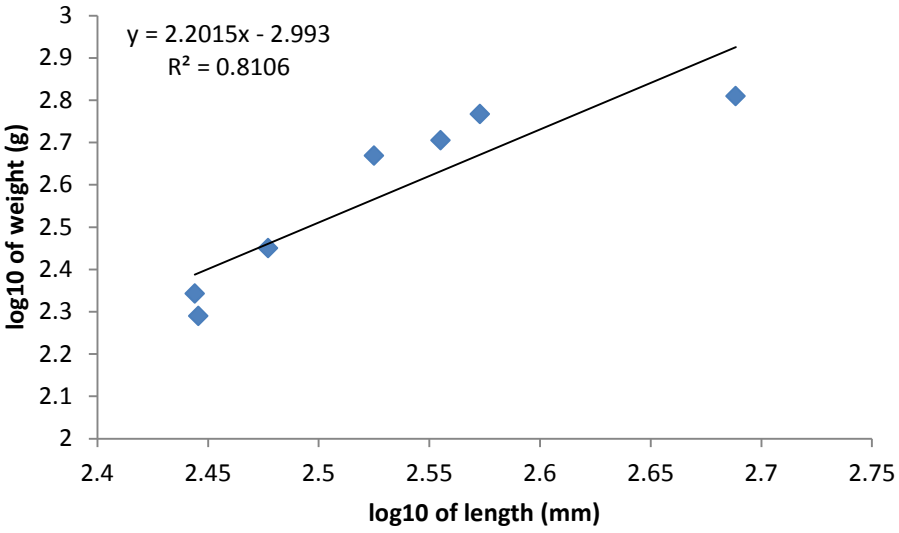

Figure 43. Total length (mm) to weight (g) for mountain whitefish in the Colville River Watershed, Stevens County, WA 2013

Table 44. Age/Length key for mountain whitefish in the Colville River Watershed, Stevens County, WA 2013.

mm	# captured	# Scaled	Age							
			2	3	4	5	6	7	8	Total
180	5	5 (2)	5							5
190	0									
200	0									
210	0									
220	0									
230	0									
240	0									
250	0									
260	0									
270	2	2 (3)		2						2
280	0									
290	0									
300	1	1 (4)			1					1
310	0									
320	0									
330	1	1 (5)				1				1
340	0									
350	1	1 (6)								
360	0									
370	1	1 (6)					1			1
380	0									
390	0									
400	0									
410	0									
420	0									
430	0									
440	0									
450	0									
460	0									
470	0									
480	1	1 (8)							1	1
Total	12		5	2	1	1	1	0	1	12

Table 45. Mean length, weight, and condition factor (± standard deviation) of westslope cutthroat trout in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
4+	2	284±14	212±64	0.91±.015

Table 46. Backcalculated length [mm (±SD)] at annulus formation for westslope cutthroat trout in the Colville River Watershed, Stevens County, WA 2013

		Mean total length (mm) at each annulus			
Cohort	n	1	2	3	4
1+	1	108 (nc)	170 (nc)	201 (nc)	248 (nc)
Mean	1	108 (nc)	170 (nc)	201 (nc)	248 (nc)

Rainbow trout

A total of 346 rainbow trout were captured that ranged in length between 35 to 615 mm, in weight between 1 g and 2222 g, and in condition factor, based on total length, between 0.47 and 2.63, with a mean condition factor of 1.00 (Table 47). Mean condition factor matches mean condition factors between 0.90 and 1.09 reported by Carlander (1969).Figure 44 shows the linear relationship between length and weight for rainbow trout (R^2=0.98). The grand means were 93 mm at age 1+, 166 at age 2+, 236 at age 3 +, 299 at age 4+, 361 at age 5+, 434 at age 6+, 490 at age 7+, 539 at age 8+, and 586 at age 9+(Table 48). Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 49).

Redband trout

A total of 610 redband trout were captured that ranged in length between 24 to 392 mm, in weight between 1 g and 656 g, and in condition factor, based on total length, between 0.93 and 1.94, with a mean condition factor of 0.98 (Table 50). Mean condition factor matches mean condition factors between 0.90 and 1.09 reported by Carlander (1969).Figure 45 shows the linear relationship between length and weight for redband trout(R^2=0.81). Backcalculated lengths at each age were 92 mm at age 1+, 157 at age 2+, 227 at age 3 +, 323 at age 4+, and 371 at age 5+ (Table 51). Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 52). +.Figure 46 represents the age frequency distribution of age 0+, 1+, 2+, 3+, 4+, and 5+ redband trout. The slope of the descending limb, between ages 0-4, was used to determine a mean instantaneous mortality rate of 1.48% (Figure 47). Annual mortality was calculated at 77.2%.

Table 47. Mean length, weight, and condition factor (± standard deviation) of rainbow trout in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
0+	101	62±17	3±2	-
1+	137	127±18	21±9	-
2+	63	194±18	71±22	0.95±.13
3+	22	263±17	195±48	1.05±.10
4+	8	326±12	323±80	0.94±.23
5+	8	388±12	638±94	1.09±.13
6+	3	467±23	1198±308	1.16±.17
7+	1	535	1733	1.13
8+	2	559±25	1721±105	0.99±.07
9+	1	615	2222	0.96

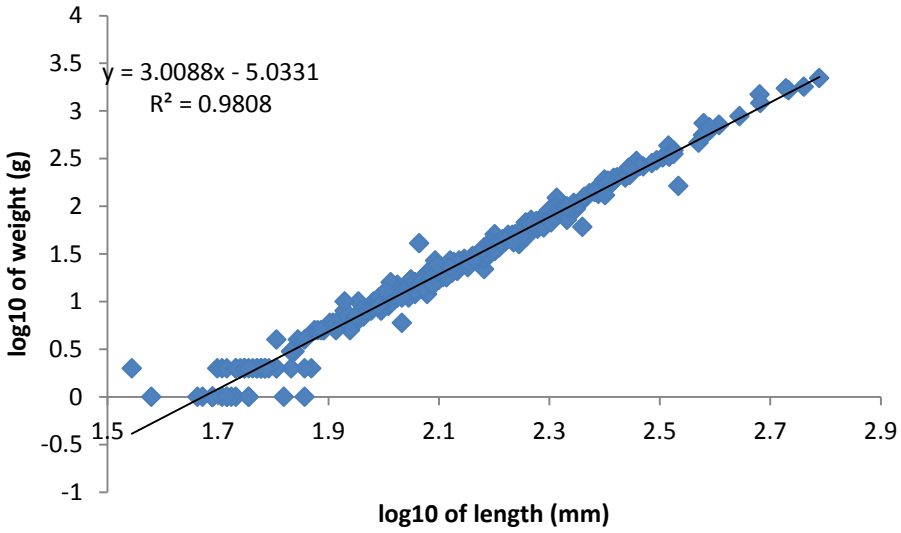

Figure 44. Total length (mm) to weight (g) for rainbow trout in the Colville River Watershed, Stevens County, WA 2013.

Table 48. Backcalculated length [mm (±SD)] at annulus formation for rainbow trout in the Colville River Watershed, Stevens County, WA 2013

		Mean total length (mm) at each annulus								
Cohort	**n**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1+	115	93 (14)								
2+	65	95 (15)	165 (21)							
3+	23	90 (9)	167 (27)	237 (28)						
4+	16	91 (6)	157 (22)	226 (12)	289 (13)					
5+	12	98 (17)	168 (12)	230 (14)	292 (22)	352 (14)				
6+	6	74 (nc)	184 (nc)	230 (nc)	303 (nc)	358 (nc)	404 (nc)			
7+	5	89 (11)	170 (14)	249 (25)	306 (40)	362 (40)	427 (46)	482 (27)		
8+	2	108 (nc)	189 (nc)	289 (nc)	361 (nc)	424 (nc)	460 (nc)	496 (nc)	532 (nc)	
9+	1	88 (nc)	156 (nc)	234 (nc)	293 (nc)	351 (nc)	459 (nc)	508 (nc)	547 (nc)	586 (nc)
Mean	115	**93 (14)**	**166 (20)**	**236 (23)**	**299 (27)**	**361 (28)**	**434 (36)**	**490 (22)**	**539 (10)**	**586 (nc)**

Table 49. Age/Length key for rainbow trout in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class (page 1 of 2).

			Age									
mm	**# captured**	**# Scaled**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
30	5	0	***5***									
40	25	0	***25***									
50	22	0	***22***									
60	16	1 (0)	16									
70	11	3 (0)	11									
80	17	2 (0)	17									
90	14	8 (0)	14									
100	18	4 (0), 3 (1)	10	8								
110	26	10 (1)		26								
120	26	10 (1)		26								
130	22	10 (1)		22								
140	12	6 (1)		12								
150	20	10 (1)		20								
160	9	4 (2)			9							
170	11	5 (2)			11							
180	11	6 (2)			11							
190	12	1 (1), 9 (2)		1	11							
200	11	8 (2)			11							
210	6	2 (2)			6							
220	5	2 (2), 1 (3)			3	2						
230	3	2 (2)			3							
240	4	1 (2), 1 (3)			2	2						
250	5	2 (2)			5							
260	4	1 (2), 1 (3)			2	2						
270	4	1 (3)				4						
280	2	2 (3),				2						
290	2	0				***2***						
300	1	0					***1***					
310	1	1 (4)					1					

			Age									
mm	**# captured**	**# Scaled**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
320	3	1 (3), 2 (4)				1	2					
330	2	1 (4)					2					
340	1	0					***1***					
350	0	0										
360	0	0										
370	2	1 (5)						2				
380	3	3 (5)						3				
390	1	0						***1***				
400	2	2 (5)						2				
410	0	0										
420	0	0										
430	0	0										
440	1	1 (6)							1			
450	0	0										
460	0	0										
470	0	0										
480	2	1 (7)								2		
490	0	0										
500	0	0										
510	0	0										
520	0	0										
530	1	1 (7)								1		
540	1	1 (7)								1		
550	0	0										
560	0	0										
570	1	1 (8)									1	
580	0	0										
590	0	0										
600	0	0										
610	1	1 (9)										1
Total	**346**		**120**	**115**	**74**	**15**	**7**	**8**	**1**	**4**	**1**	**1**

Table 50. Mean length, weight, and condition factor (± standard deviation) of redband trout in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
0+	301	67±13	3±2	-
1+	239	117±18	17±9	-
2+	56	187±20	67±23	0.99±.11
3+	12	247±12	151±29	1.00±.12
4+	1	325	396	1.15
5+	1	392	656	1.09

Table 51. Backcalculated length [mm (±SD)] at annulus formation for redband trout in the Colville River Watershed, Stevens County, WA 2013

		Mean total length (mm) at each annulus				
Cohort	n	1	2	3	4	5
1+	106	94 (12)				
2+	45	88 (11)	156 (19)			
3+	7	94 (11)	158 (15)	223 (13)		
4+	2	96 (nc)	163 (nc)	229 (nc)	306 (nc)	
5+	1	93 (nc)	186 (nc)	248 (nc)	340 (nc)	371 (nc)
Mean	106	92 (12)	157 (18)	227 (14)	323 (24)	371 (nc)

Table 52. Age/Length key for redband trout in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class (page 1 of 2).

mm	# captured	# Scaled	Age						
			0	1	2	3	4	5	Total
20	1	0	*1*						1
30	4	0	*4*						4
40	17	0	*17*						17
50	66	0	*66*						66
60	77	1 (0)	77						77
70	77	3 (0)	77						77
80	53	5 (0)	53						53
90	55	8 (0), 2 (1)	44	11					55
100	52	10 (1)		52					52
110	46	10 (1)		46					46
120	33	8 (1)		33					33
130	24	10 (1)		24					24
140	19	10 (1)		19					19
150	18	7 (1), 2 (2)		14	4				18
160	12	3 (1), 6 (2)		4	8				12
170	8	4 (2)			8				8
180	9	1 (1), 5 (2)		2	8				9
190	12	8 (2)			12				12
200	3	2 (2)			3				3
210	5	4 (2)			5				5
220	6	4 (2), 1 (3)			4	2			6
230	2	1 (2)			2				2
240	5	3 (3)				5			5
250	2	2 (2)			2				2
260	2	1 (3)				2			2
270	0	0							0
280	0	0							0
290	0	0							0
300	0	0							0
310	0	0							0
320	1	1 (4)					1		1
330	0	0							0
340	0	0							0
350	0	0							0

mm	# captured	# Scaled	Age						
			0	1	2	3	4	5	Total
360	0	0							0
370	0	0							0
380	0	0							0
390	1	1 (5)						1	1
Total	**610**		**339**	**205**	**56**	**9**	**1**	**1**	**610**

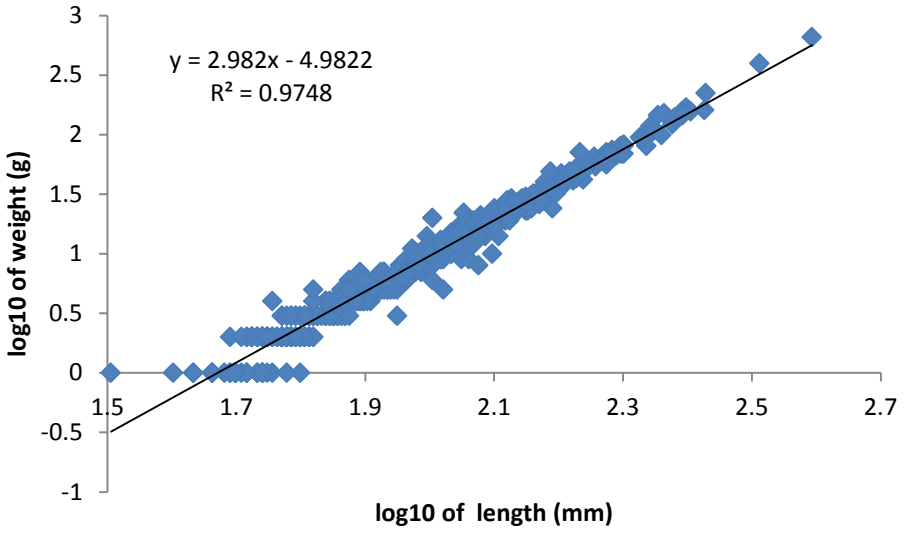

Figure 45. Total length (mm) to weight (g) for redband trout in the Colville River Watershed, Stevens County, WA 2013

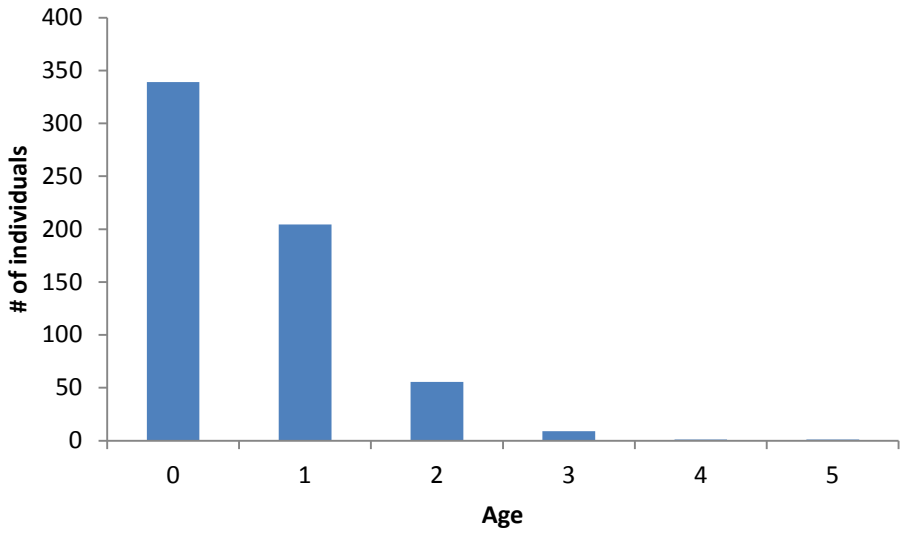

Figure 46. Age frequency distribution for redband trout in the Colville River Watershed, Stevens County, WA. 2013 (n=610).

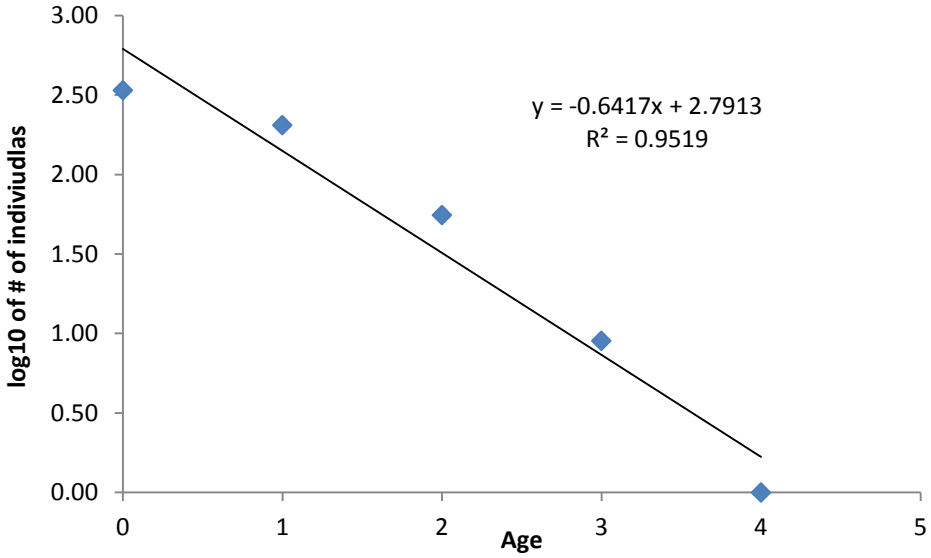

Figure 47. Log10 plot of the catch curve for redband trout ages 0-4 in the Colville River Watershed, Stevens County, WA. 2013.

Brown trout

A total of 346 brown trout were captured that ranged in length between 40 to 555 mm, in weight between 1 g and 2124 g, and in condition factor, based on total length, between 0.56 and 2.01 with a mean condition factor of 0.99 (Table 53). Mean condition factor matches mean condition factors between 0.79 and 1.09 reported by Carlander (1969).Figure 48 shows the linear relationship between length and weight for brown trout(R^2=0.99).Backcalculated lengths at each age were 93 mm at age 1+, 167 at age 2+, 240 at age 3 +, 293 at age 4+, 361 at age 5+. 411 at age 6+, 476 at age 7+, and 521 at age 8+ (Table 54). Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 55). Figure 49 represents the age frequency distribution of age 0+, 1+, 2+, 3+, 4+, 5+, 6+, 7+, and 8+ brown trout. The slope of the descending limb, between ages 1-5, was used to determine a mean instantaneous mortality rate of 0.67% (Figure 50). Annual mortality was calculated at 48.7%.

Eastern brook trout

A total of 476 eastern brook trout were captured that ranged in length between 26 to 315 mm, in weight between 1 g and 261 g, and in condition factor, based on total (Table 56) Mean condition factor matches mean condition factors between 0.80 and 1.07 reported by Carlander (1977).Figure 51 shows the linear relationship between length and weight for eastern brook trout(R^2=0.95). Backcalculated length at each age were 82 mm at age 1+, 139 at age 2+, 187 at age 3 +, 223 at age 4+, and 277 at age 5+ (Table 57). Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 58).

Table 53. Mean length, weight, and condition factor (± standard deviation) of brown trout in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
0+	120	74±11	4±2	-
1+	81	122±22	20±11	0.98±.11
2+	56	203±22	83±29	0.96±.10
3+	42	264±16	177±39	0.95±.10
4+	18	323±18	337±64	0.99±.11
5+	11	380±12	530±89	0.96±.12
6+	12	439±17	796±119	0.94±.11
7+	5	495±10	1133±119	0.93±0.4
8+	1	555	2124	1.24

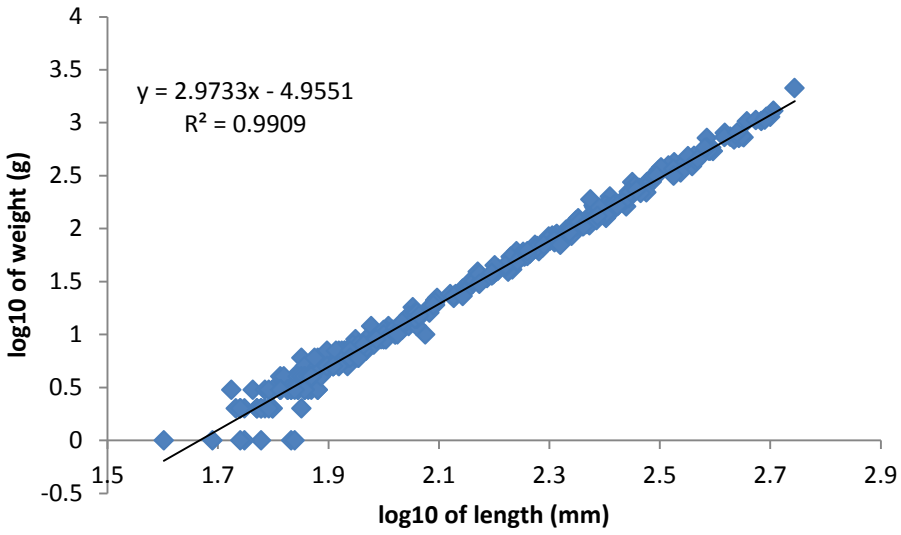

Figure 48. Total length (mm) to weight (g) for brown trout in the Colville River Watershed, Stevens County, WA 2013

Table 54. Backcalculated length [mm (±SD)] at annulus formation for brown trout in the Colville River Watershed, Stevens County, WA 2013

		Mean total length (mm) at each annulus							
Cohort	n	1	2	3	4	5	6	7	8
1+	135	92 (7)							
2+	95	95 (9)	171 (14)						
3+	56	91 (12)	165 (26)	236 (34)					
4+	34	89 (11)	160 (28)	230 (38)	287 (34)				
5+	18	85 (8)	161 (9)	249 (18)	292 (18)	343 (16)			
6+	14	88 (11)	156 (21)	244 (30)	295 (25)	363 (23)	407 (16)		
7+	5	103 (6)	177 (7)	251 (14)	304 (11)	370 (17)	416 (7)	474 (11)	
8+	1	102 (nc)	181 (nc)	272 (nc)	306 (nc)	385 (nc)	430 (nc)	487 (nc)	521 (nc)
Mean	135	93 (10)	167 (21)	240 (33)	293 (28)	361 (22)	411 (15)	476 (12)	521 (nc)

Table 55. Age/Length key for brown trout in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class (page 1 of 2).

			Age									
mm	**# captured**	**# Scaled**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
40	2	0	***2***									2
50	10	0	***10***									10
60	26	2(0)	26									26
70	39	15 (0)	39									39
80	37	12(0), 1(1)	34	3								37
90	18	6 (1)		18								18
100	19	5 (1)		19								19
110	14	7 (1)		14								14
120	7	3 (1)		7								7
130	7	2 (1)		7								7
140	10	5 (1)		10								10
150	6	1 (1)		6								6
160	7	3 (1)		7								7
170	9	3 (1), 4 (2)		4	5							9
180	9	7 (2)			9							9
190	6	2 (1), 1 (2), 1 (3)		3	2	2						7
200	9	6 (2), 3 (3)			6	3						9
210	6	2 (1), 2 (2)		3	3							6
220	7	4 (2), 1 (3), 1 (4)			5	1	1					7
230	9	4 (2)			9							9
240	9	5 (2), 1 (3)			8	2						9
250	10	3 (2), 2 (3), 1 (4)			5	3	2					10
260	7	1 (2),1 (3)			4	4						8
270	7	1 (2), 3 (3), 1 (4)				1	4	1				7
280	4	2 (3)				4						4
290	7	1 (2), 2 (3), 2 (4)			1	3	3					7
300	3	2 (3), 1 (4)				2	1					3

			Age									
mm	**# captured**	**# Scaled**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
310	4	1 (3), 2 (4)				1	3					4
320	1	1 (4)					1					1
330	5	1 (3), 4 (4)				1	4					5
350	1	1 (5)					1					1
360	3	1 (4), 1 (5)					2	2				3
370	1	0										0
380	4	1 (4), 2 (5)					1	3				4
390	3	1 (6)							3			3
400	0	0										0
410	2	1 (6)							2			2
420	1	0										0
430	3	3 (6)							3			3
440	4	3 (6)							4			4
450	1	1 (6)							1			1
460	0	0										0
470	1	1 (7)								1		1
480	1	1 (7)								1		1
490	2	1 (7)								2		2
500	2	1 (7)								2		2
510	0	0										0
520	0	0										0
530	0	0										0
540	0	0										0
550	1	1 (8)									1	1
	346	**0**	**111**	**101**	**57**	**29**	**23**	**6**	**13**	**6**	**1**	**346**

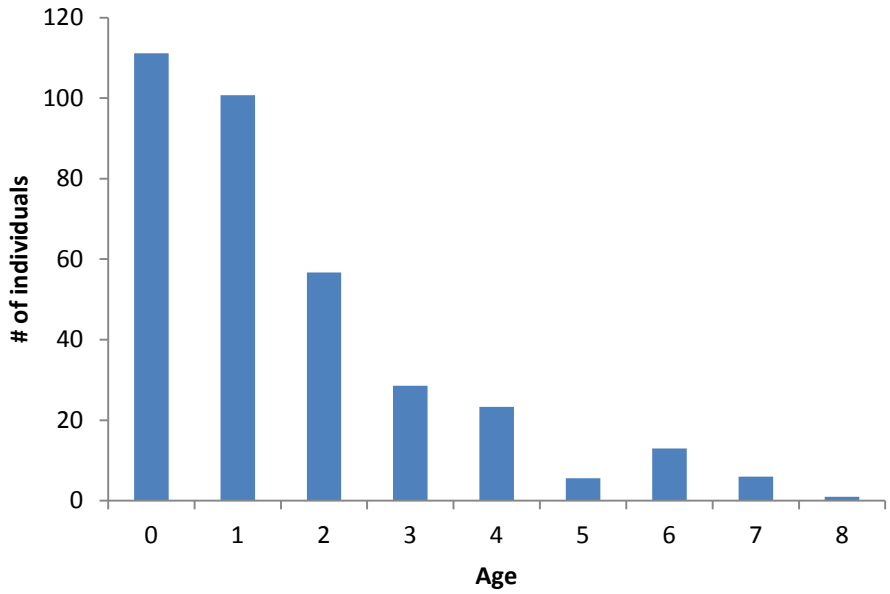

Figure 49. Age frequency distribution for brown trout in the Colville River Watershed, Stevens County, WA. 2013 (n=346).

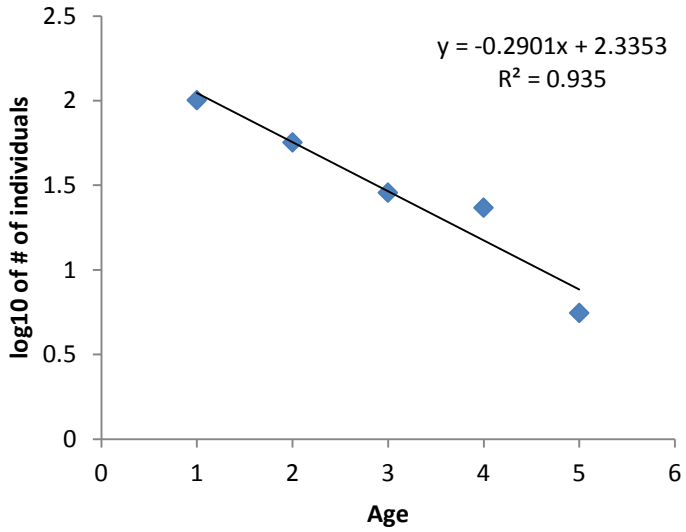

Figure 50. Log10 plot of the catch curve for brown trout ages 1-5 in the Colville River Watershed, Stevens County, WA. 2013.

Table 56. Mean length, weight, and condition factor (± standard deviation) of eastern brook trout in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
0+	175	63±13	3±1	-
1+	185	108±16	12±5	0.92±.17
2+	88	159±13	39±12	0.95±.16
3+	18	196±11	72±14	0.95±.13
4+	7	241±10	128±14	0.92±.13
5+	3	299±20	213±42	0.79±.10

Table 57. Backcalculated length [mm (±SD)] at annulus formation for eastern brook trout in the Colville River Watershed, Stevens County, WA 2013

		Mean total length (mm) at each annulus				
Cohort	n	1	2	3	4	5
1+	93	82 (7)				
2+	44	83 (3)	138 (8)			
3+	11	81 (9)	137 (11)	181 (11)		
4+	3	84 (3)	150 (9)	187 (4)	225 (0)	
5+	1	87 (nc)	146 (nc)	175 (nc)	219 (nc)	277 (nc)
Mean	93	82 (7)	139 (9)	183 (11)	223 (4)	277 (nc)

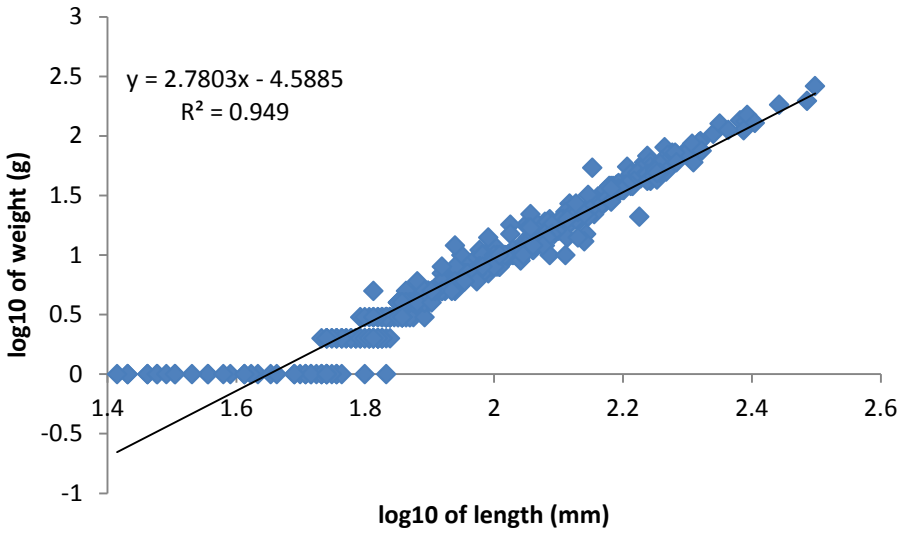

Figure 51. Total length (mm) to weight (g) for eastern brook trout in the Colville River Watershed, Stevens County, WA 2013

Table 58. Age/Length key for eastern brook trout in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class.

			Age						
mm	**# captured**	**# Scaled**	**0**	**1**	**2**	**3**	**4**	**5**	**Total**
20	5	0	***5***						5
30	11	0	***11***						11
40	11	0	***11***						11
50	30	0	***30***						30
60	60	1 (0)	60						60
70	50	4 (0)	50						50
80	40	8 (0), 2 (1)	32	8					40
90	25	8 (1)		25					25
100	35	10 (1)		35					35
110	38	10 (1)		38					38
120	33	8 (1)		33					33
130	24	4 (1)		24					24
140	24	7 (1), 2 (2)		19	5				24
150	24	9 (2)			24				24
160	16	8 (2)			16				16
170	15	6 (2)			15				15
180	14	6 (2)			14				14
190	4	2 (2), 1 (3)			3	1			4
200	5	3 (3)				5			5
210	2	1 (3)				2			2
220	1	1 (3)				1			1
230	1	0				(1)			1
240	4	1 (3), 1 (4)				2	2		4
250	1	0					***1***		1
260	0	0							0
270	1	1 (4)					1		1
280	0	0							0
290	0	0							0
300	1	1 (5)						1	1
310	1	0						***1***	1
Total	**476**		**199**	**182**	**77**	**12**	**4**	**2**	**476**

Prickly sculpin

A total of 124 prickly sculpin were captured that ranged in length between 32 to 162 mm, in weight between 1 g and 71 g, and in condition factor, based on total length, between 0.60 and 2.05 with a mean condition factor of 1.25 . Figure 52 shows the linear relationship between length and weight for prickly sculpin (R^2=0.95).

Mottled sculpin

A total of 111 mottled sculpin were captured that ranged in length between 35 to 135 mm, in weight between 1 g and 29 g, and in condition factor, based on total length, between 0.73 and 1.76 with a mean condition factor of 1.26. Figure 53 shows the linear relationship between length and weight for mottled sculpin (R^2=0.91).

Slimy sculpin

A total of 3 slimy sculpin were captured that ranged in length between 66 to 88 mm, in weight between 4 g and 9 g, and in condition factor, based on total length, between 1.31 and 1.39, with a mean condition factor of 1.34. Figure 54 shows the linear relationship between length and weight for slimy sculpin (R^2=1.00).

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Shorthead sculpin

A total of 46 shorthead sculpin were captured that ranged in length between 32 to 95 mm, in weight between 1 g and 13 g, and in condition factor, based on total length,

between 1.03 and 2.85, with a mean condition factor of 1.54.Figure 55 shows the linear relationship between length and weight for shorthead sculpin (R^2=0.90).

Torrent sculpin

A total of 327 torrent sculpin were captured that ranged in length between 19 to 150 mm, in weight between 1 g and 53 g, and in condition factor, based on total length, between 0.65 and 3.60, with a mean condition factor of 1.43. Figure 56 shows the linear relationship between length and weight for torrent sculpin (R^2=0.93).

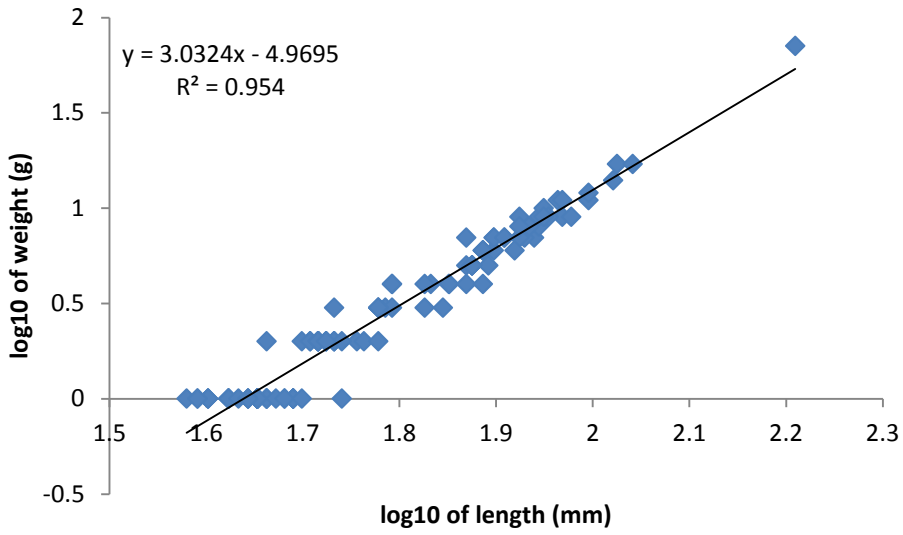

Figure 52. Total length (mm) to weight (g) for prickly sculpin in the Colville River Watershed, Stevens County, WA 2013

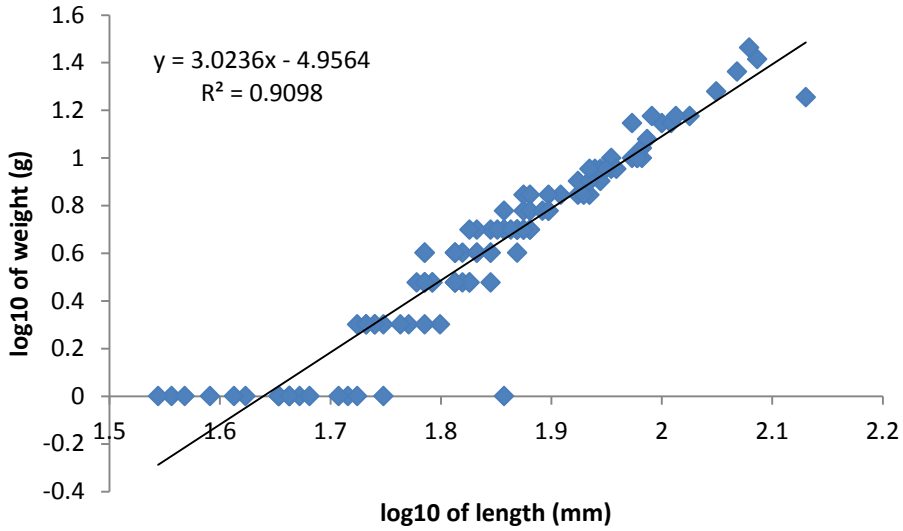

Figure 53. Total length (mm) to weight (g) for mottled sculpin in the Colville River Watershed, Stevens County, WA 2013.

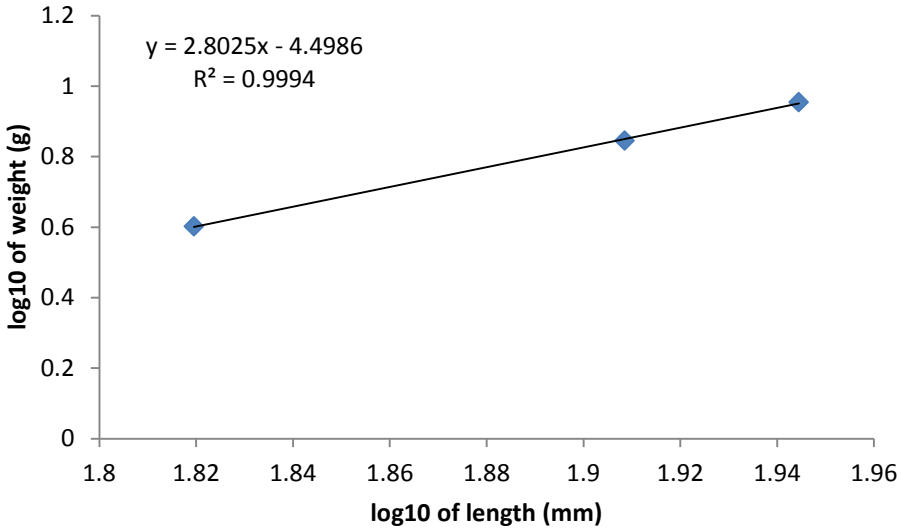

Figure 54. Total length (mm) to weight (g) for slimy sculpin in the Colville River Watershed, Stevens County, WA 2013.

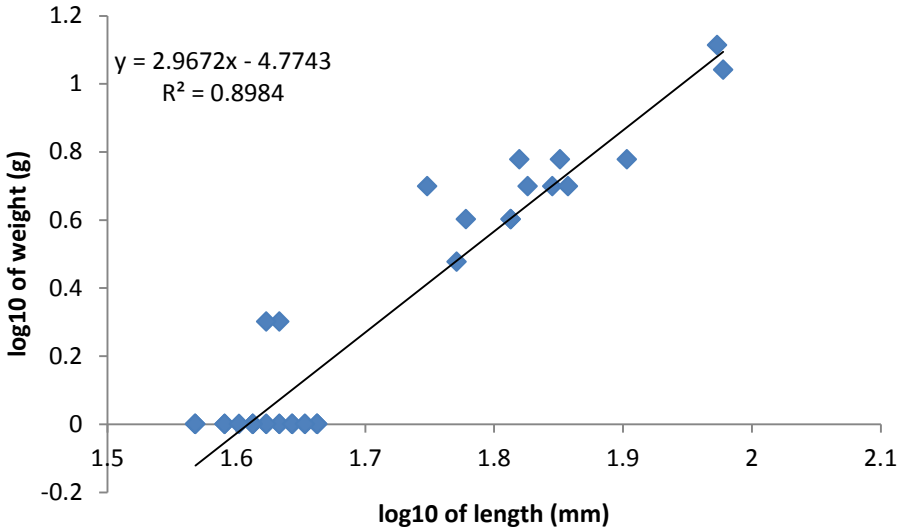

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Figure 55. Total length (mm) to weight (g) for shorthead sculpin in the Colville River Watershed, Stevens County, WA 2013.

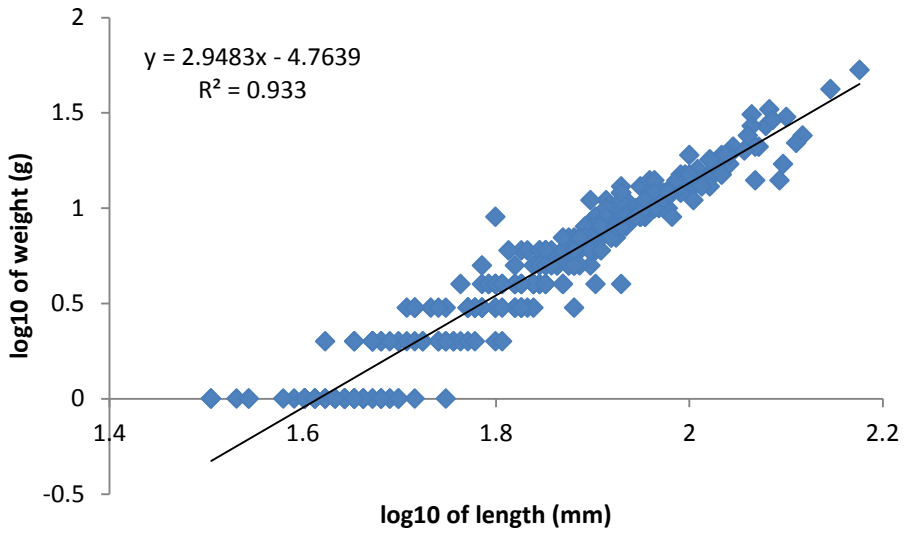

Figure 56. Total length (mm) to weight (g) for torrent sculpin in the Colville River Watershed, Stevens County, WA 2013.

Green sunfish

One green sunfish was captured that was 84 mm in length, 7 g in weight, and had a condition factor of 1.2 (Table 59)The length at annulus formation was found to be 42 mm for age class 1+, and 75 for age class 2+ (Table 60).

Pumpkinseed

A total of 48 pumpkinseed were captured that ranged in length between 49 to 93 mm, in weight between 2 g and 15 g, and in condition factor, based on total length, between 1.02 and 2.26, with a mean condition factor of 1.72 (Table 61). Mean condition factor falls between average condition factors of 1.59 – 2.60 reported by Carlander (1977).Figure 57 shows the linear relationship between length and weight for pumpkinseed (R^2=0.88).The length at each annulus was determined for a subset of pumpkinseed collected from the CRW (Table 62). The grand means were 44 mm at age 1+, and 64 at age 2+.Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 63). There were 27 fish in age class 1+, and 21 fish in age class 2+.

Bluegill

Three bluegill were captured that ranged between 69 to 71 mm in length, 6 to 7 g in weight, and 1.83 to 2.13 in condition factor, with a mean condition factor of 1.97 (Table 64). Mean condition factor falls between average condition factors of 1.78 – 2.05 reported by Carlander (1977).

The length at annulus formation was found to be 44 mm for age class 1+ (Table 65).

Table 59. Mean length, weight, and condition factor (± standard deviation) of green sunfish in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
2+	1	84	7	1.18

Table 60. Backcalculated length [mm (±SD)] at annulus formation for green sunfish in the Colville River Watershed, Stevens County, WA 2013

Mean total length (mm) at each annulus			
Cohort	n	1	2
2+	1	42 (nc)	75 (nc)
Mean	1	42 (nc)	75 (nc)

Table 61. Mean length, weight, and condition factor (± standard deviation) of pumpkinseed in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
1+	23	59±4	4±1	1.72±.25
2+	25	73±8	7±3	1.71±.27

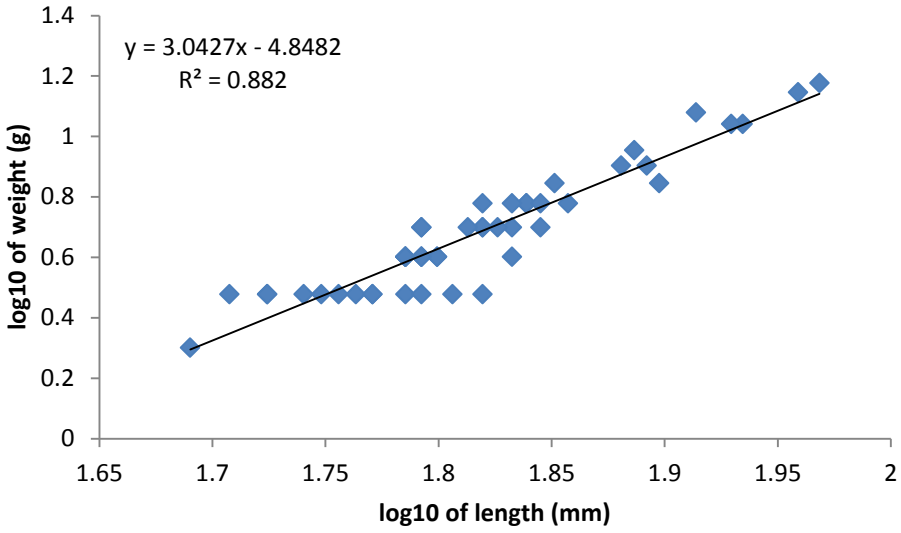

Figure 57. Total length (mm) to weight (g) for pumpkinseed in the Colville River Watershed, Stevens County, WA 2013.

Table 62. Backcalculated length [mm (±SD)] at annulus formation for pumpkinseed in the Colville River Watershed, Stevens County, WA 2013

Mean total length (mm) at each annulus			
Cohort	n	1	2
1+	29	47 (2)	
2+	15	42 (5)	64 (8)
Mean	29	44 (5)	64 (8)

Table 63. Age/Length key for pumpkinseed in the Colville River Watershed, Stevens County, WA 2013.

		Age			
mm	**# captured**	**# Scaled**	**1**	**2**	**Total**
40	1	1 (1)	1		1
50	9	4 (1)	9		9
60	25	10 (1), 5 (2)	17	8	25
70	8	7 (2)		8	8
80	3	1 (2)		3	3
90	2	2 (2)		2	2
Total	**48**		**27**	**21**	**48**

Table 64. Mean length, weight, and condition factor (± standard deviation) of bluegill in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
1+	3	69	6	1.97±.15

Table 65. Backcalculated length [mm (±SD)] at annulus formation for bluegill in the Colville River Watershed, Stevens County, WA 2013

Mean total length (mm) at each annulus		
Cohort	n	1
1+	1	44 (nc)
Mean	1	44 (nc)

Largemouth bass

One largemouth bass was captured that was 251 mm in length, 219 g in weight, and 1.38 in condition factor. Mean condition factor matches mean condition factors between 0.97 and 1.71 reported by Carlander (1977).

Yellow Perch

A total of 21 pumpkinseed were captured that ranged in length between 33 to 94 mm, in weight between 1 g and 20 g, and in condition factor, based on total length, between 0.84 and 2.41, with a mean condition factor of 1.21 (Table 66). Mean condition factor falls between average condition factors of 0.92 -1.53 reported by Carlander (1997).Figure 58 shows the linear relationship between length and weight for yellow perch (R^2=0.The length at each annulus was determined for a subset of yellow perch collected from the CRW (Table 67). The grand mean was 62 mm at age 1+.Ages of fishes that scales were not collected from were determined by constructing an age-length key (Table 68).

Table 66. Mean length, weight, and condition factor (± standard deviation) of yellow perch in the Colville River Watershed, Stevens County, WA. 2013.

Age	N	Mean TL (mm) ± SD	Mean weight (g) ± SD	Condition Factor ±SD
0+	16	56±7	2±1	-
1+	5	72±13	7±8	1.37±.61

Table 67. Backcalculated length [mm (±SD)] at annulus formation for yellow perch in the Colville River Watershed, Stevens County, WA 2013

Mean total length (mm) at each annulus		
Cohort	n	1
1+	3	62 (3)
Mean	3	62 (3)

Table 68. Age/Length key for yellow perch in the Colville River Watershed, Stevens County, WA 2013. Bold and italicized numbers are estimates due to no scales from that size class.

			Age		
mm	# captured	# Scaled	0	1	Total
30	1	0	*1*		1
40	0	0			0
50	12	1 (0)	12		12
60	6	2 (0), 2 (1)	3	3	6
70	1	0		*1*	1
80	0	0			0
90	1	1 (1)		1	1
Total	21		16	5	21

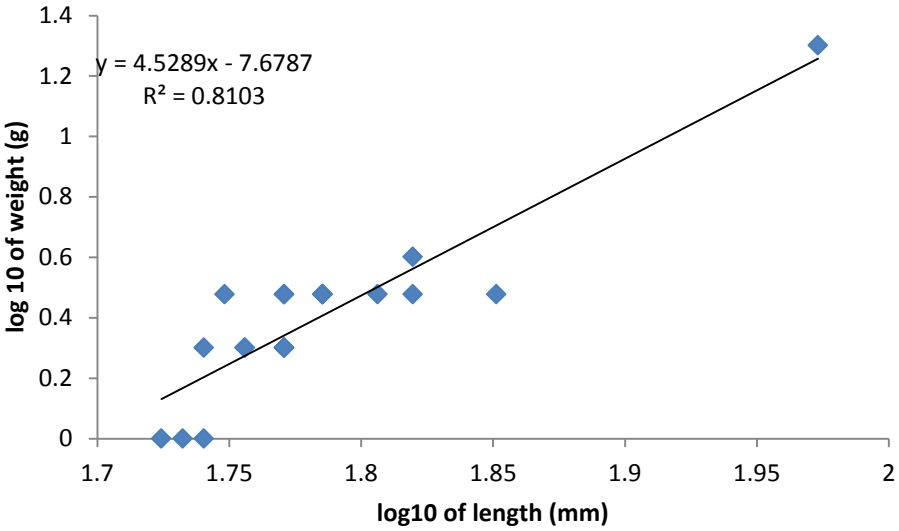

Figure 58. Total length (mm) to weight (g) for yellow perch in the Colville River Watershed, Stevens County, WA 2013.

Diet

Diet was described for eight species of fish: longnose dace, Umatilla dace, speckled dace, redside shiner, brown trout, prickly sculpin, mottled sculpin, and torrent sculpin. A diet overlap comparison was conducted to estimate competition between species.

Longnose dace

Stomach contents of 14 longnose dace were examined, five stomachs were empty. Diet was dominated by blackfly (s*imuliidae)* which made up 38% of the diet by number and 33% of the diet by weight, macroinvertebrate parts were the second most abundant prey item making up 27% of the diet by number and 20% by weight. By order true flies (Dipterans) accounted for the majority of the diet, 58% by number and 51% by weight (Table 69)

Umatilla dace

Stomach contents of 25 Umatilla dace were examined, 13 were empty. Diet was dominated by macroinvertebrate parts which made up 80% of the diet by number and 47% by weight; detritus was the second most abundant group at 10% by number and 46% by weight. The most abundant order was the caddisflies (trichopterans) at 6% by number and 5% by weight (Table 70).

Speckled dace

Stomach contents of 15 speckled dace were examined, five were empty. Diet was dominated by detritus which constituted 42% of its diet by number and 36% of its diet by weight. True flies (Dipterans) were the most abundant order by number (25%) and caddisflies (Trichopterans) were the most abundant order by weight (25%) (Table 71).

Table 69. Number, % by number, weight (g), % by weight, frequency of occurrence (FO), index of relative importance (IRI) of diet of longnose dace.

Prey		#	% by #	Wt.	% by Wt.	FO	IRI
Order	**Family**						
Coleoptera	Elmidae	4	0.83	0.0041	0.44	0.07	0.66
Diptera	Unidentified	93	19.25	0.1697	18.13	0.14	18.60
Diptera	Chironomidae	4	0.83	0.0056	0.60	0.14	0.78
Diptera	Ephydridae	1	0.21	0.0014	0.15	0.07	0.21
Diptera	Simuliidae	185	38.10	0.3148	33.43	0.29	35.59
Trichoptera	Unidentified	9	1.86	0.082	8.76	0.29	5.40
Trichoptera	Hydropsychidae	3	0.62	0.0517	5.52	0.14	3.11
Trichoptera	Hydroptilidae	1	0.21	0.0047	0.50	0.07	0.39
Detritus		5	1.04	0.0206	2.20	0.14	1.68
Macroinvertebrate parts		132	27.33	0.1916	20.47	0.21	23.79
Rocks		47	9.73	0.0918	9.81	0.21	9.79
		484	**100**	**0.938**	**100**		**100**

Table 70. Number, % by number, weight (g), % by weight, frequency of occurrence (FO), index of relative importance (IRI) of diet of Umatilla dace.

Prey		#	% by #	Wt.	% by Wt.	FO	IRI
Order	**Family**						
Trichoptera	Unidentified	15	3.89	0.10	3.64	0.12	3.81
Trichoptera	Hydropsychidae	11	2.85	0.04	1.49	0.12	2.22
Trichoptera	Psychomyiidae	1	0.26	0.00	0.02	0.04	0.16
Detritus		41	10.62	1.31	46.34	0.20	28.47
Macroinvertebrate Parts		311	80.57	1.34	47.40	0.20	63.83
Rocks		7	1.81	0.03	1.11	0.12	1.51
		386	**100.00**	**2.82**	**100.00**		**100.00**

Table 71. Number, % by number, weight (g), % by weight, frequency of occurrence (FO), index of relative importance (IRI) of diet of speckled dace.

Prey		#	% by #	Wt.	% by Wt.	FO	IRI
Order	**Family**						
Diptera	Unidentified	1	0.96	0.0046	2.00	0.07	1.50
Diptera	Chironomidae	24	23.08	0.0342	14.84	0.13	18.90
Diptera	Dixidae	1	0.96	0.0055	2.39	0.07	1.70
Ephemeroptera	Unidentified	3	2.88	0.0146	6.33	0.20	4.68
Trichoptera	Unidentified	3	2.88	0.0105	4.56	0.07	3.73
Trichoptera	Hydropsychidae	5	4.81	0.0453	19.65	0.13	12.22
Detritus		44	42.31	0.0844	36.62	0.47	39.44
Macroinvertebrate parts		23	22.12	0.0314	13.62	0.13	17.82
		104	**100**	**0.2305**	**100**		**100**

Redside Shiner

Stomach contents of 16 redside shiner were examined, six were empty. Diet was dominated by marcoinvertebrate parts at 78% by number and 45% by weight. The most abundant order in the diet was the caddisflies (Trichopterans) 7% by number and 18% by weight (Table 72).

Brown trout

Stomach contents of 47 brown trout were examined. Diet was dominated by marcoinvertebrate parts (34%) and rocks (30%) by number, and sunfish (Centrarchidae) (22%) and trout (Salmonidae) (21%) by weight (Table 73).

Prickly sculpin

Stomach contents of five prickly sculpin were examined, two were empty. Diet was dominated by unidentified caddislfies (Trichopterans) by number (50%) and weight (55 %). Caddisflies were the dominate order by number (80%) and weight (88%), mayflies (Ephemeroptera) and stoneflies (Plecopterans) were equal by number (10%) but stoneflies had a higher percent by weight (7%) (Table 74).

Mottled sculpin

Stomach contents of seven mottled sculpin were examined. Diet was dominated by macroinvertebrate parts by number (41%) and weight (38%). Caddisflies (Trichopterans) were the dominate order by number (12%) and stoneflies (plecopterans)were the dominate order by weight (33%) (Table 75)

Table 72. Number, % by number, weight (g), % by weight, frequency of occurrence (FO), index of relative importance (IRI) of diet of redside shiner.

Prey		#	% by #	Wt.	% by Wt.	FO	IRI
Order	**Family**						
Coleoptera	Unidentified	1	0.63	0.0162	4.07	0.06	2.37
Diptera	Unidentified	1	0.63	0.0024	0.60	0.06	0.65
Diptera	Chironomidae	1	0.63	0.0032	0.80	0.06	0.75
Ephemeroptera	Unidentified	8	5.06	0.0766	19.27	0.06	12.14
Hymenaptera	Formicidae	1	0.63	0.0205	5.16	0.06	2.91
Trichoptera	Unidentified	7	4.43	0.0646	16.25	0.19	10.38
Trichoptera	Hydropsychidae	4	2.53	0.007	1.76	0.13	2.20
Detritus		11	6.96	0.0271	6.82	0.13	6.92
Macroinvertebrate parts		124	78.48	0.18	45.27	0.25	61.69
		158	**100**	**0.3976**	**100**		**100**

Table 73. Number, % by number, weight (g), % by weight, frequency of occurrence (FO), index of relative importance (IRI) of diet of brown trout (page 1 of 3)

Prey		#	% by #	Wt.	% by Wt.	FO	IRI
Order	**Family**						
Acari	Unidentified	1	0.04	0.0017	0.00	0.02	0.03
Araneae	Unidentified	1	0.04	0.0013	0.00	0.02	0.03
Basommatophora	Lymnaeidae	1	0.04	0.0391	0.02	0.02	0.04
Basommatophora	Physidae	2	0.09	0.0618	0.04	0.04	0.08
Coleoptera	Unidentified	1	0.04	0.0025	0.00	0.02	0.03
Coleoptera	Dytiscidae	10	0.43	0.05	0.03	0.02	0.23
Coleoptera	Elmidae	11	0.47	0.0274	0.02	0.11	0.29
Coleoptera	Haliplidae	1	0.04	0.001	0.00	0.02	0.03
Coleoptera	Staphylinidae	1	0.04	0.0078	0.00	0.02	0.03
Decapoda	Astacidae	1	0.04	1.5181	0.92	0.02	0.48
Diptera	Unidentified	74	3.15	0.4108	0.25	0.13	1.71
Diptera	Chironomidae	9	0.38	0.0087	0.01	0.11	0.24
Diptera	Culicidae	5	0.21	0.0178	0.01	0.09	0.15
Diptera	Deuterophlebiidae	1	0.04	0.019	0.01	0.02	0.04
Diptera	Empidae	1	0.04	0.0035	0.00	0.02	0.03
Diptera	Simuliidae	84	3.57	0.2388	0.14	0.28	1.94
Diptera	Syrphidae	2	0.09	0.0115	0.01	0.04	0.07
Diptera	Tipulidae	1	0.04	0.0096	0.01	0.02	0.03
Ephemeroptera	Unidentified	8	0.34	0.0511	0.03	0.09	0.22
Ephemeroptera	Ameletidae	1	0.04	0.0099	0.01	0.02	0.03
Ephemeroptera	Baetidae	5	0.21	0.009	0.01	0.06	0.14
Ephemeroptera	Caenidae	1	0.04	0.0004	0.00	0.02	0.03
Ephemeroptera	Ephemerellidae	78	3.32	0.3977	0.24	0.15	1.80
Ephemeroptera	Heptageniidae	1	0.04	0.0081	0.00	0.02	0.03
Ephemeroptera	Leptophlebiidae	7	0.30	0.0596	0.04	0.02	0.17

Prey		#	% by #	Wt.	% by Wt.	FO	IRI
Order	**Family**						
Ephemeroptera	Oligoneuridae	1	0.04	0.004	0.00	0.02	0.03
Ephemeroptera	Perolidae	1	0.04	0.0044	0.00	0.02	0.03
Ephemeroptera	Siphlonuridae	1	0.04	0.0027	0.00	0.02	0.03
Hemiptera	Corixidae	1	0.04	0.0278	0.02	0.02	0.04
Hemiptera	Gerridae	1	0.04	0.0133	0.01	0.02	0.03
Hemiptera	Macrovelliidae	1	0.04	0.0005	0.00	0.02	0.03
Hemiptera	Notonectidae	1	0.04	0.0057	0.00	0.02	0.03
Hemiptera	Ochteridae	2	0.09	0.0249	0.02	0.02	0.06
Hymenaptera	Unidentified	1	0.04	0.0061	0.00	0.02	0.03
Hymenaptera	Eulophidae	2	0.09	0.035	0.02	0.02	0.06
Hymenaptera	Figitidae	2	0.09	0.0259	0.02	0.04	0.07
Hymenaptera	Formicidae	10	0.43	0.2019	0.12	0.15	0.34
Hymenaptera	Vespidae	1	0.04	0.0485	0.03	0.02	0.05
Isopoda	Armadilliaiidae	1	0.04	0.0518	0.03	0.02	0.05
Lepidoptera	Crambiadae	1	0.04	0.0098	0.01	0.02	0.03
Lepidoptera	Petrophila	2	0.09	0.0276	0.02	0.02	0.06
Odonata	Unidentified	1	0.04	0.0047	0.00	0.02	0.03
Odonata	Coenagrionidae	2	0.09	0.0114	0.01	0.02	0.06
Orthoptera	Unidentified	2	0.09	0.0855	0.05	0.02	0.08
Plecoptera	Unidentified	11	0.47	0.1112	0.07	0.13	0.32
Plecoptera	Capniidae	1	0.04	0.0703	0.04	0.02	0.05
Plecoptera	Nemouridae	1	0.04	0.0034	0.00	0.02	0.03
Plecoptera	Perlodidae	2	0.09	0.5693	0.34	0.04	0.23
Plecoptera	Pteronarcyidae	11	0.47	0.1287	0.08	0.11	0.32
Plecoptera	Taeniopterygidae	1	0.04	0.0117	0.01	0.02	0.03
Pulmonata	Planorbidae	1	0.04	0.0018	0.00	0.02	0.03
Trichoptera	Unidentified	22	0.94	1.1307	0.68	0.30	0.93

Prey		#	% by #	Wt.	% by Wt.	FO	IRI
Order	**Family**						
Trichoptera	Brachycentridae	7	0.30	0.2628	0.16	0.11	0.27
Trichoptera	Glossosomatidae	28	1.19	0.3908	0.24	0.13	0.76
Trichoptera	Hydropsychidae	25	1.06	1.0404	0.63	0.19	0.92
Trichoptera	Hydroptilidae	1	0.04	0.0104	0.01	0.02	0.03
Trichoptera	Lepiclostomatidae	2	0.09	0.0402	0.02	0.02	0.06
Trichoptera	Leptoceridae	5	0.21	0.6609	0.40	0.09	0.34
Trichoptera	Polycentropodidae	2	0.09	0.2161	0.13	0.04	0.13
Trichoptera	Rhyacophilidae	1	0.04	0.0101	0.01	0.02	0.03
Cypriniformes	Cyprinidae	7	0.30	14.35111	8.69	0.09	4.41
Diplopoda	Unidentified	1	0.04	0.0526	0.03	0.02	0.05
Perciformes	Centrarchidae	2	0.09	37.1937	22.51	0.02	10.99
Rodentia	Cricetidae	1	0.04	51.617	31.24	0.02	15.22
Salmoniformes	Salmonidae	11	0.47	35.1515	21.28	0.09	10.61
Scorpaeniformes	Cottidae	2	0.09	4.8707	2.95	0.04	1.49
Oligochaete	Unidentified	3	0.13	1.3673	0.83	0.04	0.48
Arthropod parts		8	0.34	0.0589	0.04	0.02	0.19
Fish parts		50	2.13	0.2139	0.13	0.21	1.20
Detritus		243	10.33	3.8375	2.32	0.74	6.51
Hairs		10	0.43	0.0015	0.00	0.02	0.22
Macroinvertebrate parts		817	34.74	2.1653	1.31	0.60	17.81
Rocks		722	30.70	3.2297	1.95	0.47	16.10
Seed		1	0.04	0.0014	0.00	0.02	0.03
Trichoptera cases		3	0.13	0.0819	0.05	0.02	0.10
Vertebrate Parts		5	0.21	2.7761	1.68	0.04	0.94
Wings		3	0.13	0.0371	0.02	0.02	0.08
		2352	**100**	**165.22371**	**100**		**100**

Table 74. Number, % by number, weight (g), % by weight, frequency of occurrence (FO), index of relative importance (IRI) of diet of prickly sculpin.

Prey		#	% by #	Wt.	% by Wt	FO	IRI
Order	**Family**						
Ephemeroptera	Unidentified	1	10.00	0.0043	5.01	0.20	7.55
Plecoptera	Unidentified	1	10.00	0.0059	6.87	0.20	8.47
Trichoptera	Unidentified	5	50.00	0.0476	55.41	0.40	52.54
Trichoptera	Hydropsychidae	2	20.00	0.0216	25.15	0.40	22.61
Trichoptera	Hydroptilidae	1	10.00	0.0065	7.57	0.20	8.82
		10	**100**	**0.0859**	**100**		**100**

Table 75. Number, % by number, weight (g), % by weight, frequency of occurrence (FO), index of relative importance (IRI) of diet of mottled sculpin.

Prey		#	% by #	Wt.	% by Wt.	FO	IRI
Order	**Family**						
Ephemeroptera	unidentified	3	1.96	0.0244	2.41	0.50	2.52
Ephemeroptera	Baetidae	2	1.31	0.0054	0.53	0.33	1.12
Ephemeroptera	Ephemerillidae	8	5.23	0.0736	7.27	0.17	6.58
Plecoptera	Nemaridae	4	2.61	0.0311	3.07	0.17	3.04
Plecoptera	Perlidae	1	0.65	0.2067	20.41	0.17	10.96
Plecoptera	Perlodidae	1	0.65	0.0087	0.86	0.17	0.87
Plecoptera	Pteronarcyidae	7	4.58	0.091	8.99	0.33	7.20
Trichoptera	Unidentified	18	11.76	0.0874	8.63	0.50	10.88
Trichoptera	Hydropsychidae	1	0.65	0.0169	1.67	0.17	1.29
Detritus		15	9.80	0.0594	5.87	0.50	6.76
Hair		25	16.34	0.0108	1.07	0.17	9.21
Macroinvertebrate parts		63	41.18	0.3853	38.05	0.50	37.17
Rock		5	3.27	0.0119	1.18	0.17	2.40
		153	**100**	**1.0126**	**100**		**100**

Torrent sculpin

Stomach contents of 34 torrent sculpin were examined, two were empty. Diet was dominated by macroinvertebrate parts by number (61%) and salmonidae by weight (36%). The dominate macroinverebrates were caddisflies (trichopterans) by number (7%) and weight (8%) (Table 76).

Diet overlap

Table 77 shows diet overlap of the eight species that had stomach contents analyzed. Longnose dace had the highest diet overlap with prickly sculpin at 0.23, Umatilla dace had the highest diet overlap with speckled dace at 0.83, speckled dace had the highest diet overlap with redside shiner at 0.36, redside shiner had the highest diet overlap with prickly sculpin at 0.46, brown trout had the highest diet overlap with torrent sculpin at 0.50, and mottled had the highest diet overlap with redside shiner.

Table 76. Number, % by number, weight (g), % by weight, frequency of occurrence (FO), index of relative importance (IRI) of diet of torrent sculpin.

Prey		#	% by #	Wt.	% by Wt.	FO	IRI
Order	**Family**						
Calanoida	Cycloploida	1	0.21	0.0081	0.08	0.03	0.16
Cypriniformes	Cyprinidae	2	0.43	2.2435	23.08	0.06	11.63
Diptera	Unidentified	5	1.06	0.0959	0.99	0.06	1.04
Diptera	Simuliidae	1	0.21	0.0093	0.10	0.03	0.17
Ephemeroptera	Unidentified	13	2.77	0.1029	1.06	0.21	1.99
Ephemeroptera	Ephemerellidae	1	0.21	0.0037	0.04	0.03	0.14
Ephemeroptera	Leptophlebiidae	2	0.43	0.0187	0.19	0.06	0.33
Hemiptera	Unidentified	1	0.21	0.0736	0.76	0.03	0.49
Isopoda	Unidentified	1	0.21	0.0458	0.47	0.03	0.35
Odonata	Unidentified	5	1.06	0.085	0.87	0.03	0.97
Plecoptera	Unidentified	6	1.28	0.148	1.52	0.18	1.47
Plecoptera	Perlidae	1	0.21	0.0366	0.38	0.03	0.31
Plecoptera	Perlodidae	1	0.21	0.0095	0.10	0.03	0.17
Plecoptera	Pteronarcyidae	3	0.64	0.0373	0.38	0.03	0.52
Salmoniformes	Salmonidae	1	0.21	3.5759	36.79	0.03	18.28
Trichoptera	Unidentified	16	3.40	0.542	5.58	0.32	4.59
Trichoptera	Hydropsychidae	14	2.98	0.2343	2.41	0.21	2.76
Trichoptera	Limnophilidae	2	0.43	0.0063	0.06	0.03	0.26
Fish parts		2	0.43	0.0157	0.16	0.06	0.32
Detritus		74	15.74	0.3179	3.27	0.38	9.57
Macroinvertebrate parts		290	61.70	1.0439	10.74	0.53	36.01
Oligochaeta		5	1.06	0.7602	7.82	0.03	4.40
Rocks		23	4.89	0.3063	3.15	0.21	4.07
		470	**100**	**9.7204**	**100**		**100**

Table 77. Diet overlap of fishes in the Colville River Watershed, Stevens County 2013.

Species	Longnose dace	Umatilla dace	Speckled dace	Redside shiner	Brown trout	Prickly sculpin	Mottled sculpin	Torrent sculpin
Longnose dace	1.00							
Umatilla dace	0.08	1.00						
Speckled dace	0.13	0.83	1.00					
Redside shiner	0.15	0.26	0.36	1.00				
Brown trout	0.02	0.05	0.06	0.02	1.00			
Prickly sculpin	0.23	0.08	0.27	0.46	0.02	1.00		
Mottled sculpin	0.09	0.22	0.22	0.27	0.02	0.24	1.00	
Torrent sculpin	0.03	0.09	0.10	0.10	0.50	0.13	0.07	1.00

Fecundity

Egg skeins were collected from four species of cyprinids; longnose dace, Umatilla dace, speckled dace, and redside shiner.

Longnose dace

Eggs skeins were collected from nine longnose dace. Fecundity ranged from 1357 eggs in a 105 mm 10 g female to 3256 eggs in a 114 mm and 15 g female. Average fecundity was 2026 eggs per female. Weight (Figure 60) was more indicative of number of eggs per female (y (# of eggs) =195.78(Weight (g))-323.44; R^2=.41) then length weight (Figure 59) (y (# of eggs) = 47.004(length (mm))-3191.6; R^2=.1591) for longnose dace.

Umatilla dace

Egg skeins were collected from 18 Umatilla dace. Fecundity ranged from 474 eggs in an 86 mm and 5 g female to 2038 eggs in a 114 mm and 15 g female. Average fecundity was 1259 eggs per female. Length (Figure 61) was more indicative of number of eggs per female (y (# of eggs) =44.203 (length (mm))-3337.8; R^2=.5574) then weight (Figure 62) (y (# of eggs) =110.79(weight (g))-14.801; R^2=.4681) for Umatilla dace.

Speckled dace

Eggs skeins were collected from seven speckled dace. Fecundity ranged from 1483 eggs in a 77 mm and 4 g female to 3092 eggs in a 85 mm and 7 g female. Average fecundity was 2044 eggs per female. Determining number of eggs per female varies little

from length (Figure 63), y (# of eggs=38.058 (length (mm))-1005.6; R^2=.1873) to weight (Figure 64) (y (# of eggs) = 135.8(weight (g)) +1307.3; R^2=.1871) in speckled dace.

Redside shiner

Eggs skeins were collected from five redside shiner. Fecundity ranged from 1494 in a 92 mm and 8 g female to 2338 in a 125 mm and 12 g female. Average fecundity was 2024 eggs per female. Length (Figure 65) was more indicative of number of eggs per female (y (#of eggs)=12.578(length(mm))+624.96; R^2=.2569) then weight (Figure 66) (y (#of eggs)= 38.913 (weight(g))+1533.3; R^2=.1262) for redside shiner.

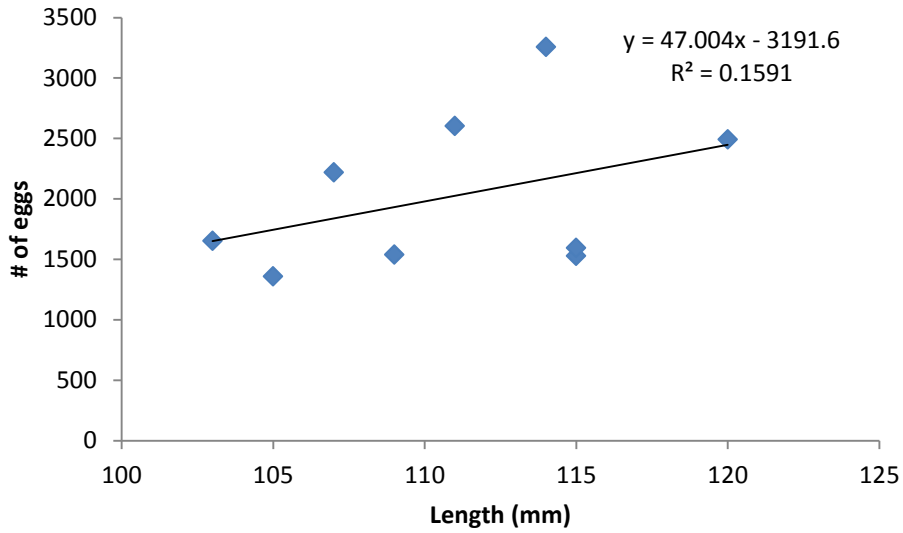

Figure 59. Length (mm) vs. fecundity (number of eggs) regression for longnose dace in the Colville River Watershed, Stevens County, WA 2013.

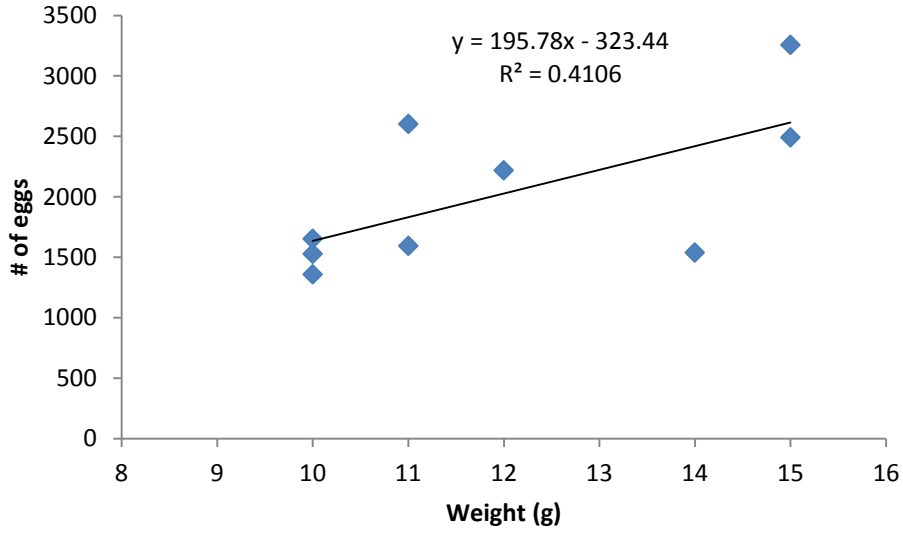

Figure 60. Weight (g) vs. fecundity (number of eggs) regression for longnose dace in the Colville River Watershed, Stevens County, WA 2013.

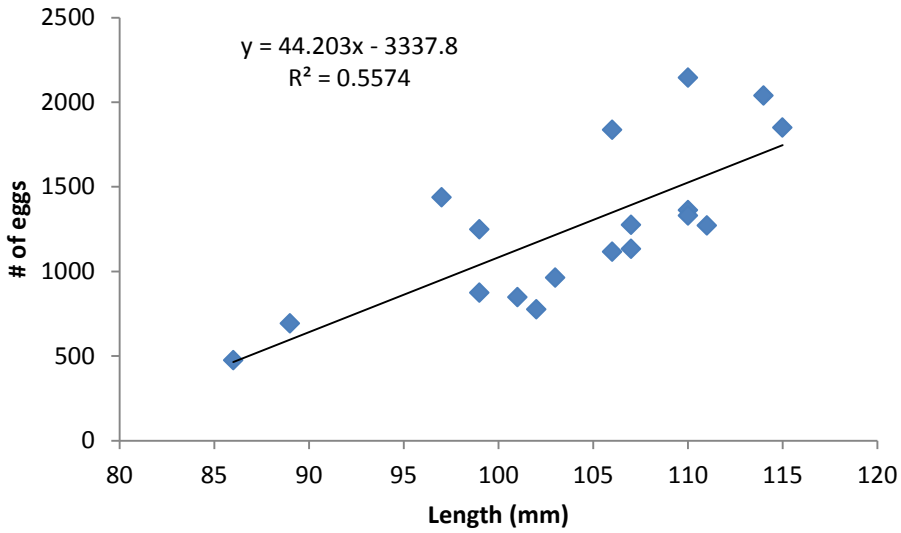

Figure 61. Length (mm) vs. fecundity (number of eggs) regression for Umatilla dace in the Colville River Watershed, Stevens County, WA 2013.

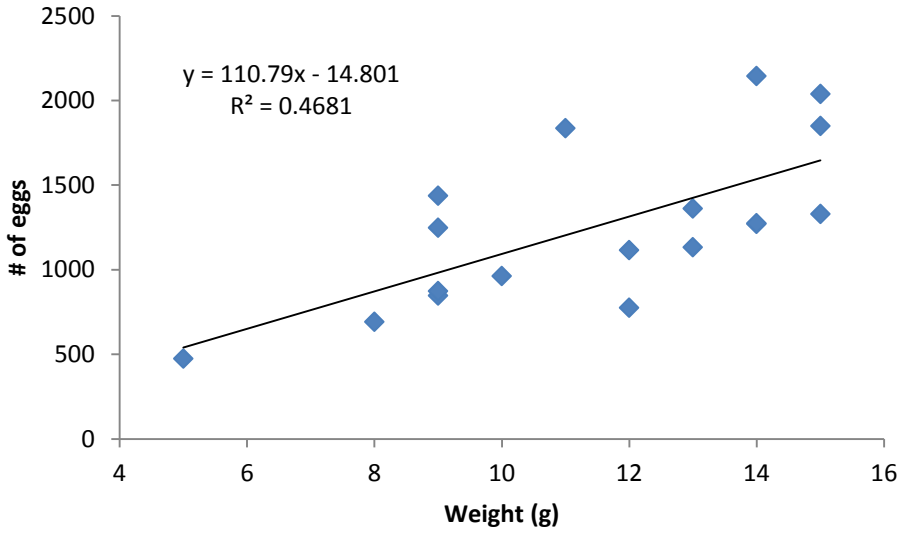

Figure 62. Weight (g) vs. fecundity (number of eggs) regression for Umatilla dace in the Colville River Watershed, Stevens County, WA 2013.

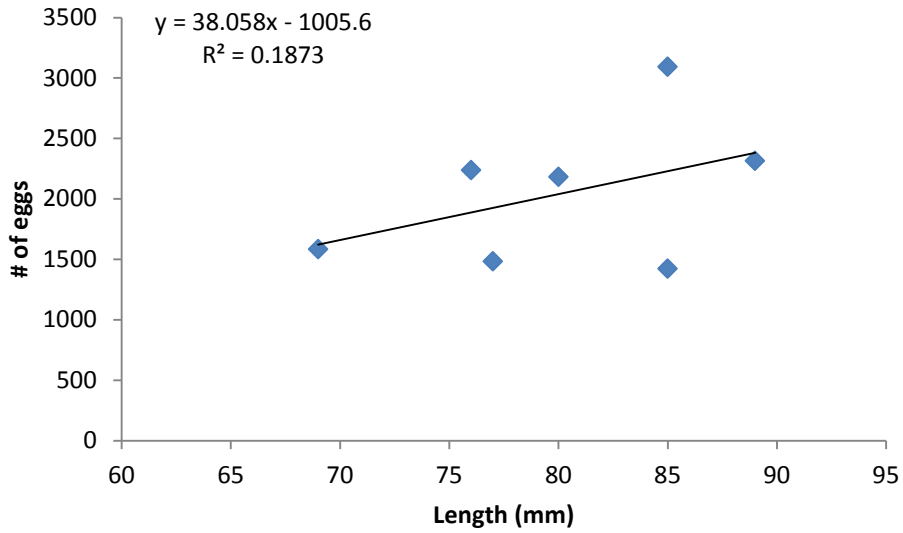

Figure 63. Length (mm) vs. fecundity (number of eggs) regression for speckled dace in the Colville River Watershed, Stevens County, WA 2013.

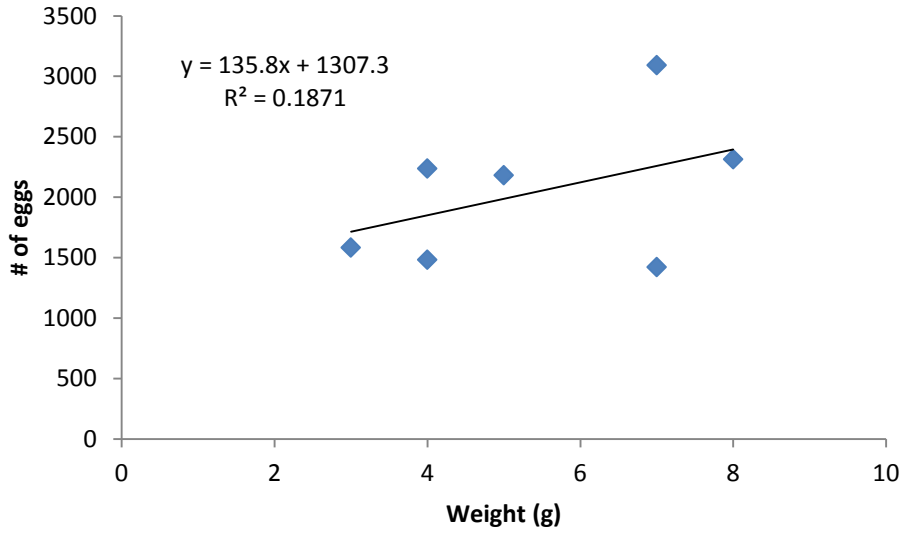

Figure 64. Weight (g) vs. fecundity (number of eggs) regression for speckled dace in the Colville River Watershed, Stevens County, WA 2013.

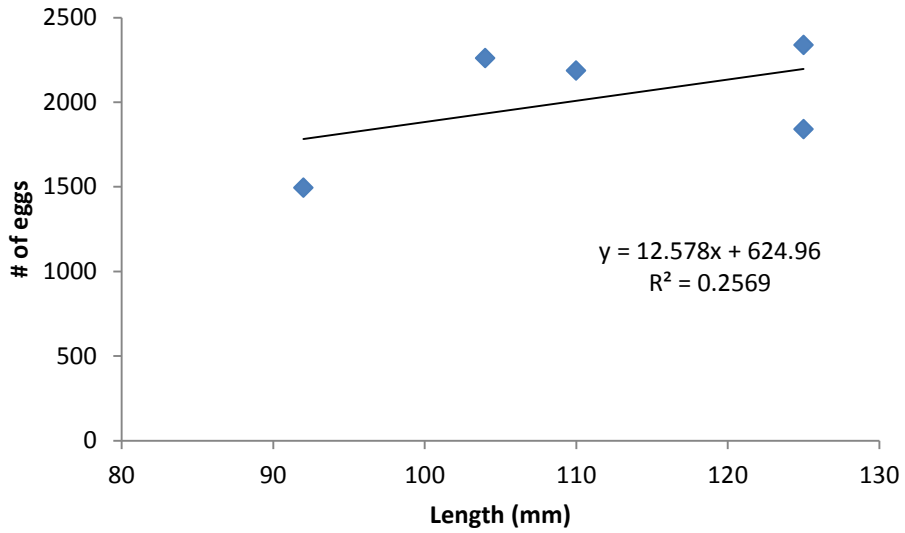

Figure 65. Length (mm) vs. fecundity (number of eggs) regression for redside shiner in the Colville River Watershed, Stevens County, WA 2013.

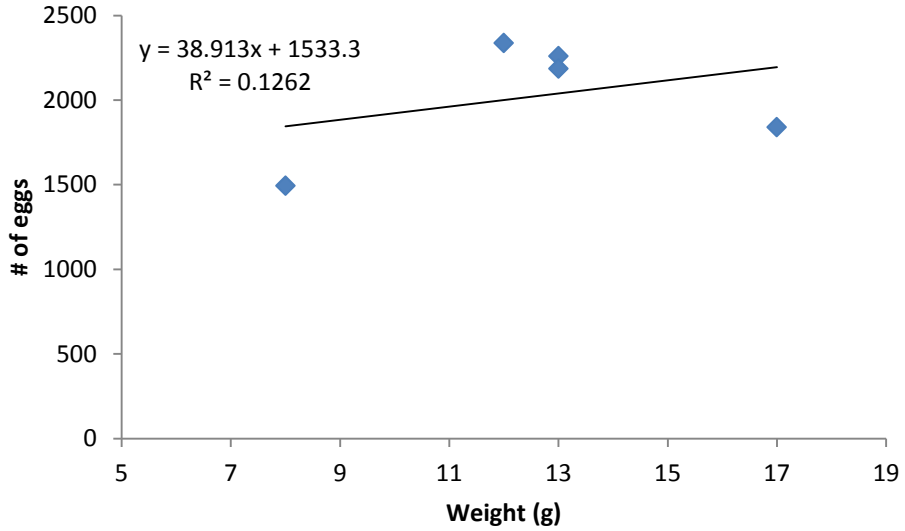

Figure 66. Weight (g) vs. fecundity (number of eggs) regression for redside shiner in the Colville River Watershed, Stevens County, WA 2013.

Discussion

Relative abundance

Relative abundances varied from that reported by previous studies due to the number of species identified and sampling effort. In 2007 the WRIA 59 report sampled 18 streams and 24 sites with a total of 948 fish caught by backpack electrofishing (Table 2). The most abundant species were rainbow trout, redside shiner, and the Family Cottidae (sculpin) (Table 2).In the present study we sampled 20 streams and 69 sites with a total of 4,314 fish caught by electrofishing, seine netting, and minnow traps (Table 4). The most abundant species were speckled dace, redband trout, and redside shiner. The difference in abundance can be explained by more sampling in the Colville River, where the most abundant family was the cyprinids. Also I identified the superspecies rainbow trout into its two subspecies coastal rainbow trout (rainbow trout) and interior rainbow trout (redband trout). Lastly by identifying the sculpin family to species distributed the relative abundance over five species. As a family total number (n=611) increased but relative abundance decreased (RA=14.2%) for sculpin in 2013 compared to 2007 (n=173; RA=18%).

In both sampling years the Colville River had the highest total number of fish captured. The 2007 report captured 146 fish (15% of the relative abundance for the 2007 study) and in 2013 I captured 2,105 fish (49% of the relative abundance for this study). Table 2 reports the relative abundance in 2007 and Table 4 reports the relative for this study. The 2007 report only indentified six species from two families and identified two just to family, while the 2013 study identified 28 species from six families. The difference in species numbers between 2007 and 2013 can be partially explained by

sampling effort (two sites in 2007 and 19 in 2013) and sampling methods. In 2013 five sites were located below Meyers Falls (none sampled in 2007) which had eight species that were unique to that area. The 2007 sites were also restricted geographically between Chewelah Creeks and the Little Pend Oreille River. Also in 2007 sucker and sculpin were identified just to family, while in 2013 I was able to identify eight species in the watershed from these two families alone.

Appendix A shows species, abundance, and range of length and weight for each species in each stream in the CRW. Appendix E shows the synoptic list of known species in this watershed updated with information from this study. Information from the WDFW 1975 report could not be compared to this study due to only identifying three groups of fishes (rainbow trout, brown trout, and aggregate) (Nielsen 1975).

Catch per unit effort (CPUE)

Electofishing

Electrofishing was the most effective way to catch fish. It has been reported that electrofishing is biased towards size and species (Peterson et al 2004) however in this watershed it encountered 25 of the 28 species that ranged in size from 16-615 mm and in weight from >1-2,222 g. Electrofishing was used at 98.5% of the sites (68 of 69) and tended to be the easiest form of sampling. The only site not sampled by electrofishing was on the Colville River near the town of Valley because the water levels were too deep to safely sample.

Electroseining

Electoseining had the second highest CPUE for this watershed. As mentioned previously electoseining is a combination of electrofishing and seine netting. By combining the two methods I was able to eliminate the reported bias of electrofishing and problems associated with seine netting (entangling on substrate, probability of encirclement, and retention). (Peterson et al 2004; Schwanke and Hubert 2004). Electroseing encountered 17 of the 28 species that ranged in size from 29-493 mm and in weight from 1-1136 g. It was only used on 31.9% (22 of 69) of the sampled sites. Limiting factors for the use of this technique ended up being flow, riparian density, and wetted width. Six of the streams ended up being sampled this way with at least three sites being sampled on each of the four major streams in this watershed.

Minnow traps

Minnow traps had the lowest CPUE for this study. When combining across all species the CPUE was less than 2 fish per set night (Table 7). Minnow traps were the lone sampling technique that was passive and is used to target bottom dwelling species (Murphy and Willis 1996). It is dependent on two things; species abundance and species activity (Dorn et al 2005). Overall 19 of the 28 species ranging in size from 30-231 and in weight from 1-112 g were encountered in minnow traps. Minnow traps were set in 81.2% (56 of the 69) of the sampled sites. Limiting factors for setting traps include wetted depth, stream was not deep enough, and flow, flows were too high. Surprisingly minnow traps encountered 146 trout and char (salmonids), with the largest individual captured in the traps being an eastern brook trout. The traps did a good encountering minnow

(cyprinids) (~65% of catch) but a poor job of encountering sculpin (cottids) (~6% of catch) which I was expecting the sculpin catch to be higher by this method.

Distribution

Known fish distribution

Appendix E shows the updated known distribution including this study and the previous data for the CRW. This study added many new species to each stream, with 19 new species identified in the Colville mainstem.

Stocking

Stocking of this watershed has occurred from 1905 to present day. Appendix F Stocking record by stream and species

Table shows the stocking of the streams that were sampled in this study along with the Lakes that impact two particular streams (WDFW 2006; Honeycutt 2008). All species stocked are nonnative to Eastern Washington and have been stocked for recreational purposes. Stocking years in this table were 1905 and 1933-present. Stocked streams include the Colville River, Gold Creek, Mill Creek, Clugston Creek, Haller Creek, Bear Creek, Stranger Creek, Blue Creek, Chewelah Creek, Cottonwood Creek, Huckleberry Creek, Sherwood Creek, Jumpoff Joe Creek, Sheep Creek, and Deer Creek. The two lake groups are the Little Pend Oreille Lakes and Jumpoff Joe Lake.

Over 10 million fish have been stocked in this time frame. Two species make up ~75% of the total number stocked. Rainbow trout (n>4,400,000) were stocked in 13 streams and both lake groups. The heaviest stocking effort of rainbow trout has occurred

in Jumpoff Joe Lake (n>1,200,000) followed by Deer Creek (n>610,000). Eastern brook trout have been stocked in 14 streams and both lake groups. The heaviest stocking effort of eastern brook trout occurred in Mill Creek (n>670,000) followed by the Little Pend Oreille Lake (n>570,000). Rainbow trout where found in 16 streams and at 43 sites and eastern brook trout were found in 16 streams and at 40 sites in this study.

Other species stocked include kokanee (n>1,200,000), cutthroat (n> 1,000,000), steelhead (n~ 200,000) in the Colville River, Mill Creek, and Chewelah Creek, brown trout (n~ 250,000) in the Colville River, the Little Pend Oreille Lakes, Chewelah Creek, and Jumpoff Joe Lake, tiger trout (n=54,500) in the Little Pend Oreille Lakes, arctic grayling (n=100,000) in the Little Pend Oreille Lakes, bass (n=2,000) in Jumpoff Joe Creek, and yellow perch (n>11,000) in Jumpoff Joe Creek.

Barrier Falls

Distribution

Meyers Falls, Douglas Falls, and Crystal Falls have all been reported as barrier waterfalls to fish migration. Meyers Falls is a series of waterfalls on the Colville River that is 80 feet high. Douglass Falls is a single waterfall on Mill Creek that is 45 feet high. Lastly Crystal Falls is a series of waterfalls on the Little Pend Oreille River that is 60 feet high.

To test this idea I examined the number of species present in each of the 5 regions. What I found was that region 1 (below Meyers Falls) had 23 species present, region 2 (Colville River above Meyers Falls) had 18 species present, region 3 (all tributaries between barrier falls) had 19 species, region 4 (above Crystal Falls) had six species, and region 5 (above Douglas Fall) had five species present. I combined regions 2

and 3 to simplify things, making region 2 (between barrier falls) having 20 species. What I found was that the number of species decreases above each barrier waterfall; providing evidence to support the idea that the waterfalls are barriers to fish passage (Table 8).

To take this idea a step further region 1 has eight species that are unique to below Meyers Falls. Region 2 (between barrier falls) has five species unique to above Meyer's falls, with all five of these species disappearing above the other two barrier waterfalls, providing more evidence that species cannot make it above these waterfalls (Table 8).

There are three species that can be found ubiquitously throughout the watershed, they are present in all five regions. Species can entrain over the falls but cannot make it back over. These species make up over 50% of the species abundance in regions 4 and 5, with this number decreasing for these three species as the entrain over the falls (Table 8).

Abundance

The Tukey pairwise comparison indicates that river size is more likely to impact the number of species present in each region than the barrier waterfalls. The test showed that the number of species present at each site on the Colville River is different from the number of species present on all of the tributaries. If the waterfalls were more important than size region 1 would differ from 2, 3, 4, and 5, regions 2 and 3 similar but yet differing from 4 and 5, and regions 4 and 5 similar to one another.

Water Quality

A major concern in this watershed is water quality. As of 2003 a total maximum daily load (TMDL) was established for this watershed (WDOE 2003). TMDLs are established in watersheds that are considered "impaired" after proper technological based

controls are in place (WDOE 2003). Historically the CRW has violated many of the states criterias for water quality. Water quality criterias of concern for fish are temperature and dissolved oxygen (DO). The state mandates that temperatures cannot exceed 18°C and dissolved oxygen cannot be less than 8 mg/L for protection of salmonid fish (WDOE 2011). Water quality data was not collected in this study but was gathered from SCCD and WDOE.

Appendix G shows the average monthly and daily temperature from 10 streams in this watershed. The Colville River is broken into below and above Meyers Falls. The month with the highest average monthly temperature was July; temperatures greater than 18°C were observed in the Colville River both below and above Meyer Falls, Jumpoff Joe Creek, and Sheep Creek. The Colville River above and below Meyers Falls also violated the state criteria in August.

Appendix H shows the average monthly DO concentration from five streams in this watershed. DO levels were the lowest in the months of July and August, which corresponds to the months with the highest average temperatures. Temperature and DO concentration are inversely proportional to one another, as temperature increases DO decreases. The only stream that violated the state criteria of <8mg/L was Jumpoff Joe Creek in July. No annual average DO concentrations violate the state criteria.

The stream of the most concern is the Colville River itself. The Colville River below Meyers Falls has a yearly temperature range from 0.0-24.8°C. It violated the criteria 17% of the time (43 of 250 measurements) with a majority of these violations in July and August. The temperature range when it violates the criteria was 18.0 -24.8 °C .

However the daily DO below Meyers Falls ranged from 5-13.9 mg/L, violating the state criteria 6.4% of the time with violations mainly occurring in July and August

The most abundant family of fish below Meyers Fall was the Cyprinidae (52.9%), with the most abundant species being Umatilla dace (22.5%). Cyprinids prefer warmer water temperatures and generally can be found in waters up to 25°C (Scholz and McLellan 2010).

The Colville River above Meyers Falls ranged from -1.5-23.4°C and violated the state criteria 8.4% of the time (32 of 381 measurements), with most of the violations occurring in July and August, when temperatures ranged from 18.2-23.4°C . The daily DO concentration ranged from 6.4-14.6 mg/L, violating the state criteria 15.3% of the time, with the majority of violations coming in June, July, and August.

The most abundant family above Meyers Falls was the Cyprinidae (80.7%), with the most abundant species being the speckled dace (38.6%). Salmonids (<5%) avoid the mainstem until the temperatures decreased to 14°C and DO increased to 9 mg/L in September (84% 53 of the 63 encountered).

Mill Creek temperatures were collected only in April and July. The highest temperature recorded in this stream was 14.4°C (Table G-1). The most abundant family was Salmonidae (84.6%), with eastern brook trout being the most abundant species (34.1%).

The average monthly temperature for the Little Pend Oreille River did not exceed 16°C but the state criteria was violated 3% of the time sampled. Daily temperature ranged from -1.7 to 20.8°C (Table G-2). The monthly DO ranged from 9.1 to 13.7 mg/L, and

daily range was 8.5 to 14.4 mg/L (Appendix H). State DO criteria was violated 0% of the time sampled. The most abundant family in this stream was Salmonidae (53.6%).

The average monthly temperature for Blue Creek ranged from 8.8 to 17.1°C and daily ranged from 8.8 to 19.0°C violating the state criteria 12.5% of the time sampled (Appendix G). The monthly DO concentration ranged from 8.5-10.7 mg/L and the daily ranged from 7.9-10.7, violating the state criteria 12.5% of the time (Appendix H) . Salmonids were the most abundant family (86.2%) and redband trout were the most abundant species (56.9%).

The average monthly temperature for Chewelah Creek ranged from 1.7 to 12.5°C, and daily temperatures ranged from 1.7 to 22.2, violating the state criteria 1.4% of the time sampled (Appendix G). The most abundant family was Salmonidae (73.2%) with the most abundant species being brown trout (45.3%).

The average monthly temperature for Cottonwood Creek ranged from 5.9 to 12.2°C, and had a daily temperature range of 5.6 to 12.2°C (Appendix G). The most abundant family was Salmonidae (82.5%) with the most abundant species being coastal rainbow trout (26.8%) followed closely by redband trout (25.8%). The high abundance of these two species supports that the stream temperatures stay low throughout the year.

The average monthly temperatures for Sherwood Creek ranged from 8.8 to 11.11°C, and the daily temperatures ranged from 8.3 to 11.1 °C. The most abundant family was Salmonidae (58.1%) and the most abundant species was torrent sculpin (37.1%).

The average monthly temperature for Jumpoff Joe Creek ranged from 10.7 to 20.6° C and daily temperatures ranged from 10.7 to 21.6°C, violating the state criteria

25% of the times sampled (Appendix G). Average monthly DO concentrations ranged from 8.9 to 10.1 mg/L and daily concentrations ranged from 6.5 to 10.4 mg/L, violating the state criteria 17% of the time (Appendix H).The most abundant family was Percidae (67.9%) with the most abundant species being yellow perch (67.9%).

The average monthly temperatures for Sheep Creek ranged from 2.4 to 19.1°C and daily temperatures ranged from 2.4 to 21.1°C, violating the state criteria 18% of the time (Appendix G). The average monthly DO concentration ranged from 9.6 to 12.5 mg/L and daily concentrations ranged from 8.6 to 12.5 mg/L (Appendix H). The most abundant family was Salmonidae (52.1%) however the most abundant species was redside shiner (28.9%).

The average monthly temperature for Deer Creek was 10°C, the temperature was only recorded in April. The most abundant family in Deer Creek was Salmonidae (71.1%) with the most abundant species being redband trout (55.1%). Redband indicate that during the sampling months of July and November that water temperatures would have been below 18°C and that DO would have been above 8 mg/L.

Overall the CRW violated the state criteria for water temperature (>18°C) 12.1% of time and DO (<8 mg/L) 11.2% of the time. The highest number of violations was in the Colville River both above (94 of 785) and below (59 of 500) Meyers Falls. Water temperature is a better indicator of species presence and abundance than DO. Matthews and Berg (1996) found that trout species are more likely to subject themselves to areas of lower DO than to be in water temperatures that exceed their thermal threshold.

The Colville River was warmer than its tributaries in the summer months. The Colville River had the highest summer temperatures (average 17.7°C). Minnows were the

most abundant family at 71% of the relative abundance. In tributaries, summer temperatures were cooler (averaged 12.8°C). Trout were the most abundant family at 73% of the relative abundance. Trout prefer the cool temperatures of tributaries during the summer and may rely on them to provide thermal refuge during the summer months.

Fishes

Common Carp

Carp where not described in any previous studies of this watershed however they are described in Lake Roosevelt (Scholz and McLellan 2010). They were only found below Meyers Falls at three of the five sites. The Colville River below Meyers Falls and Lake Roosevelt are a connected stream allowing for migration of species found in Lake Roosevelt to occupy the Colville River. Carp were captured both by electrofishing and minnow traps. Length at age 1 was different then lengths described by Scholz and McLellan (2010) and Mauck and Summerfelt (1970). However they were reporting growth in a lake or reservoir environment compared to a river environment. Linton (1961) reported that age 1 carp in the Arkansas River grew to 51 mm, which is similar to growth reported in this study. Their average Condition factor (TL) for this study is above averages reported by Mauck and Summerfelt (1970) and falls within the average range reported by Carlander (1969). The high presence of Carp (21% of the RA below Meyers Falls) indicates that water temperatures were high (>18°C). Calhoun (1966) reported that Carp are tolerant of high water temperatures and have an upper lethal temperature of 36 °C.

Northern pikeminnow

Northern pikeminnow were found only in the Colville River above Meyers Falls and Little Pend Oreille River below Crystal Falls. Growth was slower then lengths reported by Scholz and McLellan (2010) on Latah Creek and Beckman et al (1985) in Lake Roosevelt (Table 78)

Longnose dace

Longnose dace were collected above Meyers Falls and below both Douglas Falls and Crystal Falls. They occurred in five streams and were aged from YOY-5 years old. Table 79 compares the backcalculated lengths of longnose dace between this study, Latah Creek, and Rock Creek (Scholz and McLellan 2010). Overall growth was faster in the Colville River than in Latah Creek and Rock Creek.Longnose dace preyed primarily on macroinvertebrates. Diet of longnose dace in this watershed was similar to that reported by Brown (1971), Gerald (1966), and Gray and Dauble (2001) who reported that flies (Dipterans) made up the bulk of their diet. Longnose dace had a low diet overlap with all other species encountered in this watershed. Fecundity range is similar to that reported by Scholz and McLellan (2010) (603-1,078 eggs in females that ranged from 72-103 mm) and Wydoski and Whitney (1979) (395-3,374 eggs in females that ranged from 69-127 mm).

Umatilla dace

See Appendix C for the note submitted to Northwest Naturalist on 23 May 2014.

Speckled dace

Speckled dace were the most abundant species in this watershed and were captured with all three sampling methods. They were found in four streams, including Colville River. They grew at a similar pace as speckled dace described in other Eastern Washington stream (Scholz and McLellan 2010) (Table 80). Mean condition factor (TL) was higher than that reported by Rader et al (2006) Diet of speckled dace constituted was comprised primarily of benthic macroinvertebartes. This was comparable to diet of speckled dace reported by Carlander (1969), Radar et al (2006), and Wydoski and Whitney (2003). Fecundity was higher than that reported by Peden and Hughes (1981) (170-2,000 eggs in females 50-78 mm SL) and Lee (2008) (54-151 eggs in females that were 60-64 mm TL).

Redside shiner

Redside shiner were the third most abundant species and were collected by all three sampling methods. They were found in four streams, mainly the Colville River above Meyers Falls. Growth was similar to that of redside shiner reported in other Eastern Washington streams (Scholz and McLellan 2010) (Table 81). Mean condition factor (TL) was higher than that reported by Nine et al (2005). Annual mortality was higher than that reported by Rader et al (2006) and Nine et al (2005). Redside diet was similar to diets reported by Gray and Dauble (1976) Rader et al (2006). Their diet was most similar to that of prickly sculpin in this watershed. Fecundity was higher than reported by Lee (2005).

Tench

Tench were encountered in three streams in the watershed, with the majority captured in the Colville River. They were collected by all three sampling methods. Table 82 indicates that growth was similar to growth of tench from other lakes and rivers in Eastern Washington (Scholz and McLellan 2010).

Table 78. Back-calculated lengths of northern pikeminnow at each age in four Eastern Washington drainages (1. Scholz and McLellan 2010; 2. Ward et al 1995; 3. Beckman et al 1985)

		Back-calculated TL (mm) at age				
County	Location	n	1	2	3	4
Stevens	Colville River	9	55	112	-	-
[1]Spokane	Latah Creek	36	67	135	181	208
[2]Benton/Franklin/Walla Walla	McNary Reservoir	104	45	138	205	250
[3]Ferry/Lincoln/Stevens	Lake Roosevelt	887	75	122	168	223

Table 79. Back-calculated lengths of longnose dace at each age in three Eastern Washington drainages (1.Scholz and McLellan 2010)

		Back-calculated TL (mm) at age					
County	Location	n	1	2	3	4	5
Stevens	Colville River	145	48	64	77	89	104
[1]Spokane	Latah Creek	8	46	59	70	83	97
[1]Whitman	Rock Creek	5	51	57	69	80	101

Table 80. Back-calculated lengths of speckled dace at each age in three Eastern Washington drainages (1. Scholz and McLellan 2010).

		Back-calculated TL (mm) at age				
County	Location	n	1	2	3	4
Stevens	Colville River	633	35	55	70	84
[1] Spokane	Latah Creek	16	33	55	71	-
[1] Whitman	Cottonwood Creek	46	30	50	79	-

Table 81. Back-calculated lengths of redside shiner at each age in four Eastern Washington drainages (1.Scholz and McLellan 2010).

		Back-calculated TL (mm) at age				
County	Location	n	1	2	3	4
Stevens	Colville River	63	55	85	109	-
[1] Lincoln	Crab Creek	12	55	75	106	-
[1] Spokane	Latah Creek	21	45	80	-	-
[1] Average growth		n/a	50	80	111	129

Table 82. Back-calculated lengths of tench at each age in four Eastern Washington drainages (1. Scholz and McLellan 2010; 2. Taylor 2000; 3. Barber et al 1989)

		Back-calculated TL (mm) at age				
County	Location	n	1	2	3	4
Stevens	Colville River	6	90	127	164	-
[1] Spokane	Clear Lake	58	78	120	171	203
[2] Adams/ Lincoln	Sprague Lake	47	77	139	201	266
[3] Pend Oreille	Box Canyon	84	114	151	186	226

Longnose sucker

Longnose sucker were only encountered in the Colville River, with the majority captured below Meyers Falls by electrofishing and minnow traps. Growth was slower than that of longnose sucker reported by Beeman et al (2003), Heaton (1992), and Nine (2005) (Table 83). Mean condition factor (TL) similar to that reported by Nine (2005).

Bridgelip sucker

Bridgelip suckers were caught in the Colville River, one was found in Stensgar Creek. They were encountered by electrofishing and seine netting. Growth was similar to another location in Eastern Washington (Scholz 2002) (Table 84).

Largescale sucker

Largescale suckers were caught in three streams, mainly the Colville River above Meyers Falls, by electrofishing and seine netting. Growth was similar to that of other largescale suckers population in Eastern Washington and Southern British Columbia (McLellan 2000; Fishers et al 2004; Scholz and McLellan 2010) (Table 85).Mean condition factor was higher than that reported by Rader et al (2006) in Bead Lake, Pend Oreille County. Annual mortality was calculated from age classes YOY to 3 years old.

Table 83. Back-calculated lengths of longnose sucker at each age in four Eastern Washington drainages (1. Beeman et al 2003; 2. Heaton 1992; 3. Nine 2005)

		Back-calculated TL (mm) at age			
County	Location	n	1	2	3
Stevens	Colville River	13	85	144	185
[1] Grant/Okanogan	Chief Joseph Reservoir	202	89	166	222
[2] Lincoln/ Stevens	Little Falls Reservoir	90	99	148	196
[3] Pend Oreille	Sullivan Lake	93	93	164	247

Table 84. Back-calculated lengths of bridgelip sucker at each age in two Eastern Washington drainages (1. Scholz 2002)

		Back-calculated TL (mm) at age		
County	Location	n	1	2
Stevens	Colville River	2	88	150
[1] Spokane	California Creek	76	81	134

Table 85. Back-calculated lengths of largescale sucker at each age in four drainages (1. Fishers et al 2004; 2. Scholz and McLellan 2010; 3. McLellan 2000)

		Back-calculated TL (mm) at age					
County	Location	n	1	2	3	4	5
Stevens	Colville River	10	82	160	237	324	403
[1] British Columbia	Skaha Lake	NR	46	76	164	170	180
[2] Whitman	Rock Lake	149	79	164	287	331	394
[3] Ferry/Lincoln/Stevens	Lake Roosevelt	281	85	156	237	321	401

Mountain Whitefish

Mountain whitefish were only captured below Meyers Falls by electrofishing with a majority being captured in the plunge pool directly below it in October. Most were ripe individuals expressing gamates so they likely represented a natural population that was attempting to spawn below the falls. Their large size indicates that they are possibly an adfluvial population that resides in Lake Roosevelt for most of the year. Growth was similar to other water bodies in Eastern Washington (Table 86).

Rainbow trout

Rainbow trout were found ubiquitously throughout the watershed. They were captured by all three sampling methods. Growth in the CRW is similar to other water bodies in Eastern Washington (Table 87).Mean condition factor (TL) falls into the good range reported by Carlander (1969). This indicates that habitat and food availability is adequate to support coastal rainbow trout in this watershed. Knowing the habitat can support this species is useful information for managers and stocking areas for recreational fishing.

Table 86. Back-calculated lengths of mountain whitefish at each age in four drainages (1. McLellan et al 2003, Scofield et al 2004, and Pavlik-Kunkel et al 2005; 2. Ashe and Scholz 2002; 3. Scholz and McLellan 2010)

			Back-calculated TL (mm) at age							
County	Location	n	1	2	3	4	5	6	7	8
			10	17	23	28	31	35	41	46
Stevens	Colville River	12	1	2	7	3	8	4	0	2
[1] Ferry/Lincoln/			10	19	25	31	35	37	35	38
Stevens	Lake Roosevelt	49	9	2	4	7	5	5	7	5
	Box Canyon	154	14	20	25	28	34	38	41	43
[2] Pend Oreille	Reservoir	0	9	6	0	5	1	1	3	5
[3] Spokane /	Long Lake			15	23	26				
Stevens	Reservoir	6	67	2	1	1				

Table 87. Back-calculated lengths of rainbow trout at each age in four Eastern Washington drainages (1. Scholz and McLellan 2010; Scholz et al 1985)

			Back-calculated TL (mm) at age								
County	Location	n	1	2	3	4	5	6	7	8	9
	Colville			16	23	29	36	43	49	53	58
Stevens	River	115	93	6	6	9	1	4	0	9	6
			19	26	29	30	35				
[1] Stevens	Deer Lake	32	5	0	5	3	2	-	-	-	-
[1] Ferry/	Lake	257	14	25	34	40	45	47			
Lincoln/Stevens	Roosevelt	5	4	0	4	6	5	0	-	-	-
				19							
[2] Spokane	Latah Creek	1	98	7	-	-	-	-	-	-	-

Redband trout

Redband trout were found in the most sites throughout the watershed but none were found below Meyers Falls. They were captured with all three sampling methods. Growth in the CRW is similar to other populations in Eastern Washington (Tab 88). Mean condition factor (TL) falls in the good range reported by Carlander (1969). This indicates that habitat and food availability is adequate to support interior rainbow trout in this watershed. Supporting the growth and distribution of interior rainbow trout vs. coastal is crucial because redband are native to this watershed and rainbow are introduced. Encouraging the growth of native species is more desirable than that of introduced species. Introductions do not always act as predicted and can alter ecosystem function.

Brown trout

Brown trout were found in the majority of the watershed, except above Douglas and Crystal Falls. They were encountered by all three sampling methods. Growth was similar to that reported by Ashe and Scholz (1992) in Tacoma Creek but slower than at other location in Eastern Washington. (Table 89). Mean condition factor (TL) falls into the good growth range reported by Carlander (1969). Many of the streams brown trout were found in were physically cooler than the Colville River suggesting they spend most of their time in this cool environment which allows them adequate time to put on weight as they grow. The major prey item of brown trout by weight was fish (>50%). The most interesting prey item was a vole (Rodentia:Cricetidae), which was the heaviest prey item by weight . Fish consumed include Cyprinidae, Salmonidae, Cottidae, and Centrachidae. The most fish from a single stomach were nine individuals. Black flies (Diptera:

Simuliidae) were the most abundant macroinvertebrate followed by spiny crawler mayflies (Ephemeroptera: Ephemerellidae). In all there were over 20 differentorders identified in brown trout stomachs.

Eastern brook trout

Eastern brook trout were found throughout the watershed, with abundances increasing over each barrier waterfall. They were captured by all three sampling methods. Growth was similar to other water bodies in Eastern Washington (Table 90).Mean condition factor falls into the good range reported by Carlander (1977). They were found to be closer to the high end of this range indicating that this watershed provides the right environment conducive for their growth. High abundance of brook trout in a stream indicates that the stream is likely cool (13-16°C) and well oxygenated (Scholz and McLellan 2010).

Prickly sculpin

Prickly sculpin were found throughout the watershed but not above either Douglass or Crystal Falls. They were captured by all three sampling methods. Ages were not determined for this species however comparing their growth to reported growths I conclude that they were ages 1-5 (Rickard 1980) (Table 91). Only one fish would be a 5 year old at over 160 mm (TL) the rest are all smaller than 110 mm.Diet of prickly sculpin was dominated by macroinvertebrates, with the dominate prey item being caddisflies (Trichoptera). Orders present are similar to that reported by Rickard (1980), Willms et al (1989), and Taylor (2000). Their diet had the highest overlap with redside shiner in the CRW.

Table 88. Back-calculated lengths of redband trout at each age in four Eastern Washington drainages (1. Scholz and McLellan 2010; Scholz et al 1985)

		Back-calculated TL (mm) at age					
County	Location	n	1	2	3	4	5
Stevens	Colville River	106	92	157	227	323	371
[1]Stevens	Deer Lake	32	195	260	295	303	352
[1]Ferry/ Lincoln/Stevens	Lake Roosevelt	2575	144	250	344	406	455
[2]Spokane	Latah Creek	1	98	197	-	-	-

Table 89. Back-calculated lengths of brown trout at each age in four Eastern Washington drainages (1.McLellan et al 2003, Scofield et al 2004, Pavlik – Kunkel et al 2005; 2. Uehara et al 1988; 3. Ashe and Scholz 1992)

		Back-calculated TL (mm) at age								
County	Location	n	1	2	3	4	5	6	7	8
Stevens	Colville River	135	93	167	240	293	361	411	476	521
[1]Ferry/Lincoln/Stevens	Lake Roosevelt	35	131	212	302	354	427	425	-	-
[2]Stevens	Chamokane Creek	59	104	198	285	373	429	-	-	-
[3]Pend Oreille	Tacoma Creek	132	93	164	212	-	-	-	-	-

Table 90. Back-calculated lengths of eastern brook trout at each age in four Eastern Washington drainages (1. McLellan et al 2003, Lee et al 2003, Scofield et al 2004; Ashe and Scholz 1992; 3. Scholz and McLellan 2010)

		Back-calculated TL (mm) at age					
County	Location	n	1	2	3	4	5
Stevens	Colville River	93	82	139	183	226	277
[1] Ferry/Lincoln/Stevens	Lake Roosevelt	21	166	243	-	-	-
[2] Pend Oreille	Tacoma Creek	180	78	123	198	-	-
[3] Spokane	Marshall Creek	157	97	163	206	284	318

Table 91. Back-calculated lengths of prickly sculpin at each age in Lake Washington (1. Rickard 1980)

		Back-calculated TL (mm) at age					
County	Location	n	1	2	3	4	5
[1]King	Lake Washington	1,099	42	89	110	128	147

Mottled Sculpin

Mottled sculpin were found throughout the entire watershed. They were collected by all three sampling methods. Ages were not determined for this species however comparing their growth to reported growths I conclude that they were ages 1-5 (Patten 1971, Zarbock 1952) (Table 92).Their diet was dominated by macroinvertebrates. Their diet was very similar to that reported by Scholz and McLellan (2010) who state that their diet consisted of stoneflies (Plecoptera), mayflies (Ephemeroptera), and caddisflies (Trichopterans). Interesting items found in mottled sculpin diet were detritus, rocks, and hair. The detritus and rocks likely came from caddisflies cases. Their diet had the highest overlap with prickly sculpin in this watershed.

Slimy sculpin

Only three individuals were collected, all were collectedlater in the year (October and November) and by electrofishing and seine net. Ages were not determined however comparing their lengths to reported ages I conclude that individuals ranged from 2 to 3 years. (Wydoski and Whitney 2003) (Table 93). All three individuals were >51 mm, so they were likely sexually mature since Wydoski and Whitney (2003) reported that sexually maturity in this species was reached by the time individuals reached 51 mm TL.

Torrent sculpin

Torrent sculpin were the most abundant sculpin species and were found distributed throughout the entire watershed, except above Crystal Falls. They were collected by all three sampling methods, with the majority captured by electrofishing. Age was not determined

however comparing their lengths to reported ages I conclude that individuals were 1 to 6 years old (Bond 1963) (Table 94). Their diet consisted mainly of macroinvertebrates. Insects found were similar to those reported by Northcote (1954). They also ate fish including minnows (Cyprinidae), trout (Salmonidae), and fish parts (bones, scales, etc). Fish and associated parts were only found in individuals 99 mm TL or greater. Items not previously reported in the diet of torrent sculpin were dragonflies (Odonata) and worms (Oligochaeta). Torrent sculpin diet overlapped with brown trout in the CRW (0.50 overlap coefficient) because both species were piscivorous.

Pumpkinseed

Pumpkinseed were found throughout the watershed expect above Douglas and Crystal Falls. They were captured by all three sampling methods. Growth rates were slower than other pumpkinseed populations in Eastern Washington (Table 95). Mean condition factor falls in the good range reported by Carlander (1977).

Yellow Perch

Yellow perch were mainly found in Jumpoff Joe Creek, with two found in the Colville River, one below and one above Meyers Falls. They were captured using electrofishing and minnow traps. Growth was found to be the same as that reported for Jumpoff Joe Lake (Diven and Phillips 1999). Yellow perch were stocked in Jumpoff Joe Lake in 1939 accounting for their presence in the CRW.

Fish distribution in eastern Washington

In total 28 species were described in 2013, expanding upon the known species in the CRW. Seventeen of the species were native: peamouth, northern pikeminnow, longnose dace, Umatilla dace, speckled dace, redside shiner, longnose sucker, bridgelip sucker, largescale sucker, mountain whitefish, westslope cutthroat trout, redband trout, prickly sculpin, mottled sculpin, slimy sculpin, shorthead sculpin, and torrent sculpin. Eleven species were non native; carp, tench, lake whitefish, coastal rainbow trout, brown trout, eastern brook trout, green sunfish, pumpkinseed, bluegill, largemouth bass, and yellow perch. Chinook salmon, redband steelhead trout, and pacific lamprey are native anadromous species that made use of the Colville River before Grand Coulee Dam blocked passage.This number is similar to that reported in other eastern Washington watersheds in the blocked area above Grand Coulee Dam. Lee (2005) described 11 species in the Latah (Hangman) Creek watershed but 19 species have been described historically (Scholz 2011). Thirteen of these species are native (chiselmouth, northern pikeminnow, longnose dace, speckled dace, redside shiner, longnose sucker, bridgelip sucker, rainbow trout, Chinook salmon, mottled sculpin, shorthead sculpin, and torrent sculpin) and six nonnative species (tench, brown bullhead, eastern brook trout, pumpkinseed, bluegill, and largemouth bass). McLellan (2004) described 21 species in the Little Spokane River with 28 species described historically in the watershed (Scholz 2011). Twenty of these species are native (chiselmouth, lake chub, peamouth, northern pikeminnow, longnose dace, Umatilla dace, speckled dace, redside shiner, longnose sucker, bridgelip sucker, largescale sucker, mountain whitefish, rainbow trout, kokanee, bull trout, prickly sculpin, mottled sculpin, slimy sculpin, shorthead sculpin, and torrent sculpin) and eleven of the species were nonnative (carp, tench, ,

brown trout, eastern brook trout, pumpkinseed, smallmouth bass, largemouth bass, and yellow perch). In the Kettle River Watershed 2829 species were described (Scholz 2011) sixteen of them native (chiselmouth, northern pikeminnow, longose dace, speckled dace, redside shiner, longnose sucker, bridgelip sucker, largescale sucker, pygmy whitefish, mountain whitefish, cutthroat trout, rainbow trout, kokanee, mottled sculpin, slimy sculpin, and torrent sculpin) and twelve nonnative (carp, tench, white sucker, yellow bullhead, brown bullhead, brown trout, eastern brook trout, pumpkinseed, bluegill, largemouth bass, black crappie, and yellow perch). Scholz (2011) reported that 31 species of fishes are known in the Pend Oreille drainage, 13 native species (chiselmouth, lake chub, peamouth, northern pikeminnow, redside shiner, longnose sucker, largescale sucker, mountain whitefish, cutthroat, rainbow trout, kokanee, bull trout, and slimy sculpin) and 18 nonnative: (goldfish, tench, black bullhead, brown bullhead, redfin pickerel, northern pike, lake whitefish, cutthroat rainbow hybrid, brown trout, eastern brook trout, lake trout, tiger trout, pumpkinseed, smallmouth bass, largemouth bass, black crappie, yellow perch , and walleye).

The Kettle River (2,928(±739) CFS annually) and Pend Oreille River (25,044 (±6,140) CFS annually) are larger rivers than the Colville River (307(±138) CFS annually), and the Little Spokane (302(±98) CFS annually) and Latah (232 (±116) CFS annually) Watersheds are approximately the same size as the Colville.

Table 92. Back-calculated lengths of mottled sculpin at each age in two watersheds(1. Patten 1971; 2. Zarbock 1952)

		Back-calculated TL (mm) at age				
Location	n	1	2	3	4	5
[1]Montana	NC	43	66	81	97	-
[2]Logan River, UT	NC	36-53	46-84	56-109	71-119	91-130

Table 93. Back-calculated lengths of slimy sculpin at each age (1. Wydoski and Whitney 2003)

		Back-calculated TL (mm) at age				
County	Location	n	1	2	3	4
[1]N/A	N/A	NC	36	41	53	84

Table 94. Back-calculated lengths of torrent sculpin at each age (1. Bond 1963).

Back-calculated TL (mm) at age						
n	1	2	3	4	5	6
[1]NC	38	53	63	66	84	94

Table 95. Back-calculated lengths of pumpkinseed at each age in three water bodies (1. McLellan et al; 2. 2006Divens and Phillips 1999)

		Back-calculated TL (mm) at age		
County	Location	n	1	2
Stevens	Colville River	29	44	64
[1] Stevens	Deer Lake	48	47	93
[2] Spokane	Silver Lake	26	32	63

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Appendix A Synoptic list of species by stream

Table A-1. Synoptic list of species found in each stream in 2013, their abundance (n), and minimum and maximum lengths and weights associated with that stream. The Colville River, Mill Creek, and Little Pend Orielle River have been split up to show composition above and below the waterfalls (page 1 of 6).

			Length		Weight	
Stream	**Species**	**n**	**Min**	**Max**	**Min**	**Max**
Colville River (Below Meyers Falls)	carp	149	46	103	1	17
	peamouth	1	83	83	5	5
	Umatilla dace	163	29	115	1	15
	speckled dace	41	25	96	1	10
	redside shiner	27	44	125	1	21
	tench	2	96	150	12	53
	longnose sucker	62	62	201	2	170
	bridgelip sucker	1	186	186	79	79
	lake whitefish	1	446	446	1134	1134
	mountain whitefish	12	180	488	44	645
	westslope cutthroat trout	1	294	294	257	257
	rainbow trout	44	125	615	24	2222
	brown trout	47	121	555	16	2124
	eastern brook trout	4	254	315	128	261
	prickly sculpin	60	36	162	1	71
	mottled sculpin	26	44	78	1	7
	slimy sculpin	2	66	81	4	7
	shorthead sculpin	46	32	95	1	13
	torrent sculpin	30	32	102	1	15
	green sunfish	1	84	84	7	7
	pumpkinseed	1	70	70	6	6

Stream	Species	n	Length		Weight	
			Min	Max	Min	Max
Colville River (Below Meyers Falls)	largemouth bass	1	251	251	219	219
	yellow perch	1	94	94	20	20
Colville River (Above Meyers Falls)	northern pikeminnow	10	39	131	2	20
	longnose dace	77	30	109	1	14
	speckled dace	533	16	95	1	11
	redside shiner	491	19	125	1	20
	tench	4	67	123	4	26
	longnose sucker	12	38	205	1	92
	bridgelip sucker	2	114	125	14	19
	largescale sucker	49	34	432	1	1026
	rainbow trout	3	172	201	42	68
	redband trout	39	62	254	2	156
	brown trout	18	59	385	2	715
	eastern brook trout	3	179	181	43	49
	prickly sculpin	46	43	105	1	14
	mottled sculpin	13	45	122	1	26
	torrent sculpin	56	35	122	1	29
	pumpkinseed	24	51	93	3	15
	bluegill	1	69	69	6	6
	yellow perch	1	71	71	3	3
Gold Creek	longnose dace	1	111	111	11	11
	rainbow trout	73	35	229	1	61
	redband trout	58	46	222	1	106
	brown trout	1	89	89	7	7
	eastern brook trout	18	45	204	1	60
Mill Creek (Below Meyers Falls)	longnose dace	10	84	105	6	11
	rainbow trout	12	56	312	2	304

Stream	Species	n	Length		Weight	
			Min	Max	Min	Max
Mill Creek (Below Meyers Falls)	redband trout	44	35	247	2	153
	brown trout	71	56	501	1	1136
	eastern brook trout	7	85	246	6	132
	mottled sculpin	6	36	100	1	14
	torrent sculpin	21	20	115	4	21
Mill Creek (Above Meyers Falls)	rainbow trout	10	68	236	3	137
	redband trout	1	131	131	23	23
	eastern brook trout	77	35	192	1	72
	mottled sculpin	1	94	94	14	14
	torrent sculpin	4	61	116	3	31
Clugston Creek	eastern brook trout	9	64	143	2	28
Haller Creek	rainbow trout	2	106	109	12	13
	redband trout	8	92	192	8	71
	eastern brook trout	6	160	241	38	135
	torrent sculpin	3	80	131	4	24
Spratt Creek	eastern brook trout	25	46	181	1	52
Little Pend Orielle River (Below Crystal Falls)	northern pikeminnow	1	85	85	7	7
	longnose dace	55	36	131	1	23
	redside shiner	10	74	102	4	10
	westslope cutthroat trout	1	274	274	166	166
	rainbow trout	24	91	245	7	135
	redband trout	16	59	392	3	656
	brown trout	3	72	328	3	393
	eastern brook trout	43	71	247	4	150
	prickly sculpin	3	44	88	1	9
	mottled sculpin	23	37	97	1	12
Little Pend Orielle River (Below Crystal Falls)	slimy sculpin	1	88	88	9	9

Stream	Species	n	Length		Weight	
			Min	Max	Min	Max
	torrent sculpin	16	30	140	1	42
	pumpkinseed	19	49	82	2	12
Little Pend Orielle River (Above Crystal Falls)	speckled dace	57	48	85	1	7
	redside shiner	22	44	115	1	9
	rainbow trout	13	60	223	2	94
	redband trout	15	58	198	2	69
	eastern brook trout	108	55	191	1	72
	mottled sculpin	7	66	112	3	19
Bear Creek	eastern brook trout	24	52	178	1	53
Stranger Creek	rainbow trout	16	52	201	1	77
	redband trout	100	40	139	1	26
	brown trout	2	60	63	2	3
	eastern brook trout	7	78	160	5	39
Stensgar Creek	speckled dace	1	59	59	4	4
	bridgelip sucker	1	192	192	75	75
	largescale sucker	1	198	198	94	94
	rainbow trout	10	64	263	4	195
	redband trout	1	108	108	15	15
	brown trout	1	282	282	274	274
	torrent sculpin	23	55	111	2	20
Blue Creek	tench	1	100	100	13	13
	rainbow trout	17	35	149	1	28
	redband trout	37	24	200	2	82
	brown trout	2	68	70	3	4
	torrent sculpin	8	78	99	7	14
Paye Creek	rainbow trout	6	72	118	4	17
Paye Creek	redband trout	1	131	131	25	25

Stream	Species	n	Length		Weight	
			Min	Max	Min	Max
	eastern brook trout	3	122	175	17	59
	torrent sculpin	13	32	95	1	10
Chewelah Creek	longnose dace	2	77	79	4	5
	rainbow trout	26	77	222	5	101
	redband trout	29	49	192	2	74
	brown trout	135	40	455	1	1028
	eastern brook trout	28	67	184	3	62
	prickly sculpin	7	44	93	1	11
	mottled sculpin	21	37	120	1	29
	torrent sculpin	50	19	150	1	53
Thomanson Creek	rainbow trout	1	89	89	6	6
	redband trout	4	109	130	9	22
	eastern brook trout	35	26	173	1	68
Sherwood Creek	speckled dace	1	65	65	3	3
	redside shiner	1	106	106	12	12
	rainbow trout	3	85	140	10	28
	redband trout	4	100	127	12	23
	brown trout	16	53	148	3	39
	eastern brook trout	13	29	201	1	80
Sherwood Creek	torrent sculpin	23	69	120	5	27
	pumpkinseed	1	68	68	5	5
Cottonwood Creek	rainbow trout	26	102	215	9	99
	redband trout	25	50	156	1	36
	brown trout	20	49	310	1	310
	eastern brook trout	9	67	203	3	86
	prickly sculpin	5	32	77	1	6
Cottonwood Creek	mottled sculpin	3	39	117	1	23

Stream	Species	n	Length		Weight	
			Min	Max	Min	Max
	torrent sculpin	9	30	89	1	9
Huckleberry Creek	rainbow trout	33	46	196	1	80
	redband trout	65	43	195	1	67
	eastern brook trout	38	49	231	1	112
	torrent sculpin	1	73	73	5	5
Jumpoff Joe Creek	brown trout	5	68	74	1	3
	pumpkinseed	2	59	61	3	4
	bluegill	2	69	71	7	7
	yellow perch	19	33	66	1	4
Sheep Creek	redside shiner	41	80	125	5	18
	tench	5	81	182	9	96
	brown trout	24	55	161	2	42
	eastern brook trout	7	87	244	6	111
	rainbow trout	4	114	159	13	34
	redband trout	39	66	246	3	155
	prickly sculpin	3	39	75	1	5
	mottled sculpin	1	35	35	1	1
Sheep Creek	torrent sculpin	17	32	126	1	30
	pumpkinseed	1	91	91	14	14
Deer Creek	largescale sucker	2	118	132	15	20
	rainbow trout	23	61	231	2	126
	redband trout	124	32	267	1	160
	brown trout	1	97	97	9	9
	eastern brook trout	12	83	219	5	104
	mottled sculpin	10	41	135	1	18
	torrent sculpin	53	30	129	1	22

Appendix B Location of each site

Table B-1. Sampled sites and their associated coordinate system (page 1 of 2).

Site #	Stream	Longitude	Latitude
1	Colville River	-118.08685	48.57299
2	Colville River	-118.08488	48.57236
3	Colville River	-118.07175	48.57493
4	Colville River	-118.06266	48.584
5	Colville River	-118.061102	48.594325
6	Colville River	-117.985406	48.585602
7	Colville River	-117.96875	48.57902
8	Colville River	-117.9471	48.5668
9	Colville River	-117.93189	48.54329
10	Colville River	-117.9048	48.4909
11	Colville River	-117.88828	48.46023
12	Colville River	-117.85423	48.40307
13	Colville River	-117.83719	48.34849
14	Colville River	-117.8195	48.3199
15	Colville River	-117.77454	48.29473
16	Colville River	-117.715242	48.260545
17	Colville River	-117.7417	48.2063
18	Colville River	-117.730053	48.176904
19	Colville River	-117.736014	48.150566
20	Gold Creek	-117.96324	48.57409
21	Gold Creek	-117.96691	48.5713
22	Gold Creek	-117.96342	48.57347
23	Mill Creek	-117.940649	48.579734
24	Mill Creek	-117.93372	48.59386
25	Clugston Creek	-117.88953	48.68686
26	Mill Creek	-117.900078	48.614505
27	Mill Creek	-117.89963	48.61353
28	Mill Creek	-117.73041	48.683431
29	Mill Creek	-117.75381	48.62307
30	Mill Creek	-117.69543	48.60531
31	Haller Creek	-117.92808	48.45739
32	Spratt Creek	-118.024004	48.451699
33	Little Pend Oreille River	-117.8799	48.46014
34	Little Pend Oreille River	-117.83694	48.4762
35	Little Pend Oreille River	-117.75999	48.46016
36	Little Pend Oreille River	-117.73219	48.46016

Site #	Stream	Longitude	Latitude
37	Bear Creek	-117.67597	48.44158
38	Little Pend Oreille River	-117.68642	48.47537
39	Little Pend Oreille River	-117.66073	48.50919
40	Little Pend Oreille River	-117.657209	48.512209
41	Little Pend Oreille River	-117.6163	48.53217
42	Little Pend Oreille River	-117.6263	48.53014
43	Little Pend Oreille River	-117.57528	48.54403
44	Stranger Creek	-117.97323	48.41153
45	Stensgar Creek	-117.83775	48.34845
46	Stensgar Creek	-117.8531	48.34973
47	Blue Creek	-117.82045	48.31921
48	Blue Creek	-117.82037	48.31948
49	Paye Creek	-117.72377	48.28564
50	Chewelah Creek	-117.7248	48.26072
51	Chewelah Creek	-117.71301	48.28454
52	Chewelah Creek	-117.72862	48.2981
53	Chewelah Creek	-117.738828	48.33439
54	Chewelah Creek	-117.59637	48.386805
55	Chewelah Creek	-117.58669	48.34982
56	Thomanson Creek	-117.69803	48.27559
57	Sherwood Creek	-117.68688	48.25078
58	Sherwood Creek	-117.68878	48.25008
59	Cottonwood Creek	-117.63694	48.20275
60	Cottonwood Creek	-117.60764	48.19525
61	Huckleberry Creek	-117.76512	48.20312
62	Huckleberry Creek	-117.79096	48.21706
63	Huckleberry Creek	-117.90864	48.22253
64	Jump Off Joe Creek	-117.706216	48.143719
65	Jump Off Joe Creek	-117.70416	48.14286
66	Sheep Creek	-117.76512	48.11448
67	Sheep Creek	-117.750664	48.057172
68	Deer Creek	-117.770248	48.116794
69	Deer Creek	-117.78785	48.11472

Appendix C Umatilla Dace

Two images showing the identified Umatilla dace. Image C-1 shows the full body of the Umatilla dace and Image C-2 shows the pelvic fin stay characteristic used to positively identify this species.

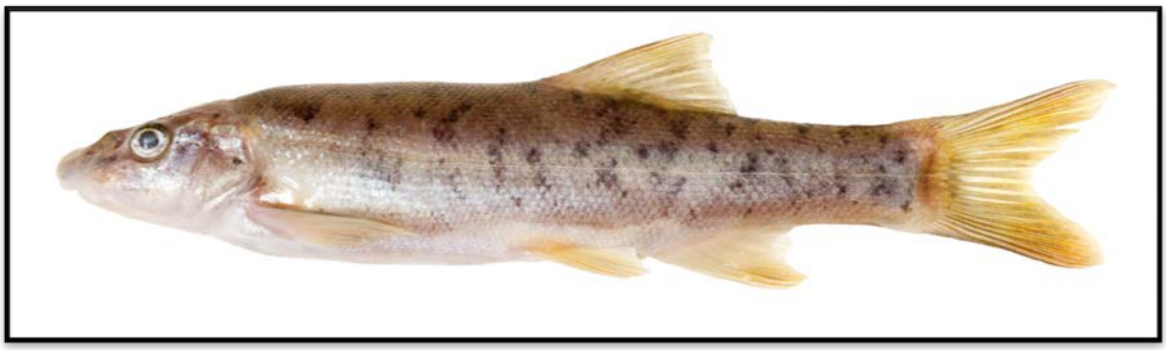

Image C-1. Umatilla dace found in the Colville River Watershed, Stevens County, WA. 2013

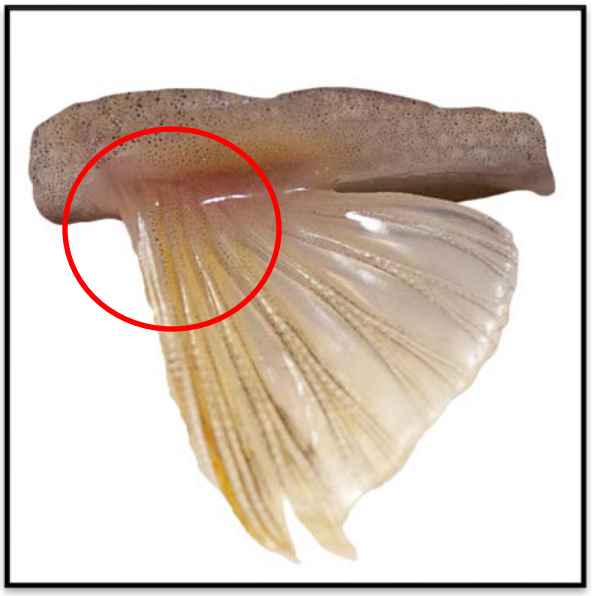

Image C-2. Pelvic fin of Umatilla dace. The pelvic fin stay is circled in red.

LIFE HISTORY OF UMATILLA DACE (*RHINICHTHYS UMATILLA*) IN THE COLVILLE RIVER

Umatilla Dace (*Rhinichthys umatilla)* were first described in the Columbia River Umatilla, Oregon (Gilbert and Everman 1894). However, prior to 2004 most taxonomists considered them a subspecies of Speckled Dace (*Rhinichthys osculus)*. Based on morphological work by Peden and Hughes (1988) and genetic work by Haas (2001) they were finally recognized as a valid species by the American Fisheries Society and American Society of Ichthyologists and Herpetologists (Nelson et al 2004). Geographically they have a patchy distribution in the Columbia River drainage (Wydoski and Whitney 2003; Scholz and McLellan 2010). Umatilla Dace specimens from the Colville River, Stevens County, Washington were preserved at the Royal British Columbia Museum (Peden and Hughes 1988). Here we report on the life history of the Umatilla Dace, the first publication to do so in the United States. Previously, the only data available about life history of the Umatilla Dace was from the British Columbia populations (McPhail 2007, COSEWIC 2010).

The Colville River meanders 85 RKM from its headwaters to its confluence with the Columbia River at RKM 1120. Meyers Falls, 8 RKM upstream of the confluence, is an impassable fish barrier, 24 m high, on the Colville River. Sampling occurred from May-November of 2013 and included backpack electrofishing, seine netting, and minnow traps. We sampled 69 sites, 19 sites on the Colville River (14 above Meyers Falls and 5 below) and 50 sites on the tributaries that entered the Colville River above Meyers Falls.

Umatilla Dace (n=163) were identified using the taxonomic key of Wydoski and Whitney (2003) and Scholz and McLellan (2009; 2010). They comprised 3.8% of the

4314 fishes collected in the Colville River Watershed by Mettler (2014). All Umatilla Dace were collected below Meyers Falls. We collected data on total length (TL in mm), weight (g), and calculated condition factor for each individual sampled. We collected scales from a subsample (n=45) to investigate age and growth (Murphy and Willis 1996). An age/length key was constructed to examine abundance by cohort (Murphy and Willis 1996). Total length (TL) at age was backcalculated from using the direct proportions methods (Le Cren 1974). Stomach contents of Umatilla Dace were collected to analyze diet. We determined the frequency of occurrence, numerical frequency, and weight frequency of each food item in the diet and combined these values to determine index of relative importance (Murphy and Willis 1996). Egg skeins were collected to analyze fecundity. We plotted fecundity against total length and weight and conducted regression analyses to determine the total length/fecundity and weight/fecundity relationship.

The mean (SD) TL, weight, and condition factor (cf) of Umatilla Dace was 79 (21) mm, 6 (4) g, and 1.06 (0.28) c.f. respectively. Individuals were aged at 1+ (n=6), 2+ (n=15), 3+ (n=15), and 4+ (n=9). The age/length key indicated that the number of individuals in the populations were: age 0+ (n=43), 1+ (n= 17), 2+ (n= 37), 3+ (n=45), and 4+ (n=21) . Backcalculated total lengths of each cohort are shown in. The average backcalculated TL was 45 mm (age 1), 64 mm (age 2), 84 mm (age 3), and 101 mm (age 4). We measured total length (TL), fork length (FL), and standard length (SL) to provide conversions: multiple SL by 1.18 and FL by 1.08 to get TL and multiple TL by 0.85 to get SL and 0.92 to get FL.

Diet was comprised mainly of benthic macroinvertebrates. The primary order identified were caddisflies (Trichoptera). Detritus and rocks found in the diet were of

sizes consistent with those found in caddisfly cases, and the majority of macroinvertebrate parts resembled caddisfly appendages. IRI values indicated that macroinvertebrate parts and detritus were the most important items in the diet.

Average (range) fecundity (n=18) was 1,259 (474 to 2,145) eggs in females that averaged 104 (86 to 115) mm TL and 11.5 (5 to 15) g. Total length was a better predictor of fecundity (R^2=0.5574, p <0.001, t=4.489, and f-ratio=20.152) than weight (R^2=0.4681, p=0.002, t=3.753, and f-ratio=14.081).

McPhail (2007) reported that the maximum age and growth of Umatilla Dace in British Columbia was 5 years and 119 mm SL (140 mm TL), and that individuals rarely surpassed 30 mm SL (35 mm TL) by age 1. In contrast Umatilla Dace in the Colville River grew to 45 mm TL at age 1. The differences in growth may be related to either water temperature (which presumably is warmer in the Colville River than British Columbia Rivers because it is geographically further south) or differences in food availability in British Columbia and Colville watersheds. The diet of Umatilla Dace in the Colville River (n=25) was comprised primarily of caddisflies while in British Columbia it was comprised mainly of mayflies (Ephemeroptera) and midges (Chironomidae) (COSEWIC 2010). Fecundity ranged from 300-2,000 eggs in females 80-115 mm FL (86-124 mm TL) (COSEWIC 2010) which was similar to Umatilla Dace in the Colville River (474-2,145 eggs in females 86-115 mm TL).

Appendix D Complete stocking record

Table D-1. Site, year, species, and total number stocked of fish species in 15 streams and two lakes in the Colville River Watershed, Stevens County, WA. (page 1 of 19)

Release Site	Year	SpeciesName	TOTAL
BEAR CREEK	1989	EASTERN BROOK TROUT	989
BEAR CREEK	1990	EASTERN BROOK TROUT	1064
BEAR CREEK	1991	EASTERN BROOK TROUT	998
BEAR CREEK	1992	EASTERN BROOK TROUT	1001
BEAR CREEK	1938	CUTTHROAT	32500
BEAR CREEK	1941	CUTTHROAT	42524
BEAR CREEK	1942	RAINBOW TROUT	19992
BEAR CREEK	1946	RAINBOW TROUT	22634
BEAR CREEK	1947	RAINBOW TROUT	23983
BEAR CREEK	1951	RAINBOW TROUT	1404
BEAR CREEK	1952	RAINBOW TROUT	1000
BEAR CREEK	1955	RAINBOW TROUT	2370
BEAR CREEK	1963	EASTERN BROOK TROUT	500
BEAR CREEK	1979	EASTERN BROOK TROUT	1400
BEAR CREEK	1980	EASTERN BROOK TROUT	900
BEAR CREEK	1981	EASTERN BROOK TROUT	2000
BLUE CREEK	1984	RAINBOW TROUT	2015
BLUE CREEK	1985	RAINBOW TROUT	2000
CHEWELAH CREEK	1986	EASTERN BROOK TROUT	740
CHEWELAH CREEK	1987	EASTERN BROOK TROUT	3040
CHEWELAH CREEK	1933	EASTERN BROOK TROUT	30000
CHEWELAH CREEK	1934	EASTERN BROOK TROUT	40000
CHEWELAH CREEK	1935	EASTERN BROOK TROUT	20000
CHEWELAH CREEK	1936	RAINBOW TROUT	21000
CHEWELAH CREEK	1936	STEELHEAD	15000
CHEWELAH CREEK	1936	EASTERN BROOK TROUT	26000
CHEWELAH CREEK	1936	EASTERN BROOK TROUT	24000
CHEWELAH CREEK	1936	EASTERN BROOK TROUT	15000
CHEWELAH CREEK	1936	EASTERN BROOK TROUT	7000
CHEWELAH CREEK	1936	EASTERN BROOK TROUT	3500
CHEWELAH CREEK	1936	EASTERN BROOK TROUT	8000
CHEWELAH CREEK	1937	EASTERN BROOK TROUT	30000
CHEWELAH CREEK	1937	EASTERN BROOK TROUT	30000
CHEWELAH CREEK	1937	EASTERN BROOK TROUT	20000
CHEWELAH CREEK	1937	RAINBOW TROUT	35200
CHEWELAH CREEK	1938	EASTERN BROOK TROUT	30250

Release Site	Year	SpeciesName	TOTAL
CHEWELAH CREEK	1938	EASTERN BROOK TROUT	20000
CHEWELAH CREEK	1938	RAINBOW TROUT	22750
CHEWELAH CREEK	1938	EASTERN BROOK TROUT	30000
CHEWELAH CREEK	1938	RAINBOW TROUT	2000
CHEWELAH CREEK	1939	EASTERN BROOK TROUT	15100
CHEWELAH CREEK	1939	RAINBOW TROUT	10000
CHEWELAH CREEK	1939	RAINBOW TROUT	2991
CHEWELAH CREEK	1940	RAINBOW TROUT	29980
CHEWELAH CREEK	1940	RAINBOW TROUT	4995
CHEWELAH CREEK	1941	EASTERN BROOK TROUT	33550
CHEWELAH CREEK	1941	RAINBOW TROUT	30470
CHEWELAH CREEK	1942	RAINBOW TROUT	19469
CHEWELAH CREEK	1943	RAINBOW TROUT	14412
CHEWELAH CREEK	1943	RAINBOW TROUT	14412
CHEWELAH CREEK	1944	RAINBOW TROUT	31491
CHEWELAH CREEK	1945	RAINBOW TROUT	35000
CHEWELAH CREEK	1946	RAINBOW TROUT	23160
CHEWELAH CREEK	1947	RAINBOW TROUT	14988
CHEWELAH CREEK	1952	RAINBOW TROUT	2500
CHEWELAH CREEK	1952	RAINBOW TROUT	1500
CHEWELAH CREEK	1953	RAINBOW TROUT	5117
CHEWELAH CREEK	1954	RAINBOW TROUT	5970
CHEWELAH CREEK	1961	RAINBOW TROUT	5000
CHEWELAH CREEK	1962	EASTERN BROOK TROUT	3155
CHEWELAH CREEK	1965	RAINBOW TROUT	1000
CHEWELAH CREEK	1966	EASTERN BROOK TROUT	480
CHEWELAH CREEK	1970	RAINBOW TROUT	1200
CHEWELAH CREEK	1977	BROWN TROUT	210
CHEWELAH CREEK	1979	EASTERN BROOK TROUT	1400
CLUGSTON CREEK	1947	RAINBOW TROUT	7985
CLUGSTON CREEK	1958	EASTERN BROOK TROUT	1020
COLVILLE RIVER	1981	BROWN TROUT	5110
COLVILLE RIVER	1982	BROWN TROUT	5035
COLVILLE RIVER	1933	STEELHEAD	49300
COLVILLE RIVER	1933	CUTTHROAT	20000
COLVILLE RIVER	1934	EASTERN BROOK TROUT	40000
COLVILLE RIVER	1934	RAINBOW TROUT	30000
COLVILLE RIVER	1934	STEELHEAD	21400
COLVILLE RIVER	1935	RAINBOW TROUT	20000
COLVILLE RIVER	1935	STEELHEAD	30425

Release Site	Year	SpeciesName	TOTAL
COLVILLE RIVER	1935	RAINBOW TROUT	10500
COLVILLE RIVER	1936	CUTTHROAT	15410
COLVILLE RIVER	1936	RAINBOW TROUT	8000
COLVILLE RIVER	1936	RAINBOW TROUT	20000
COLVILLE RIVER	1936	RAINBOW TROUT	7500
COLVILLE RIVER	1937	RAINBOW TROUT	13200
COLVILLE RIVER	1937	RAINBOW TROUT	60000
COLVILLE RIVER	1937	CUTTHROAT	31437
COLVILLE RIVER	1937	RAINBOW TROUT	10560
COLVILLE RIVER	1939	RAINBOW TROUT	19992
COLVILLE RIVER	1943	EASTERN BROOK TROUT	13703
COLVILLE RIVER	1943	RAINBOW TROUT	38667
COLVILLE RIVER	1944	RAINBOW TROUT	18126
COLVILLE RIVER	1944	RAINBOW TROUT	11548
COLVILLE RIVER	1945	RAINBOW TROUT	1000
COLVILLE RIVER	1946	RAINBOW TROUT	17050
COLVILLE RIVER	1947	RAINBOW TROUT	15002
COLVILLE RIVER	1947	RAINBOW TROUT	12624
COLVILLE RIVER	1948	RAINBOW TROUT	10357
COLVILLE RIVER	1949	RAINBOW TROUT	2378
COLVILLE RIVER	1949	RAINBOW TROUT	2716
COLVILLE RIVER	1949	RAINBOW TROUT	3350
COLVILLE RIVER	1951	RAINBOW TROUT	10076
COLVILLE RIVER	1952	BROWN TROUT	5750
COLVILLE RIVER	1952	BROWN TROUT	11160
COLVILLE RIVER	1953	BROWN TROUT	31673
COLVILLE RIVER	1953	BROWN TROUT	19734
COLVILLE RIVER	1961	RAINBOW TROUT	5000
COLVILLE RIVER	1963	RAINBOW TROUT	11880
COLVILLE RIVER	1970	RAINBOW TROUT	300
COLVILLE RIVER	1980	BROWN TROUT	5075
COLVILLE RIVER	1981	BROWN TROUT	5110
COTTONWOOD CREEK	1986	EASTERN BROOK TROUT	1480
COTTONWOOD CREEK	1934	EASTERN BROOK TROUT	10000
COTTONWOOD CREEK	1935	EASTERN BROOK TROUT	10000
COTTONWOOD CREEK	1936	EASTERN BROOK TROUT	15000
COTTONWOOD CREEK	1937	EASTERN BROOK TROUT	15000
COTTONWOOD CREEK	1938	EASTERN BROOK TROUT	15000
COTTONWOOD CREEK	1938	RAINBOW TROUT	2000
COTTONWOOD CREEK	1939	RAINBOW TROUT	4995

Release Site	Year	SpeciesName	TOTAL
COTTONWOOD CREEK	1939	RAINBOW TROUT	2994
COTTONWOOD CREEK	1940	RAINBOW TROUT	29988
COTTONWOOD CREEK	1941	RAINBOW TROUT	35975
COTTONWOOD CREEK	1942	RAINBOW TROUT	16487
COTTONWOOD CREEK	1943	RAINBOW TROUT	14980
COTTONWOOD CREEK	1944	EASTERN BROOK TROUT	15989
COTTONWOOD CREEK	1945	EASTERN BROOK TROUT	9980
COTTONWOOD CREEK	1947	EASTERN BROOK TROUT	9700
COTTONWOOD CREEK	1954	EASTERN BROOK TROUT	5000
COTTONWOOD CREEK	1955	EASTERN BROOK TROUT	2200
COTTONWOOD CREEK	1957	EASTERN BROOK TROUT	4400
COTTONWOOD CREEK	1958	EASTERN BROOK TROUT	800
COTTONWOOD CREEK	1960	EASTERN BROOK TROUT	2861
COTTONWOOD CREEK	1961	EASTERN BROOK TROUT	2750
COTTONWOOD CREEK	1965	RAINBOW TROUT	1000
DEER CREEK	1982	EASTERN BROOK TROUT	8960
DEER CREEK	1982	EASTERN BROOK TROUT	8960
DEER CREEK	1982	EASTERN BROOK TROUT	6608
DEER CREEK	1982	RAINBOW TROUT	7560
DEER CREEK	1982	RAINBOW TROUT	8400
DEER CREEK	1982	EASTERN BROOK TROUT	10230
DEER CREEK	1983	RAINBOW TROUT	36300
DEER CREEK	1983	RAINBOW TROUT	12980
DEER CREEK	1983	RAINBOW TROUT	10032
DEER CREEK	1983	RAINBOW TROUT	10065
DEER CREEK	1984	RAINBOW TROUT	45570
DEER CREEK	1984	RAINBOW TROUT	51200
DEER CREEK	1984	RAINBOW TROUT	6678
DEER CREEK	1984	RAINBOW TROUT	8060
DEER CREEK	1984	EASTERN BROOK TROUT	5320
DEER CREEK	1984	EASTERN BROOK TROUT	5396
DEER CREEK	1984	EASTERN BROOK TROUT	4392
DEER CREEK	1984	RAINBOW TROUT	7701
DEER CREEK	1984	RAINBOW TROUT	7950
DEER CREEK	1985	RAINBOW TROUT	56520
DEER CREEK	1985	RAINBOW TROUT	45900
DEER CREEK	1985	RAINBOW TROUT	20010
DEER CREEK	1985	RAINBOW TROUT	6156
DEER CREEK	1985	RAINBOW TROUT	1606
DEER CREEK	1986	RAINBOW TROUT	50315

Release Site	Year	SpeciesName	TOTAL
DEER CREEK	1986	RAINBOW TROUT	15000
DEER CREEK	1988	RAINBOW TROUT	6182
DEER CREEK	1988	RAINBOW TROUT	6160
DEER CREEK	1988	RAINBOW TROUT	7205
DEER CREEK	1988	EASTERN BROOK TROUT	35316
DEER CREEK	1989	RAINBOW TROUT	9520
DEER CREEK	1989	RAINBOW TROUT	9312
DEER CREEK	1989	RAINBOW TROUT	8547
DEER CREEK	1990	RAINBOW TROUT	10098
DEER CREEK	1990	RAINBOW TROUT	11055
DEER CREEK	1990	RAINBOW TROUT	11514
DEER CREEK	1990	RAINBOW TROUT	12379
DEER CREEK	1991	RAINBOW TROUT	30395
DEER CREEK	1991	RAINBOW TROUT	21000
DEER CREEK	1992	RAINBOW TROUT	3038
DEER CREEK	1992	RAINBOW TROUT	7500
DEER CREEK	1992	RAINBOW TROUT	7700
DEER CREEK	1992	RAINBOW TROUT	6817
DEER CREEK	1992	RAINBOW TROUT	8000
DEER CREEK	1993	RAINBOW TROUT	7042
DEER CREEK	1993	RAINBOW TROUT	6975
DEER CREEK	1994	RAINBOW TROUT	6325
DEER CREEK	1994	RAINBOW TROUT	7931
GOLD CREEK	1982	EASTERN BROOK TROUT	1100
GOLD CREEK	1981	EASTERN BROOK TROUT	2000
HALLER CREEK	1943	EASTERN BROOK TROUT	9999
HALLER CREEK	1945	RAINBOW TROUT	8000
HALLER CREEK	1971	EASTERN BROOK TROUT	1950
HUCKLEBERRY CREEK	1945	EASTERN BROOK TROUT	6740
HUCKLEBERRY CREEK	1946	RAINBOW TROUT	51176
HUCKLEBERRY CREEK	1947	EASTERN BROOK TROUT	9800
HUCKLEBERRY CREEK	1947	RAINBOW TROUT	9992
HUCKLEBERRY CREEK	1954	EASTERN BROOK TROUT	5200
HUCKLEBERRY CREEK	1955	EASTERN BROOK TROUT	3520
HUCKLEBERRY CREEK	1958	EASTERN BROOK TROUT	800
HUCKLEBERRY CREEK	1958	EASTERN BROOK TROUT	1600
HUCKLEBERRY CREEK	1958	EASTERN BROOK TROUT	800
HUCKLEBERRY CREEK	1960	EASTERN BROOK TROUT	2070
HUCKLEBERRY CREEK	1967	EASTERN BROOK TROUT	825
JUMP OFF JOE LAKE	1954	RAINBOW TROUT	30010

Release Site	Year	SpeciesName	TOTAL
JUMP OFF JOE LAKE	1955	RAINBOW TROUT	12600
JUMP OFF JOE LAKE	1955	RAINBOW TROUT	5000
JUMP OFF JOE LAKE	1955	RAINBOW TROUT	5040
JUMP OFF JOE LAKE	1955	RAINBOW TROUT	7500
JUMP OFF JOE LAKE	1955	RAINBOW TROUT	350
JUMP OFF JOE LAKE	1956	RAINBOW TROUT	35000
JUMP OFF JOE LAKE	1957	RAINBOW TROUT	6000
JUMP OFF JOE LAKE	1957	RAINBOW TROUT	18970
JUMP OFF JOE LAKE	1958	RAINBOW TROUT	1100
JUMP OFF JOE LAKE	1958	RAINBOW TROUT	25200
JUMP OFF JOE LAKE	1959	RAINBOW TROUT	75200
JUMP OFF JOE LAKE	1960	RAINBOW TROUT	75400
JUMP OFF JOE LAKE	1960	RAINBOW TROUT	15000
JUMP OFF JOE LAKE	1961	RAINBOW TROUT	75380
JUMP OFF JOE LAKE	1963	RAINBOW TROUT	77024
JUMP OFF JOE LAKE	1963	RAINBOW TROUT	77024
JUMP OFF JOE LAKE	1963	RAINBOW TROUT	31568
JUMP OFF JOE LAKE	1965	RAINBOW TROUT	37920
JUMP OFF JOE LAKE	1965	RAINBOW TROUT	10000
JUMP OFF JOE LAKE	1965	RAINBOW TROUT	1760
JUMP OFF JOE LAKE	1965	RAINBOW TROUT	75000
JUMP OFF JOE LAKE	1966	RAINBOW TROUT	4929
JUMP OFF JOE LAKE	1966	RAINBOW TROUT	74900
JUMP OFF JOE LAKE	1966	RAINBOW TROUT	12800
JUMP OFF JOE LAKE	1967	RAINBOW TROUT	350
JUMP OFF JOE LAKE	1967	RAINBOW TROUT	10025
JUMP OFF JOE LAKE	1967	RAINBOW TROUT	1500
JUMP OFF JOE LAKE	1967	RAINBOW TROUT	75400
JUMP OFF JOE LAKE	1968	RAINBOW TROUT	10164
JUMP OFF JOE LAKE	1968	RAINBOW TROUT	75600
JUMP OFF JOE LAKE	1968	RAINBOW TROUT	12650
JUMP OFF JOE LAKE	1969	RAINBOW TROUT	810
JUMP OFF JOE LAKE	1969	RAINBOW TROUT	169
JUMP OFF JOE LAKE	1969	RAINBOW TROUT	1300
JUMP OFF JOE LAKE	1969	RAINBOW TROUT	23753
JUMP OFF JOE LAKE	1969	RAINBOW TROUT	3298
JUMP OFF JOE LAKE	1970	RAINBOW TROUT	601
JUMP OFF JOE LAKE	1970	RAINBOW TROUT	24380
JUMP OFF JOE LAKE	1970	RAINBOW TROUT	693
JUMP OFF JOE LAKE	1970	RAINBOW TROUT	2160

Release Site	Year	SpeciesName	TOTAL
JUMP OFF JOE LAKE	1970	EASTERN BROOK TROUT	10250
JUMP OFF JOE LAKE	1971	EASTERN BROOK TROUT	2644
JUMP OFF JOE LAKE	1971	RAINBOW TROUT	1600
JUMP OFF JOE LAKE	1971	RAINBOW TROUT	670
JUMP OFF JOE LAKE	1971	RAINBOW TROUT	19228
JUMP OFF JOE LAKE	1971	RAINBOW TROUT	2022
JUMP OFF JOE LAKE	1971	EASTERN BROOK TROUT	29775
JUMP OFF JOE LAKE	1971	EASTERN BROOK TROUT	50600
JUMP OFF JOE LAKE	1972	EASTERN BROOK TROUT	7832
JUMP OFF JOE LAKE	1972	RAINBOW TROUT	15030
JUMP OFF JOE LAKE	1972	EASTERN BROOK TROUT	93600
JUMP OFF JOE LAKE	1973	RAINBOW TROUT	10037
JUMP OFF JOE LAKE	1973	RAINBOW TROUT	500
JUMP OFF JOE LAKE	1973	EASTERN BROOK TROUT	20145
JUMP OFF JOE LAKE	1974	EASTERN BROOK TROUT	500
JUMP OFF JOE LAKE	1974	RAINBOW TROUT	10010
JUMP OFF JOE LAKE	1974	EASTERN BROOK TROUT	24037
JUMP OFF JOE LAKE	1975	RAINBOW TROUT	10020
JUMP OFF JOE LAKE	1975	EASTERN BROOK TROUT	525
JUMP OFF JOE LAKE	1975	EASTERN BROOK TROUT	25003
JUMP OFF JOE LAKE	1975	RAINBOW TROUT	500
JUMP OFF JOE LAKE	1975	RAINBOW TROUT	25030
JUMP OFF JOE LAKE	1976	RAINBOW TROUT	9295
JUMP OFF JOE LAKE	1976	EASTERN BROOK TROUT	20000
JUMP OFF JOE LAKE	1976	EASTERN BROOK TROUT	1838
JUMP OFF JOE LAKE	1977	EASTERN BROOK TROUT	13962
JUMP OFF JOE LAKE	1977	RAINBOW TROUT	3990
JUMP OFF JOE LAKE	1977	EASTERN BROOK TROUT	275
JUMP OFF JOE LAKE	1977	EASTERN BROOK TROUT	6049
JUMP OFF JOE LAKE	1977	RAINBOW TROUT	1476
JUMP OFF JOE LAKE	1978	EASTERN BROOK TROUT	846
JUMP OFF JOE LAKE	1978	EASTERN BROOK TROUT	20014
JUMP OFF JOE LAKE	1979	EASTERN BROOK TROUT	1185
JUMP OFF JOE LAKE	1979	EASTERN BROOK TROUT	20006
JUMP OFF JOE LAKE	1980	EASTERN BROOK TROUT	1520
JUMP OFF JOE LAKE	1980	RAINBOW TROUT	495
JUMP OFF JOE LAKE	1980	EASTERN BROOK TROUT	20026
JUMP OFF JOE LAKE	1981	EASTERN BROOK TROUT	900
JUMP OFF JOE LAKE	1981	EASTERN BROOK TROUT	20034
JUMPOFF JOE	1934	KOKANEE	25000

Release Site	Year	SpeciesName	TOTAL
JUMPOFF JOE	1936	EASTERN BROOK TROUT	11500
JUMPOFF JOE	1937	BASS: GENERAL	2000
JUMPOFF JOE	1938	EASTERN BROOK TROUT	40000
JUMPOFF JOE	1938	EASTERN BROOK TROUT	1500
JUMPOFF JOE	1939	PERCH, YELLOW	11379
JUMPOFF JOE	1940	EASTERN BROOK TROUT	5990
JUMPOFF JOE	1940	EASTERN BROOK TROUT	1500
JUMPOFF JOE	1941	EASTERN BROOK TROUT	9990
JUMPOFF JOE	1944	RAINBOW TROUT	5060
JUMPOFF JOE	1944	RAINBOW TROUT	5180
JUMPOFF JOE	1944	RAINBOW TROUT	5098
JUMPOFF JOE	1946	RAINBOW TROUT	10022
JUMPOFF JOE	1946	RAINBOW TROUT	1680
JUMPOFF JOE	1946	RAINBOW TROUT	12476
JUMPOFF JOE	1947	RAINBOW TROUT	10024
JUMPOFF JOE	1948	RAINBOW TROUT	5411
JUMPOFF JOE	1948	RAINBOW TROUT	5587
JUMPOFF JOE	1948	RAINBOW TROUT	5563
JUMPOFF JOE	1948	RAINBOW TROUT	5563
JUMPOFF JOE	1948	RAINBOW TROUT	2925
JUMPOFF JOE	1949	RAINBOW TROUT	10135
JUMPOFF JOE	1949	RAINBOW TROUT	4846
JUMPOFF JOE	1949	RAINBOW TROUT	6128
JUMPOFF JOE	1949	RAINBOW TROUT	4342
JUMPOFF JOE	1950	RAINBOW TROUT	24015
JUMPOFF JOE	1950	RAINBOW TROUT	15193
JUMPOFF JOE	1951	RAINBOW TROUT	11260
JUMPOFF JOE	1951	RAINBOW TROUT	19183
JUMPOFF JOE	1952	RAINBOW TROUT	13215
JUMPOFF JOE	1952	RAINBOW TROUT	11436
JUMPOFF JOE	1952	RAINBOW TROUT	5453
JUMPOFF JOE	1953	RAINBOW TROUT	21552
JUMPOFF JOE	1953	RAINBOW TROUT	8512
LITTLE PEND OREILLE LAKES	1940	RAINBOW TROUT	17095
LITTLE PEND OREILLE LAKES	1952	CUTTHROAT	14880
LITTLE PEND OREILLE LAKES	1953	CUTTHROAT	15400
LITTLE PEND OREILLE LAKES	1954	CUTTHROAT	15000
LITTLE PEND OREILLE LAKES	1955	CUTTHROAT	15340
LITTLE PEND OREILLE LAKES	1956	CUTTHROAT	15000
LITTLE PEND OREILLE LAKES	1957	CUTTHROAT	10395

Release Site	Year	SpeciesName	TOTAL
LITTLE PEND OREILLE LAKES	1960	CUTTHROAT	10000
LITTLE PEND OREILLE LAKES	1961	CUTTHROAT	10000
LITTLE PEND OREILLE LAKES	1978	RAINBOW TROUT	504
LITTLE PEND OREILLE LAKES	1978	CUTTHROAT	2006
LITTLE PEND OREILLE LAKES	1933	EASTERN BROOK TROUT	25000
LITTLE PEND OREILLE LAKES	1935	CUTTHROAT	50575
LITTLE PEND OREILLE LAKES	1935	RAINBOW TROUT	34000
LITTLE PEND OREILLE LAKES	1936	EASTERN BROOK TROUT	26000
LITTLE PEND OREILLE LAKES	1936	EASTERN BROOK TROUT	34000
LITTLE PEND OREILLE LAKES	1936	EASTERN BROOK TROUT	8500
LITTLE PEND OREILLE LAKES	1936	EASTERN BROOK TROUT	8000
LITTLE PEND OREILLE LAKES	1936	EASTERN BROOK TROUT	8000
LITTLE PEND OREILLE LAKES	1936	GRAYLING, ARCTIC	100000
LITTLE PEND OREILLE LAKES	1938	KOKANEE	100000
LITTLE PEND OREILLE LAKES	1938	EASTERN BROOK TROUT	13300
LITTLE PEND OREILLE LAKES	1939	RAINBOW TROUT	9990
LITTLE PEND OREILLE LAKES	1939	RAINBOW TROUT	4997
LITTLE PEND OREILLE LAKES	1939	EASTERN BROOK TROUT	14985
LITTLE PEND OREILLE LAKES	1939	EASTERN BROOK TROUT	13992
LITTLE PEND OREILLE LAKES	1941	RAINBOW TROUT	17125
LITTLE PEND OREILLE LAKES	1941	RAINBOW TROUT	8150
LITTLE PEND OREILLE LAKES	1941	RAINBOW TROUT	5995
LITTLE PEND OREILLE LAKES	1941	RAINBOW TROUT	15145
LITTLE PEND OREILLE LAKES	1942	RAINBOW TROUT	25156
LITTLE PEND OREILLE LAKES	1947	RAINBOW TROUT	14502
LITTLE PEND OREILLE LAKES	1949	KOKANEE	104800
MILL CREEK	1933	EASTERN BROOK TROUT	60000
MILL CREEK	1933	EASTERN BROOK TROUT	10000
MILL CREEK	1933	CUTTHROAT	20000
MILL CREEK	1934	EASTERN BROOK TROUT	50000
MILL CREEK	1935	EASTERN BROOK TROUT	40000
MILL CREEK	1936	EASTERN BROOK TROUT	700
MILL CREEK	1936	RAINBOW TROUT	21210
MILL CREEK	1936	STEELHEAD	14860
MILL CREEK	1936	EASTERN BROOK TROUT	24000
MILL CREEK	1936	EASTERN BROOK TROUT	26000
MILL CREEK	1936	EASTERN BROOK TROUT	25000
MILL CREEK	1936	EASTERN BROOK TROUT	16000
MILL CREEK	1936	EASTERN BROOK TROUT	6500
MILL CREEK	1936	EASTERN BROOK TROUT	7000

Release Site	Year	SpeciesName	TOTAL
MILL CREEK	1936	EASTERN BROOK TROUT	8000
MILL CREEK	1937	EASTERN BROOK TROUT	50000
MILL CREEK	1937	EASTERN BROOK TROUT	28000
MILL CREEK	1937	EASTERN BROOK TROUT	16900
MILL CREEK	1937	RAINBOW TROUT	20000
MILL CREEK	1938	RAINBOW TROUT	3000
MILL CREEK	1938	EASTERN BROOK TROUT	20400
MILL CREEK	1938	CUTTHROAT	35000
MILL CREEK	1938	CUTTHROAT	30000
MILL CREEK	1938	EASTERN BROOK TROUT	50000
MILL CREEK	1939	EASTERN BROOK TROUT	22700
MILL CREEK	1939	RAINBOW TROUT	9985
MILL CREEK	1939	RAINBOW TROUT	4488
MILL CREEK	1940	EASTERN BROOK TROUT	19950
MILL CREEK	1940	RAINBOW TROUT	23240
MILL CREEK	1940	RAINBOW TROUT	14998
MILL CREEK	1940	RAINBOW TROUT	4995
MILL CREEK	1941	EASTERN BROOK TROUT	28490
MILL CREEK	1941	EASTERN BROOK TROUT	4995
MILL CREEK	1941	EASTERN BROOK TROUT	5845
MILL CREEK	1941	RAINBOW TROUT	38950
MILL CREEK	1941	RAINBOW TROUT	13950
MILL CREEK	1941	RAINBOW TROUT	16180
MILL CREEK	1941	CUTTHROAT	19470
MILL CREEK	1942	EASTERN BROOK TROUT	26557
MILL CREEK	1942	EASTERN BROOK TROUT	15740
MILL CREEK	1942	RAINBOW TROUT	29991
MILL CREEK	1942	RAINBOW TROUT	27985
MILL CREEK	1943	EASTERN BROOK TROUT	46326
MILL CREEK	1943	CUTTHROAT	27074
MILL CREEK	1943	RAINBOW TROUT	11996
MILL CREEK	1943	RAINBOW TROUT	9675
MILL CREEK	1943	RAINBOW TROUT	9675
MILL CREEK	1944	EASTERN BROOK TROUT	44094
MILL CREEK	1944	RAINBOW TROUT	45596
MILL CREEK	1944	CUTTHROAT	10000
MILL CREEK	1944	CUTTHROAT	21000
MILL CREEK	1945	RAINBOW TROUT	20000
MILL CREEK	1945	CUTTHROAT	50000
MILL CREEK	1946	RAINBOW TROUT	10472

Release Site	Year	SpeciesName	TOTAL
MILL CREEK	1947	RAINBOW TROUT	29980
MILL CREEK	1947	RAINBOW TROUT	8140
MILL CREEK	1948	RAINBOW TROUT	2114
MILL CREEK	1949	RAINBOW TROUT	3694
MILL CREEK	1949	RAINBOW TROUT	2068
MILL CREEK	1949	RAINBOW TROUT	3312
MILL CREEK	1951	RAINBOW TROUT	9210
MILL CREEK	1952	RAINBOW TROUT	5891
MILL CREEK	1952	RAINBOW TROUT	4290
MILL CREEK	1953	RAINBOW TROUT	5016
MILL CREEK	1953	RAINBOW TROUT	5148
MILL CREEK	1954	RAINBOW TROUT	5000
MILL CREEK	1954	RAINBOW TROUT	4692
MILL CREEK	1956	RAINBOW TROUT	5040
MILL CREEK	1960	EASTERN BROOK TROUT	1125
MILL CREEK	1961	EASTERN BROOK TROUT	600
MILL CREEK	1961	RAINBOW TROUT	15060
MILL CREEK	1962	EASTERN BROOK TROUT	875
MILL CREEK	1962	RAINBOW TROUT	2590
MILL CREEK	1963	RAINBOW TROUT	2528
MILL CREEK	1964	EASTERN BROOK TROUT	300
MILL CREEK	1964	RAINBOW TROUT	2500
MILL CREEK	1965	RAINBOW TROUT	2500
MILL CREEK	1966	RAINBOW TROUT	2520
MILL CREEK	1967	RAINBOW TROUT	2640
MILL CREEK	1968	RAINBOW TROUT	2502
MILL CREEK	1969	RAINBOW TROUT	2500
MILL CREEK	1970	EASTERN BROOK TROUT	900
MILL CREEK	1970	RAINBOW TROUT	2540
MILL CREEK	1971	EASTERN BROOK TROUT	1050
MILL CREEK	1971	RAINBOW TROUT	2502
MILL CREEK	1972	EASTERN BROOK TROUT	2400
MILL CREEK	1972	RAINBOW TROUT	2550
MILL CREEK	1973	RAINBOW TROUT	2902
MILL CREEK	1978	RAINBOW TROUT	600
MILL CREEK	1950	RAINBOW TROUT	9780
MILL CREEK	1963	EASTERN BROOK TROUT	1000
MILL CREEK	1963	EASTERN BROOK TROUT	1750
MILL CREEK	1971	EASTERN BROOK TROUT	1500
MILL CREEK	1978	EASTERN BROOK TROUT	2250

Release Site	Year	SpeciesName	TOTAL
MILL CREEK	1980	EASTERN BROOK TROUT	2250
MILL CREEK	1982	EASTERN BROOK TROUT	1980
MILL CREEK	1984	EASTERN BROOK TROUT	2000
MILL CREEK	1986	EASTERN BROOK TROUT	2400
MILL CREEK	1982	EASTERN BROOK TROUT	1540
MILL CREEK	1985	EASTERN BROOK TROUT	1800
LITTLE PEND OREILLE LAKES	1933	KOKANEE	79340
LITTLE PEND OREILLE LAKES	1933	EASTERN BROOK TROUT	75000
LITTLE PEND OREILLE LAKES	1933	EASTERN BROOK TROUT	75000
LITTLE PEND OREILLE LAKES	1933	RAINBOW TROUT	50000
LITTLE PEND OREILLE LAKES	1933	EASTERN BROOK TROUT	15000
LITTLE PEND OREILLE LAKES	1933	CUTTHROAT	30000
LITTLE PEND OREILLE LAKES	1934	KOKANEE	150000
LITTLE PEND OREILLE LAKES	1934	EASTERN BROOK TROUT	50000
LITTLE PEND OREILLE LAKES	1934	EASTERN BROOK TROUT	20000
LITTLE PEND OREILLE LAKES	1934	EASTERN BROOK TROUT	29730
LITTLE PEND OREILLE LAKES	1934	CUTTHROAT	9960
LITTLE PEND OREILLE LAKES	1934	RAINBOW TROUT	60000
LITTLE PEND OREILLE LAKES	1934	CUTTHROAT	10000
LITTLE PEND OREILLE LAKES	1934	RAINBOW TROUT	60000
LITTLE PEND OREILLE LAKES	1935	KOKANEE	122740
LITTLE PEND OREILLE LAKES	1935	EASTERN BROOK TROUT	40000
LITTLE PEND OREILLE LAKES	1935	EASTERN BROOK TROUT	40000
LITTLE PEND OREILLE LAKES	1936	KOKANEE	38000
LITTLE PEND OREILLE LAKES	1936	EASTERN BROOK TROUT	14000
LITTLE PEND OREILLE LAKES	1936	EASTERN BROOK TROUT	3500
LITTLE PEND OREILLE LAKES	1936	EASTERN BROOK TROUT	3500
LITTLE PEND OREILLE LAKES	1936	RAINBOW TROUT	4500
LITTLE PEND OREILLE LAKES	1937	KOKANEE	100000
LITTLE PEND OREILLE LAKES	1937	KOKANEE	97800
LITTLE PEND OREILLE LAKES	1937	RAINBOW TROUT	40000
LITTLE PEND OREILLE LAKES	1937	RAINBOW TROUT	10560
LITTLE PEND OREILLE LAKES	1938	EASTERN BROOK TROUT	60000
LITTLE PEND OREILLE LAKES	1939	KOKANEE	299600
LITTLE PEND OREILLE LAKES	1939	RAINBOW TROUT	2999
LITTLE PEND OREILLE LAKES	1939	RAINBOW TROUT	2998
LITTLE PEND OREILLE LAKES	1940	KOKANEE	79650
LITTLE PEND OREILLE LAKES	1940	KOKANEE	74925
LITTLE PEND OREILLE LAKES	1940	RAINBOW TROUT	1275
LITTLE PEND OREILLE LAKES	1940	RAINBOW TROUT	26516

Release Site	Year	SpeciesName	TOTAL
LITTLE PEND OREILLE LAKES	1940	RAINBOW TROUT	1316
LITTLE PEND OREILLE LAKES	1940	RAINBOW TROUT	20390
LITTLE PEND OREILLE LAKES	1940	RAINBOW TROUT	9965
LITTLE PEND OREILLE LAKES	1940	RAINBOW TROUT	9972
LITTLE PEND OREILLE LAKES	1977	RAINBOW TROUT	1500
LITTLE PEND OREILLE LAKES	1978	RAINBOW TROUT	1560
LITTLE PEND OREILLE LAKES	1978	BROWN TROUT	1260
LITTLE PEND OREILLE LAKES	1979	RAINBOW TROUT	1503
LITTLE PEND OREILLE LAKES	1986	BROWN TROUT	525
LITTLE PEND OREILLE LAKES	1988	BROWN TROUT	280
LITTLE PEND OREILLE LAKES	1993	RAINBOW TROUT	9724
LITTLE PEND OREILLE LAKES	1994	RAINBOW TROUT	1032
SHEEP CREEK	1987	RAINBOW TROUT	5040
SHEEP CREEK	1988	RAINBOW TROUT	5044
SHEEP CREEK	1989	RAINBOW TROUT	5031
SHEEP CREEK	1991	RAINBOW TROUT	4995
SHEEP CREEK	1994	RAINBOW TROUT	7020
SHEEP CREEK	1933	EASTERN BROOK TROUT	30000
SHEEP CREEK	1933	EASTERN BROOK TROUT	15000
SHEEP CREEK	1935	RAINBOW TROUT	20000
SHEEP CREEK	1935	EASTERN BROOK TROUT	50000
SHEEP CREEK	1936	EASTERN BROOK TROUT	20000
SHEEP CREEK	1936	EASTERN BROOK TROUT	11500
SHEEP CREEK	1936	RAINBOW TROUT	10000
SHEEP CREEK	1938	RAINBOW TROUT	1000
SHEEP CREEK	1939	EASTERN BROOK TROUT	28100
SHEEP CREEK	1942	EASTERN BROOK TROUT	36550
SHEEP CREEK	1942	RAINBOW TROUT	52624
SHEEP CREEK	1942	RAINBOW TROUT	46750
SHEEP CREEK	1943	EASTERN BROOK TROUT	51931
SHEEP CREEK	1943	EASTERN BROOK TROUT	18625
SHEEP CREEK	1943	RAINBOW TROUT	14994
SHEEP CREEK	1944	RAINBOW TROUT	14566
SHEEP CREEK	1945	EASTERN BROOK TROUT	45900
SHEEP CREEK	1962	RAINBOW TROUT	880
SHEEP CREEK	1966	RAINBOW TROUT	5000
SHERWOOD CREEK	1986	EASTERN BROOK TROUT	740
STRANGER CREEK	1985	EASTERN BROOK TROUT	1980
STRANGER CREEK	1946	RAINBOW TROUT	24975
STRANGER CREEK	1950	EASTERN BROOK TROUT	2400

Release Site	Year	SpeciesName	TOTAL
STRANGER CREEK	1954	RAINBOW TROUT	1500
STRANGER CREEK	1954	EASTERN BROOK TROUT	5000
STRANGER CREEK	1954	EASTERN BROOK TROUT	8800
STRANGER CREEK	1957	EASTERN BROOK TROUT	6900
STRANGER CREEK	1959	EASTERN BROOK TROUT	4800
STRANGER CREEK	1961	EASTERN BROOK TROUT	900
STRANGER CREEK	1962	EASTERN BROOK TROUT	2590
STRANGER CREEK	1971	EASTERN BROOK TROUT	1050
STRANGER CREEK	1973	EASTERN BROOK TROUT	1000
STRANGER CREEK	1981	EASTERN BROOK TROUT	1500
JUMP OFF JOE LAKE	1995	EASTERN BROOK TROUT	4534
JUMP OFF JOE LAKE	1995	EASTERN BROOK TROUT	3024
JUMP OFF JOE LAKE	1996	BROWN TROUT	252
JUMP OFF JOE LAKE	1996	EASTERN BROOK TROUT	37525
JUMP OFF JOE LAKE	1996	EASTERN BROOK TROUT	6384
JUMP OFF JOE LAKE	1996	EASTERN BROOK TROUT	5700
JUMP OFF JOE LAKE	1996	BROWN TROUT	2025
JUMP OFF JOE LAKE	1997	EASTERN BROOK TROUT	4900
JUMP OFF JOE LAKE	1997	BROWN TROUT	2020
JUMP OFF JOE LAKE	1997	EASTERN BROOK TROUT	7200
JUMP OFF JOE LAKE	1997	EASTERN BROOK TROUT	9068
JUMP OFF JOE LAKE	1997	BROWN TROUT	5040
JUMP OFF JOE LAKE	1997	EASTERN BROOK TROUT	10064
JUMP OFF JOE LAKE	1998	RAINBOW TROUT	100
JUMP OFF JOE LAKE	1998	BROWN TROUT	320
JUMP OFF JOE LAKE	1998	BROWN TROUT	2001
JUMP OFF JOE LAKE	1998	EASTERN BROOK TROUT	7498
JUMP OFF JOE LAKE	1998	EASTERN BROOK TROUT	7502
JUMP OFF JOE LAKE	1998	EASTERN BROOK TROUT	3172
JUMP OFF JOE LAKE	1999	BROWN TROUT	250
JUMP OFF JOE LAKE	1999	EASTERN BROOK TROUT	38
JUMP OFF JOE LAKE	1999	EASTERN BROOK TROUT	250
JUMP OFF JOE LAKE	1999	EASTERN BROOK TROUT	400
JUMP OFF JOE LAKE	1999	BROWN TROUT	2000
JUMP OFF JOE LAKE	1999	EASTERN BROOK TROUT	12005
JUMP OFF JOE LAKE	2000	BROWN TROUT	485
JUMP OFF JOE LAKE	2000	EASTERN BROOK TROUT	5432
JUMP OFF JOE LAKE	2000	EASTERN BROOK TROUT	11070
JUMP OFF JOE LAKE	2000	BROWN TROUT	2002
JUMP OFF JOE LAKE	2001	BROWN TROUT	425

Release Site	Year	SpeciesName	TOTAL
JUMP OFF JOE LAKE	2001	RAINBOW TROUT	4320
JUMP OFF JOE LAKE	2001	BROWN TROUT	1716
JUMP OFF JOE LAKE	2001	BROWN TROUT	12283
JUMP OFF JOE LAKE	2002	BROWN TROUT	550
JUMP OFF JOE LAKE	2002	BROWN TROUT	4773
JUMP OFF JOE LAKE	2002	BROWN TROUT	3383
JUMP OFF JOE LAKE	2002	BROWN TROUT	539
JUMP OFF JOE LAKE	2002	RAINBOW TROUT	4002
JUMP OFF JOE LAKE	2002	BROWN TROUT	5355
JUMP OFF JOE LAKE	2003	BROWN TROUT	425
JUMP OFF JOE LAKE	2003	BROWN TROUT	4761
JUMP OFF JOE LAKE	2003	RAINBOW TROUT	2022
JUMP OFF JOE LAKE	2003	BROWN TROUT	5796
JUMP OFF JOE LAKE	2003	RAINBOW TROUT	2000
JUMP OFF JOE LAKE	2004	BROWN TROUT	175
JUMP OFF JOE LAKE	2004	BROWN TROUT	4315
JUMP OFF JOE LAKE	2004	BROWN TROUT	6686
JUMP OFF JOE LAKE	2004	RAINBOW TROUT	4050
JUMP OFF JOE LAKE	2005	BROWN TROUT	250
JUMP OFF JOE LAKE	2005	RAINBOW TROUT	4008
JUMP OFF JOE LAKE	2005	BROWN TROUT	1368
JUMP OFF JOE LAKE	2005	BROWN TROUT	9682
JUMP OFF JOE LAKE	2006	BROWN TROUT	250
JUMP OFF JOE LAKE	2006	BROWN TROUT	11997
JUMP OFF JOE LAKE	2006	RAINBOW TROUT	3964
JUMP OFF JOE LAKE	2007	BROWN TROUT	250
JUMP OFF JOE LAKE	2007	RAINBOW TROUT	4502
JUMP OFF JOE LAKE	2007	BROWN TROUT	2464
JUMP OFF JOE LAKE	2007	RAINBOW TROUT	4000
JUMP OFF JOE LAKE	2007	BROWN TROUT	5037
JUMP OFF JOE LAKE	2008	RAINBOW TROUT	3995
JUMP OFF JOE LAKE	2008	BROWN TROUT	4810
JUMP OFF JOE LAKE	2008	BROWN TROUT	2695
JUMP OFF JOE LAKE	2008	BROWN TROUT	255
JUMP OFF JOE LAKE	2010	BROWN TROUT	181
JUMP OFF JOE LAKE	2011	BROWN TROUT	244
JUMP OFF JOE LAKE	2011	RAINBOW TROUT	800
JUMP OFF JOE LAKE	2011	RAINBOW TROUT	2373
JUMP OFF JOE LAKE	2011	BROWN TROUT	2940
JUMP OFF JOE LAKE	2011	BROWN TROUT	4564

Release Site	Year	SpeciesName	TOTAL
JUMP OFF JOE LAKE	2009	BROWN TROUT	1940
JUMP OFF JOE LAKE	2010	BROWN TROUT	931
JUMP OFF JOE LAKE	2009	BROWN TROUT	6076
JUMP OFF JOE LAKE	2010	BROWN TROUT	2664
JUMP OFF JOE LAKE	2010	BROWN TROUT	2544
JUMP OFF JOE LAKE	2010	RAINBOW TROUT	4034
JUMP OFF JOE LAKE	2010	BROWN TROUT	2861
JUMP OFF JOE LAKE	2009	RAINBOW TROUT	4036
JUMP OFF JOE LAKE	2009	BROWN TROUT	300
LITTLE PEND OREILLE LAKES	1995	RAINBOW TROUT	3038
LITTLE PEND OREILLE LAKES	1995	CUTTHROAT	5016
LITTLE PEND OREILLE LAKES	1996	RAINBOW TROUT	4725
LITTLE PEND OREILLE LAKES	1997	RAINBOW TROUT	5040
LITTLE PEND OREILLE LAKES	1998	CUTTHROAT	1100
LITTLE PEND OREILLE LAKES	1998	CUTTHROAT	5000
LITTLE PEND OREILLE LAKES	1998	CUTTHROAT	9400
LITTLE PEND OREILLE LAKES	1999	CUTTHROAT	10640
LITTLE PEND OREILLE LAKES	2000	CUTTHROAT	12012
LITTLE PEND OREILLE LAKES	2001	CUTTHROAT	12005
LITTLE PEND OREILLE LAKES	2002	CUTTHROAT	12006
LITTLE PEND OREILLE LAKES	2003	CUTTHROAT	15000
LITTLE PEND OREILLE LAKES	2003	CUTTHROAT	4998
LITTLE PEND OREILLE LAKES	2004	CUTTHROAT	3608
LITTLE PEND OREILLE LAKES	2004	CUTTHROAT	10005
LITTLE PEND OREILLE LAKES	2004	CUTTHROAT	14981
LITTLE PEND OREILLE LAKES	2005	TIGER TROUT	2000
LITTLE PEND OREILLE LAKES	2005	RAINBOW TROUT	2469
LITTLE PEND OREILLE LAKES	2006	TIGER TROUT	1455
LITTLE PEND OREILLE LAKES	2006	RAINBOW TROUT	2447
LITTLE PEND OREILLE LAKES	2007	CUTTHROAT	9000
LITTLE PEND OREILLE LAKES	2007	TIGER TROUT	2020
LITTLE PEND OREILLE LAKES	2007	RAINBOW TROUT	2437
LITTLE PEND OREILLE LAKES	2008	TIGER TROUT	2000
LITTLE PEND OREILLE LAKES	1995	RAINBOW TROUT	1984
LITTLE PEND OREILLE LAKES	1995	CUTTHROAT	2016
LITTLE PEND OREILLE LAKES	1996	RAINBOW TROUT	3000
LITTLE PEND OREILLE LAKES	1997	RAINBOW TROUT	3024
LITTLE PEND OREILLE LAKES	1998	CUTTHROAT	3116
LITTLE PEND OREILLE LAKES	1998	CUTTHROAT	4900
LITTLE PEND OREILLE LAKES	1999	CUTTHROAT	5000

Release Site	Year	SpeciesName	TOTAL
LITTLE PEND OREILLE LAKES	2000	CUTTHROAT	6996
LITTLE PEND OREILLE LAKES	2001	CUTTHROAT	6997
LITTLE PEND OREILLE LAKES	2002	CUTTHROAT	7120
LITTLE PEND OREILLE LAKES	2003	CUTTHROAT	3702
LITTLE PEND OREILLE LAKES	2003	CUTTHROAT	3300
LITTLE PEND OREILLE LAKES	2003	CUTTHROAT	4841
LITTLE PEND OREILLE LAKES	2003	CUTTHROAT	148
LITTLE PEND OREILLE LAKES	2004	CUTTHROAT	2600
LITTLE PEND OREILLE LAKES	2004	CUTTHROAT	4320
LITTLE PEND OREILLE LAKES	2005	TIGER TROUT	3985
LITTLE PEND OREILLE LAKES	2005	RAINBOW TROUT	4547
LITTLE PEND OREILLE LAKES	2006	TIGER TROUT	3465
LITTLE PEND OREILLE LAKES	2006	RAINBOW TROUT	4557
LITTLE PEND OREILLE LAKES	2007	TIGER TROUT	4040
LITTLE PEND OREILLE LAKES	2007	RAINBOW TROUT	11856
LITTLE PEND OREILLE LAKES	2008	TIGER TROUT	4000
LITTLE PEND OREILLE LAKES	1995	RAINBOW TROUT	9982
LITTLE PEND OREILLE LAKES	1995	CUTTHROAT	12000
LITTLE PEND OREILLE LAKES	1996	RAINBOW TROUT	17025
LITTLE PEND OREILLE LAKES	1997	RAINBOW TROUT	17019
LITTLE PEND OREILLE LAKES	1998	CUTTHROAT	1520
LITTLE PEND OREILLE LAKES	1998	CUTTHROAT	6195
LITTLE PEND OREILLE LAKES	1998	CUTTHROAT	6226
LITTLE PEND OREILLE LAKES	1998	CUTTHROAT	20007
LITTLE PEND OREILLE LAKES	1998	CUTTHROAT	928
LITTLE PEND OREILLE LAKES	1998	CUTTHROAT	13078
LITTLE PEND OREILLE LAKES	1999	CUTTHROAT	35862
LITTLE PEND OREILLE LAKES	2000	CUTTHROAT	5850
LITTLE PEND OREILLE LAKES	2000	CUTTHROAT	34800
LITTLE PEND OREILLE LAKES	2001	CUTTHROAT	12730
LITTLE PEND OREILLE LAKES	2001	CUTTHROAT	27538
LITTLE PEND OREILLE LAKES	2002	CUTTHROAT	12877
LITTLE PEND OREILLE LAKES	2002	CUTTHROAT	15000
LITTLE PEND OREILLE LAKES	2002	CUTTHROAT	12877
LITTLE PEND OREILLE LAKES	2003	CUTTHROAT	13986
LITTLE PEND OREILLE LAKES	2003	CUTTHROAT	35010
LITTLE PEND OREILLE LAKES	2003	CUTTHROAT	5250
LITTLE PEND OREILLE LAKES	2003	CUTTHROAT	10014
LITTLE PEND OREILLE LAKES	2004	CUTTHROAT	9182
LITTLE PEND OREILLE LAKES	2004	CUTTHROAT	828

Release Site	Year	SpeciesName	TOTAL
LITTLE PEND OREILLE LAKES	2004	CUTTHROAT	4800
LITTLE PEND OREILLE LAKES	2004	CUTTHROAT	17280
LITTLE PEND OREILLE LAKES	2005	TIGER TROUT	7971
LITTLE PEND OREILLE LAKES	2005	RAINBOW TROUT	16444
LITTLE PEND OREILLE LAKES	2006	TIGER TROUT	7484
LITTLE PEND OREILLE LAKES	2006	RAINBOW TROUT	11262
LITTLE PEND OREILLE LAKES	2006	RAINBOW TROUT	5194
LITTLE PEND OREILLE LAKES	2007	CUTTHROAT	10800
LITTLE PEND OREILLE LAKES	2007	TIGER TROUT	8080
LITTLE PEND OREILLE LAKES	2007	RAINBOW TROUT	16434
LITTLE PEND OREILLE LAKES	2008	TIGER TROUT	8000
MILL CREEK	1995	RAINBOW TROUT	2448
MILL CREEK	1995	RAINBOW TROUT	4588
MILL CREEK	1995	RAINBOW TROUT	504
MILL CREEK	1995	STEELHEAD	15200
MILL CREEK	1996	RAINBOW TROUT	4495
MILL CREEK	1996	RAINBOW TROUT	2135
MILL CREEK	1996	STEELHEAD	17550
MILL CREEK	1996	STEELHEAD	2448
MILL CREEK	1997	RAINBOW TROUT	7000
MILL CREEK	1997	STEELHEAD	21900
MILL CREEK	1998	RAINBOW TROUT	5000
MILL CREEK	1998	STEELHEAD	9165
MILL CREEK	1999	RAINBOW TROUT	2015
MILL CREEK	2000	RAINBOW TROUT	424
MILL CREEK	2004	RAINBOW TROUT	422
SHEEP CREEK	2000	RAINBOW TROUT	10005
SHEEP CREEK	2001	RAINBOW TROUT	10000
SHEEP CREEK	2002	RAINBOW TROUT	9993
SHEEP CREEK	2004	RAINBOW TROUT	6054
SHEEP CREEK	2004	RAINBOW TROUT	4928
SHEEP CREEK	2005	RAINBOW TROUT	5002
SHEEP CREEK	2006	RAINBOW TROUT	5746
SHEEP CREEK	2007	RAINBOW TROUT	5223
SHEEP CREEK	2008	RAINBOW TROUT	4661
JUMP OFF JOE LAKE	2008	BROWN TROUT	255
JUMP OFF JOE LAKE	2010	BROWN TROUT	181
JUMP OFF JOE LAKE	2011	BROWN TROUT	244
JUMP OFF JOE LAKE	2011	RAINBOW TROUT	800
JUMP OFF JOE LAKE	2011	RAINBOW TROUT	2373

Release Site	Year	SpeciesName	TOTAL
JUMP OFF JOE LAKE	2011	BROWN TROUT	2940
JUMP OFF JOE LAKE	2011	BROWN TROUT	4564
JUMP OFF JOE LAKE	2009	BROWN TROUT	1940
JUMP OFF JOE LAKE	2010	BROWN TROUT	931
JUMP OFF JOE LAKE	2009	BROWN TROUT	6076
JUMP OFF JOE LAKE	2010	BROWN TROUT	2664
JUMP OFF JOE LAKE	2010	BROWN TROUT	2544
JUMP OFF JOE LAKE	2010	RAINBOW TROUT	4034
JUMP OFF JOE LAKE	2010	BROWN TROUT	2861
JUMP OFF JOE LAKE	2009	RAINBOW TROUT	4036
JUMP OFF JOE LAKE	2009	BROWN TROUT	300

Appendix E Known fish distribution on the Colville River Watershed

Table E-1. Known fish distribution for the Colville River Watershed (combined list from the WRIA report and this study) (page 1 of 6) (Underlined streams names were sampled in this report, italicized species were caught in both studies, bold species are new to this study, and regular text were not encountered in this study)

Stream	**Known Species**
Bayley Creek	rainbow trout eastern brook trout
Bear Creek	cutthroat trout rainbow trout *eastern brook trout* sculpin sp
Bestrom Creek	cutthroat trout eastern brook trout sculpin sp
Blue Creek	longnose dace speckled dace redside shiner **tench** *rainbow trout* **redband trout** *brown trout* **torrent sculpin**
Bulldog Creek	brown trout sculpin sp
Butte Creek	rainbow trout eastern brook trout
Cedar Creek	eastern brook trout
Chewelah Creek	**longnose dace** *rainbow trout* **redband trout** *brown trout* *eastern brook trout* **prickly sculpin** *mottled sculpin* **torrent sculpin**
Colville River (below Meyers Falls)	**carp** **peamouth** **Umatilla dace** **speckled dace** **redside shiner** **tench**

Stream	Known Species
Colville River (below Meyers Falls)	**longnose sucker** **bridgelip sucker** **lake whitefish** **mountain whitefish** **westslope cutthroat trout** **rainbow trout** **brown trout** **eastern brook trout** **prickly sculpin** **mottled sculpin** **slimy sculpin** **shorthead sculpin** **torrent sculpin** **green sunfish** **pumpkinseed** **largemouth bass** **yellow perch**
Colville River (above Meyers Falls)	*northern pikeminnow* *longnose dace* *speckled dace* *redside shiner* **tench** **longnose sucker** **bridgelip sucker** **largescale sucker** *rainbow trout* **redband trout** *brown trout* *eastern brook trout* *prickly sculpin* **mottled sculpin** **torrent sculpin** *pumpkinseed* **bluegill** **yellow perch**
Cottonwood Creek	redside shiner sucker sp westslope cutthroat *rainbow trout* redband trout *brown trout*

Stream	Known Species
Cottonwood Creek	*eastern brook trout* **prickly sculpin** **mottled sculpin** **torrent sculpin**
Deer Creek	**largescale sucker** *rainbow trout* **redband trout** *brown trout* *eastern brook trout* **mottled sculpin** **torrent sculpin**
Drummond Creek	eastern brook trout
Gillette Creek	westslope cutthroat eastern brook trout
Gold Creek	**longnose dace** *rainbow trout* **redband trout** **brown trout** *eastern brook trout*
Green Mountain Creek	cutthroat trout eastern brook trout
Grouse Creek	rainbow trout eastern brook trout sculpin sp
Haller Creek	rainbow trout eastern brook trout sculpin sp
Hande Creek	westslope cutthroat rainbow trout eastern brook trout
Hanson Creek	eastern brook trout
Hartill Creek	eastern brook trout
Healey Creek	eastern brook trout
Howler Creek	rainbow trout brown trout eastern brook trout
Huckleberry Creek	*rainbow trout* *brown trout*

Stream	Known Species
Huckleberry Creek	*eastern brook trout* **torrent sculpin**
Jacobsen Creek	cutthroat trout eastern brook trout
Jumpoff Joe Creek	westslope cutthroat **brown trout** eastern brook trout **pumpkinseed** **bluegill** **yellow perch**
Kegal Creek	cutthroat trout eastern brook trout
Little Pond Oreille River	*nothern pikeminnow* *longnose dace* **speckled dace** **redside shiner** tench sucker sp *westslope cutthroat trout* *rainbow trout* **redband trout** red/coastal hybrid kokanee *brown trout* *eastern brook trout* **prickly sculpin** **mottled sculpin** **slimy sculpin** shorthead sculpin torrent sculpin sculpin sp **pumpkinseed** yellow perch
Little Sweden Creek	rainbow trout eastern brook trout
Mill Creek	**longnose dace** sucker sp westslope cutthroat trout *rainbow trout*

Stream	Known Species
Mill Creek	**redband trout** red/coast hybrid *brown trout* *eastern brook trout* *mottled sculpin* slimy sculpin **torrent sculpin**
Robins Creek	cutthroat trout eastern brook trout
Rogers Creek	westslope cutthroat
Sheep Creek	**Redside shiner** **Tench** *rainbow trout* **redband trout** kokanee *brown trout* *eastern brook trout* **prickly sculpin** **mottled sculpin** **torrent sculpin** **pumpkinseed**
Sherwood Creek	**speckled dace** **redside shiner** *rainbow trout* **redband trout** *brown trout* *eastern brook trout* **torrent sculpin** **pumpkinseed**
Six Mile Creek	eastern brook trout
Smith Creek	eastern brook trout
Stensgar Creek	longnose dace *speckled dace* redside shiner **bridgelip sucker** **largescale sucker** *rainbow trout* **redband trout** *brown trout* eastern brook trout **torrent sculpin**

Stream	**Known Species**
Strauss Creek	redband trout eastern brook trout
Stranger Creek	*rainbow trout* **redband trout** **brown trout** *eastern brook trout* sculpin sp
Thomason Creek	*rainbow trout* **redband trout** brown trout *eastern brook trout* sculpin sp
Waitts Creek	rainbow trout brown trout eastern brook trout
Wilson Creek	rainbow trout eastern brook trout

Appendix F Stocking record by stream and species

Table F-1. Stocking record of fish species in the streams sampled in the Colville River Watershed, Stevens County, WA 2013 (two lake groups are include that feed two sampled streams)

Stream	Cutthroat trout	Rainbow trout	Steelhead	Kokanee	Brown trout	Eastern brook trout	Tiger trout	Arctic Grayling	Bass	Yellow perch	Total
Colville River	66,847	359,826	101,125		88,647	53,703					670,148
Gold Creek						3,100					3,100
Mill Creek	212,544	515,226	81,123			678,917					1,487,810
Clugston Creek		7,985				1,020					9,005
Haller Creek		8,000				11,949					19,949
Little Pend Oreille Lakes	713,021	610,953		1,246,855	2,065	577,507	54,500	100,000			3,304,901
Bear Creek	75,024	71,383				8,852					155,259
Stranger Creek		26,475				36,920					63,395
Blue Creek		4,015									4,015
Chewelah Creek		334,605	15,000		210	391,215					741,030
Cottonwood Creek		108,419				120,160					228,579
Huckleberry Creek		61,168				31,355					92,523
Sherwood Creek						740					740
Jumpoff Joe Creek		229,859		25,000		70,480			2,000	11,379	338,718
Jumpoff Joe Lake		1,202,880			157,380	527,332					1,887,592
Sheep Creek		254,556				307,606					562,162
Deer Creek		612,698				85,182					697,880
Total	**1,067,436**	**4,408,048**	**197,248**	**1,271,855**	**248,302**	**2,906,038**	**54,500**	**100,000**	**2,000**	**11,379**	**10,266,806**

Appendix G Water temperature

Table G-1. Average monthly temperature of 10 streams in the Colville River Watershed, Stevens County, WA 2013. (Bold and italicized indicates violation of the state standard 18°C, dashed line indicate no data recorded for that month)

	January	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Colville River (below)	1.21	2.29	4.76	7.79	12.04	16.17	***18.65***	***20.06***	14.95	9.63	4.43	2.03
Colville River (above)	1.80	1.73	3.31	7.79	11.47	14.17	***18.62***	***18.23***	14.53	8.27	4.52	1.32
Mill Creek	-	-	-	9.63	-	-	13.22	-	-	-	-	-
Little Pend Oreille River	(-)0.80	1.57	3.23	4.63	10.40	13.00	14.40	15.90	11.61	6.07	4.77	0.40
Blue Creek	-	-	-	-	12.30	13.15	17.10	10.93	10.43	8.82	-	-
Chewelah Creek	-	2.22	8.33	9.78	-	-	12.53	-	-	-	-	1.67
Cottonwood Creek	-	-	5.93	10.00	-	-	12.22	-	-	-	-	-
Sherwood Creek	-	-	8.80	9.72	-	-	11.11	-	-	-	-	-
Jumpoff Joe Creek	-	-	-	-	14.45	14.88	***20.61***	15.07	14.84	10.74	-	-
Sheep Creek	2.40	-	5.10	10.10	14.80	14.99	***19.11***	14.87	13.11	9.64	6.80	-
Deer Creek	-	-	-	10.00	-	-	-	-	-	-	-	-

Table G-2. Total # of measurements, # of violations, daily temperature range, and violation temperature range of 10 streams in the Colville River Watershed, Stevens County, WA 2013. (Dashed lines indicates no violations were reported)

Stream	Total # of measurements	# of violations	Daily temperature range (°C)	Violation temperature Range (°C)
Colville River (below)	250	43	0.0-24.8	18.0-24.8
Colville River (above)	381	32	(-)1.5-23.4	18.2-23.4
Mill Creek	8	0	9.4-14.4	-
Little Pend Oreille River	34	1	(-)1.7-20.8	20.8
Blue Creek	8	1	8.8-19.0	19.0
Chewelah Creek	216	3	1.7-22.2	20.0-22.2
Cottonwood Creek	5	0	5.6-12.2	-
Sherwood Creek	13	0	8.3-11.1	-
Jumpoff Joe Creek	16	4	10.7-21.6	19.8-21.6
Sheep Creek	45	8	2.4-21.1	18.3-21.1
Deer Creek	4	0	10.0-10.0	-

Appendix H Dissolved Oxygen Concentration

Table H-1. Average monthly dissolved oxygen concentration (mg/L) of 10 streams in the Colville River Watershed, Stevens County, WA 2013. (Bold and italicized indicates violation of the state standard 18°C, dashed line indicate no data recorded for that month)

	January	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Colville River (below)	12.51	12.13	11.81	11.18	10.13	9.25	8.91	8.25	9.13	10.46	11.61	12.07
Colville River (above)	11.12	11.55	11.68	10.81	9.99	8.63	8.67	8.74	9.66	10.37	10.48	11.71
Little Pend Oreille River	13.65	12.41	12.11	11.88	10.00	9.80	9.07	9.55	10.02	10.83	11.25	13.38
Blue Creek	-	-	-	-	-	9.70	8.50	10.50	10.72	10.34	-	-
Jumpoff Joe Creek	-	-	-	-	-	9.15	***7.77***	8.93	9.10	10.12	-	-
Sheep Creek	12.50	-	11.10	10.70	10.10	9.96	9.59	10.50	9.70	11.12	11.30	-

Table H-2Total # of measurements, # of violations, daily dissolved oxygen range, and violation dissolved oxygen range of 10 streams in the Colville River Watershed, Stevens County, WA 2013. (Dashed lines indicates no violations were reported)

Stream	Total # of Measurements	# of Violations	Daily dissolved oxygen range (mg/L)	Violation DO Range (mg/L)
Colville River (below)	250	16	5-13.9	5-7.9
Colville River (above)	404	62	6.4-14.6	6.4-7.97
Little Pend Oreille River	33	0	8.5-14.35	-
Blue Creek	8	1	7.9-10.7	7.9
Jumpoff Joe Creek	12	2	6.5-10.4	6.5-7.8
Sheep Creek	46	0	8.6-12.5	-

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