RECLAMATION

*Managing Water in the West*

**Technical Report for Upper Snake River Biological Opinion # 1009.2700**

# Distribution and Abundance of Bull Trout (*Salvelinus confluentus*) in the Middle Fork Boise River Basin, Idaho

**Summary Report 2001-2003**

**U.S. Department of the Interior**
**Bureau of Reclamation**

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**Summary Report 2001-2003**

**U.S. Bureau of Reclamation, Snake River Area Office - West**
**230 Collins Road, Boise Idaho**

*by*

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**September 2004**

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DISTRIBUTION AND ABUNDANCE OF BULL TROUT (*Salvelinus confluentus)* IN THE MIDDLE FORK BOISE RIVER BASIN, IDAHO

## Introduction

With growing concerns surrounding fisheries in the Northwest, the status of many native salmonid fishes such as bull trout *Salvelinus confluentus* have become a focus of interest. The status of Pacific Northwest bull trout populations have been under Federal agency review for over fifteen years. The Columbia and the Klamath River Basin populations of bull trout were listed as threatened under the Endangered Species Act in June 1998 and the final rule was published in the Federal Register (USFWS 1998). Reasons for declining bull trout populations included habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, poor past management practices, and the introduction of non-native competitors such as brook trout *Salvelinus fontinalis*.

In response to the federal listing, the U.S. Forest Service and the U.S. Bureau of Reclamation initiated a four-year cooperative study to investigate the factors affecting the distribution of bull trout in the North Fork Boise River basin. The study began in July 1999 and continued through August 2002. The purpose of the work was to assess habitat, water temperature, and flow conditions as they relate to bull trout presence or absence, abundance, movement, and age-class distribution on a large-watershed scale. The study was designed to meet the following objectives:

1. To determine the distribution of bull trout and the environmental factors that affect their distribution within the Middle Fork Boise River Basin;
2. To quantify sizes related to age classes and growth rates of bull trout within tributary streams;
3. To gather tissue from bull trout in order to complete genetic population analyses;
4. To determine the effects of forest management practices on bull trout habitat and populations;

5. To develop potential conservation measures that would be most beneficial to migratory bull trout;

## Study Area

The Boise River basin is located in southwestern Idaho and is a major tributary to the Snake River. The Boise River basin covers 5,700 km² of the granitic rock-dominated landscape with elevations ranging from 931 m to 3,231 m elevation. The upper Boise River includes three sub-basins: the North, Middle, and South Forks of the Boise River. The work discussed in this report occurred in the Middle Fork Boise River that joins the North Fork Boise River 30 km upstream from the South Fork/ Middle Fork Boise River confluence (Figure 1). The Middle Fork Boise River encompasses approximately 6,330 km² of the Boise River watershed area and extends to 2,740 m elevation. The Boise River system is fed primarily by snowmelt run-off with highest flows occurring in May and lowest in September-October. Flows range from 5.06 m³/s to over 198.28 m³/s in the mainstem Boise River below the confluence of the North and Middle Fork Boise Rivers. The Middle Fork Boise River flows range from 4.04 m³/s to 119 m³/s. Land uses in the Middle Fork watershed include grazing, mining, recreation, and both commercial and individual timber harvest. The majority of the Boise River basin lies within Forest Service or Wilderness area boundaries.

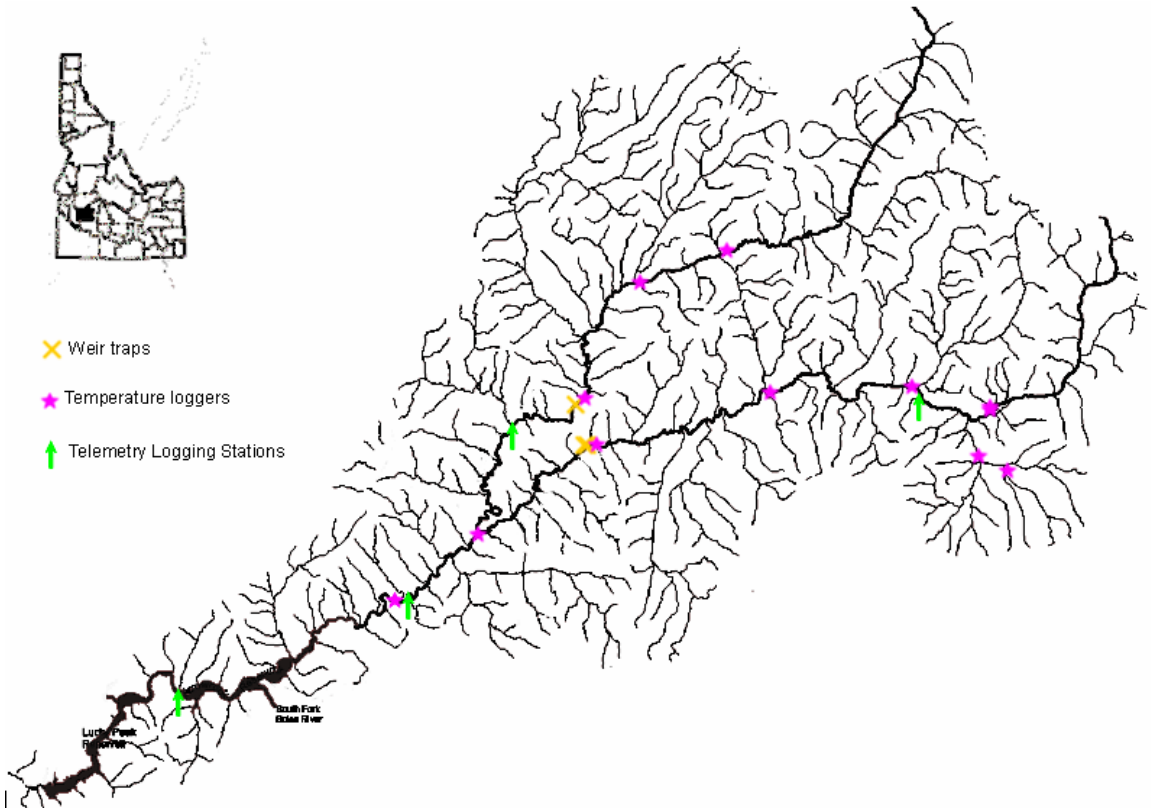


Figure 1. Boise River watershed showing Arrowrock and Lucky Peak Reservoirs, temperature, trapping and telemetry logger locations.

## Methods

Fish Data Collection

Stream reaches were sampled by electrofishing using two different methods. Part of the purpose of stream sampling was to collect tissue samples from bull trout in tributary streams for microsatellite analysis (see Whiteley et al. 2003). For these stream sites, single pass electrofishing was conducted, targeting bull trout. Sites lengths were estimated and all other species of game fishes were measured and released. Sculpin were counted, and tailed frogs were noted with but stage of development was not. The second purpose of stream sampling was to conduct density estimates and collect habitat data. For these streams, Two-pass backpack electrofishing was performed. Smith-Root™ battery-operated electrofishers were used; batteries were changed every 3,500 to 4,000 operating seconds. Electrofishers were set between 500 and 900 volts and 30 to 40 Hz, depending on stream size and conductivity. The Middle Fork and its tributaries have low conductivity, which averaged 53 µS (range: 48 µS - 84 µS). Gasoline-powered generator electrofishing units were not used during any part of the sampling due to designated Wilderness Area restrictions on motors in the higher elevation sites.

All captured fish were identified to species and enumerated. Total length (TL) was recorded for all species. All amphibians were counted and released, though stage of development was not noted. Scale samples and fin clips were taken from all bull trout captured to be used for aging and genetic analysis.

Habitat Data Collection: 2-pass density sites

Habitat condition was measured following modified R1/R4 methods of the USFS as described in Burton (1999).

Each stream site was located with a Garmin™ GPS 76, and UTM coordinates were recorded. Habitat was measured using the following methodology: waters were first categorized by the observer as slow or fast based on USFS training (Burton 1999). Different measurements are taken for either slow or fast water. A two-meter stadia rod marked in tenth meter units was used to measure all habitat variables. Field staff was trained each year for habitat measurement under guidance of the USFS.

Parameters collected for slow water habitats were: thalweg lengths, maximum depth, mean depth, crest depth, averaged wetted width, available cover area, and percent

fines. Parameters collected for fast water habitats were: thalweg length, mean depth and wetted width.

Definition of Habitat Parameters Collected

*Thalweg Length*: thalweg length was the measured distance in the path of a stream that followed the deepest part of the channel from the crest of the slow water unit to the formative feature of the habitat unit (Armantrout 1998).

*Crest depth*: crest depth is the downstream point of transition of slow water habitat types. It is the shallow downstream end of the depression in scour pools and the point of greatest flow over a dam.

*Maximum Depth*: maximum depth was the greatest depth measured in the slow water type.

*Mean Depth*: mean depth was taken at the area where average width was measured.

*Depths were measured at approximately ¼, ½, and ¾ of the channel width and the average was calculated by dividing the sum by four (to account for zero depth at the banks).

*Average Width*: average width was the wetted width measured at location of the pool that was the the mean depth calculated from the depth at the crest and maximum depth of the pool.

*Available Cover Area*: cover was categorized as large wood debris, overhanging vegetation, or undercut banks. All cover types had to be at least 0.30 m in width to be measured and capable of providing refuge to fish. All aggregates of wood were measured for combined total area (each piece was added to calculate a combined total). Each habitat feature was measured by length and width and area was calculated. The area of cover is reported in square meters ($m^2$).

*Grid Fines*: percent fines were estimated at each slow water pool tail. Fines were measured using a 100-intersection grid. Field staff measured the percent of the wetted substrate area of pool tail that is made up of fine particles, defined as sand/silt less that 6 mm, by randomly tossing the grid. The cross section of the pool tail was subdivided into 3 segments: right, middle, and left. The grid intersections were counted only where substrate was smaller than 6 mm.

*Elevation:* site locations were mapped using UTM coordinates collected with a Garmin GPS 76 unit at each site. Waypoint locations were mapped and elevation (m) was taken from coordinates.

## Results

A total of 63 sites were sampled in the Middle Fork Boise River basin over three years (Appendix A Table 1, Figures 1-3). Twenty-two sites had 2-pass depletion estimates calculated and habitat data collected. Five species of fish were captured. There were 1361 individuals captured during the three years including fifty bull trout ranging from 42 mm to 250 mm total length (Table 1). Two large adfluvial bull trout (430-500 mm total length) were reported, but not captured during the sampling in 2003.

Table 1. Total Fish Captured during electrofishing sampling 2001-2003

**Middle Fork Boise River Fish Summary**

| Species | Number Captured 2001 | Number Captured 2002 | Number Captured 2003 |
|---|---|---|---|
| Bull Trout (*Salvelinus confluentus*) | 22 | 5 | 23 |
| Rainbow trout (*Oncorhynchus mykiss*) | 352 | 118 | 108 |
| Westslope cutthroat (*Oncorhynchus clarki lewisi*) | 5 | 0 | 0 |
| Brook trout (*Salvelinus fontinalis*) | 8 | 0 | 0 |
| Sculpin sp.(*Cottus sp.*) | 816 | 24 | 0 |
| Total | 1203 | 147 | 131 |

Bull trout were found in 17 of the 63 sites sampled. Figure 2 shows the distribution of bull trout from the Middle Fork sites sampled over all three years.

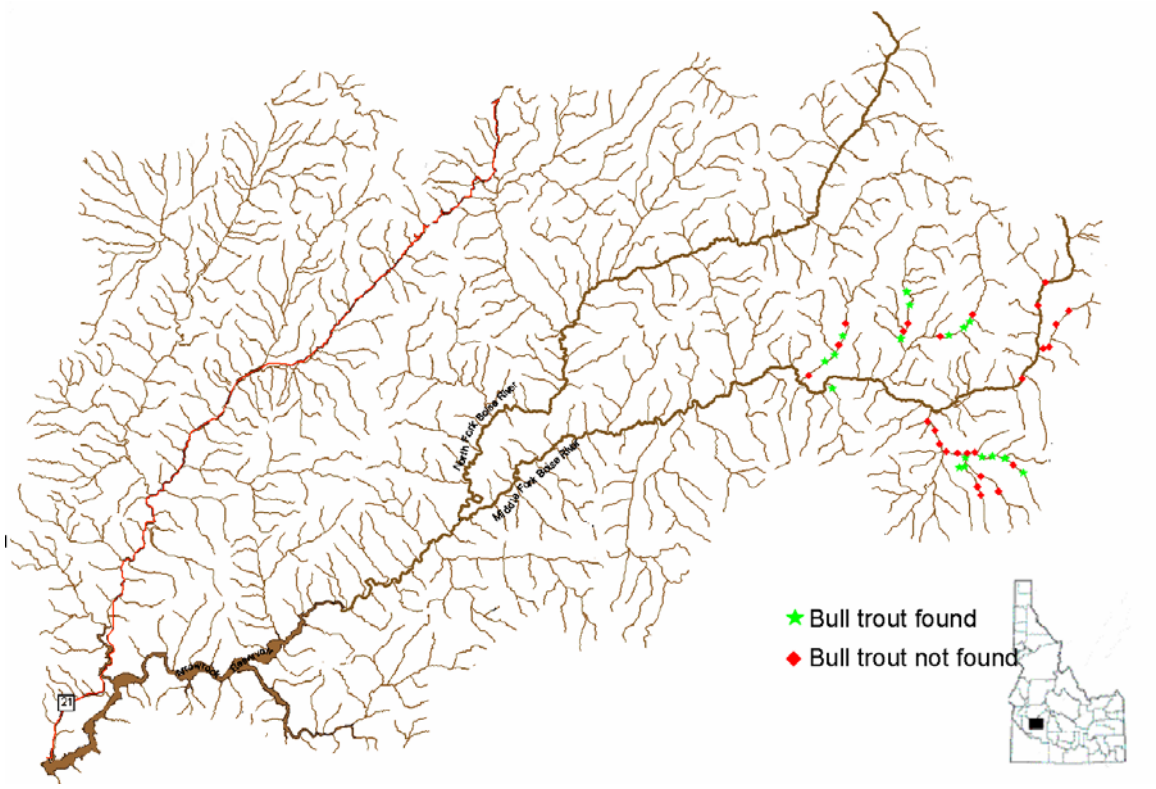


Figure 2. Distribution of bull trout in sites sampled on the Middle Fork Boise River, during years 2001 through 2003.

Two pass depletion estimates were calculated for twenty-two sites sampled during the three years. Table 2 shows the number of sites sampled, number of fish captured, and the mean two-pass estimate for all sites where fish were present (bull trout, sculpin spp. and rainbow trout). Two-pass abundance estimates for bull trout ranged from 0 to 12 individuals per survey site. The number of bull trout actually captured ranged of 0 to 12 bull trout at each site for both depletion estimate sites and single pass presence/absence sites.

Table 2. Fish captures and depletion estimates for all sites sampled with 2-pass depletion methods in years 2001 through 2003.

| | **2001 (10 sites with 2-pass estimates calculated)** | | | **2002 (11 sites with 2-pass estimates calculated)** | | | **2003 (1 site with 2-pass estimates calculated)** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Species** | Number Captured | 2-pass estimate | Number of sites where present | Number Captured | 2-pass estimate | Number of sites where present | Number Captured | 2-pass estimate | Number of sites where present |
| Bull trout *(Salvelinus confluentus)* | 2 | 2 | 2 | 6 | 5.0 | 2 | 8 | 12.5 | 1 |
| Rainbow trout (*Oncorhynchus mykiss*) | 42 | 6.85 | 10 | 124 | 14.36 | 11 | 17 | 17.3 | 1 |
| Sculpin (*Cottus sp.)* | 26 | 1.5 | 4 | 24 | 3.3 | 3 | 0 | 0 | 0 |

## Literature Cited

Armantrout, N.B. compiler. 1998. Glossary of aquatic habitat inventory terminology. American Fisheries Society, Bethesda, Marylyand. 136 p.

Burton, T. 1999. Bull trout fisheries monitoring plan for the North Fork Boise River. Boise National Forest. Boise, Idaho.

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# APPENDIX A

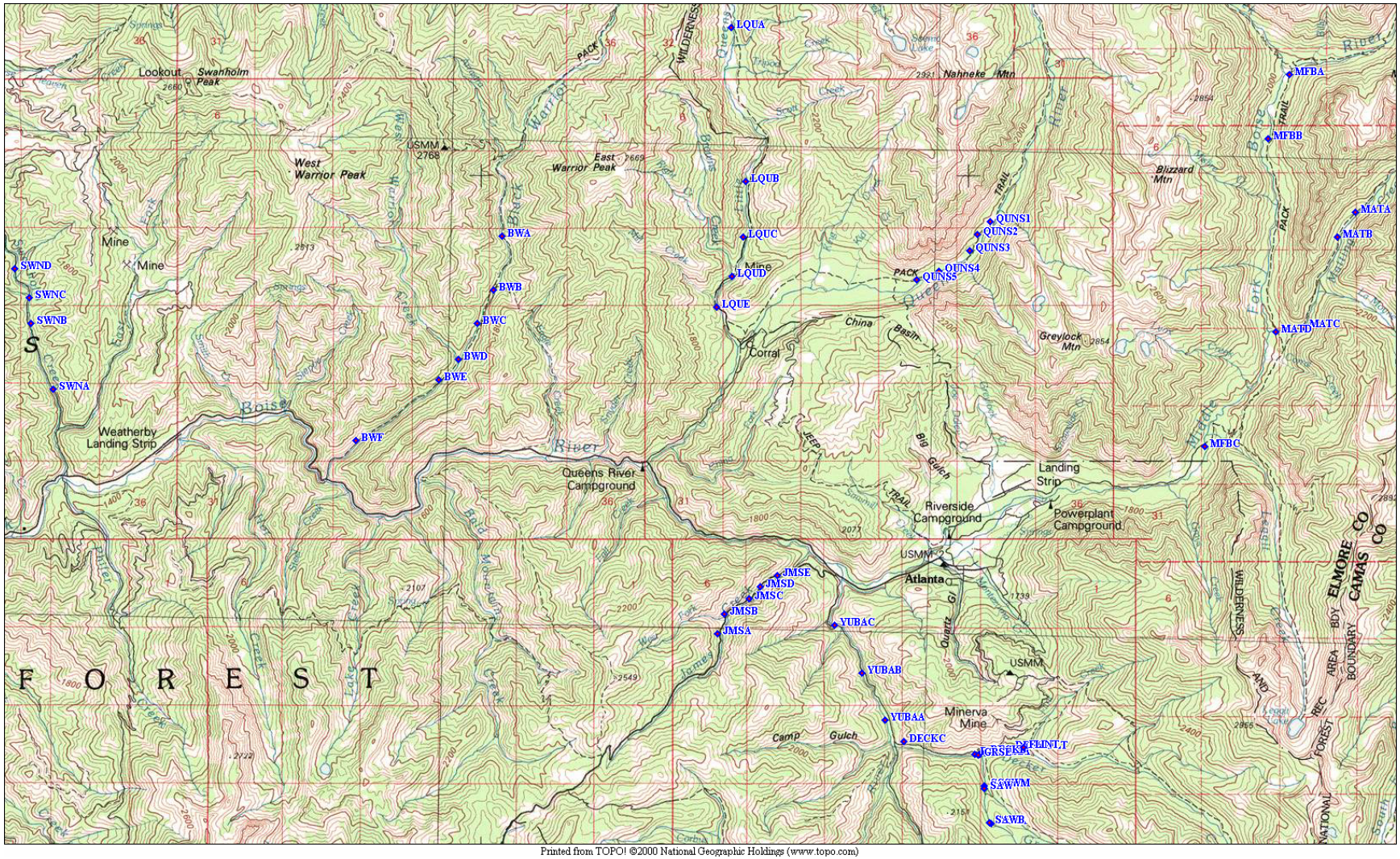


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Figure 1. Sites sampled on the Middle Fork Boise River with electrofishing in 2001

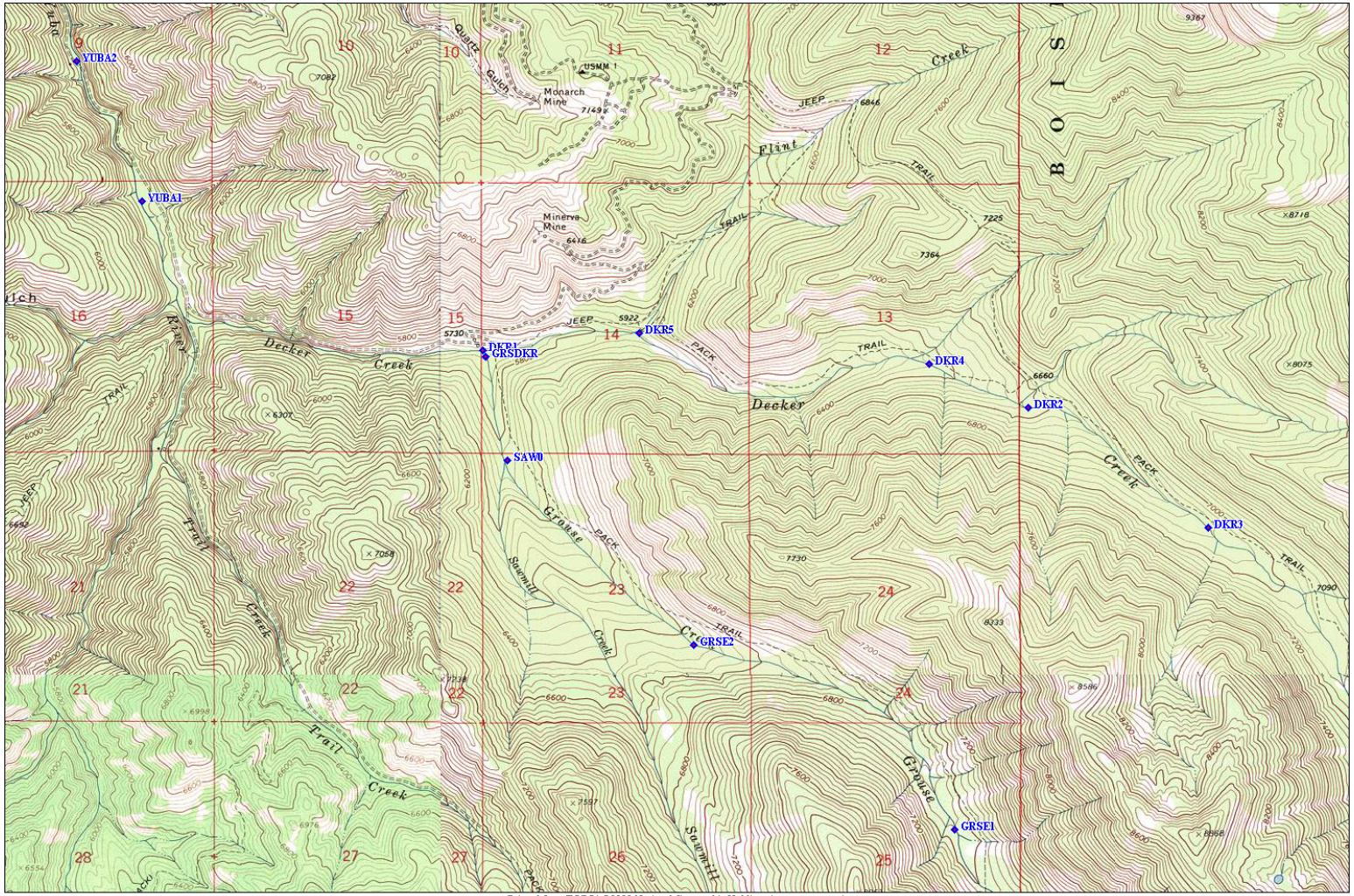


Figure 2. Sites sampled on the Middle Fork Boise River with electrofishing in 2002

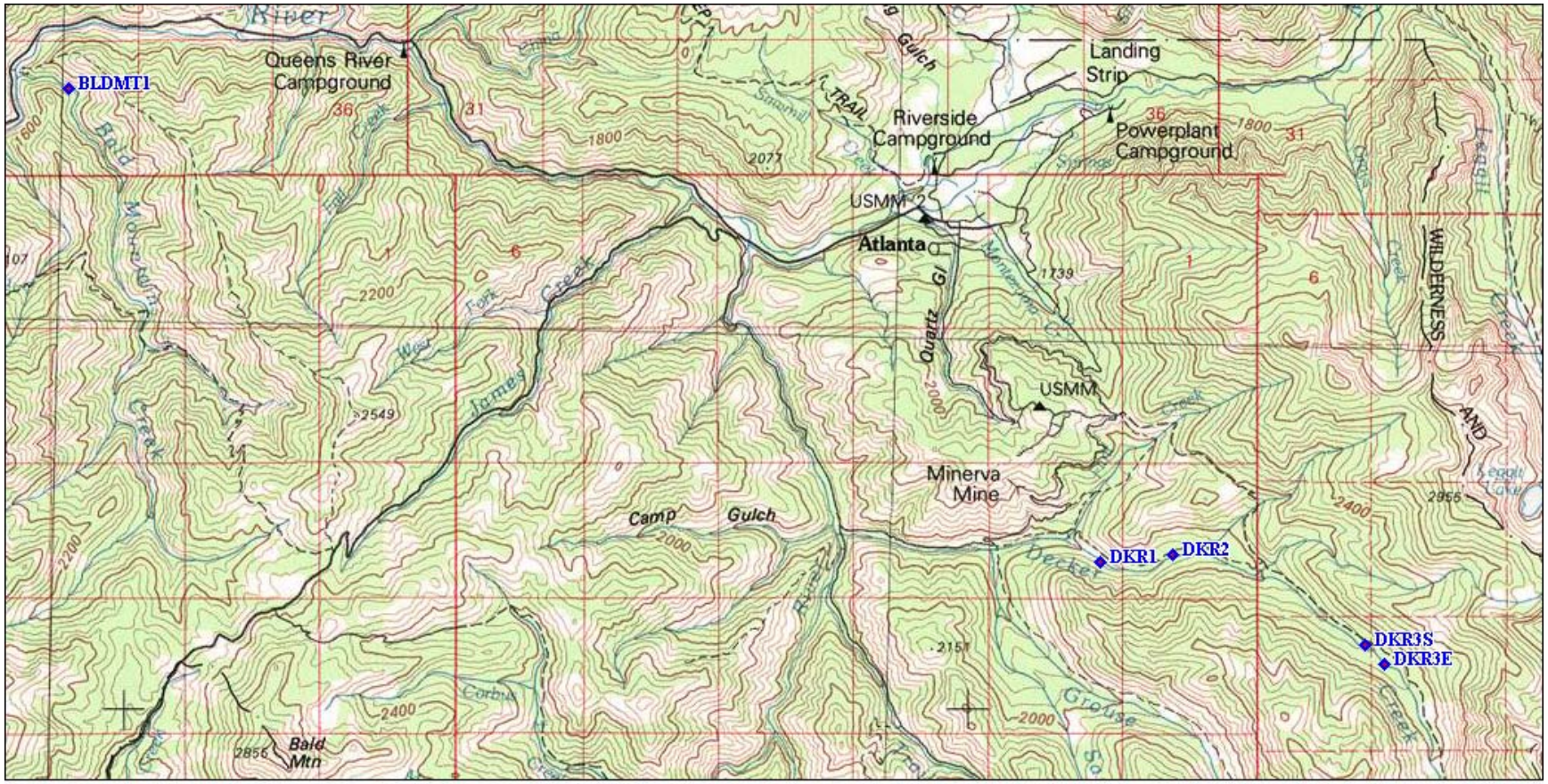


Figure 3. Sites sampled on the Middle Fork Boise River with electrofishing in 2003

Table 1. Sites sampled and UTM coordinates for 2001-2003

| Site | Creek | Zone | UTME | UTMN | Method | Length |
|---|---|---|---|---|---|---|
| BWA | Black Warrior Cr. | 11T | 641034 | 4858216 | 1-pass presence/absence | 150 m (approx.) |
| BWB | Black Warrior Cr. | 11T | 640887 | 4857099 | 1-pass presence/absence | 150 m (approx.) |
| BWC | Black Warrior Cr. | 11T | 640558 | 4856415 | 1-pass presence/absence | 150 m (approx.) |
| BWD | Black Warrior Cr. | 11T | 640198 | 4855658 | 1-pass presence/absence | 150 m (approx.) |
| BWE | Black Warrior Cr. | 11T | 639790 | 4855225 | 1-pass presence/absence | 150 m (approx.) |
| BWF | Black Warrior Cr. | 11T | 638113 | 4853939 | 1-pass presence/absence | 150 m (approx.) |
| DECKA | Decker Cr. | 11T | 651754 | 4847872 | 1-pass presence/absence | 150 m (approx.) |
| DECKB | Decker Cr. | 11T | 651232 | 4847762 | 1-pass presence/absence | 150 m (approx.) |
| DECKC | Decker Cr. | 11T | 649549 | 4847953 | 1-pass presence/absence | 150 m (approx.) |
| FLINT | Flint Cr. at Decker | 11T | 652035 | 4847899 | 2-pass depletion | 100 m |
| JMSA | James Cr. | 11T | 645667 | 4850107 | 1-pass presence/absence | 150 m (approx.) |
| JMSB | James Cr. | 11T | 645788 | 4850518 | 1-pass presence/absence | 150 m (approx.) |
| JMSC | James Cr. | 11T | 646296 | 4850834 | 1-pass presence/absence | 150 m (approx.) |
| JMSD | James Cr. | 11T | 646528 | 4851094 | 1-pass presence/absence | 150 m (approx.) |
| JMSE | James Cr. | 11T | 646866 | 4851335 | 1-pass presence/absence | 150 m (approx.) |
| LQUA | Little Queens River | 11T | 645665 | 4862635 | 1-pass presence/absence | 150 m (approx.) |
| LQUB | Little Queens River | 11T | 646034 | 4859458 | 1-pass presence/absence | 150 m (approx.) |
| LQUC | Little Queens River | 11T | 646009 | 4858311 | 1-pass presence/absence | 150 m (approx.) |
| LQUD | Little Queens River | 11T | 645801 | 4857492 | 1-pass presence/absence | 150 m (approx.) |
| LQUE | Little Queens River | 11T | 645486 | 4856852 | 1-pass presence/absence | 150 m (approx.) |
| MATA | Mattingly Cr. | 11T | 658623 | 4859113 | 1-pass presence/absence | 100 m |
| MATB | Mattingly Cr. | 11T | 658249 | 4858581 | 1-pass presence/absence | 100 m |
| MATC | Mattingly Cr. | 11T | 657605 | 4856727 | 1-pass presence/absence | 100 m |
| MATD | Mattingly Cr. | 11T | 657033 | 4856601 | 1-pass presence/absence | 100 m |
| MFBA | Middle Fork Boise R. | 11T | 657197 | 4861920 | 1-pass presence/absence | 100 m |
| MFBB | Middle Fork Boise R. | 11T | 656787 | 4860591 | 1-pass presence/absence | 100 m |
| MFBC | Middle Fork Boise R. | 11T | 655618 | 4854201 | 1-pass presence/absence | 100 m |
| QUNS1 | Queens R. | 11T | 651102 | 4858749 | 1-pass presence/absence | 150 m (approx.) |
| QUNS2 | Queens R. | 11T | 650831 | 4858472 | 1-pass presence/absence | 150 m (approx.) |
| QUNS3 | Queens R. | 11T | 650685 | 4858133 | 1-pass presence/absence | 150 m (approx.) |
| QUNS4 | Queens R. | 11T | 650065 | 4857688 | 1-pass presence/absence | 150 m (approx.) |
| QUNS5 | Queens R. | 11T | 649611 | 4857512 | 1-pass presence/absence | 150 m (approx.) |
| SWNA | Swanholm Cr. | 11T | 631844 | 4854869 | 1-pass presence/absence | 150 m (approx.) |
| SWNB | Swanholm Cr. | 11T | 631359 | 4856220 | 1-pass presence/absence | 150 m (approx.) |
| SWNC | Swanholm Cr. | 11T | 631310 | 4856742 | 1-pass presence/absence | 150 m (approx.) |
| SWND | Swanholm Cr. | 11T | 630998 | 4857336 | 1-pass presence/absence | 150 m (approx.) |
| YubaA | Yuba R. | 11T | 649163 | 4848391 | 1-pass presence/absence | 100 m |
| YubaB | Yuba R. | 11T | 648659 | 4849363 | 1-pass presence/absence | 100 m |
| YubaC | Yuba R. | 11T | 648078 | 4850332 | 1-pass presence/absence | 100 m |
| DCKFLT | Decker Cr. | 11T | 651964 | 4847871 | 2-pass depletion | 100 m |
| DCKGSA | Decker Cr. | 11T | 651138 | 4847735 | 2-pass depletion | 100 m |

| Site | Creek | Zone | UTME | UTMN | Method | Length |
|---|---|---|---|---|---|---|
| DCKGSB | Decker Cr. | 11T | 651035 | 4847727 | 2-pass depletion | 100 m |
| GRSE | Grouse Cr. | 11T | 651105 | 4847721 | 2-pass depletion | 100 m |
| GSSWM | Grouse Cr. | 11T | 651244 | 4847073 | 2-pass depletion | 200 m |
| SAW | Sawmill Cr. | 11T | 651229 | 4847019 | 2-pass depletion | 100 m |
| SAWA | Sawmill Cr. | 11T | 651392 | 4846301 | 2-pass depletion | 100 m |
| SAWB | Sawmill Cr. | 11T | 651364 | 4846327 | 2-pass depletion | 100 m |
| TRAIL | Trail Creek near mouth | 11T | 649325 | 4847854 | 2-pass depletion | 100m |
| | | | **2002** | | | |
| DKR1 | Decker | 11T | 651076 | 4847739 | 2-Pass Depletion | 100 m |
| DKR2 | Decker | 11T | 654354 | 4847473 | 2-Pass Depletion | 100 m |
| DKR3 | Decker | 11T | 655445 | 4846782 | 2-Pass Depletion | 100 m |
| DKR4 | Decker | 11T | 653757 | 4847719 | 2-Pass Depletion | 100 m |
| DKR5 | Decker | 11T | 652020 | 4847866 | 2-Pass Depletion | 100 m |
| GRSE1 | Grouse | 11T | 653973 | 4844946 | 2-Pass Depletion | 100 m |
| GRSE2 | Grouse | 11T | 652296 | 4846059 | 2-Pass Depletion | 100 m |
| GRSDKR | Grouse at Decker Cr. | 11T | 65111 | 4847706 | 2-Pass Depletion | 100 m |
| SAW0 | Sawmill | 11T | 651251 | 4847090 | 2-Pass Depletion | 100 m |
| YUBA1 | Yuba | 11T | 649037 | 4848583 | 2-Pass Depletion | 100 m |
| YUBA2 | Yuba | 11T | 648630 | 4849410 | 2-Pass Depletion | 100 m |
| | | | **2003** | | | |
| BLDMT1 | Bald Mountain | 11T | 640056 | 4852960 | 2-pass depletion | ~300 m |
| DKR3 | Decker | 11T | 655903 | 4846444 | 1-Pass presence | ~300 m |
| DKR1 | Decker | 11T | 652479 | 4847580 | 1-Pass presence | ~150 m |
| DKR2 | Decker | 11T | 653345 | 4847692 | 1-Pass presence | ~150 m |