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The Resources Agency
DEPARTMENT OF FISH AND GAME

ANNUAL REPORT
KLAMATH RIVER TRIBUTARY JUVENILE ABUNDANCE INDEX
NORTH RUSSIAN CREEK, 2001
PROJECT 2c4

by

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Steelhead Research and Monitoring Program
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Abstract

This report summarizes the Dolloff et al. (1993) Basinwide Estimation of Habitat and Fish Populations in Streams performed on North Russian Creek in Siskiyou County, California during August through October of 2001 for juvenile steelhead (*Oncorhyncus myskiss irideus*). A level II habitat survey (California Salmonid Stream Habitat Restoration Manual) was performed. Twenty percent of each habitat type was visually sampled for steelhead and unit habitat measurements were taken. Volume measurements were estimated for all other units. Dive units were selected using a random systematic method. Sixty percent of the dives were calibrated by depletion electrofishing to establish a correlation factor to apply to all dive counts.

Steelhead densities for North Russian Creek are 0.36 fish per square meter and 2.11 fish per cubic meter. Steelhead were more dense in runs (3.10 fish per cubic meter) compared to pools (1.85 fish per cubic meter), and riffles (1.44 fish per cubic meter). More steelhead were found in pools (44%) and runs (41%) while riffles only contained 15% of the overall total of steelhead found in North Russian Creek. Age 2+ steelhead were only found in runs and pools.

Background

Various techniques can be used to collect data for monitoring the quality and quantity of stream habitat and fish populations. Comprehensive surveys that involve counting every fish in the watershed, although the most accurate, are impractical because of the cost and the labor required. Representative reaches, or index reaches, count fish in a particular section of stream (typically 30 to 300 meters long) and extrapolate their findings to the watershed. This technique is accurate for the particular reach surveyed, but data beyond the reach may not hold accurate throughout all of the drainage. The technique chosen for this estimate follows a "basinwide visual estimation technique" (Doloff et al. 1993) and includes data from representative habitat types within North Russian Creek. A basinwide estimate was selected because it produces a statistically valid population estimate without the bias of an index reach. The primary goal of this study is to establish an estimate of the number of 0+ and 1+ juvenile steelhead rearing in North Russian Creek during the summer of 2001.

North Russian Creek was well suited for this study for the following reasons. The stream has a known population of steelhead with no significant fish passage problems. Most of the stream lies within the Klamath National Forest so access in the future is guaranteed. There are no agricultural diversions or sources of returning irrigation water to impact water quality. The entire portion of the stream included in this study maintained conditions suitable for salmonids throughout the summer. A watershed analysis was performed by the Forest Service in 1995, providing background information. Placement of a Hobotemp reader by the Salmon River Restoration Council was also helpful in understanding temperature regimes throughout the year.

Watershed overview

North Russian Creek located within the North Fork of the Salmon River watershed, Siskiyou County, California. North Russian Creek is approximately 6.7 miles long from its confluence with South Russian Creek, at 2798 ft., to the second order streams stemming from its headwaters at 3371 ft (elevations from Maptech 2001). The drainage has had no large fires within its sub-drainage in the past 20 years (USDA Watershed Analysis 1995).

Average precipitation ranges from 35 to 80 inches, contributed mostly by winter snow and rainstorms. Past mining operations within the watershed date back to the 1850's. Mining techniques such as hydraulic placer mining and dredging were employed for resource extraction (USDA Watershed Analysis 1995). Large tailings along with widening of the streambed can be seen next to Snowden (see Figure 1) and the bridge upstream of China Gulch. Water temperatures on the North Russian Creek vary from a low of 2°C in March to highs of 18°C in July. Coldest water within the creek is found at the confluence with South Russian Creek (SRRC, Charts 5A-B).

Siskiyou county road (1C01 –road between Etna and Sawyers Bar) follows the stream for approximately 5 miles. The road is paved and is mostly one lane. Soil erosion from the road and lack of bank stability due to steep slopes makes the creek susceptible to road runoff with a high sediment load.

Figure 1 - North Fork Russian Creek, start at the confluence with the South Fork Russian Creek

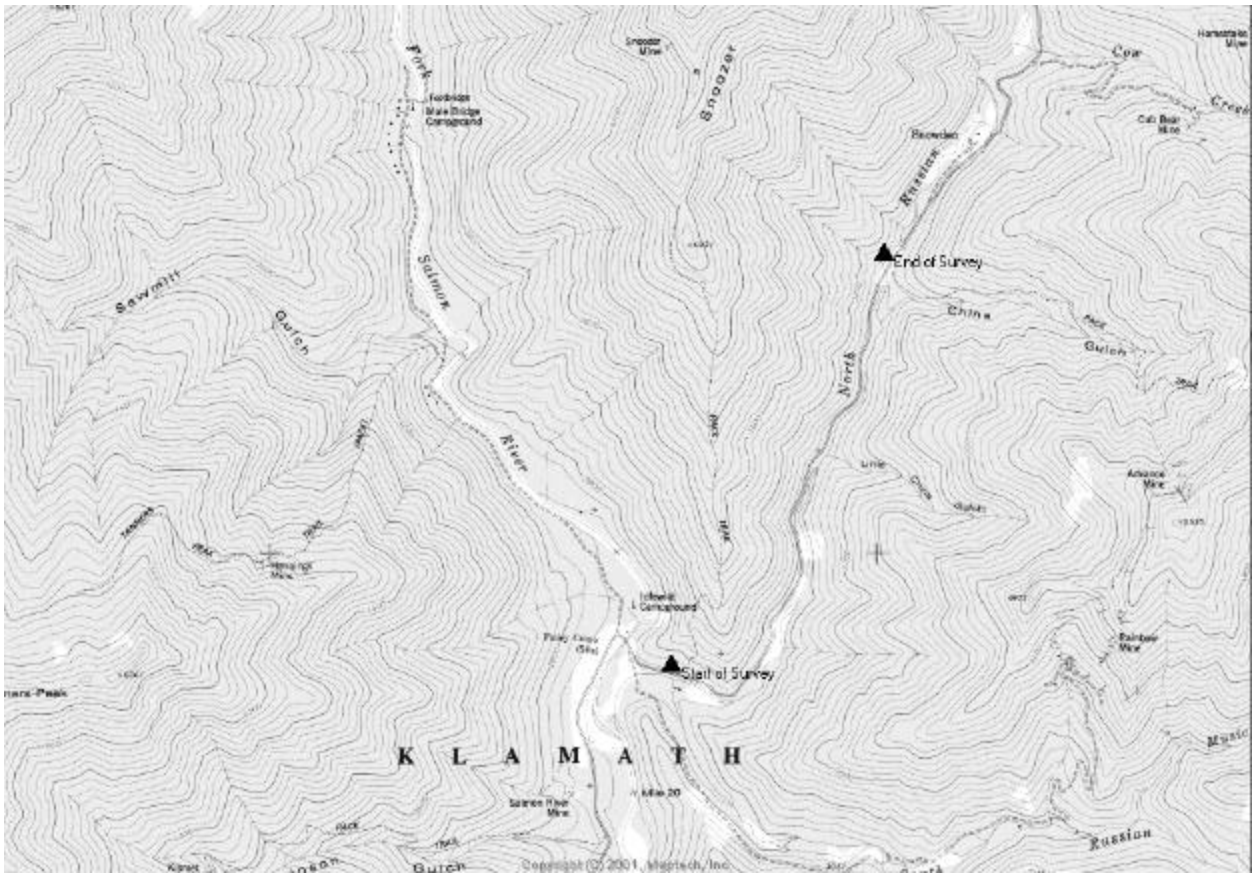
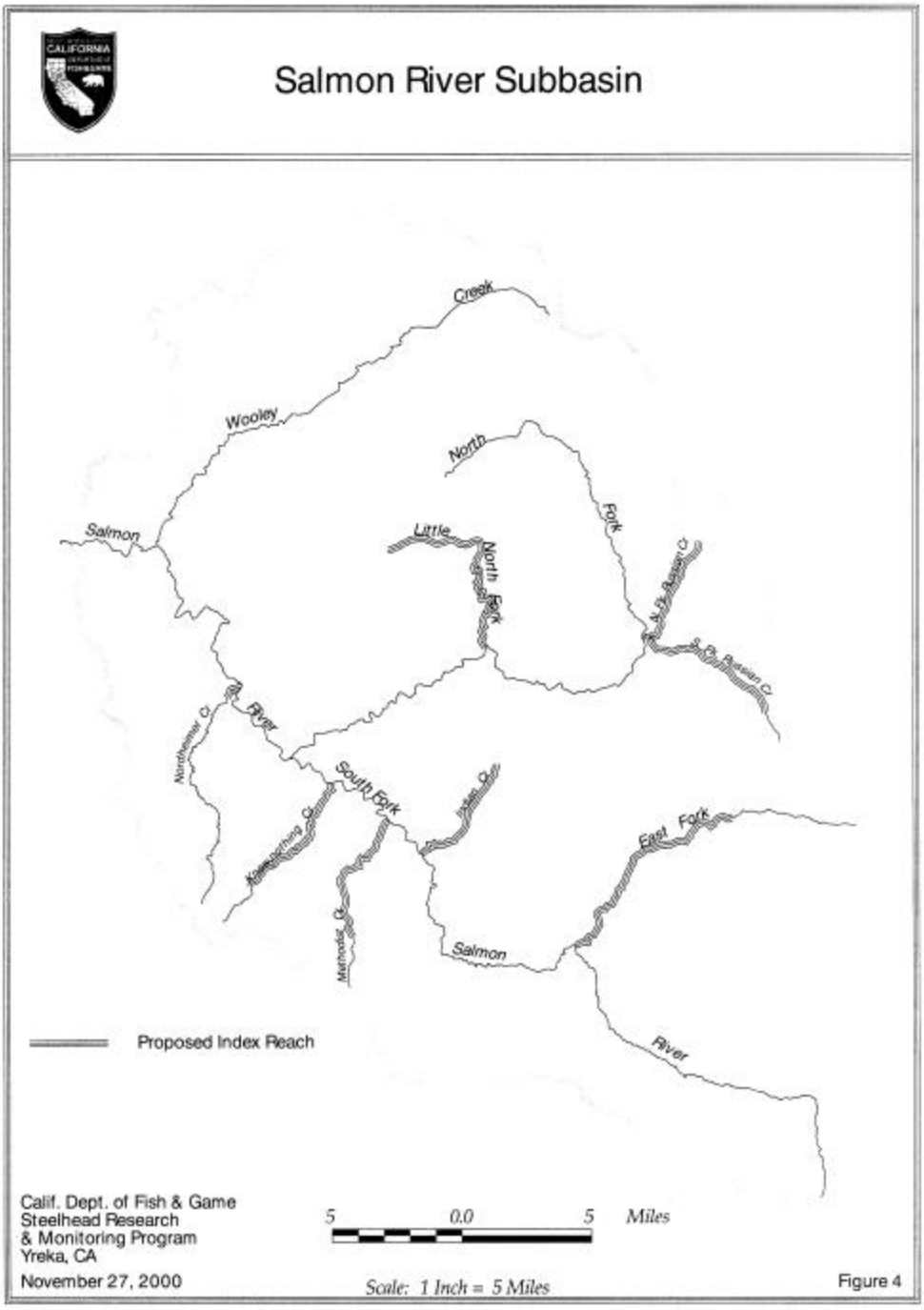


Figure 2


Salmon River Subbasin
Creek
Wooley
North
Fork
Salmon
Little
North Fork
River
South Fork
Salmon
East Fork
River
Proposed Index Reach
Calif. Dept. of Fish & Game
Steelhead Research
& Monitoring Program
Yreka, CA
November 27, 2000
5 0.0 5 Miles
Scale: 1 Inch = 5 Miles
Figure 4

Methods

Habitat Survey

The habitat survey was performed at a level II according to the California Salmon Stream Habitat Restoration Manual (section III, pg. 28). With this criteria three habitat types are used: pool, riffle, and run (flatwater). Estimates of the physical characteristics of all habitat units were made using the method described in Dolloff et al. (1993). The wetted width and depth were visually estimated with the aid of stadia rods and length was taken with a hip-chain.

Dive Units

Prior to the start of the habitat survey, a sampling rate of twenty percent per habitat type or every fifth unit was established. The first dive unit of each habitat type was randomly selected within the first five units of that habitat type. After the first unit was selected, every fifth unit of that habitat type was flagged for future diving. Each dive unit was measured by laying a tape down the center of the unit. Width and depth transects were taken at the beginning and end of the unit and every ten feet in-between. For units less then 30 feet long, transects were taken every five feet. Depths were measured at 25%, 50%, and 75% of the wetted width.

Visual Counts

Diving was performed according to the California Salmon Stream Habitat Restoration Manual (section IV, pg. 3). Fish were counted by age class, 0+ (30-99mm), 1+ (100-149mm), and 2+ (>149mm). Three types of dives were used. A lane dive was used when a unit was too wide for one diver to see from side to side, or when the unit was divided by obstructions. Individual diver counts were additive. A replicate dive was used for units with high visibility. Two or more divers counted all fish. The individual diver counts were recorded and the average number of fish per age class was used. The third diving method was the solo dive, used for narrow units.

Electrofishing

Sixty percent of the dive units were randomly selected to be electrofished using the Seber-LeCron (1967) depletion method. Sampling took place within 48 hours of the visual survey. If more than 48 hours elapsed, the visual survey would be repeated. Blocking seines were set at the top and bottom of the unit. Two Smith-Root 12B battery backpack units were used to methodically sample the unit working from downstream up. The unit remained undisturbed for twenty minutes between passes. Fork length and weight were taken on 25 steelhead of each age class per unit, and five scale samples were taken from each age class per day. All species were returned to the sampled unit when electrofishing was complete.

Estimates

Estimates were calculated using the methods described in Dolloff et al. (1993).

Condition Factor

Fulton's condition factor ((weight/length cubed) * 10,000) was used to compare the fork length weight relationship between habitat types (Murphy and Willis 1996)

Results

Habitat Survey

A total of 175 units were surveyed, consisting of 30.9% pools, 28.6% runs, 37.7% riffles, and 2.9% dry units. The study reach is 3,194m long, with a total area of 13,577 square meters, and a total volume of 2,344 cubic meters (Table 1). For an individual habitat breakdown see table 1.

Population Estimate

The estimated total number of steelhead in the study reach is 4,938 (Table 1). Steelhead densities were 0.36 fish per square meter and 2.11 fish per cubic meter (Table 1). Densities were 3.1 fish per cubic meter in runs, 1.85 fish per cubic meter in pools, and 1.44 fish per cubic meter in riffles (Table 1). For fish per square meter see table 1. Of the overall steelhead numbers 44% were found in pools, 41% in runs, and 15% in riffles (Table 1, Chart 1).

Steelhead Size

Fork lengths were taken on 434 steelhead. Fork length did not vary between habitat types. Refer to charts 2A-C for percent frequency fork length data for individual habitat types, and chart 3 for percent frequency fork length information for the entire study reach. No difference in condition was found between habitat types or age class, average condition factor is .116. Age 2+ steelhead were absent from riffles. See chart 4 for age class distributions within habitat types.

Discussion

This investigation took place from late August to early October. Water temperatures for the years of 1999 and 2000 never reached more then 18ºC (Chart 5A-B, SRRC), below acute stressful levels for salmonids (Belchik 1997). Stream flow during this time was 0.38cfs (SRRC). No other North Russian stream flow data is available. Throughout the mid-Klamath region this year was considered to be a low flow year and North Russian Creek presumes similar trends. However, no hard data is available to firmly support this. Upon observation, stretches of the creek were dry with fish stranded in isolated pools.

This supports the hypothesis of low flow conditions, but this could be an annual event. In a "normal" water year it would be expected that summer low flows would be greater then what was observed. Higher flows would have changed our habitat typing for certain units and would decrease our fish density estimates.

A significant problem with this study is the number of units that were electrofished to verify the visual estimates. Doloff et al. (1993) suggests that a minimum of ten units per stratum should be verified. In this case, only six pools, four runs, and five riffles were verified due to time constraints, rainfall, and the changing of seasons. Estimates were still generated but with wide confidence intervals. If this study is to be repeated on North Russian Creek we recommend that the percentage of visually estimated units be increased to 45% and the verification rate remain at 60%. Using these percentages we would complete the minimum number of verified units. To accommodate an increased sampling rate the project should be started earlier in the season.

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Appendix

Chart 1

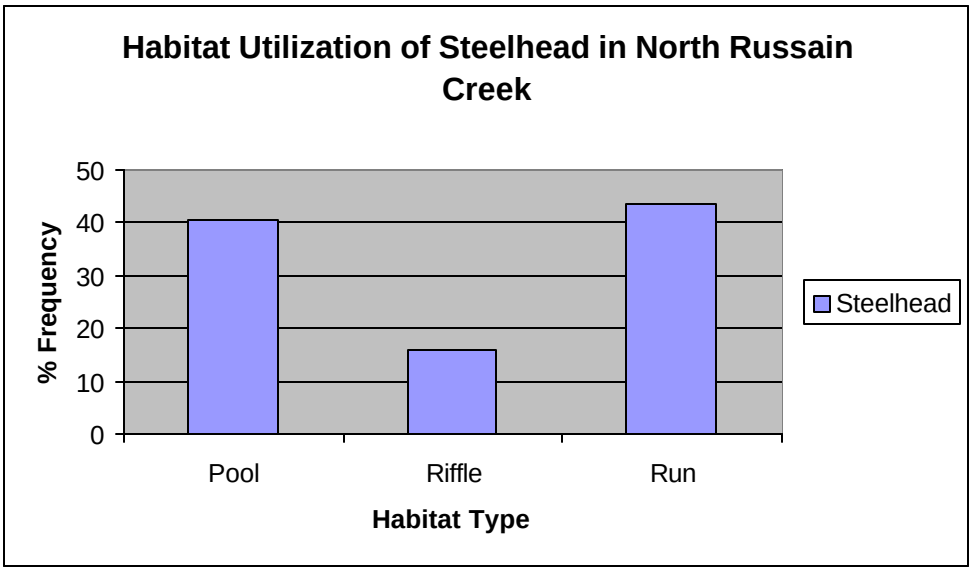


Chart 2A

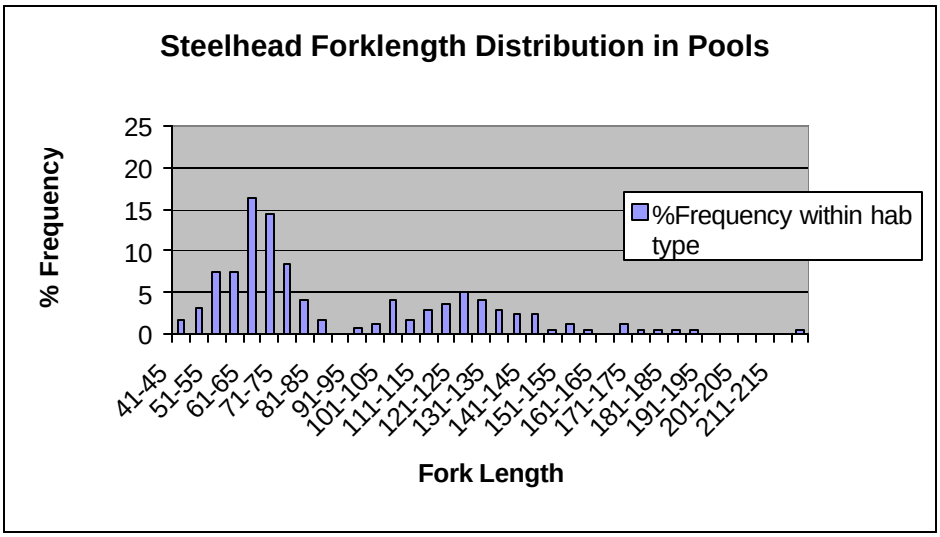


Chart 2B

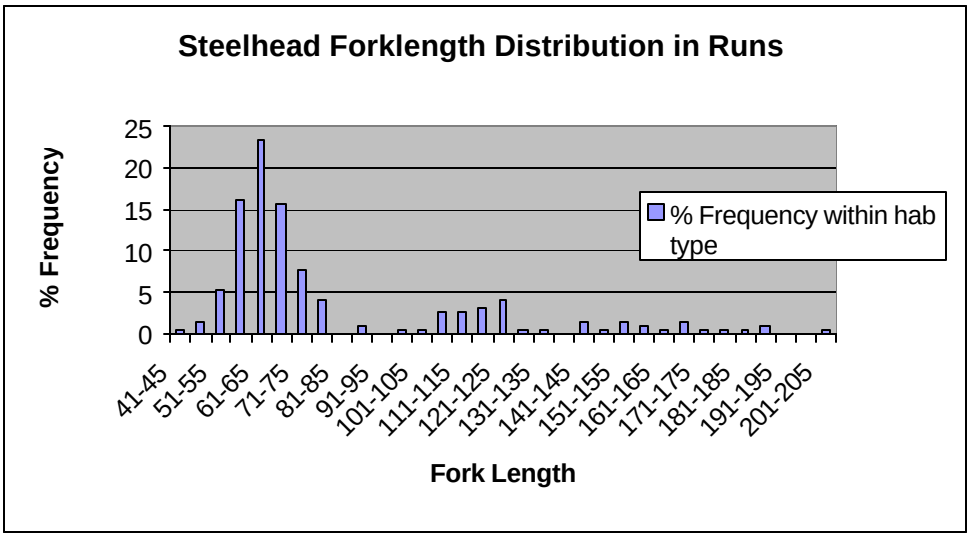


Chart 2C

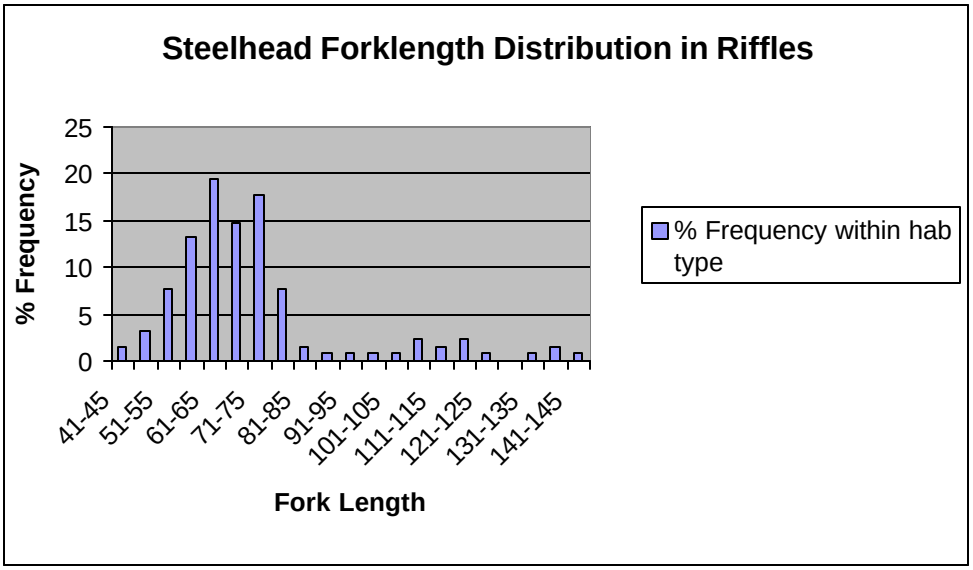


Chart 3

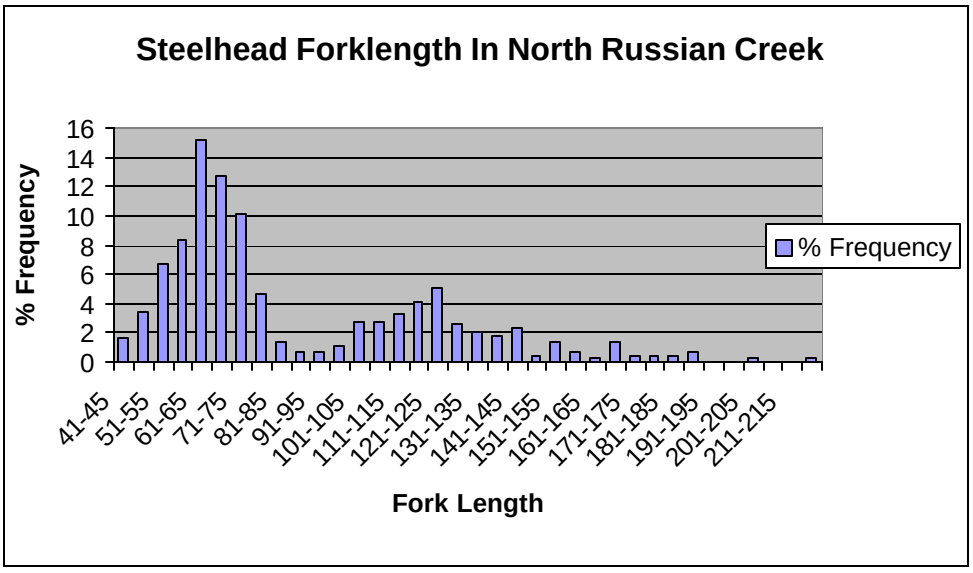


Chart 4

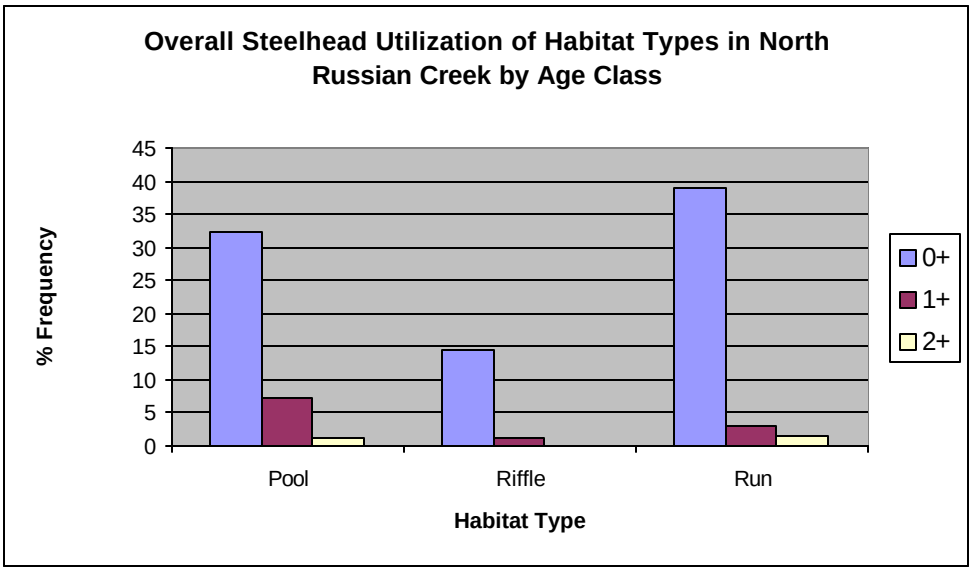
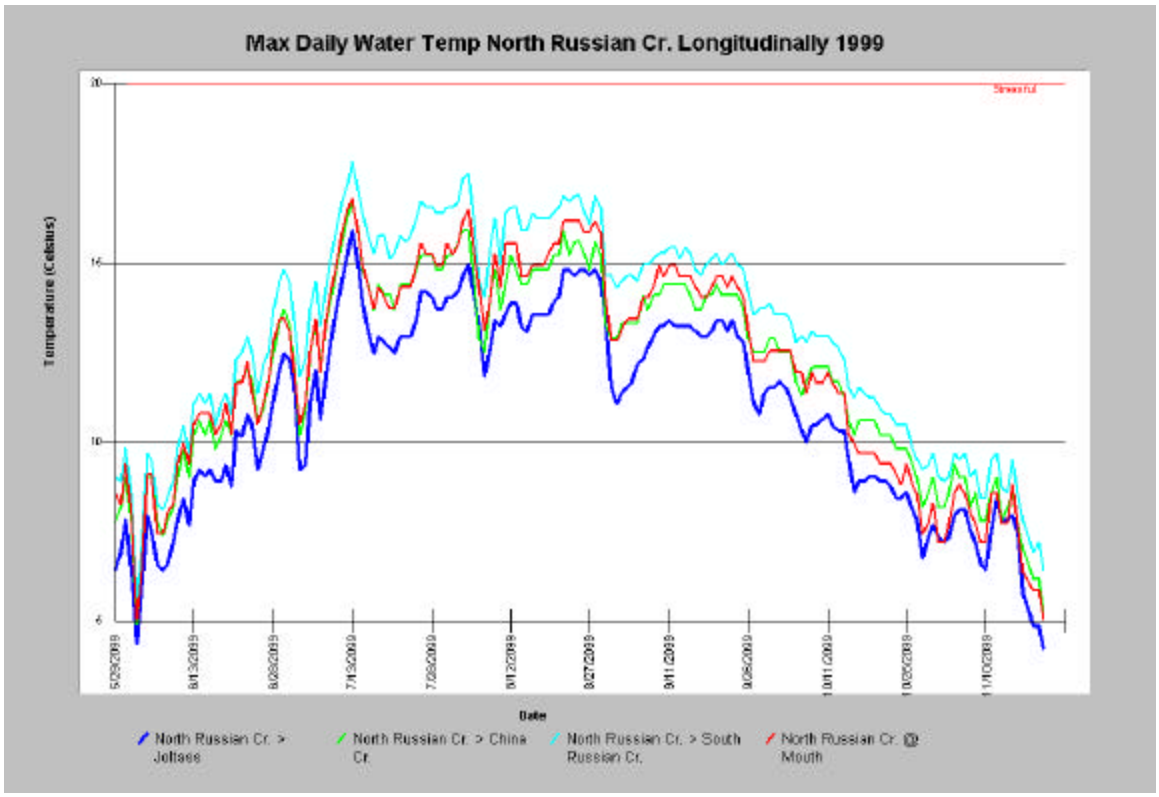
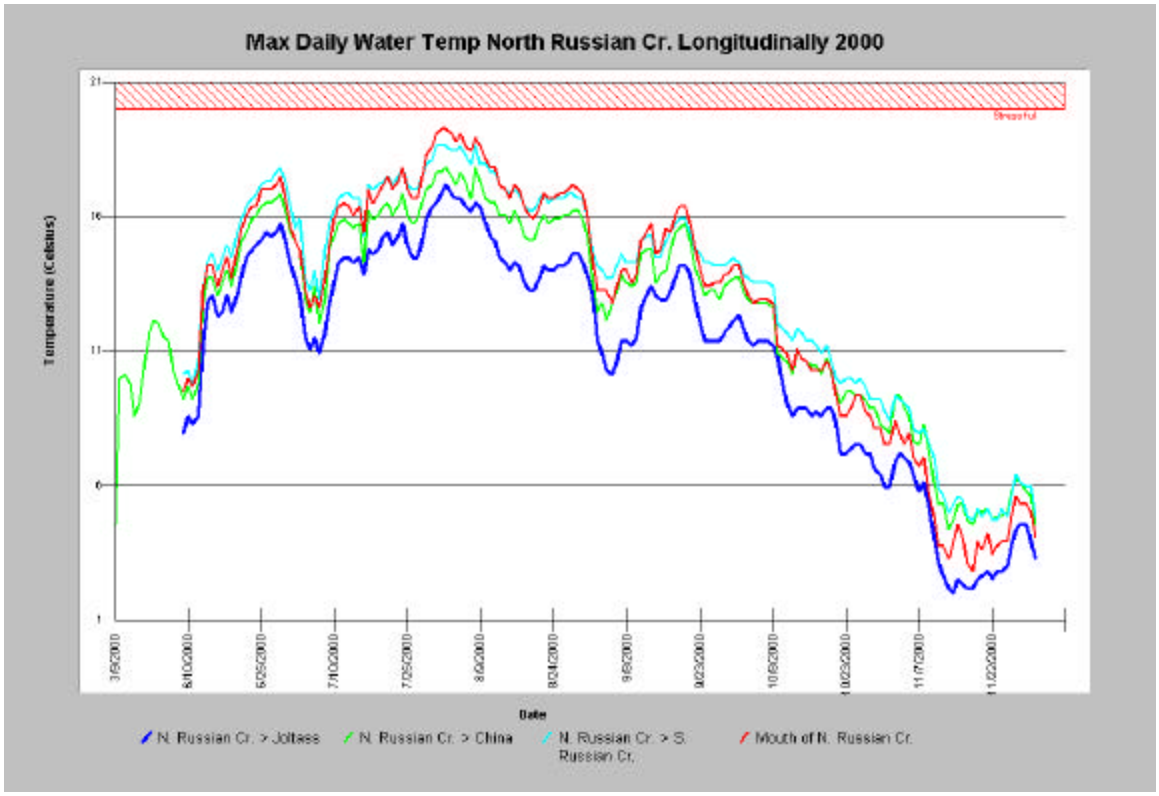


Chart 5A



Courtesy of the Salmon River Restoration Council

Chart 5B



Courtesy of the Salmon River Restoration Council

Table 1 Basinwide Estimation of Habitat and Fish Populations Summary

Summation Per Habitat Type								
	Pool		**Run**		**Riffle**		**Dry**	
Total Number of Habitat Units	54	30.9%	50	28.6%	66	37.7%	5	2.9%
Total Number of Dive Units	10		10		13		0	
Total Number of E-Fished Units	6		4		5		0	
Fish per Unit	40.40		40.41		11.15		0.00	
Total Number of Fish per Habitat Type	2,181.60	44%	2,020.37	41%	736.09	15%	0.00	
Total Length per Habitat Type (ft)	2,183.00		3,792.00		3,634.00		870.00	
Total Area per Habitat Type (ft^2)	33,071.22		55,669.98		57,405.98		0.00	
Total Volume per Habitat Type (ft^3)	41,685.46		23,023.71		18,124.03		0.00	
Fish per Square foot	0.07		0.04		0.01		0.00	
Fish per Cubic foot	0.05		0.09		0.04		0.00	
Total Length per Habitat Type (m)	665.38	20.8%	1,155.80	36.2%	1,107.64	34.5%	265.18	8.3%
Total Area per Habitat Type (m^2)	3,072.32	22.6%	5,171.74	38.1%	5,333.02	39.3%	0.00	
Total Volume per Habitat Type (m^3)	1,179.70	50.3%	651.57	27.8%	512.91	21.9%	0.00	
Fish per Square Meter	0.71		0.39		0.14		0.00	
Fish per Cubic Meter	1.85		3.10		1.44		0.00	

Reach Totals			
Total Number of Habitat Units	176	Conversion Factors	
Total Number of Dive Units	33	1ft = 0.3048m	
Total Number of E-Fish Units	15	1ft^2 = 0.0929m^2	
Total Number of Fish	4,938.91	1ft^3 = 0.0283m^3	
Total Length of Reach (ft)	10,479.00		
Total Area (ft^2)	146,147.18		
Total Volume (ft^3)	82,833.20		
Fish per Square Foot	0.03		
Fish per Cubic Foot	0.06		
Total Length (m)	3,194.00		
Total Area (m^2)	13,577.07		
Total Volume (m^3)	2,344.18		
Fish per Square Meter	0.36		
Fish per Cubic Meter	2.11		