

**INVESTIGATION OF BULL TROUT *Salvelinus confluentus*
IN ARROWROCK RESERVOIR, IDAHO**



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ABSTRACT

Studies were continued in 1998 on Arrowrock and Lucky Peak Reservoirs to document the magnitude and timing of adfluvial bull trout *Salvelinus confluentus* movements from Arrowrock Reservoir, to estimate the Arrowrock Reservoir population of bull trout greater than 300 mm in length, to document the entrainment of bull trout through Arrowrock Dam into Lucky Peak Reservoir, and to investigate methods to re-establish bull trout above a migration barrier (Kirby Dam). Between March and May of 1998, short-term gill net sets were utilized to collect bull trout from Arrowrock and Lucky Peak Reservoirs near Boise, Idaho. A total of sixty-eight bull trout were implanted with radio transmitters. Radio-tagged fish generally left Arrowrock Reservoir by early May, entered summer residence tributaries between late July and early August, exited tributaries by the second week in September, and returned to the reservoir between October and early November. Radio tagged bull trout transported from Lucky Peak Reservoir to Arrowrock Reservoir did not differ from Arrowrock Reservoir bull trout in migration timing or distance traveled. We estimated there were approximately 354 (95% CI = 133-575) bull trout in Arrowrock 300 mm or greater in length. Bull trout that had been entrained through Arrowrock Dam accounted for 39% of the Lucky Peak bull trout catch. Seven radio implanted bull trout were transported around Kirby Dam, a migration barrier 98 km upstream from Arrowrock Dam. Two radio tagged bull trout remained above the barrier near spawning habitat by the end of September.

INTRODUCTION

Bull trout *Salvelinus confluentus* are currently listed as a threatened species by the U.S. Fish and Wildlife Service under the Endangered Species Act. To facilitate bull trout population recovery and prevent further declines, the State of Idaho developed the Bull Trout Conservation Plan (Batt 1996). The plan identified fifty-nine key watersheds in which conservation measures could facilitate reaching the desired objectives of the State of Idaho. Arrowrock Reservoir and associated tributaries were identified as key bull trout watersheds in the southwestern Idaho basin.

Bull trout were collected during routine lake surveys of Arrowrock Reservoir and downstream in Lucky Peak Reservoir by the Idaho Department of Fish and Game (IDFG) in 1994 (IDFG file data). Bull trout populations have been identified in several tributaries upstream of Arrowrock Reservoir but have not been found in tributaries to Lucky Peak (IDFG and U. S. Forest Service file data). Sampling conducted in 1996 and 1997, as part of a IDFG and U.S. Bureau of Reclamation (BOR) cooperative study documented movement of bull trout into Lucky Peak Reservoir from Arrowrock Reservoir during water releases in the spring of 1997 (Flatter 1997). Arrowrock Dam is a barrier to all upstream migrating fish. As a result, any bull trout located in Lucky Peak are blocked from migrating to spawning areas in the upper drainage.

Adfluvial bull trout are relatively common in the western U.S. and have been extensively studied in Oregon (Ratliff et al. 1996), Montana (Fralely and Shepard 1989), and Canada (Stelfox and Egan 1995). Bull trout utilizing lakes and reservoirs generally grow to a large size and have been found capable of migrating up to 225 kilometers to complete spawning (Shepard et al. 1984). Radio tag data collected in 1996 and 1997 indicates an adfluvial bull trout population exists in Arrowrock (Flatter 1997).

In an effort to collect more life history information concerning bull trout, IDFG and the BOR continued to study the Arrowrock Reservoir adfluvial bull trout population in 1998. This report details the results of the second year of bull trout research conducted in the Boise River basin by IDFG and BOR.

OBJECTIVES

1. Document the timing and magnitude of bull trout movement between Arrowrock Reservoir and upstream tributaries.
2. Provide an estimate of the bull trout population size in Arrowrock.
3. Document entrainment losses of bull trout across Arrowrock Dam into Lucky Peak Reservoir.
4. Investigate the feasibility of re-establishing a migratory bull trout population above the migration barrier formed by Kirby Dam.

STUDY AREA

The Boise River basin is located in southwestern Idaho and is one of the major tributaries of the Snake River. In 1915 Arrowrock Dam was constructed on the Boise River at river km 121.4 (Figure 1). Arrowrock Dam creates a 1,275 ha multipurpose reservoir primarily managed for flood control and irrigation purposes. The full pool elevation and storage capacity of Arrowrock Reservoir (hereafter referred to as Arrowrock) are 980 m and 286,600 acre feet, respectively (U.S. Army Corps of Engineers 1983). There are two main tributaries to Arrowrock: the South Fork Boise River (SFBR) and the Middle Fork Boise River (MFBR). The upper Boise River watershed rises to approximately 3,230 m in elevation. There are two man-made migration barriers in the upper Boise River watershed, the Kirby Dam on the MFBR near the town of Atlanta, and Anderson Ranch Dam on the SFBR (Figure 1). Kirby Dam and Anderson Ranch Dam are 98 km and 79 km upstream from Arrowrock Dam, respectively. The Boise River basin drainage area above Arrowrock, which includes the MFBR and SFBR below Anderson Ranch Dam, is 5,798 km².

Lucky Peak Dam is located at river km 102.7, which is 18.7 river km downstream from Arrowrock Dam and 14.5 km southeast of Boise, Idaho (Figure 1). At full pool, Lucky Peak Dam backs water onto the base of Arrowrock Dam. Lucky Peak Dam was completed in 1954 and created a 1,128 ha reservoir providing flood control, irrigation, hydropower, recreation and water for fish and wildlife. The full pool elevation and storage capacity of Lucky Peak Reservoir (hereafter referred to as Lucky Peak) are 931 m and 264,371 acre feet, respectively (U.S. Army Corps of Engineers 1983). The main tributary to Lucky Peak, Mores Creek, provides 90% of Lucky Peak's 1,222 km² drainage area.

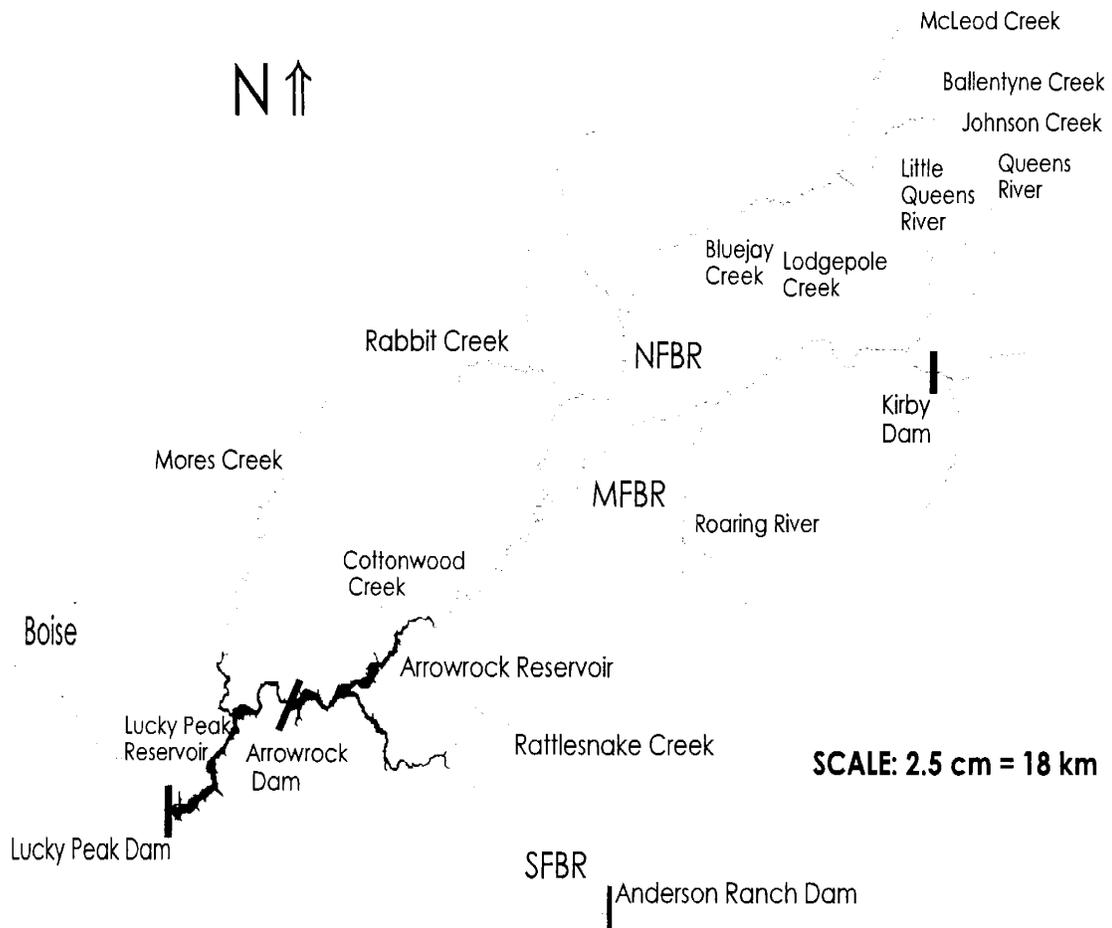


Figure 1. Map of Boise River basin study area.

METHODS

Fish Capture

Gillnetting

Experimental monofilament sinking gill nets were utilized to capture bull trout. Each net was 45.7 m long, 1.8 m deep, and contained six equal size panels of different mesh sizes (1.9, 2.5, 3.2, 3.8, 5.1, and 6.3 cm square mesh). Four nets were utilized each sampling day. Gillnetting began typically at 0830 and continued until 1630 each day. Time between gill net set and retrieval was approximately 30 min. Approximately 24 gill net sets were made each sampling day.

Gill nets were generally placed perpendicular to banks, with one end of the net within 1.8 m of the shoreline. Nets were set alternating the size of mesh (small mesh and large mesh) nearest shore. Gentle sloping shorelines, points, and beaches were the primary habitats sampled. Upon pulling nets, bull trout and other game fish were removed and placed in a recirculating aerated 322 L livewell and held for processing at the end of the sampling day. Nongame species were held in large tubs until weighed and measured after all bull trout and game fish had been processed.

Overall gill net catch rates were calculated by dividing total bull trout caught by total gill net effort. Recaptures were included in catch rate calculations. Gill net catch rates between strata and reservoirs were tested using the Pearson Chi-square test statistic (Zar 1984). Immediate handling mortality rates were calculated by dividing the total number of bull trout which died by the combined total bull trout catch for all gear types.

Gillnetting conducted in the MFBR was accomplished by placing a gillnet perpendicular to the water flow, for the entire width of the river. Nets were placed in riffle sections below large pools. Ends of the net were tied to shore and rocks were used to keep the nets from being swept downstream. Three snorkelers located and drove bull trout downstream towards the nets.

Trap Netting

Trap nets contained a front box maze of two 1.2 m x 1.8 m steel frames with center braces, five 76 cm diameter hoops with crowfoot throats on first and third hoops, and a 15 m x 1.2 m #9 treated twine lead with polycore floats and lead lines. Two centimeter square netting was used throughout.

Trap nets were set next to the shoreline in shallow areas with trap net boxes set at least 6 m off shore and the lead extending perpendicular to shore. The top of the box frames were within 30 cm of the water surface. Trap nets were typically set before dark, fished overnight and pulled the following morning. Nontarget species were counted and immediately released.

Backpack Electrofishing

A Smith-Root Model 15-B backpack electrofishing unit was utilized to collect bull trout from the Queens River. Sampling was conducted in an upstream direction by one netter and one electrofishing unit operator in random pools and runs between the mouth of the Little Queens River and the confluence of the Queens River with the MFBR.

Angling

Angling was conducted in the MFBR in the early morning and late evening hours utilizing small spinners and spoons. Four anglers concentrated their efforts in boulder strewn deep pools and runs.

Timing and Boundaries of Reservoir Sampling

Arrowrock Reservoir

Arrowrock was partitioned into three sampling strata to divide the sampling effort and to provide relative locations for recording catch and movement within the reservoir (Figure 2). Field operations began on March 30, 1998 and were completed on April 30, 1998.

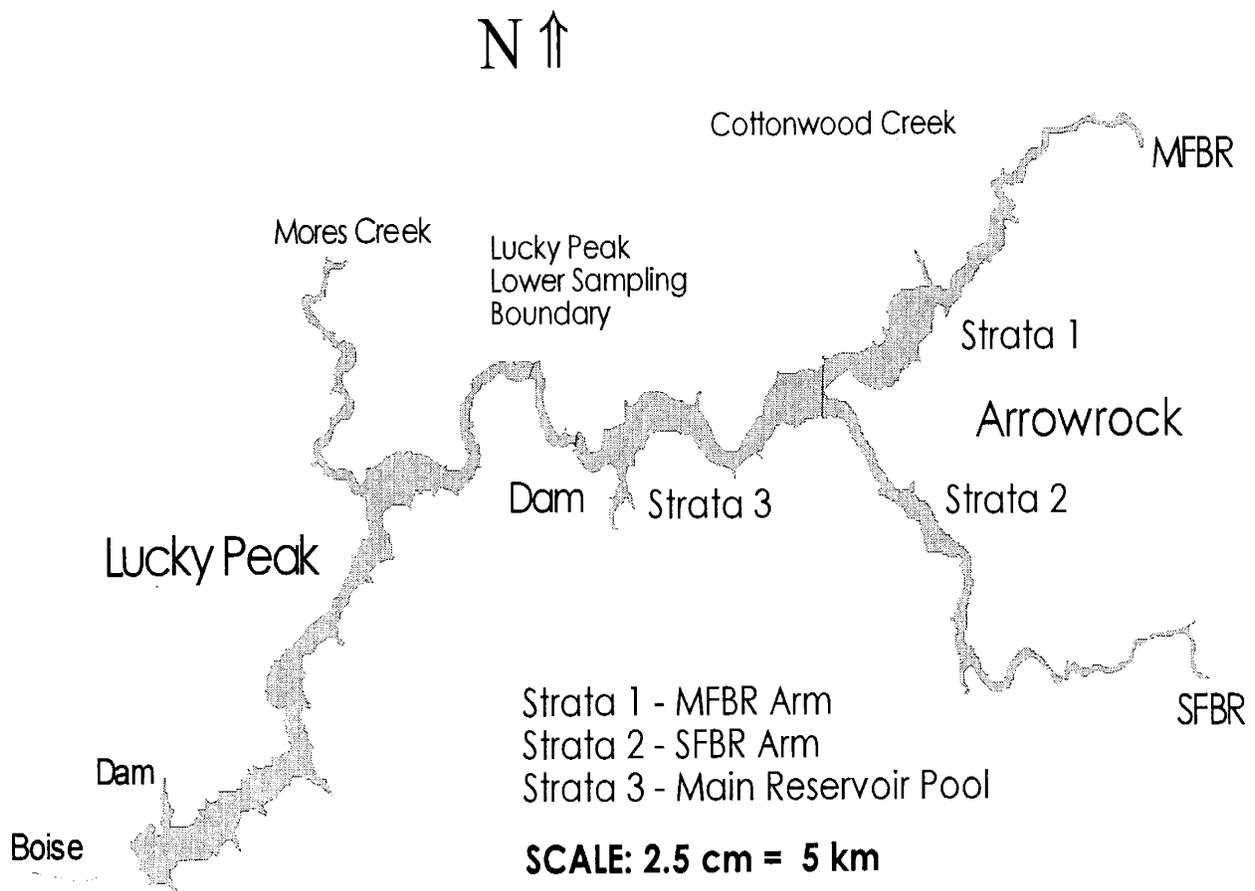


Figure 2. Arrowrock and Lucky Peak study areas.

Lucky Peak Reservoir

Gillnetting in Lucky Peak was conducted in the 3 km reach downstream of Arrowrock Dam from March 1 to May 28, 1998.

Bull Trout Processing

After netting was completed, bull trout were removed from the holding tank and placed in a 76 L plastic tub and anesthetized in a 60 mg/L MS222 (tricaine methanesulfonate) solution. Fish were weighed to the nearest g and were measured to the nearest mm in total length (TL). Average length, weight and condition factor ($CF = Wt/L^3 \times 105$, Everhart et al. 1975) were calculated separately for Arrowrock and Lucky Peak fish. Arrowrock bull trout received a pelvic fin notch, and Lucky Peak fish received a pectoral fin notch. Lucky Peak bull trout were inspected for adipose fin clips (mark used in the 1996-97 project) and pelvic fin notches (mark used in 1998 project) to ascertain if they had entrained through Arrowrock Dam.

Radio Transmitter Surgery

After anesthetizing, bull trout were surgically implanted with either model 393, 357, 10-35, 5902, 5955 or model 6 ATS (Advanced Telemetry Systems, Inc., Insanti, MN) trailing antennae radios. Six sizes of radio transmitters were used: 2.1 g, 3.6 g, 11 g, 17 g, 20 g and 30 g depending on the size of the bull trout. A 2% (or less) of body mass guideline was used to determine the appropriate radio size for each bull trout (Marty and Summerfelt 1986).

Each radio transmitted on a unique frequency in either the 150 or 151 MHz band. The battery life of each Lithium powered transmitter was life-optimized by the manufacturer by lowering the pulse rate to 40 pulses per minute. The theoretical transmitting life for each implanted radio can be found in Appendix A.

The surgery methodology followed was a modification of the shielded needle technique (Ross and Kleiner 1982). A small incision (approximately 2 to 3 cm) was made parallel to the linea alba and the radio transmitter was inserted lengthwise into the peritoneal cavity. The antennae exited the body cavity approximately 2 to 3 cm posterior to the pelvic fins along the ventral midline. Antennae were trimmed flush with the trailing edge of the caudal fin. Each incision was closed with a 3-0 Dermalon suture (Davis+Geck, Wayne, NJ).

Arrowrock bull trout were released near their original capture locations after being allowed to recuperate a minimum of 15 min from anesthesia. Following radio transmitter implantation, selected fish captured in Lucky Peak were transported and released to either Arrowrock or above the Kirby Dam.

Bull Trout Transportation

Transported bull trout were either placed in a 322 L aerated livewell for relocation in Arrowrock, or were placed in a 475 L aerated fish transport trailer and hauled to the upper MFBR for release above the Kirby Dam.

Radio Telemetry

Ground And Air Telemetry

Radio implanted bull trout were located using a Lotek SRX 400 radio receiver (Lotek Engineering Inc., Ontario, Canada). Telemetry searches were conducted twice a week from April 15 to December 23, 1999 from the ground while the bull trout were in areas accessible by roads. When bull trout entered roadless areas, they were located approximately bimonthly from fixed winged aircraft. Radio telemetry by air was conducted on eight flights occurring between June 18 and September 30, 1998.

Stationary Receiver At Arrowrock Dam

A stationary Lotek SRX 400 radio receiver/data logger and two high gain antennae were utilized to record the time and date when bull trout containing radios passed Arrowrock Dam into Lucky Peak. The data logger operated 24 h a day from March 25 through January 31, 1999. The data logger was programmed to receive all radios implanted in 1998 and those implanted in 1996-97 which were expected to transmit in 1998.

Bull Trout Population Estimate For Arrowrock Reservoir

The bull trout population size was estimated using the Petersen estimator (Ricker 1975). Bull trout mark and recapture periods were March 9 - April 15, 1998 and April 20 - April 30, 1998, respectively. Recaptured bull trout were identified by observing for pelvic fin notches. Two population estimates were calculated, one was for bull trout ≥ 300 mm

and the second for bull trout <300 mm. The calculation of two separate estimates was an attempt to address any selection bias created by our sampling gear.

RESULTS

Arrowrock Reservoir

Fish Capture

Gill net and/or trap net sampling was conducted for 26 days between March 9 and April 30, 1998. A total of 149 bull trout were captured. Gill nets were set for a total of 461.6 h and captured 149 bull trout (Table 1). The average weight and CF for Arrowrock bull trout was 668 g (SE = 59.4) and 0.86 (SE = 0.02), respectively. The length of bull trout ranged from 247 mm to 711 mm with a mean total length of 387 mm (SE= 8.6) (Figure 3). The overall gill net catch rate for all strata was 0.32 (SE = 0.04) bull trout/h. The gill net catch rates for strata 1,2, and 3 were 0.26, 0.64, and 0.44 bull trout/h, respectively. Gill net catch rates in these three strata were statistically different ($P > 0.006$, $\chi^2 = 10.106$, 2 df). In 1996-97 the catch rates in the three strata were not statistically different (Flatter 1997). Trap netting was conducted for 251.7 h, yielding no bull trout (Table 2). In 1998, the trap netting and gillnetting efforts were 21% and 74% of our levels of effort in 1996-97, respectively.

A total of five bull trout died following capture in gill nets. The handling mortality rate for all bull trout was 3.3% (Table 3).

Fifty-seven bull trout were implanted with radios between March 13 and April 18, 1998 (Appendix A).

Species of game fish collected included: bull trout, chinook salmon *Oncorhynchus tshawytscha*, hatchery rainbow trout *O. mykiss*, kokanee salmon *O. nerka kennerlyi*, mountain whitefish *Prosopium williamsoni*, redband trout *O. mykiss gairdneri*, smallmouth bass *Micropterus dolomieu*, westslope cutthroat *O. clarki lewisi*, and yellow perch *Perca flavescens*. A list of all fish species encountered during sampling can be found in Appendix B.

Population Estimate

The Arrowrock bull trout population estimates were calculated from fish captured between March 9 and April 30, 1998. One hundred and three bull trout were marked and ten were recaptured. Thirty bull trout less than 300 mm were marked with only one

Table 1. Period of sampling, collection effort and bull trout catch by month, Arrowrock Reservoir, 1998.

Date (3/9/98 - 4/30/98)	March	April	Total
# collection days	11	15	26
Hours of gillnetting	181.4	280.19	461.6
Hours of trap netting	251.7	0	251.7
# bull trout caught in gill nets	79	70	149
# bull trout caught in trap nets	0	0	0

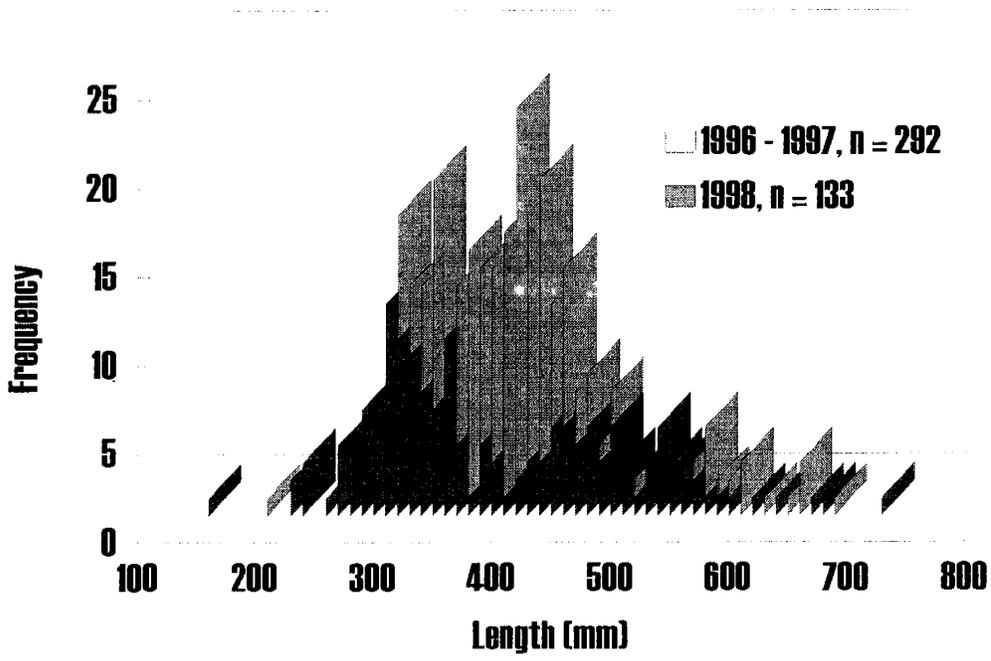


Figure 3. Length frequency of bull trout captured in Arrowrock Reservoir between October 18, 1996 - May 2, 1997, and March 9 - April 30, 1998 (Recaptured bull trout not included).

Table 2. Arrowrock Reservoir effort and catch rates for bull trout by gear type and strata in 1997 and 1998.

	Gill net hours		Gill net catch		Bull trout/hour	
	1997	1998	1997	1998	1997	1998
Year	1997	1998	1997	1998	1997	1998
Strata 1	441	330.5	182	87	0.41	0.26
Strata 2	72.5	20.4	23	13	0.32	0.64
Strata 3	107	110.7	35	49	0.33	0.44
Overall	620.5	461.6	240	149	0.39	0.32

	Trap net hours		Trap net catch		Bull trout/hour	
	1997	1998	1997	1998	1997	1998
Year	1997	1998	1997	1998	1997	1998
Strata 1	2492	251.7	170	0	0.070	0
Strata 2	318	0	1	0	0.003	0
Strata 3	16	0	0	0	0	0
Overall	2826	251.7	171	0	0.06	0

	Total gear hours		Total catch		Combined gear bull trout/hour	
	1997	1998	1997	1998	1997	1998
Year	1997	1998	1997	1998	1997	1998
Strata 1	2933	582.2	352	87	0.12	0.15
Strata 2	390.5	20.4	24	13	0.06	0.63
Strata 3	123	110.7	35	49	0.28	0.44
Overall	3446.5	713	411	149	0.12	0.21

Table 3. Composition of bull trout catch in Arrowrock Reservoir in 1998.

	Total	Processed and released alive in Arrowrock	Mortalities	Implanted with radios	% of total bull trout catch (n= 143)
Bull trout caught during 1998 Petersen population estimate marking period	106	103	3	57	74
Recaptured bull trout applied towards 1998 Petersen population estimate	10	9	1	0	7
Unmarked bull trout applied towards 1998 Petersen population estimate	27	26	1	0	19
Total	143	138	5	57	100

* Twenty-four bull trout included in the above table were marked in Arrowrock in 1996-97 and were recaptured in 1998.

* Six bull trout captured twice in the 1998 marking period were counted once only in the above table. The total number of bull trout caught in Arrowrock in 1998 was 149.

Table 4. Arrowrock bull trout population estimates for 1997 and 1998.

	Population Estimate	95% C.I.
1997 \geq 300 mm	471	Lower = 389 Upper = 590
1998 \geq 300 mm	354 ¹	Lower = 133 Upper = 575
1998 all sizes	381 ¹	Lower = 186 Upper = 576
1998 < 300 mm	328 ¹	Lower = 120 Upper = 536

¹ NS different than 1997 estimate at 95% C.I., Schnabel estimator used in 1997, Petersen estimator used in 1998.

Table 5. Lucky Peak Reservoir sampling effort and catch by month in 1998.

Date (3/11/98 - 5/28/98)	March	April	May	Total
# collection days	2	3	5	10
Hours of gillnetting	40	53	102	195
Hours of trap netting	0	0	0	0
# bull trout caught in gill nets	2	6	21	29

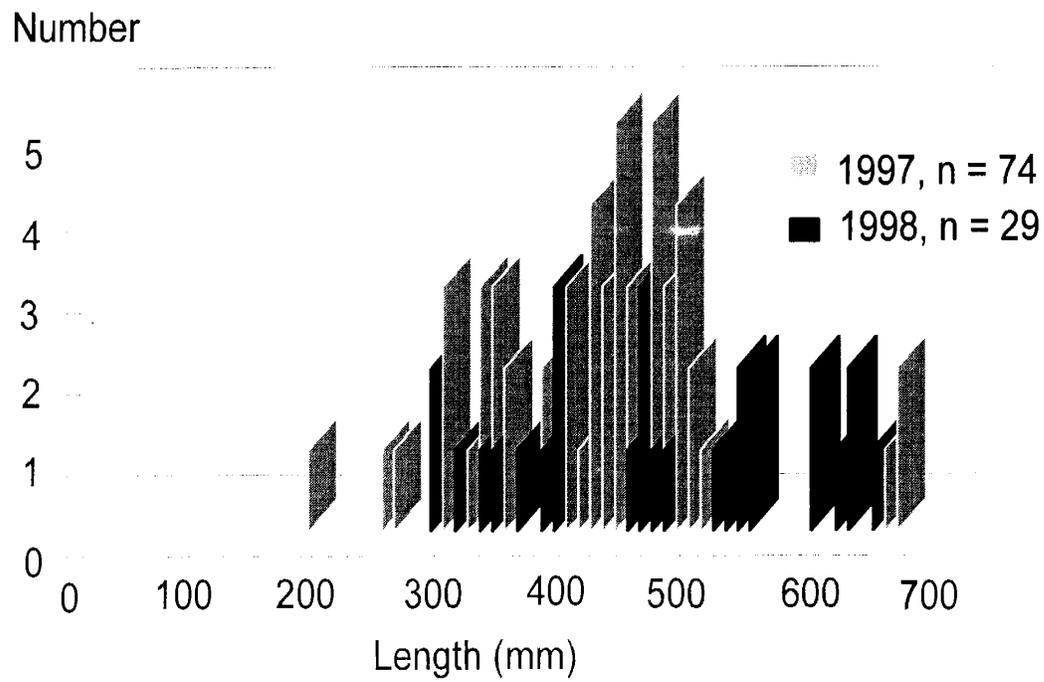


Figure 4. Length frequency of bull trout captured in Lucky Peak Reservoir in 1997 and 1998 (recaptured bull trout not included).

Entrainment

Eight of the 103 bull trout marked in Arrowrock in 1998 were recaptured while gillnetting Lucky Peak. Arrowrock bull trout fin marked or implanted with radios in 1998 accounted for 39% of all bull trout caught in Lucky Peak (this entrainment loss includes 16% of the 1998 radio fish, and 8% of the fin marked fish). Arrowrock bull trout marked or implanted with radios in 1996-97 accounted for 15% of the 39 bull trout caught or located in Lucky Peak in 1998 (this entrainment loss includes 3% of the 1996-97 radio fish, and 2% of the fin marked fish) (Table 6). It should be noted that in 1997 Arrowrock Dam was not equipped with a data logger to monitor the outlet structures 24 h a day for passing radio tagged fish as in 1998. Therefore, additional radio tagged fish probably passed the dam undetected by our 1997 telemetry efforts.

Middle Fork Boise River and Queens River

Fish Capture

Seven bull trout were collected from the MFBR and the Queens River utilizing angling, gillnetting, and backpack electrofishing between August 17 and August 20, 1998. Seventeen hours of angling resulted in the catch of four bull trout, two bull trout were captured in 8 h of gillnetting and one bull trout was captured in 1.5 h of electrofishing.

Numerous bull trout were lost while angling. During August of 1998 our snorkeling efforts indicated the highest concentrations of bull trout below Kirby Dam were from the mouth of Black Warrior Creek to the dam. A downstream float conducted by two snorkelers on August 18, 1998 counted 35 sub-adult and adult bull trout in the first 2.4 km of the MFBR below Kirby Dam.

Bull Trout Transportation

Lucky Peak

Ten bull trout captured in Lucky Peak were implanted with radios and transported to other areas. Five were transported and released in Arrowrock, three were transported and released on the upstream side of the Kirby Dam in the Yuba River and two were released upstream of Kirby Dam in the MFBR. Two of the 1998 Arrowrock recaptures were transported and released in Arrowrock. One bull trout captured in Lucky Peak was transported and released without a radio above the Kirby

Table 6. Composition of bull trout catch in Lucky Peak Reservoir in 1998.

	Total	Processed and released alive in Lucky Peak	Mortalities	Moved to Arrowrock Reservoir	% of total bull trout catch (n= 39)
1996-97 Arrowrock Recaptures	6 ^A	0	0	5 ^B	15 ^C
1998 Arrowrock Recaptures	12 ^D	0	2	2	30.7 ^D
1996-97 Lucky Peak Recaptures	4	0	0	4 ^E	10.2
Not Previously Caught	17	4	4	9 ^F	43.6
Total	39	4	6 ^G	21 ^H	100

^A Includes one bull trout located below Arrowrock Dam with radio telemetry

^B Includes one bull trout moved to the Yuba River upstream from Kirby Dam

^C Includes one bull trout located with radio telemetry

^D Includes nine bull trout located with radio telemetry

^E Includes one bull trout moved to the MFBR 5.6 km upstream of the Kirby Dam

^F Includes two bull trout moved to the MFBR 5.6 km upstream of the Kirby Dam and two moved to the Yuba River

^G Five died from apparent effects of supersaturated dissolved gasses while being held in a live car approximately 350 m downstream from Arrowrock Dam

^H Number includes 6 bull trout transported and released above Kirby Dam

Dam in the MFBR. Detailed information about these bull trout can be found in Appendix D.

It took approximately one h to transport bull trout from Lucky Peak to Arrowrock and approximately 3 h to transport bull trout from Lucky Peak to the release locations upstream of the Kirby Dam. The tank water was tempered twice during the trip to Atlanta with MFBR water. We estimated our total costs of capturing and relocating six bull trout from Lucky Peak to above Kirby Dam to be \$2,779.00, or \$491.00/bull trout with a radio implanted. Our cost estimate includes four personnel, mileage for two vehicles, rental for two boats, five radio transmitters, and miscellaneous supplies. Bull trout transported to Atlanta without radios implanted cost approximately \$321.00 each.

MFBR and Queens River

Seven bull trout captured in the MFBR and the Queens River were transported and released above the Kirby Dam in the Yuba River on August 21, 1998. Only two bull trout in this group were implanted with radios (Appendix D).

Radio Telemetry

Sixty-two total bull trout were implanted with radios in 1998 (excluding the seven released upstream of the Atlanta Dam), twenty-three entered the NFBR, thirteen traveled up the MFBR, and five entered the SFBR. This represented 56%, 32% and 12% of all bull trout migrating upstream and out of Arrowrock, respectively.

The remaining bull trout were located either near their release location in Arrowrock or downstream in Lucky Peak. Specifically, eleven remained in Arrowrock, nine entered Lucky Peak (includes one fish that spent the summer in the SFBR and one that traveled to the NFBR), and three radios were never located after release. We assumed any fish which remained in the same location for more than one month was dead or had expelled the radio transmitter. After the lake level had been lowered, one of the eleven radios which remained in Arrowrock was recovered from a sandbar near the mouth of Cottonwood Creek on September 15, 1998. The fate of the fish that had been carrying the radio is unknown. Of the radios which remained in Arrowrock, no movement was detected in two and the remaining eight appeared to move only slightly from their release location.

Timing of Migrations and Distance Traveled

Radio-tagged bull trout generally left Arrowrock between mid April and mid May, entered upper watershed tributaries between late July and early August, exited the tributaries by the second week in September and returned to the reservoir between the second week in September and the third week in October. A graph illustrating the migrations of a subsample of 1998 and 1997 Arrowrock bull trout can be found in Figure 5. Upstream migration distances for all sizes of bull trout leaving Arrowrock ranged from 18.5 to 117 km (\bar{x} = 69 km, SD = 29 km). The average migration distances for bull trout ≥ 300 mm and < 300 mm were 69 km (SD = 29 km) and 47 km (SD = 14.5 km), respectively. A complete listing of Arrowrock and Lucky Peak bull trout locations determined by radio telemetry can be found in Appendix E.

Bull Trout Summer Rearing Locations

Radios Located in Lucky Peak Reservoir

Nine bull trout radio-tagged in Arrowrock entered Lucky Peak between March 26 1998 and January 4, 1999 (Table 7).

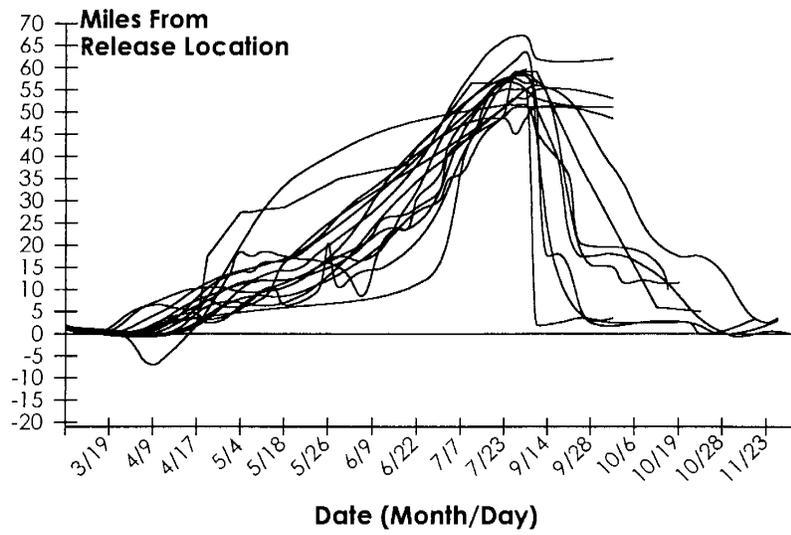
Radio Signals Remaining in Arrowrock Reservoir

Of the 11 bull trout which remained in the upper reservoir, three were located near Trail Creek and eight were located near Cottonwood Creek. Two of the fish located near Cottonwood Creek were less than 300 mm in length (Figure 6).

South Fork Boise River

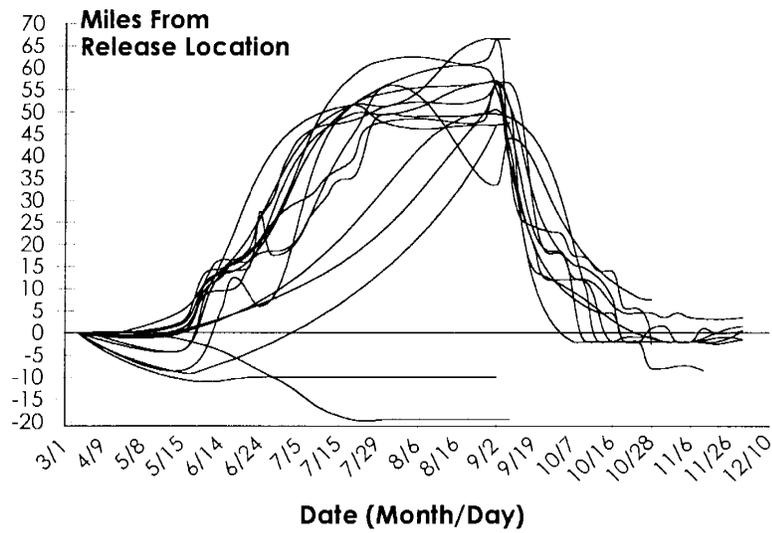
Five bull trout entered the SFBR and remained there throughout the summer. The confluence of Rattlesnake Creek and the SFBR was the summer location of a radio tagged bull trout in 1997 and 1998. In 1998, radio telemetry indicated that bull trout traveled 29 km further upstream in the SFBR than the radio tagged fish in 1997. The mouth of Cow Creek was the furthest upstream any bull trout traveled. Cow Creek is approximately 10.5 km downstream from Anderson Ranch Dam. A small bull trout (287 mm) which used the SFBR for summer rearing was located on December 31, 1998 below Arrowrock Dam in Lucky Peak. A general summer location map of all the bull trout entering the SFBR can be found in Figure 7. We were unable to determine if any of these bull trout entered SFBR tributaries.

1998 Arrowrock Bull Trout Migration Patterns



Mile 0 = Release Location
 Mile 7 = Mouth of MFBR
 Mile -8 = Arrowrock Dam

1997 Arrowrock Bull Trout Migration Patterns



Mile 0 = Release Location
 Mile 2 = Mouth of MFBR
 Mile -9 = Arrowrock Dam

Figure 5. Migration patterns of Arrowrock Reservoir bull trout in 1997 and 1998.

Table 7. Bull trout captured in gill nets or located with radio telemetry in Lucky Peak that had been previously captured and marked in Arrowrock Reservoir.

Length (mm)	Weight (g)	Radio Frequency (MHz)	Date When Tagged In Arrowrock Reservoir	Best Estimate Of When Passed Arrowrock Dam Into Lucky Peak Reservoir
247	110	150.053	3/25/98	1/4/99 at 1:47 P.M.
301	200	150.202	3/17/98	12/31/98 at 8:02 A.M.
300	200	150.342	3/13/98	5/12/98 at 2:45 A.M.
305	260	150.362	3/13/98	7/31/98
455	735	150.674	3/26/98	7/1/98
440	655	150.723	4/1/98	10/23/98 at 5:18 A.M.
496	1410	151.224	3/17/98	3/26/98 at 9:35 P.M.
660	2700	151.353-LP97	5/8/97	4/2/98 at 7:35 P.M.
485	1300	151.792	4/2/98	5/11/98 at 2:52 A.M.
540	1720	151.923	3/17/98	5/7/98 at 11:56 A.M.
384	420	identified with fin clip	marked in Arrowrock Reservoir between 3/9 and 4/19/98	caught in net on 4/13/98
380	410	identified with fin clip	marked in Arrowrock Reservoir between 3/9 and 4/19/98	caught in net on 5/5/98
457	820	identified with fin clip	marked in Arrowrock Reservoir between 3/9 and 4/19/98	caught in net on 5/6/98

Table 7. (continued)

Length (mm)	Weight (g)	Radio Frequency (MHz)	Date When Tagged In Arrowrock Reservoir	Best Estimate Of When Passed Arrowrock Dam Into Lucky Peak Reservoir
533	1520	identified with fin clip	marked in Arrowrock Reservoir between 10/10/96 and 4/30/97	caught in net on 4/8/98
466	820	identified with fin clip	marked in Arrowrock Reservoir between 10/10/96 and 4/30/97	caught in net on 4/13/98
459	800	identified with fin clip	marked in Arrowrock Reservoir between 10/10/96 and 4/30/97	caught in net on 5/5/98
446	840	identified with fin clip	marked in Arrowrock Reservoir between 10/10/96 and 4/30/97	caught in net on 5/5/98
355	330	identified with fin clip	marked in Arrowrock Reservoir between 10/10/96 and 4/30/97	caught in net on 5/27/98

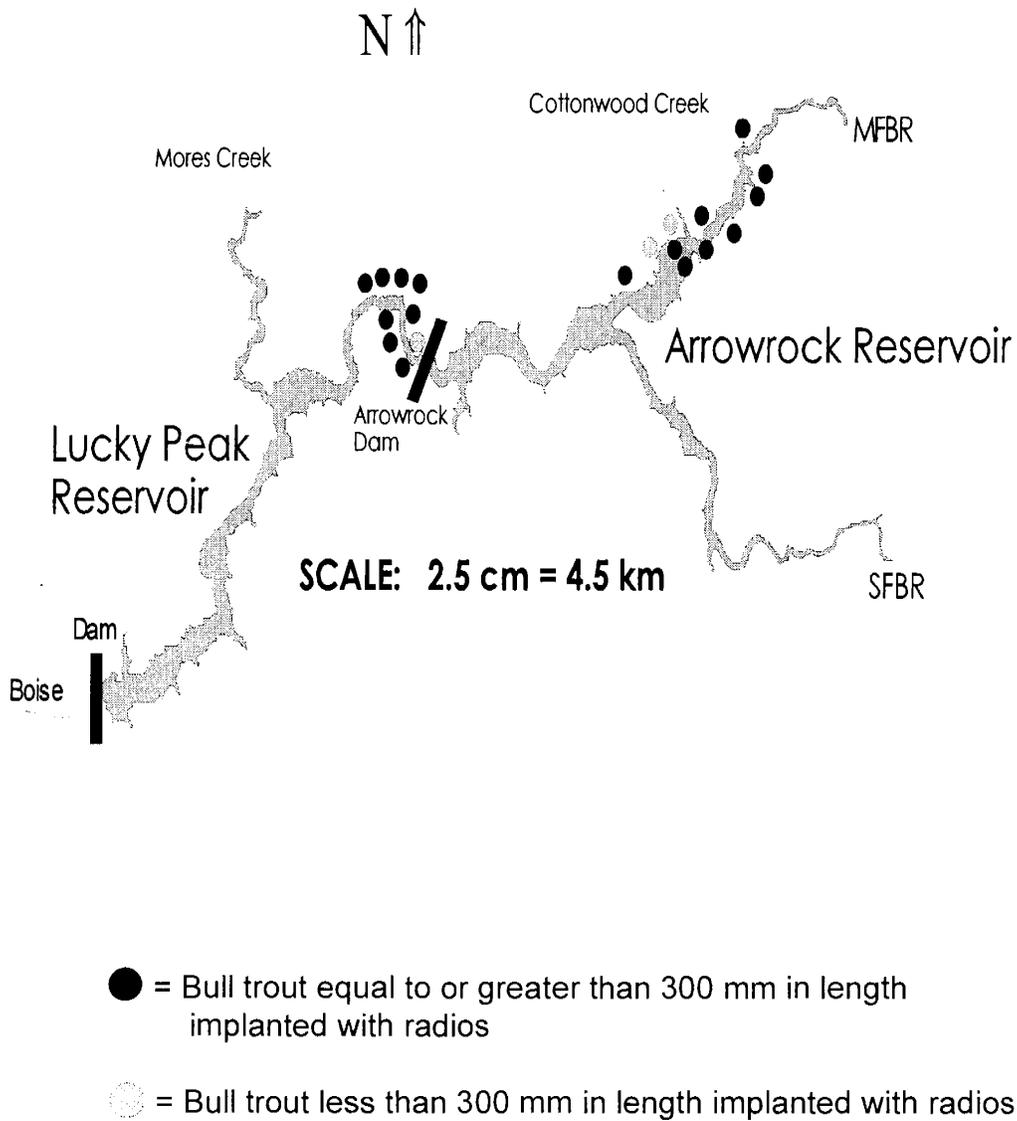


Figure 6. General locations of bull trout which traveled downstream into Lucky Peak or remained in Arrowrock Reservoir following release in 1998.

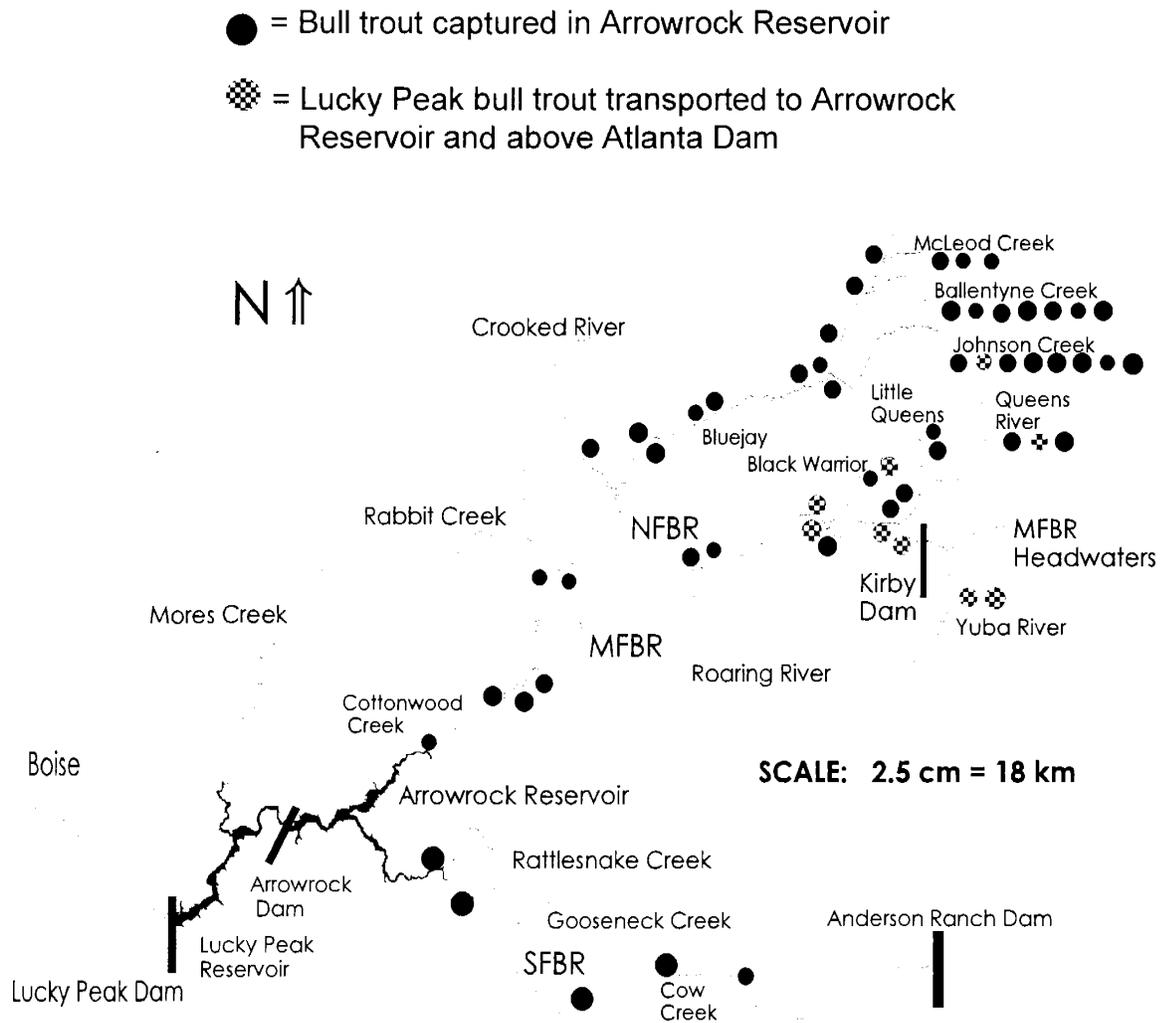


Figure 7. Bull trout locations in the SFBR, MFBR, and NFBR during August and September of 1998.

North Fork Boise River

Mcleod Creek, the furthest tributary from Arrowrock, was used by three bull trout for summer rearing. One of the three was located in approximately the same location in 1997 and 1998. Details of any bull trout located with telemetry in two or more consecutive years can be found in Table 8.

Ballentyne Creek is approximately 5.5 km downstream from Mcleod Creek and seven bull trout used Ballentyne for summer rearing in 1998.

Three of the seven fish were located in approximately the same location in 1997 and 1998. One bull trout located in Mcleod Creek in 1997 was re-located in the NFBR between Mcleod Creek and Ballentyne Creek in 1998. We were not able to determine if this bull trout entered a NFBR tributary in 1998. Twenty-two percent of the bull trout entering the NFBR were located in Ballentyne Creek, making this tributary the second most utilized in the NFBR.

Johnson Creek, approximately 9 km downstream from Ballentyne Creek, was the summer rearing tributary for nine bull trout. This represented 28% of the fish which entered the NFBR, making Johnson Creek the most utilized summer rearing tributary for bull trout in the NFBR. One of these nine fish was located in Johnson Creek in 1997, and another in Ballentyne Creek in 1997. Two additional fish were located at the mouth of Johnson Creek, and one was located between the mouth of Johnson and Ballentyne Creeks in the NFBR. We were not able to determine if these bull trout entered Johnson Creek or any other NFBR tributaries.

One bull trout was located near the mouth of Lodgepole Creek, approximately 4 km downstream of Johnson Creek. We were unable to determine if this bull trout entered Lodgepole Creek or any other NFBR tributaries.

Four bull trout were located in the NFBR between the mouth of Crooked River and Lodgepole Creek. We were unable to determine if tributaries were used by these fish.

Crooked River was used by one bull trout for summer rearing. This fish remained approximately 5 km up Crooked River until mid-September. Prior to this occurrence we had not documented any Arrowrock bull trout using this drainage.

Three bull trout were located near the mouth of Rabbit Creek. One remained there for a majority of the summer and was not located after September, one was not located after June, and the third remained approximately 1.6 km downstream from the mouth of Rabbit Creek from June through September and was not relocated. We were unable to determine if any of the three had entered Rabbit Creek during the summer.

Table 8. Migration timing and summer rearing areas for bull trout located with radio telemetry between the spring of 1997 and the fall of 1998.

Migrations Of Bull Trout Followed In 1997 And 1998						
	Approximate Date Left Reservoir		Summer Rearing Area		Approximate Date Returned To Reservoir Or Last Location	
	1997	1998	1997	1998	1997	1998
Frequency	1997	1998	1997	1998	1997	1998
151.203 ^A	6/28	n/a	SFBR	In reservoir	Unknown	Never left
151.253	6/9	5/5	Queens River	Same	10/16	9/28 returned to reservoir
151.293 ^A	6/9	Unknown	Ballentyne Creek	Johnson Creek	10/7	9/30 in Johnson Creek
151.323 ^A	6/9	5/19	Queens River	MFBR	11/19	2/4 near Roaring River
151.333 ^A	6/9	4/29	Mcleod Creek	between Mcleod and Ballentyne Creeks in river	9/23	9/10 near Deer Park
151.344 ^A	6/9	Unknown	Johnson Creek	Same	Unknown	9/30 in Johnson Creek
151.372 ^A	6/?	Unknown	Ballentyne Creek	Same	Unknown	11/18 near Troutdale

Table 8. (continued)

Migrations Of Bull Trout Followed In 1997 And 1998						
151.402	6/17	4/22	Mcleod Creek	Same	10/7	11/18 near Troutdale
151.593 ^{A, B}	6/9	4/9	Little Queens River	Same	10/21	10/14 near Troutdale
151.603 ^A	6-8/?	4/24	Johnson Creek	NFBR	10/14	9/10 returned to reservoir
151.643 ^A	6/9	4/24	Ballentyne Creek	Same	10/31	9/30 in Ballentyne Creek
151.663 ^A	6-8/?	4/?	Ballentyne Creek	Same	10/14	9/30 near Deer Park
151.703 ^A	6/9	4/17	Ballentyne Creek	Same	10/?	9/10 near Ballentyne Creek
151.904	5-6/?	4/22	Little Queens River	Same	10/9	10-11/? Returned to reservoir
151.983	5-6/?	5/8	Johnson Creek	Same	9-10/?	9/30 in Johnson Creek

^A Radios were implanted in April and May of 1997, theoretically radio batteries should be dead

^B In 1996 this bull trout used the upper Queens River for summer rearing

Middle Fork Boise River

The Queens River drainage was used by seven bull trout for summer rearing. Four moved up the Queens River, two were located near the headwaters of the Little Queens River, and one was located in the lower Queens River near the mouth of the Little Queens River. One of the bull trout located near the headwaters of the Queens River used the same general location for summer rearing in 1997. The other was a Lucky Peak captured bull trout that was released in Arrowrock. The bull trout which held near the mouth of the Little Queens River migrated the furthest of all the fish under 300 mm that had been implanted with radios.

Two bull trout used Black Warrior Creek for summer rearing; a fish released above the Kirby Dam which moved downstream from release site and a fish from Arrowrock.

Two bull trout held near the mouth of Roaring River. In August of 1997 one of the same two fish used the upper Queens River for summer rearing. We were unable to determine if either bull trout entered Roaring River.

Three bull trout appeared to remain in the lower MFBR. Telemetry data indicated one fish held near the MFBR/NFBR confluence from early summer through the late fall. It is possible that the second fish moved further upstream than our last location because the radio it was implanted with was only expected to transmit a signal into early May. We were unable to determine if the third fish moved because we were unable to locate the fish between June and September.

Bull Trout Transported Around Kirby Dam

Only two out of seven radio implanted bull trout released above Kirby Dam in 1998 remained above the dam by mid-summer. One of these fish had been transported and released in May, the other in August. Both were located approximately 4 km up the Yuba River near the mouth of Decker Creek. The summer locations of the remaining five fish were as follows: two were located near the mouth of Black Warrior Creek in the MFBR approximately 14 km downstream from Kirby Dam, one moved to the headwaters of Black Warrior Creek, one moved to a location approximately one km downstream from Kirby Dam, and one was not located until mid-September 88.5 km downstream in Arrowrock.

Some areas of the reservoir were not sampled in equal proportion to others due to the limitations of our equipment on boulder strewn shorelines and vertical basalt walls commonly found around Arrowrock (Flatter 1997). Although we invested considerable time and effort in our 1998 estimate, many areas of Arrowrock again were unsampled. It is very possible that these unsampled areas contained bull trout and as a consequence we may have substantially underestimated the population size.

3. Document entrainment losses of bull trout across Arrowrock Dam into Lucky Peak Reservoir.

During normal BOR Arrowrock Dam operations in the spring and fall of 1998, our sampling indicated a minimum of 16% of the 1998 Arrowrock radio tagged bull trout passed into Lucky Peak. The entrainment included 15.4% of the fish equal to or greater than 300 mm and 20% of the fish less than 300 mm.

Our telemetry data indicates that of the fish that passed from Arrowrock into Lucky Peak during 1998, 50% (5/10), and 40% (4/10) were entrained during spill and controlled valve release, respectively. We were unable to determine when the tenth radio tagged bull trout radio tagged during 1998 or the Arrowrock bull trout tagged in 1996-97 passed into Lucky Peak. Following similar releases conducted in the winter and spring of 1997, our sampling at that time indicated at least 9% (2/22) of the 1997 Arrowrock radio tagged bull trout passed into Lucky Peak (Flatter 1997). Based on 9% entrainment of 1997 radios and our 1997 Arrowrock population estimate (471 bull trout, 95% C.I. = 389-590), we conservatively estimate 42 bull trout (95% C.I. = 35-53 bull trout) equal to or greater than 300 mm passed from Arrowrock to Lucky Peak in 1997. Using our 1998 entrainment of 15.4% and population estimate of 354 bull trout (95% C.I. = 133-575), we conservatively estimate that 54 bull trout (95% C.I. = 20-88 bull trout) equal to or greater than 300 mm passed from Arrowrock to Lucky Peak in 1998. These estimates indicate that a substantial number of adult Arrowrock bull trout are lost each year during normal operations of Arrowrock Dam.

Losses of small bull trout may be considerable as well. Based on our population estimate of 328 bull trout under 300 mm (95% C.I. = 120-536) and 20% entrainment, we conservatively estimate 66 bull trout (95% C.I. = 24-107) under 300 mm may have passed from Arrowrock to Lucky Peak in 1998. The absence of Arrowrock fin marked bull trout under 300 mm in Lucky Peak gill nets suggests that entrainment mortality may be higher for small fish. Additionally, our data also suggests that small bull trout are four times more likely to pass Arrowrock Dam into Lucky Peak than bull trout over 305 mm (43% entrainment versus 12%, respectively, radio tag data) (Table 7).

4. Investigate the feasibility of re-establishing a migratory bull trout population above the migration barrier formed by Kirby Dam.

It appears we had limited success in re-introducing bull trout above Kirby Dam. Only two out of the seven radio tagged fish we transported above this migration barrier chose to stay through the summer. Four of the five bull trout transported above the dam on May 25, 1998 were located below the dam by June 8, 1998. At first we thought this indicated that the fish were moved too early in the year, as it turned out half of the fish we moved in August fell back over Kirby Dam quickly also.

Arrowrock and Lucky peak bull trout are vulnerable to gillnetting during April and May. During these months, reservoir levels are generally low and migratory fish are concentrated near the mouth of the MFBR and in Lucky Peak near the base of Arrowrock Dam. Although relatively easy to collect, transporting these fish 75 km upstream in early spring does not coincide with the migrations we have observed with radio tagged fish. Our telemetry results indicate adfluvial bull trout arrive in the Kirby Dam area approximately two months later (late June to mid-July) when traveling the same distance on their own. Although the timing of transport did not appear to effect the outcome, the number of fish we transported may have been too small to detect a difference. If restoring a migratory bull trout population above Kirby dam is the objective, we are not convinced moving fish early in the spring is the best tactic.

If future attempts are made to transport migratory bull trout above Kirby Dam, angling from the mouth of Black Warrior Creek to Kirby Dam during July and August is by far the most efficient collection method. Although we were successful in transporting fish from downstream reservoirs, the resources required for this strategy far exceed those associated with angling. In addition, bull trout in the upper MFBR have expressed an interest in the area by committing substantial resources to reaching the upper MFBR drainage.

Other Findings

Fish Collection

Reservoir conditions were drastically different in 1998 than in 1997. The average monthly reservoir levels in 1997 were 29 m lower during March and April than in 1998. Due to above average precipitation in the Boise River basin in the fall of 1997, Arrowrock was nearly full during our 1998 spring fish collection efforts.

As a result of the high water conditions, many of the areas which contributed heavily to our 1997 bull trout catch were submerged in deep water and were unfishable with trap nets or gill nets in 1998. It was also apparent that with the increased reservoir surface area, finding concentrations of bull trout was a much more difficult task in 1998 than in 1997. It was relatively common to catch more than one bull trout at a time in a net in 1997, in 1998 it was a rare event. The length frequency of bull trout encountered

in 1998 was different than that in 1997 as well. In 1997, 4% (17/411) of our total bull trout catch was less than 300 mm in total length. In comparison, although our overall gill net catch rates were very similar in 1997 and 1998 (0.39 and 0.32, respectively) the proportion of bull trout caught under 300 mm was five times higher in 1998 than in 1997. After fish collection efforts in 1997, we were undecided about the effectiveness of our gear to capture sub-adult bull trout and whether or not they were even present in significant numbers in Arrowrock. Our 1998 results indicate sub-adult bull trout as small as 247 mm were using Arrowrock for rearing. Our 1998 fish collection results also suggest that there may be connection between reservoir level and the presence/catchability of sub-adult bull trout. It is possible that a large year class of sub-adults returned to Arrowrock between our fall 1997 and spring 1998 netting. The gill net catch of non-target species in 1998 was very similar to our 1997 results and appeared to be unaffected by reservoir level.

Rearing Stream Fidelity

A high rate of summer rearing stream fidelity exists. In 1998 we were able to follow one particular bull trout for a third straight year after we implanted a new transmitter (frequency 151.593). In 1996 this fish used the upper Queens River for summer rearing (Allen et al. in press), in 1997 and 1998 the same fish used the upper Little Queens River. This appears to be an example of fidelity to rearing drainage but straying in terms of rearing tributary. The tributaries which were repeatedly used the most in 1998 included Little Queens and Queens Rivers, Johnson Creek, and Ballentyne Creek. These areas all share several general characteristics; they are second order streams above 1,830 m, they are in or on the border of the Sawtooth Wilderness (little man-caused disturbances other than fire), and their upper reaches contain low gradient riffle-run-pool complexes.

Kirby Dam Fish Ladder

The construction of a fish ladder around Kirby Dam began in mid summer 1998. Barring any unforeseen difficulties, the construction is scheduled for completion in June 1999.

This project will provide migratory bull trout access to abundant focal habitat which exists above the dam. Although our telemetry results from 1997 and 1998 indicate that large Arrowrock bull trout migrate to the base of the dam each summer, it is unknown if bull trout will attempt to use the newly constructed ladder. During the summer months following completion of the ladder we will attempt to document fish passage through the use of a temporary trap and video equipment installed in the new facility.

CONCLUSION

Based on our results, there were an estimated 354 (95% CI = 133-575) bull trout greater than 300 mm in Arrowrock Reservoir. Our radio telemetry efforts confirm a large segment of this population is adfluvial and on average traveled 69 km (SD = 29 km) in 1998 to summer rearing areas in the MFBR and NFBR tributaries. Thirty-nine percent of our Lucky Peak bull trout catch consisted of fish originating from Arrowrock Reservoir in 1998. When bull trout from Luck Peak were placed in Arrowrock their migrations and summer rearing areas were very similar to Arrowrock bull trout.

Our third year of bull trout research in Arrowrock and Lucky Peak Reservoirs has resulted in the collection of more information critical to achieving a better understanding of how to protect and prevent further declines of these fish. Now that we have clearly established that entrainment losses to Lucky Peak occur during normal operations of Arrowrock Dam, recovery efforts need to focus on eliminating these losses. Secondly, efforts need to be directed at providing access to rearing habitat that is currently unavailable to these fish. Addressing these points should directly increase recruitment to the Boise River basin bull trout populations.

RECOMMENDATIONS

1. The BOR needs to modify their current water management strategy to minimize spillway discharges from Arrowrock.
2. The BOR should implement a Lucky Peak bull trout capture and transport operation to offset losses from the Arrowrock population until entrainment losses are addressed.
3. Monitor the success of the Kirby Dam fish ladder for passing adult bull trout into the spawning habitat above.
4. An important component of the Arrowrock bull trout population is recruitment. We have no information concerning the timing, number and size of bull trout recruited from tributaries. This data would be extremely helpful in assessing environmental impacts such as entrainment of bull trout into Lucky Peak, therefore needs to be collected.

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Appendices A-E

Appendix A. Bull trout length (TL), weight, radio weight, radio weight as percentage of bull trout body weight, radio frequency, radio implant date and radio battery life for bull trout captured in Arrowrock Reservoir 1998.

<u>Bull Trout Length (mm)</u>	<u>Bull Trout Weight (g)</u>	<u>Radio wt/% BW*</u>	<u>Radio Frequency</u>	<u>Implant Date</u>	<u>Battery Life*</u>
288	200	2.1g/1.0	150.044	3/25/98	5/24/98
247	110	2.1g/1.9	150.053	3/25/98	5/24/98
260	140	2.1g/1.5	150.083	3/17/98	5/16/98
325	250	2.1g/0.8	150.122	3/23/98	5/22/98
346	320	2.1g/0.7	150.132	3/23/98	5/22/98
391	435	2.1g/0.5	150.162	4/10/98	6/9/98
336	260	3.6g/1.4	150.171	3/23/98	8/10/98
341	300	3.6g/1.2	150.192	3/13/98	7/31/98
301	200	3.6g/1.8	150.202	3/17/98	8/4/98
342	340	3.6g/1.0	150.212	3/13/98	7/31/98
311	220	3.6g/1.6	150.232	3/13/98	7/31/98
340	440	3.6g/0.8	150.252	3/23/98	8/10/98
339	360	3.6g/1.0	150.282	3/19/98	8/6/98
320	260	3.6g/1.4	150.292	3/17/98	8/4/98
280	170	3.6g/2.1	150.302	3/17/98	8/4/98
295	170	3.6g/2.1	150.311	3/17/98	8/4/98
300	200	3.6g/0.5	150.342	3/13/98	7/31/98
305	260	3.6g/1.4	150.362	3/13/98	7/31/98
332	280	3.6g/1.3	150.392	3/13/98	7/31/98
382	475	3.6g/0.7	150.402	3/13/98	7/31/98
437	775	11g/1.4	150.431	4/1/98	9/23/98
423	675	11g/1.6	150.514	3/26/98	9/17/98
436	650	11g/1.7	150.523	4/1/98	9/23/98
461	875	11g/1.2	150.563	4/7/98	9/29/98
454	730	11g/1.5	150.584	4/1/98	9/23/98
427	600	11g/1.8	150.604	4/10/98	10/2/98
441	660	11g/1.7	150.613	3/17/98	9/8/98
455	735	11g/1.5	150.674	3/26/98	9/17/98
461	810	11g/1.3	150.693	3/13/98	9/4/98
440	655	11g/1.7	150.723	4/1/98	9/23/98

Appendix A. (continued)

<u>Bull Trout Length (mm)</u>	<u>Bull Trout Weight (g)</u>	<u>Radio wt/% BW*</u>	<u>Radio Frequency</u>	<u>Implant Date</u>	<u>Battery Life*</u>
403	505	11g/2.2	151.143	4/1/98	9/23/98
402	505	11g/2.2	151.153	3/26/98	9/17/98
417	565	11g/1.9	151.163	4/1/98	9/23/98
455	820	11g/1.3	151.173	3/13/98	9/4/98
475	1120	17g/1.5	151.183	3/17/98	1/11/99
477	895	17g/1.9	151.193	3/26/98	1/20/99
492	1325	17g/1.3	151.204	4/1/98	1/26/99
489	1355	17g/1.2	151.214	4/7/98	2/1/99
496	1410	17g/1.2	151.224	3/17/98	1/11/99
667	3350	17g/0.5	151.253	4/10/98	2/4/99
513	1295	17g/1.3	151.264	4/2/98	1/27/99
475	985	17g/1.7	151.274	4/1/98	1/26/99
520	1375	17g/1.2	151.402	4/7/98	2/1/99
521	1415	17g/1.2	151.733	4/1/98	1/26/99
485	1300	17g/1.3	151.792	4/2/98	1/27/99
491	1220	17g/1.4	151.833	3/17/98	1/11/99
711	3860	17g/0.4	151.843	4/10/98	2/4/99
536	1905	30g/1.6	151.863	3/26/98	8/8/99
536	1825	30g/1.6	151.883	3/19/98	8/1/99
561	2040	30g/1.5	151.904	4/1/98	8/14/99
540	1720	30g/1.7	151.923	3/17/98	7/30/99
525	1830	30g/1.6	151.934	4/2/98	8/15/99
545	1710	30g/1.7	151.942	4/7/98	8/20/99
525	1750	30g/1.7	151.953	4/2/98	8/15/99
521	1620	30g/1.8	151.963	3/17/98	7/30/99
587	2845	30g/1.0	151.983	3/13/98	7/26/99
555	2220	30g/1.3	151.992	4/1/98	8/14/99

* BW = Body weight in grams at time of capture, Battery Life = Expected date when transmitter will cease transmitting signal.

Appendix B. Species composition of Arrowrock and Lucky Peak sampling occurring between March 9, 1998 - April 30, 1998 and March 11, 1998 - May 28, 1998, respectively.

Lucky Peak Population Composition		Arrowrock Population Composition	
Genus species common name	Percent of Catch ¹ (Number)	Genus species common name	Percent of Catch ¹ (Number)
<i>Salvelinus confluentus</i> bull trout	2.1 (29)	<i>Salvelinus confluentus</i> bull trout	1.4 (149)
<i>Catostomus macrocheilus</i> largescale sucker	49.9 (698)	<i>Catostomus macrocheilus</i> largescale sucker	27.3 (2,970)
<i>Catostomus columbianus</i> bridgelip sucker	16.4 (229)	<i>Catostomus columbianus</i> bridgelip sucker	12.6 (1,370)
<i>Ptychocheilus oregonensis</i> northern squawfish	12.7 (177)	<i>Ptychocheilus oregonensis</i> northern squawfish	9.9 (1,083)
<i>Prosopium williamsoni</i> mountain whitefish	16 (224)	<i>Prosopium williamsoni</i> mountain whitefish	23.5 (2,552)
<i>Perca flavescens</i> yellow perch	0.04 (4)	<i>Perca flavescens</i> yellow perch	18.1 (1,964)
<i>Salvelinus namaycush</i> lake trout	0.07 (1)	<i>Salvelinus namaycush</i> lake trout	(0)
<i>Oncorhynchus tshawytscha</i> chinook salmon	(0)	<i>Oncorhynchus tshawytscha</i> chinook salmon	0.02 (2)
<i>Oncorhynchus clarki lewisi</i> westslope cutthroat trout	0.07 (1)	<i>Oncorhynchus clarki lewisi</i> westslope cutthroat trout	0.01 (1)
<i>Richardsonius balteatus</i> reidside shiner	0.07 (1)	<i>Richardsonius balteatus</i> reidside shiner	7 (758)
<i>Oncorhynchus mykiss</i> hatchery rainbow	0.07 (1)	<i>Oncorhynchus mykiss</i> hatchery rainbow	0.03 (3)
<i>Oncorhynchus mykiss</i> redband trout	0.6 (8)	<i>Oncorhynchus mykiss</i> redband trout	0.2 (19)

Appendix B. (continued)

Lucky Peak Population Composition Arrowrock Population Composition

Genus species common name	Percent of Catch ¹ (Number)	Genus species common name	Percent of Catch ¹ (Number)
<i>Acrocheilus alutaceus</i> chiselmouth	1.7 (24)	<i>Acrocheilus alutaceus</i> chiselmouth	0.04 (4)
<i>Micropterus dolomieu</i> smallmouth bass	0.07 (1)	<i>Micropterus dolomieu</i> smallmouth bass	0.01 (1)

¹Catch from gill nets

Appendix C. Date of capture, length, and weight of bull trout less than 300 mm (TL) captured in Arrowrock Reservoir, 1998.

Sampling Date	Bull Trout	
	Length	Weight
3/25/98	247	110
3/30/98	255	125
4/1/98	255	120
3/31/98	256	135
3/31/98	258	125
3/16/98	260	140
3/30/98	263	145
4/7/98	270	140
4/1/98	275	150
4/1/98	275	155
4/2/98	275	145
3/31/98	276	180
3/31/98	277	170
3/17/98	280	170
3/26/98	283	195
3/31/98	284	175
3/12/98	285	180
3/25/98	288	200
3/11/98	290	205
4/23/98	290	200
4/27/98	290	200
4/29/98	290 ¹	210
4/30/98	290	225
4/15/98	291	195
3/30/98	293	195
3/16/98	295	170
3/26/98	295	190
3/26/98	297	225
4/30/98	297	225
4/29/98	298	225

¹ Recaptured bull trout used in population estimate for bull trout less than 300 mm in total length (TL).

Appendix D. Bull trout transported above Atlanta Dam and released in the Middle Fork Boise and Yuba Rivers in 1998.

Length (mm)	Weight (g)	Capture Location and Date	Release Location and Date, Comments	Radio Frequency
545	1660	Lucky Peak 5/28/98	2.4 km above Atlanta in MFBR on 5/28/98	151.652
545	1390	Lucky Peak 5/28/98	2.4 km above Atlanta in MFBR on 5/28/98, 1996-1997 Lucky Peak Recapture	151.433
320	250	Lucky Peak 5/28/98	2.4 km above Atlanta in MFBR on 5/28/98	Was not implanted with radio
478	900	Lucky Peak 5/28/98	In the Yuba River 2.4 km upstream from the confluence with the MFBR on 5/28/98	151.744
376	450	Lucky Peak 5/28/98	In the Yuba River 2.4 km upstream from the confluence with the MFBR on 5/28/98	150.944
355	330	Lucky Peak 5/28/98	In the Yuba River 2.4 km upstream from the confluence with the MFBR on 5/28/98, 1996-1997 Arrowrock Recapture	150.242
497	1000	In pool below Atlanta Dam 8/17/98	In the Yuba River 2.4 km upstream from the confluence with the MFBR on 8/20/98, Arrowrock recapture - radio tagged 3/17/98	151.833
510	1170	At confluence of Queens River and MFBR on 8/19/98	In the Yuba River 2.4 km upstream from the confluence with the MFBR on 8/20/98	151.392

Appendix D. (continued)

Length (mm)	Weight (g)	Capture Location and Date	Release Location and Date, Comments	Radio Frequency
190	55	Near confluence of Little Queens River and Queens River on 8/19/98	In the Yuba River 2.4 m upstream from the confluence with the MFBR on 8/20/98	Was not implanted with radio
220	85	At confluence of Queens River and MFBR on 8/19/98	In the Yuba River 2.4 km upstream from the confluence with the MFBR on 8/20/98	Was not implanted with radio
302	270	Near confluence of Queens River and MFBR on 8/19/98	In the Yuba River 2.4 km upstream from the confluence with the MFBR on 8/20/98	Was not implanted with radio
341	350	Near confluence of Queens River and MFBR on 8/19/98	In the Yuba River 2.4 km upstream from the confluence with the MFBR on 8/20/98	Was not implanted with radio
312	255	Near confluence of Queens River and MFBR on 8/19/98	In the Yuba River 2.4 km upstream from the confluence with the MFBR on 8/20/98	Was not implanted with radio

Appendix E. Locations of Arrowrock and Lucky Peak bull trout as identified by radio telemetry.

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
150.044	3/25/98	Arrowrock Reservoir - Nibbler Creek
	7/23/98	Arrowrock Reservoir - Cow Creek
150.053	3/25/98	Arrowrock Reservoir - Nibbler Creek
	5/21/98	Arrowrock Reservoir
	7/7/98	Arrowrock Reservoir - Lower boat ramp
	1/4/99	Lucky Peak - Near base of Arrowrock Dam
150.083	3/17/98	Arrowrock Reservoir - Nibbler Creek
150.122	5/21/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	3/23/98	Arrowrock Reservoir - Nibbler Creek
	5/21/98	Arrowrock Reservoir - 0.5 mile downstream from SFBR & MFBR Arms
150.132	9/15/98	Arrowrock Reservoir - Cottonwood Creek
	3/23/98	Arrowrock Reservoir - Nibbler Creek
150.162	5/21/98	Arrowrock Reservoir
	4/10/98	Arrowrock Reservoir - Nibbler Creek
	4/22/98	Arrowrock Reservoir - Cottonwood Creek
	4/24/98	Arrowrock Reservoir - Cherry Gulch
	5/8/98	MFBR
	5/19/98	MFBR - Logging Gulch
150.171	5/21/98	MFBR - Sheep Creek Hot Springs
	3/23/98	Arrowrock Reservoir - Nibbler Creek
150.192	3/13/98	Arrowrock Reservoir - Nibbler Creek
	4/24/98	Arrowrock Reservoir - 0.5 mile downstream from SFBR & MFBR Arms
	5/21/98	Arrowrock Reservoir - 0.5 mile downstream from SFBR & MFBR Arms
	7/23/98	SFBR - In river near Cougar Flat
	8/21/98	SFBR - Near Danskin Bridge in river
150.202	3/17/98	Arrowrock Reservoir - Nibbler Creek
	8/7/98	SFBR - In river near Cougar Flat
	8/21/98	SFBR - In river near Cougar Flat
	12/23/98	Arrowrock Reservoir - Dutch Creek
	12/31/98	Lucky Peak - Near base of Arrowrock Dam
150.212	3/13/98	Arrowrock Reservoir - Nibbler Creek
	4/9/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	5/21/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	8/7/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	8/21/98	Arrowrock Reservoir - Near South Fork Boise River Arm
	9/10/98	Arrowrock Reservoir
	9/15/98	Arrowrock Reservoir - Nibbler Creek
	10/19/98	Arrowrock Reservoir - Near South Fork Boise River Arm
	10/26/98	Arrowrock Reservoir - Nibbler Creek
	10/27/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/18/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/27/98	Arrowrock Reservoir - Nevins Creek
12/23/98	Arrowrock Reservoir	
150.232	3/13/98	Arrowrock Reservoir - Nibbler Creek
	4/22/98	Arrowrock Reservoir
150.242-YUB98	5/28/98	MFBR - Near mouth of the Yuba River
	6/8/98	MFBR - Half mile above Fall Creek
	6/9/98	MFBR - Queens River/Campground
	6/17/98	MFBR - Half mile below Black Warrior Creek
	6/18/98	MFBR - Half mile below Black Warrior Creek
	6/22/98	MFBR - Half mile below Black Warrior Creek

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
	6/29/98	MFBR - Half mile below Black Warrior Creek
	7/7/98	MFBR - Half mile below Black Warrior Creek
	7/14/98	MFBR - Half mile below Black Warrior Creek
	7/21/98	MFBR - Half mile below Black Warrior Creek
	7/27/98	MFBR - Half mile below Black Warrior Creek
	8/10/98	MFBR - Half mile below Black Warrior Creek
	8/17/98	MFBR - Half mile below Black Warrior Creek
	8/21/98	MFBR - Near mouth of Black Warrior Creek
	8/24/98	MFBR - Near mouth of Black Warrior Creek
	9/1/98	MFBR - Half mile below Black Warrior Creek
	9/8/98	MFBR - Near mouth of Black Warrior Creek
	9/10/98	MFBR - Near mouth of Black Warrior Creek
	9/14/98	MFBR - Between Roaring River and Lost Man Creek
	9/21/98	MFBR - Half mile below Black Warrior Creek
	9/25/98	MFBR - Swanholm Creek
	9/28/98	MFBR - Half mile below Troutdale
150.252	3/23/98	Arrowrock Reservoir - Nibbler Creek
	5/5/98	Arrowrock Reservoir - Lambing Creek
	7/10/98	NFBR - Deer Park Campground
150.282	3/19/98	Arrowrock Reservoir - Nibbler Creek
	5/12/98	Arrowrock Reservoir - Trail Creek
	5/21/98	MFBR - Birch Creek Campground
	6/1/98	MFBR
	6/9/98	MFBR
	6/15/98	MFBR
	6/22/98	MFBR
	6/30/98	MFBR
	7/7/98	MFBR
	7/14/98	MFBR
	7/21/98	MFBR
	7/27/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck)
	8/7/98	MFBR - Alder Creek
	8/10/98	MFBR
	8/17/98	MFBR
	8/21/98	MFBR - Twin Springs
	8/24/98	MFBR
	8/31/98	MFBR
	9/8/98	MFBR
	9/14/98	MFBR
	9/15/98	MFBR
	9/22/98	MFBR
	9/25/98	MFBR - Twin Springs
	9/29/98	MFBR
	9/30/98	MFBR - Alder Creek
	10/14/98	MFBR
	10/26/98	MFBR
	11/17/98	MFBR
150.292	3/17/98	Arrowrock Reservoir - Nibbler Creek
	4/9/98	Arrowrock Reservoir - Lambing Creek
150.302	3/17/98	Arrowrock Reservoir - Nibbler Creek
	7/7/98	Arrowrock Reservoir - Cottonwood Creek
	8/7/98	Arrowrock Reservoir - Trail Creek
	8/21/98	Arrowrock Reservoir - Cottonwood Creek
	9/15/98	Arrowrock Reservoir - Cottonwood Creek

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
150.431	4/1/98	Arrowrock Reservoir - Nibbler Creek
	4/9/98	Arrowrock Reservoir - Cherry Gulch
	4/22/98	Arrowrock Reservoir
	5/19/98	MFBR - Badger Creek
	5/21/98	MFBR - Near Sheep Creek mouth
	6/1/98	MFBR
	6/8/98	MFBR - Simmons Creek
	6/15/98	MFBR
	6/22/98	MFBR
	6/29/98	MFBR
	7/6/98	MFBR - Between Roaring River and Lost Man Creek
	7/10/98	MFBR - Half mile above Swanholm Creek
	9/14/98	MFBR - Half mile below Black Warrior Creek
	9/21/98	MFBR - Swanholm Creek
	9/28/98	MFBR - Between Roaring River and Lost Man Creek
	10/27/98	MFBR - Troutdale Campground
	11/17/98	Arrowrock Reservoir - Lambing Creek
12/23/98	Arrowrock Reservoir	
150.514	3/26/98	Arrowrock Reservoir - Nibbler Creek
	4/9/98	Arrowrock Reservoir - Cottonwood Creek
	5/21/98	Arrowrock Reservoir - Dutch Creek
	5/28/98	Arrowrock Dam - Upstream side
	6/8/98	MFBR
	6/17/98	MFBR - Alder Creek
	6/22/98	MFBR - Half mile below Troutdale
	6/29/98	MFBR - Troutdale Hot Springs
	7/7/98	MFBR - Pete Creek
	7/10/98	MFBR - Troutdale Hot Springs
	7/14/98	MFBR - Repeat Creek Campground
	7/21/98	MFBR
	7/23/98	MFBR
	7/27/98	MFBR - Between Roaring River and Lost Man Creek
	8/11/98	MFBR
	8/17/98	MFBR - Browns Creek
	8/21/98	MFBR - Near Smith Creek
	8/24/98	MFBR
	8/31/98	MFBR - Alder Creek
11/18/98	Arrowrock Reservoir - Nevins Creek	
12/4/98	Arrowrock Reservoir	
12/23/98	Arrowrock Reservoir	
150.523	4/1/98	Arrowrock Reservoir - Nibbler Creek
	4/17/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	4/22/98	Arrowrock Reservoir
	5/21/98	Arrowrock Reservoir - Trail Creek
	6/15/98	MFBR - Badger Creek
	6/18/98	MFBR - Near Sheep Creek mouth
	7/23/98	NFBR - 2 miles up Ballentyne Creek
	8/7/98	NFBR - 1.5 miles up Ballentyne Creek
8/21/98	NFBR - 2 miles up Ballentyne Creek	
150.563	4/7/98	Arrowrock Reservoir - Nibbler Creek
	5/21/98	MFBR - Badger Creek
	7/10/98	MFBR - Near the mouth of Roaring River
	8/7/98	MFBR - Near headwaters of Queens River
	8/21/98	MFBR - Near headwaters of Queens River

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
150.584	9/10/98	MFBR - 1.5 miles from top of Queens River
	9/30/98	MFBR - Near Sheep Creek mouth
	10/14/98	MFBR - Twin Springs
	12/23/98	Arrowrock Reservoir - Near South Fork Boise River Arm
	4/1/98	Arrowrock Reservoir - Nibbler Creek
	4/9/98	Arrowrock Reservoir
	4/15/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
	4/22/98	MFBR - Birch Creek Campground
	5/4/98	MFBR - Slide Gulch Bridge
	5/5/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
	5/19/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
	5/21/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
	6/1/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
	6/8/98	MFBR
	6/15/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
	6/22/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
	6/29/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
	7/7/98	Arrowrock Reservoir - Cherry Gulch
	7/14/98	Arrowrock Reservoir - Cherry Gulch
	7/21/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
7/23/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)	
7/27/98	Arrowrock Reservoir - Cherry Gulch	
8/7/98	MFBR - Slide Gulch	
8/10/98	Arrowrock Reservoir - Cherry Gulch	
8/17/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)	
8/21/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)	
8/24/98	Arrowrock Reservoir - Cherry Gulch	
8/31/98	Arrowrock Reservoir - Cherry Gulch	
9/8/98	Arrowrock Reservoir - Cherry Gulch	
9/10/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)	
9/14/98	Arrowrock Reservoir - Cherry Gulch	
9/15/98	Arrowrock Reservoir	
9/21/98	Arrowrock Reservoir - Cherry Gulch	
9/22/98	Arrowrock Reservoir - Cherry Gulch	
9/25/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)	
12/23/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)	
150.604	4/10/98	Arrowrock Reservoir - Nibbler Creek
	4/24/98	Arrowrock Reservoir - Cottonwood Creek
	5/18/98	Arrowrock Reservoir - Trail Creek
	5/21/98	Arrowrock Reservoir - Trail Creek
	6/1/98	Arrowrock Reservoir
150.613	3/17/98	Arrowrock Reservoir - Nibbler Creek
	6/18/98	SFBR - Near mouth of Gooseneck Creek (4 mi upriver from Rattlesnake Creek)
	7/10/98	SFBR - Near mouth of Gooseneck Creek (4 mi upriver from Rattlesnake Creek)
	7/23/98	SFBR - Near mouth of Gooseneck Creek (4 mi upriver from Rattlesnake Creek)
	8/7/98	SFBR - Near mouth of Gooseneck Creek (4 mi upriver from Rattlesnake Creek)
	8/21/98	SFBR - Near mouth of Gooseneck Creek (4 mi upriver from Rattlesnake Creek)
	9/10/98	SFBR - Near mouth of Gooseneck Creek (4 mi upriver from Rattlesnake Creek)
	10/6/98	Arrowrock Reservoir
	10/26/98	Arrowrock Reservoir
	11/17/98	Arrowrock Reservoir
	12/23/98	Arrowrock Reservoir
	150.674	3/26/98
4/9/98		MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>	
150.693	4/15/98	Arrowrock Reservoir - Cherry Gulch	
	4/17/98	Arrowrock Reservoir - Cherry Gulch	
	4/22/98	Arrowrock Reservoir - Cherry Gulch	
	7/1/98	Lucky Peak - Near base of Arrowrock Dam	
	7/5/98	Lucky Peak - Near base of Arrowrock Dam	
	7/7/98	Lucky Peak - Near base of Arrowrock Dam	
	7/23/98	Lucky Peak - Near base of Arrowrock Dam	
	8/7/98	Lucky Peak - Near base of Arrowrock Dam	
	8/10/98	Lucky Peak - Near base of Arrowrock Dam	
	8/17/98	Lucky Peak - Near base of Arrowrock Dam	
	8/21/98	Lucky Peak - Near base of Arrowrock Dam	
	8/24/98	Lucky Peak - Near base of Arrowrock Dam	
	9/1/98	Lucky Peak - Near base of Arrowrock Dam	
	9/10/98	Lucky Peak - Near base of Arrowrock Dam	
	9/14/98	Lucky Peak - Near base of Arrowrock Dam	
	9/22/98	Lucky Peak - Near base of Arrowrock Dam	
	9/30/98	Lucky Peak - Spring Shores boat ramp	
	150.723	3/13/98	Arrowrock Reservoir - Nibbler Creek
		4/9/98	Arrowrock Reservoir - Twin Creek
		4/15/98	Arrowrock Reservoir - Lambing Creek
4/17/98		Arrowrock Reservoir	
4/24/98		MFBR - Slide Gulch	
4/29/98		MFBR - Alder Creek	
5/4/98		MFBR	
5/8/98		MFBR - Browns Creek	
5/18/98		MFBR - Browns Creek	
5/21/98		MFBR	
6/8/98		NFBR - 0.5 mile downstream from Black Rock Campground	
7/10/98		NFBR - 1 mile upstream from Deer Park	
7/23/98		NFBR - 1 mile downstream from Johnson Creek in river	
8/7/98		NFBR - In Johnson Creek 2 mi above mouth	
9/10/98		NFBR - 1 mile upstream from Deer Park	
9/30/98		NFBR - Barber Flat	
10/14/98		MFBR - Gaging Station	
10/28/98	MFBR - Gaging Station		
11/18/98	MFBR - Gaging Station		
11/23/98	Arrowrock Reservoir		
150.944-YUB98	4/1/98	Arrowrock Reservoir - Nibbler Creek	
	5/5/98	Arrowrock Reservoir - Trail Creek	
	5/21/98	Arrowrock Reservoir - Cottonwood Creek	
	6/3/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)	
	6/8/98	MFBR - Gaging Station	
	6/15/98	MFBR - Birch Creek Campground	
	6/23/98	MFBR - Near Sheep Creek mouth	
	7/23/98	NFBR - 1 mile upstream from Deer Park	
	8/7/98	NFBR - Johnson Creek - near mouth	
	8/21/98	NFBR - Near mouth of Johnson Creek in river	
	9/10/98	NFBR - Between Bluejay Creek and Lodgepole Creek in river	
9/30/98	NFBR - Deer Park Campground		
11/17/98	Lucky Peak - Macks Creek		

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
	6/17/98	MFBR - Half mile above Fall Creek
	6/22/98	MFBR - Half mile above Fall Creek
	6/23/98	MFBR - Half mile above Fall Creek
	7/1/98	MFBR - 1.5 miles below James Creek
	7/6/98	MFBR - 1.5 miles below James Creek
	7/7/98	MFBR - 1.5 miles below James Creek
	7/14/98	MFBR - 1.5 miles below James Creek
	7/21/98	MFBR - 1.5 miles below James Creek
	7/23/98	MFBR - James Creek
	7/27/98	MFBR - Half mile above Fall Creek
	8/7/98	MFBR - James Creek
	8/10/98	MFBR - Half mile above Fall Creek
	8/11/98	MFBR - 1.5 miles below James Creek
	8/17/98	MFBR - 1.5 miles below James Creek
	8/21/98	MFBR - Atlanta power station
	8/24/98	MFBR - 1.5 miles below James Creek
	8/31/98	MFBR - Half mile above Fall Creek
	9/8/98	MFBR - Half mile above Fall Creek
	9/14/98	MFBR - Snyder Creek
	9/15/98	MFBR - Snyder Creek
	9/22/98	Arrowrock Reservoir - Lambing Creek
	9/29/98	Arrowrock Reservoir
	10/26/98	Arrowrock Reservoir - Upper boat ramp
	11/27/98	Arrowrock Reservoir - Grouse Creek
	12/23/98	Arrowrock Reservoir - Lower boat ramp
151.134-LP98	4/13/98	Arrowrock Reservoir - Lower boat ramp
	4/17/98	Arrowrock Reservoir - Cow Creek
	4/22/98	MFBR - Alder Creek
	5/4/98	MFBR - Repeat Creek Campground
	5/5/98	MFBR - Repeat Creek Campground
	5/8/98	MFBR
	5/18/98	MFBR - Breadwinner Creek
	6/1/98	MFBR - Browns Creek
	6/9/98	MFBR
	6/18/98	MFBR - Near the mouth of Roaring River
	6/22/98	MFBR - Buck Creek
	6/29/98	MFBR - 1 mile below Smith Creek
	7/10/98	MFBR - 1.5 mi up Queens River near mouth of Little Queens
	7/23/98	MFBR - 1.5 mi up Queens River near mouth of Little Queens
	8/7/98	MFBR - Near headwaters of Queens River
	8/21/98	MFBR - Near headwaters of Queens River
	9/10/98	MFBR - Near headwaters of Queens River
	9/25/98	MFBR - Near the mouth of Roaring River
	10/13/98	Arrowrock Reservoir
	10/26/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
151.143	4/1/98	Arrowrock Reservoir - Nibbler Creek
	4/24/98	Arrowrock Reservoir - Cottonwood Creek
	6/15/98	MFBR - Birch Creek Campground
	7/23/98	NFBR - Near mouth of Rabbit Creek
	8/7/98	NFBR - 1.5 miles downstream from Rabbit Creek mouth
	8/21/98	NFBR - Near mouth of Rabbit Creek
	9/10/98	NFBR - Near mouth of Rabbit Creek
	9/30/98	NFBR - 1 mile downstream from Rabbit Creek mouth
151.153	3/26/98	Arrowrock Reservoir - Nibbler Creek
	6/8/98	Arrowrock Reservoir - Cow Creek

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
151.153-ATL97	6/17/98	MFBR - Slide Gulch
	7/23/98	SFBR - Near mouth of Cow Creek in river
	8/7/98	SFBR - 1.5 miles upstream of Cow Creek in river
	8/21/98	SFBR - 1.5 miles upstream of Cow Creek in river
	9/10/98	SFBR - 1.5 miles upstream of Cow Creek in river
	9/25/98	SFBR - 1.5 miles upstream of Cow Creek in river
151.163	4/1/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir - Near South Fork Boise River Arm
	6/9/97	MFBR - Birch Creek Campground
	6/17/97	MFBR - Troutdale Hot Springs
	6/21/97	MFBR - Repeat Creek Campground
	6/24/97	MFBR - Alexander Creek
	6/28/97	MFBR
	7/3/97	MFBR - Dutch Creek Forest Service Station
	7/10/97	MFBR - Half mile below Black Warrior Creek
	7/12/97	MFBR - Queens River/Campground
	7/15/97	MFBR - Atlanta power station
	7/17/97	MFBR - Atlanta power station
	7/25/97	MFBR - James Creek
	7/29/97	MFBR - James Creek
	8/1/97	MFBR - Atlanta power station
	8/2/97	MFBR - Atlanta power station
	8/6/97	MFBR - Atlanta power station
	8/9/97	MFBR - Atlanta power station
	8/14/97	MFBR - Atlanta power station
	8/16/97	MFBR - Atlanta power station
	8/19/97	MFBR - Atlanta power station
	8/21/97	MFBR - Atlanta power station
	9/18/97	MFBR - Atlanta power station
	9/19/97	MFBR - Atlanta power station
	9/23/97	MFBR - Atlanta power station
	9/25/97	MFBR - Atlanta power station
	10/7/97	MFBR - Atlanta power station
	10/9/97	MFBR - Atlanta power station
	10/14/97	MFBR - Atlanta power station
	10/16/97	MFBR - Atlanta power station
	10/21/97	MFBR - Atlanta power station
	10/24/97	MFBR - Atlanta power station
10/28/97	MFBR - Atlanta power station	
10/31/97	MFBR - Atlanta power station	
11/4/97	MFBR - Atlanta power station	
11/6/97	MFBR - Atlanta power station	
11/19/97	MFBR - Atlanta power station	
11/26/97	MFBR - Atlanta power station	
11/28/97	MFBR - Atlanta power station	
5/18/98	MFBR - James Creek	
151.173	4/1/98	Arrowrock Reservoir - Nibbler Creek
	8/7/98	NFBR - 3 miles up Crooked River
	8/21/98	NFBR - 3 miles up Crooked River
	9/10/98	NFBR - Near mouth of Crooked River
	10/26/98	MFBR - Half mile below Troutdale
	11/16/98	MFBR - Half mile below Troutdale
11/17/98	MFBR - Half mile below Troutdale	
151.173	3/13/98	Arrowrock Reservoir - Nibbler Creek
	4/17/98	Arrowrock Reservoir - Trail Creek

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
151.183	6/23/98	MFBR - Twin Springs
	7/10/98	NFBR - Deer Park Campground
	8/7/98	NFBR - In Johnson Creek 2 mi above mouth
	8/21/98	NFBR - 4 mi up Johnson Creek
	9/10/98	NFBR - 2 miles from top of Johnson Creek
	9/30/98	NFBR - Near mouth of Crooked River
	10/19/98	MFBR - Half mile below Troutdale
	10/26/98	MFBR - Half mile below Troutdale
	11/23/98	Arrowrock Reservoir
	12/4/98	Arrowrock Reservoir - Trail Creek
	3/17/98	Arrowrock Reservoir - Nibbler Creek
	4/9/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
	4/24/98	MFBR - Birch Creek Campground
5/4/98	MFBR - Birch Creek Campground	
5/8/98	MFBR - Birch Creek Campground	
5/19/98	MFBR	
5/21/98	MFBR - Logging Gulch	
6/1/98	MFBR - Half mile below Troutdale	
6/8/98	MFBR	
6/18/98	NFBR - Near mouth of Rabbit Creek	
7/23/98	NFBR - 1 mile above Ballentyne Creek in river	
8/7/98	NFBR - 1 mile up Ballentyne Creek from mouth	
8/21/98	NFBR - At mouth of Ballentyne Creek	
9/10/98	NFBR - 0.5 mile up Ballentyne Creek	
9/28/98	MFBR - Near Sheep Creek mouth	
9/30/98	MFBR - Logging Gulch	
10/5/98	MFBR	
10/8/98	MFBR - Alder Creek	
10/13/98	MFBR	
10/19/98	MFBR	
151.193	3/26/98	Arrowrock Reservoir - Nibbler Creek
	4/9/98	Arrowrock Reservoir - Twin Creek
	5/5/98	Arrowrock Reservoir - Trail Creek
151.203	4/1/97	Arrowrock Reservoir - Cottonwood Creek
	6/24/97	Arrowrock Dam - Upstream side
	6/28/97	Arrowrock Dam - Upstream side
	8/21/97	SFBR - 1 mile below Rattlesnake Creek
	9/2/97	SFBR - Near mouth of Rattlesnake in SFBR
	9/12/97	SFBR - Near mouth of Rattlesnake in SFBR
	4/24/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	5/5/98	Arrowrock Reservoir - Cottonwood Creek
	5/8/98	Arrowrock Reservoir - Cottonwood Creek
	5/18/98	Arrowrock Reservoir - Cottonwood Creek
	5/21/98	Arrowrock Reservoir - 0.5 mile from dam
151.204	4/1/98	Arrowrock Reservoir - Nibbler Creek
	4/22/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	5/5/98	Arrowrock Reservoir - Cottonwood Creek
	5/21/98	Arrowrock Reservoir - 0.5 mile from dam
151.214	4/7/98	Arrowrock Reservoir - Nibbler Creek
	4/29/98	Arrowrock Reservoir
	5/5/98	Arrowrock Reservoir
	5/8/98	Arrowrock Reservoir - Trail Creek
	5/12/98	Arrowrock Reservoir

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
151.224	5/19/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
	5/21/98	MFBR - Gaging Station
	5/26/98	MFBR - Twin Springs
	6/1/98	MFBR - Alder Creek
	6/8/98	MFBR - Logging Gulch
	7/10/98	NFBR - Barber Flat
	8/21/98	NFBR - 2 miles up from confluence of NFBR and MFBR
	9/25/98	MFBR - Half mile below Troutdale
	151.242-LP98	3/17/98
3/26/98		Lucky Peak - Near base of Arrowrock Dam
9/28/98		Lucky Peak - Near base of Arrowrock Dam
9/30/98		Lucky Peak - Near base of Arrowrock Dam
10/19/98		Lucky Peak - Near base of Arrowrock Dam
10/26/98		Lucky Peak - Near base of Arrowrock Dam
10/28/98		Lucky Peak - Near base of Arrowrock Dam
11/16/98		Lucky Peak - Near base of Arrowrock Dam
11/17/98		Lucky Peak - Near base of Arrowrock Dam
11/23/98		Lucky Peak - Near base of Arrowrock Dam
11/27/98		Lucky Peak - Near base of Arrowrock Dam
12/4/98		Lucky Peak - Near base of Arrowrock Dam
12/23/98		Lucky Peak - Near base of Arrowrock Dam
151.243		4/8/98
151.253-R303	4/1/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir
	6/9/97	Arrowrock Reservoir
	6/14/97	MFBR - Slide Gulch Bridge
	6/17/97	Arrowrock Reservoir - Cherry Gulch
	6/21/97	MFBR - Slide Gulch
	6/24/97	MFBR - Troutdale
	7/5/97	MFBR - Slide Gulch Bridge
	7/15/97	MFBR - Birch Creek Campground
	7/17/97	MFBR - Birch Creek Campground
	8/21/97	NFBR - Barber Flat
	4/15/98	Arrowrock Dam - Upstream side
	4/17/98	Arrowrock Reservoir - Cow Creek
	4/1/97	Arrowrock Reservoir - Cottonwood Creek
5/15/97	Arrowrock Reservoir - Trail Creek	
6/9/97	MFBR - Browns Creek	
6/14/97	MFBR - Logging Gulch	
6/17/97	MFBR - Half mile below Troutdale	
6/21/97	MFBR - Troutdale Hot Springs	
6/28/97	MFBR - Idaho Outdoor Assn Campground	
7/3/97	MFBR - Browns Creek	
7/10/97	MFBR - Roaring River Bridge	
7/12/97	MFBR - Buck Creek	
7/17/97	MFBR - 1 mile above Swanholm Creek	
7/25/97	MFBR - Half mile below Eagle Creek	
8/1/97	MFBR - Queens River/Campground	
8/21/97	MFBR - Queens River/Campground	
9/2/97	MFBR - Near headwaters of Queens River	
9/12/97	MFBR - Near headwaters of Queens River	
9/23/97	MFBR - Troutdale Hot Springs	
9/25/97	MFBR - Troutdale Hot Springs	

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
	10/7/97	MFBR
	10/9/97	MFBR - Twin Springs
	10/16/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/21/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/24/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/28/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/31/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/4/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/6/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/19/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/20/97	Arrowrock Reservoir
	11/26/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/28/97	Arrowrock Reservoir - Nibbler Creek
	4/10/98	Arrowrock Reservoir - Nibbler Creek
	5/5/98	MFBR
	5/18/98	MFBR
	5/21/98	MFBR - Badger Creek
	6/1/98	MFBR - Browns Creek
	6/15/98	MFBR
	6/22/98	MFBR - Dobson Gulch
	6/29/98	MFBR
	7/6/98	MFBR - Lost Man Creek
	7/7/98	MFBR - Buck Creek
	7/10/98	MFBR - Half mile above Swanholm Creek
	7/14/98	MFBR - Steel Creek
	7/23/98	MFBR - Queens River/Campground
	8/7/98	MFBR - Near headwaters of Queens River
	8/21/98	MFBR - Near headwaters of Queens River
	9/10/98	MFBR - James Creek
	9/14/98	MFBR - Half mile below Troutdale
	9/15/98	MFBR - Troutdale
	9/28/98	Arrowrock Reservoir
	10/20/98	Arrowrock Reservoir
	10/28/98	Arrowrock Reservoir - Nibbler Creek
	11/24/98	Arrowrock Reservoir
151.264	4/2/98	Arrowrock Reservoir - Nibbler Creek
	4/22/98	Arrowrock Reservoir - Cottonwood Creek
	5/4/98	Arrowrock Reservoir - Cherry Gulch
	5/18/98	Arrowrock Reservoir - Cherry Gulch
	5/21/98	MFBR - Gaging Station
	5/26/98	MFBR
	6/2/98	MFBR - Twin Springs
	6/8/98	MFBR - Logging Gulch
	6/16/98	MFBR - Near Sheep Creek mouth
	6/18/98	MFBR - Near Sheep Creek mouth
	8/7/98	NFBR - 1 mile up Ballentyne Creek from mouth
	8/21/98	NFBR - 2 miles up Ballentyne Creek
	9/10/98	NFBR - 1 mile downstream from Deer Park in river
	9/30/98	NFBR - 1 mile downstream from Rabbit Creek mouth
	10/19/98	Arrowrock Reservoir
	10/26/98	Arrowrock Reservoir
	10/28/98	Arrowrock Reservoir - Trail Creek
	12/23/98	Arrowrock Reservoir - Cold Spring Creek
151.274	4/1/98	Arrowrock Reservoir - Nibbler Creek
	4/9/98	Arrowrock Reservoir - Grouse Creek
	4/17/98	Arrowrock Reservoir - Lower boat ramp

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
	4/29/98	MFBR - Browns Creek
	5/4/98	MFBR - Troutdale Campground
	5/5/98	MFBR - Half mile below Troutdale
	5/8/98	MFBR - Troutdale Campground
	5/18/98	MFBR - Half mile below Troutdale
	6/1/98	MFBR - Logging Gulch
	6/8/98	MFBR
	6/16/98	MFBR - Ninemeyer Creek/Campground
	6/18/98	MFBR - Ninemeyer Creek/Campground
	7/10/98	NFBR - Between Bluejay Creek and Lodgepole Creek in river
	7/23/98	NFBR - 3 miles from top of Johnson Creek
	8/7/98	NFBR - 4 mi up Johnson Creek
	8/21/98	NFBR - 4 mi up Johnson Creek
	9/10/98	Arrowrock Reservoir - Nevins Creek
	9/15/98	Arrowrock Reservoir
	9/25/98	Arrowrock Reservoir - Trail Creek
	9/30/98	Arrowrock Reservoir
	10/6/98	Arrowrock Reservoir
	10/14/98	Arrowrock Reservoir
	10/20/98	Arrowrock Reservoir
	10/26/98	Arrowrock Reservoir - Nibbler Creek
	10/27/98	Arrowrock Reservoir - Nevins Creek
	11/18/98	Arrowrock Reservoir - Trail Creek
151.282-LP98	4/13/98	Arrowrock Reservoir - Lower boat ramp
	5/12/98	MFBR
	5/19/98	MFBR - Gaging Station
	5/21/98	MFBR - Twin Springs
	6/18/98	NFBR - 1.5 miles upstream from Black Rock Campground
	7/10/98	NFBR - Graham Landing Strip
	7/23/98	NFBR - At headwaters
	8/7/98	NFBR - 1 mile up Mcleod Creek
	8/21/98	NFBR - 1 mile up Mcleod Creek
	9/10/98	NFBR - At mouth of Ballentyne Creek
	9/30/98	NFBR - At mouth of Ballentyne Creek
151.293-LP97	5/8/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir - Nevins Creek
	6/9/97	MFBR - Gaging Station
	6/14/97	MFBR - Birch Creek Campground
	6/17/97	MFBR - Twin Springs
	6/21/97	MFBR - Logging Gulch
	8/21/97	NFBR - 0.5 mile up Ballentyne Creek
	9/2/97	NFBR - 0.5 mile up Ballentyne Creek
	9/12/97	NFBR - 1 mile up Ballentyne Creek from mouth
	9/23/97	MFBR - Sheep Creek Hot Springs
	10/7/97	Arrowrock Reservoir - Nevins Creek
	10/9/97	Arrowrock Reservoir - Nevins Creek
	10/14/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/16/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/24/97	Arrowrock Reservoir - Nevins Creek
	10/28/97	Arrowrock Reservoir
	10/31/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/4/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/20/97	Arrowrock Reservoir - Cottonwood Creek
	11/26/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	4/24/98	MFBR - Near Sheep Creek mouth
	4/29/98	MFBR - Logging Gulch

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
	5/5/98	MFBR - Browns Creek
	5/8/98	MFBR - Browns Creek
	5/18/98	MFBR - Twin Springs
	5/21/98	MFBR
	7/10/98	NFBR - Deer Park Campground
	8/21/98	NFBR - 2 mi up Johnson Creek
	9/10/98	NFBR - 2 mi up Johnson Creek
	9/30/98	NFBR - 2 mi up Johnson Creek
151.303-LP98		
	4/9/98	Arrowrock Reservoir - Cherry Gulch
	4/13/98	Arrowrock Reservoir - Lower boat ramp
	5/12/98	MFBR - Birch Creek Campground
	5/19/98	MFBR - Browns Creek
	5/21/98	MFBR - Haga Creek
	6/8/98	NFBR - Near mouth of Rabbit Creek
	6/18/98	NFBR - 1 mile downstream from Rabbit Creek mouth
151.323-LP97		
	5/8/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir - Cottonwood Creek
	6/9/97	MFBR - Near Sheep Creek mouth
	6/17/97	MFBR - Haga Creek
	6/21/97	MFBR - Troutdale Campground
	6/28/97	MFBR - Troutdale Hot Springs
	7/3/97	MFBR
	7/10/97	MFBR
	7/12/97	MFBR - Near the mouth of Roaring River
	7/15/97	MFBR - Lost Man Creek
	7/17/97	MFBR - Between Roaring River and Lost Man Creek
	7/25/97	MFBR - Half mile below Black Warrior Creek
	8/1/97	MFBR - 1 mi up Queens River near bridge
	8/21/97	MFBR - 1.5 miles from top of Queens River
	9/2/97	MFBR - 1.5 miles from top of Queens River
	9/12/97	MFBR - 1.5 miles from top of Queens River
	9/23/97	MFBR - Swanholm Creek
	9/25/97	MFBR - Swanholm Creek
	10/7/97	MFBR
	10/9/97	MFBR - Alexander Creek
	10/28/97	MFBR - Ninemeyer Creek/Campground
	11/19/97	Arrowrock Reservoir - Near South Fork Boise River Arm
	4/22/98	Arrowrock Reservoir - Cherry Gulch
	4/29/98	Arrowrock Reservoir - Twin Creek
	5/19/98	MFBR - Birch Creek Campground
	5/21/98	MFBR
	6/8/98	MFBR - Logging Gulch
	6/15/98	MFBR - Logging Gulch
	6/16/98	MFBR - Logging Gulch
	6/22/98	MFBR - Haga Creek
	6/29/98	MFBR - Half mile below Troutdale
	7/6/98	MFBR - Troutdale Hot Springs
	7/14/98	MFBR - Ninemeyer Creek/Campground
	7/21/98	MFBR - Simmons Creek
	7/27/98	MFBR
	8/7/98	MFBR - Between Buck Creek and Lost Man Creek
	8/10/98	MFBR - Between Roaring River and Lost Man Creek
	8/17/98	MFBR - Between Roaring River and Lost Man Creek
	8/21/98	MFBR - Half mile below Dutch Creek Forest Service Station
	8/24/98	MFBR - Between Roaring River and Lost Man Creek
	8/31/98	MFBR - Near the mouth of Roaring River

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
151.333	9/8/98	MFBR - Straight Creek
	9/14/98	MFBR - Straight Creek
	9/21/98	MFBR - Near the mouth of Roaring River
	9/25/98	MFBR - Near the mouth of Roaring River
	9/28/98	MFBR - Straight Creek
	10/5/98	MFBR - Straight Creek
	10/13/98	MFBR - Straight Creek
	10/26/98	MFBR - Straight Creek
	10/28/98	MFBR - Straight Creek
	11/17/98	MFBR - Straight Creek
	11/23/98	MFBR - Straight Creek
	12/4/98	MFBR - Straight Creek
	151.344	4/9/97
5/15/97		Arrowrock Reservoir - Cold Spring Creek
6/9/97		MFBR - Gaging Station
6/14/97		MFBR - Birch Creek Campground
6/21/97		MFBR - Twin Springs
7/17/97		NFBR - In river near Graham
8/1/97		NFBR - 4 mi above Graham in river
8/21/97		NFBR - At mouth of Ballentyne Creek
9/2/97		NFBR - 1 mile up Mcleod Creek
9/12/97		NFBR - Barber Flat
9/19/97		MFBR
9/23/97		MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
9/25/97		MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
10/7/97		MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
10/9/97		MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
10/21/97		Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
10/24/97		Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
10/28/97		Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
10/31/97		Arrowrock Reservoir - Near South Fork Boise River Arm
11/4/97		Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
11/6/97		Arrowrock Reservoir - Near South Fork Boise River Arm
11/28/97		Arrowrock Reservoir - Near South Fork Boise River Arm
4/15/98		Arrowrock Reservoir - Trail Creek
4/29/98		MFBR - Birch Creek Campground
5/5/98		MFBR - Badger Creek
5/8/98		MFBR - Badger Creek
5/18/98		MFBR - Twin Springs
5/21/98	MFBR - Half mile below Troutdale	
7/23/98	NFBR - 2 miles from top of Johnson Creek	
8/7/98	NFBR - Above Graham Airport in river	
8/21/98	NFBR - Between Ballentyne and Mcleod Creeks in river	
9/10/98	NFBR - 1 mile upstream from Deer Park	
151.344	4/4/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir - Cottonwood Creek
	6/9/97	MFBR - Browns Creek
	6/14/97	MFBR - Near Sheep Creek mouth
	7/17/97	NFBR - Graham
	8/1/97	NFBR - 2 mi up Johnson Creek
	8/21/97	NFBR - 3 miles from top of Johnson Creek
	9/2/97	NFBR - 3 miles from top of Johnson Creek
	9/12/97	NFBR - 3 miles from top of Johnson Creek
	6/18/98	NFBR - 2 mi up Johnson Creek
	7/10/98	NFBR - 2 mi up Johnson Creek
	7/23/98	NFBR - 2 mi up Johnson Creek
	8/7/98	NFBR - 2 mi up Johnson Creek

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
151.353-LP97	8/21/98	NFBR - 2 mi up Johnson Creek
	9/10/98	NFBR - 2 mi up Johnson Creek
	9/30/98	NFBR - 2 mi up Johnson Creek
151.372-LP97	5/8/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir - Cottonwood Creek
	7/17/97	MFBR - Roaring River, 1.5 miles from top
	8/1/97	MFBR - Roaring River, 1.5 miles from top
	8/21/97	MFBR - At mouth of East Fork Roaring River
	9/2/97	MFBR - At mouth of East Fork Roaring River
	9/12/97	MFBR - At mouth of East Fork Roaring River
151.383-LP97	4/2/98	Lucky Peak - Near base of Arrowrock Dam
	5/8/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir - Nevins Creek
	7/17/97	NFBR - In river near Graham
	8/1/97	NFBR - 2 miles up Ballentyne Creek
	8/21/97	NFBR - 2 miles up Ballentyne Creek
	9/2/97	NFBR - 2 miles up from confluence of NFBR and MFBR
	7/10/98	NFBR - 1 mile upstream from Deer Park
	7/23/98	NFBR - Ballentyne Creek
	8/7/98	NFBR - Above Graham Airport in river
	8/21/98	NFBR - 1 mile below mouth of Ballentyne Creek in river
	9/10/98	NFBR - 0.5 mile up Ballentyne Creek
	9/30/98	NFBR - 1 mile upstream from Deer Park
	10/13/98	MFBR - Half mile below Troutdale
11/18/98	MFBR - Troutdale Campground	
151.383-LP97	5/13/97	Arrowrock Dam - Upstream side
	5/15/97	Arrowrock Reservoir - Cottonwood Creek
	6/9/97	MFBR
	6/14/97	MFBR - Sheep Creek Hot Springs
	6/17/97	MFBR - Haga Creek
	9/2/97	NFBR - Johnson Creek - near mouth
	9/12/97	NFBR - Johnson Creek - near mouth
	9/23/97	Arrowrock Reservoir - Cottonwood Creek
	9/25/97	Arrowrock Reservoir
	10/7/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/9/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/4/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/6/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	1/20/97	Arrowrock Reservoir - Cottonwood Creek
	11/26/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/28/97	Arrowrock Reservoir
	2/4/98	Arrowrock Reservoir - Near South Fork Boise River Arm
	4/9/98	MFBR - Slide Gulch Bridge
	4/22/98	MFBR - Near Sheep Creek mouth
	5/19/98	MFBR - Near Sheep Creek mouth
	7/10/98	NFBR - Horsefly Creek
	8/21/98	NFBR - Horsefly Creek
	9/10/98	NFBR - Johnson Creek - near mouth
9/29/98	MFBR - Half mile below Troutdale	
9/30/98	MFBR	
10/5/98	MFBR	
10/14/98	MFBR	
11/23/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)	

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
151.392-YUB98	8/21/98	MFBR - 2.5 miles up Yuba River
	9/10/98	MFBR - In Yuba River 0.25 mile upstream from Decker Creek Mouth
	9/25/98	MFBR - Near mouth of the Yuba River
151.402-R213	4/1/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir - Grouse Creek
	6/14/97	Arrowrock Reservoir - Cherry Gulch
	6/17/97	MFBR
	6/24/97	MFBR - Slide Gulch
	7/17/97	NFBR - Graham Landing Strip
	8/21/97	NFBR - 1 mile up Mcleod Creek
	9/2/97	NFBR - At mouth of Ballentyne Creek
	9/12/97	NFBR - Deer Park Campground
	10/7/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/9/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/14/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/16/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/21/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/24/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/28/97	Arrowrock Reservoir - Cinch Creek
	10/31/97	Arrowrock Reservoir - Cinch Creek
	11/4/97	Arrowrock Reservoir
	11/6/97	Arrowrock Reservoir
	11/19/97	Arrowrock Reservoir - Grouse Creek
	4/7/98	Arrowrock Reservoir - Nibbler Creek
	4/22/98	MFBR - Slide Gulch
	4/29/98	MFBR - Badger Creek
	5/8/98	MFBR - Alder Creek
	5/12/98	MFBR - Alder Creek
	5/21/98	MFBR - Near Sheep Creek mouth
	7/23/98	NFBR - 1 mile up Mcleod Creek
	8/7/98	NFBR - 1 mile up Mcleod Creek
	8/21/98	NFBR - Above Graham Airport in river
	9/10/98	NFBR - At mouth of Ballentyne Creek
	9/30/98	NFBR - 1 mile downstream from Deer Park in river
	11/18/98	MFBR - Troutdale Hot Springs
	151.433-ATL98	5/28/98
6/18/98		MFBR - Near mouth of Black Warrior Creek
7/10/98		MFBR - Near mouth of Black Warrior Creek
7/23/98		MFBR - Near mouth of Black Warrior Creek
8/7/98		MFBR - Near mouth of Black Warrior Creek
8/21/98		MFBR - Near mouth of Black Warrior Creek
9/10/98		MFBR - Near mouth of Black Warrior Creek
9/25/98		MFBR - Near mouth of Black Warrior Creek
10/28/98		MFBR - Fly Creek
11/17/98		MFBR - Fly Creek
11/23/98		MFBR - Fly Creek
151.593	4/24/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir - Cottonwood Creek
	6/9/97	MFBR
	6/14/97	MFBR - Troutdale
	6/17/97	MFBR - Troutdale
	6/21/97	MFBR - Loftus Creek
	6/24/97	MFBR - Dobson Gulch
	6/28/97	MFBR - Straight Creek

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
	7/3/97	MFBR - 1 mile above Swanholm Creek
	7/10/97	MFBR - Half mile below Eagle Creek
	7/17/97	MFBR - Queens River/Campground
	8/1/97	MFBR - 2 mi up Little Queens from mouth
	8/21/97	MFBR - 0.75 mile from top of Little Queens River
	9/2/97	MFBR - At headwaters of Little Queens River
	9/18/97	MFBR - Alexander Flats
	9/19/97	MFBR
	9/23/97	MFBR - Big Five Creek
	9/25/97	MFBR - Ninemeyer Creek/Campground
	10/7/97	MFBR - Troutdale Hot Springs
	10/9/97	MFBR - Troutdale Campground
	10/14/97	MFBR - Near Sheep Creek mouth
	10/16/97	MFBR - Near Sheep Creek mouth
	10/21/97	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
	10/24/97	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
	10/28/97	Arrowrock Reservoir
	4/9/98	Arrowrock Reservoir - Cherry Gulch
	5/20/98	MFBR - Half mile below Black Warrior Creek
	7/23/98	MFBR - At headwaters of Little Queens River
	8/7/98	MFBR - At headwaters of Little Queens River
	8/21/98	MFBR - At headwaters of Little Queens River
	9/10/98	MFBR - 1 mile up Little Queens from confluence w/Queens River
	9/18/98	MFBR - Near Smith Creek
	9/25/98	MFBR - Alexander Flats
	10/8/98	MFBR - Big Five Creek
	10/14/98	MFBR
151.603	4/1/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir - Cottonwood Creek
	9/2/97	NFBR - Johnson Creek - near mouth
	10/9/97	MFBR
	10/14/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/16/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/21/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/24/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/28/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/31/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/4/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/6/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/20/97	Arrowrock Reservoir - Cottonwood Creek
	11/26/97	Arrowrock Reservoir
	11/28/97	Arrowrock Reservoir
	4/24/98	MFBR - Birch Creek Campground
	5/8/98	MFBR - Alder Creek
	5/18/98	MFBR - Alder Creek
	5/21/98	MFBR - Half mile below Troutdale
	7/10/98	NFBR - Deer Park Campground
	9/10/98	Arrowrock Reservoir - Trail Creek
	10/6/98	Arrowrock Reservoir
	10/13/98	Arrowrock Reservoir
	10/19/98	Arrowrock Reservoir - Lambing Creek
	10/26/98	Arrowrock Reservoir - Lambing Creek
	11/24/98	Arrowrock Reservoir
	11/27/98	Arrowrock Reservoir - Lambing Creek
	12/23/98	Arrowrock Reservoir

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
151.613-LP97	5/13/97	Arrowrock Reservoir - Cottonwood Creek
	6/14/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	6/17/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	6/28/97	Arrowrock Reservoir
	7/17/97	Arrowrock Reservoir - Cottonwood Creek
	8/1/97	Arrowrock Reservoir - Cottonwood Creek
	8/21/97	Arrowrock Reservoir - Cottonwood Creek
	9/2/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	9/12/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	9/15/97	Arrowrock Reservoir - Near South Fork Boise River Arm
	9/18/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	9/19/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	9/23/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	9/25/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/7/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/9/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/14/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/16/97	Arrowrock Reservoir - Nibbler Creek
	10/21/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/24/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/28/97	Arrowrock Reservoir
	10/31/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/4/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/6/97	Arrowrock Reservoir - Nibbler Creek
	11/19/97	Arrowrock Reservoir
	11/20/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/26/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/28/97	Arrowrock Reservoir - Nibbler Creek
	2/4/98	Arrowrock Reservoir - 0.5 mile downstream from SFBR & MFBR Arms
	4/22/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	5/19/98	Arrowrock Reservoir - Nibbler Creek
	5/21/98	Arrowrock Reservoir - Nibbler Creek
	6/15/98	Arrowrock Reservoir - Nevins Creek
	6/16/98	Arrowrock Reservoir - Nibbler Creek
	7/7/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	7/27/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	8/10/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	8/17/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	8/24/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	9/1/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	9/8/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	9/14/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	9/15/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/6/98	Arrowrock Reservoir - Trail Creek
	10/14/98	Arrowrock Reservoir - Near South Fork Boise River Arm
	10/19/98	Arrowrock Reservoir - Nibbler Creek
	10/26/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/16/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/17/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/23/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/27/98	Arrowrock Reservoir - Cottonwood Creek
	12/4/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	12/23/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
151.643	4/1/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir - Cottonwood Creek
	6/9/97	MFBR - Birch Creek Campground
	6/17/97	MFBR

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
	6/21/97	MFBR - Sheep Creek Hot Springs
	7/17/97	NFBR - Johnson Creek - near mouth
	8/1/97	NFBR - Johnson Creek - near mouth
	8/21/97	NFBR - 1.5 miles up Ballentyne Creek
	9/2/97	NFBR - 1.5 miles up Ballentyne Creek
	9/12/97	NFBR - Graham
	9/19/97	MFBR - Near Sheep Creek mouth
	9/23/97	MFBR
	9/25/97	MFBR - Twin Springs
	10/31/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/4/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/6/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/20/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/28/97	Arrowrock Reservoir - Nevins Creek
	4/24/98	MFBR - Birch Creek Campground
	4/29/98	MFBR
	5/5/98	MFBR - Twin Springs
	5/19/98	MFBR - Near Sheep Creek mouth
	5/21/98	MFBR - Haga Creek
	6/8/98	NFBR - 1.5 miles upstream from Black Rock Campground
	7/23/98	NFBR - 2 miles up Ballentyne Creek
	8/7/98	NFBR - 1.5 miles up Ballentyne Creek
	8/21/98	NFBR - 2 miles up Ballentyne Creek
	9/10/98	NFBR - 0.5 mile up Ballentyne Creek
	9/30/98	NFBR - 1 mile up Ballentyne Creek from mouth
151.652-ATL98	5/28/98	MFBR - 3.5 miles upstream from Atlanta Dam
	6/8/98	MFBR - 3 Miles upstream from Atlanta Dam
	6/9/98	MFBR - 3.5 miles upstream from Atlanta Dam
	6/15/98	MFBR - 3.5 miles upstream from Atlanta Dam
	6/18/98	MFBR - 3.5 miles upstream from Atlanta Dam
	6/22/98	MFBR - 3.5 miles upstream from Atlanta Dam
	7/10/98	MFBR - Mouth of Leggit Creek, above Atlanta Dam
	7/23/98	MFBR - Mouth of Leggit Creek, above Atlanta Dam
	8/7/98	MFBR - 2.5 miles up Yuba River
	8/21/98	MFBR - 2.5 miles up Yuba River
	9/10/98	MFBR - In Yuba River 0.25 mile upstream from Decker Creek Mouth
	9/25/98	MFBR - 2.5 miles up Yuba River
151.663	4/1/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir - Nevins Creek
	8/21/97	NFBR - Near mouth of Johnson Creek in river
	9/2/97	NFBR - 1.5 miles up Ballentyne Creek
	9/12/97	NFBR - Four Mile Campground
	10/14/97	Arrowrock Reservoir
	10/16/97	Arrowrock Reservoir
	10/21/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/24/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/28/97	Arrowrock Reservoir
	10/31/97	Arrowrock Reservoir
	11/4/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/6/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/26/97	Arrowrock Reservoir
	11/28/97	Arrowrock Reservoir - Nibbler Creek
	4/22/98	MFBR - Troutdale
	4/24/98	MFBR - Sheep Creek Hot Springs
	4/29/98	MFBR - Sheep Creek Hot Springs
	5/8/98	MFBR - Sheep Creek Hot Springs

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
151.703-LP97	5/19/98	MFBR - Near Sheep Creek mouth
	5/21/98	MFBR - Half mile below Troutdale
	7/10/98	NFBR - Deer Park Campground
	8/7/98	NFBR - Above Graham Airport in river
	8/21/98	NFBR - At mouth of Ballentyne Creek
	9/30/98	NFBR - 1 mile upstream from Deer Park
	5/8/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	6/9/97	MFBR - Birch Creek Campground
	6/14/97	MFBR - Birch Creek Campground
6/17/97	MFBR - Birch Creek Campground	
6/21/97	MFBR - Birch Creek Campground	
6/24/97	MFBR - Browns Creek	
8/21/97	NFBR - At mouth of Ballentyne Creek	
9/2/97	NFBR - 1 mile up Ballentyne Creek from mouth	
9/12/97	NFBR - 0.5 mile up Ballentyne Creek	
10/7/97	MFBR	
10/9/97	MFBR	
10/14/97	MFBR - Twin Springs	
10/16/97	MFBR - Twin Springs	
10/21/97	MFBR	
10/24/97	MFBR	
10/28/97	MFBR - Alder Creek	
4/9/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)	
4/17/98	MFBR - Alder Creek	
4/24/98	MFBR	
4/29/98	MFBR - Alder Creek	
5/8/98	MFBR - Alder Creek	
5/18/98	MFBR - Alder Creek	
5/21/98	MFBR	
6/18/98	NFBR - Near mouth of Crooked River	
7/10/98	NFBR - Between Bluejay Creek and Lodgepole Creek in river	
7/23/98	NFBR - Above Graham Airport in river	
8/7/98	NFBR - Above Graham Airport in river	
8/21/98	NFBR - 2 miles up Ballentyne Creek	
9/10/98	NFBR - At mouth of Ballentyne Creek	
151.733	4/1/98	Arrowrock Reservoir - Nibbler Creek
	4/15/98	Arrowrock Reservoir - Lambing Creek
	4/17/98	Arrowrock Reservoir - Lambing Creek
	4/22/98	Arrowrock Reservoir
	5/8/98	MFBR - Birch Creek Campground
	5/19/98	MFBR - Twin Springs
	5/21/98	MFBR - Logging Gulch
	6/18/98	NFBR - Near mouth of Bear River
	8/7/98	NFBR - 1 mile up Mcleod Creek
	8/21/98	NFBR - At headwaters of Mcleod Creek
	9/10/98	NFBR - Deer Park Campground
	9/28/98	Arrowrock Reservoir
	9/30/98	Arrowrock Reservoir - Trail Creek
151.744-YUB98	5/28/98	MFBR - Near mouth of the Yuba River
	6/8/98	MFBR - Buck Creek
	7/23/98	MFBR - 3 miles up Black Warrior Creek
	8/7/98	MFBR - 3 miles up Black Warrior Creek
	8/21/98	MFBR - Near headwaters of Black Warrior Creek
	9/10/98	MFBR - Near headwaters of Black Warrior Creek

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
151.792	4/2/98	Arrowrock Reservoir - Nibbler Creek
	4/22/98	Arrowrock Reservoir - Cottonwood Creek
	4/24/98	Arrowrock Reservoir - Nevins Creek
	4/29/98	MFBR
	5/11/98	Lucky Peak - Near base of Arrowrock Dam
	5/12/98	Lucky Peak - Near base of Arrowrock Dam
	5/27/98	Lucky Peak - Near base of Arrowrock Dam
	6/3/98	Lucky Peak - Near base of Arrowrock Dam
	6/9/98	Lucky Peak - Near base of Arrowrock Dam
	6/17/98	Lucky Peak - Near base of Arrowrock Dam
	6/18/98	Lucky Peak - Spring Shores boat ramp
	6/19/98	Lucky Peak - Within 0.5 mile of Lucky Peak Dam
	6/26/98	Lucky Peak - Near base of Arrowrock Dam
	6/27/98	Lucky Peak - Near base of Arrowrock Dam
	7/7/98	Lucky Peak - Near base of Arrowrock Dam
	7/10/98	Lucky Peak - Near base of Arrowrock Dam
	7/23/98	Lucky Peak - Near base of Arrowrock Dam
	8/7/98	Lucky Peak - Near base of Arrowrock Dam
	8/17/98	Lucky Peak - Near base of Arrowrock Dam
	8/25/98	Lucky Peak - Near base of Arrowrock Dam
9/8/98	Lucky Peak - Near base of Arrowrock Dam	
9/30/98	Lucky Peak - 0.5 miles upriver from Spring Shores boat ramp	
10/20/98	Lucky Peak	
10/28/98	Lucky Peak - Browns Gulch	
11/24/98	Lucky Peak - Browns Gulch	
12/23/98	Lucky Peak	
151.812-LP98	4/8/98	Arrowrock Reservoir - Lower boat ramp
	5/4/98	MFBR
	5/5/98	MFBR
	5/8/98	MFBR - Birch Creek Campground
	5/18/98	MFBR - Badger Creek
	5/21/98	MFBR - Near Sheep Creek mouth
	7/10/98	NFBR - 1 mile upstream from Deer Park
	8/7/98	NFBR - 2 mi up Johnson Creek
8/21/98	NFBR - 3 miles from top of Johnson Creek	
151.833-YUB98	3/17/98	Arrowrock Reservoir - Nibbler Creek
	4/15/98	Arrowrock Reservoir
	4/17/98	Arrowrock Reservoir - Twin Creek
	4/22/98	MFBR - Troutdale Campground
	4/29/98	MFBR - Sheep Creek Hot Springs
	5/12/98	MFBR - Big Five Creek
	5/19/98	MFBR
	6/2/98	MFBR - Swanholm Creek
	6/8/98	MFBR - Half mile below Black Warrior Creek
	6/15/98	MFBR - Near Bald Mountain Creek
	6/18/98	MFBR - In Queens River near mouth
	6/29/98	MFBR - 1.5 miles below James Creek
	7/6/98	MFBR - 1.5 miles below James Creek
	8/7/98	MFBR - James Creek
8/21/98	MFBR - 2.5 miles up Yuba River	
9/30/98	Arrowrock Reservoir - Near South Fork Boise River Arm	
151.843	4/10/98	Arrowrock Reservoir - Nibbler Creek
	4/24/98	MFBR - Willow Creek/Campground (Mouth of Middle Fork Boise at full pool)
	5/12/98	Arrowrock Reservoir - Cherry Gulch

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
151.863	5/19/98	MFBR - Slide Gulch Bridge
	5/21/98	MFBR - Badger Creek
	6/18/98	NFBR - 1.5 miles upstream from Black Rock Campground
	7/10/98	NFBR - 1 mile upstream from Deer Park
	8/7/98	NFBR - 1.5 miles up Ballentyne Creek
	8/21/98	NFBR - 2 miles up Ballentyne Creek
	9/10/98	NFBR - At mouth of Ballentyne Creek
151.883	3/26/98	Arrowrock Reservoir - Nibbler Creek
	4/24/98	Arrowrock Reservoir - Cherry Gulch
	5/5/98	Arrowrock Reservoir - Cherry Gulch
	5/18/98	MFBR - Slide Gulch Bridge
	5/21/98	MFBR - Slide Gulch Bridge
	6/2/98	MFBR - Slide Gulch Bridge
	6/8/98	MFBR - Slide Gulch Bridge
	6/16/98	MFBR - Birch Creek Campground
	6/22/98	MFBR
	6/29/98	MFBR - Half mile below Troutdale
	7/10/98	NFBR - Near mouth of Crooked River
	7/23/98	NFBR - 1 mile upstream from Deer Park
	8/7/98	NFBR - Above Graham Airport in river
	8/21/98	NFBR - Graham Landing Strip
	9/10/98	NFBR - Johnson Creek - near mouth
	9/30/98	NFBR - Johnson Creek - near mouth
151.904-R282	3/19/98	Arrowrock Reservoir - Nibbler Creek
	4/22/98	MFBR - Slide Gulch
	4/29/98	MFBR - Birch Creek Campground
	5/5/98	MFBR - Alder Creek
	5/8/98	MFBR - Alder Creek
	5/19/98	MFBR - Twin Springs
	5/21/98	MFBR
	6/2/98	MFBR - Half mile below Troutdale
	6/9/98	MFBR
	6/15/98	MFBR - Simmons Creek
	6/18/98	MFBR - Alexander Flats
	6/22/98	MFBR - Alexander Creek
	6/29/98	MFBR - Straight Creek
	7/6/98	MFBR - 1 mile below Smith Creek
	7/10/98	MFBR - 0.5 mile up Black Warrior Creek
	7/23/98	MFBR - 5 miles up Black Warrior Creek
	8/7/98	MFBR - Near headwaters of Black Warrior Creek
	8/21/98	MFBR - Near headwaters of Black Warrior Creek
9/10/98	MFBR - Near headwaters of Black Warrior Creek	
9/25/98	MFBR - Near headwaters of Black Warrior Creek	
151.904-R282	4/1/97	Arrowrock Reservoir - Cottonwood Creek
	5/15/97	Arrowrock Reservoir
	6/9/97	MFBR - Alder Creek
	6/14/97	MFBR
	6/17/97	MFBR - Half mile below Troutdale
	6/21/97	MFBR - Half mile below Troutdale
	6/24/97	MFBR - Troutdale Hot Springs
	7/3/97	MFBR
	7/10/97	MFBR - Alexander Creek
	7/12/97	MFBR - Straight Creek
	7/15/97	MFBR - Buck Creek
	7/17/97	MFBR - Buck Creek

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
	7/29/97	MFBR - 1 mi up Queens River near bridge
	8/1/97	MFBR - 1.5 mi up Queens River near mouth of Little Queens
	8/2/97	MFBR - 1 mi up Queens River near bridge
	8/9/97	MFBR - 1 mi up Queens River near bridge
	8/16/97	MFBR - 1 mi up Queens River near bridge
	8/21/97	MFBR - 1.5 mi up Queens River near mouth of Little Queens
	9/2/97	MFBR - 1 mile up Little Queens from confluence w/Queens River
	9/23/97	MFBR - Loftus Creek
	9/25/97	MFBR - Loftus Creek
	10/9/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/14/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/16/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	10/21/97	Arrowrock Reservoir
	10/24/97	Arrowrock Reservoir
	10/28/97	Arrowrock Reservoir
	10/31/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/4/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/6/97	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/19/97	Arrowrock Reservoir
	11/20/97	Arrowrock Reservoir - Cottonwood Creek
	11/26/97	Arrowrock Reservoir - Cottonwood Creek
	11/28/97	Arrowrock Reservoir - Nevins Creek
	4/1/98	Arrowrock Reservoir - Nibbler Creek
	4/22/98	MFBR
	5/8/98	MFBR - Alder Creek
	5/12/98	MFBR - Alder Creek
	5/19/98	MFBR - Twin Springs
	5/21/98	MFBR - Logging Gulch
	6/1/98	MFBR - Half mile below Troutdale
	6/8/98	MFBR - Loftus Creek
	6/16/98	MFBR - Ninemeyer Creek/Campground
	6/18/98	MFBR - Ninemeyer Creek/Campground
	6/22/98	MFBR - Mink Creek
	6/29/98	MFBR - Between Buck Creek and Lost Man Creek
	7/6/98	MFBR - Steppe Creek
	7/10/98	MFBR - Queens River/Campground
	8/7/98	MFBR - At headwaters of Little Queens River
	8/21/98	MFBR - 0.75 mile from top of Little Queens River
	9/10/98	MFBR - 1 mile up Little Queens from confluence w/Queens River
	9/15/98	MFBR - Half mile above Dutch Creek Forest Service Station
	9/25/98	MFBR - Half mile below Troutdale
	9/28/98	MFBR - Half mile below Troutdale
	9/30/98	MFBR - Troutdale
	10/8/98	MFBR - Logging Gulch
	11/16/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/17/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/23/98	Arrowrock Reservoir
	12/23/98	Arrowrock Reservoir
151.923	3/17/98	Arrowrock Reservoir - Nibbler Creek
	5/7/98	Lucky Peak - Near base of Arrowrock Dam
	5/11/98	Lucky Peak - Near base of Arrowrock Dam
	5/12/98	Lucky Peak - Near base of Arrowrock Dam
	5/21/98	Lucky Peak - Near base of Arrowrock Dam
	5/24/98	Lucky Peak - Near base of Arrowrock Dam
	6/8/98	Lucky Peak - Near base of Arrowrock Dam
	6/18/98	Lucky Peak - Near base of Arrowrock Dam
	7/7/98	Lucky Peak - Near base of Arrowrock Dam

Appendix E. (continued)

<u>Frequency</u> (MHZ)	<u>Date</u>	<u>Location</u>
151.934	7/10/98	Lucky Peak - Near base of Arrowrock Dam
	8/21/98	Lucky Peak - Near base of Arrowrock Dam
	9/10/98	Lucky Peak - Near base of Arrowrock Dam
	9/25/98	Lucky Peak - Near base of Arrowrock Dam
	9/30/98	Lucky Peak - Near base of Arrowrock Dam
	10/14/98	Lucky Peak - Near base of Arrowrock Dam
	10/19/98	Lucky Peak - Near base of Arrowrock Dam
	10/26/98	Lucky Peak - Near base of Arrowrock Dam
	11/16/98	Lucky Peak - Near base of Arrowrock Dam
	11/17/98	Lucky Peak - Near base of Arrowrock Dam
	11/23/98	Lucky Peak - Near base of Arrowrock Dam
	11/27/98	Lucky Peak - Near base of Arrowrock Dam
	12/4/98	Lucky Peak - Near base of Arrowrock Dam
	12/23/98	Lucky Peak - Near base of Arrowrock Dam
151.942	4/2/98	Arrowrock Reservoir - Nibbler Creek
	4/15/98	Arrowrock Reservoir - Cherry Gulch
	4/17/98	Arrowrock Reservoir - Cherry Gulch
	4/22/98	MFBR - Slide Gulch
	5/5/98	MFBR - Birch Creek Campground
	5/18/98	MFBR - Badger Creek
	5/21/98	MFBR
	6/1/98	MFBR - Near Sheep Creek mouth
	6/8/98	MFBR
	6/9/98	MFBR
	9/14/98	MFBR - Near Sheep Creek mouth
	9/15/98	MFBR - Near Sheep Creek mouth
	9/22/98	Arrowrock Reservoir
	9/25/98	Arrowrock Reservoir - Cottonwood Creek
	9/28/98	Arrowrock Reservoir
	10/27/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
	11/16/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)
11/17/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)	
11/23/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)	
12/23/98	Arrowrock Reservoir - Irish Creek (Upper camping area below Cottonwood Ck.)	
151.953	4/7/98	Arrowrock Reservoir - Nibbler Creek
	4/15/98	Arrowrock Reservoir - Trail Creek
	4/17/98	Arrowrock Reservoir - Trail Creek
	4/24/98	Arrowrock Reservoir - Trail Creek
	5/12/98	MFBR - Birch Creek Campground
	5/18/98	Arrowrock Reservoir - Cherry Gulch
	5/21/98	MFBR - Birch Creek Campground
	5/26/98	MFBR - Birch Creek Campground
	6/1/98	MFBR - Birch Creek Campground
	6/8/98	MFBR
	6/15/98	MFBR - Logging Gulch
	7/10/98	NFBR - Deer Park Campground
	7/23/98	NFBR - At mouth of Ballentyne Creek
	8/7/98	NFBR - At mouth of Ballentyne Creek
	8/21/98	NFBR - 4 mi up Johnson Creek
9/10/98	NFBR - 2 mi up Johnson Creek	
9/30/98	NFBR - Near mouth of Johnson Creek in river	