

# **PROGRESS REPORT**

## **Teton Canyon Fishery Study**

**by**

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During construction of the Teton Dam and after its collapse on June 5, 1976, significant fish habitat changes occurred in the upstream 17 miles of Teton River through the Teton Canyon. The lower portion of one spawning tributary, Canyon Creek, was also altered. A four-year fishery study was initiated in 1997 to determine the current status of the Teton Canyon fishery and its restoration potential. Co-funded by Bureau of Reclamation (BOR) and Idaho Department of Fish and Game (IDFG) - Teton River Enhancement Program, this study is one of several research activities being conducted in the old Teton Dam reservoir area (Schrader 1997; Randle and Bauman 1997). The recent petition for listing Yellowstone cutthroat trout, a Teton resident, as a threatened species under the federal Endangered Species Act has heightened the importance of this research.

Major goals of the fishery study are to: 1) survey anglers and their catch; 2) describe fish life history, movement, and habitat use patterns; and 3) inventory fish populations. This report summarizes progress made achieving these goals by IDFG work crews (Mike Jones, Kevin Brenden, Gillian Crymes, numerous volunteers, and myself) during 1999. Progress on additional tasks is also presented. All data have been entered into computer files and proofed, and some preliminary analyses have been completed. Results presented here are provisional and have not been peer-reviewed.

One major task remains to be completed in 2000. A fully randomized creel survey used in 1974 and 1975 (Irving et al. 1977), 1980 (Jeppson 1981), and 1988 and 1994 (IDFG Region 6 files) will be repeated and will require the majority of our field time. Reward jaw tags may be used to estimate exploitation. Data from the 1974, 1975, and 1980 surveys have been retrieved and will be entered into the IDFG creel survey program for comparable analysis; 1988 and 1994 data have already been entered and analyzed.

In addition, genetic analysis of all radiotagged fish will be completed. John Irving's raw data from 1974 have been entered but not analyzed. We were unable to resample any of his original 1974 Canyon study sections because the descriptions and photos are lost. ERI data from 1987 and 1988 ladder trapping at Felt Dam have been entered but not analyzed. IDFG data from 1988-91 Canyon float trips, 1991 Barrow Ponds gill netting, and 1992 Parkinson electrofishing have been entered but not analyzed.

## FISCAL YEAR 1999 STUDY ACCOMPLISHMENTS

### Survey Anglers and their Catch

**Incidental Creel Survey.** Like 1998, we planned to collect incidental creel information in 1999 using volunteer postcards and angler interviews. However, we abandoned this objective due to insufficient time and personnel. This was our lowest priority, as analysis of previous incidental creel data (1987-95; IDFG Region 6 files) and other postcard surveys from the Upper Snake Region have shown inconclusive results.

### Describe Fish Life History, Movement, and Habitat Use Patterns

**Fish Marking.** To describe fish movements in the Teton drainage, we designed a fish marking program and used protocols as described by Nielsen (1992). Three types of permanent marks have been used since 1997: 1) radio tags on adult trout ( $\geq 385$  mm, TL) in 1998-99; 2) ventral fin clips (pelvic or pectoral) on trout, mountain whitefish, and suckers in 1997-99; and 3) visible implant (VI) tags on adult trout ( $\geq 300$  mm, TL) in 1999. Different kinds of marks were used in order to corroborate results. We abandoned using ventral fin clips in July 1999, partly because of confusion when recording pelvic (lv or rv) versus pectoral (lp or rp) clips. We will continue to record them and any other marks encountered in the future.

Historically, jaw tags were used to study pre-dam trout movements in 1974-75 (Irving et al. 1977). Jaw tags were also used on post-dam trout in 1987-88 (ERI 1987, 1988) and by IDFG personnel in 1987-95 (IDFG Region 6 files). Pre- and post-dam movement comparisons based on current and historic marking data will be presented in the final report.

Preliminary analyses of our 1997-99 marking data (excluding radiotagged fish) have shown the following:

- ✓ Total 5,446 fish marked (Table 1).
- ✓ Almost three-fourths were mountain whitefish (2,386 or 44%) and suckers (1,633 or 30%).
- ✓ Total 39 of all marked fish were recaptured (Table 2).
- ✓ Most were mountain whitefish (17 or 44%) and cutthroat trout (15 or 38%).
- ✓ All recaptures except seven were caught in the same study zone where they were marked.
- ✓ Possible that some recaptured fin clips were not recorded correctly - pelvic versus pectoral.

**Radiotelemetry.** Seventy-nine adult trout ( $\geq 600$  g or  $\geq 385$  mm TL) were radio tagged in the mainstem Teton River from 5 August 1998 to 23 May 1999 (Table 3; Figure 1). Tagging was initially stratified by study zone (20 fish in the Lower Teton, 20 in the Teton Canyon, and 20 in the Teton Valley) in August and September 1998, but nineteen transmitters were retrieved from

fish that died and re-used. Eight were retrieved and re-used in the Valley in September and October 1998, prior to winter. Eleven more were retrieved and re-used in April and May 1999, prior to spawning (2 in the Lower Teton, 4 in the Canyon, and 5 in the Valley). Of all 79 fish tagged, 28% were in the Lower Teton (22 fish), 30% were in the Canyon (24 fish), and 42% were in the Valley (33 fish).

We also tried to stratify tagging by river mile, successfully in the Valley where access and sampling conditions were good, but unsuccessfully in the Canyon and Lower Teton where they were not. Hence, some portions of the Teton River did not receive radiotagged fish (Figure 1). No fish were tagged from the Highway 33 bridge down to Badger Creek including at the Felt Dam ladder. Nor were fish tagged at the Barrow Ponds just above Teton Dam. Except for two fish that were trapped and tagged at the South Fork ladder, no fish were tagged from the Hog Hollow bridge (north of Newdale) down to the lower portions of the two Teton forks.

We radio tagged the first suitable cutthroat (57 fish, or 72%), rainbow (9 fish, or 11%), or cutthroat x rainbow hybrid trout (13 fish, or 17%) captured each river mile, irrespective of species, while floating downstream (Table 3). Genetic analysis using DNA techniques will be completed in 2000 to confirm these taxa. A suitable fish had to be healthy in appearance and weigh more than 575 g for the tag-to-body weight ratio to be less than 2.0%. Yellowstone cutthroat trout are wild and native to the drainage, but naturalized rainbow and hybrid trout are descendents of previously stocked hatchery fish. Most tagged fish (64) were captured by electrofishing from a drift boat. We ceased tagging on 23 May 1999 when we sunk the boat and gear. Another thirteen fish were caught by hook-and-line gear from white water rafts in August and early September 1998, and two fish were trapped at the South Fork ladder in April 1999.

Radiotelemetry gear specifications, surgery techniques, and location methods are described in last year's annual report (Schrader 1999).

We last located radiotagged fish on 26 October 1999. At that time nine fish were still alive (three in the Lower Teton, two in the Canyon, and four in the Valley). From 5 August 1998 to 26 October 1999, more than a year after beginning, we logged 1380 locations for the combined 79 radiotagged fish (Figure 2). Some of these locations will not be used due to tagging effects and some will be used to calculate error estimates. All location data have been entered into an ArcView GIS database (ESRI, Inc., Redlands, CA), movement maps for each fish have been produced, but techniques to quantify and analyze these data still needs to be acquired.

A major assumption of any radiotelemetry study is that capturing the animal or having it carry a radio transmitter does not influence its future behavior or survival (White and Garrott 1990). Unusually warm temperatures in August 1998, combined with stress from angling and surgery, probably contributed to high post-surgery mortality in the Canyon. Tagging effects, though not as severe, were also observed in the other study zones. This resulted in a final sample size of 53 radiotagged fish, of which 38% were in the Lower Teton (20 fish), 15% were in the Canyon (8 fish), and 47% were in the Valley (25 fish). In-depth survival analyses using a Kaplan-Meier

computer program (Version 5.0, North Carolina State University, Raleigh, NC) will be presented in the final report. The modified Kaplan-Meier or product limit procedure is commonly used in medical and wildlife telemetry studies subject to censoring (Pollock et al. 1989).

Preliminary analyses of our radiotagged fish data have shown the following:

- ✓ Total 79 adult trout radiotagged (Figure 1; Table 3).
- ✓ Significant tagging effects - 26 fish or 33% died within eight weeks of surgery, leaving final sample of 53 fish.
- ✓ Higher tagging effects in the Canyon (16 fish) - higher post-surgery mortality.
- ✓ Thirty-one fish died of natural causes.
- ✓ Three fish were harvested by anglers.
- ✓ Ten fish were lost or "censored" - one transmitter malfunctioned, others cause is unknown.
- ✓ Nine fish survived to the end.
- ✓ Kaplan-Meier estimated survival through one year was 37% (23 to 51% confidence interval,  $\alpha = 0.05$ ,  $n = 53$ ).
- ✓ Survival comparisons among study zones is not possible - sample sizes too small.
- ✓ Marked decline in survival with the onset of spawning.

Preliminary analyses of our radiotelemetry location data have shown the following:

- ✓ Flight locations were accurate to within  $\pm 0.4$  mile - so describing habitats used will not be possible.
- ✓ Little movement at any time between study zones - only one fish at Teton Dam, excluding fish that died (Figure 2).
- ✓ Little if any movement in fall and winter (September to February).
- ✓ No migration to Teton Canyon or Henrys Fork Snake River to over winter.
- ✓ Significant movement in spring and summer (March to August) - spawning migration observed for 33 fish, but 11 other fish did not move.
- ✓ Two Moody Creek spawners - both cutthroat, spawned below Webster Dam, Woodmansee-Johnson canal diversion and Moody Creek railroad culvert not a barrier.
- ✓ One Canyon Creek spawner - cutthroat, spawned below Green Canyon Hot Springs, landslides and pump diversion at highway bridge not a barrier, Canyon Creek canal diversion at Green Canyon may be barrier as no spawners observed upstream on 29 June 1999.
- ✓ Two Bitch Creek spawners - both cutthroat, spawned below highway bridge.
- ✓ Ten Teton Creek spawners - all cutthroat except one rainbow/hybrid, spawned below highway bridge.
- ✓ One Fox Creek spawner - rainbow/hybrid, spawned near mouth.
- ✓ Total sixteen tributary spawners - all cutthroat except two, from all study zones.
- ✓ Three Henrys Fork Snake River mainstem spawners - one cutthroat and two rainbow/hybrids, from North Fork Teton.

- ✓ Fourteen Teton River mainstem spawners - nine cutthroat, five rainbow/hybrids, from all study zones.
- ✓ Total 17 mainstem spawners - 10 cutthroat, 7 rainbow/hybrids.
- ✓ As many mainstem as tributary spawners.
- ✓ Eleven fish did not move - six cutthroat, five rainbow/hybrids, may have spawned in mainstem but spawning status unknown.
- ✓ Significant migration to Rexburg - mainstem spawning above highway bridge.
- ✓ Teton Canyon and Canyon Creek landslides are not migration barriers.
- ✓ Corroborates fish trapping results.

**South Fork Teton Ladder Trap.** Like 1995, we used a funnel trap placed in the South Fork Teton fish ladder to monitor upstream movement of adult fish ( $\geq 350$  mm, TL; Figure 3). The trap was installed 30 March and removed 31 May 1999, although the irrigation diversion breached on 1 May allowing fish to bypass the ladder. We checked and cleaned the trap daily.

The fish ladder was constructed by IDFG in 1994 at the Rexburg City ditch diversion. The diversion is a complete fish migration barrier, and fish must navigate to and through the ladder to move upstream (except when breached in 1997 and 1999). We had a new trap fabricated to fit inside the ladder, replacing the old one blown out during high water in 1995. Because we were concerned about trapping during high water, and to reduce trap injury to the fish, we used electrical conduit for pickets that could be easily removed and cleaned. Pickets were also spaced to leave as much gap as possible (1.25 inch) and still capture adult fish ( $>350$  mm, TL) moving upstream. The new trap design was essentially the same as the old one, except that we used pickets spaced a little wider (0.25 inch greater gap). Both old and new traps, used in 1995 and 1999, are functionally the same as that used at the Felt Dam ladder in 1998 and 1999.

All fish captured were anesthetized with MS-222, identified, measured (TL, in mm), and weighed (g) with a Pesola or spring scale. We also tried to determine sex and maturity. Trout, mountain whitefish, and suckers were marked with rp fin clips (Table 1). We examined each fish for other marks and noted signs of black spot or whirling disease. We did not sample for genetics. Fish were released above the trap.

Preliminary analyses of our South Fork ladder trapping data have shown the following:

- ✓ Total 1,068 fish captured in 1999 - 1,054 were adults.
- ✓ Marked and released 1,061 fish (Table 1).
- ✓ Four fish were recaptures from previous marking (Table 2).
- ✓ Radiotagged two fish - but one died and one was lost shortly afterwards, no useful movement data.
- ✓ Total 394 fish captured in 1995 - 388 were adults, but shorter trapping period (IDFG Region 6 files).
- ✓ Over 90% suckers both years.

- ✓ Total 16 adult trout in 1995 and 69 in 1999 - remnant run of large fish still exists.
- ✓ Significant sucker and cutthroat upstream migration - from Lower Teton or Henrys Fork, destination unknown except Moody Creek.
- ✓ Stark contrast to Felt ladder trap results.
- ✓ Corroborates radiotelemetry results.

**Felt Dam Ladder Trap.** Like last year, we used a funnel trap placed in the fish ladder at Felt Dam to monitor upstream movement of adult fish (>350 mm, TL; Figure 3). The trap was installed 29 March and removed 5 June 1999. Though not part of this year's work plans, our objective was to trap during April (which we missed last year) and to radiotag adult trout. We checked and cleaned the trap daily.

Descriptions of the dam, the fish ladder, and the custom designed trap are found in last year's annual report (Schrader 1999). Captured fish were processed the same as at the South Fork Teton ladder trap (see above), except that 1p fin clips were used to mark fish (Table 1).

Preliminary analyses of our Felt ladder trapping data have shown the following:

- ✓ Total 26 fish captured in 1999 - 2 were adults.
- ✓ Marked and released 19 fish (Table 1).
- ✓ None were recaptures from previous marking (Table 2).
- ✓ None were radiotagged - not large enough.
- ✓ Total 70 fish captured in 1998 - 7 were adults, but longer trapping period (Schrader 1999).
- ✓ No suckers either year.
- ✓ Total 5 adult trout in 1998 and 2 in 1999.
- ✓ Insignificant upstream migration - from Teton Canyon or below, for any taxa.
- ✓ Stark contrast to South Fork Teton ladder trap results.
- ✓ Corroborates radiotelemetry results.

**Hog Hollow Screw Trap.** We used a floating screw trap placed at the USGS St. Anthony gage (Figure 3) to monitor downstream movement of juvenile and other small fish (<160 mm, TL). The trap was installed 23 April and removed 29 October 1999. We checked and cleaned the trap daily through the end of June, then three days a week thereafter.

All fish captured were identified and measured (TL, in mm), except after 4 May we measured a sub-sample of 20 non-trout each day and tallied the remainder. Fish were not anesthetized or weighed, nor did we generally determine sex or maturity. Age 1 and older trout were marked with rp fin clips, but non-trout were not marked (Table 1). We examined each fish for other marks and noted signs of black spot or whirling disease. We did not sample for genetics. Fish were released below the trap.

Preliminary analyses of our Hog Hollow screw trapping data have shown the following:

- ✓ Total 8,098 fish captured in 1999 - only eight were >160 mm (TL).
- ✓ Marked and released 16 fish (Table 1).
- ✓ None were recaptures from previous marking (Table 2).
- ✓ More than 99% were non-trout - 52.5% longnose or speckled dace, 19.2% redbase shiners, 15.6% unknown cyprinid or catostomid fry (<25 mm, TL), 6.4% mountain whitefish, 2.8% suckers, 2.6% sculpins, and 0.1% Utah chubs.
- ✓ Less than 1% (64 fish) were trout - 0.5% unknown trout fry, 0.2% cutthroat, and <0.1% rainbow, no brown trout or brook trout.
- ✓ Total 17,481 fish captured in 1998 at Narrows - only 39 were >160 mm (TL), more than 99% were non-trout, less than 1.0% (99 fish) were trout (Schrader 1999).
- ✓ Total 8,507 fish captured in 1975 (pre-dam) at Narrows - 98.4% were non-trout, 1.6% (14 fish) were trout, but shorter trapping period (Irving et al. 1977).
- ✓ Numbers not adjusted for trap efficiency - from 1 to 5% in 1998 and 1999.
- ✓ Significant dace and redbase shiner downstream migration throughout Teton.
- ✓ Insignificant trout downstream migration throughout Teton.
- ✓ Corroborates radiotelemetry and ladder trapping results.

### **Inventory Fish Populations**

**Pool Sampling Techniques.** We abandoned experimenting with various gear types to sample the Teton Canyon pools after radiotagging fish in April and May 1999. We used a drift boat with electrofishing gear to capture these and other fish, but sank the boat on 23 May at Little Parkinson Rapid (rapid number 26). In July we outfitted a whitewater raft (Avon 16 ft self-bailer, Irvine, CA) with the same kind of gear, used a two-person crew, and left the boat and gear on the river overnight while we hiked in and out of the Canyon. The electrofisher box (Coffelt VVP-15, Flagstaff, AZ) was generally set at 225 V, 5 A, 20%, and 90 Hz. Two days were needed to electrofish from Felt Dam to Spring Hollow (pools 1-9), and at least three days were needed to electrofish from Spring Hollow to Canyon Creek (pools 10-27).

Our combined electrofishing effort consisted of four days in July and eight days in August, representing one pass above and three passes below Spring Hollow (Table 4). All types of habitat were sampled, including pools, rapids and runs. A total of 1352 fish were captured below Spring Hollow in 20 man-days, or 67.6 fish/man-day. A total of 322 fish were captured above Spring Hollow in 4 man-days, or 80.5 fish/man-day. Electrofishing catch rates are the highest of the various techniques we have evaluated to date (beach seines, gill nets, hook-and-line, and electrofishing).

Sinking gill nets were effective in sampling the Barrow Ponds in 1998, but we did not use them in 1999 because of time limitations and because they are unlikely to be very effective in the other

Canyon pools (Table 4). The Borrow Ponds have a flat bottom with no debris and there is less current. Most of the Canyon pools contain debris and have some current, which we encountered while seining in 1997. We also considered using lethal methods (explosives) to sample fish but abandoned the idea because of public relations.

**Electrofishing.** In 1999, from late July to early October, we electrofished six mainstem Teton River sections to inventory fish populations (Figure 4). Two sections were electrofished in each study zone. We used a drift boat to sample the South Fork and North Fork sections in the Lower Teton, the Parkinson section in the Teton Canyon, and the Breckenridge and Nickerson sections in the Teton Valley. We used a whitewater raft to sample the difficult Spring Hollow section (Bitch Creek to Canyon Creek) in the Teton Canyon as described above.

All sections except Spring Hollow have been electrofished in previous years using standard IDFG protocols. Irving et al. (1977) also electrofished in each study zone, but at unknown locations, prior to Teton Dam construction. Our goal is to assess Teton Canyon fish populations over time (pre- versus post-dam) and space (Teton Canyon versus the other study zones). This assessment will be completed in the final report.

All fish captured were anesthetized with MS-222, identified, measured (TL, in mm), and weighed (g) with a digital bench scale (Ohaus model B25AS20, Florham Park, NJ). Sex and maturity were not generally determined. Age 1 and older trout, mountain whitefish, and suckers were marked with a temporary caudal fin clip during marking runs. In the Teton Canyon, most larger trout ( $\geq 300$  mm, TL) were also marked with VI tags (Table 1). We examined each fish for other marks and noted signs of black spot or whirling disease. We did not sample for genetics. Fish were released near where they were captured.

Preliminary analyses of our electrofishing data have shown the following:

- ✓ Six Teton River mainstem sections electrofished in 1999 - two in each study zone (Figure 4).
- ✓ Total electroshock on-time almost 25 hr over 29 sampling days (Tables 5 and 6) - less than one hour per day on average.
- ✓ Total 1,534 trout captured in 1999 - 305 in Lower Teton, 572 in Teton Canyon, and 657 in Teton Valley (Table 5).
- ✓ Total catch rate for trout about 62 fish/hr - highest in Lower (102 trout/hr), lowest in Canyon (41 trout/hr), and intermediate in Valley (82 trout/hr).
- ✓ Total 3,016 mountain whitefish and suckers captured in 1999 - 357 in Lower, 1,863 in Canyon, and 796 in Valley (Table 6).
- ✓ Total catch rate for mountain whitefish and suckers (121 fish/hr) about twice that of trout - intermediate in Lower Teton (119 fish/hr), highest in Canyon (134 fish/hr), and lowest in Valley (100 fish/hr).
- ✓ Possibly fewer trout but more mountain whitefish and suckers in Canyon than in other zones.
- ✓ Trout were selectively netted over other species - but bias probably the same in all sections.

- ✓ Unbiased abundance estimates not possible at many sections - need >3 recaptures (Ricker 1975), will need to combine taxa (Tables 5 and 6).
- ✓ Electrofishing limitations in Canyon - deep water (pools) and fast water (rapids) limits gear efficiency, but most fish captured near rapids or in the chute (pool 24 just below Linderman).
- ✓ Analyses of other population statistics will be completed in final report.

### **Additional Tasks**

**Field Support.** We provided logistical support to BOR for survey work conducted below Bitch Creek on 13 July 1999. Support was also provided for the Snake River study.

**Flows and Water Temperatures.** As in 1997 and 1998, daily mean discharge data for 1999 were obtained from published records for USGS gaging stations at four locations (Figure 5). They are: 1) South Fork Teton River at Rexburg, 2) North Fork Teton River at Teton, 3) Teton River near St. Anthony, and 4) Teton River above South Leigh Creek near Driggs. For simplicity we refer to these as the South Fork, North Fork, St. Anthony, and Leigh gages. The Leigh gage is in the Teton Valley, whereas the other gages are in the Lower Teton below Teton Dam. As part of this study, England (1998) summarized historic flow records for the Teton drainage at these and other gages.

Flows at the South Fork ladder trap were approximated using values from the South Fork gage, and flows at the Felt Dam ladder trap (before diversion) were approximated using values from the Leigh gage. Actual flows at these traps were undoubtedly different, however, due to tributary and groundwater contributions and irrigation or other withdrawals. As a check, we recorded water stage when we checked the traps by using a standard USGS metal staff gage mounted to the ladder outlet concrete wall. The Hog Hollow screw trap was located at the St. Anthony gage, and we recorded the instantaneous USGS water stage and flow when we checked the trap.

Water temperatures were recorded at four standard and two additional locations in 1999 using Ryan RL100 digital loggers (Figure 6; Table 7). Three loggers were deployed in the Lower Teton (South Fork, North Fork, and Hog Hollow), and one was deployed in the Teton Valley (Leigh). The South Fork logger washed away. Temperatures were recorded every 5 hr throughout the year at these standard locations. One additional logger was deployed in the Lower Teton (at the South Fork ladder trap) and another in the Teton Canyon (at the Felt ladder trap). Temperatures were recorded hourly throughout the time period we trapped fish.

From 1996 to 1999, we have logged approximately 100,000 temperature data points throughout the Teton drainage. These data have been entered and summarized and will be presented in our final report. As part of this study, Bowser (1999) also collected temperature data in the Teton Canyon in 1998.

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## **TABLES**

Table 1. Record of trout, mountain whitefish, suckers, and chubs that were permanently marked in the Teton River drainage, 1997-99 (excluding radiotagged trout). Dace, shiners, and sculpins were also captured but not marked.

Date	Location	Gear	Mark <sup>a</sup>	Number Marked <sup>b</sup>							Notes	
				YCT	WRB/ HYB	HRB	EBT	MWF	SUC	UTC		Total
<b>Lower Teton</b>												
3/30/99 to 5/31/99	South Fork	Ladder Trap	RP Clip	64	2	--	--	9	986	--	1,061	
4/23/99 to 10/29/99	Hog Hollow	Screw Trap	RP Clip	11	5 <sup>c</sup>	--	--	--	--	--	16 <sup>d</sup>	Most fish not marked
<b>Total</b>				75	7	0	0	9	986	0	1,077	
<b>Teton Canyon</b>												
9/23/97	Pools # 10 & 11	Seine	LP Clip	5	1	11	--	7	2	--	26	
6/18/98	Barrow Ponds	Seine	LP Clip	--	--	--	--	--	--	--	0	No fish captured
7/23/98	Barrow Ponds	Gill Net (Floating)	LP Clip	--	--	--	--	--	--	--	0	No fish captured
7/23/98	Barrow Ponds	Gill Net (vertical)	LP Clip	--	--	--	--	--	--	--	0	No fish captured
7/23,28,31; 8/12,18/98	Barrow Ponds	Gill Net (sinking)	LP Clip	34	--	--	--	56	169	161	420	Many morts not marked
8/4,7,11,14, 15,22,27; 9/4/98	Felt to Teton Dam	Hook & Line	LP Clip	--	--	--	--	--	--	--	0	No fish marked of 154 caught
9/15, 16/98	Parkinson	Electro- fishing	LP Clip	31	7	--	--	129	27	--	194 <sup>e</sup>	Age 1 & older <sup>f</sup>
4/30/98 to 10/30/98	Felt Dam	Ladder Trap	LP Clip	2	4	--	--	58	--	--	64 <sup>g</sup>	
3/29/99 to 6/5/99	Felt Dam	Ladder Trap	LP Clip	1	7	--	--	11	--	--	19	

Table 1. Continued.

Date	Location	Gear	Mark <sup>a</sup>	Number Marked <sup>b</sup>								Notes
				YCT	WRB/ HYB	HRB	EBT	MWF	SUC	UTC	Total	
<b>Teton Canyon, cont.</b>												
8/3, 4/99	Pools # 1-9	Electro-fishing	VI Tag	29	3	--	--	--	--	--	32	Trout ≥ 300 mm, TL
7/22,23,26, 27; 8/10, 11,12,17, 18,19/99	Pools # 10-27	Electro-fishing	VI Tag	111	26	--	--	--	--	--	137	Trout ≥ 300 mm, TL
<b>Total</b>				213	48	11	0	261	198	161	892	
<b>Teton Valley</b>												
9/2, 3, 10, 11/97	Nickerson	Electro-fishing	RV Clip	159	19	1	70	509	56	--	814	Age 1 & older <sup>f</sup>
8/3 1/99	Nickerson	Electro fishing	VI Tag	5	1	--	--	--	--	--	6	Trout ≥ 300 mm, TL
9/23, 24; 10/1/97	Breckenridge	Electro fishing	RV Clip	70	60	1	113	306	3	--	553	Age 1 & older <sup>f</sup>
9/5, 11/97	Fox Creek	Electro-fishing	LV Clip	46	37	1	98	432	--	--	614	Age 1 & older <sup>f</sup>
9/4, 12/97	Teton Creek	Electro fishing	LV Clip	87	6	3	44	861	--	--	1,001	Age 1 & older <sup>f</sup>
3/31/98 to 11/2/98	Narrows	Screw Trap	RV Clip	49	38 <sup>h</sup>	--	4	8	390	--	489	
<b>Total</b>				416	161	6	329	2,116	449	--	3,477	
<b>Grand Total</b>				704	216	17	329	2,386	1,633	161	5,446	

Table 1. Continued.

<sup>a</sup> RV = right pelvic/ventral; LV = left pelvic/ventral; RP = right pectoral; LP = left pectoral; VI = visible implant.

<sup>b</sup> YCT = Yellowstone cutthroat trout; WRB = wild rainbow trout; HYB = hybrid cutthroat x rainbow trout; HRB = hatchery rainbow trout; EBT = Eastern brook trout; MWF = mountain whitefish; SUC = sucker; UTC = Utah chub.

<sup>c</sup> Includes three trout fry too small to identify.

<sup>d</sup> Includes one YCT and two WRB accidentally marked with LV clip.

<sup>e</sup> Includes one MWF accidentally marked with LV clip.

<sup>f</sup> Age 1 and older fish are  $\geq 100$  mm for spring spawners (YCT, WRB, HYB, SUC, and UTC) or  $\geq 150$  mm for fall spawners (EBT and MWF).

Includes one YCT accidentally marked with RP clip.

<sup>h</sup> Includes 14 trout fry too small to identify

Table 2. Record of permanently marked trout, mountain whitefish, suckers, and chubs that were recaptured in the Teton River drainage, 1997-99 (excluding radiotagged trout). Recaptured fish from other study zones are shaded.

Date	Location	Gear	Mark <sup>a</sup>	Number Recaptured <sup>b</sup>								Notes	
				YCT	WRB/ HYB	HRB	EBT	MWF	SUC	UTC	Total		
				<b>Lower Teton</b>									
3/30/99 to 5/31/99	South Fork	Ladder Trap	RP Clip	1 (RV)	--	--	--	--	--	2 (RP) 1 (LV)	--	4	
9/1, 7/99	South Fork	Electro- fishing	None	--	--	--	--	--	--	--	--	0	
9/15, 22/99	North Fork	Electro- fishing	None	--	--	--	--	--	--	--	--	0	
4/23/99 to 10/29/99	Hog Hollow	Screw Trap	RP Clip	--	--	--	--	--	--	--	--	0	
<b>Total</b>				1	0	0	0	0	3	0	0	4	
				<b>Teton Canyon</b>									
9/23/97	Pools # 10 & 11	Seine	LP Clip	--	--	--	--	--	--	--	--	0	
6/18/98	Barrow Ponds	Seine	LP Clip	--	--	--	--	--	--	--	--	0	
7/23/98	Barrow Ponds	Gill Net (floating)	LP Clip	--	--	--	--	--	--	--	--	0	
7/23/98	Barrow Ponds	Gill Net (vertical)	LP Clip	--	--	--	--	--	--	--	--	0	
7/23,28,31; 8/12,18/98	Barrow Ponds	Gill Net (sinking)	LP Clip	--	--	--	--	--	--	1 (LP)	--	1	Net recapture
8/4,7,11,14, 15,22,27; 9/4/98	Felt to Teton Dam	Hook & Line	LP Clip	-	--	--	--	--	--	--	--	0	
9/15, 16/98	Parkinson	Electro- fishing	LP Clip	--	--	--	--	--	--	--	--	0	

Table 2. Continued.

Date	Location	Gear	Mark <sup>a</sup>	Number Recaptured <sup>b</sup>								Notes
				YCT	WRB/ HYB	HRB	EBT	MWF	SUC	UTC	Total	
<b>Teton Canyon, cont.</b>												
4/30/98 to 10/30/98	Felt Dam	Ladder Trap	LP Clip	--	1 (LP)	--	--	--	--	--	1	Trap recapture
3/29/99 to 6/5/99	Felt Dam	Ladder Trap	LP Clip	--	--	--	--	--	--	--	0	
9/8, 13, 14 20, 27/99	Parkinson	Electro- fishing	None	1 (LP)	--	--	--	1 (LV)	--	--	2	
8/3, 4/99	Pools # 1-9	Electro- fishing	VI Tag	--	--	--	--	--	--	--	0	
7/22,23,26, 27; 8/10,11, 12,17,18, 19/99	Pools # 10-27	Electro- fishing	VI Tag	1 (RP)	--	--	--	--	--	--	1	
<b>Total</b>				2	1	0	0	1	0	1	5	
<b>Teton Valley</b>												
9/2, 3, 10, 11 /97	Nickerson	Electro- fishing	RV Clip	--	--	--	--	--	--	--	0	
9/9/98	Nickerson	Electro- fishing	None	1 (RV)	--	--	--	--	--	--	1	
8/31; 9/2, 3, 9/99	Nickerson	Electro- fishing	VI Tag	1 (LV) 9 (RV)	1 (LP & RP)	--	--	2 (LV) 8 (RV)	--	--	21	
9/23, 24; 10/ 1 /97	Breckenridge	Electro- fishing	RV Clip	--	--	--	--	--	--	--	0	
9/28, 29; 10/6, 8/99	Breckenridge	Electro- fishing	None	1 (RP)	--	--	--	1 (RP) 3 (RV) 2 (LV)	--	--	7	

Table 2. Continued.

Date	Location	Gear	Mark <sup>a</sup>	Number Recaptured <sup>b</sup>								Notes	
				YCT	WRB/ HYB	HRB	EBT	MWF	SUC	UTC	Total		
<b>Teton Valley, cont.</b>													
9/5, 11/97	Fox Creek	Electro-fishing	LV Clip	--	--	--	--	--	--	--	--	0	
9/4, 12/97	Teton Creek	Electro-fishing	LV Clip	--	--	--	--	--	--	--	--	0	
3/31/98 to 11/2/98	Narrows	Screw Trap	RV Clip	--	--	--	--	--	--	1 (RV)	--	1	Trap recapture
<b>Total</b>				12	1	0	0	16	1	0		30	
<b>Grand Total</b>				15	2	0	0	17	4	1		39	

<sup>a</sup> RV = right pelvic/ventral; LV = left pelvic/ventral; RP = right pectoral; LP = left pectoral.

<sup>b</sup> YCT = Yellowstone cutthroat trout; WRB = wild rainbow trout; HYB = hybrid cutthroat x rainbow trout; HRB = hatchery rainbow trout; EBT = Eastern brook trout; MWF = mountain whitefish; SUC = sucker; UTC = Utah chub.

Table 3. Specifics of the 79 adult trout radiotagged and released in the mainstem Teton River, 5 August 1998 to 23 May 1999. Records are sorted by transmitter frequency where those differing by 1-2 KHz are the same transmitter that was re-used (the highest is the true frequency). The 19 re-used transmitter frequencies are shaded and their antenna lengths were not altered. Week number one is the first week of tagging.

Record Number	Radio Freq (MHz)	Tag Zone	Tag Week Number	Tag Date	Species <sup>a</sup>	TL (mm) <sup>b</sup>	Weight (g)	% Tag Weight	Surgery		Capture Method <sup>d</sup>	BSD? <sup>e</sup>	Hook Scar?	Notes
									Time (min)	Ant <sup>c</sup>				
48	150.013	LOWER	7	09/17/98	YCT	479	1325	0.9	7	LONG	SHOCK	Y		
52	150.022	LOWER	7	09/17/98	YCT	423	710	1.6	5	LONG	SHOCK	Y	Y	
69	150.023	LOWER	37	04/13/99	YCT	429	940	1.2	9	*LONG	TRAP	Y	Y	GREEN FEMALE: SHREDDED ANTENNA
5	150.034	CANYON	2	08/11/98	HYB	400	650	1.8	12	CUT	H&L			
38	150.045	LOWER	6	09/10/98	YCT	554	1650	0.7	6	LONG	SHOCK	Y		
41	150.053	CANYON	7	09/15/98	YCT	385	610	1.9	6	CUT	SHOCK	Y		CUT INTESTINE; ANAL FIN DAMAGE
7	150.064	CANYON	2	08/11/98	HYB	424	820	1.4	5	CUT	H&L			
61	150.074	LOWER	8	09/24/98	YCT	435	685	1.7	5	CUT	SHOCK			OLD BIRD MARK
56	150.085	LOWER	8	09/23/98	YCT	411	740	1.6	5	CUT	SHOCK			LEFT OPERCLE INCOMPLETE
54	150.094	LOWER	8	09/23/98	HYB	417	670	1.7	5	CUT	SHOCK			
34	150.103	LOWER	6	09/10/98	HYB	468	1250	0.9	6	LONG	SHOCK			MISSING RIGHT EYE; OLD BIRD MARK
70	150.104	LOWER	37	04/13/99	YCT	560	2300	0.5	7	*LONG	TRAP	Y		GREEN FEMALE
1	150.112	VALLEY	1	08/05/98	YCT	408	600	1.9	20	CUT	H&L			TALON MARKS ON BACK
18	150.113	VALLEY	5	09/03/98	YCT	414	685	1.7	7	*CUT	SHOCK	Y		
66	150.114	VALLEY	10	10/09/98	YCT	427	800	1.4	6	*CUT	SHOCK			
36	150.124	LOWER	6	09/10/98	YCT	438	920	1.3	6	CUT	SHOCK	Y		
44	150.133	CANYON	7	09/16/98	YCT	433	720	1.6	5	LONG	SHOCK	Y	Y	
8	150.145	CANYON	2	08/14/98	YCT	415	695	1.7	5	CUT	H&L			
14	150.153	VALLEY	5	09/02/98	YCT	430	800	1.4	5	CUT	SHOCK	Y	Y	
68	150.154	VALLEY	13	10/27/98	YCT	527	1500	0.8	4	*CUT	SHOCK			RED SORES ALONG SIDES
4	150.161	CANYON	1	08/07/98	YCT	409	650	1.8	12	CUT	H&L			
78	150.162	CANYON	43	05/23/99	YCT	419	815	1.4	5	*CUT	SHOCK	Y		GREEN MALE
9	150.173	CANYON	4	08/27/98	HYB	435	875	1.3	8	LONG	H&L	Y		
28	150.313	VALLEY	6	09/08/98	YCT	434	820	1.4	5	LONG	SHOCK			
23	150.352	CANYON	5	09/04/98	YCT	418	745	1.5	5	LONG	H&L	Y		
76	150.353	CANYON	42	05/19/99	YCT	467	1200	1.0	4	*LONG	SHOCK	Y		GREEN MALE: L RAKER OUT & CLIPPED
43	150.373	CANYON	7	09/15/98	YCT	418	720	1.6	5	CUT	SHOCK	Y		SLOW RECOVERY
39	150.383	LOWER	6	09/10/98	WRB	436	720	1.6	5	CUT	SHOCK			RIGHT HEAD DENT

Table 3. Continued.

Record Number	Radio Freq (MHz)	Tag Zone	Tag Week Number	Tag Date	Specie <sup>a</sup>	TL (mm) <sup>b</sup>	Weight (g)	% Tag Weight	Surgery Time		Capture		Hook Scar?	Notes
									(min)	Ant <sup>c</sup>	Method <sup>d</sup>	BSD? <sup>e</sup>		
49	150.403	LOWER	7	09/17/98	YCT	467	1025	1.1	6	CUT	SHOCK	Y		OLD BIRD MARK
19	150.412	VALLEY	5	09/03/98	YCT	512	1650	0.7	5	LONG	SHOCK		Y	
72	150.413	VALLEY	37	04/15/99	YCT	423	800	1.4	7	*LONG	SHOCK			UNKNOWN SEX; CAUDAL FIN CHEWED
11	150.422	VALLEY	5	09/02/98	YCT	408	660	1.7	3	LONG	SHOCK	Y		GENETIC SAMPLE DRY
62	150.423	VALLEY	10	10/07/98	YCT	461	970	1.2	6	*LONG	SHOCK		Y	
13	150.432	VALLEY	5	09/02/98	YCT	409	610	1.9	6	LONG	SHOCK	Y		CAUGHT UPSTREAM
63	150.433	VALLEY	10	10/07/98	YCT	478	1150	1.0	5	*LONG	SHOCK		Y	OLD SORE BEHIND R OPERCLE
26	150.452	VALLEY	6	09/08/98	WRB	460	960	1.2	6	LONG	SHOCK		Y	
75	150.453	VALLEY	40	05/05/99	HYB	475	1000	1.2	6	*LONG	SHOCK	Y		GREEN FEMALE
45	150.463	CANYON	7	09/16/98	HYB	440	600	1.9	5	CUT	SHOCK			
31	150.472	VALLEY	6	09/09/98	YCT	439	670	1.7	6	CUT	SHOCK	Y		FLY IN MOUTH
74	150.473	VALLEY	37	04/16/99	YCT	484	1200	1.0	5	*CUT	SHOCK	Y		GREEN FEMALE
6	150.483	CANYON	2	08/11/98	YCT	417	630	1.8	10	CUT	H&L			
57	150.494	LOWER	8	09/23/98	YCT	521	1375	0.8	4	LONG	SHOCK			STRANGE BEHAVIOR ON RELEASE
30	150.503	VALLEY	6	09/08/98	WRB	398	630	1.8	5	LONG	SHOCK			
24	150.514	CANYON	5	09/04/98	YCT	421	680	1.7	5	CUT	H&L	Y		
77	150.515	CANYON	43	05/23/99	YCT	414	720	1.6	4	*CUT	SHOCK			GREEN MALE
59	150.523	LOWER	8	09/24/98	YCT	428	685	1.7	6	CUT	SHOCK			OLD BIRD MARK
40	150.542	CANYON	7	09/15/98	YCT	406	660	1.7	5	LONG	SHOCK	Y		SLOW RECOVERY
32	150.552	VALLEY	6	09/09/98	YCT	424	725	1.6	6	LONG	SHOCK		Y	RV CLIP: SORE JAW
73	150.553	VALLEY	37	04/16/99	YCT	500	1250	0.9	5	*LONG	SHOCK	Y		RIPE MALE
27	150.563	VALLEY	6	09/08/98	YCT	440	870	1.3	5	CUT	SHOCK		Y	
29	150.643	VALLEY	6	09/08/98	WRB	412	710	1.6	9	CUT	SHOCK			LOTS BLOOD
3	150.653	CANYON	1	08/07/98	YCT	392	650	1.8	15	CUT	H&L			
25	150.673	CANYON	5	09/04/98	YCT	438	735	1.6	5	LONG	H&L	Y		
17	150.693	VALLEY	5	09/02/98	YCT	472	1250	0.9	4	LONG	SHOCK	Y		
67	150.694	VALLEY	10	10/09/98	HYB	526	1500	0.8	5	*LONG	SHOCK	Y		
55	150.713	LOWER	8	09/23/98	YCT	489	1400	0.8	4	LONG	SHOCK	Y		PHOTO W/O FREO NUMBER
60	150.722	LOWER	8	09/24/98	YCT	488	1250	0.9	5	LONG	SHOCK			
10	150.733	CANYON	4	08/27/98	YCT	396	600	1.9	6	LONG	H&L	Y		
79	150.734	CANYON	43	05/23/99	WRB	474	1200	1.0	5	*LONG	SHOCK	Y		GREEN MALE; BURN MARK; SUNK BOAT
35	150.764	LOWER	6	09/10/98	WRB	465	1400	0.8	6	LONG	SHOCK			
42	150.783	CANYON	7	09/15/98	HYB	434	755	1.5	5	LONG	SHOCK	Y		
37	150.823	LOWER	6	09/10/98	WRB	428	690	1.7	7	CUT	SHOCK			
53	150.843	LOWER	8	09/23/98	YCT	442	760	1.5	5	LONG	SHOCK	Y		WHIRLING DISEASE?
22	150.883	VALLEY	5	09/03/98	WRB	549	1800	0.6	5	CUT	SHOCK	Y		LOWER CAUDAL RAW

Table 3. Continued.

<u>Record Number</u>	<u>Radio Freq (MHz)</u>	<u>Tag Zone</u>	<u>Tag Week Number</u>	<u>Tag Date</u>	<u>Specie<sup>a</sup></u>	<u>TL (mm)<sup>b</sup></u>	<u>Weight (g)</u>	<u>% Tag Weight</u>	<u>Surgery Time (min)</u>	<u>Ant<sup>c</sup></u>	<u>Capture Method<sup>d</sup></u>	<u>BSD?<sup>e</sup></u>	<u>Hook Scar?</u>	<u>Notes</u>
12	150.904	VALLEY	5	09/02/98	YCT	523	1700	0.7	5	LONG	SHOCK		Y	BILL'S FISH
50	150.923	LOWER	7	09/17/98	HYB	433	995	1.2	5	LONG	SHOCK	Y		
15	150.942	VALLEY	5	09/02/98	WRB	579	2000	0.6	5	CUT	SHOCK	Y	Y	MIKE'S FISH; GENETIC SAMPLE DRY
71	150.943	VALLEY	37	04/15/99	HYB	494	1295	0.9	7	*CUT	SHOCK	Y		GREEN FEMALE
16	150.954	VALLEY	5	09/02/98	HYB	452	1150	1.0	6	CUT	SHOCK	Y		DUTY CYCLE TIMING OFF; GENETIC DRY
20	150.963	VALLEY	5	09/03/98	YCT	517	1300	0.9	5	CUT	SHOCK			SLOW RECOVERY
65	150.964	VALLEY	10	10/08/98	YCT	464	1150	1.0	4	*CUT	SHOCK	Y		
33	150.973	VALLEY	6	09/09/98	YCT	427	660	1.7	4	LONG	SHOCK			BLOODY RIGHT EYE
58	150.983	LOWER	8	09/24/98	YCT	464	960	1.2	5	LONG	SHOCK	Y		
46	150.993	CANYON	7	09/16/98	YCT	479	1325	0.9	8	LONG	SHOCK	Y	Y	FUNGUS
21	151.002	VALLEY	5	09/03/98	YCT	476	1200	1.0	6	LONG	SHOCK	Y		SORE ON PEDUNCLE
64	151.003	VALLEY	10	10/07/98	YCT	411	620	1.9	4	*LONG	SHOCK		Y	
2	151.034	CANYON	1	08/07/98	YCT	465	1250	0.9	20	CUT	H&L			DOUG'S FISH
47	151.054	CANYON	7	09/16/98	HYB	388	655	1.8	8	CUT	SHOCK	Y	Y	
51	151.073	LOWER	7	09/17/98	YCT	408	720	1.6	5	CUT	SHOCK	Y	Y	
Count:	79	79	79	79	79	79	79	79	79	79	79	43	16	
Min:	150.013		1	08/05/98		385	600	0.5	3					
Max:	151.073		43	05/23/99		579	2300	1.9	20					
Mean:						449.7	972.3	1.3	6.2					

LOWER	22
CANYON	24
VALLEY	<u>33</u>
	79

YCT	57
WRB	9
HYB	<u>13</u>
	79

LONG	30	SHOCK	64
CUT	30	H&L	13
*LONG	11	TRAP	<u>2</u>
*CUT	<u>8</u>		79
	79		

<sup>a</sup> YCT = Yellowstone cutthroat trout; WRB = wild rainbow trout; HYB = cutthroat x rainbow hybrid trout.

<sup>b</sup> TL = total length of fish.

<sup>c</sup> Ant = antenna length.

<sup>d</sup> SHOCK = electrofish; TRAP = trapped at South Fork Teton ladder; H&L = hook and line.

<sup>e</sup> BSD = black spot disease.

Table 4. Catch statistics for different gear types used in the Teton Canyon pools, 1997-99.

<b>Date</b>	<b>Location</b>	<b>Gear</b>	<b>Number of Fish Caught</b>	<b>Effort (man-day)</b>	<b>Catch Rate (fish/man-day)</b>	<b>Comments</b>
9/23/97	Pools # 10 & 11	Beach seine - 150' x 6' x 1/8" w/bag & 150' x 12' x 1" w/o bag	26	1.5	17.3	From jet boat - stuck; 4 hauls; lot of snags & rolls w/1" mesh & small fish gilled
6/18/98	Barrow Ponds	Beach seine - 150' x 12' x 1" w/o bag	0	3	0.0	From jet boat; no fish captured; many hauls
7/23/98	Barrow Ponds	Gill net - floating, six panel experimental 150' x 6'	1	0.5	2.0	From jet boat; one shiner captured; 3 sets, 15 min each
7/23/98	Barrow Ponds	Gill net - vertical, six panel experimental 150' x 6'	0	0.5	0.0	From jet boat; no fish captured; 4 sets, range 30-45 min each
7/23,28,31; 8/12,18/98	Barrow Ponds	Gill net - sinking, six panel experimental 150' x 6'	639	10	63.9	From jet boat; 40 sets, range 15-60 min each
8/4,7,11,14, 15,22,27; 9/4/98	Felt to Teton Dam	Hook & line - flies, lures, & bait	154 <sup>a</sup>	44	3.5	From whitewater rafts; not all fishing was in pools
7/22,23,26,27; 8/10,11,12, 17,18,19/99	Pools # 10-27	Electrofishing - pulsed DC from dangler anodes	1352	20	67.6	From whitewater rafts; not all fishing was in pools
8/3, 4/99	Pools # 1-9	Electrofishing - pulsed DC from dangler anodes	322	4	80.5	From whitewater rafts; not all fishing was in pools

<sup>a</sup> Includes 12 fish radio tagged

Table 5. Mark-recapture and catch rate statistics for trout at Teton River electrofishing sections, 1999. Results are from MR5 database for all sizes of fish.

Section	Sampling Dates (1999)	Number of Days	Number of Runs	Mark-recapture Statistics <sup>a</sup>				Total Fish Caught (M+C)	Electro-shock on Time (sec) <sup>b</sup>	Electro-shock on Time (hr) <sup>b</sup>	Catch Rate (fish/hr) <sup>c</sup>	Catch Rate (fish/day) <sup>d</sup>
				M	C	R	R/C (%)					
<b>Lower Teton</b>												
South Fork	9/1, 7	2	1 Mark 1 Recap	68	67	21	31	135	6,705	1.86	73	68
North Fork	9/15, 22	2	1 Mark 1 Recap	95	75	13	17	170	4,122	1.14	149	85
<b>Total</b>		4						305	10,827	3.00	102	76
<b>Teton Canyon</b>												
Parkinson	9/8, 13, 14, 20, 27	5	3 Mark 2 Recap	161	121	17	14	282	18,953	5.26	54	56
Lower Spring Hollow (Pools # 10-27)	7/22,23,26, 27; 8/10, 11, 12, 17, 18, 19	10	2 Mark 1 Recap	145	83	2	2	228	27,264	7.57	30	23
Upper Spring Hollow (Pools # 1-9)	8/3, 4	2	1 Mark <sup>e</sup>	62 <sup>e</sup>	--	--	--	62	3,986	1.11	56	31
<b>Total</b>		17						572	50,203	13.94	41	34

Table 5. Continued.

Section	Sampling Dates (1999)	Number of Days	Number of Runs	Mark-recapture Statistics <sup>a</sup>				Total Fish Caught (M+C)	Electroshock on Time (sec) <sup>b</sup>	Electroshock on Time (hr) <sup>b</sup>	Catch Rate (fish/hr) <sup>c</sup>	Catch Rate (fish/day) <sup>d</sup>
				M	C	R	R/C (%)					
<b>Teton Valley</b>												
Breckenridge	9/28, 29; 10/6, 8	4	2 Mark 2 Recap	150	114	25	22	264	12,255	3.40	78	66
Nickerson	8/31; 9/2, 3, 9	4	2 Mark <sup>f</sup> 1 Recap	225	168	46	27	393	16,515 <sup>f</sup>	4.59	86	98
<b>Total</b>		8						657	28,770	7.99	82	82
<b>Grand Total</b>		29						1,534	89,800	24.94	62	53

<sup>a</sup> M = number of fish marked on marking runs; C = number of fish caught on recap runs; R = number of marked fish recaptured on recap runs.

<sup>b</sup> From electroshocker box (Coffelt VVP-15).

<sup>c</sup> Includes recaptured fish; catch rate = (M+C)/electroshock on time.

<sup>d</sup> Includes recaptured fish; catch rate = (M+C)/number of sampling days.

<sup>e</sup> Only one marking run and no recapture runs due to low flows between Felt Dam and Bitch Creek.

<sup>f</sup> Equipment breakdown during first marking day; actual shock time is somewhat higher.

Table 6. Mark-recapture and catch rate statistics for mountain whitefish and suckers at Teton River electrofishing sections, 1999. Results are from MR5 database for all sizes of fish.

Section	Sampling Dates (1999)	Number of Days	Number of Runs	Mark-recapture Statistics <sup>a</sup>				Total Fish Caught (M+C)	Electro-shock on Time (sec) <sup>b</sup>	Electro-shock on Time (hr) <sup>b</sup>	Catch Rate (fish/hr) <sup>c</sup>	Catch Rate (fish/day) <sup>d</sup>
				M	C	R	R/C (%)					
<b>Lower Teton</b>												
South Fork	9/1, 7	2	1 Mark 1 Recap	130	66	3	5	196	6,705	1.86	105	98
North Fork	9/15, 22	2	1 Mark 1 Recap	70	91	5	5	161	4,122	1.14	141	80
<b>Total</b>		4						357	10,827	3.00	119	89
<b>Teton Canyon</b>												
Parkinson	9/8,13, 14, 20, 27	5	3 Mark 2 Recap	249	230	1	<1	479	18,953	5.26	91	96
Lower Spring Hollow (Pools # 10-27)	7/22,23,26, 27; 8/10, 11, 12, 17, 18, 19	10	2 Mark 1 Recap	712	412	4	1	1,124	27,264	7.57	148	112
Upper Spring Hollow (Pools # 1-9)	8/3, 4	2	1 Mark <sup>e</sup>	260 <sup>e</sup>	--	--	--	260	3,986	1.11	234	130
<b>Total</b>		17						1,863	50,203	13.94	134	110

Table 6. Continued.

Section	Sampling Dates (1999)	Number of Days	Number of Runs	Mark-recapture Statistics <sup>a</sup>				Total Fish Caught (M+C)	Electroshock on Time (sec) <sup>b</sup>	Electroshock on Time (hr) <sup>b</sup>	Catch Rate (fish/hr) <sup>c</sup>	Catch Rate (fish/day) <sup>d</sup>
				M	C	R	R/C (%)					
<b>Teton Valley</b>												
Breckenridge	9/28, 29; 10/6, 8	4	2 Mark 2 Recap	139	116	6	5	255	12,255	3.40	75	64
Nickerson	8/31; 9/2, 3, 9	4	2 Mark <sup>f</sup> 1 Recap	269	272	5	2	541	16,515 <sup>f</sup>	4.59	118	135
<b>Total</b>		8						796	28,770	7.99	100	100
<b>Grand Total</b>		29						3,016	89,800	24.94	121	104

<sup>a</sup> M = number of fish marked on marking runs; C = number of fish caught on recap runs; R = number of marked fish recaptured on recap runs.

<sup>b</sup> From electroshocker box (Coffelt VVP-15).

<sup>c</sup> Includes recaptured fish; catch rate = (M+C)/electroshock on time.

<sup>d</sup> Includes recaptured fish; catch rate = (M+C)/number of sampling days.

<sup>e</sup> Only one marking run and no recapture runs due to low flows between Felt Dam and Bitch Creek.

<sup>f</sup> Equipment breakdown during first marking day; actual shock time is somewhat higher.

Table 7. Specifics of Ryan RL 100 temperature loggers (Ryan Instruments, Redmond, WA) deployed in the Teton River drainage, 1996-1999.

<b>Logger</b>	<b>Location</b>	<b>Deployment Period</b>	<b>Recording Interval</b>	<b>Study Zone</b>	<b>Notes</b>
South Fork	Fish ladder at Rexburg City Ditch diversion, just below confluence of Moody Creek	25 Mar 1997 - 10 Nov 1997	1 hour	Lower	Ladder dry few days in early July 1997
		10 Nov 1997 - 30 Oct 1998	5 hours		Logger malfunctioned - no data
		30 Oct 1998 - ?	5 hours		Logger missing - washed away
		1 Apr 1999 - 3 Jun 1999	1 hour		
North Fork	Highway 20 bridge	31 Mar 1997 - 10 Nov 1997	1 hour	Lower	Logger ¼ out of water in early September 1997
		10 Nov 1997 - 29 Oct 1998	5 hours		Logger out of water after runoff in 1998
		29 Oct 1998 - 25 Oct 1999	5 hours		Logger out of water after runoff in 1999
Hog Hollow	Concrete abutments just below Hog Hollow bridge, just above USGS gage	31 Mar 1997 - 10 Nov 1997	1 hour	Lower	
		10 Nov 1997 - 30 Oct 1998	5 hours		
		30 Oct 1998 - 25 Oct 1999	5 hours		Two loggers deployed, one malfunctioned
Bitch Creek	Just below old road bridge, 0.5 mi below Highway 32 bridge	21 May 1996 - 22 Oct 1996	1 hour	Canyon	No data 5 to 7 August 1996
		20 Mar 1997 - 16 Sep 1997	1 hour		No data 6 May to 2 July 1997; logger malfunctioned
Badger Creek	Bull Elk road bridge	21 May 1996 - 21 Jul 1996	1 hour	Canyon	Channel dry since 22 July 1996?

Table 7. Continued.

<b>Logger</b>	<b>Location</b>	<b>Deployment Period</b>	<b>Recording Interval</b>	<b>Study Zone</b>	<b>Notes</b>
Felt Dam	Fish ladder at Felt Dam, 0.8 mi above confluence of Badger Creek	1 May 1998 - 3 Nov 1998	1 hour	Canyon	
		1 Apr 1999 - 15 Jun 1999	1 hour		Logger stuck in log jam
Narrows	Old USGS gage at screw trap, 1.7 mi below Highway 33 bridge	31 Mar 1998 - 2 Nov 1998	1 hour	Canyon	No data 15 to 17 June 1998
Leigh	USGS gage, just above Cache Bridge	21 May 1996 - 22 Oct 1996	1 hour	Valley	No data 5 to 7 August 1996; logger 1/2 out of water in early August 1996
		20 Mar 1997 - 10 Nov 1997	1 hour		
		10 Nov 1997 - 30 Oct 1998	5 hours		
		30 Oct 1998 - 26 Oct 1999	5 hours		Two loggers deployed, both OK
Teton Creek	Steel bridge, 1.1 mi above confluence	21 May 1996 - 22 Oct 1996	1 hour	Valley	No data 5 to 7 August 1996; logger 1/2 out of water in early August 1996
		20 Mar 1997 - 10 Nov 1997	1 hour		
		10 Nov 1997 - 21 Dec 1997	5 hours		Logger malfunctioned - no data after 21 December 1997
Fox Creek	Near IDFG fence line, 0.5 mi above confluence	21 May 1996 - 22 Oct 1996	1 hour	Valley	No data 5 to 7 August 1996
		20 Mar 1997 - 10 Nov 1997	1 hour		
		10 Nov 1997 - 30 Oct 1998	5 hours		

## **FIGURES**

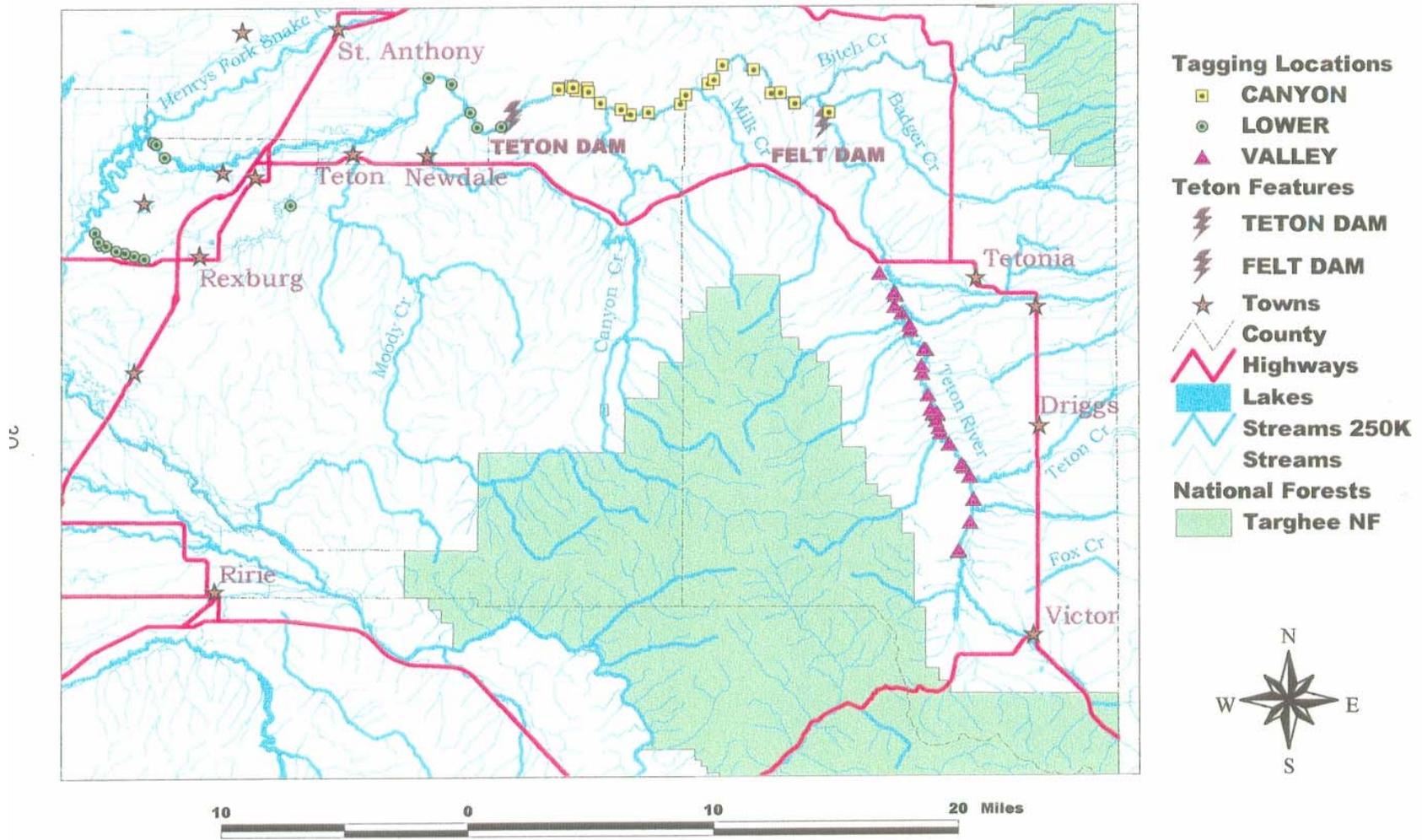


Figure 1. Location of the 79 adult trout implanted with radiotelemetry transmitters and released in the mainstem Teton River, 5 August 1998 to 23 May 1999 (n = 22 in Lower, n = 24 in Canyon, and n = 33 in Valley).

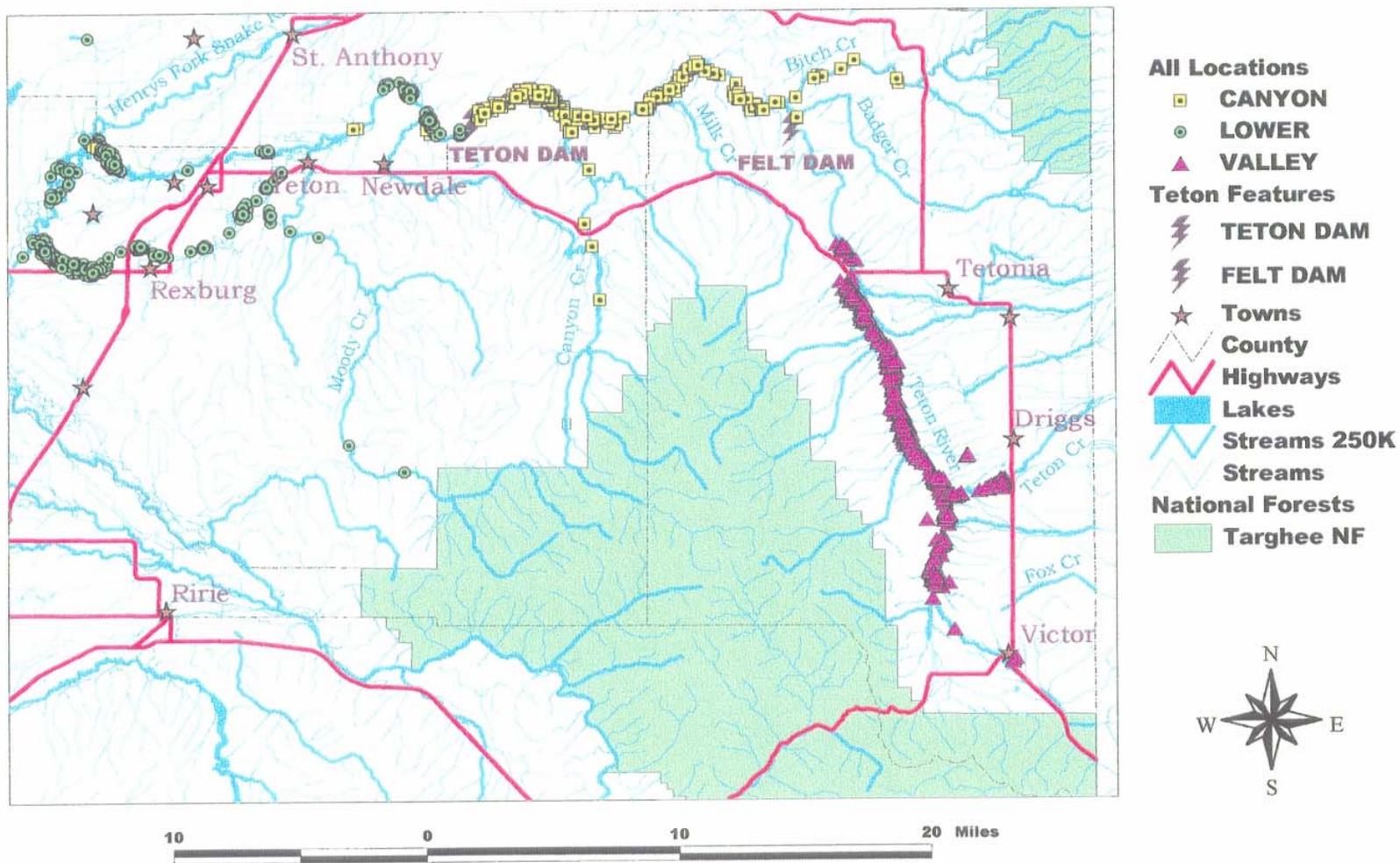


Figure 2. All locations (n = 1380) of the 79 radiotagged trout in the Teton River drainage from 5 August 1998 to 26 October 1999 (n = 490 in Lower, n = 319 in Canyon, and n = 571 in Valley).

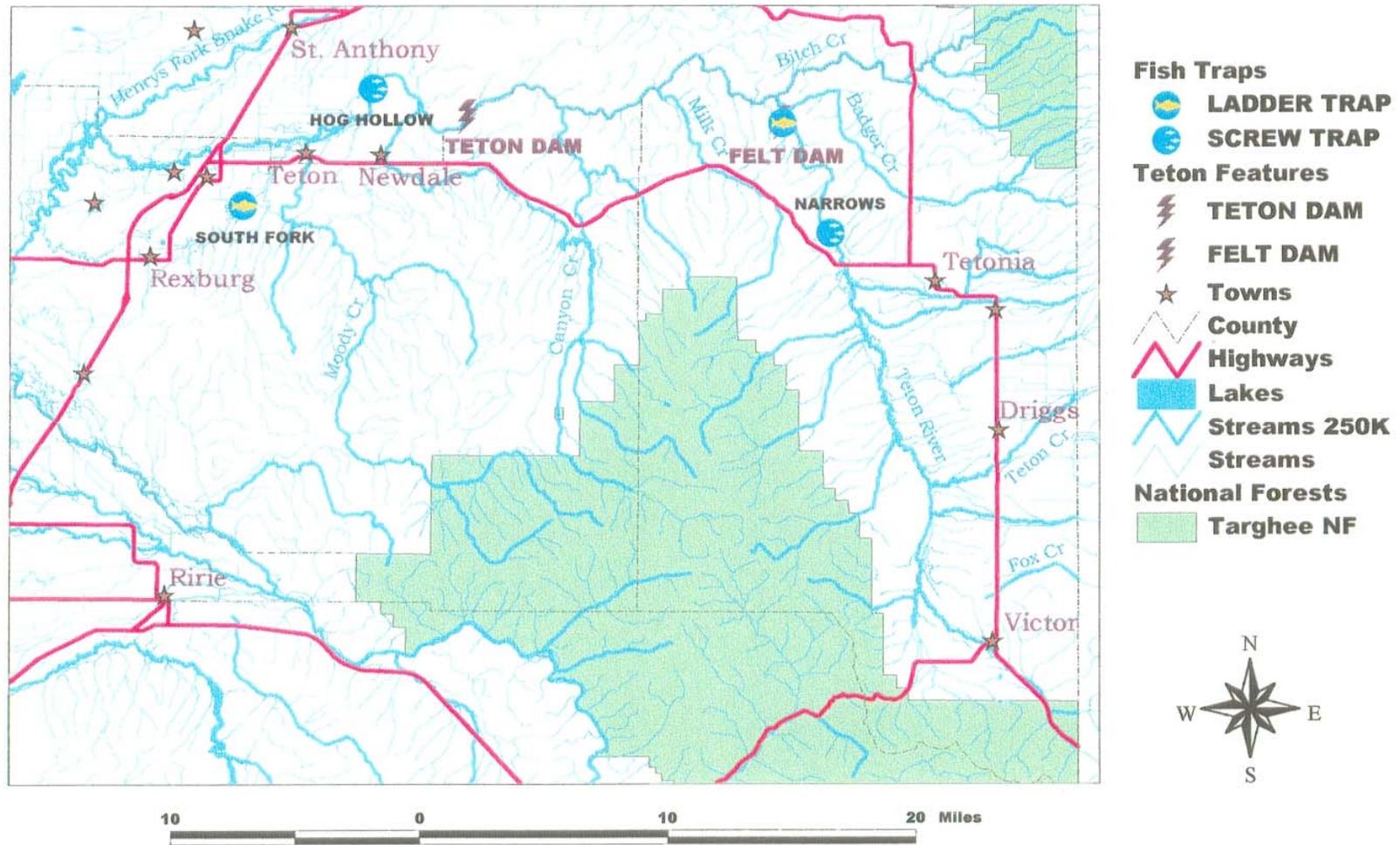


Figure 3. Location of ladder traps and screw traps used in the mainstem Teton River, 1998-99. The ladder traps captured adult upstream migrants, whereas the screw traps captured juvenile and other small fish downstream migrants.

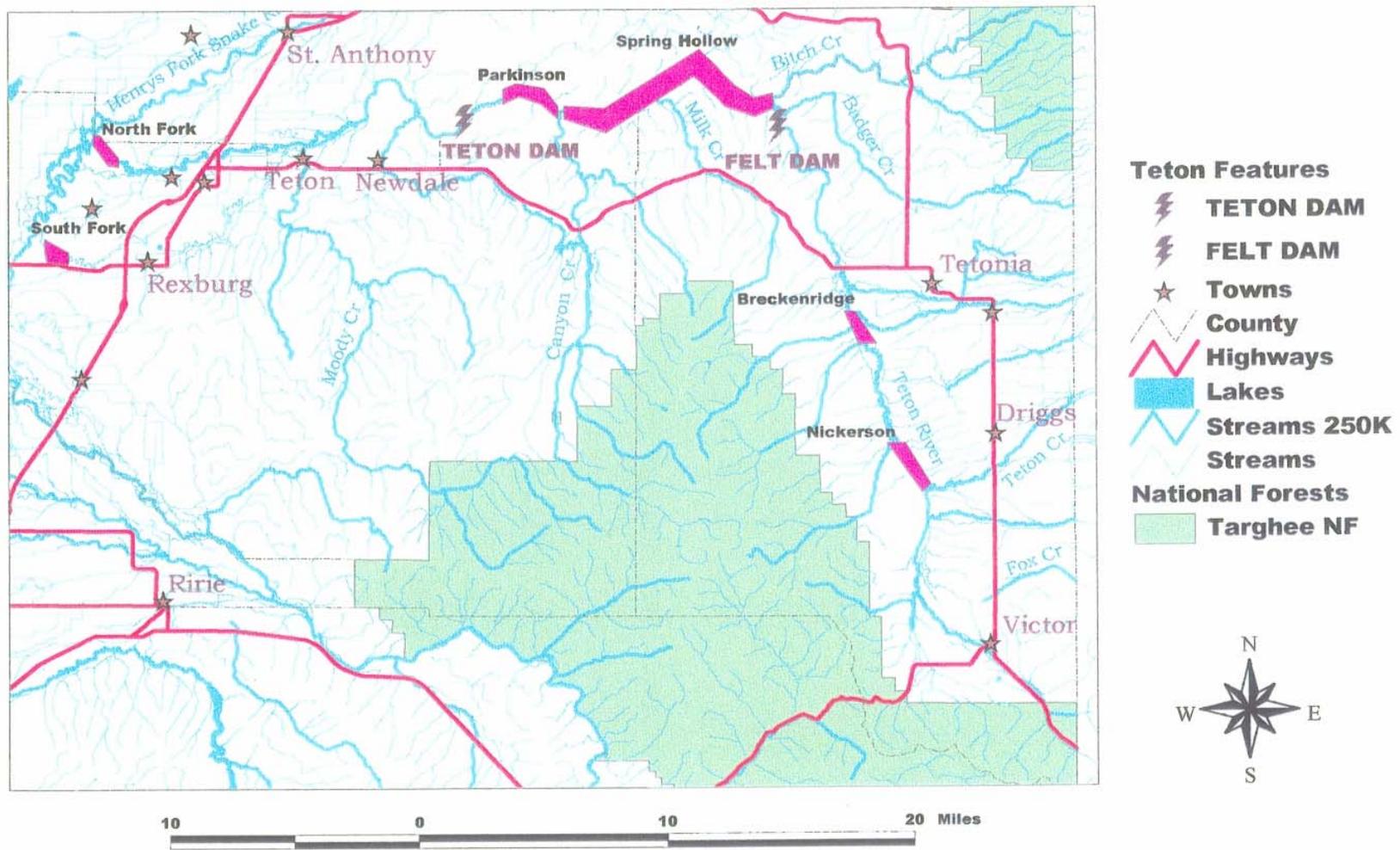


Figure 4. Location of mainstem Teton River sections electrofished in 1999.

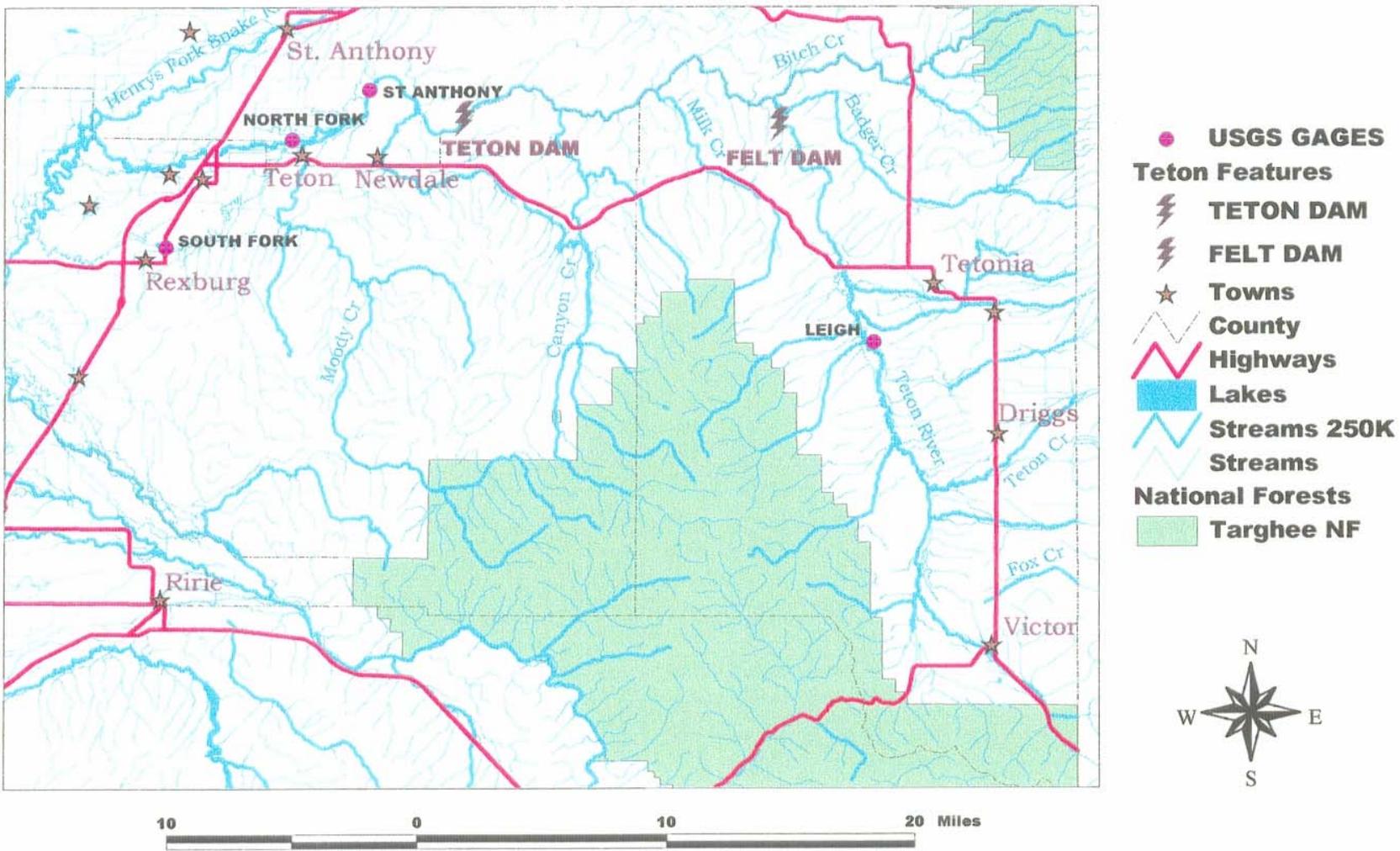


Figure 5. Location of USGS gaging stations in the Teton River drainage, 1996-99.

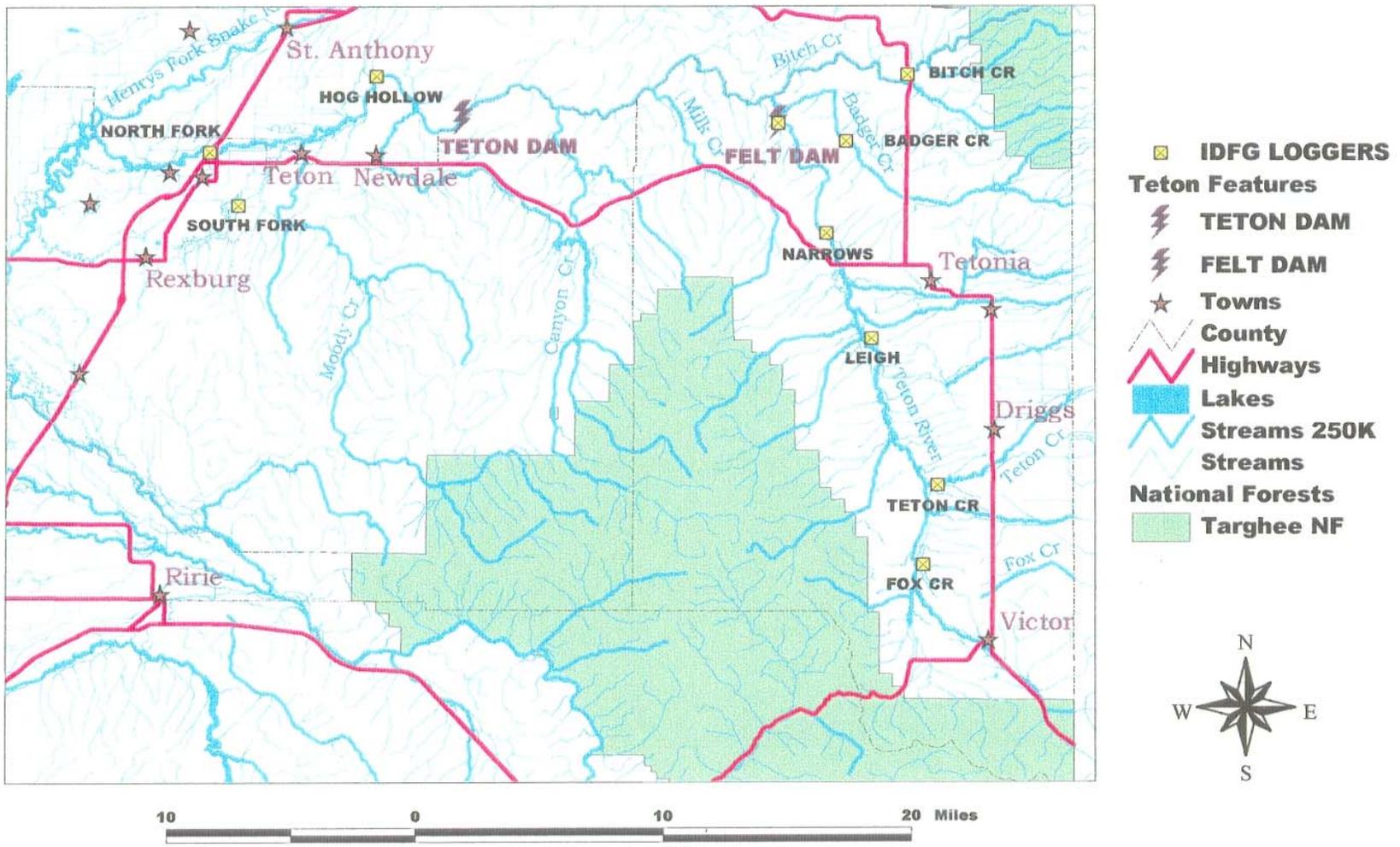


Figure 6. Location of IDFG water temperature loggers in the Teton River drainage, 1996-99.