FISHERY RESEARCH

REDBAND AND YELLOWSTONE CUTTHROAT TROUT INVESTIGATIONS

Grant # F-73-R-24

July 1, 2001 to June 30, 2002

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Annual Performance Report

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Project 6 Redband and Yellowstone Cutthroat Trout Investigations

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ABSTRACT

This report describes initial work from a multi-year effort to evaluate desert redband trout status in Idaho. In general, life history and distribution/abundance data are lacking for desert redband trout streams in Idaho and elsewhere. Such data can be useful in evaluating risk of population extinction from demographic and stochastic factors. We collected redband trout using backpack electrofishing gear in 14 study streams during 2001. Fish were collected to determine appropriate aging structures, model effects of conductivity on growth, and develop maturity schedules for redband across the range of high desert environments in Idaho. Only a subsample of analyzed data from the latter issue is presented in this progress report. A total of 648 redband trout were sampled during collection efforts. During lab necropsy, a variety of structures were removed from these fish including otoliths, scales, heads (for whirling disease analysis), hearts, gills, ovaries, and testes. Maturity status for each fish was also evaluated. For fish of known sex, we developed a “maturity transition point” (MTP) between immature and mature fish within study streams by relating fish length to maturity via logistic regression. Maturity transition point for what appears to be a resident population in 1.5 m wide Crab Creek was 107 mm for males and only 125 mm for females. Maturity transition point for redband trout residing in the East Fork Jarbidge River was considerably larger at 155 mm and 169 mm, respectively. The MTP estimates for the remaining 11 streams will be reported by this project in the upcoming year along with development of a multiple-regression model that will allow its prediction across the landscape based on landscape level parameters. In addition to life history structure collection and analysis, temperature data for periods ranging from March to November were collected at 30 sites including the 14 study streams above in 2001. Results of this temperature monitoring effort are presented. Temperature data for the entire summer warm-water period were successfully recorded at all but four locations. This temperature database will be extended into future years and used to build predictive models relating to fish growth, maturity schedules, and physiological parameters.

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INTRODUCTION

Idaho Department of Fish and Game (IDFG) and Bureau of Land Management (BLM) have both identified the desert redband trout as a sensitive species. Redband trout in Idaho were proposed for listing during the mid-1990's, but the petition was not found to be warranted at that time. Recently, interior basin redband trout in Oregon were petitioned for Endangered Species Act (ESA) petition, and listing was found to be unwarranted. The original petition that involved Idaho fish did not distinguish between desert redband trout and other interior forms including steelhead. However, strong interest in the status of desert redband in Idaho remains among environmental groups, and the potential for a future petition submittal remains high.

Desert redband trout have been found surviving in high temperatures relative to other salmonids (Behnke 1992; Zoellick 1999) and are common in a number of south Idaho streams. Population information across Idaho ranges from nonexistent to scattered inventory efforts to more intense evaluations (Zoellick 1999). However, in general, desert redband trout are probably the least studied Idaho salmonid. Although population inventories have been conducted in select drainages (e.g. Allen et al. 1996), basic population dynamics information is lacking for Idaho redband stocks and for the subspecies in general outside of Idaho. Drainage-wide distribution patterns remain to be investigated, and with the exception of work in Big and Little Jacks creeks (B. Zoellick, BLM, unpublished data), rough approximations of drainage population abundance in Idaho are unknown. The most effective aging structure for redband trout has never been determined, nor has maximum age been assessed. Past aging work has typically involved the use of scales, an unlikely structure given the temperature extremes and likelihood of growth checks. Age-at-maturity, an important parameter for evaluating the effect of angler harvest and for calculating effective population size, has not been investigated for desert redband.

The most basic life history information available for most Idaho salmonids is not available for this subspecies. For example, no estimates of natural mortality by cohort exist in Idaho, nor do studies of spawning migration patterns. Although several studies have documented that temperature can influence distribution of redband trout (Li et al. 1994), possible mechanisms the subspecies employs to deal with the unusually high temperatures of its environment remain unknown. In particular, large-scale movement patterns of both juvenile and adult fish during summer temperature extremes have not been well documented. Knowledge of suspected spawning areas and associated habitat exists for a few streams (B. Zoellick, BLM, personal communication), but actual observation of high desert redband spawning by biologists is nonexistent.

In general, distribution/abundance and life history data are lacking for desert redband trout streams in Idaho. Availability of such information is considered by some biologists to have been a major factor in the eventual 2001 decision to not list Yellowstone cutthroat trout under the ESA (Steve Yundt, IDFG, personal communication).

OBJECTIVES

1. Collect distribution, population dynamics, and life history data necessary to evaluate the status of desert redband trout in Idaho.

2. Collect water temperature information for use in assessing redband trout/temperature interactions.

STUDY AREA

Behnke (1992) designated all native rainbow trout in the Columbia River basin east of the Cascade Mountains as redband trout, a large area that includes populations residing in both arid and cooler mountainous environments. Presently, it is not possible to genetically distinguish differences in redband groups and “their classification is a matter of personal preference and professional judgment” (Behnke 1992). We subjectively defined desert redband trout in Idaho as those populations residing in the relatively arid portion of the Snake River drainage upstream of the Boise River confluence to their natural barrier, Shoshone Falls (Figure 1). We excluded the Big Wood drainage from the study because of the largely montane nature of its principal tributaries.

For the fish sampling portion of this study, we selected 14 streams known or suspected to contain desert redband trout populations across their longitudinal distribution in Idaho (Figure 1). Study streams for this effort were selected based on suspected differences in water temperature regimes and their ability to absorb lethal sampling based on either quantitative or qualitative estimates of population size (Bruce Zoellick, BLM, personal communication). Study streams varied in width from 1.2 to 8.4 m, and elevation at sampling sites ranged from 942 to 1843 m (Table 1). None of the streams are currently stocked with hatchery rainbow trout, although stocking had occurred historically at several of the sites (IDFG, unpublished data).

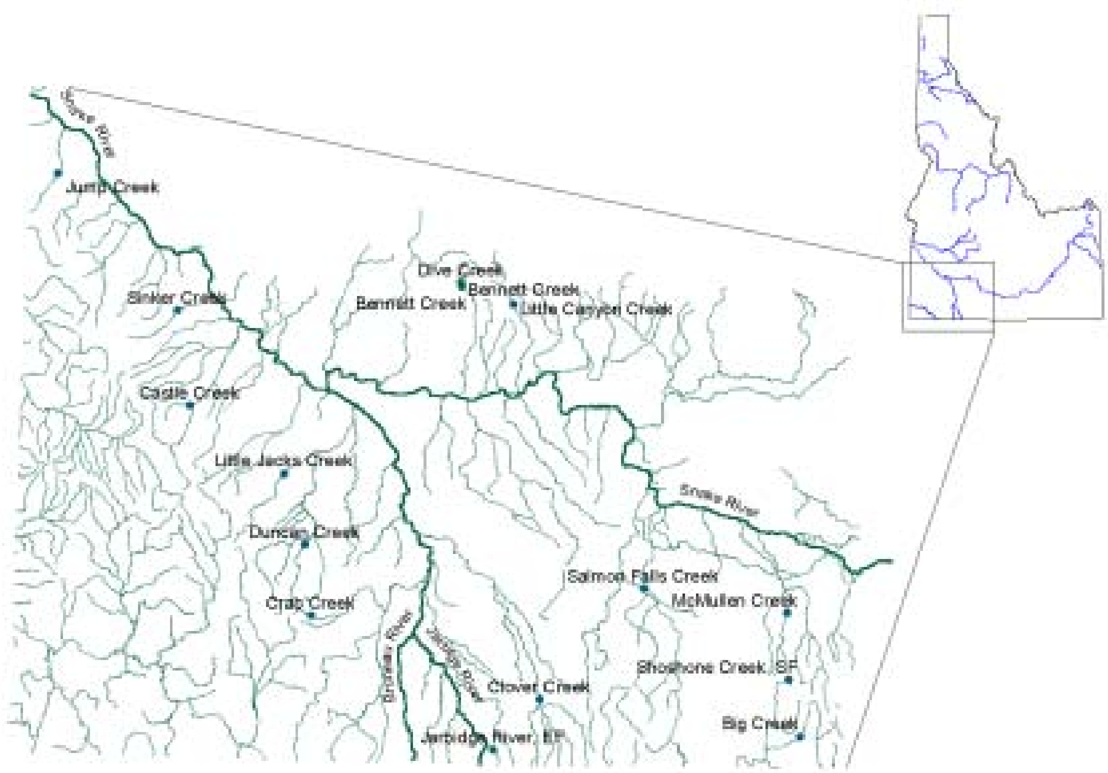


Figure 1. Location of desert redband trout sample sites.

Table 1. Collection sites and sample size obtained via DC electrofishing for evaluation of redband trout maturity schedules, March-April 2001.

Site Name	Date Collected	Total Sample Size (n)	Stream Width (m)	UTM Easting	UTM Northing	Elevation (m)
Bennett Creek	3/22/01	32		621328	4786796	1420
Big Creek	4/4/01	6	1.2	721455	4661460	1843
Castle Creek	3/20/01	69	2.2	546074	4749350	1085
Crab Creek	4/2/01	46	1.5	582386	4690950	1707
Dive Creek	3/22/01	42		621333	4787012	1419
Duncan Creek	3/21/01	75	2	579833	4711068	1384
Jarbidge River, EF	4/5/01	83	8.4	635122	4654588	1565
Jump Creek	3/29/01	50	2.9	506380	4813950	762
Little Canyon Creek	3/23/01	41	1.6	636402	4781260	1561
Little Jacks Creek	3/20/01	69	3.2	573257	4731076	1088
McMullen Creek	4/4/01	57		716688	4696449	1305
Salmon Falls Creek	4/4/01	23	4.4	675859	4702004	1113
Sinker Creek	3/23/01	55	2.7	541490	4776243	942

METHODS

Redband Trout Maturity Schedules

We collected redband trout using backpack electrofishing gear in the 14 study streams from March 20 to April 5, 2001 (Table 1). Fish were collected to determine appropriate aging structures, model effects of conductivity on growth, and develop maturity schedules for redband across the range of high desert environments in Idaho. Only a subsample of data from the latter issue is presented in this progress report. Target sample sizes were 50-75 fish per location with sizes being approximately spaced across the observed size range. Fish were sacrificed via overdose with MS222, bagged, and transported directly to a freezer for subsequent lab analysis.

Before necropsy, trout were defrosted, weighed to the nearest 0.01 g, and measured (total length) to the nearest mm. We ascertained sex of individuals via examination of gonads following the methods of Downs et al. (1997). Gonads with discernable eggs and those showing signs of graininess to the naked eye were classified as females. Fish were classified as mature males if enlargement of gonads included any development of white testicular tissue (Downs 1997). Immature fish were also sexed when possible. Remaining fish were classified as immature, sex unknown.

For fish of known sex, we developed a “maturity transition point” (MTP) between immature and mature fish within streams by relating fish length to maturity via logistic regression (Meyer et al. in review). We considered MTP as the fish length at which the probability of being mature was 0.5 on the logistic curves.

Stream Temperature Evaluations

To obtain temperature profiles, continuously recording Hobo Temp™ thermographs were installed at sites throughout the study area. Thermographs were installed at each sampling site where redband trout were collected via electrofishing described above (Figure 1). We also placed a thermograph on Clover Creek at a site where no redband trout were captured via spring electrofishing. Clover Creek is a map synonym for the Jarbidge River just below Three Forks. In addition, numerous thermographs were installed within the Big Jacks Creek drainage (Figure 2) for establishing temperature baselines for use in upcoming redband telemetry movement studies and to assist in evaluation of redband temperature tolerances. In anticipation of future redband movement studies, two additional thermographs were placed in Crab Creek upstream and downstream of the main thermograph site where electrofishing collections occurred. Thermographs recorded temperatures hourly from installation date until data were downloaded during October and November 2001. Thermographs were subsequently relaunched to allow for development of a complete annual temperature profile during the upcoming year.

FINDINGS

Maturity Schedules

A total of 648 redband trout were sampled during the collection efforts, 42 of which were sampled in Crab Creek (Table 1). This small (1.5 m) wide stream near Grasmere flowed approximately 10.5 km during the spring sampling period before the water table dropped and flows ceased. Maturity transition point for this apparent resident population was 107 mm for males and only 125 mm for females (Figure 3). As expected, MTP for redband trout residing in the East Fork Jarbidge River was considerably larger at 155 mm and 169 mm, respectively (Figure 4). MTP estimates for the remaining 11 streams will be calculated by this project in the upcoming year along with development of a multiple-regression model that will allow its prediction across the landscape based on landscape level parameters.

Stream Temperature Evaluations

Temperature data for periods ranging from March to November were collected at 30 sites in 2001. Preliminary results of this temperature monitoring effort are presented in Appendix 1 along with associated UTM coordinates for all sites (Appendix 2). Temperature data for the entire summer warm-water period were successfully recorded at all but four locations. Due to a fire and subsequent bedload movement, water flow at the Bennett and Dive Creek sites effectively declined to zero during mid-summer with resultant thermograph dewatering. The lower Crab Creek site was dewatered by late July (Appendix 1). Due to time constraints we were unable to download data from a single site on Duncan Creek. Vandals removed another thermograph on this stream during the deployment period. All thermographs were downloaded before the onset of winter to minimize potential data loss during high spring flow events. A more complete analysis of this data including comparison with past temperature records will be completed in the upcoming project year.

Figure 2. Location of thermographs installed in the Big Jacks Creek Drainage at sites where fish were not collected for maturity studies, summer and fall 2001. The Cottonwood confluence site includes a recorder in Cottonwood Creek and one in Big Jacks Creek about 50 m upstream.

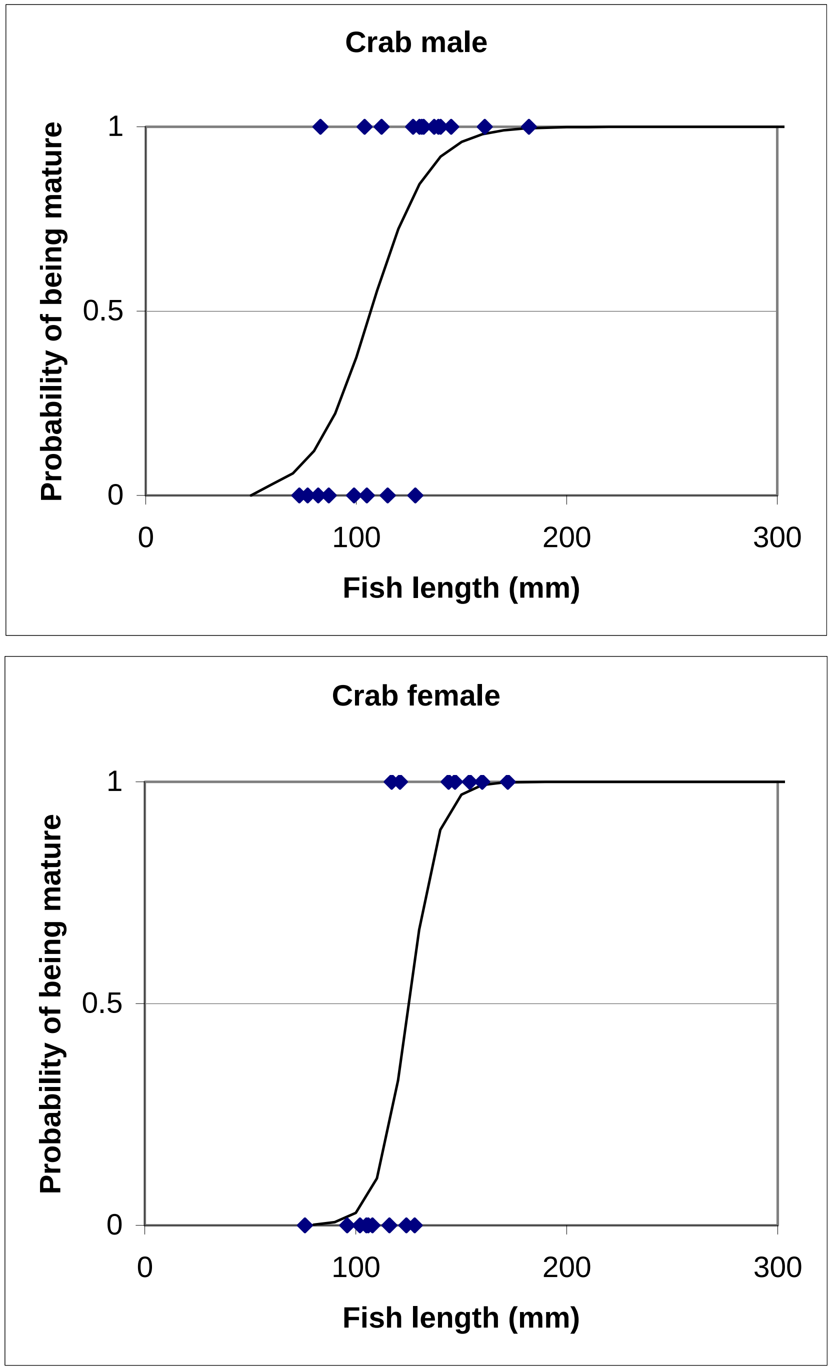
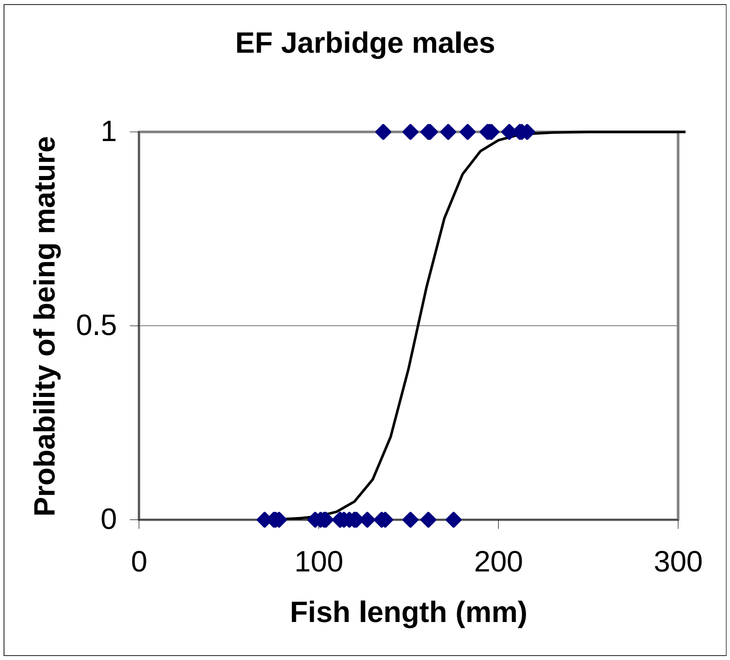


Figure 3. Maturity transition points for male and female redband trout in Crab Creek, Idaho, April 4, 2001.



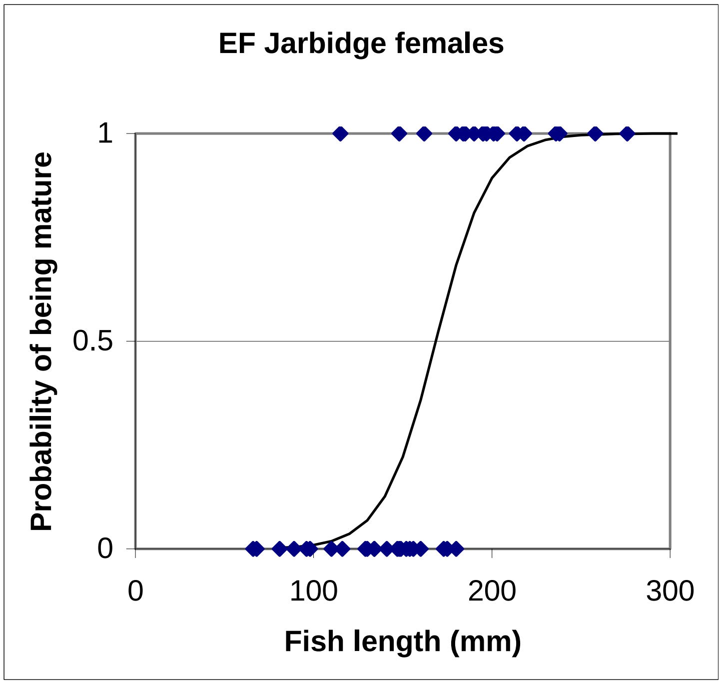


Figure 4. Maturity transition points for male and female redband trout in East Fork Jarbidge River, Idaho, April 5, 2001.

ACKNOWLEDGEMENTS

We thank Bruce Zoellick and Tim Burton of the Bureau of Land Management for assisting with field electrofishing and thermograph installation. Numerous Idaho Department of Fish and Game employees assisted with the necropsies. This project was funded by the Sport Fish and Restoration Act.

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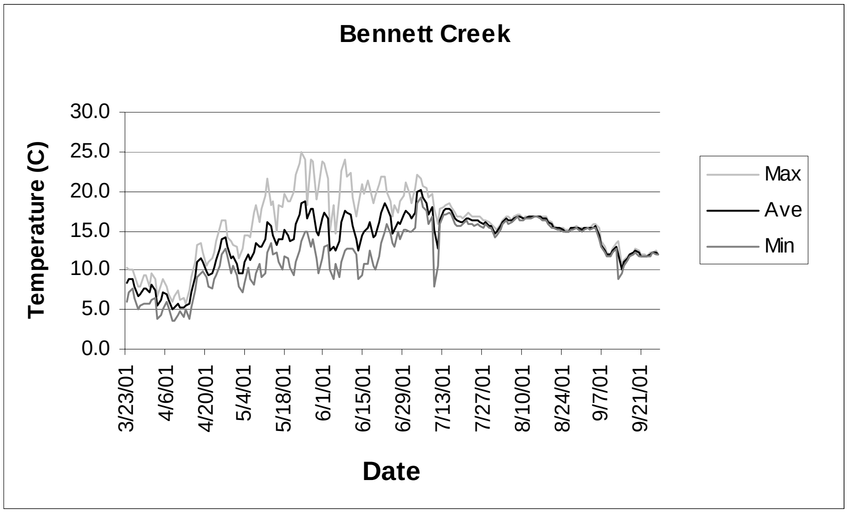
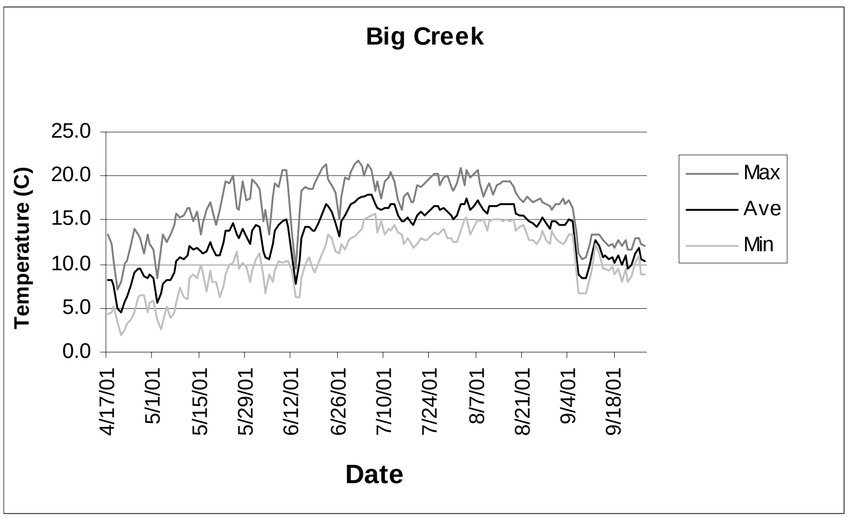
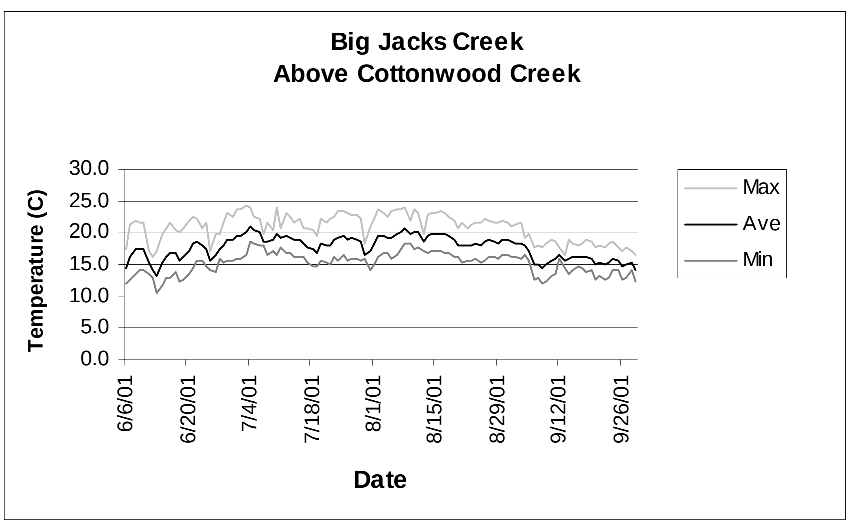
APPENDICES

Appendix 1. Daily mean, maximum, and minimum water temperatures recorded by thermographs at 30 sites across Idaho desert redband trout range, March to November 2001.







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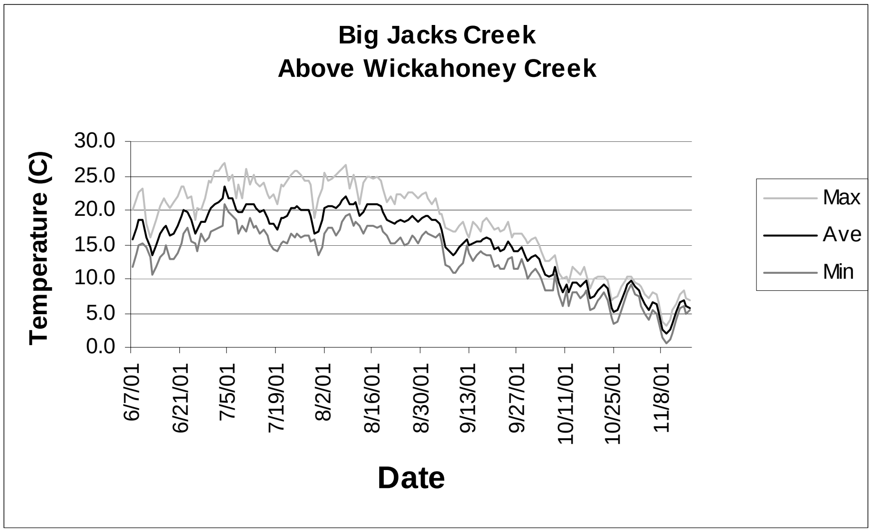

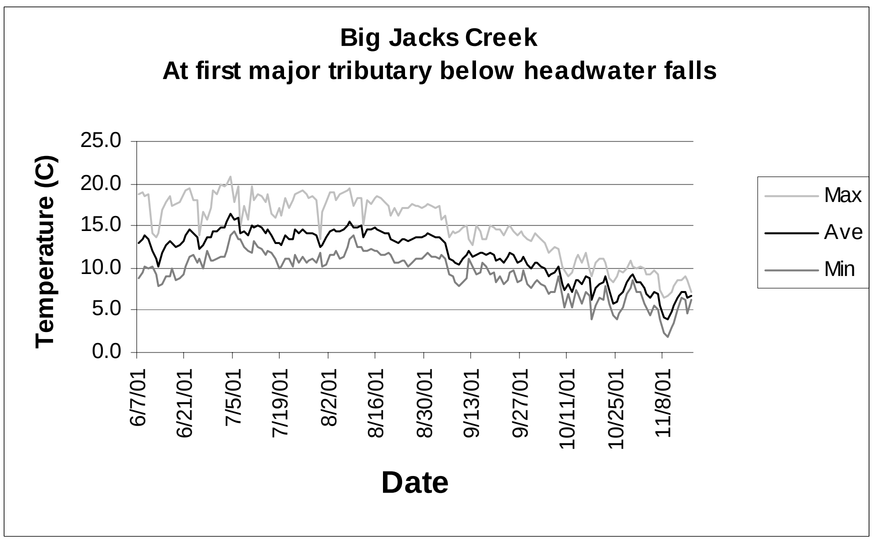

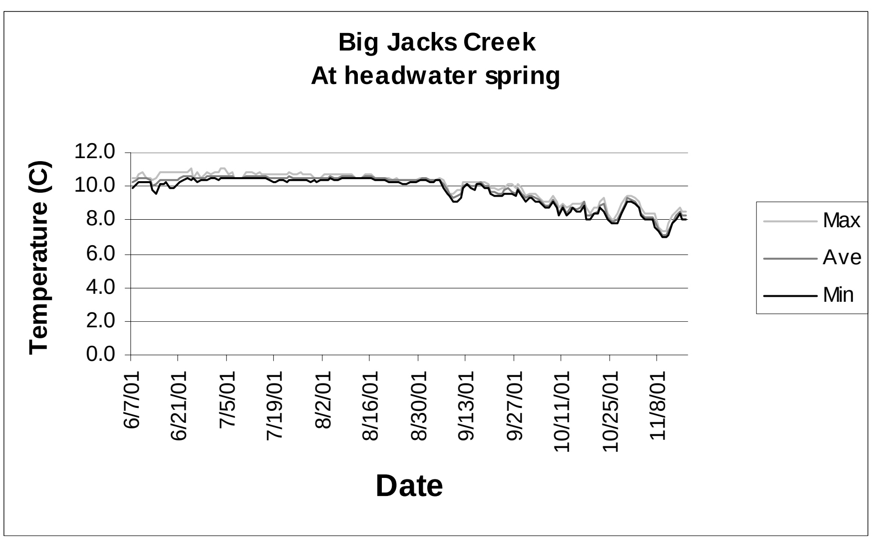

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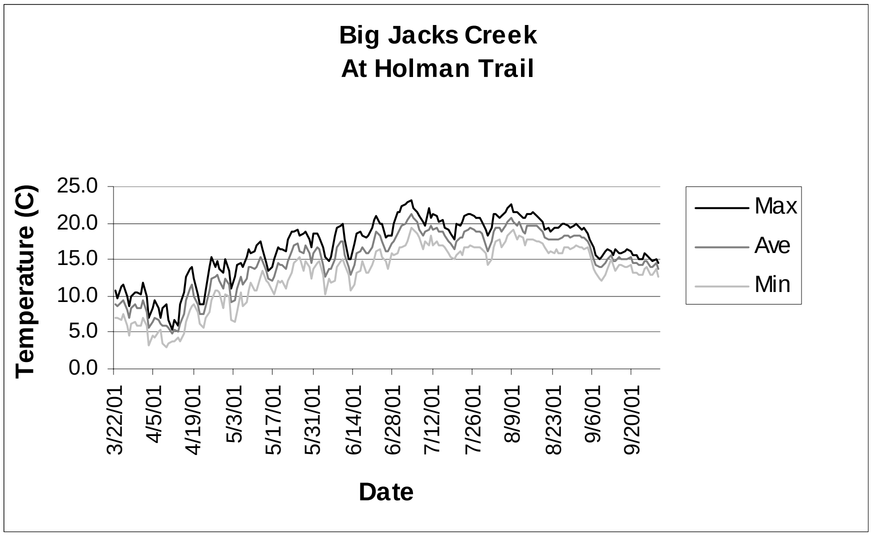

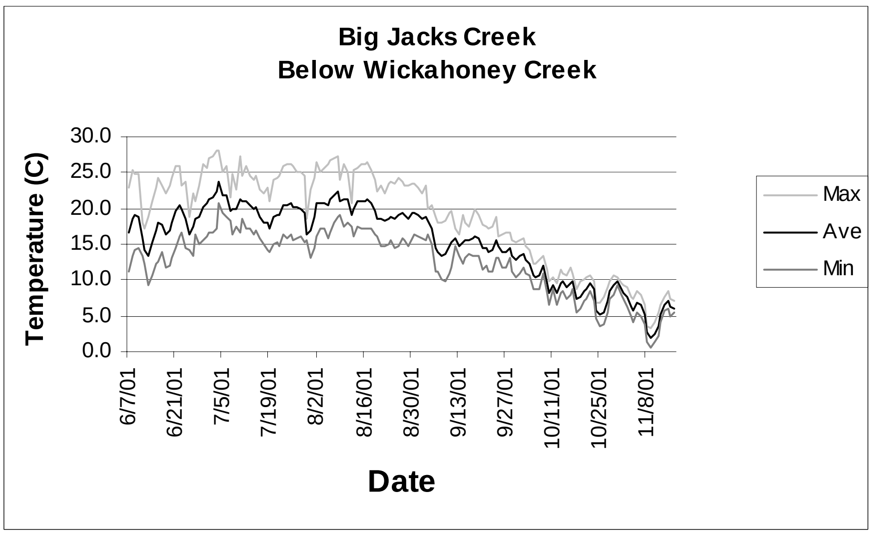

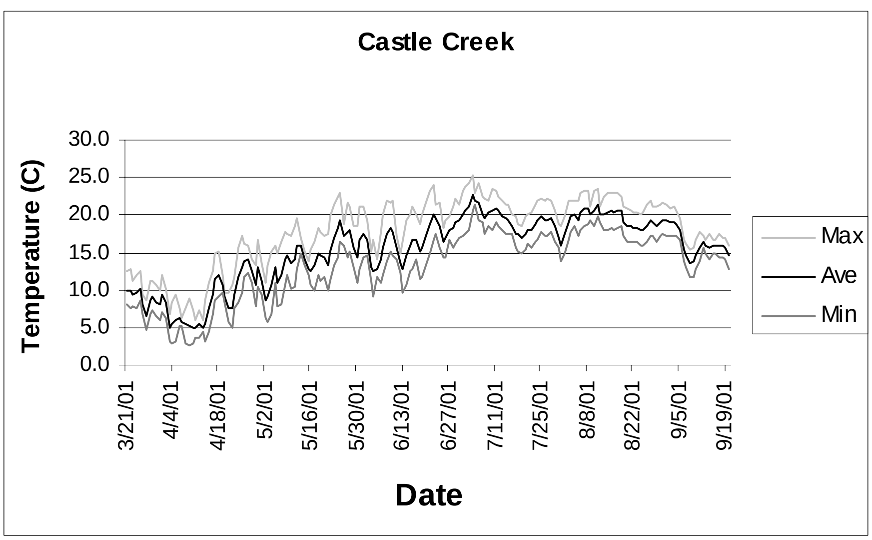

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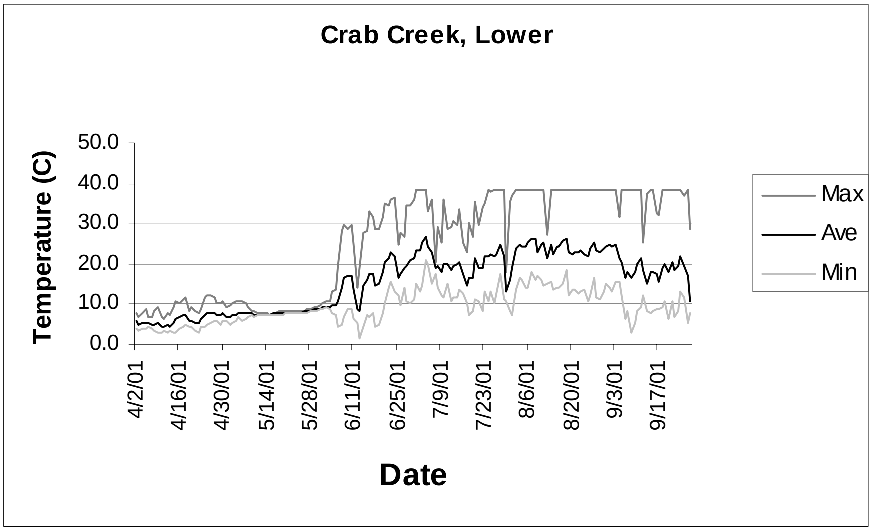

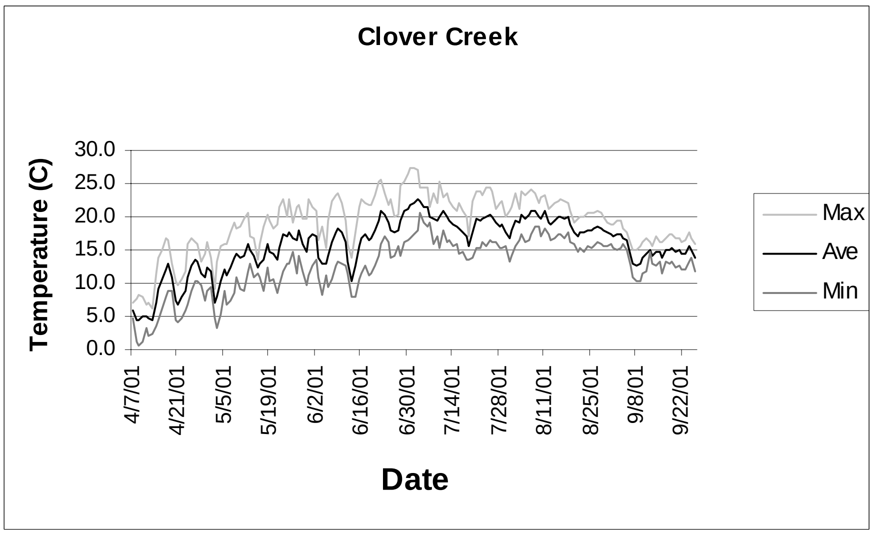

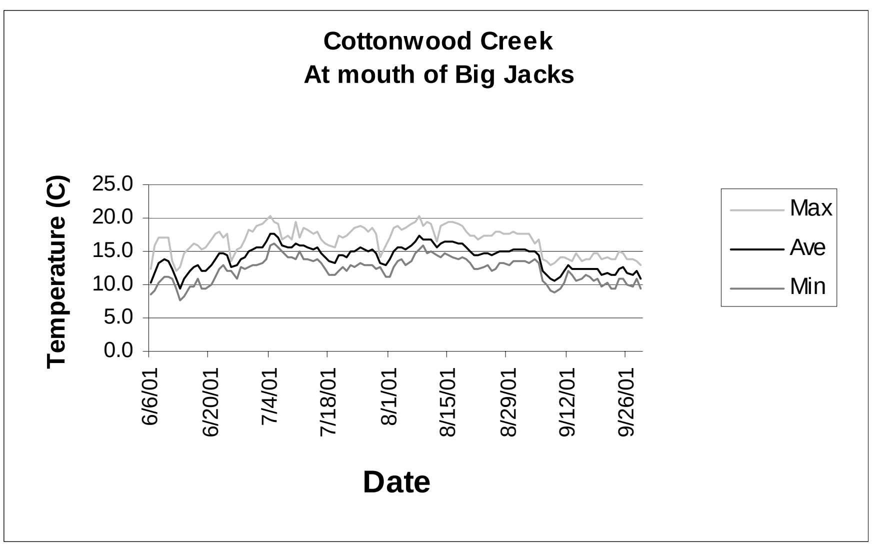

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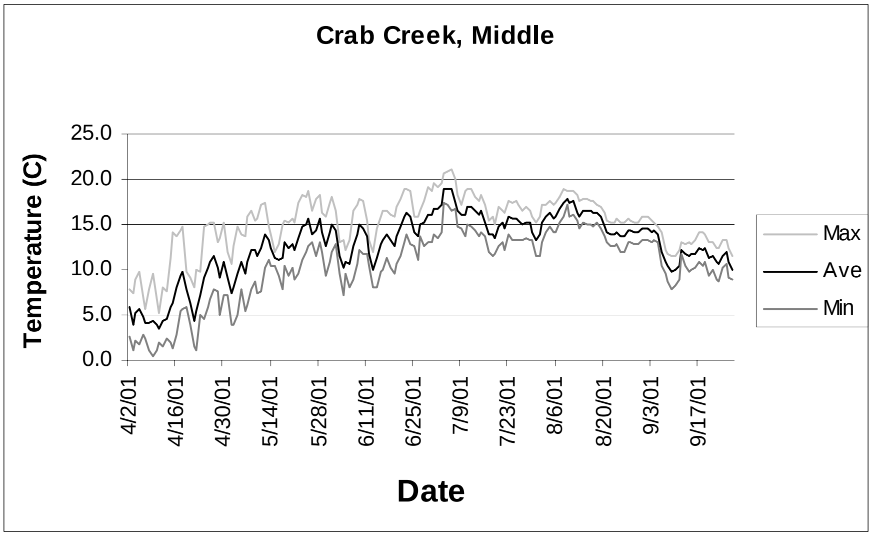

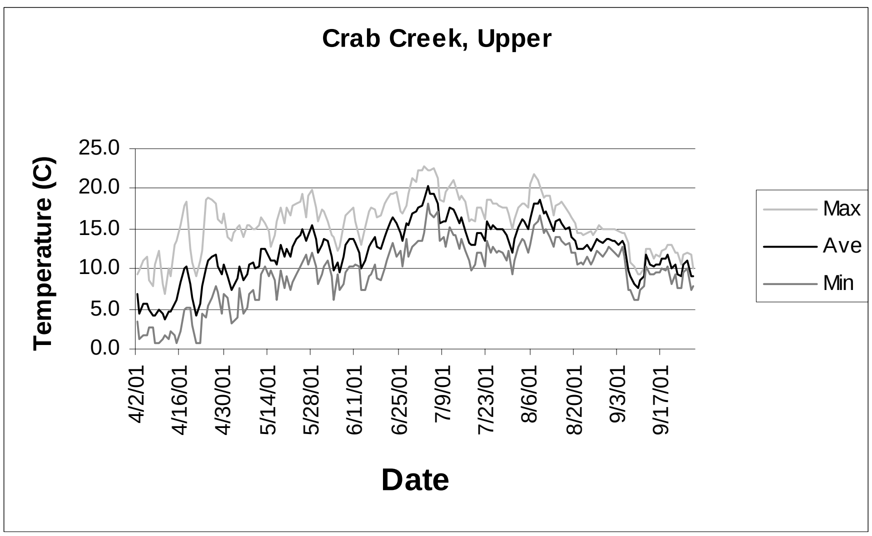

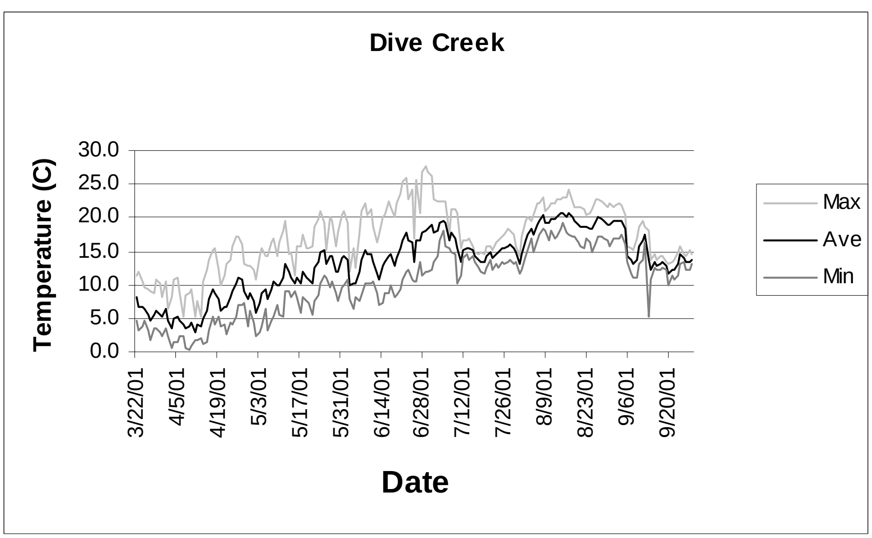

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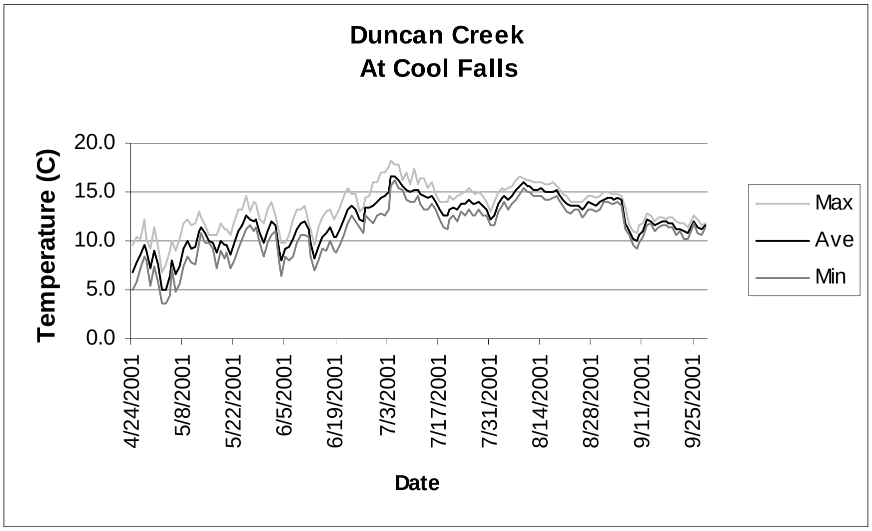

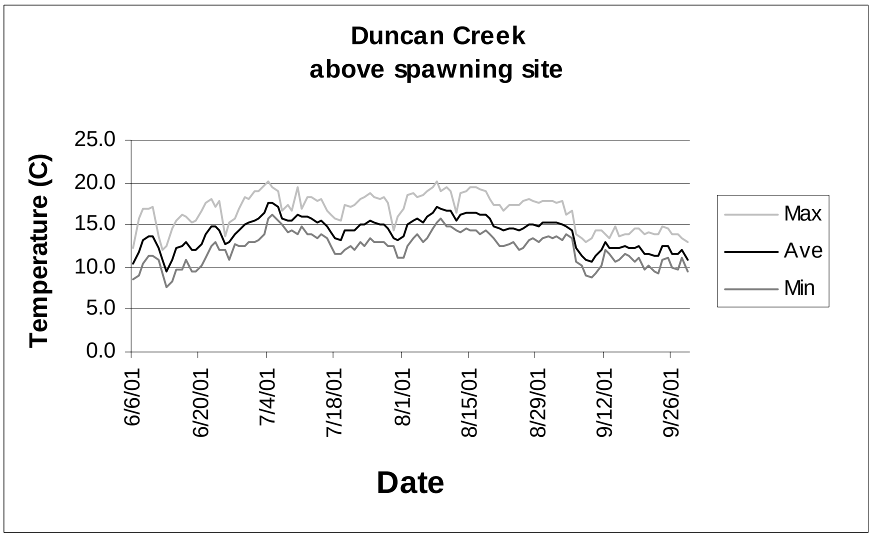

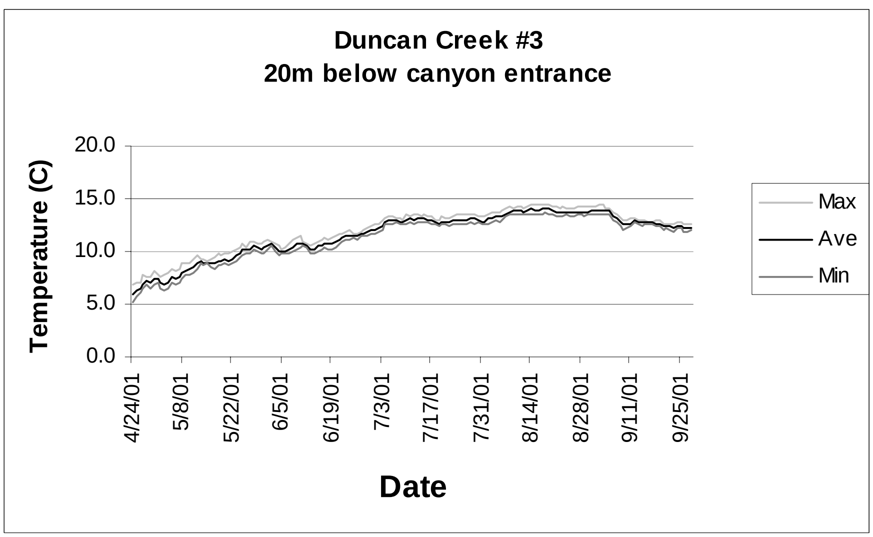

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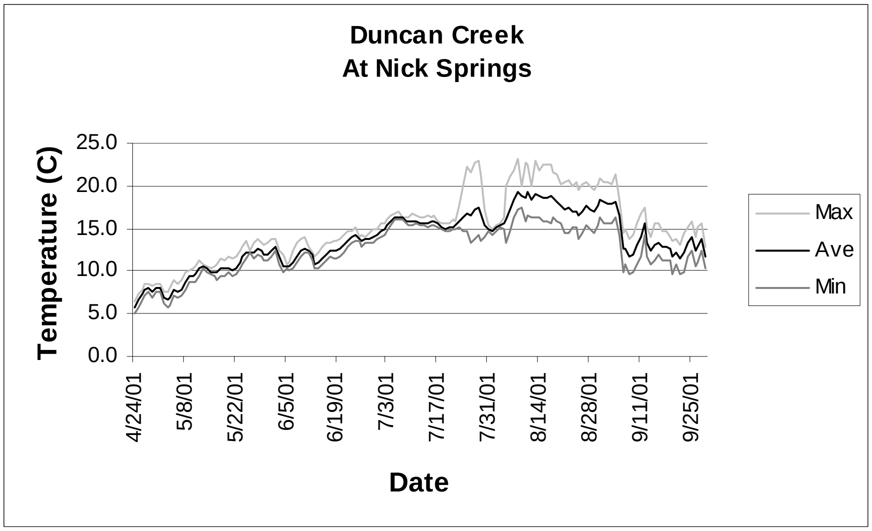

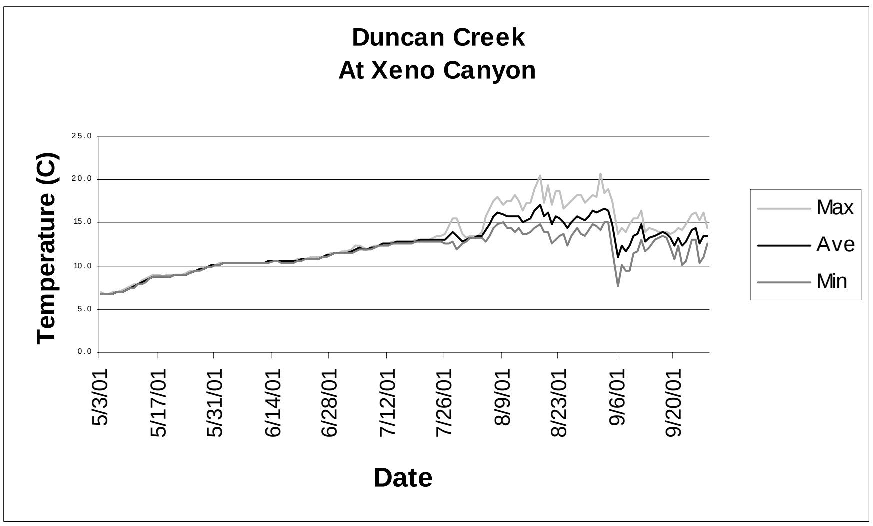

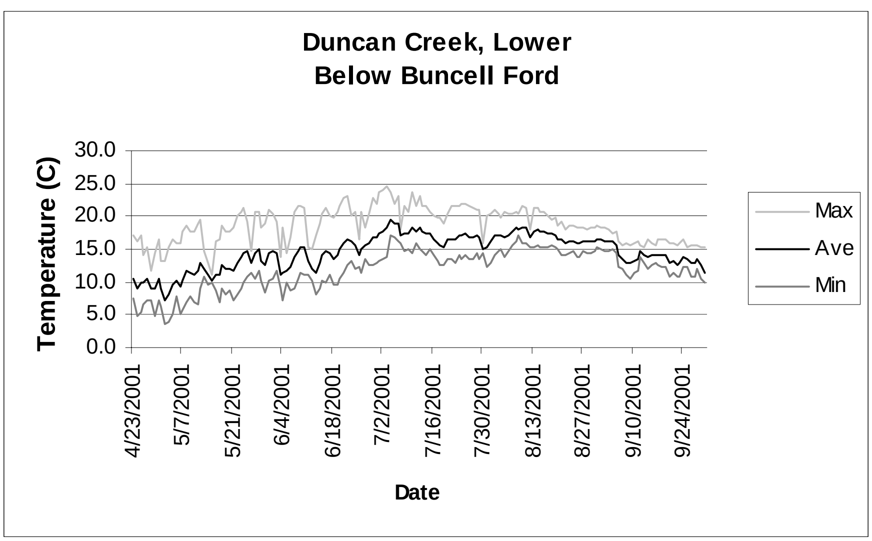

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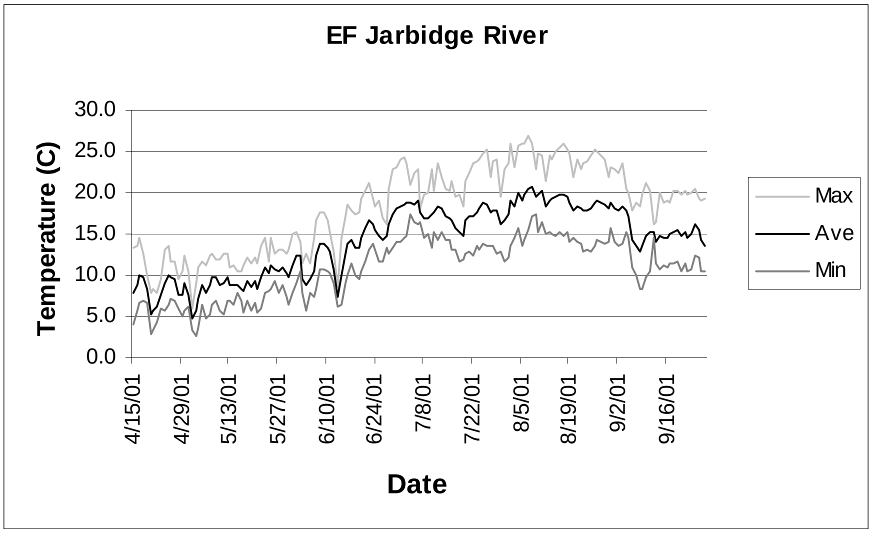

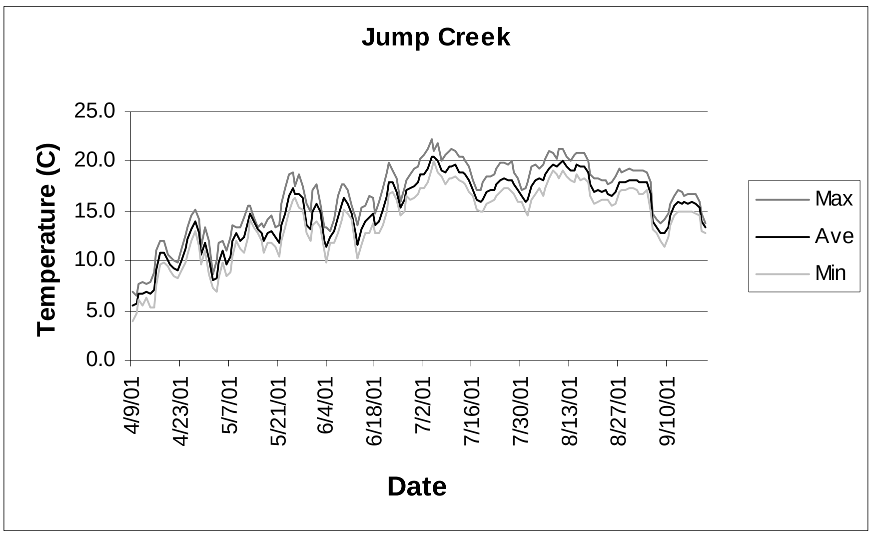

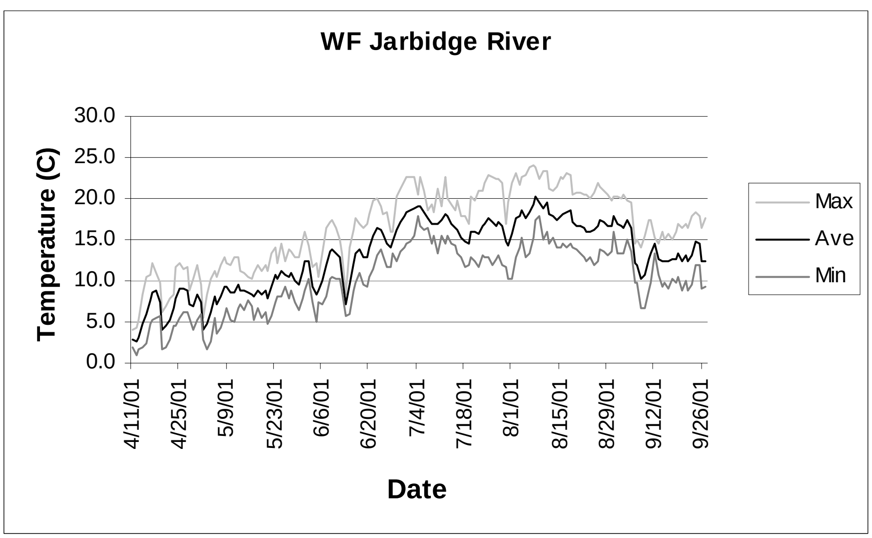

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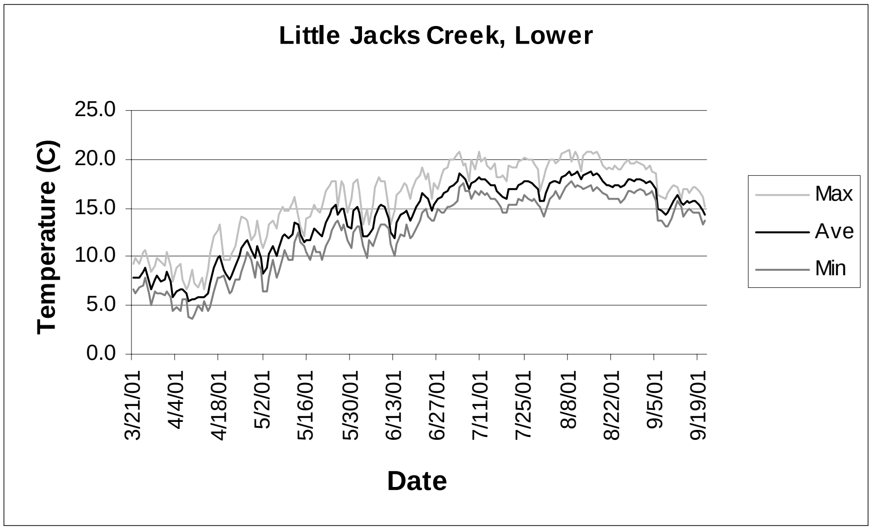

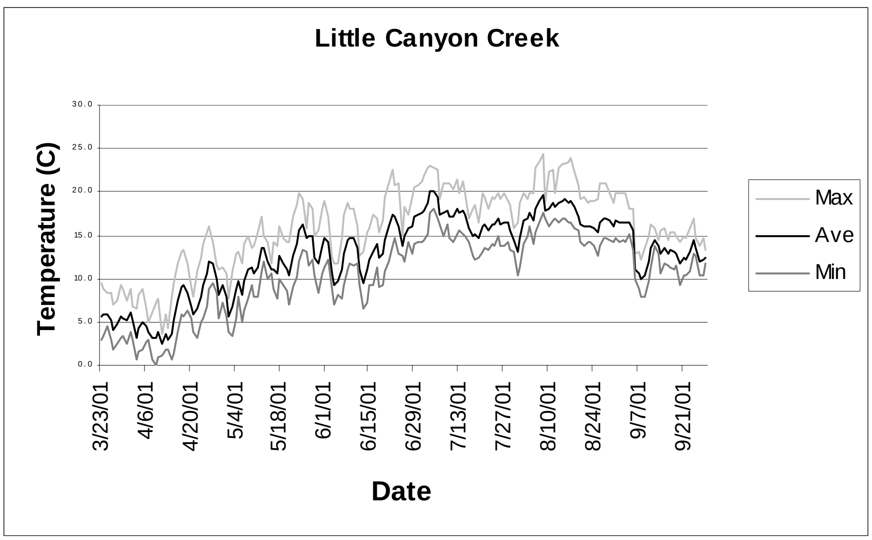

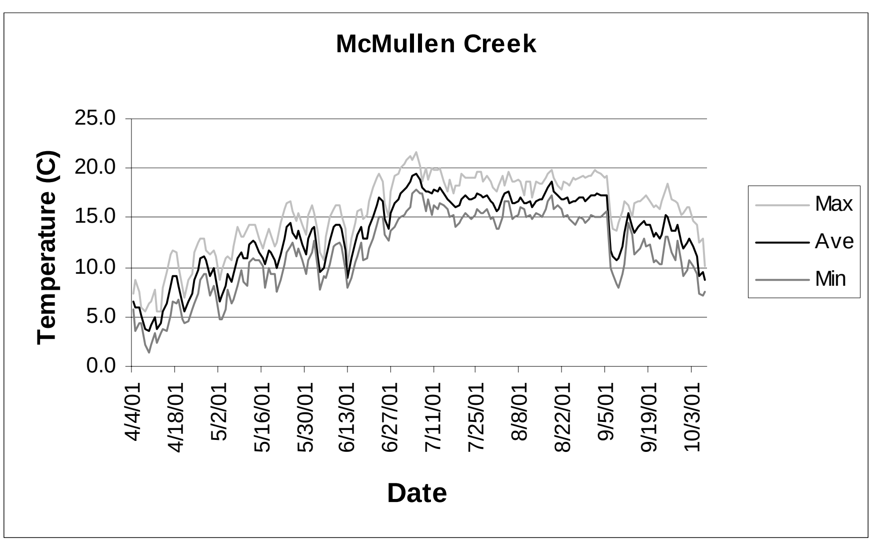

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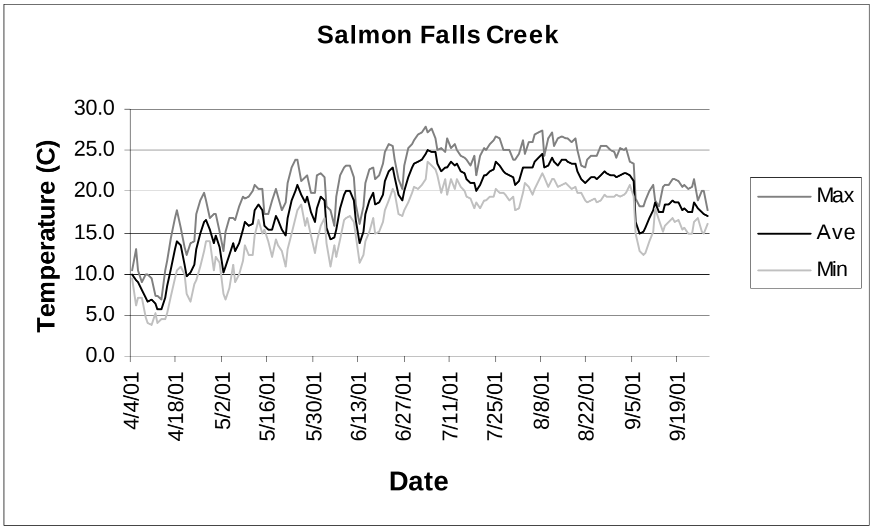

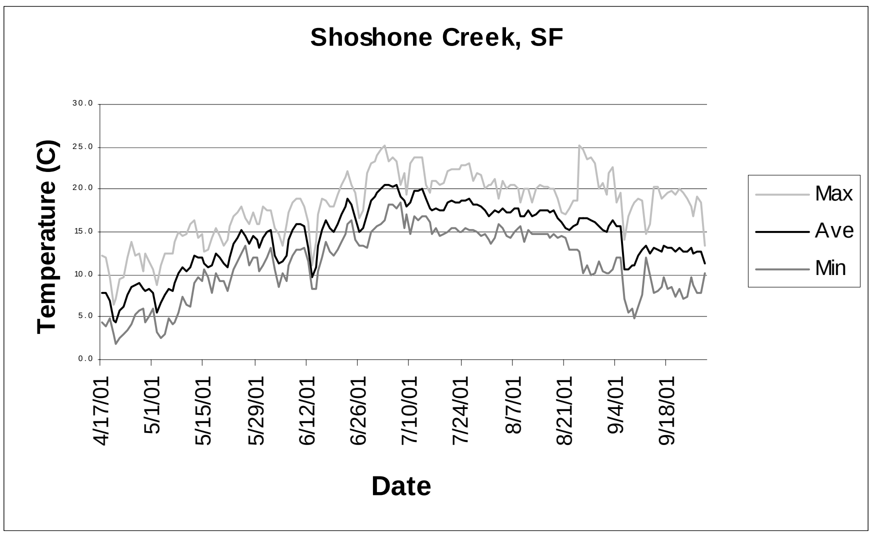

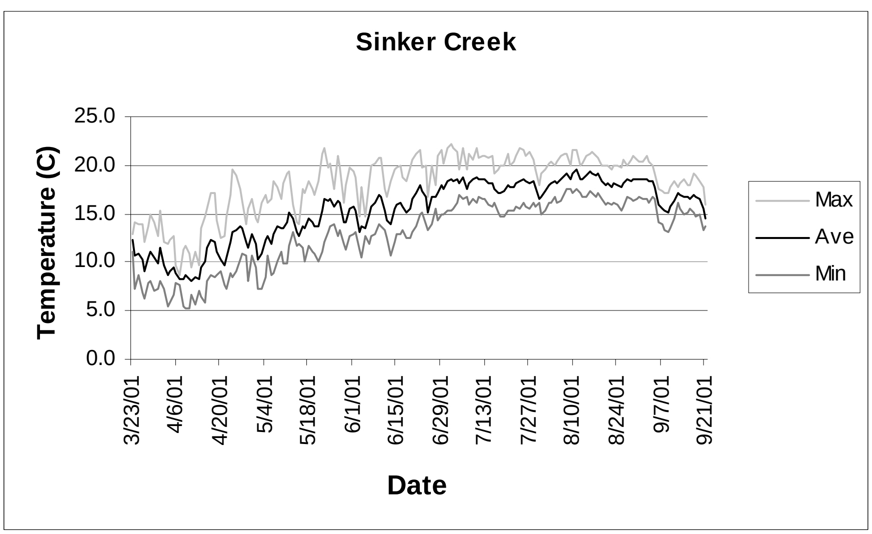

Appendix 2. Locations of thermograph sites within desert redband study area, 2001.

Stream	Location	Datum	Zone	UTM Easting	UTM Northing
Bennett Creek	Above Dive Creek	WGS 84	11	621328	4786796
Big Creek	Upper T15S R18E S34	NAD27	11	721455	4661460
Big Jacks Creek	Above Cottonwood Creek	NAD27	11	575725	4710697
Big Jacks Creek	Above Wickahoney	NAD27	11	582085	4714467
Big Jacks Creek	At Holman Trail	WGS 84	11	578740	4712795
Big Jacks Creek	Below falls	NAD27	11		
Big Jacks Creek	Below Wickahoney	NAD27	11	582078	4714474
Big Jacks Creek	1st major tributary below falls	NAD27	11		
Castle Creek	At Alder Creek	WGS 84	11	546074	4749350
Clover Creek	R11E T145S S31	NAD27	11	647660	4669510
Cottonwood Creek	At mouth onto Big Jacks	NAD27	11	575861	4710783
Crab Creek, Lower	Lower	NAD27	11	585719	4690330
Crab Creek	Middle, in canyon	NAD27	11	582386	4690950
Crab Creek, Upper	Upper	NAD27	11	581757	4691573
Dive Creek		WGS 84	11	621333	4787012
Duncan Creek	20m below canyon entrance	NAD27	11	577290	4707063
Duncan Creek	Above spawning site	NAD27	11	576932	4704873
Duncan Creek	Cool Falls	NAD27	11	576697	4705643
Duncan Creek	At Nick Springs	NAD27	11	577045	4706138
Duncan Creek	Xeno Canyon, T115 R3E Sec11 NE NE	NAD27	11	576946	4704875
Duncan Creek	Below Buncell near mouth of Big Jacks	NAD27	11	580800	4712708
Duncan Creek	By very large rock	NAD27	11	578485	4709247
Duncan Creek	At Buncell Ford	WGS 84	11	579833	4711068
Jarbidge River, EF	R9E T165 S25	NAD27	11	635122	4654588
Jarbidge River, WF	.1 mi above EF confluence	NAD27	11	633149	4656102
Jump Creek	Below falls	NAD27	11	506380	4813950
Little Canyon Creek		WGS 84	11	636402	4781260
Little Jacks Creek	Lower, at BLM crossing	WGS 84	11	573257	4731076
McMullen Creek	Private property, 3 mi from main road	NAD27	11	716688	4696449
Salmon Falls Creek	Lilly Grade road crossing	NAD27	11	675859	4702004
Shoshone Creek, SF		NAD27	11	717793	4677399
Sinker Creek	Below Highway 78	NAD27	11	541490	4776243

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