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Southwest Idaho Bull Trout Restoration (South Fork Boise River) Completion Report

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TABLE OF CONTENTS

Page

ABSTRACT 1

INTRODUCTION 2

DRAINAGE AREA 2

METHODS 3

RESULTS 4

DISCUSSION 30

RECOMMENDATIONS 31

LITERATURE CITED 32

LIST OF TABLES

Table 1. Monitoring locations of radio-tagged bull trout in the South Fork Boise River drainage upstream of Anderson Ranch Dam during 1998 and 1989 5

Table 2. Uppermost points where radio-tagged migratory bull trout were found in South Fork Boise River tributaries in 1998 and 1999 13

Table 3. Fish sampling sites in the South Fork Boise River drainage upstream of Anderson Ranch Dam prior to 1990 15

Table 4. Fish sampling sites in the South Fork Boise River drainage system upstream of Anderson Ranch Dam after 1990 16

Table 5. Surveyed stream crossings and related structures in the South Fork Boise River drainage system upstream of Anderson Ranch Reservoir, 1997-2000 26

LIST OF FIGURES

Figure 1. Uppermost locations and known movement corridors of fluvial bull trout in the South Fork Boise River drainage above Anderson Ranch Reservoir during 1998 and 1999 13

Figure 2. Stream sampling sites for fish and sites where bull trout were found in the South Fork Boise River drainage above Anderson Ranch Reservoir during 1975-1989 15

LIST OF FIGURES (continued)

Figure 3. Stream sampling sites for fish and sites where bull trout were found in the South Fork Boise River drainage above Anderson Ranch Reservoir during 1990-1999 18

Figure 4. Stream crossing structures examined in the Southy Fork Boise River drainage above Anderson Ranch Reservoir with those that are potential barriers to upstrem movement of bull trout noted 27

ABSTRACT

Thirty-seven bull trout *Salvelinus confluentus* were monitored moving out of Anderson Ranch Reservoir into headwater tributaries during 1998 and 1999 with the use of implanted radios. Radio-tagged bull trout used at least ten headwater tributaries, and fluvial sized bull trout were also observed in two additional streams. Monitoring of radio-tagged bull trout found that fish began moving upriver from the reservoir during May with all fish being in the upper river or tributaries by the end of June. Radio-tagged bull trout remained in headwater streams from late August to early September, at which time they began to move downstream.

Juvenile fluvial or resident bull trout were found in 18% of stream survey sites conducted in the drainage upstream of Anderson Ranch Dam in the 1990s. The only larger tributaries without bull trout were Fall, Trinity, Little Smoky, and Lime creeks.

A total of 105 individual road crossings of streams were surveyed with 26 potential barriers observed. Of the 26, only 7 were on drainages of sufficient size to contain bull trout populations. The larger drainages were Big Water, Fall, Little Water, Steel, Trinity, and Whiskey Jack creeks, and the Feather River.

INTRODUCTION

Bull trout *Salvelinus confluentus* were initially petitioned for listing under the Endangered Species Act in 1992, with most populations within the Columbia River basin subsequently listed as Threatened in June of 1998. Since the initial petitioning for listing there has been an increased interest in learning about the life history of bull trout and the environmental factors that affect their populations. Bull trout are classified as either migratory or resident with the migratory forms being further classified as either fluvial or adfluvial. Both migratory forms spawn and reside in small headwater tributaries during early life stages with the fluvial forms moving downstream into larger mainstem riverine habitats for the winter and the adfluvial forms moving downstream into large lakes for the winter. Initial downstream migration of juvenile fish from the early rearing headwaters does not occur until age-2+ or age-3+ (Elle 1995). Both forms return to the headwater tributaries to spawn, and some immature fish migrate upstream for summer refugia to escape high downstream water temperatures. The upstream migration from wintering areas generally occurs during the spring as water temperatures and flows increase. Historically, the migratory population in the South Fork Boise River was a fluvial population with access down through the Boise River to the Snake River. Since the construction of Anderson Ranch Dam in the early 1940s creating the large 1,900 ha reservoir, the population has been considered adfluvial. However this population appears to still retain their fluvial characteristics with all juvenile and non-spawning adults returning to headwater streams each summer (Partridge, et al. In Press).

This report focuses on migration corridors for fluvial bull trout in the South Fork Boise River drainage upstream of Anderson Ranch Dam. This study will provide information so that management decisions can be made which will improve and maintain passage between spawning, rearing and wintering habitats for these fluvial populations of bull trout. The report includes three sections: 1) Seasonal migration routes and timing of adult bull trout movement; 2) General distribution of bull trout populations in the drainage; and 3) Location of human constructed migration barriers associated with roaded streams in the South Fork Boise River drainage.

DRAINAGE AREA

The upper South Fork Boise River is 97 km long from Anderson Ranch Dam upstream to the confluence of Emma and Ross Fork creeks. The first 25 km lies in Anderson Ranch Reservoir when the reservoir is at full pool. Drainage area upstream of the dam is 2,500 km^2 (Brennan et al. 2000). The upper river and several of the tributary streams are accessible to the public throughout most of their length with graded gravel roads and numerous U.S. Forest Service (USFS) maintained campgrounds and pullouts. The drainage lies within the southern end of the granitic Idaho batholith and as a result, streams are low in productivity.

In addition to bull trout, Idaho Department of Fish and Game (Department) records show the following fish species present in the reservoir, streams, and mountain lakes upstream of Anderson Ranch Dam: rainbow/redband trout *Oncorhynchus mykiss* of wild and hatchery origin, cutthroat trout *O. clarki*, kokanee *O. nerka*, brook trout *Salvelinus fontinalis,* mountain whitefish *Prosopium williamsoni*, Arctic grayling *Thymallus arcticus*, longnose dace *Rhinichthys cataractae*, speckled dace *R. osculus*, redside shiner *Richardsonius balteatus*, northern squawfish *Ptychocheilus oregonensis*, smallmouth bass *Micropterus dolomieu*, mountain sucker

Catostomus platyrhynchus, bridgelip sucker *C. columbianus*, largescale sucker *C. macrocheilus*, mottled sculpin *Cottus bairdi* and yellow perch *Perca flavescens*. The cutthroat trout, brook trout, kokanee, Arctic grayling, smallmouth bass and yellow perch are not indigenous to the drainage but have been introduced in the past few decades.

METHODS

Bull trout wintering in Anderson Ranch Reservoir were sampled in 1998 and 1999. Gear used for collecting bull trout included sinking gill nets and trap nets (Partridge et al. In Press). The gill nets were set and checked for fish every 30 minutes to reduce sampling mortality. Nets were set starting March 9 and ending on May 25, 1998 and from April 6 to May 25, 1999. Downstream migrating bull trout were also captured from October 9 to November 30, 1998 at the old kokanee trapping weir at the Pine Bridge, just upstream of the reservoir.

All bull trout sampled were measured, weighed and marked by clipping the left pelvic fin and then released. Several of the bull trout sampled were implanted with a radio tag with an external antenna, which was surgically implanted into the lower body cavity. Radio tags were no more than 2% of the fish's body weight.

Radio tagged fish were tracked by fixed-wing aircraft equipped with a radio receiver and wing mounted antennas. These flights occurred on six different dates each summer during 1998 and 1999. In 1998, these flights were between May 28 and November 4, and in 1999 between May 31 and October 22. Due to the plane's distance above the ground and speed of travel, accuracy of locations recorded was probably within 0.5 km. This accuracy range made it difficult to determine specific stream locations when fish were found near the confluence of two streams. Locations were recorded using the Universal Transverse Mercator (UTM) reference system.

Resident and juvenile bull trout distribution data was compiled from Collecting Permit Reports received from the U. S. Forest Service-Intermountain Research Station (FS-IRS), U.S. Forest Service-Boise National Forest (BNF), and Idaho Division of Environmental Quality (IDEQ). These reports were compiled along with Department surveys conducted on the South Fork Boise River and its tributaries. Sampling was conducted by backpack electrofishing or by snorkeling.

Data on potential barriers at road crossings of streams was collected by driving roads located along the South Fork Boise River and its tributaries. Individual crossings were recorded with GPS units or by locating the point on USGS topographic maps. Sensitivity of the handheld GPS units resulted in potential location errors of up to 0.25 km. Photos were taken of the bridges and culverts. At crossings using culverts, culvert length, gradient, and outfall drop measurements were taken at potential barriers on streams of sufficient size to contain bull trout populations. Additional crossing data was obtained from Department reservists and volunteers working with IDEQ surveys of road culverts.

RESULTS

A total of 57 bull trout had radios implanted in them during 1998 and 1999. Thirty-seven of these fish were monitored moving out of the reservoir into the South Fork Boise River and tributaries (Table 1). Most of the radios remaining in the reservoir were later recovered along the shoreline during low water periods. Although some of the recovered radios had some indications of being angler induced mortalities, it is possible that some were shed by the bull trout instead of the fish actually dying (Elle 1994). Monitoring of radio-tagged bull trout found that fish begin moving upriver from the reservoir during May, with all fish being in the upper river or tributaries by the end of June. Radio-tagged bull trout used at least ten headwater tributaries (Figure 1, Table 2). Fluvial sized bull trout were also found in two additional tributaries while doing stream surveys (Kevin Meyer, Department, pers. comm). Maximum distance traveled from the reservoir was 93 km by fish in both the Big Smoky and Johnson creek drainages. Radio-tagged bull trout remained in headwater streams until late August and early September, at which time they began to move downstream. Of the individual samples of fish located during both August and September, 70% were at their highest point in the drainage during late August with the remaining fish being at the highest point during the September flights. Most bull trout had re-entered Anderson Ranch Reservoir by the end of November.

With the potential and eventual listing of bull trout, there was a significant increase in efforts to gain information on population distributions. Prior to the early 1990s, only a limited amount of stream survey work had been done in the South Fork Boise River drainage upstream of Anderson Ranch Dam. Department records indicated 21 stream sites were surveyed by either the USFS or the Department from 1975 through 1989 (Figure 2, Table 3). Bull trout were found in only one site that was in Fall Creek. From 1990 through 1999, Department records indicate five different divisions of State and Federal agencies conducted 292 stream surveys in the drainage (Figure 3,Table 4). Bull trout, either resident or juvenile fluvial populations, were present in 18% of the sites surveyed and in most of the major drainages except Fall, Trinity, Lime and Little Smoky. Although reported surveys in the Little Smoky drainage have not observed bull trout, Department officers report that anglers have caught a few in the lower reaches. Also, a bull trout was reported to be sampled by a Fairfield District USFS crew in Little Smoky Creek near Blackhorse Creek in 1999. The 1999 collecting permit reports for this work have not been filed at the time of this report so exact location of these surveys are not included in this report.

From 1997 through 1999, Department and IDEQ crews surveyed 105 individual road/stream crossings or related sites (Figure 4, Table 5). Of the sites surveyed, 26 were considered to be barriers to bull trout passage under some flow conditions. The primary reason most of the structures were considered barriers was due to gradient and resulting high water velocities. Of the 26, only 7 were on drainages of significant sizes to contain bull trout populations. The smaller drainages were generally intermittent streams or streams less than 0.05 m^3/s. The larger drainages were Big Water, Fall, Little Water, Steel, Trinity, and Whiskey Jack creeks and the Feather River. It was also determined that not all of these structures were complete barriers to upstream movement. The culverts on the Feather River had surface velocities of greater than 3 m/s during spring runoff along with a cement base below the outlet, however radio-tagged bull trout were found upstream of the culvert. Low water evaluation of the Feather River culverts found the joints in the bottom of the culvert folded up which created baffles reducing bottom velocities.

Table 1. Monitoring locations of radio-tagged bull trout in the South Fork Boise River drainage upstream of Anderson Ranch Dam during 1998 and 1999.

Radio frequency	Year tagged[a]	Total length (mm)	Monitoring locations				
			Date	Water	UTM easting	UTM northing	Elevation (m)
150.021	S 1999	370	4/12/99	Anderson Ranch Res.	630300	4808000	1260
150.021			6/23/99	S.F. Boise River	639254	4826597	1350
150.021			7/28/99	S.F. Boise River	639254	4826597	1350
150.022	S 1998	345	4/30/98	Anderson Ranch Res.	628700	4806000	1260
150.022			5/28/98	Anderson Ranch Res.	637806	4808852	1260
150.022			7/1/98	S.F. Boise River	656704	4828745	1510
150.022			7/22/98	S.F. Boise River	669356	4834520	1700
150.022			8/27/98	S.F. Boise River	665861	4848472	1910
150.032	S 1998	370	4/24/98	Anderson Ranch Res.	636600	4812700	1260
150.032			8/27/98	Anderson Ranch Res.	637473	4809975	1260
150.042	S 1999	325	5/17/99	Anderson Ranch Res.	636600	4812700	1260
150.042			7/28/99	S.F. Boise River	658398	4824355	1520
150.042			8/25/99	S.F. Boise River	669496	4835053	1710
150.042			9/17/99	S.F. Boise River	669339	4833789	1690
150.042			10/22/99	S.F. Boise River	665055	4828052	1600
150.072	S 1998	350	4/2/98	Anderson Ranch Res.	636600	4812700	1260
150.072			5/12/98	Anderson Ranch Res.	638242	4811248	1260
150.072[b]	S 1999	350	4/13/99	Anderson Ranch Res.	628700	4806000	1260
150.072			5/5/99	Anderson Ranch Res.	636939	4811479	1260
150.153	S 1998	325	3/24/98	Anderson Ranch Res.	628700	4806000	1260
150.153			5/28/98	Anderson Ranch Res.	626614	4802541	1260
150.153			7/1/98	Anderson Ranch Res.	626088	4803660	1260
150.174	S 1999	440	4/19/99	Anderson Ranch Res.	627609	4802650	1260
150.174			6/23/99	S.F. Boise River	644404	4830020	1400
150.174			10/22/99	S.F. Boise River	638312	4821985	1320
150.174			5/18/00	S.F. Boise River	639539	4825825	1347
150.192	S 1999	580	5/6/99	Anderson Ranch Res.	637500	4813200	1260
150.192			6/23/99	S.F. Boise River	644005	4829808	1400
150.192			7/28/99	Boardman Creek	666639	4828776	1690
150.192			8/25/99	Boardman Creek	666667	4825499	1840
150.192			9/17/99	Boardman Creek	666758	4828316	1710
150.192			10/22/99	Anderson Ranch Res.	637399	4812596	1260
150.213	S 1999	455	5/3/99	Anderson Ranch Res.	638500	4811200	1260
150.213			6/23/99	S.F. Boise River	639459	4827119	1360
150.213			7/28/99	S.F. Boise River	668650	4831790	1670
150.213			8/25/99	S.F. Boise River	668087	4845075	1870
150.213			9/17/99	S.F. Boise River	667888	4845496	1870
150.213			10/22/99	S.F. Boise River	668105	4845409	1870

Table 1. continued.

Radio frequency	Year tagged[a]	Total length (mm)	Monitoring locations				
				Water	UTM easting	UTM northing	Elevation (m)
150.213			11/9/99	S.F. Boise River[c]	668105	4845409	1870
150.293	S 1999	410	5/3/99	Anderson Ranch Res.	638500	4811200	1260
150.293			6/23/99	Anderson Ranch Res.	638069	4810202	1260
150.293			7/28/99	Anderson Ranch Res.	637849	4811068	1260
150.293			8/25/99	Anderson Ranch Res.	637789	4811363	1260
150.293			9/17/99	Anderson Ranch Res.	637440	4811912	1260
150.293			10/22/99	Anderson Ranch Res.	637760	4811455	1260
150.303	S 1999	465	5/4/99	Anderson Ranch Res.	636600	4812700	1260
150.303			6/23/99	S.F. Boise River	642232	4829641	1380
150.303			7/28/99	S.F. Boise River	641276	4829676	1380
150.303			8/25/99	S.F. Boise River	641612	4829683	1380
150.303			9/10/99	S.F. Boise River[c]	641400	4829700	1372
150.313	S 1999	435	5/3/99	Anderson Ranch Res.	638500	4811200	1260
150.313			6/23/99	S.F. Boise River	639680	4827457	1360
150.313			10/22/99	Feather River	641637	4829758	1380
150.313			11/2/99	Feather River[c]	641200	4831200	1402
150.403	S 1999	405	4/19/99	Anderson Ranch Res.	630300	4808000	1260
150.403			6/23/99	S.F. Boise River	649524	4829707	1450
150.403			7/28/99	Johnson Creek	667740	4852975	2100
150.403			8/25/99	Johnson Creek	667313	4853446	2100
150.403			9/17/99	Johnson Creek	668345	4850823	2010
150.403			10/22/99	Johnson Creek	668388	4851214	2020
150.523	S 1999	480	5/6/99	Anderson Ranch Res.	637500	4813200	1260
150.523			6/23/99	S.F. Boise River	644747	4830305	1400
150.523			7/28/99	Big Smoky Creek	644747	4830305	1400
150.523			8/25/99	Big Peak Creek	682707	4832474	2050
150.523			9/17/99	Big Smoky Creek	681528	4840703	1930
150.523			10/22/99	Anderson Ranch Res.	637386	4813225	1260
150.523			5/18/00	S.F. Boise River	658122	4828644	1524
150.564	S 1999	440	5/6/99	Anderson Ranch Res.	637500	4813200	1260
150.564			6/23/99	S.F. Boise River	644764	4830139	1400
150.564			7/28/99	Big Smoky Creek	677267	4835680	1790
150.564			8/25/99	Big Peak Creek	681883	4832618	2030
150.564			9/17/99	Big Smoky Creek	670694	4830268	1660
150.564			10/22/99	Anderson Ranch Res.	637750	4813899	1260
150.564			5/18/00	S.F. Boise River	645698	4830511	1260
150.614	S 1999	450	4/26/99	Anderson Ranch Res.	638500	4811200	1260
150.614			6/23/99	S.F. Boise River	639350	4827154	1360
150.614			7/28/99	Big Smoky Creek	639350	4827154	1360
150.614			8/25/99	Big Smoky Creek	683163	4844805	2020
150.614			9/17/99	Big Smoky Creek	670301	4830350	1660
150.614			10/22/99	S.F. Boise River	650274	4829260	1460
150.614			5/18/00	S.F. Boise River	639374	4824729	1341
150.784	F 1998	550	10/22/98	S.F. Boise Trap	637000	4815700	1280
150.784			11/4/98	Anderson Ranch Res.	631738	4806528	1260

Table 1. continued.

Radio frequency	Year tagged[a]	Total length (mm)	Monitoring locations				
				Water	UTM easting	UTM northing	Elevation (m)
150.804	S 1998	430	4/16/98	Anderson Ranch Res.	638500	4811200	1260
150.804			5/28/98	S.F. Boise River	649085	4830426	1440
150.804			7/1/98	S.F. Boise River	664663	4826514	1590
150.804			7/22/98	Boardman Creek	665735	4824835	1890
150.804			8/27/98	Boardman Creek	664729	4822439	2070
150.804			9/23/98	S.F. Boise River	664425	4827729	1590
150.804		450	10/31/98	S.F. Boise Trap	637000	4815700	1280
150.804			11/4/98	Anderson Ranch Res.	637604	4812163	1260
150.824	S 1998	450	4/8/98	Anderson Ranch Res.	637400	4814100	1260
150.824			5/28/98	Anderson Ranch Res.	636801	4815165	1260
150.824			7/1/98	S.F. Boise River	649360	4828740	1460
150.824			7/22/98	Willow Creek	651994	4834436	1680
150.824			8/27/98	Willow Creek	653427	4835877	1830
150.824			9/23/98	Willow Creek	654429	4836752	1910
150.824			11/4/98	S.F. Boise River	639424	4825866	1350
150.824		475	11/9/98	S.F. Boise Trap	637000	4815700	1280
150.844	S 1998	390	4/23/98	Anderson Ranch Res.	636600	4812700	1260
150.844			5/28/98	Anderson Ranch Res.	636801	4815165	1260
150.844			7/1/98	S.F. Boise River	639221	4828174	1360
150.844			7/22/98	Willow Creek	650377	4831603	1540
150.844			8/27/98	S.F. Boise River	650590	4829293	1460
150.903	S 1998	400	3/26/98	Anderson Ranch Res.	638500	4811200	1260
150.903			5/28/98	S.F. Boise River	639366	4826736	1350
150.903			7/1/98	S.F. Boise River	659008	4828059	1540
150.903			9/23/98	S.F. Boise River	657465	4828821	1500
150.903			11/2/98	S.F. Boise River	636750	4816400	1280
150.913	F 1998	450	10/29/98	S.F. Boise Trap	637000	4815700	1280
150.913			6/23/99	Anderson Ranch Res.	637495	4814524	1260
150.913			7/28/99	Anderson Ranch Res.	637333	4814502	1260
150.913			8/24/99	Anderson Ranch Res.[c]	637333	4814502	1260
150.953	S 1998	430	4/13/98	Anderson Ranch Res.	638500	4811200	1260
150.953			7/1/98	S.F. Boise River	648894	4828937	1450
150.953			7/22/98	Big Smoky Creek	682321	4841011	1940
150.953			8/27/98	W.F. Big Smoky Creek	682984	4845771	2050
150.953			9/23/98	S.F. Boise River	668006	4829874	1630
150.953			11/4/98	S.F. Boise River	637256	4821914	1320
150.953		435	11/7/98	S.F. Boise Trap	637000	4815700	1280
150.963	F 1998	410	10/31/98	S.F. Boise Trap	637000	4815700	1280
150.972	S 1998	420	4/1/98	Anderson Ranch Res.	638500	4811200	1260
150.972			5/28/98	S.F. Boise River	641913	4829789	1380
150.972			7/1/98	S.F. Boise River	644032	4829757	1390
150.972			7/22/98	Skeleton Creek	663938	4832755	1830
150.972			8/27/98	Burnt Log Creek	663185	4834385	1950
150.972			9/23/98	S.F. Boise River	658824	4828298	1520
150.972			11/4/98	S.F. Boise River	657716	4829050	1500
150.972			11/30/98	S.F. Boise River	638140	4821790	1320
150.972		450	5/3/99	Anderson Ranch Res.	638500	4811200	1260

Table 1. continued.

Radio frequency	Year tagged[a]	Total length (mm)	Monitoring locations				
				Water	UTM easting	UTM northing	Elevation (m)
150.983	S 1998	400	5/5/98	Anderson Ranch Res.	638400	4811200	1260
150.983			5/28/98	S.F. Boise River	637418	4820584	1310
150.983			7/1/98	S.F. Boise River	648356	4828925	1440
150.983			7/22/98	S.F. Boise River	667565	4845292	1870
150.983			9/23/98	S.F. Boise River	668140	4844862	1870
150.983			11/4/98	S.F. Boise River	637026	4816040	1290
150.983		420	11/5/98	S.F. Boise Trap[d]	637000	4815700	1280
150.983	F 1998	410	11/24/98	S.F. Boise Trap[d]	637000	4815700	1280
150.983		420	4/13/99	Anderson Ranch Res.	628700	4806000	1260
150.983			6/23/99	S.F. Boise River	647301	4831065	1430
150.983			7/28/99	S.F. Boise River	669205	4843344	1830
150.993	S 1998	400	4/2/98	Anderson Ranch Res.	636600	4812700	1260
150.993			5/22/98	S.F. Boise River	636600	4817500	1293
151.004	S 1999	665	5/6/99	Anderson Ranch Res.	637500	4813200	1260
151.004			6/23/99	S.F. Boise River	655497	4829787	1510
151.004			7/28/99	Big Smoky Creek	680230	4840020	1890
151.004			8/25/99	Big Smoky Creek	682906	4842908	1990
151.004			9/17/99	Big Smoky Creek	683256	4844344	2010
151.034	S 1998	445	4/1/98	Anderson Ranch Res.	637500	4813200	1260
151.034			4/18/98	Anderson Ranch Res.	638200	4808200	1260
151.034[b]	S 1999	465	4/26/99	Anderson Ranch Res.	638500	4811200	1260
151.034			6/23/99	S.F. Boise River	639374	4824729	1340
151.034			7/28/99	Willow Creek	639374	4824729	1340
151.034			8/25/99	S.F. Boise River	650200	4830759	1500
151.034			9/17/99	S.F. Boise River	661715	4827563	1560
151.034			5/18/00	S.F. Boise River	649986	4829513	1463
151.043	S 1999	590	5/3/99	Anderson Ranch Res.	638500	4811200	1260
151.043			6/23/99	Anderson Ranch Res.	637410	4812078	1260
151.043			10/22/99	Anderson Ranch Res.	637434	4811560	1260
151.043			5/18/00	Anderson Ranch Res.	637044	4811515	1260
151.045	S 1998	430	4/13/98	Anderson Ranch Res.	638400	4811200	1260
151.045			8/27/98	Anderson Ranch Res.	638575	4808238	1260
151.045			11/4/98	Anderson Ranch Res.	638747	4809723	1260
151.045			4/8/99	Anderson Ranch Res.[c]	638753	4808602	1260
151.053	S 1999	515	4/26/99	Anderson Ranch Res.	638500	4811200	1260
151.053			6/23/99	S.F. Boise River	645788	4830698	1410
151.053			7/28/99	S.F. Boise River	668871	4843817	1830
151.053			8/25/99	Bear Creek	666335	4843716	2010
151.053			9/17/99	Bear Creek	665109	4843297	2070
151.053			10/22/99	Bear Creek	664971	4842904	2070
151.053			11/9/99	Bear Creek[c]	664971	4842904	2070
151.054	S 1998	350	3/19/98	Anderson Ranch Res.	628700	4806000	1260
151.054			5/28/98	Anderson Ranch Res.	630716	4809100	1260
151.054			7/22/98	Anderson Ranch Res.	630784	4809064	1260
151.054			8/27/98	Anderson Ranch Res.	630297	4809092	1260

Table 1. continued.

Radio frequency	Year tagged[a]	Total length (mm)	Monitoring locations				
				Water	UTM easting	UTM northing	Elevation (m)
151.054			11/4/98	Anderson Ranch Res.	628611	4805504	1260
151.054			4/19/99	Anderson Ranch Res.[c]	630300	4808000	1260
151.072	S 1998	400	5/7/98	Anderson Ranch Res.	636600	4812700	1260
151.072			5/12/98	Anderson Ranch Res.	637500	4813200	1260
151.073	S 1999	470	5/3/99	Anderson Ranch Res.	638500	4811200	1260
151.084	S 1999	525	4/26/99	Anderson Ranch Res.	638500	4811200	1260
151.084			6/23/99	S.F. Boise River	639416	4825952	1350
151.084			7/28/99	Boardman Creek	639416	4825952	1350
151.084			8/25/99	Boardman Creek	665297	4823131	2010
151.084			9/17/99	Boardman Creek	666246	4826711	1770
151.084			10/22/99	S.F. Boise River	650442	4828986	1460
151.084			5/18/00	Anderson Ranch Res.	626952	4803633	1260
151.092	F 1998	455	10/28/98	S.F. Boise Trap	637000	4815700	1280
151.092			4/26/99	Anderson Ranch Res.[c]	638500	4811200	1260
151.104	S 1998	385	3/31/98	Anderson Ranch Res.	637500	4813200	1260
151.104			7/1/98	S.F. Boise River	648877	4829678	1450
151.104			7/22/98	S.F. Boise River	669289	4834481	1700
151.104			8/27/98	Big Smoky Creek	672761	4831847	1690
151.104			9/23/98	Big Smoky Creek	669843	4830161	1650
151.104		450	10/18/98	S.F. Boise Trap	637000	4815700	1280
151.104			11/4/98	Anderson Ranch Res.	637276	4813675	1260
151.114	F 1998	425	10/23/98	S.F. Boise Trap	637000	4815700	1280
151.114			11/4/98	Anderson Ranch Res.	633584	4806008	1260
151.114			7/28/99	Skeleton Creek EF	663266	4835176	1950
151.114			8/25/99	Skeleton Creek WF	662831	4835351	2010
151.114			9/17/99	S.F. Boise River	661138	4827475	1560
151.114			10/22/99	S.F. Boise River	638267	4821595	1320
151.123	S 1998	435	5/5/98	Anderson Ranch Res.	638500	4811200	1260
151.123			5/28/98	L. Camas Res.	631113	4797665	1500
151.123			7/22/98	L. Camas Res.	631262	4797630	1500
151.123			7/24/98	L. Camas Res.[e]	631262	4797630	1500
151.315	S 1998	495	4/2/98	Anderson Ranch Res.	636600	4812700	1260
151.315			5/28/98	S.F. Boise River	639275	4826586	1350
151.315			7/1/98	S.F. Boise River	662403	4826844	1570
151.315			7/22/98	S.F. Boise River	668488	4844370	1850
151.315			8/27/98	Emma Creek	670801	4846893	2120
151.315			9/23/98	S.F. Boise River	668784	4833709	1690
151.315			11/4/98	S.F. Boise River	649286	4829838	1450
151.315		515	11/14/98	S.F. Boise Trap	637000	4815700	1280
151.315		515	5/11/99	Anderson Ranch Res.	636600	4812700	1260
151.315			6/23/99	S.F. Boise River	654230	4829295	1490
151.315			7/28/99	Emma Creek	654230	4829295	1490
151.315			8/25/99	Emma Creek	672179	4847810	2210
151.315			9/17/99	Emma Creek	671917	4847043	2220
151.315			10/22/99	Emma Creek	670796	4846792	2120
151.315			11/19/99	Emma Creek[c]	671015	4847111	2097

Table 1. continued.

Radio frequency	Year tagged[a]	Total length (mm)	Monitoring locations				
				Water	UTM easting	UTM northing	Elevation (m)
151.392	S 1998	620	4/21/98	Anderson Ranch Res.	638500	4811200	1260
151.392			5/28/98	Anderson Ranch Res.	636801	4815165	1260
151.392			7/22/98	S.F. Boise River	638733	4822834	1330
151.392			7/23/98	S.F. Boise River[f]	638733	4822834	1330
151.412	F 1998	495	10/23/98	S.F. Boise Trap	637000	4815700	1280
151.412			11/4/98	Anderson Ranch Res.	636946	4812686	1260
151.412			6/23/99	Anderson Ranch Res.	637504	4813413	1260
151.412			7/28/99	Anderson Ranch Res.	637504	4813413	1260
151.412			8/25/99	Anderson Ranch Res.	637526	4814339	1260
151.412			9/17/99	Anderson Ranch Res.	637148	4814350	1260
151.412			10/22/99	Anderson Ranch Res.	637199	4814462	1260
151.412			11/2/99	Anderson Ranch Res.[c]	637199	4814462	1260
151.422	S 1998	480	4/21/98	Anderson Ranch Res.	638500	4811200	1260
151.422			5/28/98	S.F. Boise River	639402	4828218	1370
151.422			7/1/98	S.F. Boise River	657923	4828403	1520
151.422			7/22/98	S.F. Boise River	659740	4827708	1540
151.422			8/27/98	S.F. Boise River	660663	4827971	1560
151.422			9/23/98	S.F. Boise River	660381	4827909	1560
151.422			11/4/98	S.F. Boise River	647895	4831270	1440
151.422		515	11/14/98	S.F. Boise Trap	637000	4815700	1280
151.422			6/23/99	S.F. Boise River	649862	4829621	1450
151.422			7/28/99	Skeleton Creek	649862	4829621	1450
151.422			8/25/99	Skeleton Creek WF	662526	4835176	2010
151.422			9/17/99	Skeleton Creek WF	662777	4835368	2000
151.422			10/22/99	S.F. Boise River	658282	4828704	1524
151.454	F 1998	520	10/29/98	S.F. Boise Trap	637000	4815700	1280
151.454			11/4/98	Anderson Ranch Res.	637378	4813991	1260
151.454		535	4/15/99	Anderson Ranch Res.	638190	4811700	1260
151.454			6/23/99	S.F. Boise River	649649	4829543	1450
151.454			7/28/99	Willow Creek	649649	4829543	1450
151.454			8/25/99	Willow Creek	656311	4837584	2050
151.454			9/17/99	Willow Creek	656305	4837862	2050
151.454			10/22/99	S.F. Boise River	638792	4822902	1330
151.454			5/18/00	S.F. Boise River	641890	4829893	1378
151.483	S 1998	625	4/15/98	Anderson Ranch Res.	638500	4811200	1260
151.483			5/28/98	S.F. Boise River	645075	4830394	1400
151.483			7/22/98	Willow Creek	652615	4836099	1770
151.483			8/27/98	Willow Creek	654648	4836590	1910
151.483			9/23/98	Willow Creek	654592	4836663	1910
151.483			11/4/98	S.F. Boise River	636707	4815811	1290
151.483		650	11/4/98	S.F. Boise Trap	637000	4815700	1280
151.483		675	4/15/99	Anderson Ranch Res.	638190	4811700	1260
151.483			6/23/99	S.F. Boise River	649903	4829622	1450
151.483			7/28/99	Willow Creek	649903	4829622	1450
151.483			8/25/99	Willow Creek	654206	4836776	1890
151.483			9/17/99	Willow Creek	653708	4836191	1850
151.543	S 1998	500	5/7/98	Anderson Ranch Res.	636600	4812700	1260
151.543			7/1/98	Anderson Ranch Res.	633867	4806401	1260
151.543			7/22/98	Anderson Ranch Res.	635564	4807622	1260

Table 1. continued.

Radio frequency	Year tagged[a]	Total length (mm)	Monitoring locations				
				Water	UTM easting	UTM northing	Elevation (m)
151.543			8/27/98	Anderson Ranch Res.	634988	4808055	1260
151.543			11/4/98	Anderson Ranch Res.	636255	4808154	1260
151.543			4/29/99	Anderson Ranch Res.[c]	636255	4808154	1260
151.553	F 1998	480	10/27/98	S.F. Boise Trap	637000	4815700	1280
151.553			11/4/98	Anderson Ranch Res.	628353	4804888	1260
151.553			6/23/99	Anderson Ranch Res.	627510	4803384	1260
151.553			7/28/99	Anderson Ranch Res.	627510	4803384	1260
151.553			8/24/99	Anderson Ranch Res.[c]	627609	4802650	1260
151.583	S 1998	505	4/15/98	Anderson Ranch Res.	638500	4811200	1260
151.583			5/28/98	S.F. Boise River	639895	4829117	1370
151.583			7/1/98	S.F. Boise River	640808	4829503	1370
151.583			9/23/98	S.F. Boise River	642626	4829786	1380
151.583		540	10/14/98	S.F. Boise Trap	637000	4815700	1280
151.583			11/4/98	Anderson Ranch Res.	637141	4813690	1260
151.583			6/23/99	S.F. Boise River	641907	4829726	1380
151.583			9/17/99	S.F. Boise River	641074	4829653	1380
151.583			10/22/99	Anderson Ranch Res.	628920	4805226	1260
151.714	F 1998	495	10/29/98	S.F. Boise River	637000	4815700	1280
151.714			11/4/98	Anderson Ranch Res.	637518	4813716	1260
151.714			6/23/99	Big Smoky Creek	672097	4831192	1690
151.714			7/28/99	S.F. Boise River	665439	4828302	1600
151.714			8/25/99	S.F. Boise River	665103	4828294	1600
151.714			9/10/99	S.F. Boise River[c]	665364	4829806	1609
151.723	S 1998	480	5/7/98	Anderson Ranch Res.	636600	4812700	1260
151.723			5/28/98	S.F. Boise River	637078	4820115	1310
151.723			7/1/98	S.F. Boise River	656023	4829100	1510
151.723			7/22/98	Big Peak Creek	680960	4832712	2000
151.723			9/23/98	S.F. Boise River	667905	4829612	1630
151.723			11/4/98	S.F. Boise River	637404	4815344	1290
151.723			11/30/98	S.F. Boise River	636990	4815770	1280
151.723		510	4/15/99	Anderson Ranch Res.	638190	4811700	1260
151.723		515	5/15/99	Anderson Ranch Res.	638600	4810900	1260
151.723			6/23/99	S.F. Boise River	646225	4831060	1430
151.723			7/28/99	Big Smoky Creek	679432	4839202	1870
151.723			8/25/99	Big Smoky Creek	683264	4846512	2100
151.723			9/17/99	S.F. Boise River	668152	4829648	1630
151.723			10/22/99	S.F. Boise River	650152	4829295	1460
151.753	S 1998	500	5/12/98	Anderson Ranch Res.	638500	4811200	1260
151.753			5/28/98	S.F. Boise River	636436	4817879	1290
151.753			7/1/98	S.F. Boise River	638551	4823494	1330
151.753			7/22/98	S.F. Boise River	660262	4827832	1540
151.753			8/27/98	Skeleton Creek	662554	4830462	1710
151.753			9/23/98	S.F. Boise River	658824	4828298	1540
151.753			11/4/98	Anderson Ranch Res.	637479	4814308	1260
151.753			6/23/99	Anderson Ranch Res.	637769	4811011	1260
151.753			7/28/99	Anderson Ranch Res.	637399	4814577	1260
151.753			8/24/99	Anderson Ranch Res.[c]	637399	4814577	1260
151.763	S 1998	520	4/23/98	Anderson Ranch Res.	636600	4812700	1260

Table 1. continued.

Radio frequency	Year tagged[a]	Total length (mm)	Monitoring locations				
				Water	UTM easting	UTM northing	Elevation (m)
151.763			5/28/98	Anderson Ranch Res.	633975	4805349	1260
151.763			7/1/98	Anderson Ranch Res.	632959	4804532	1260
151.763			7/22/98	Anderson Ranch Res.	634396	4806580	1260
151.763			8/27/98	Anderson Ranch Res.	633743	4804808	1260
151.763			11/4/98	Anderson Ranch Res.	637832	4810223	1260
151.763			4/29/99	Anderson Ranch Res.[c]	635518	4806238	1260
151.774	S 1998	545	4/1/98	Anderson Ranch Res.	637500	4813200	1260
151.774			7/1/98	Anderson Ranch Res.	638549	4808533	1260
151.774			3/26/99	Anderson Ranch Res.[c]	638200	4808200	1260

[a] S 1998 and S 1999 are bull trout caught in spring time gill nets in the reservoir. F 1998 are bull trout trapped in the fall at the weir at Pine.
[b] New radio with same frequency as previous year.
[c] Radio recovered, unknown mortality or expelled radio.
[d] Radio removed from bull trout on 11/4/98 and implanted in second bull trout on 11/24/98.
[e] Radio recovered in Little Camas Reservoir, very likely an angler induced mortality.
[f] Radio recovered, known mortality of unknown cause.

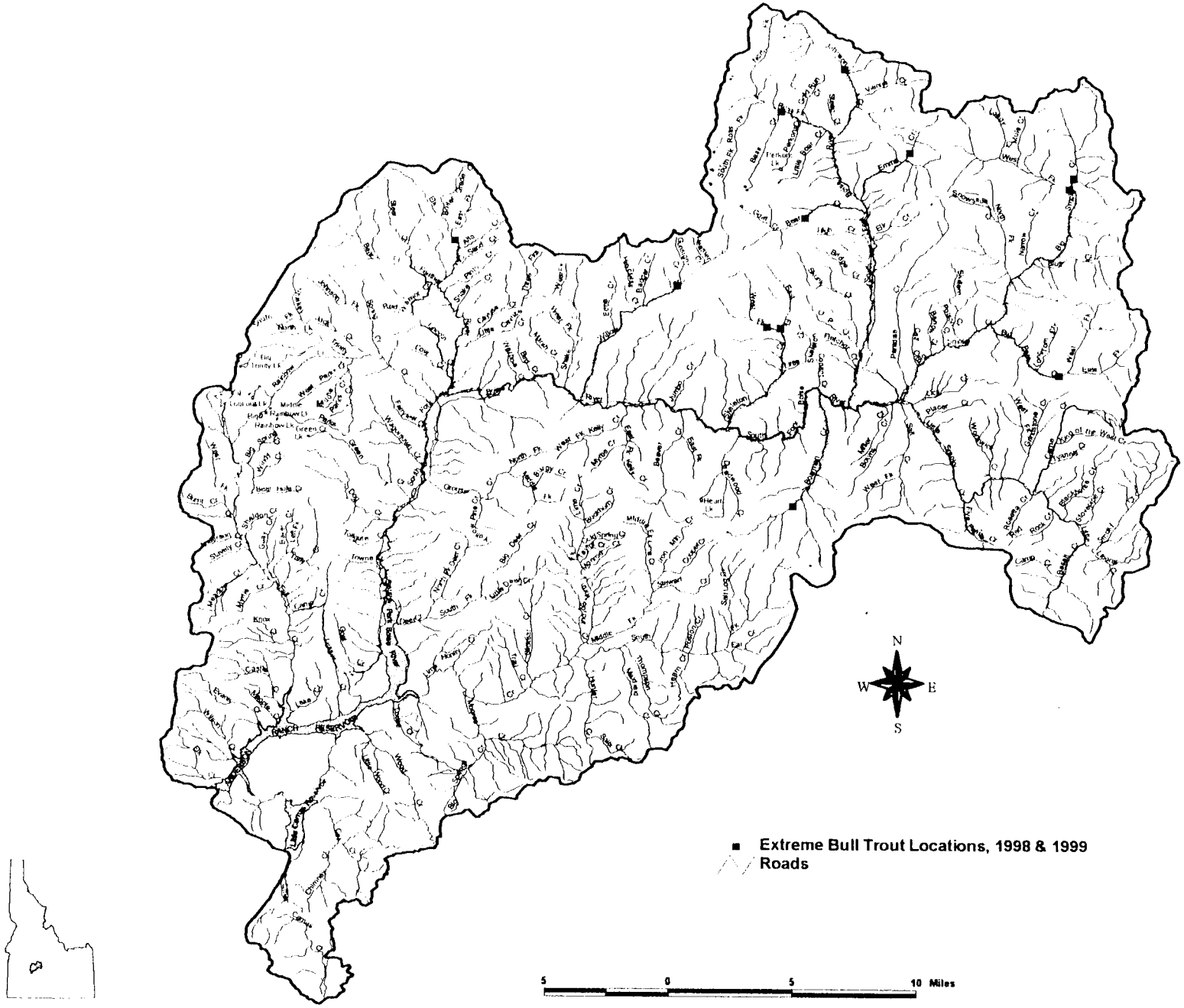

Figure 1. Upper most locations and known movement corridors of fluvial bull trout in the South Fork Boise River drainage above Anderson Ranch Reservoir during 1998 and 1999.

Table 2. Uppermost points where radio-tagged migratory bull trout were found in South Fork Boise River tributaries in 1998 and 1999.

Stream name	Distance from upper most site to reservoir (km)	UTM easting	UTM northing	Radio frequency	Total length (mm)
Bear Creek	85	664971	4842904	151.053	515
Big Peak Creek	85	682707	4832474	150.523	480
Big Smoky Creek	93	683264	4846512	151.723	480
Big Smoky Creek WF	92	682984	4845771	150.953	430
Boardman Creek	69	664729	4822739	151.084	495
Elk Creek	35	641000	4840500	Elec.[a]	430
Emma Creek	87	672000	4847810	151.315	495
Johnson Creek	93	667313	4853446	150.403	405
Ross Fork Creek	91	663100	4850400	Elec.	375
Skeleton Creek EF	58	663466	4835176	151.114	425
Skeleton Creek WF	59	662526	4835176	151.422	480
Willow Creek	48	656305	4837862	151.454	520

[a] Sampled while electrofishing during IDFG Fish Research stream surveys, summer 1999.

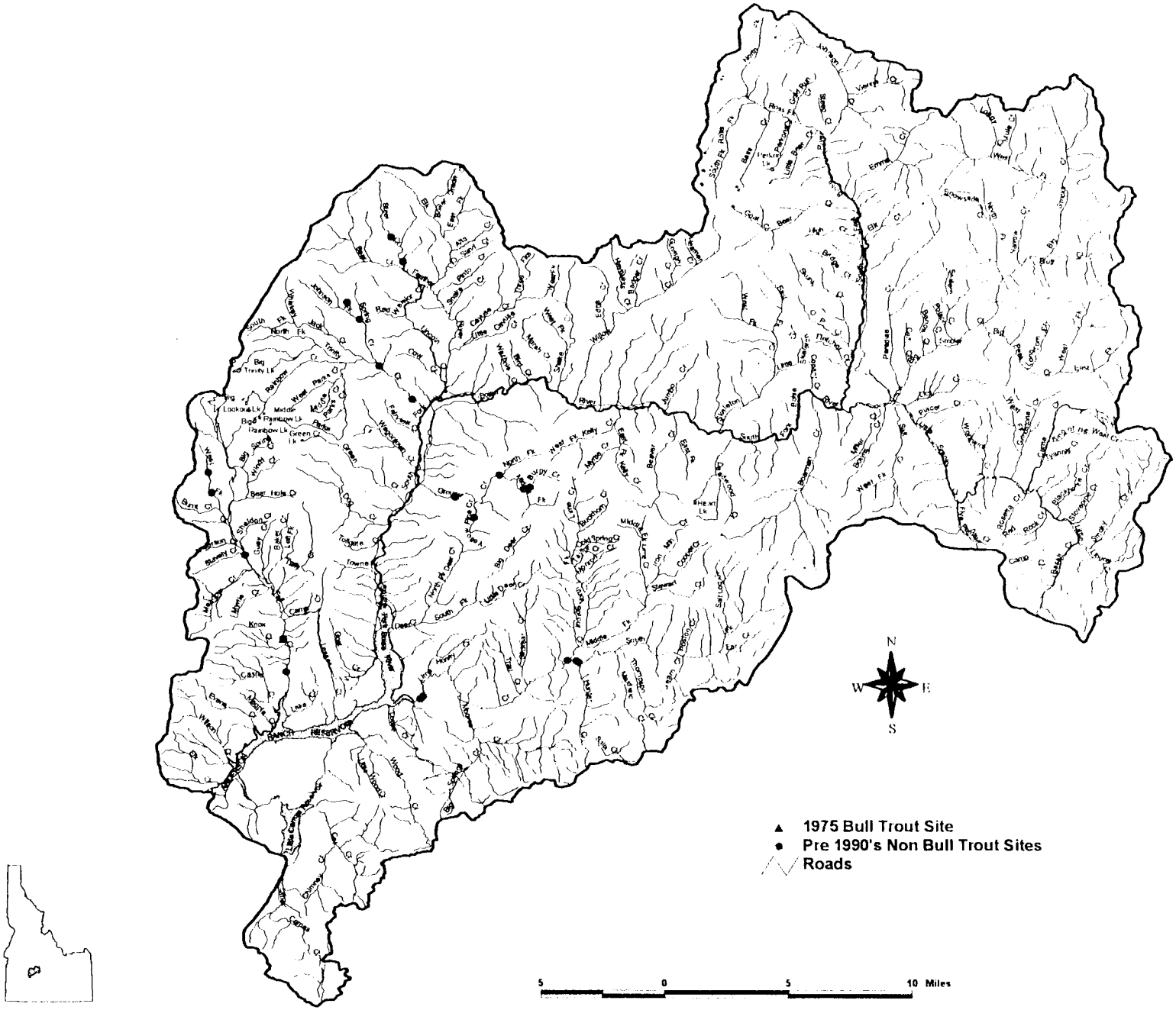

Figure 2. Stream sampling sites for fish and sites where bull trout were found in the South Fork Boise River drainage above Anderson Ranch Reservoir during 1975-1989.

Table 3. Fish sampling sites in the South Fork Boise River drainage upstream of Anderson Ranch Dam prior to 1990.

Stream name	Year	Agency sampling[a]	UTM easting	UTM northing	Elevation	Bull trout present	Rainbow trout present	Brook trout present	Other species [b]
Burgy Creek	1989	IDFG	647100	4823600	6060		P		
Fall Creek	1975	BNF	630600	4810200	4320				MWF, SCU, SU
Fall Creek	1975	BNF	630300	4812500	4720	P	P		MWF, SCU
Fall Creek	1975	BNF	627600	4818300	5120		P	P	SCU
Grouse Creek	1989	IDFG	641900	4822800	5120		P		
Grouse Creek	1989	IDFG	644900	4824400	5640		P		
Johnson Fork Spring Creek	1975	BNF	635100	4834900	5320		P		SCU
Johnson Fork Spring Creek	1975	BNF	634200	4836000	5720		P		SCU
Lime Creek	1988	IDFG	639900	4808600	4230		P		MWF, SCU, YP
Lime Creek	1988	IDFG	640100	4808800	4250		P		MWF, SCU, SU, YP
Lime Creek	1988	IDFG	649900	4811700	5190		P		SCU
Grouse Creek MF	1989	IDFG	646600	4823500	5990		P		
Lime Creek SF	1988	IDFG	650500	4811600	5220		P		SU
Lime Creek SF	1988	IDFG	650700	4811600	5240		P		SU
Steel Creek	1975	BNF	638000	4839000	5320		P		SCU
Steel Creek	1975	BNF	637100	4840700	5780		P		
Trinity Creek	1975	BNF	638800	4829400	4600		P		MWF, SU, SQF, DACE
Trinity Creek	1975	BNF	636500	4831700	4920		P		SCU
Fall Creek WF	1975	BNF	625200	4822500	5680		P		
Fall Creek WF	1975	BNF	624900	4823900	6040		P		
Yellow Pine Creek	1989	IDFG	643300	4821400	5600				

[a] BNF= Boise National Forest, IDFG= Idaho Department of Fish and Game (Region 4).
[b] Dace = Dace sp., MWF = Mountain whitefish, SCU = Sculpin sp., SU = Sucker sp., SQF = Northern squawfish, YP = Yellow perch.

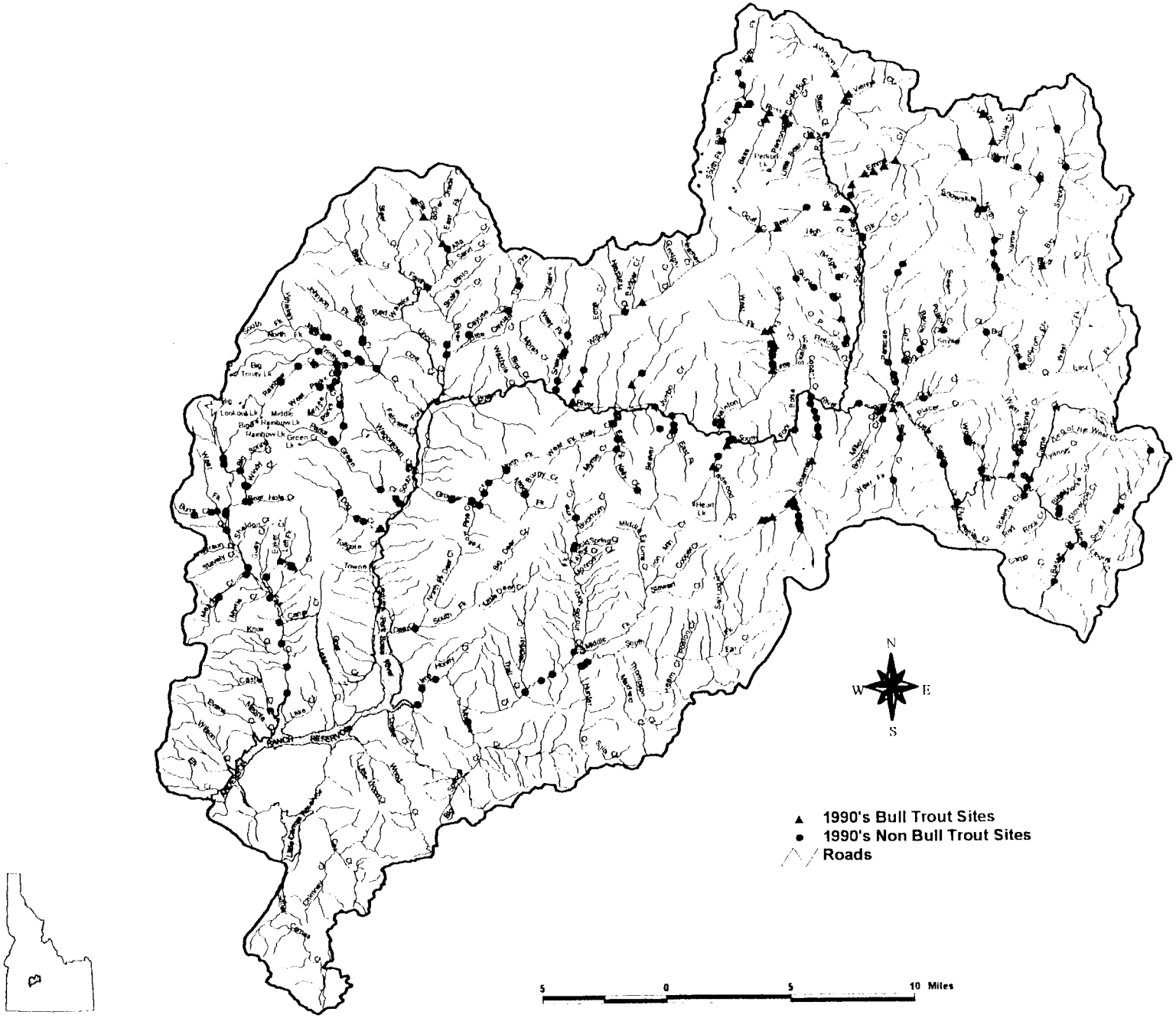

Figure 3. Stream sampling sites for fish and sites where bull trout were found in the South Fork Boise River drainage above Anderson Ranch Reservoir during 1990-1999.

Table 4. Fish sampling sites in the South Fork Boise River drainage upstream of Anderson Ranch Dam after 1990.

Stream name	Year	Agency sampling[a]	UTM easting	UTM northing	Elevation	Bull trout present	Rainbow trout present	Brook trout present	Other species [b]
Barlow Creek	1998	IDFG	673700	4834100	5800		P		
Basalt Creek	1993	BNF	683600	4819800	6460				SCU
Basalt Creek	1993	BNF	683100	4818300	6560				
Basalt Creek	1997	IDFG	684200	4820800	6400		P		BLS, MSCU
Bass Creek	1994	FS-IRS	662900	4849900	6640	P	P		
Bear Creek	1993	BNF	668500	4843700	6120		P		
Bear Creek	1993	BNF	668400	4843800	6160		P		SCU
Bear Creek	1993	BNF	663900	4842300	6940	P	P		SCU
Bear Creek	1996	IDEQ	639000	4837600	5110				
Bear Creek	1996	IDEQ	636400	4838800	5350				
Bear Creek	1998	IDFG	667200	4843900	6400	P	P		SCU
Bear Hole Creek	1995	BNF	627700	4822290	5740		P		
Bear Hole Creek	1995	BNF	627940	4822270	5780		P		
Beaver Creek	1993	BNF	656800	4829000	4960				
Beaver Creek	1993	BNF	657000	4828400	5120				
Beaver Creek	1994	FS-IRS	657000	4828000	5480		P		
Beaver Creek	1994	FS-IRS	656000	4826500	5680		P		
Big Peak Creek EF	1993	BNF	678200	4835400	6030		P		SCU
Big Peak Creek EF	1993	BNF	680700	4833100	6420		P		SCU
Big Peak Creek EF	1999	IDFG-RES	687700	4835800	8360				
Big Smoky Creek	1993	BNF	679100	4839200	6110				MWF, SCU
Big Smoky Creek	1993	BNF	682800	4849800	7260		P		
Big Smoky Creek	1993	BNF	669600	4830200	5420		P		SCU
Big Smoky Creek	1993	BNF	683400	4847100	6900		P		SCU
Big Smoky Creek WF	1999	IDFG-RES	676000	4849200	7880				
Big Smoky Creek NF	1993	BNF	679100	4839300	6120		P		SCU
Big Smoky Creek NF	1993	BNF	678600	4841000	6320		P		SCU
Big Smoky Creek NF	1993	BNF	677800	4844000	6880		P		SCU
Big Smoky Creek NF	1999	IDFG-RES	678800	4839800	6180		P		MSCU
Big Smoky Creek NF	1999	IDFG-RES	678700	4840100	6210		P		MSCU
Big Smoky Creek NF	1999	IDFG-RES	678600	4841900	6400		P		MSCU

Table 4. continued.

Stream name	Year	Agency sampling[a]	UTM easting	UTM northing	Elevation	Bull trout present	Rainbow trout present	Brook trout present	Other species [b]
Big Smoky Creek WF	1993	BNF	681700	4846200	6840		P		SCU
Big Smoky Creek WF	1993	BNF	678700	4847500	7100		P		SCU
Big Smoky Creek WF	1993	BNF	676600	4847700	7360	P			SCU
Big Smoky Creek WF	1999	IDFG-RES	680100	4847000	6980		P		MSCU
Big Smoky Creek WF	1999	IDFG-RES	676300	4848000	7480				MSCU
Big Smoky Creek WF (UN trib)	1993	BNF	676500	4847700	7400		P		
Big Spring Creek	1995	BNF	627280	4824390	6100		P		
Big Water Gulch	1994	FS-IRS	654000	4831100	5240	P	P		
Big Water Gulch	1994	FS-IRS	654700	4831900	5560		P		
Blackhorse Creek	1999	IDFG-RES	683400	4823000	6240		P		
Blackhorse Creek	1999	IDFG-RES	683400	4823400	6270		P		
Blackhorse Creek	1999	IDFG-RES	683700	4824300	6480		P		MSCU
Bluff Creek	1993	BNF	682000	4840200	6590	P			
Boardman Creek	1993	BNF	666300	4830600	5320		P		SCU
Boardman Creek	1993	BNF	666200	4830100	5400		P		SCU
Boardman Creek	1993	BNF	666500	4829600	5480		P		
Boardman Creek	1993	BNF	666600	4829100	5520		P		SCU
Boardman Creek	1993	BNF	666800	4828500	5600				SCU
Boardman Creek	1993	BNF	666900	4827900	5680		P		SCU
Boardman Creek	1993	BNF	663400	4822000	7080				
Boardman Creek	1993	BNF	663800	4822300	6920	P			
Boardman Creek	1993	BNF	665200	4823400	6540		P		
Boardman Creek	1999	IDFG	663100	4822000	7190	P			
Boardman Creek	1999	IDFG-RES	666300	4826300	5810	P	P		MSCU
Boardman Creek	1999	IDFG-RES	665200	4823500	6560	P	P		
Boardman Creek	1999	IDFG-RES	664900	4823200	6620	P	P		
Bowns Creek	1994	FS-IRS	671200	4829200	5720		P		
Bowns Creek	1998	IDFG	671300	4830000	5500		P		
Bridge Creek	1994	FS-IRS	668100	4839000	6240		P		
Burnt Creek	1995	BNF	625380	4821510	5510		P		
Burnt Creek	1995	BNF	624200	4821320	5780		P		
Burnt Log Creek	1994	FS-IRS	663500	4834200	6240		P		
Calf Creek	1998	IDFG	672700	4833300	5760		P		
Carrie Creek	1993	BNF	681400	4825300	6160				
Carrie Creek	1998	IDFG	683100	4830300	6880		P		
Carrie Creek	1998	IDFG	681200	4824800	6100		P		SCU
Castle Creek	1994	BNF	629680	4807890	4280		P		UNK
Cayuse Creek	1998	IDFG	645500	4836000	5810		P		

Table 4. continued.

Stream name	Year	Agency sampling[a]	UTM easting	UTM northing	Elevation	Bull trout present	Rainbow trout present	Brook trout present	Other species [b]
Cayuse Creek	1999	IDFG-RES	642800	4834200	5030		P		MSCU
Cayuse Creek	1999	IDFG-RES	646300	4837700	6420		P		
Cayuse Creek	1999	IDFG-RES	646200	4837800	6470				
Deadwood Creek	1993	BNF	660800	4827400	5160		P		
Deadwood Creek	1993	BNF	659700	4825600	5980	P	P		
Deadwood Creek	1994	FS-IRS	660600	4827100	5280	P	P		
Deadwood Creek	1994	FS-IRS	660000	4826300	5840		P		
Deer Creek	1995	BNF	639500	4813800	4400		P		SCU
Dog Creek	1994	BNF	637040	4820710	4390	P	P		SCU, UNK
Dog Creek	1994	BNF	635790	4821140	4680		P		SCU, UNK-TR
Dog Creek	1995	BNF	635370	4821330	4840		P		SCU
Dog Creek	1996	IDEQ	636600	4820700	4510				
Dog Creek	1999	IDFG-RES	636900	4820700	4420	P	P		MSCU
Dog Creek	1999	IDFG-RES	634100	4823100	5780		P		
Dog Creek	1999	IDFG-RES	633100	4824900	6480				
Elk Creek	1993	BNF	669600	4841800	5960		P		
Elk Creek	1994	FS-IRS	669600	4841900	6000		P		
Elk Creek	1996	IDEQ	639900	4837400	5040		P		SCU
Elk Creek	1996	IDEQ	638900	4843400	6350		P		
Elk Creek	1999	IDFG-RES	641200	4840200	5440		P		MSCU
Elk Creek	1999	IDFG-RES	641000	4840700	5480	P	P		MSCU
Elk Creek	1999	IDFG-RES	639600	4842400	5920	P	P		
Elk Creek (UN trib)	1996	IDEQ	640500	4844100	6840				
Emma Creek	1993	BNF	668800	4844700	6110		P		SCU
Emma Creek	1993	BNF	670300	4846500	6720	P			
Emma Creek	1999	IDFG-RES	668800	4845500	6280	P	P		
Emma Creek	1999	IDFG-RES	669700	4846300	6540	P			
Emma Creek	1999	IDFG-RES	671000	4846900	6940	P	P		
Emma Creek (UN trib)	1994	FS-IRS	671800	4847300	7160	P			
Fall Creek	1994	BNF	630820	4809110	4220		P		SCU
Fall Creek	1994	BNF	630780	4810900	4420		P		SCU, UNK-TR
Fall Creek	1994	BNF	630370	4812500	4700		P		SCU
Fall Creek	1994	BNF	630180	4813980	4840		P		SCU, UNK-TR
Fall Creek	1994	BNF	629490	4815640	4980		P	P	SCU, UNK-TR
Fall Creek	1994	BNF	?	?	?		P	P	SCU
Fall Creek	1994	BNF	?	?	?		P	P	SCU
Fall Creek	1994	BNF	627940	4817680	5100		P	P	SCU
Fall Creek	1994	BNF	626460	4820300	5340		P		UNK-TR
Fall Creek (EF??)	1994	BNF	626430	4821590	5500		P		UNK-TR

Table 4. continued.

Stream name	Year	Agency sampling[a]	UTM easting	UTM northing	Elevation	Bull trout present	Rainbow trout present	Brook trout present	Other species [b]
Fall Creek EF	1995	BNF	626390	4821400	5450		P		
Fall Creek EF	1995	BNF	627650	4823410	5860		P		
Fall Creek EF	1995	BNF	626160	4824810	6320		P		
Fall Creek EF	1995	BNF	626120	4825250	6400		P		
Fall Creek WF	1995	BNF	625730	4821560	5460		P		
Feather River	1996	IDEQ	641300	4832800	4590		P		SCU
Feather River	1996	IDEQ	641300	4833500	4680		P		SCU
Five Points Creek	1998	IDFG	676300	4823200	5870		P		SCU
Goat Creek	1994	FS-IRS	662600	4842300	7240	P	P		
Green Creek	1994	BNF	638270	4822490	4400		P		SCU
Green Creek	1994	BNF	636920	4823370	4840		P		
Green Creek	1996	IDEQ	638200	4822500	4450				
Green Creek	1999	IDFG-RES	638000	4822800	4490		P		MSCU
Green Creek	1999	IDFG-RES	633700	4826300	6340				
Green Creek	1999	IDFG-RES	633300	4826200	6500				
Grindstone Creek	1993	BNF	680100	4825500	6030				
Grindstone Creek	1996	IDEQ	680100	4825500	6050		P		SCU
Grindstone Creek	1998	IDFG	681000	4825600	6040		P		SCU
Grindstone Creek	1998	IDFG	680700	4827200	6190		P		SCU
Grindstone Creek	1998	IDFG	680300	4827500	6240		P		SCU
Grindstone Creek	1999	IDFG-RES	680400	4826400	6120		P		
Grindstone Creek	1999	IDFG-RES	680600	4827100	6170		P		
Grindstone Creek	1999	IDFG-RES	680800	4827900	6270		P		MSCU
Grouse Creek	1994	BNF	643730	4822450	5460		P		
Grouse Creek	1994	BNF	644330	4824030	5590		P		
Grouse Creek	1995	BNF	644060	4823310	5530		P		
Grouse Creek	1999	IDFG-RES	641800	4822800	5080		P		
Grouse Creek	1999	IDFG-RES	643200	4822800	5320		P		
Grouse Creek NF	1995	BNF	645530	4824910	5790		P		
Johnson Creek	1993	BNF	667500	4853200	6895	P	P		
Johnson Creek	1993	BNF	667000	4848900	6340		P		SCU
Johnson Creek (UN trib)	1994	FS-IRS	668200	4850900	6640	P			
Johnson Fork Creek	1996	IDEQ	635700	4832900	5150				
Kelly Creek	1993	BNF	653000	4829000	4880		P		SCU
Kelly Creek	1993	BNF	653100	4828800	4920		P		
Kelly Creek	1993	BNF	652800	4828300	5000				
Kelly Creek EF	1994	FS-IRS	653100	4827300	5250		P		
Kelly Creek EF	1999	IDFG-RES	652700	4828400	5000		P		MSCU
Kelly Creek EF	1999	IDFG-RES	653000	4826600	5470		P		

Table 4. continued.

Stream name	Year	Agency sampling[a]	UTM easting	UTM northing	Elevation	Bull trout present	Rainbow trout present	Brook trout present	Other species [b]
Kelly Creek EF	1999	IDFG-RES	654500	4823800	6730				
Lick Creek	1998	IDFG	674000	4830700	5680		P	P	SCU
Lime Creek	1993	BNF	650400	4812500	5240		P		SCU
Lime Creek	1993	BNF	650700	4812700	5250		P		SCU
Lime Creek	1994	BNF	639730	4808530	4195		P		SCU, SU
Lime Creek	1994	BNF	640010	4809690	4300		P		SCU, SU
Lime Creek	1994	BNF	640930	4810360	4380		P		SCU
Lime Creek	1994	BNF	647080	4809620	4980		P		SCU
Lime Creek MF	1993	BNF	650900	4812600	5320		P		SCU
Lime Creek NF	1993	BNF	650300	4821800	6300				
Lime Creek NF	1993	BNF	650300	4819900	6000		P		SCU
Lime Creek NF	1993	BNF	650200	4819600	5960		P		SCU
Lime Creek SF	1993	BNF	650900	4811500	5240		P		
Lime Creek SF	1993	BNF	651400	4811800	5280		P		
Lime Creek SF	1993	BNF	651100	4811600	5260		P		SU
Lime Creek SF	1993	BNF	650900	4811500	5240				SU
Little Bear Creek	1994	FS-IRS	666000	4848900	6450	P			SCU, UNK-TR
Little Smoky Creek	1993	BNF	675200	4826800	5670		P		MWF
Little Smoky Creek	1993	BNF	678500	4825300	6000		P		DACE, MWF, SU
Little Smoky Creek	1993	BNF	685100	4820900	6440		P		SCU
Little Smoky Creek	1996	IDEQ	676400	4823600	5820		P		DACE, MWF, SCU
Little Smoky Creek	1998	IDFG	678200	4825300	6000		P		BLS, LND, RSS, SPD
Little Smoky Creek	1998	IDFG	687600	4823600	6690		P		SCU
Little Smoky Creek	1998	IDFG	672400	4830200	5520		P		BLS, LND, MWF, SCU
Little Smoky Creek	1998	IDFG	675400	4826200	5710		P		BLS, LND, MWF, SCU
Little Smoky Creek	1999	IDFG-RES	687300	4823300	6680		P		MSCU
Little Smoky Creek	1999	IDFG-RES	689500	4827500	7220		P		MSCU
Loggy Creek	1999	IDFG-RES	678400	4848800	7440	P	P		
Loggy Creek	1999	IDFG-RES	677700	4850600	7880	P			
Middle Fork Grouse Creek	1998	IDFG	646800	4823300	5980		P		
Middle Fork Grouse Creek	1998	IDFG	646800	4823300	5980		P		
Middle Fork Grouse Creek	1998	IDFG	643300	4822600	5390		P		
Middle Parks Creek	1995	BNF	633380	4830320	5680		P		
Middle Parks Creek WF	1995	BNF	633720	4830750	5520		P		
Miller Creek	1998	IDFG	670900	4829700	5540		P		
Paradise Creek	1993	BNF	672000	4831800	5570			P	SCU
Paradise Creek	1993	BNF	671900	4832300	5640		P	P	SCU
Paradise Creek	1993	BNF	672400	4840000	6760		P	P	SCU
Paradise Creek	1995	BNF	671540	4833140	5720		P	P	SCU

Table 4. continued.

Stream name	Year	Agency sampling[a]	UTM easting	UTM northing	Elevation	Bull trout present	Rainbow trout present	Brook trout present	Other species [b]
Paradise Creek	1996	IDEQ	671900	4832300	5620		P	P	SCU
Paradise Creek	1997	IDFG	672000	4832000	5590		P	P	MSCU
Paradise Creek	1997	IDFG	672100	4839400	6590		P		MSCU
Parks Creek	1995	BNF	634230	4831830	5220		P		SCU
Parks Creek	1995	BNF	634060	4829130	5840		P		
Parks Creek	1995	BNF	634330	4827700	6120		P		
Parks Creek	1995	BNF	633670	4826550	6480		P		
Parks Creek	1998	IDFG	633800	4831400	5380		P		
Parks Creek	1998	IDFG	634300	4831900	5190		P		
Parks Creek	1998	IDFG	633500	4826700	6600		P		
Perkons Creek (Ross Fork)	1994	FS-IRS	664400	4849500	6560		P		
Rosetta Creek	1996	IDEQ	681000	4824200	6120		P		SCU
Ross Fork Creek	1994	FS-IRS	666200	4849200	6360				
Ross Fork Creek	1994	FS-IRS	664400	4849800	6480		P		
Ross Fork Creek	1994	FS-IRS	663000	4850400	6530	P	P		
Ross Fork Creek	1999	IDFG-RES	664200	4850000	6470				MSCU
Ross Fork Creek	1999	IDFG-RES	664300	4849600	6480		P		MSCU
Ross Fork Creek	1999	IDFG-RES	663100	4850400	6520	P	P		MSCU
Ross Fork Creek NF	1999	IDFG-RES	661200	4852200	6720		P		MSCU
Ross Fork Creek NF	1999	IDFG-RES	661000	4853000	6870		P		MSCU
Ross Fork Creek NF	1999	IDFG-RES	661600	4854200	7160	P	P		
Ross Fork Creek SF	1993	BNF	661800	4850900	6600		P		SCU
Ross Fork Creek SF	1993	BNF	661600	4850900	6620	P	P		SCU
Ross Fork Creek SF	1999	IDFG-RES	661000	4850800	6630		P		MSCU
Ross Fork Creek SF	1999	IDFG-RES	660800	4850500	6660	P	P		MSCU
Ross Fork Creek SF	1999	IDFG-RES	659900	4848300	7160	P	P		
Ross Fork Creek SF	1999	IDFG-RES	661000	4850800	6630		P		MSCU
Ross Fork Creek SF	1999	IDFG-RES	660800	4850500	6660	P	P		MSCU
Ross Fork Creek SF	1999	IDFG-RES	659900	4848300	7160		P		
S. F. Boise River	1991	IDFG	661000	4827500	5100	P	P		LND, MTS, MWF, SCU
S. F. Boise River	1993	BNF	665200	4828300	5250		P		MWF
S. F. Boise River	1993	BNF	655600	4829600	4900		P		MWF, SU
S. F. Boise River	1994	IDFG	661000	4827500	5100	P	P		BLS, CT, LND, MSCU, MWF, SQF
S. F. Boise River	1996	IDEQ	639300	4823700	4370				
S. F. Boise River	1996	IDEQ	643700	4829500	4560				
S. F. Boise River	1998	IDFG	661000	4827500	5100	P	P		BLS, LND, LSS, MTS, MWF, SCU, SQF, KOK
Salt Creek	1994	FS-IRS	672000	4830000	5570	P	P		SCU

Table 4. continued.

Stream name	Year	Agency sampling[a]	UTM easting	UTM northing	Elevation	Bull trout present	Rainbow trout present	Brook trout present	Other species [b]
Salt Creek	1994	FS-IRS	672400	4827900	5880		P	P	SCU
Salt Creek	1994	FS-IRS	672000	4825000	6650		P		
Shake Creek	1993	BNF	648800	4830600	4780		P		SCU
Shake Creek	1993	BNF	649200	4832900	5120		P		
Shake Creek	1994	FS-IRS	649400	4833200	5200		P		
Shake Creek	1994	FS-IRS	649500	4834400	5720				
Shake Creek	1996	IDEQ	649000	4831200	4840		P		SCU
Shake Creek	1996	IDEQ	649400	4833200	5220		P		
Skeleton Creek	1993	BNF	656000	4828100	5090				
Skeleton Creek	1993	BNF	660200	4828700	5140				
Skeleton Creek	1993	BNF	663600	4832700	5940		P		SCU
Skeleton Creek	1993	BNF	663600	4832800	5980		P		SCU
Skeleton Creek	1993	BNF	663600	4833400	6050		P		SCU
Skeleton Creek	1993	BNF	663700	4833700	6090		P		SCU
Skeleton Creek	1994	FS-IRS	663700	4832400	5920	P	P		
Skeleton Creek	1994	FS-IRS	663800	4834100	6160	P	P		
Skeleton Creek	1999	IDFG-RES	660200	4828500	5120	P	P		MSCU
Skeleton Creek EF	1994	FS-IRS	663500	4835200	6400	P	P		
Skeleton Creek WF	1994	FS-IRS	663100	4835000	6400	P	P		
Skillern Creek	1993	BNF	675300	4835500	6080		P		SCU
Skunk Creek	1993	BNF	668600	4834300	5630		P		SCU
Skunk Creek	1993	BNF	668300	4836000	5920		P		
Skunk Creek	1994	FS-IRS	668500	4835700	5820		P		SCU
Skunk Creek	1994	FS-IRS	667800	4837400	6260		P		
Skunk Creek	1994	FS-IRS	666400	4838200	6850		P		
Skunk Creek	1999	IDFG-RES	668700	4834700	5690		P		
Skunk Creek	1999	IDFG-RES	667700	4837600	6340		P		
Skunk Creek	1999	IDFG-RES	665100	4838800	7460		P		
Smoky Dome Creek	1993	BNF	665600	4821800	6960		P		
Smoky Dome Creek	1993	BNF	665700	4821500	7000		P		
Smoky Dome Creek	1993	BNF	665600	4822400	6790		P		
Smoky Dome Creek	1993	BNF	665400	4823000	6650	P	P		
Smoky Dome Creek	1993	BNF	665200	4823300	6590	P	P		
Smoky Dome Creek	1999	IDFG	665600	4822100	6860	P	P		
Snowslide Creek	1999	IDFG-RES	677500	4844100	6960	P	P		
Snowslide Creek	1999	IDFG-RES	676800	4844400	7310				
Snowslide Creek	1999	IDFG-RES	676100	4844500	7800				
Spring Creek	1996	IDEQ	636000	4832600	5080				
Spring Creek	1999	IDFG-RES	635500	4833500	5190		P		MSCU

Table 4. continued.

Stream name	Year	Agency sampling[a]	UTM easting	UTM northing	Elevation	Bull trout present	Rainbow trout present	Brook trout present	Other species [b]
Spring Creek	1999	IDFG-RES	635500	4833700	5220		P		MSCU
Spring Creek	1999	IDFG-RES	635200	4835100	5450		P		
Trinity Creek	1996	IDEQ	638700	4829500	4590				
Trinity Creek	1996	IDEQ	638100	4830200	4790				
Trinity Creek	1996	IDEQ	634100	4831900	5240				
Trinity Creek	1996	IDEQ	632600	4832800	5640				
Trinity Creek NF	1996	IDEQ	632100	4833100	5800				
Vienna Creek	1993	BNF	668500	4851800	6830	P			
Wagontown Creek	1999	IDFG-RES	639100	4824800	4440		P		MSCU
Wagontown Creek	1999	IDFG-RES	636200	4827900	5600				
Weeks Gulch	1994	FS-IRS	659800	4828600	5240		P		
West Parks Creek	1995	BNF	632650	4830330	5960		P		
Whiskey Jack Creek	1995	BNF	635270	4832320	5060		P		SCU
Whiskey Jack Creek	1995	BNF	633200	4833790	5420		P		SCU
Whiskey Jack Creek	1995	BNF	632850	4833780	5500		P		SCU
Whiskey Jack Creek	1996	IDEQ	633200	4833800	5440				
Whiskey Jack Creek	1999	IDFG-RES	634500	4832700	5180		P		MSCU
Whiskey Jack Creek	1999	IDFG-RES	632300	4834100	5580		P		MSCU
Whiskey Jack Creek	1999	IDFG-RES	632100	4834100	5600		P		MSCU
Willow Creek	1993	BNF	650000	4829800	4820	P	P		SCU
Willow Creek	1993	BNF	650700	4832000	5110		P		
Willow Creek	1993	BNF	650400	4831100	4960	P	P		
Willow Creek	1993	BNF	650200	4830600	4870		P		
Willow Creek	1993	BNF	653500	4836100	6040		P		
Willow Creek	1993	BNF	654700	4836800	6350	P	P		
Windy Creek	1995	BNF	627780	4823370	5900		P		
Worswick Creek	1997	IDFG	678000	4825900	6020		P		LND, MSCU
Worswick Creek	1999	IDFG-RES	677100	4827800	6320		P		MSCU
Worswick Creek	1999	IDFG-RES	677000	4827900	6320		P		MSCU
Worswick Creek	1999	IDFG-RES	677000	4828000	6360		P		

a. BNF= Boise National Forest, IDEQ= Idaho Division of Environmental Quality, FS-IRS= Forest Service-Intermountain Research Station, IDFG=Idaho Department of Fish and Game (Region 4). IDFG-RES= Idaho Department of Fish and Game Research.

b. BLS= Bridgelip sucker, CT= Cutthroat trout, Dace = Dace sp., KOK= Kokanee, LND= Longnose dace, LSS= Largescale sucker, MSCU= Mottled sculpin, MTS= Mountain sucker, MWF = Mountain whitefish, RSS= Redside shiner, SCU = Sculpin sp., SPD= Speckled dace, SQF= Northern squawfish, SU= Sucker sp., UNK= Unknown sp., UNK-TR= Unknown trout sp.

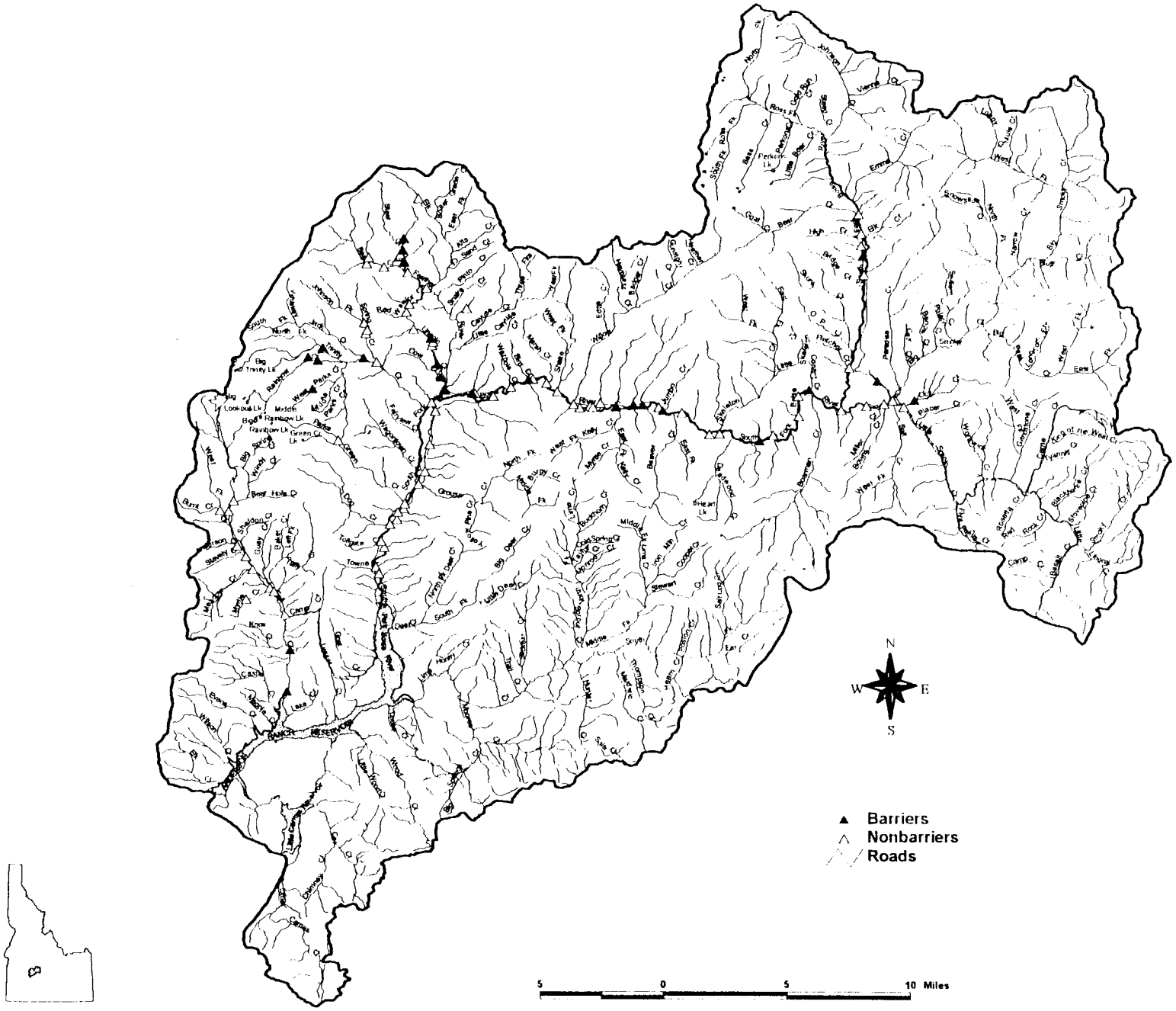

Figure 4. Stream crossing structures examined in the South Fork Boise River drainage above Anderson Ranch Reservoir with those that are potential barriers to upstream movement of bull trout noted.

Table 5. Surveyed stream crossings and related structures in the South Fork Boise River drainage upstream of Anderson Ranch Reservoir, 1997-2000.

Stream	UTM location easting	UTM location northing	Width (m)	Structure type	Culvert type	Jump height (m) Water	Jump height (m) Bank full	Culvert length (m)	Gradient (Percent)	Barrier
Barker Gulch	642869	4830045		Culvert	Round	3.0				Y-D
Bear Cr.	639400	4837475	9.1	Culvert	Squashed	0.0	0.0	17.1	1.0	
Bear Cr. [a]	636620	4838910		Culvert	Round	0.0	0.0	8.0	0.8	
Bear Cr.	635320	4839180	4.6	Bridge						
Big Smokey Cr.	670000	4830175	18.6	Bridge						
Big Smokey Cr.	671400	4830275	36.9	Bridge						
Big Smokey Cr.	671950	4830475	20.7	Bridge						
Big Water Gulch	654025	4829575	3.1	Culvert	Round	0.3	0.2	6.9	10.2	Y-G
Bird Cr.	646700	4831100		Culvert	Round	Boulder field barrier below culvert				Y-D
Blake Gulch [a]	637850	4840790		Culvert	Squashed	0.2	0.0	9.8	5.0	Y-G
Blake Gulch [a]	637820	4840943		Culvert	Squashed	0.0	0.0	0.0		
Bowns Cr.	671250	4830025		Ford						
Bowns Cr.	671225	4830175	3.3	Culvert	Squashed	0.0	0.0	12.2	1.5	
Bronco Gulch	637920	4821159		Culvert						
Casey Gulch	639786	4824588		Culvert	Round					
Charcoal Cr. [a]	635660	4839300		Culvert	Round	0.3	0.1	17.7	1.9	
Clark Gulch	640049	4829423		Culvert	Round					
Conant Cr.	666075	4831075	0.7	Culvert	Round	0.4	0.2	7.3	8.0	Y-G
Dare Gulch	637184	4819189		Culvert	Round					
Democrat Gulch [a]	642350	4835950		Culvert						
Dixie Gulch	638346	4821933		Culvert	Squashed					
Dog Cr.	637355	4820825		Culvert	Round					
Elk Cr.	638925	4843587	6.1	Bridge						
Fall Cr.	630775	4808875	9.1	Culvert	Round	0.5	-1.5	24.4	3.9	Y-G
Fall Cr.	630850	4811625		Falls		4.3				Y-D
Fall Cr.	629325	4816125		Bridge						
Fall Cr.	628050	4817350		Bridge						
Fall Cr.	627500	4818450		Bridge						
Fall Cr., E.F.	626375	4821300		Bridge						
Fall Cr., E.F.	626625	4822050		Bridge						
Fall Cr., W.F.	625750	4821500	3.0	Culvert	Squashed	0.0	0.0	10.7	3.7	
Feather River	640922	4830094		Culvert	Round					Y-D

Table 5. continued.

Stream	UTM location easting	UTM location northing	Width (m)	Structure type	Culvert type	Jump height (m) Water	Jump height (m) Bank full	Culvert length (m)	Gradient (Percent)	Barrier
Feather River [b]	640922	4830094		Culvert	Round			Drop structure installed		
Green Cr.	638422	4822325		Culvert	Bottomless					
Grouse Cr.	639505	4823621		Culvert	Squashed					
High Cr.	669422	4841404	1.0	Culvert	Round	0.0	0.0	12.0	0.4	
High Cr.	669225	4842175	2.6	Culvert	Squashed	0.3	0.2	9.1	3.6	
Houseman Gulch	665283	4829257		Culvert	Round					
Jumbo Cr.	656125	4829250	1.6	Culvert	Squashed	0.0	0.0	9.0	5.4	Y-G
Kodak Gulch	650988	4829489		Culvert	Below grade					
Lick Cr.	672625	4830175	3.5	Culvert	Squashed	0.0	0.0	15.4	0.9	
Lick Cr.	673350	4830550	1.4	Culvert	Round	0.0	0.0	10.2	12.1	Y-G
Lincoln Cr.	640700	4830950	2.1	Culvert	Squashed	0.0	0.0	18.0	5.7	Y-G
Lincoln Cr.	640675	4831375	1.9	Culvert	Squashed	0.5	0.3	11.9	3.8	
Lincoln Cr.	640400	4831925		Culvert	Round	0.3	0.2	17.9	8.1	Y-G
Lincoln Cr.	640025	4833250	2.0	Culvert	Squashed	0.0	0.0	12.1	3.6	
Lincoln Cr.	640100	4833525	2.0	Culvert	Round	0.2	0.0	12.0	2.7	
Lincoln Cr.	639950	4833750	1.9	Culvert	Round	0.3	0.2	10.5	8.9	Y-G
Lincoln Cr. trib.	638825	4834400	1.6	Culvert	Round	0.0	0.0	8.6	4.0	
Little Jumbo Cr.	655812	4829561		Culvert						
Little Water Gulch	654575	4829700	2.9	Culvert	Round	0.0	0.0	14.8	6.0	Y-G
Marsh Cr.	648075	4830925	2.2	Culvert	Squashed	0.5	0.3	0.0		
Mrytle Cr.	627725	4815250	0.9	Culvert	Round	0.7	0.5	10.7	4.5	
Nichols Gulch	636689	4817841		Culvert	Round					
Paradise Cr.	671600	4830575	9.1	Bridge						
Paradise Cr. trib.	670700	4831825	1.0	Culvert	Round	0.0	0.0	9.7	8.3	Y-G
Parks Cr.	633750	4826475	3.0	Culvert	Round	0.3	0.2	9.1	3.5	
Parks Cr., W.F.	631900	4829960		Culvert	Round	0.9	0.6	18.3	7.0	Y-D,G
Rainbow Cr.	632250	4831875		Culvert	Round	1.5	1.2	12.2	8.5	Y-D,G
Rainbow Cr.	631540	4832100	6.1	Culvert	Round	0.2	0.0	16.9	12.6	Y-G
Red Warrior Cr.	638175	4835550	1.7	Culvert	Round	0.2	0.0	14.5	2.3	
Roberts Gulch	640213	4826409		Culvert	Squashed					
Rough Gulch	647095	4831219		Culvert	Round					
S.F. Boise River	668300	4829825	18.3	Bridge						
S.F. Boise River	668800	4832500	21.9	Bridge						
S.F. Boise River	669625	4839150	28.3	Bridge						
S.F. Boise River	669150	4843475	17.2							
S.F. Boise River trib.	637691	4821742		Culvert	Squashed					

Table 5. continued.

Stream	UTM location easting	UTM location northing	Width (m)	Structure type	Culvert type	Jump height (m) Water	Jump height (m) Bank full	Culvert length (m)	Gradient (Percent)	Barrier
S.F. Boise River trib.	662725	4827450	1.1	Culvert	Round	0.0	0.0	8.0	11.6	Y-G
S.F. Boise River trib.	663618	4827927		Culvert	Below grade					
S.F. Boise River trib.	659439	4827934		Culvert	Below grade	DRY				
S.F. Boise River trib.	640353	4828718		Culvert	Squashed					
S.F. Boise River trib.	657309	4829245		Culvert	Round	DRY				
S.F. Boise River trib.	651347	4829474		Culvert	Below grade					
S.F. Boise River trib.	650253	4829565		Culvert	Below grade					
S.F. Boise River trib.	644249	4830026		Culvert	Below grade					
S.F. Boise River trib.	665271	4830655		Culvert						
S.F. Boise River trib.	665805	4831048		Culvert	Round					
S.F. Boise River trib.	669525	4840525	1.6	Culvert	Round	0.5	0.3	10.5	9.6	Y-G
Sand Cr. [a]	642080	4839400		Culvert		0.2	0.0	6.4	5.6	Y-G
Shake Cr.	648750	4830350	6.4	Culvert	Round	0.0	0.0	15.2	3.0	
Sheldon Cr.	627275	4819050	0.6	Culvert	Squashed	0.0	0.0	0.0		
Skeleton Cr.	659970	4828025	6.1	Bridge						
Spring Cr.	636250	4832050	3.0	Culvert	Round	0.2	0.0	15.2		
Spring Cr. trib. [a]	635520	4833970		Culvert		0.4				
Spring Cr. trib. [a]	635540	4834550		Culvert		0.3				
Spring Cr. trib. [a]	635560	4834220		Culvert		0.2				
Steel Cr.	637948	4838456	3.2	Culvert	Squashed	0.2	0.0	12.8	0.8	
Steel Cr. [a]	637930	4839195		Culvert	Round	0.8	0.0	12.4	3.6	Y-D
Steel Cr. [a]	637830	4839300		Culvert	Squashed	0.2	0.0	10.3	1.6	
Steel Cr. [a]	637770	4839435		Culvert	Squashed	0.0	0.0	11.7	3.1	
Steel Cr. [a]	637720	4839480		Culvert	Squashed	0.0	0.0	12.1	2.0	
Steel Cr. [a]	637620	4839770		Culvert	Squashed	0.2	0.0	11.7	2.2	
Steel Cr. [a]	637830	4839890		Culvert	Squashed	0.4	0.2	9.9	7.8	Y-G
Stevens Gulch	651700	4829475	1.4	Culvert	Round	0.0	0.0	8.4	2.0	
Swain Gulch	643064	4830019		Culvert	Round					
Tally Cr.	629600	4815850	3.0	Culvert	Squashed	0.2	0.1	12.9	2.2	
Tollgate Cr.	636655	4819526		Culvert	Round					
Towne Cr.	636575	4817278		Culvert	Round					
Trinity Cr.	632550	4832825	3.0	Culvert	Round	1.2	0.9	16.5	4.1	Y-D
Trinity Cr. [c]	632550	4832825		Culvert	Bottomless			19.4	8.5	
Van Gulch	652800	4829500	1.2	Culvert	Squashed	0.0	0.0	7.1	1.2	
Van Gulch	652814	4829542		Culvert	Round	1.2		Private pond		Y-D
Warbois Cr.	645510	4830678		Culvert	Below grade					
Whiskey Jack Cr.	635375	4832200	3.0	Culvert	Round	1.1	0.8	27.4	4.1	Y-D

Table 5. continued.

Stream	UTM location easting	UTM location northing	Width (m)	Structure type	Culvert type	Jump height (m) Water	Jump height (m) Bank full	Culvert length (m)	Gradient (Percent)	Barrier
Wide West Gulch	638410	4836170	2.0	Culvert	Squashed	0.0	0.0	10.8	3.2	
Willow Cr.	649875	4829525	9.0	Bridge						

[a]. Surveyed by Idaho Division of Environmental Quality volunteer crews.
[b]. Drop structures installed below culverts and velocity reduction structure placed in one culvert during fall of 1999.
[c]. Culvert replaced with bottomless culvert in fall of 1999.

In addition to culverts and bridges, the falls on Fall Creek was also evaluated. This falls is located 3 kilometers upstream from the reservoir and has a drop exceeding 4 meters. In the geologic past, there was a high water channel, which flowed around the falls and re-entered the stream approximately 200 m downstream allowing upstream movement of fish during high water conditions. This channel flows along the base of the fill below the road and may have been blocked off several years ago by road maintenance crews to reduce problems of erosion along the fill.

DISCUSSION

Although radio-tagged bull trout were found to use ten tributary streams in the drainage in 1998-1999, it is likely that these are not the only streams in the drainage being used by fluvial fish. Thirty-seven radio-tagged fish only account for about ten percent of the estimated bull trout over 300 mm which wintered in Anderson Ranch Reservoir in 1998-1999 (Partridge et al. In Press). Additionally, another third of the fluvial bull trout overwintering in the reservoir were less than 300 mm and not included in the estimated population of 368 bull trout. It is possible that some fluvial fish return to or attempt to return to other tributary streams besides the twelve streams in which they were observed. Fluvial bull trout may also return to drainages that were observed to have resident or juvenile populations, such as Big Water Gulch and Dog and Deadwood creeks. The culvert on the main South Fork road at Big Water Gulch has a high gradient that may prevent fluvial bull trout from returning to their native headwaters. However information gathered on the Feather River culvert indicates that bull trout have the capability to pass through structures we normally consider barriers under the right circumstances.

Even though bull trout have the capability to pass some suspected barriers, this may only be possible under ideal flow conditions. Suspected barriers should be replaced or modified as soon as possible. Currently, some barriers are already being addressed such as the Feather River structure which has been modified with an in culvert fishway (Clancy and Reichmuth 1990). Additionally, further head cutting downstream of the culvert has been stopped and the height of the outlet plunge pool has been raised with drop structures. The USFS is also actively working on replacing problem culverts in the Trinity Creek drainage.

Although some barrier structures are being addressed, additional information needs to be collected and evaluated on the Fall Creek drainage before considering whether to re-establish flows around the falls. Currently the drainage contains brook trout. It may be best to maintain the existing barrier at the falls and prevent bull trout from re-establishing in the Fall Creek drainage until further information is obtained about threats of hybridization between bull and brook trout.

With the exception of Little Smoky, Lime, Fall and Trinity creek drainages, bull trout appear to be fairly wide spread in the South Fork Boise River drainage upstream of Anderson Ranch Reservoir. Both Little Smoky and Lime creek drainages are generally lower in elevation than other drainages upstream of Anderson Ranch Dam, however anglers have reported catching bull trout in these drainages in the past. It is possible that overall habitat in these drainages is marginal for bull trout due to lower elevations

and southern exposures. Fall Creek appears to have suitable general habitat but loss of access to headwaters may have reduced the native population so that other factors such as road construction, logging and fishing may have eliminated the native population. Although not evaluated in this study, there appears to be a significant amount of sand in the substrate in the main part of Fall Creek. These factors may also be the reason bull trout do not appear to be present in the Trinity Creek drainage.

RECOMMENDATIONS

Work with land management agencies and road districts to accomplish the following:

1) Prevent existing culvert structures from becoming barriers by watching for the development of head cuts below the culverts on both USFS and Idaho Highway District roads. Specific streams to watch include the Feather River, Dog Creek and Big and Little Water gulches.

2) Replace or modify culverts that are potential barriers in the Trinity Creek drainage, especially the culvert on Whiskey Jack Creek where it crosses the main Trinity Creek road.

3) Replace or modify culverts that are potential barriers in the Spring Creek drainage.

4) Pursue funding to further evaluate the distribution and potential impacts of brook trout hybridization with bull trout in the Fall Creek drainage. Additionally, the quality of habitat in the drainage needs to be determined. If habitat is found suitable and brook trout threat is negligible, then consider developing a passage flow around the falls.

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