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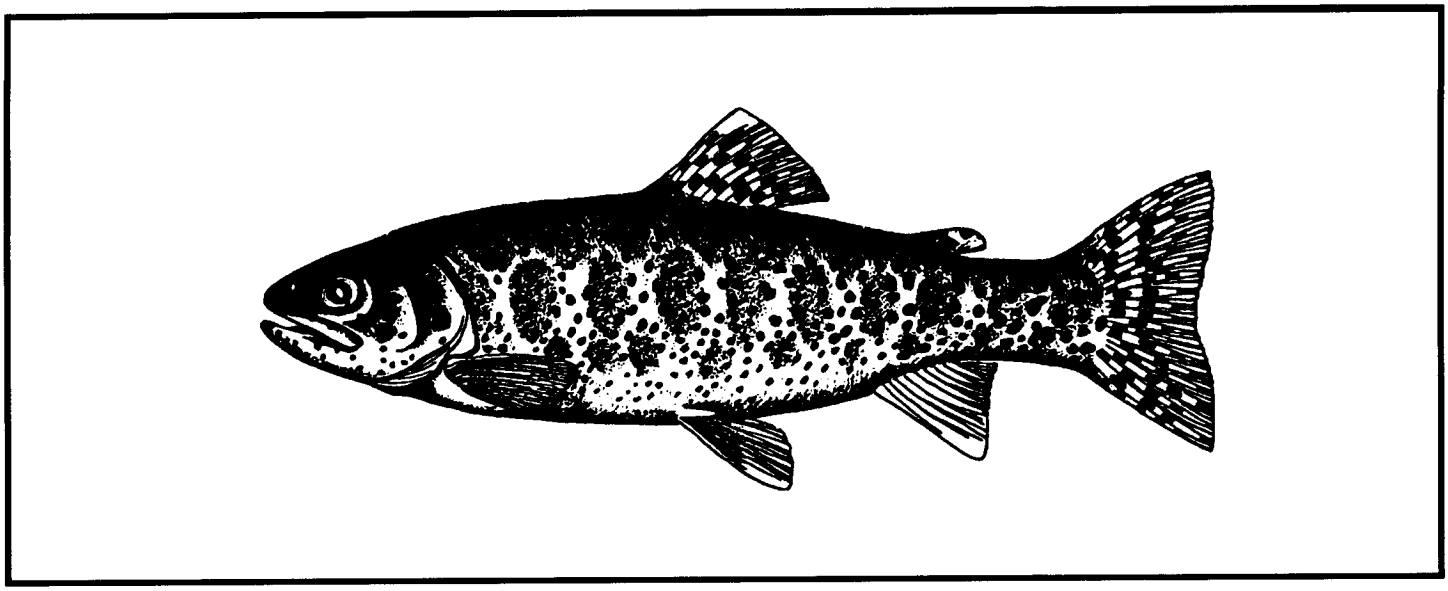

Redband Trout *(Oncorhynchus mykiss gairdneri)* Population and Stream Habitat Surveys in Western Owyhee County, Idaho

by
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BY

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ABSTRACT

Redband trout (*Oncorhynchus mykiss gairdneri*) were captured in twelve of the fourteen stream segments sampled in 1996. Stream segments were sampled on: Jordan, McBride, Cow, Pickett, North Fork Castle, Rock, Josephine, Big Boulder, Juniper, Cabin, South Mountain, and South Fork Boulder Creeks and the North Fork Owyhee River. Six of those sites had been previously sampled by BLM. Five of the resampled sites contained more redbands than were captured in previous sampling. Densities of trout greater than 100 mm in length at all sites ranged from 0 to 41.5 trout /100 m^2.

Habitat data were also collected on the sampled stream segments. Data collected included mean depth and width, percent of stream gradient, and percent composition of substrate. Measurements of bank stability, percent of stream shading, and available trout habitat were collected.

Water quality measurements of temperature, pH, conductivity, hardness, and alkalinity were all within acceptable ranges for trout survival. Recording thermographs were placed in seven Owyhee County streams, two thermographs recorded water temperatures consistantly greater than 25 C.

INTRODUCTION

This report presents redband trout(*Oncorhynchus mykiss gairdneri*) population and stream habitat data collected on the Owyhee Resource Area of the Bureau of Land Management (BLM) lands in Owyhee County, Idaho in 1996. Data was collected by Idaho Department of Fish and Game (IDFG) Southwest Region fisheries management staff in a cooperative project with the Boise District BLM. This report documents the fourth field season of stream and habitat surveys conducted by Southwest region IDFG. Previous survey data were reported in Allen et al. 1994, 1995, 1996.

Redband trout historically occupied perennial drainages in Owyhee County, Idaho (Behnke, 1992). Sampling of these redband trout populations by BLM staff from 1976-1991 documented fragmented populations composed of small numbers of redband trout. Drought conditions experienced from 1987-1994 likely negatively impacted these redband trout populations. Unfortunately, accurate distribution maps documenting the presence or absence of redband trout in Owyhee County streams were not available to document changes in redband distributions. The main objectives of this fourth year of investigation remain constant:

(1) To determine redband trout density estimates for previously sampled stream segments.

(2) To establish trout density estimates for unsurveyed stream segments.

(3) To measure stream substrate, bank stability, instream fish cover, solar input, composition of greenline plant communities, and water quality.

STUDY AREA

Stream surveys were conducted on Pickett, McBride, Cow, Jordan, Big Boulder, North Fork Castle, Rock, Josepine, Juniper, Cabin, South Mountain Creeks, and the North Fork Owyhee River. Locations and descriptions of the survey sites are presented in Table 1 and Appendix A.

Table 1. Location of stream sites sampled in Owyhee County, Idaho in 1996.

SITE	LOCATION	LATITUDE/ LONGITUDE	SITE DESCRIPTION
JORDA097.9	T4S R3W S7 NENE	N 43° 00.53' W 116° 43.74'	AT ROAD CROSSING ABOVE SILVER CITY
JORDA067.7	T6S R5W S23 SWSW	N 42° 52.86' W 116° 54.39'	AT BIG BEND THAT LIES TO THE NORTH
MCBRI010.0	T2S R5W S22	N 43° 14.71' W 116° 55.74'	~ .8 MI EAST OF THE FORK IN THE ROAD
COW__032.8	T4S R5W S12 SWNE	N 43° 05.19' W 116° 53.03'	AT ROAD CROSSING ABOVE JACKS CREEK
PICKE010.2	T5S R2W S16	N 42° 59.47' W 116° 34.55'	~ .7 MI WEST OF GATE
NFCAS003.7	T7S R2W S15	N 42° 48.72' W 116° 33.34'	BELOW COW VALLEY RESERVOIR
ROCK_003.7	T7S R3W S15 SWNW	N 42° 48.69' W 116° 41.04'	ROAD CROSSING AT JOSEPHINE CREEK
JOSEP000.6	T7S R3W S22 NWSW	N 42° 48.43' W 116° 41.08'	~ .25 MI ABOVE CONFLUENCE
BOULD008.0	T7S R4W S10 SESW	N 42° 49.45' W 116° 47.67'	AT CONFLUENCE OF COMBINATION CR
NFOWY014.4	T9S R5W S32 NESW	N 42° 35.99' W 116° 57.17	BELOW JUNIPER RIM RESERVOIR
JUNIP002.0	T9S R5W S21 SWSE	N 42° 37.29' W 116° 56.07'	4X4 ROAD CROSSING
CABIN003.4	T9S R5W S15 SWSW	N 42° 38.06' W 116° 54.54'	4X4 ROAD CROSSING
SMOUN006.6	T7S R5W S36 NESE	N 42° 45.47' W 116° 52.30'	ABOVE 4X4 ROAD CROSSING
SFBOU001.6	T7S R4W S21	N 42° 46.46' W 116° 50.19'	PACKTRAIL BELOW BARBWIRE FENCE

METHODS

Fish Populations

The 1996 sample sites were selected to document the presence or absence of redband trout in the western drainages of Owyhee County. Fourteen sample sites on thirteen different streams were assessed. Six of the fourteen sample sites had been previously sampled.

Sample stream segments were approximately 61 m in length. The upstream and downstream sample segment boundaries were located at stream constrictions to minimize fish migration during electrofishing.

A Smith-Root Model 15-B backpack electrofishing unit was utilized by two people electrofishing from the lower to the upper boundaries of the sample segment. All fish species encountered were netted and placed in small net pens placed in the stream. We made two or three electrofishing passes, removing and segregating the fish from each pass. If no redband trout were encountered on the first pass and collection conditions were considered good, no further electrofishing passes were completed. All trout collected were measured to the nearest mm; weighed to the nearest gram; and a scale sample collected. Trout were released after data collection. All other fish species were identified to species, counted and released.

Collected trout scales were mounted on acetate sheets and pressed with a Carver Heat Press to create a readable impression in the acetate. A microfiche reader was then used to indentify and transfer the locations of the focus, annuli, and margin of the scale from the acetate impression to a sheet of paper. The annuli marks were entered on a digitizing pad and the DisBCal 89 V1.0 Program in the Fishery Analysis Tools software of the Missouri Department of Conservation. This program produced average back-calculated lengths for each age class of trout.

Redband trout population estimates and confidence intervals were calculated utilizing the MicroFish 3.0 program developed by Van Deventer and Platts (1987). Population estimates were calculated for all trout captured and for all trout greater than 100 mm in length, giving two estimates for sites where trout were collected. Trout densities were calculated by dividing the population estimate by sampled area and reported as trout/100m^2.

Stream Habitat

Each stream segment was divided into ten equal length sections starting from the bottom. At each cross section, depth measurements were taken at 1/4,1/2, and 3/4 widths across the channel. Substrate composition was determined with standard IDFG methods, categorizing the substrate into size classes (Petrosky and Holubetz, 1988).

Instream fish cover was a subjective visual assessment of several parameters and was recorded for each cross-section as the percentage of the stream width defined as cover. For this study, cover was defined as areas where redband trout were likely to be found: (1) pools >0.45 m (>1.5 feet) in depth, (2) overhanging bank vegetation, (3) instream vegetation, (4) near large instream rocks, (5) velocity breaks ie. broken water surface (6) pocket water behind or beside large rocks, (7) near large woody debris.

Stream gradient was measured using an ocular hand level and a stadia rod. Gradient is the vertical drop between the upstream and downstream boundaries divided by the stream segment length and reported as a percentage.

Streambank stability measurements were a visual assessment to determine the vulnerability of the bank slopes to erosion (Platts, et. al., 1983). Four classes were used to rate the stability of the streambanks. Covered and Stable: over 50 percent of banks in healthy vegetation and/or anchoring rocks. The banks did not show signs of erosion. Covered and Unstable: more than 50 percent of streambank covered by vegetation but signs of erosion were present. Uncovered and Stable: less than 50 percent of stream bank covered by vegetation or anchoring rock. Does not show signs of erosion, ie. banks were bare but not vertical or slumped. Uncovered and Unstable: less than 50 percent covered with vegetation. Banks show some erosion, ie. slumped or vertical bare banks.

Thermal input to the stream waters was measured using a Solar Pathfinder™ following Platts, et. al. (1987). Percent stream shading was reported as the average percent of shading on the stream surface during June through September at 10 cross sections.

The "greenline" is the first continuous cover of perennial vegetation above the stable low water level (USDA, 1992). We determined the composition of plant communities along the greenline on both banks for each stream transect. Streambank distances were summed for each community type and the percentage of the total greenline made up by each community type was calculated for each stream segment.

Water Quality

Several water quality parameters were measured at each stream segment. Conductivity and pH measurements were taken with hand held conductivity and pH meters. Alkalinity and hardness measurements were taken with Hach Company field titration kits. Water temperature was recorded with a pocket thermometer at each site.

Recording thermographs (HOBOS) were placed in Castle, (2 sites), North Fork Castle, Jump, McBride, and North Fork Boulder Creeks, and the North Fork Owyhee River. Thermographs were placed in the streams between June 19 and 21st and removed between September 18 and October 4th, 1996.

RESULTS AND DISCUSSION

Redband Trout Populations

Trout Densities

Redband trout were captured in twelve of the fourteen stream segments sampled in 1996. Six of those sites had been previously sampled by BLM. Redband trout population estimates and 95% confidence intervals and calculated densities per 100 m^2 are presented in Table 2. Five of the resampled sites contained more redbands than were captured in previous sampling. Juniper Creek was slightly less in 1996 than in 1991. Densities of trout greater than 100 mm in length at all sites ranged from 0 to 41.5 trout / 100 m^2 (Table 2).

Jordan Creek

Two sites were sampled in 1996 on Jordan Creek adding to sites sampled in 1993 (Allen et al. 1994). Site JORDA097.9 was above Silver City and contained many redband trout much like the previous site JORDAO95.0. Three brook trout *(Salvelinus fontinalis)*, mean length of 117 mm, were captured at this site. These fish have obviously reproduced, because the last stocking was done in the 1970's by IDFG. The second Jordan Creek site was approximately 1.5 km below the confluence of Big Boulder Creek. This sample site (JORDA067.7) had low trout densities similiar to JORDA070.8 which was sampled in 1993.

McBride Creek

McBride Creek sampling did not locate any fish of any species. The stream is extremely small and likely dewaters during drought years. This stream likely was not historical redband habitat.

Cow Creek

Densities of redband trout were the highest documented in 1996. Previous sampling indicated densites much lower than found in 1996 (Table 2). Most of the fish captured were young of the year, but densities of age 1+ and greater were good.

Pickett Creek

Densities of redband trout were good. Redband trout were the only fish captured in sampling. Densities were much higher in 1996 samples than in 1976 (Table 2).

North Fork Castle Creek

Moderate densities were found in the section sampled on the North Fork Castle

Creek. No previous sampling had been conducted. Redband trout were also observed downstream of the Triangle road crossing in a series of isolated deep pools.

Rock Creek

Rock Creek was sampled below Hardiman Springs at the road crossing. A few adult redbands were captured and densities were low.

Josephine Creek

No redband trout were captured in sampling approximately 0.5 km above the mouth.

Big Boulder Creek

Fair numbers of redband trout were captured at the sample site near the mouth of Combination Creek. No young of the year were captured.

North Fork Owyhee River

Densities of redbands are low and comparable to previous sampling conducted in 1991, although slightly higher.

Juniper Creek

Densities of redbands were slightly lower in 1996 versus sampling conducted in 1991. This was the only site in 1996 that had lower redband densities than previous sampling had identified.

Cabin Creek

Densities of redbands were high. Most of the redbands captured were young of the year. Densities of redbands were much higher than those found in 1977.

South Mountain Creek

Redband densities were suprisingly high considering the small width and depth of the creek. Densities were much higher than previous sampling conducted in 1977.

South Fork Boulder Creek

South Fork Boulder Creek had good numbers of redbands present. Redbands were also observed upstream on private property at a roadcrossing.

Table 2. Redband trout population estimates and densities of select stream sites sampled in 1996, in Owyhee County, Idaho.

SITE	DATE COLLECTED	POPULATION ESTIMATE (95%CI)	DENSITY TROUT /100M^2	DENSITY TROUT>100mm /100M2
JORDA097.9	7/30/96	41.0 (1.8)	18.9	14.8
JORDA067.7	10/03/96	2.0	0.3	0.3
MCBRI010.0	7/10/96	0	0	0
COW 032.8	9/24/96 7/19/77*	120.0 (3.8) 7.0 (0.8)	126.1 6.0	29.4
PICKE010.2	8/07/96 10/19/76*	60.0 7.0	34.1 4.0	19.9
NFCAS003.7	9/30/96	41.0 (1.2)	18.0	16.4
ROCK 003.7	10/02/96	4.0	1.0	1.0
JOSEP000.6	10/02/96	0	0	0
BOULD008.0	10/01/96	32.0 (5.3)	7.3	7.3
NFOWY014.4	9/26/96 7/31/91*	5.0 2.0	1.4 1.0	0.8
JUNIP002.0	9/26/96 8/01/91*	8.0 (1.0) 11.0	4.1 4.0	4.1
CABIN003.4	9/25/96 8/03/77*	67.0 (0.6) 5.0 (0.1)	52.3 6.0	20.3
SMOUN006.6	9/27/96 6/21/77*	116.0 (4.0) 9.0 (0.7)	111.9 14.0	41.5
SFBOU001.6	9/25/96	93.0 (2.8)	47.6	35.9

* Historical sampling dates.

Redband Trout Length Frequency and Age and Growth

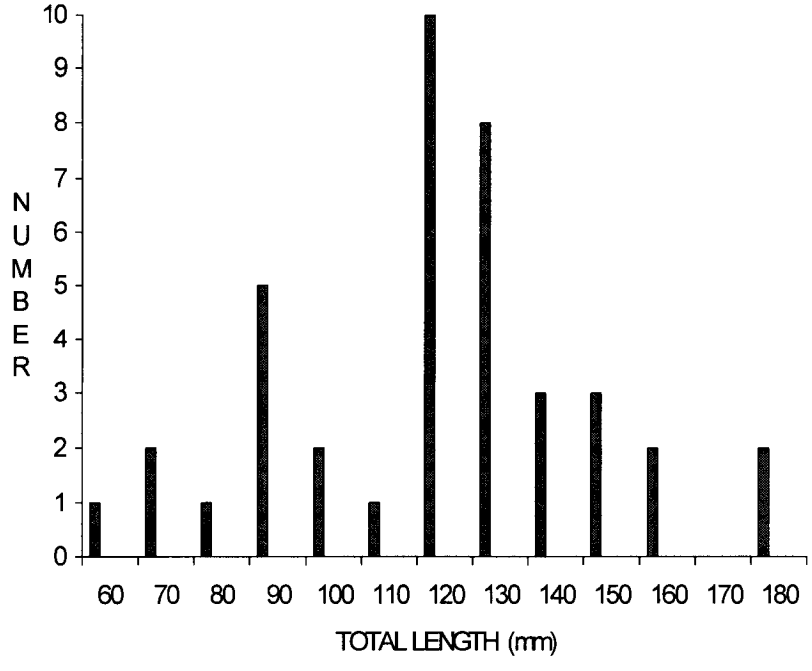
In general most of the streams sampled contained several year classes of redbands. The redband population structure in the general vicinity of South Mountain was more complete than observed in other areas of Owyhee County, i.e. missing year classes were not as prevelent as in other areas and years. Figures 3 through 10 depict the length frquency of the redband trout samples and tables of estimated length at age for Jordan, Cow, Pickett, North Fork Castle, Big Boulder, Cabin, South Mountain, and South Fork Boulder Creeks. Length at age data for sample sites, ROCK003.7, NFOWY014.4, and JUNIP002.0 where few redbands were sampled are presented in Table 3. For site JORDA067.7 only one redband was captured and aged at V+ years old. Several streams, Jordan Creek above Silver City (JORDA097.9), Cow, Cabin and South Mountain Creek, contained only younger fish which may indicate that these streams dewatered in the recent drought and the fish populations have begun to reestablish.

Nongame Fish Species Collected

Several nongame species were collected at sample sites. Species observed were: speckled dace, *Rhinichthys osculus*; longnose dace, *Rhinichthys cataractae*; redshide shiner, *Richardsonius balteatus*; chiselmouth, *Acrocheilus alutaceus*; northern squawfish, *Ptychocheilus oregonensis*; bridgelip sucker, *Catostomus columbianus*; largescale sucker, *Catostomus macrocheilus*; brown bullhead, *Ictaluris melas*; and mottled Sculpin, *Cottus bairdi.* Species occurrence and location is presented in Table 4.

REDBAND TROUT LENGTH FREQUENCY
JORDAN CREEK

SITE: JORDA097.9 7/30/96

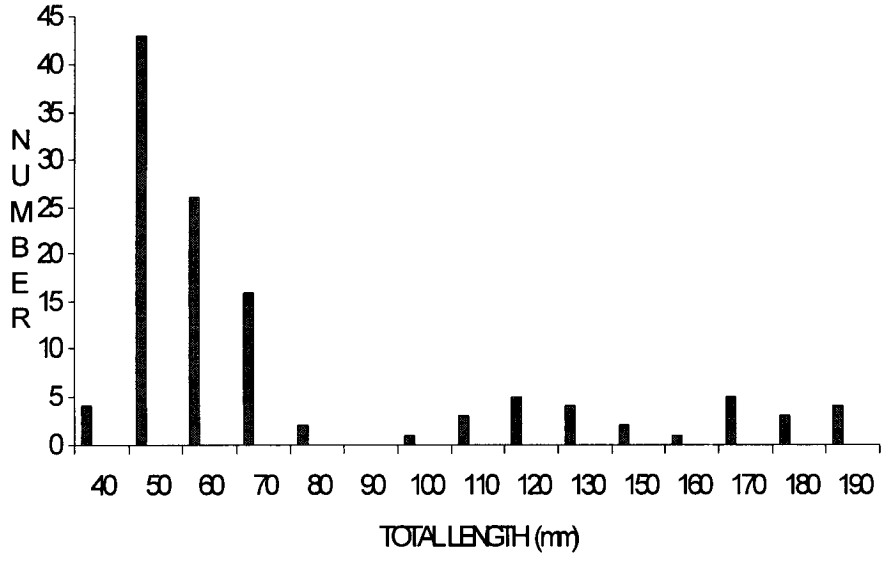


Age	I+	II+
Average length (mm)	81.8	115.3
Number = 41	17	17

Figure 3. Length frequency and average age at annuli of redband trout captured by electrofishing at sample site JORDA097.9 on Jordan Creek, Owyhee County, Idaho.

REDBAND TROUT LENGTH FREQUENCY
COW CREEK

SITE: COW 032.8 9/24/96

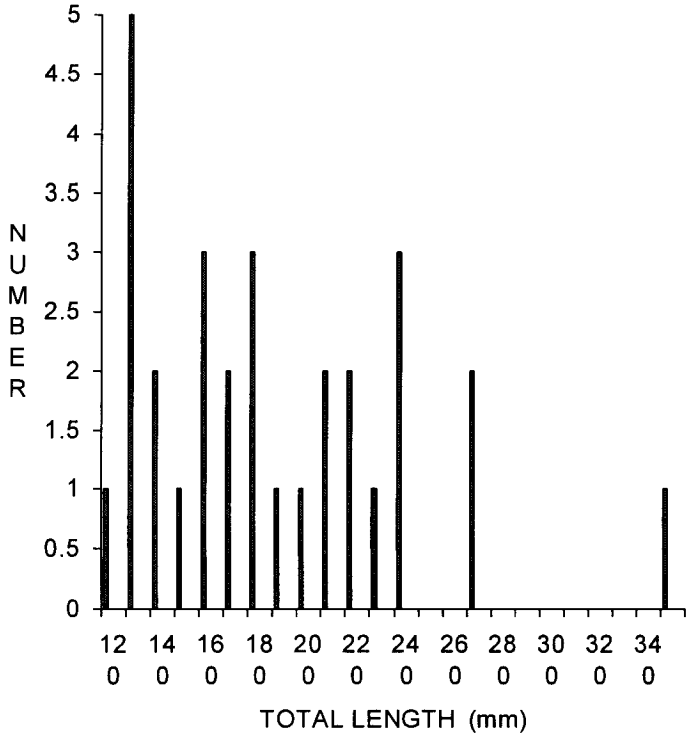


Age	I+	II+	III+
Average length (mm)	84.9	130.4	157.1
Number = 32	25	14	6

Figure 4. Length frequency and average age at annuli of redband trout captured by electrofishing at sample site COW 032.8 on Cow Creek, Owyhee County, Idaho.

REDBAND TROUT LENGTH FREQUENCY
BIG BOULDER CREEK

BOULD008.0 10/1/96

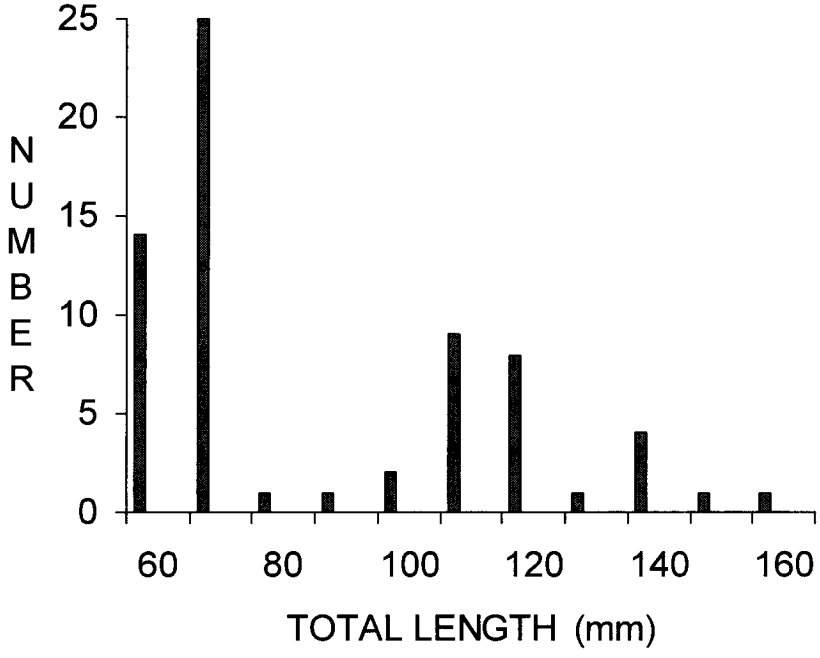


Age	I+	II+	III+	IV+	V+	VI+
Average length (mm)	81.3	126.3	181.7	225.6	318.3	343.7
Number= 30	30	23	13	4	1	1

Figure 5. Length frequency and average age at annuli of redband trout captured by electrofishing at sample site BOULD008.0 on Big Boulder Creek, Owyhee County, Idaho.

REDBAND TROUT LENGTH FREQUENCY
CABIN CREEK

SITE: CABIN003.4 9/25/96

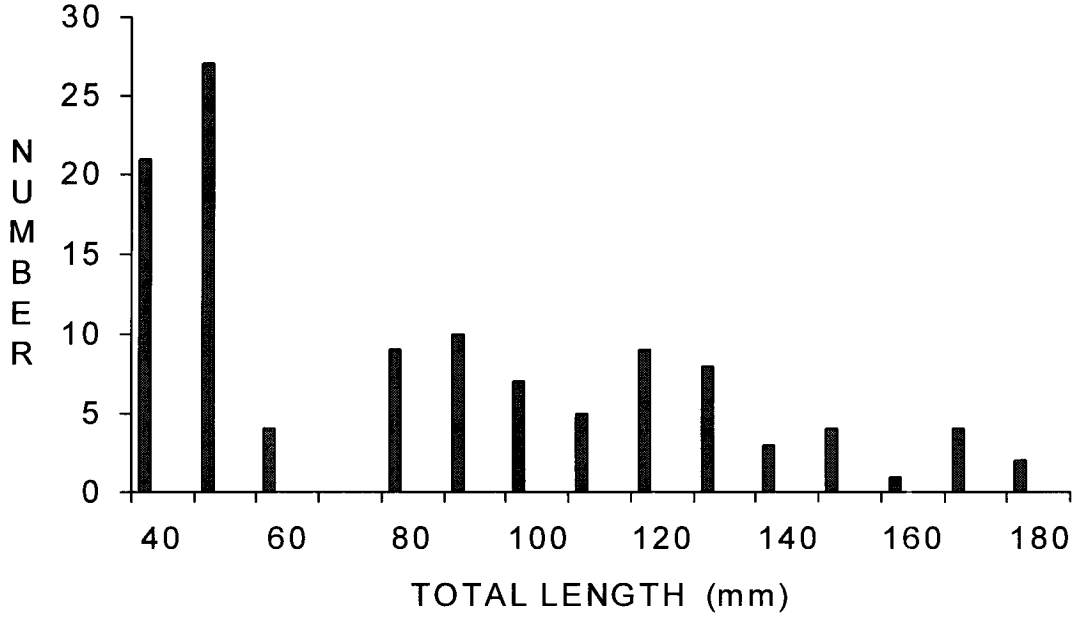


Age	I+	II+
Average length (mm)	83.6	123.6
Number = 28	21	4

Figure 6. Length frequency and average age at annuli of redband trout captured by electrofishing at sample site CABIN003.4 on Cabin Creek Owyhee County, Idaho.

REDBAND TROUT LENGTH FREQUENCY
SOUTH MOUNTAIN CREEK

SITE: SMOUN006.6 9/27/96

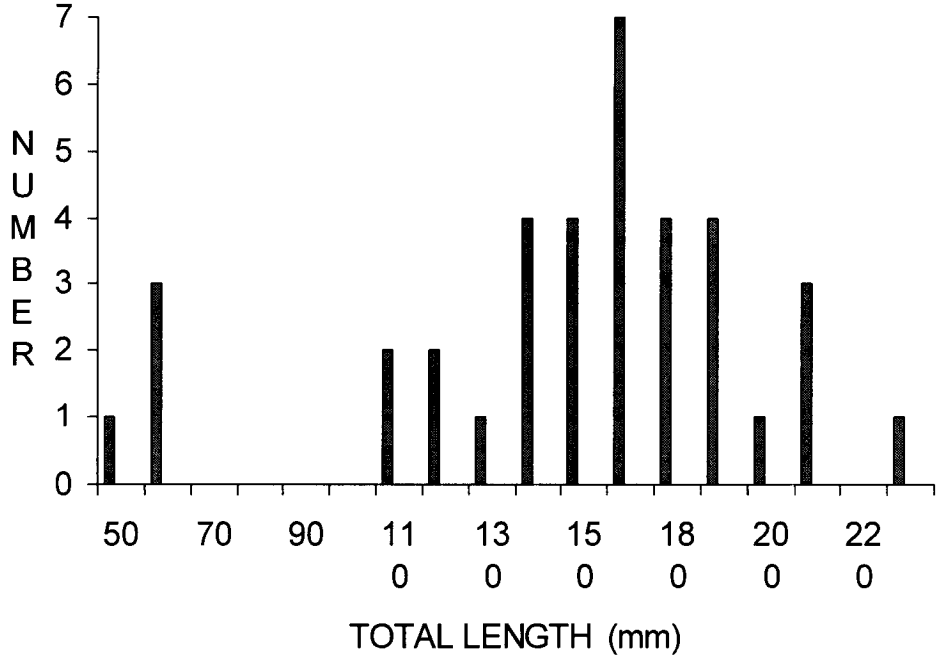


Age	I+	II+	III+
Average length (mm)	97.6	133.6	151.4
Number = 34	32	13	1

Figure 7. Length frequency and average age at annuli of redband trout captured by electrofishing at sample site SMOUN006.6 on South Mountain Creek, Owyhee County, Idaho.

REDBAND TROUT LENGTH FREQUENCY
NORTH FORK CASTLE CREEK

NFCAS003.7 9/30/96

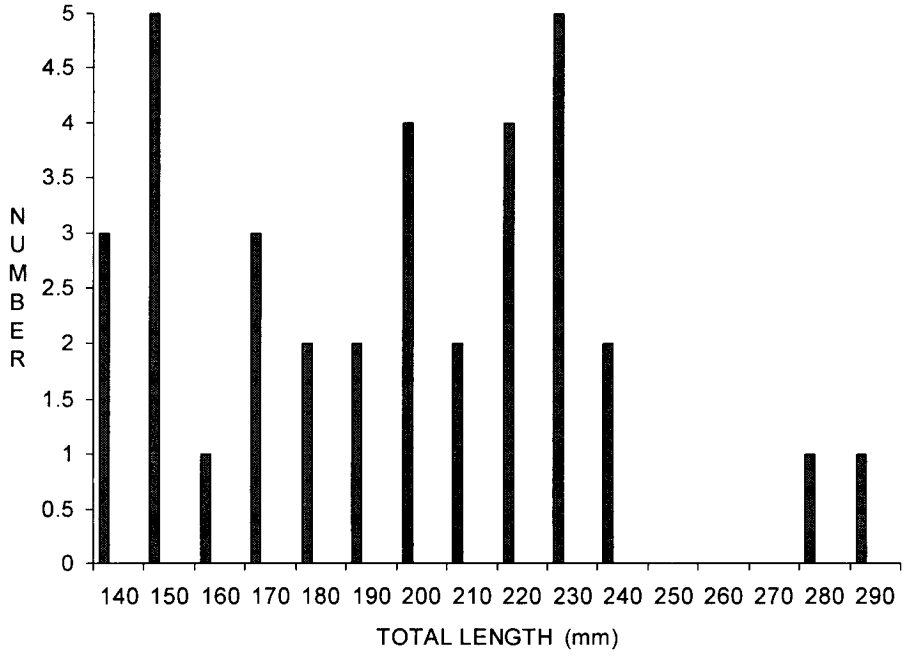


Age	I+	II+	III+	IV+
Average length (mm)	81.0	119.7	159.1	185.7
Number = 36	34	29	16	6

Figure 8. Length frequency and average age at annuli of redband trout captured by electrofishing at sample site NFCAS003.7 on North Fork Castle Creek, Owyhee County, Idaho.

REDBAND TROUT LENGTH FREQUENCY
PICKETT CREEK

SITE: PICKE010.2 8/7/96

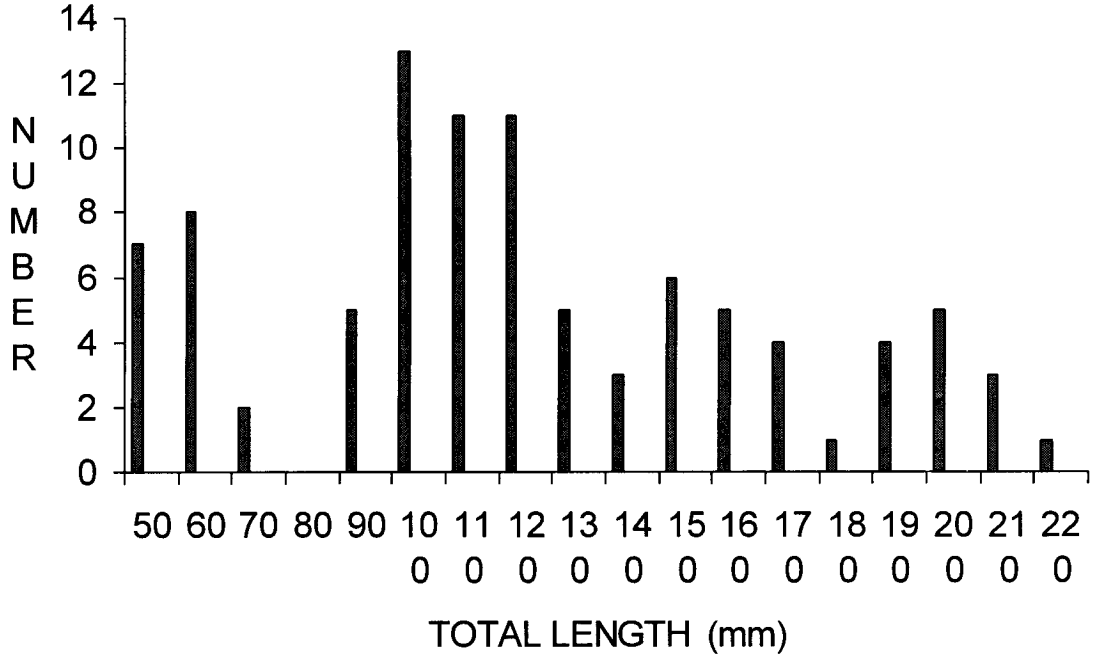


Age	I+	II+	III+	IV+	V+
Average length (mm)	90.2	132.1	174.4	217.8	260.8
Number = 29	29	28	14	3	1

Figure 9. Length frequency and average length at annuli of redband trout captured by electrofishing at sample site PICKE010.2 on Pickett Creek, Owyhee County, Idaho.

REDBAND TROUT LENGTH FREQUENCY
SOUTH FORK BOULDER CREEK

SITE: SFBOU001.6 9/25/96



Age	I+	II+	III+	IV+
Average length (mm)	83.6	123.9	159.0	189.2
Number = 42	35	25	10	4

Figure 10. Length frequency and average age at annuli of redband trout captured by electrofishing at site SFBOU001.6 on South Fork Boulder Creek, Owyhee County, Idaho.

Table 3. Average back-calculated length for each age class for redband trout captured by electrofishing in Owyhee County, Idaho in 1996 at sample sites; ROCK003.7, NFOWY014.4, JUNIP002.0.

Site: ROCK 003.7

Age	I+	II+	III+	IV+
Average length (mm)	96.9	132.6	168.7	215.8
Number = 4	4	4	4	3

Site: NFOWY014.4

Age	I+	II+	III+
Average length (mm)	88.6	207.7	242.1
Number = 5	3	1	1

Site: JUNIP002.0

Age	I+	II+	III+	IV+
Average length (mm)	94.4	148.9	191.7	225.2
Number = 8	8	4	1	1

Table 4. Presence (X) of fish species at select sample sites in 1996 in Owyhee County, Idaho.

SITE	WRB	BKT	NSF	RSS	SPD	LND	MTS	CSL	BBH	BLS	LSS
JORDA097.9	X	X									
JORDA067.7	X			X	X			X		X	X
MCBRI010.0											
COW__032.8	X										
PICKE010.2	X										
NFCAS003.7	X				X						
ROCK003.7	X		X	X		X	X	X	X	X	
JOSEP000.6			X	X			X	X		X	
BOULD008.0	X		X	X	X	X		X		X	
NFOWY014.4	X			X	X	X				X	
JUNIP002.0	X			X	X					X	
CABIN003.4	X				X					X	
SMOUN006.6	X										
SFBOU001.6	X						X				

WRB = REDBAND RAINBOW TROUT, BKT = BROOK TROUT, NSF = NORTHERN SQUAWFISH, RSS = REDSIDE SHINER, SPD = SPECKLED DACE, LND = LONGNOSE DACE, MTS = MOTTLED SCULPIN, CSL = CHISLEMOUTH, BBH = BROWN BULLHEAD, BLS = BRIDGELIP SUCKER, LSS = LARGESCALE SUCKER.

Habitat

Habitat variables were collected consistent with previous surveys (Allen, et al. 1994). The data were collected to provide baseline riparian habitat conditions. Habitat variables of stream sample length, mean stream width, mean depth, substrate composition, and gradient are presented in Table 5. Assessment of instream fish cover and percent habitat type is provided by sample site in Table 6. Percent of streambank stability is presented in Table 7. Percent of stream shading derived from the Solar Pathfinder™ is summarized in Table 8. The percentage of vegetative community types, "greenline" for each stream segment are presented in Appendix A.

Water Quality

Water quality variables measured during 1996 are presented in Table 9. The pH "pen" for pH sampling was broken during field work so data was not collected. The parameters measured were all acceptable to trout survival at the time of sampling.

Of the seven recording thermographs placed in 1996, six provided season long temperature recordings (Table 10 and Appendix B). The thermograph on the North Fork Castle Creek was covered by a deep layer of sediment in early July after a severe thunderstorm and data after that time is not reliable.

Temperatures were recorded in the stream segments of Castle Creek near Highway 78 and Mud Flat Road crossing of the North Fork Owyhee River that were consistantly above 25 C. Other temperature recorders did not document these higher temperatures.

CONCLUSION

Twelve of fourteen sample sites in 1996 contained redband trout, a higher percentage of sites than has been found in previous years. The sites visited in 1996 were generally higher in elevation, above 1500 m, which in general leads to smaller and cooler streams which tend to support redband trout. Six of the sites had historical data and all of these common sites contained redbands at both samplings. Summer stream flows have been "normal" in 1995 and 1996 compared to the recent drought years. More "normal " stream flows in Owyhee County seem to have increased the abundance of redbands observed.

As called for in Allen et al. (1996) a methodology needs to be developed to monitor and define the maximun production potential of redband trout in the Owyhee County desert streams. We again suggest that BLM use exsisting and new 5-20 ha riparian exclosure study areas scattered around the county to help define the maximum production potential of redband trout populations on public lands.

RECOMMENDATIONS

1. Complete surveys of all major Owyhee County stream drainages. Project field studies will be completed in 1997 and a final report published in 1998.

2. Complete resampling any remaining historical sample sites in the county.

3. Resample several of the 1993 sample sites that were sampled during the recent drought to document any recovery of trout populations from "good water years".

4. Monitor seasonal stream temperatures with recording thermographs placed into stream segments to be sampled.

5. Establish several 10-20 hectare stream and riparian exclosures and monitor the changes to the riparian area, stream channel, and fish populations over time.

Table 5. Stream sample length, average width, average depth, percent gradient, and percent composition of substrate in stream sections sampled in 1996 in Owyhee County, Idaho.

SITE	LENGTH (m)	AVE. WIDTH (m)	AVE. DEPTH (m)	% GRAD-IENT	% SAND	% GRAVEL	% RUBBLE	% BOULD-ER
JORDA 097.9	57	3.8	0.1	1.62	17	21	43	20
JORDA 067.7	61	10.4	0.4	0.49	17	32	36	15
MCBRI 010.0	46	1.1	0.2	1.95	73	7	20	0
COW 032.8	52.9	1.8	0.1	1.99	23	52	26	0
PICKE 010.2	80	2.2	0.1	N/A	41	29	16	14
NFCAS 003.7	61	3.0	0.2	1.13	67	21	12	0
ROCK 003.7	61	6.3	0.3	0.86	20	47	31	2
JOSEP 000.6	61	3.6	0.2	0.62	19	40	39	0
BOULD 008.0	61	7.2	0.4	1.44	21	29	24	26
NFOWY 014.4	61	6.0	0.2	0.82	14	36	30	19
JUNIP 002.0	61	3.2	0.1	0.29	27	48	19	3
CABIN 003.4	61	2.1	0.1	1.55	18	48	35	0
SMOUN 006.6	61	1.7	0.1	1.88	29	59	12	0
SFBOU 001.6	61	3.2	0.1	1.01	22	44	34	0

Table 6. Percent habitat type and percent trout cover at stream sample sites in 1996 in Owyhee County, Idaho.

SITE	% POOL	% RIFFLE	% RUN	% POCKET WATER	% TROUT COVER
JORDA097.9	26.7	60.0	13.3	0.0	13.0
JORDA067.7	3.3	16.7	80.0	0.0	38.0
MCBRI010.0	100.0	0.0	0.0	0.0	50.0
COW__032.8	13.3	53.3	33.3	0.0	29.0
PICKE010.2	43.3	23.3	33.3	0.0	65.0
NFCAS003.7	20.0	16.7	63.3	0.0	32.0
ROCK_003.7	0.0	10.0	90.0	0.0	48.0
JOSEP000.6	0.0	0.0	100.0	0.0	54.0
BOULD008.0	26.7	6.7	56.7	10.0	67.0
NFOWY014.4	10.0	20.0	40.0	30.0	41.0
JUNIP002.0	20.0	26.7	53.3	0.0	28.0
CABIN003.4	0.0	70.0	30.0	0.0	1.0
SMOUN006.6	0.0	60.0	40.0	0.0	5.0
SFBOU001.6	3.3	36.7	60.0	0.0	9.0

Table 7. Streambank stability rating in percent at stream sample sites in 1996 in Owyhee County, Idaho.

SITE	COVERED/ STABLE	COVERED/ UNSTABLE	UNCOVERED/ STABLE	UNCOVERED/ UNSTABLE
JORDA097.9	32.5	0.0	50.5	17.0
JORDA067.7	70.75	0.0	28.5	0.75
MCBRI010.0	35.9	59.3	0.0	4.8
COW__032.8	59.5	2.0	38.5	0.0
PICKE010.0	56.3	0.0	43.7	0.0
NFCAS003.7	78.5	12.0	5.25	4.25
ROCK_003.7	82.0	3.5	12.5	2.0
JOSEP000.6	83.5	11.25	3.25	2.0
BOULD008.0	11.75	2.25	83.75	2.25
NFOWY014.4	18.25	0.0	77.0	4.75
JUNIP002.0	23.5	49.0	15.75	11.75
CABIN003.4	17.0	12.5	17.0	53.5
SMOUN006.6	40.75	4.25	18.0	37.0
SFBOU001.6	11.25	0.0	71.50	17.25

Table 8. Percent of stream shading on stream sample sites in 1996 in Owyhee County, Idaho.

SITE	PERCENT SHADE
JORDA097.9	N/A
JORDA067.7	13.0
MCBRI010.0	N/A
COW__032.8	49.6
PICKE010.2	73.1
NFCAS003.7	33.7
ROCK_003.7	5.2
JOSEP000.6	11.7
BOULD008.0	25.2
NFOWY014.4	14.6
JUNIP002.0	15.7
CABIN003.4	10.7
SMOUN006.6	42.4
SFBOU001.6	42.0

Table 9. Water quality sampling results for stream sites sampled in 1996 in Owyhee County, Idaho.

SITE	DATE	WATER TEMP C	pH	CONDUCTIVITY *Us*/cm	HARDNESS mg/l as $CaCO_3$	ALKALINITY mg/l as $CaCO_3$
JORDA097.9	07/30/96	18.3	7.5	N/A	51	68
JORDA067.7	10/03/96	15.0	N/A	100	60	65
MCBRI010.0	07/10/96	17.8	7.5	150	102	136
COW__032.8	09/24/96	12.0	N/A	140	60	55
PICKE010.2	08/07/96	18.9	7.0	N/A	34	51
NFCAS003.7	09/30/96	16.0	N/A	110	40	70
ROCK_003.7	10/02/96	9.0	N/A	200	60	110
JOSEP000.6	10/02/96	12.0	N/A	90	40	115
BOULD008.0	10/01/96	10.0	N/A	110	40	60
NFOWY014.4	09/26/96	11.0	N/A	60	40	45
JUNIP002.0	09/26/96	11.0	N/A	N/A	100	85
CABIN003.4	09/25/96	12.0	N/A	120	60	90
SMOUN006.6	09/27/96	6.0	N/A	100	75	100
SFBOU001.6	09/25/96	5.5	N/A	130	80	75

Table 10. Locations of thermographs placed in streams in 1996 in Owyhee County, Idaho.

SITE DESCRIPTION	LEGAL DESCRIPTION	ELEVATION (m)
1. Jump Cr. ~1 km downstream of falls	T2N R5W S27	750
2. McBride Cr. ~ 3.3 km upstream from Hyw 95 road crossing of McBride Cr.	T2S R5W S16	1660
3. North Fork Owyhee River ~ 1km below road crossing	T10S R5W S36	1480
4. North Fork Castle Cr. below road crossing	T6S R2W S27	1725
5. Castle Cr. just upstream Hyw. 78	T4S R1E S25	750
6. Castle Cr. below confluence N and S Forks Castle Crs.	T6S R1W S34	1250
7. North Fork Boulder Cr. public lands below Triangle road crossing	T7S R3W S6	1520

REFERENCES

Allen, D.B., B.J. Flatter, K. Fite, and S.P. Yundt. 1994. Redband trout (*Oncorhynchus mykiss*) population and habitat inventory in Owyhee County, Idaho. Idaho Department of Fish and Game, Bureau of Land Management Challenge Cost Share Project, ID013-435001-25-9Z.

Allen, D.B., B.J. Flatter, K. Fite. 1995. Redband trout (*Oncorhynchus mykiss gairdneri*) population and habitat surveys in Jump, Reynolds, and Sheep Creeks, and sections of the Owyhee River in Owyhee County, Idaho. Idaho Bureau of Land Management, Technical Bulletin No. 95-6.

Allen,D.B., K. Fite, J. Nelson, and B.J. Flatter. 1996. Redband trout (*Oncorhynchus mykiss gairdneri*) population and habitat surveys in southern Owyhee County, Idaho. Idaho Department of Fish and Game, Idaho Bureau of Land Management 1996 Cooperative Study Report.

Behnke, R.J. 1992. Native trout of western North America. American Fisheries Society Monograph 6.

Petrosky, C.E.and T. Holubetz. 1988. Idaho habitat evaluation for offsite mitigation record. Annual Report, 1987, Project 83-7 Dept. of Energy, BPA, Division of Fish and Wildlife.

Platts, W.S., W.F. Megahan, and G.W. Minshall. 1983. Methods for evaluating stream, riparian, and biotic conditions. U.S.D.A. Forest Service, Intermountain Forest and Range Experiment Station, Gen. Tech. Report INT- 138. Ogden, UT. 70pp.

Platts, W.S., C. Armour, G.D. Booth, M. Bryant, L. L. Bufford, P. Culpin, S. Jensen, G.W. Lienkaemper, G. W. Minshall, S. B. Monsen, R. L. Nelson, J. R. Sedell, and J. S. Tuhy. 1987. Methods for evaluating riparian habitats with applications to management. Gen. Tech. Report INT-221. U.S.D.A. Forest Service, Intermountain Research Station,Ogden, UT. 177pp.

U.S. Department of Agriculture, Forest Service. 1992. Integrated riparian evaluation guide. Technical Riparian Work Group Report, Intermountain Region, Ogden UT.

Van Deventer, J. S. and W. S. Platts. 1989. Microcomputer software system for generating population statistics from electrofishing data-users guide for MicroFish 3.0. U.S.D.A. Forest Service, Intermountain Research Station, Gen. Tech. Report INT-254.

APPENDIX A

Synopsis of of stream sample site data collected in 1996 on select streams in western Owyhee County, Idaho.

STREAM: MCBRI010.0 SAMPLE DATE: 7/10/96
EPA REACH: 17050103 QUAD MAP: Captain Butte
RTS: R5W, T2S, S22 LAT/LONG: 43 14.71 ; 116 55.74
SECTION DESCRIPTION: McBride Creek - ~.8 miles east of fork in the road. Do not cross creek at gravel pit, Drive straight east up creek to site.

Length Frequency

Species	CM Group	Method	Number Measured

Transect Information:

Section Length (m):	46		
Elevation (m):	1660		
Gradient (%):	1.95%		
Population Est:	0.0	S.E(popest):	0
Shade (%):	0.0		
Mean Width (m):	1.1		
Mean Depth (m):	0.2		
Cover (%):	50		

Habitat Type:

Pool:	100.0	%
Riffle:	0.0	%
Run:	0.0	%
Pocket:	0.0	%

Substrate

Organic:	0	%
Sand:	73	%
Gravel:	7	%
Rubble:	20	%
Boulder:	0	%
Bedrock:	0	%

Water Chemistry

Time:	12:35 PM
H2O Temp(C):	17.8
Air Temp(C):	36.1
pH:	7.5
Alkalinity(mg/l CaCO3):	136
Hardness(mg/l CaCO3):	102
Conductivity(uS/cm3):	150

Greenline	%
Crataegus	19.4
Poa	15.4
Dipsacus sylvestris	10.9
Salix	9.4
Rosa woodsii	8.8
Bare soil	7.4
Agropyron	6.9
Achillea nobilis	6.7
Bromus tectorum	6.3
Artemesia tridentata/Artemesia cana	4.8
Cirsium arvense	2.2
Taenitherium caput-medusae	1.8
Mimulus	0.6
Elymus	0.4

STREAM:PICKE010.2 SAMPLE DATE: 8/7/96

EPA REACH: 17050103 QUAD MAP: Toy Pass

RTS: R2W, T5S, S16 LAT/LONG: 42 59.47 ; 116 34.55

SECTION DESCRIPTION: Pickett Creek - ~.7 mile west of gate. Park and walk ~ 40 yds upstream. The section starts and ends in large pools.

Length Frequency

Species	CM Group	Method	Number Measured
WRB	14	EF	3.00
WRB	15	EF	5.00
WRB	16	EF	1.00
WRB	17	EF	3.00
WRB	18	EF	2.00
WRB	19	EF	2.00
WRB	20	EF	4.00
WRB	21	EF	2.00
WRB	22	EF	4.00
WRB	23	EF	5.00
WRB	24	EF	2.00
WRB	28	EF	1.00
WRB	29	EF	1.00

Transect Information:

Section Length (m):	80		
Elevation (m):	1840		
Gradient (%):	0.00%		
Population Est:	60.0	S.E(popest):	0
Shade (%):	73.1		
Mean Width (m):	2.2		
Mean Depth (m):	0.1		
Cover (%):	65		

Habitat Type:

Pool:	43.3	%
Riffle:	23.3	%
Run:	33.3	%
Pocket:	0.0	%

Substrate

Organic:	0	%
Sand:	41	%
Gravel:	29	%
Rubble:	16	%
Boulder:	14	%
Bedrock:	0	%

Water Chemistry

Time:	03:45 PM
H2O Temp(C):	18.9
Air Temp(C):	26.1
pH:	7.0
Alkalinity(mg/l CaCO3):	51
Hardness(mg/l CaCO3):	34
Conductivity(uS/cm3):	

Greenline	%
Salix	53.3
Rocks/Cliff	20.2
Bare soil	8.6
Populus angustifolia	5.0
Rosa woodsii	3.0
Betula	2.9
Juniperus occidentalis	2.6
Poa	1.5
Prunus virginiana	1.0
Forb	0.9
Artemesia	0.8
Verbascum thapsus	0.2

STREAM: NFCAS003.7 SAMPLE DATE: 9/30/96
EPA REACH: 17050103 QUAD MAP: Triangle Reservoir
RTS: R2W, T7S, S15 LAT/LONG: 42 48.72 ; 116 33.34
SECTION DESCRIPTION: NF Castle Creek - Site below Cow Valley Reservoir. Follow drainage to stream. Drainage may be called Cow Valley Creek. Bottom of site is a barbwire fence crossing the stream.

Length Frequency

Species	CM Group	Method	Number Measured
SPD	3	EF	1.00
SPD	4	EF	4.00
SPD	5	EF	4.00
SPD	6	EF	13.00
SPD	7	EF	10.00
SPD	8	EF	4.00
WRB	5	EF	1.00
WRB	6	EF	3.00
WRB	11	EF	2.00
WRB	12	EF	2.00
WRB	13	EF	1.00
WRB	14	EF	4.00
WRB	15	EF	4.00
WRB	16	EF	7.00
WRB	17	EF	3.00
WRB	18	EF	4.00
WRB	19	EF	4.00
WRB	20	EF	1.00
WRB	21	EF	3.00
WRB	23	EF	1.00

Transect Information:

Section Length (m):	61		
Elevation (m):	1673		
Gradient (%):	1.13%		
Population Est:	41.0	S.E(popest):	1
Shade (%):	33.7		
Mean Width (m):	3.0		
Mean Depth (m):	0.2		
Cover (%):	32		

Habitat Type:

Pool:	20.0	%
Riffle:	16.7	%
Run:	63.3	%
Pocket:	0.0	%

Substrate

Organic:	0	%
Sand:	67	%
Gravel:	21	%
Rubble:	12	%
Boulder:	0	%
Bedrock:	0	%

Water Chemistry

Time:	
H2O Temp(C):	16
Air Temp(C):	
pH:	
Alkalinity(mg/l CaCO3):	70
Hardness(mg/l CaCO3):	40
Conductivity(uS/cm3):	110

Greenline	%
Salix lutea	32.5
Juncus balticus/Agrostis	15.5
Agrostis/Forb	13.75
Salix lemmonii	9.25
Eleocharis	8.0
Scirpus	5.75
Moist Forb/Rocks	5.5
Moist Forb	2.5
Juncus balticus/Salix lemmonii	1.5
Salix lutea/Moist Forb	1.25
Salix lutea/Rosa woodsii	1.25
Carex	1.25
Artemesia ludoviciana	0.75
Salix lutea/Ribes aureum	0.5
Artemesia tridentata	0.5
Rosa woodsii	0.25

STREAM: NFOWY014.4 SAMPLE DATE: 9/26/96
EPA REACH: 17050107 QUAD MAP: Fairylawn
RTS: R5W, T9S, S32 NESW LAT/LONG: 42 35.99 ; 116 57.17
SECTION DESCRIPTION: NF Owyhee River - Follow drainage down from Juniper Rim Reservoir. Site ~1/8 mi below Cabin Creek confluence.

Length Frequency

Species	CM Group	Method	Number Measured
BLS	6	EF	1.00
BLS	7	EF	4.00
BLS	8	EF	1.00
BLS	9	EF	1.00
BLS	10	EF	1.00
LND	4	EF	1.00
LND	6	EF	1.00
LND	7	EF	2.00
LND	8	EF	1.00
RSS	5	EF	3.00
RSS	7	EF	2.00
SPD	3	EF	3.00
SPD	4	EF	2.00
SPD	6	EF	1.00
SPD	7	EF	1.00
WRB	7	EF	1.00
WRB	8	EF	1.00
WRB	14	EF	1.00
WRB	15	EF	1.00
WRB	26	EF	1.00

Transect Information:

Section Length (m):	61		
Elevation (m):	1683		
Gradient (%):	0.82%		
Population Est:	5.0	S.E(popest):	0
Shade (%):	14.6		
Mean Width (m):	6.0		
Mean Depth (m):	0.2		
Cover (%):	41		

Habitat Type:

Pool:	10.0	%
Riffle:	20.0	%
Run:	40.0	%
Pocket:	30.0	%

Substrate

Organic:	0	%
Sand:	14	%
Gravel:	36	%
Rubble:	30	%
Boulder:	19	%
Bedrock:	0	%

Water Chemistry

Time:	03:00 PM
H2O Temp(C):	11
Air Temp(C):	
pH:	
Alkalinity(mg/l CaCO3):	45
Hardness(mg/l CaCO3):	40
Conductivity(uS/cm3):	60

Greenline	%
Equisetum arvense/Forb	33.25
Cliff vegetation	17.0
Forb	16.5
Salix lasiandra	6.5
Cornus sericea/Clematis ligusticifolia	4.75
Cornus sericea	4.25
Salix lutea/Equisetum arvense/Forb	3.75
Alnus incana	3.5
Salix exigua	3.0
Eleocharis	2.5
Salix lutea	2.5
Cornus sericea/Alnus incana	1.0
Rosa woodsii/Forb	0.75
Fern	0.75

STREAM: CABIN003.4 SAMPLE DATE: 9/25/96
EPA REACH: 17050107 QUAD MAP: Cliffs
RTS: R5W, T9S, S15 SWSW LAT/LONG: 42 38.06 ; 116 54.54
SECTION DESCRIPTION: Cabin Creek - Site begins about 15 meters below road crossing.

Length Frequency

Species	CM Group	Method	Number Measured
BLS	3	EF	1.00
BLS	4	EF	7.00
BLS	5	EF	1.00
BLS	8	EF	2.00
BLS	9	EF	3.00
SPD	5	EF	1.00
SPD	6	EF	4.00
WRB	6	EF	14.00
WRB	7	EF	25.00
WRB	8	EF	1.00
WRB	9	EF	1.00
WRB	10	EF	2.00
WRB	11	EF	9.00
WRB	12	EF	8.00
WRB	13	EF	1.00
WRB	14	EF	4.00
WRB	15	EF	1.00
WRB	16	EF	1.00

Transect Information:

Section Length (m):	61		
Elevation (m):	1805		
Gradient (%):	1.55%		
Population Est:	67.0	S.E(popest):	0
Shade (%):	10.7		
Mean Width (m):	2.1		
Mean Depth (m):	0.1		
Cover (%):	1		

Habitat Type:

Pool:	0.0	%
Riffle:	70.0	%
Run:	30.0	%
Pocket:	0.0	%

Substrate

Organic:	0	%
Sand:	18	%
Gravel:	48	%
Rubble:	35	%
Boulder:	0	%
Bedrock:	0	%

Water Chemistry

Time:	06:00 PM
H2O Temp(C):	12
Air Temp(C):	15
pH:	
Alkalinity(mg/l CaCO3):	90
Hardness(mg/l CaCO3):	60
Conductivity(uS/cm3):	120

Greenline	%
Mesic Forb	46.0
Eleocharis	16.25
Bare soil	10.25
Poa bulbosa/Rock	5.75
Juncus/Mesic Forb	5.75
Carex	5.0
Salix exigua/Forb	4.25
Carex/Mesic Forb	2.0
Salix lutea/Forb	1.75
Salix exigua	1.75
Chrysothamnus nauseosus	0.75
Salix lasiandra	0.25
Salix lutea	0.25

STREAM: JUNIP002.0 SAMPLE DATE: 9/26/96
EPA REACH: 17050107 QUAD MAP: Cliffs
RTS: R5W, T9S, S21 SWSE LAT/LONG: 42 37.29 ; 116 56.07
SECTION DESCRIPTION: Juniper Creek - The road crossing was used as the bottom of the section.

Length Frequency

Species	CM Group	Method	Number Measured
BLS	6	EF	3.00
BLS	7	EF	5.00
RSS	3	EF	3.00
RSS	5	EF	3.00
RSS	7	EF	2.00
RSS	8	EF	8.00
RSS	9	EF	2.00
SPD	5	EF	2.00
SPD	7	EF	1.00
SPD	8	EF	2.00
WRB	13	EF	1.00
WRB	14	EF	2.00
WRB	15	EF	1.00
WRB	18	EF	1.00
WRB	19	EF	2.00
WRB	25	EF	1.00

Transect Information:

Section Length (m):	61		
Elevation (m):	1677		
Gradient (%):	0.29%		
Population Est:	8.0	S.E(popest):	1
Shade (%):	15.7		
Mean Width (m):	3.2		
Mean Depth (m):	0.1		
Cover (%):	28		

Habitat Type:

Pool:	20.0	%
Riffle:	26.7	%
Run:	53.3	%
Pocket:	0.0	%

Substrate

Organic:	0	%
Sand:	27	%
Gravel:	48	%
Rubble:	19	%
Boulder:	3	%
Bedrock:	0	%

Water Chemistry

Time:	12:00 PM
H2O Temp(C):	11
Air Temp(C):	22
pH:	
Alkalinity(mg/l CaCO3):	85
Hardness(mg/l CaCO3):	100
Conductivity(uS/cm3):	

Greenline	%
Mesic Forb	58.25
Carex/Forb	14.25
Eleocharis	9.25
Salix exigua/Forb	5.25
Salix lasiandra	4.5
Carex	3.5
Rosa woodsii/Juniperus occidentalis	2.0
Salix exigua/Salix lasiandra	1.75
Rosa woodsii	1.25

STREAM: JORDA067.7 SAMPLE DATE: 10/3/96
EPA REACH: 17050108 QUAD MAP: Flint
RTS: R5W, T6S, S23 SWSW LAT/LONG: 42 52.86 ; 116 54.39
SECTION DESCRIPTION: Jordan Creek - Section at big bend that lies north. Walked ~ 300m upstream. The top of section is a riffle at a rock outcrop.

Length Frequency

Species	CM Group	Method	Number Measured
BLS	7	EF	3.00
BLS	8	EF	6.00
BLS	9	EF	3.00
BLS	10	EF	2.00
BLS	12	EF	2.00
BLS	13	EF	1.00
BLS	15	EF	1.00
BLS	19	EF	1.00
BLS	24	EF	1.00
CSL	9	EF	1.00
LSS	6	EF	1.00
LSS	8	EF	2.00
LSS	9	EF	1.00
LSS	10	EF	1.00
LSS	12	EF	1.00
RSS	3	EF	1.00
RSS	4	EF	1.00
RSS	5	EF	3.00
RSS	6	EF	1.00
RSS	7	EF	2.00
RSS	8	EF	2.00
SPD	5	EF	4.00
SPD	6	EF	4.00
WRB	32	EF	1.00
WRB	34	EF	1.00

Transect Information:

Section Length (m):	61		
Elevation (m):	1460		
Gradient (%):	0.49%		
Population Est:	2.0	S.E(popest):	0
Shade (%):	13.0		
Mean Width (m):	10.4		
Mean Depth (m):	0.4		
Cover (%):	38		

Habitat Type:

Pool:	3.3	%
Riffle:	16.7	%
Run:	80.0	%
Pocket:	0.0	%

Substrate

Organic:	0	%
Sand:	17	%
Gravel:	32	%
Rubble:	36	%
Boulder:	15	%
Bedrock:	0	%

Water Chemistry

Time:	
H2O Temp(C):	15
Air Temp(C):	
pH:	
Alkalinity(mg/l CaCO3):	65
Hardness(mg/l CaCO3):	60
Conductivity(uS/cm3):	100

Greenline	%
Apocynum cannabinum/Salix lasiandra/Salix lutea	27.25
Solidago occidentalis/Carex	21.25
Apocynum cannabinum/Carex	12.5
Solidago occidentalis/Equisetum/Salix exigua	12.0
Equisetum/Salix exigua/Carex	6.0
Solidago occidentalis/Apocynum cannabinum/ Salix exigua	4.5
Salix exigua	3.75
Apocynum cannabinum	3.5
Salix lasiandra	2.5
Solidago occidentalis/Equisetum	2.5
Apocynum cannabinum/Salix exigua	2.25
Solidago occidentalis/Clematis ligusticifolia/Carex	1.25
Rosa woodsii	0.75

STREAM: SFBOU001.6 SAMPLE DATE: 9/25/96
EPA REACH: 17050108 QUAD MAP: Combination Ridge
RTS: R4W, T7S, S21 LAT/LONG: 42 46.46 ; 116 50.19
SECTION DESCRIPTION: SF Boulder Creek - Follow jeep trail until it becomes a pack trail. Follow pack trail down the draw to stream. The top of the site is an old barbwire fence that crosses the stream.

Length Frequency

Species	CM Group	Method	Number Measured
MTS	2	EF	1.00
MTS	4	EF	2.00
MTS	5	EF	1.00
MTS	7	EF	4.00
MTS	8	EF	3.00
MTS	9	EF	4.00
MTS	10	EF	1.00
WRB	5	EF	7.00
WRB	6	EF	8.00
WRB	7	EF	2.00
WRB	9	EF	5.00
WRB	10	EF	13.00
WRB	11	EF	11.00
WRB	12	EF	11.00
WRB	13	EF	5.00
WRB	14	EF	3.00
WRB	15	EF	6.00
WRB	16	EF	5.00
WRB	17	EF	4.00
WRB	18	EF	1.00
WRB	19	EF	4.00
WRB	20	EF	5.00
WRB	21	EF	3.00
WRB	22	EF	1.00

Transect Information:

Section Length (m):	61		
Elevation (m):	1745		
Gradient (%):	1.01%		
Population Est:	93.0	S.E(popest):	1
Shade (%):	42.0		
Mean Width (m):	3.2		
Mean Depth (m):	0.1		
Cover (%):	9		

Habitat Type:

Pool:	3.3	%
Riffle:	36.7	%
Run:	60.0	%
Pocket:	0.0	%

Substrate

Organic:	0	%
Sand:	22	%
Gravel:	44	%
Rubble:	34	%
Boulder:	0	%
Bedrock:	0	%

Water Chemistry

Time:	
H2O Temp(C):	5.5
Air Temp(C):	
pH:	
Alkalinity(mg/l CaCO3):	75
Hardness(mg/l CaCO3):	80
Conductivity(uS/cm3):	130

Greenline	%
Equisetum	38.75
Salix lutea	17.25
Salix exigua/Equisetum	17.25
Alnus incana	6.75
Cornus sericea	6.25
Ribes aureum	3.5
Alnus incana/Equisetum	3.25
Salix lasiandra/Equisetum	3.0
Salix lutea/Equisetum	1.0
Salix lutea/Alnus incana	0.75
Rosa woodsii	0.5
Ribes aureum/Cornus sericea	0.5
Salix exigua	0.5
Salix exigua/Alnus incana	0.5
Salix exigua/Salix lutea	0.25

STREAM: SMOUN006.6 SAMPLE DATE: 9/27/96
EPA REACH: 17050108 QUAD MAP: Combination Ridge
RTS: R5W, T7S, S36 NESE LAT/LONG: 42 45.47 ; 116 52.3
SECTION DESCRIPTION: South Mountain Creek - The bottom of section starts above the 4X4 road crossing located south of the main road.

Length Frequency

Species	CM Group	Method	Number Measured
WRB	4	EF	21.00
WRB	5	EF	27.00
WRB	6	EF	4.00
WRB	8	EF	9.00
WRB	9	EF	10.00
WRB	10	EF	7.00
WRB	11	EF	5.00
WRB	12	EF	9.00
WRB	13	EF	8.00
WRB	14	EF	3.00
WRB	15	EF	4.00
WRB	16	EF	1.00
WRB	17	EF	4.00
WRB	18	EF	2.00

Transect Information:

Section Length (m):	61		
Elevation (m):	1870		
Gradient (%):	1.88%		
Population Est:	116.0	S.E(popest):	2
Shade (%):	42.4		
Mean Width (m):	1.7		
Mean Depth (m):	0.1		
Cover (%):	5		

Habitat Type:

Pool:	0.0	%
Riffle:	60.0	%
Run:	40.0	%
Pocket:	0.0	%

Substrate

Organic:	0	%
Sand:	29	%
Gravel:	59	%
Rubble:	12	%
Boulder:	0	%
Bedrock:	0	%

Water Chemistry

Time:	09:30 AM
H2O Temp(C):	6
Air Temp(C):	
pH:	
Alkalinity(mg/l CaCO3):	100
Hardness(mg/l CaCO3):	75
Conductivity(uS/cm3):	100

Greenline	%
Mesic Forb	27.25
Salix lutea	16.75
Poa	10.5
Alnus incana	8.75
Poa/Populus tremuloides	8.25
Salix lutea/Mesic Forb	6.75
Alnus incana/Mesic Forb	6.25
Symphoricarpos/Grass	3.5
Salix lutea/Alnus incana	2.5
Pseudotsuga menziesii	2.0
Populus tremuloides/Juniperus occidentalis	1.25
Pseudotsuga menziesii/Symphoricarpos	1.25
Forb/Eroding bank	1.25
Salix lutea/Pseudotsuga menziesii	1.0
Salix lutea/Symphoricarpos	1.0
Juniperus occidentalis	0.75
Populus tremuloides/Juniperus occidentalis/ Salix lutea	0.5
Salix lutea/Ribes	0.5

STREAM: BOULD008.0 SAMPLE DATE: 10/1/96
EPA REACH: 17050108 QUAD MAP: Combination Ridge
RTS: R4W, T7S, S10 SESW LAT/LONG: 42 49.45 ; 116 47.67
SECTION DESCRIPTION: Big Boulder Creek - Site at the confluence of Combination Creek. A beaver dam was used as the top of section.

Length Frequency

Species	CM Group	Method	Number Measured
BLS	9	EF	1.00
BLS	10	EF	1.00
BLS	11	EF	1.00
BLS	12	EF	2.00
BLS	13	EF	10.00
BLS	14	EF	5.00
BLS	15	EF	2.00
BLS	16	EF	1.00
BLS	17	EF	4.00
BLS	18	EF	3.00
BLS	19	EF	2.00
BLS	20	EF	1.00
BLS	21	EF	1.00
CSL	8	EF	2.00
CSL	11	EF	1.00
CSL	13	EF	1.00
LND	5	EF	1.00
LND	7	EF	2.00
LND	9	EF	2.00
LND	10	EF	1.00
NSF	9	EF	1.00
NSF	14	EF	1.00
NSF	15	EF	2.00
NSF	20	EF	1.00
NSF	22	EF	1.00
NSF	24	EF	1.00
RSS	3	EF	2.00
RSS	6	EF	2.00
RSS	7	EF	4.00
RSS	8	EF	14.00
RSS	9	EF	5.00
RSS	10	EF	2.00
SPD	3	EF	1.00
SPD	6	EF	2.00
SPD	7	EF	4.00
WRB	12	EF	1.00
WRB	13	EF	5.00
WRB	14	EF	2.00
WRB	15	EF	1.00
WRB	16	EF	3.00
WRB	17	EF	2.00
WRB	18	EF	3.00
WRB	19	EF	1.00
WRB	20	EF	1.00
WRB	21	EF	2.00
WRB	22	EF	2.00
WRB	23	EF	1.00
WRB	24	EF	3.00
WRB	27	EF	2.00
WRB	35	EF	1.00

Transect Information:

Section Length (m):	61		
Elevation (m):	1615		
Gradient (%):	1.44%		
Population Est:	32.0	S.E(popest):	3
Shade (%):	25.2		
Mean Width (m):	7.2		
Mean Depth (m):	0.4		
Cover (%):	67		

Habitat Type:

Pool:	26.7	%
Riffle:	6.7	%
Run:	56.7	%
Pocket:	10.0	%

Substrate

Organic:	0	%
Sand:	21	%
Gravel:	29	%
Rubble:	24	%
Boulder:	26	%
Bedrock:	0	%

Water Chemistry

Time:	
H2O Temp(C):	10
Air Temp(C):	
pH:	
Alkalinity(mg/l CaCO3):	60
Hardness(mg/l CaCO3):	40
Conductivity(uS/cm3):	110

Greenline	%
Cliff	25.0
Equisetum arvense/Salix lutea/Eleocharis	17.5
Eleocharis	16.75
Alnus incana	13.5
Equisetum arvense/Eleocharis	10.75
Solidago occidentalis	6.25
Equisetum arvense/Solidago occidentalis/Eleocharis	2.5
Equisetum arvense/Solidago occidentalis/ Mentha spicata	2.0
Equisetum arvense/Solidago occidentalis	2.0
Cornus sericea/Clematis ligusticifolia	1.75
Clematis ligusticifolia	1.0
Cornus sericea	0.75
Salix lutea	0.25

STREAM: JOSEP000.6 SAMPLE DATE: 10/2/96
EPA REACH: 17050108 QUAD MAP: Triangle Flat
RTS: R3W, T7S, S22 NWSW LAT/LONG: 42 48.43 ; 116 41.08
SECTION DESCRIPTION: Josephine Creek - Turn south at Hardiman Spring and follow road to Rock Creek. Site is ~.25 mi above confluence.

Length Frequency

Species	CM Group	Method	Number Measured
BLS	6	EF	3.00
BLS	7	EF	4.00
BLS	8	EF	2.00
BLS	12	EF	2.00
CSL	5	EF	2.00
CSL	6	EF	6.00
CSL	7	EF	2.00
CSL	8	EF	1.00
CSL	10	EF	2.00
CSL	11	EF	3.00
CSL	12	EF	2.00
MTS	4	EF	1.00
MTS	7	EF	1.00
MTS	8	EF	2.00
NSF	5	EF	4.00
NSF	6	EF	10.00
NSF	8	EF	3.00
NSF	9	EF	1.00
NSF	10	EF	3.00
NSF	11	EF	3.00
NSF	13	EF	1.00
NSF	14	EF	2.00
NSF	15	EF	2.00
NSF	17	EF	1.00
RSS	5	EF	4.00
RSS	6	EF	5.00
RSS	9	EF	5.00

Transect Information:

Section Length (m):	61		
Elevation (m):	1547		
Gradient (%):	0.62%		
Population Est:	0.0	S.E(popest):	0
Shade (%):	11.7		
Mean Width (m):	3.6		
Mean Depth (m):	0.2		
Cover (%):	54		

Habitat Type:

Pool:	0.0	%
Riffle:	0.0	%
Run:	100.0	%
Pocket:	0.0	%

Substrate

Organic:	0	%
Sand:	19	%
Gravel:	40	%
Rubble:	39	%
Boulder:	0	%
Bedrock:	0	%

Water Chemistry

Time:	
H2O Temp(C):	12
Air Temp(C):	
pH:	
Alkalinity(mg/l CaCO3):	115
Hardness(mg/l CaCO3):	40
Conductivity(uS/cm3):	90

Greenline	%
Eleocharis	40.0
Carex	35.75
Alopecurus	19.5
Salix lutea/Carex	3.75
Salix lutea	1.0

STREAM: ROCK_003.7 SAMPLE DATE: 10/2/96
EPA REACH: 17050108 QUAD MAP: Triangle Flat
RTS: R3W, T7S, S15 SWNW LAT/LONG: 42 48.69 ; 116 41.04
SECTION DESCRIPTION: Rock Creek - Turn south at Hardiman Spring and follow road to creek. Top of site is just above where the road crosses stream and the mouth of Josephine Creek.

Length Frequency

Species	CM Group	Method	Number Measured
BBH	11	EF	1.00
BLS	6	EF	1.00
BLS	8	EF	1.00
BLS	14	EF	1.00
BLS	15	EF	1.00
BLS	24	EF	1.00
CSL	3	EF	7.00
CSL	4	EF	3.00
CSL	5	EF	1.00
CSL	6	EF	4.00
CSL	7	EF	5.00
CSL	9	EF	1.00
CSL	11	EF	1.00
CSL	12	EF	1.00
LND	7	EF	1.00
MTS	4	EF	1.00
NSF	2	EF	1.00
NSF	3	EF	1.00
NSF	5	EF	11.00
NSF	6	EF	13.00
NSF	7	EF	4.00
NSF	8	EF	2.00
NSF	9	EF	5.00
NSF	10	EF	6.00
NSF	11	EF	1.00
NSF	12	EF	1.00
NSF	13	EF	2.00
NSF	14	EF	2.00
NSF	15	EF	1.00
NSF	18	EF	1.00
RSS	3	EF	2.00
RSS	4	EF	3.00
RSS	5	EF	8.00
RSS	6	EF	9.00
RSS	7	EF	2.00
RSS	8	EF	5.00
RSS	9	EF	8.00
RSS	10	EF	2.00
WRB	21	EF	1.00
WRB	23	EF	1.00
WRB	24	EF	1.00
WRB	27	EF	1.00

Transect Information:

Section Length (m):	61		
Elevation (m):	1673		
Gradient (%):	0.86%		
Population Est:	4.0	S.E(popest):	0
Shade (%):	5.2		
Mean Width (m):	6.3		
Mean Depth (m):	0.3		
Cover (%):	48		

Habitat Type:

Pool:	0.0	%
Riffle:	10.0	%
Run:	90.0	%
Pocket:	0.0	%

Substrate

Organic:	0	%
Sand:	20	%
Gravel:	47	%
Rubble:	31	%
Boulder:	2	%
Bedrock:	0	%

Water Chemistry

Time:	10:30 AM
H2O Temp(C):	9
Air Temp(C):	
pH:	
Alkalinity(mg/l CaCO3):	110
Hardness(mg/l CaCO3):	60
Conductivity(uS/cm3):	200

Greenline	%
Carex	51.5
Carex/Salix lutea	12.75
Eleocharis	12.5
Juncus	9.5
Road crossing	6.25
Forb	3.0
Salix lutea	2.25
Mouth of Josephine Creek	1.5
Salix lasiandra	0.75

STREAM: JORDA097.9 SAMPLE DATE: 7/30/96
EPA REACH: 17050108 QUAD MAP: Silver City
RTS: R3W, T4S, S7 NENE LAT/LONG: 43 0.53 ; 116 43.74
SECTION DESCRIPTION: Jordan Creek - Above Silver City at road crossing.

Length Frequency

Species	CM Group	Method	Number Measured
BKT	0	EF	1.00
BKT	11	EF	2.00
BKT	12	EF	1.00
WRB	6	EF	1.00
WRB	7	EF	2.00
WRB	8	EF	1.00
WRB	9	EF	5.00
WRB	10	EF	2.00
WRB	11	EF	1.00
WRB	12	EF	10.00
WRB	13	EF	8.00
WRB	14	EF	3.00
WRB	15	EF	3.00
WRB	16	EF	2.00
WRB	18	EF	2.00

Transect Information:

Section Length (m):	57		
Elevation (m):	2062		
Gradient (%):	1.62%		
Population Est:	41.0	S.E(popest):	1
Shade (%):	0.0		
Mean Width (m):	3.8		
Mean Depth (m):	0.1		
Cover (%):	13		

Habitat Type:

Pool:	26.7	%
Riffle:	60.0	%
Run:	13.3	%
Pocket:	0.0	%

Substrate

Organic:	0	%
Sand:	17	%
Gravel:	21	%
Rubble:	43	%
Boulder:	20	%
Bedrock:	0	%

Water Chemistry

Time:	12:30 PM
H2O Temp(C):	18.3
Air Temp(C):	
pH:	7.5
Alkalinity(mg/l CaCO3):	68
Hardness(mg/l CaCO3):	51
Conductivity(uS/cm3):	

STREAM: COW__032.8 SAMPLE DATE: 9/24/96
EPA REACH: 17050108 QUAD MAP: Captain Butte
RTS: R5W, T4S, S12 SWNE LAT/LONG: 43 5.19 ; 116 53.03
SECTION DESCRIPTION: Cow Creek - Site ~ 4.8 miles in from DeLamar Rd @ Slaughterhouse Gultch. The road crossing past private ground was used as the bottom of the section.

Length Frequency

Species	CM Group	Method	Number Measured
WRB	4	EF	4.00
WRB	5	EF	43.00
WRB	6	EF	26.00
WRB	7	EF	16.00
WRB	8	EF	2.00
WRB	10	EF	1.00
WRB	11	EF	3.00
WRB	12	EF	5.00
WRB	13	EF	4.00
WRB	14	EF	1.00
WRB	15	EF	2.00
WRB	16	EF	1.00
WRB	17	EF	5.00
WRB	18	EF	3.00
WRB	19	EF	4.00

Transect Information:

Section Length (m):	52.9		
Elevation (m):	1817		
Gradient (%):	1.99%		
Population Est:	120.0	S.E(popest):	2
Shade (%):	49.6		
Mean Width (m):	1.8		
Mean Depth (m):	0.1		
Cover (%):	29		

Habitat Type:

Pool:	13.3	%
Riffle:	53.3	%
Run:	33.3	%
Pocket:	0.0	%

Substrate

Organic:	0	%
Sand:	23	%
Gravel:	52	%
Rubble:	26	%
Boulder:	0	%
Bedrock:	0	%

Water Chemistry

Time:	
H2O Temp(C):	12
Air Temp(C):	
pH:	
Alkalinity(mg/l CaCO3):	55
Hardness(mg/l CaCO3):	60
Conductivity(uS/cm3):	140

Greenline	%
Juncus	25.0
Salix lutea	22.5
Poa	14.0
Poa/Forb	14.0
Poa/Salix lutea	9.0
Bare soil	5.0
Salix exigua	4.5
Artemesia tridentata	3.5
Alnus	1.5
Artemesia ludoviciana	1.0

APPENDIX B

Recording thermograph charts for Jump Creek , McBride Creek, North Fork Owyhee River, North Fork Castle Creek, Castle Creek lower, Castle Creek upper, and North Fork Boulder Creek.

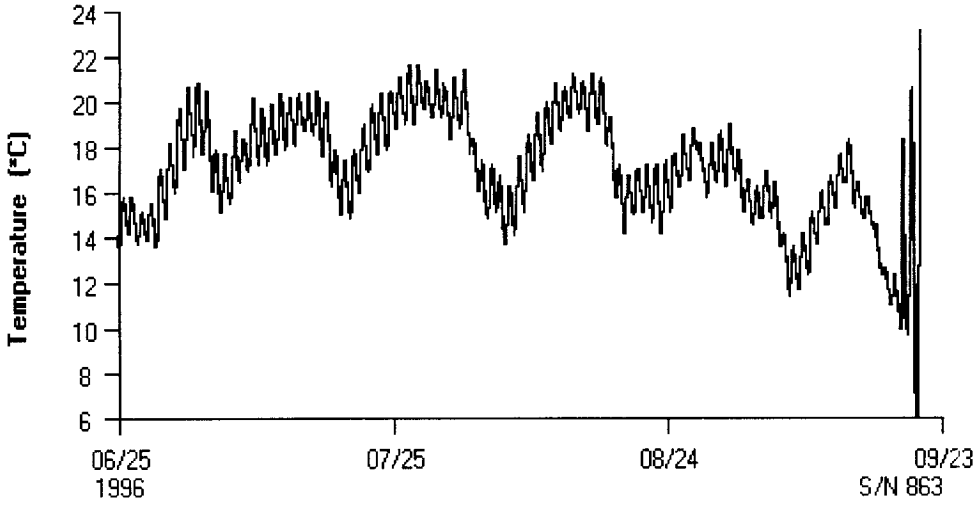


Figure B1. Recording thermograph data for Jump Creek, Owyhee County, Idaho.

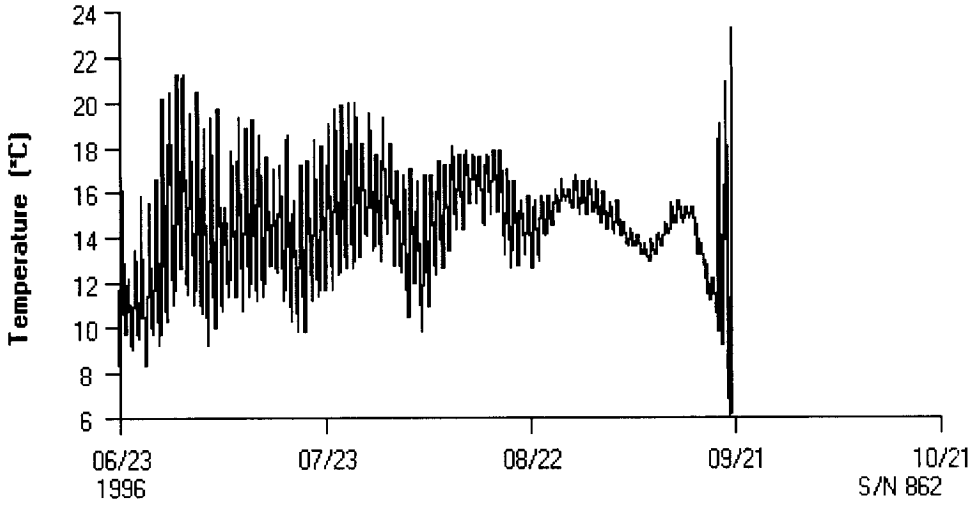


Figure B2. Recording thermograph data for McBride Creek, Owyhee County, Idaho.

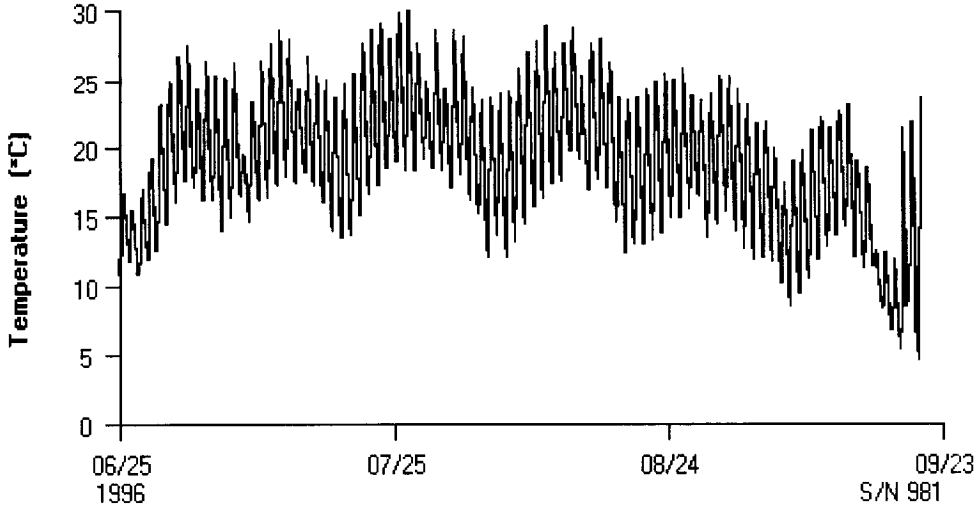


Figure B3. Recording thermograph data for the North Fork Owyhee River, Owyhee County, Idaho.

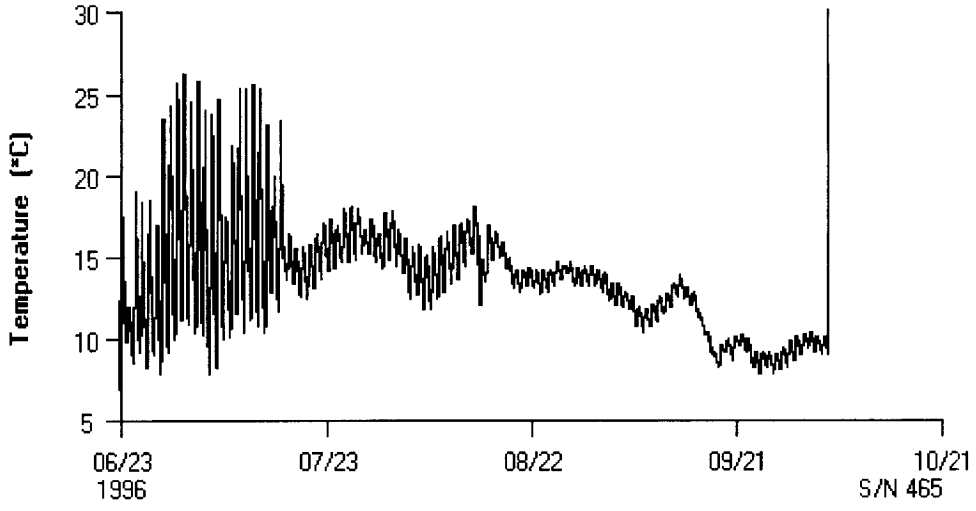


Figure B4. Recording thermograph data for North Fork Castle Creek, Owyhee County, Idaho.

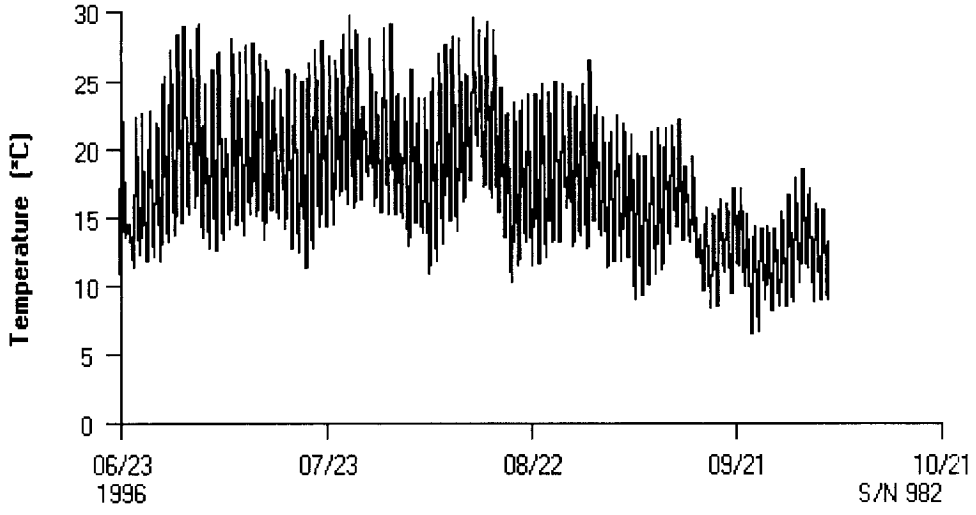


Figure B5. Recording thermograph data for Castle Creek, near Highway 78, Owyhee County, Idaho.

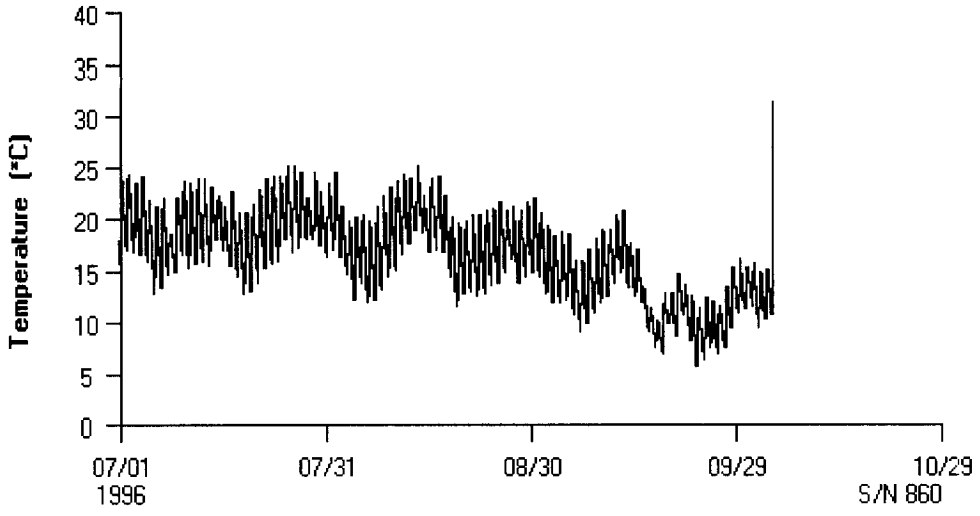


Figure B6. Recording thermograph data for Castle Creek, below the North and South Forks, Owyhee County, Idaho.

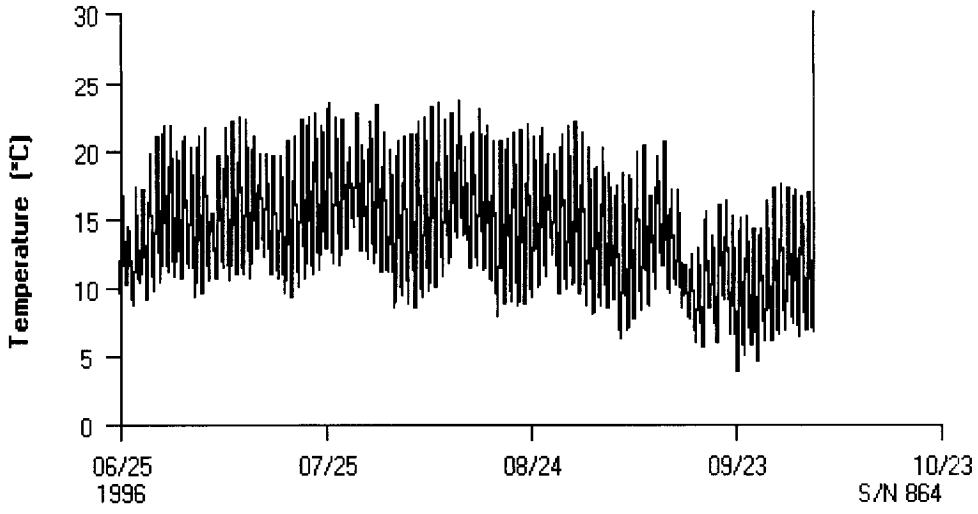


Figure B7. Recording thermograph data for North Fork Boulder Creek, Owyhee County, Idaho.

Bureau of Land Management
Idaho State Office
1387 S. Vinnell Way
Boise, Idaho 83709

BLM/ID/PT-97/011+1150