Johnson 1999

STATE OF NEVADA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

DIVISION OF WILDLIFE

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April 7, 1999

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RENO FIELD STATION
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RENO, NEVADA
U.S. Fish & Wildlife Service

Mr. Bob Williams, Field Supervisor
U.S. Fish and Wildlife Service
Nevada Field Office
1340 Financial Blvd. Suite 234
Reno, NV 89502

Dear Bob:

Enclosed please find a copy of the Division report, The Status of The Bull Trout in Nevada (Johnson 1999). This report presents the results of the bull trout surveys of the Jarbidge River System in northeastern Nevada conducted in late summer and fall, 1998.

If you have any questions or comments, please let me know.

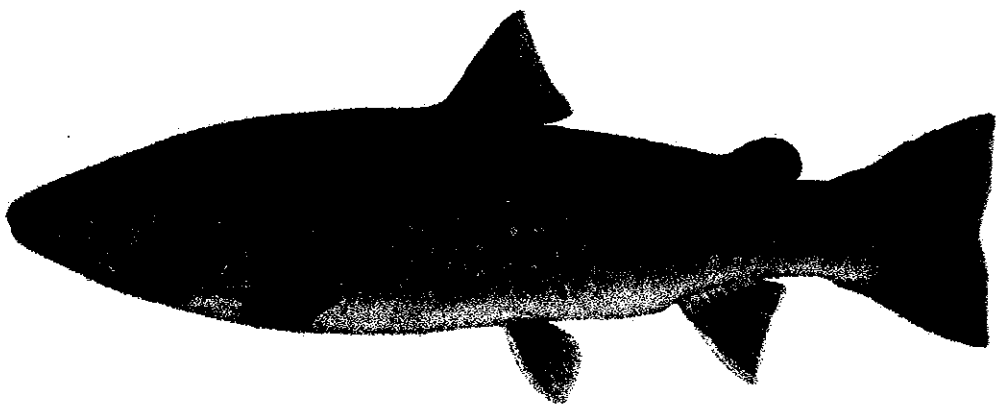
Sincerely,

Gene

Gene Weller
Chief of Fisheries

encl.

THE STATUS OF THE BULL TROUT IN NEVADA



Prepared by:

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March 30, 1999

The Status of the Bull Trout in Nevada

Abstract

In late summer and fall, 1998, an intensive survey of all bull trout, *Salvelinus confluentus*, habitats in Northeastern Nevada was conducted. The information collected was intended to supplement population status work completed in 1994 and reported in The Status of The Bull Trout in Nevada (Johnson et. al. 1994). The Jarbidge River system is the southern-most distribution of bull trout and has been designated as a Distinct Population Segment (DPS) by the U.S. Fish and Wildlife Service in rule making processes associated with the Endangered Species Act of 1973 as amended. Currently the bull trout of the Jarbidge River DPS are classified as emergency endangered. Results from these 1998 studies show that bull trout in the Jarbidge River System are distributed in all suitable habitats, albeit at low densities. These low densities are commensurate with available habitat, which is based upon deterministic habitat factors of gradient, temperature and stream flow. The bull trout, a glacial relict, is dependent upon cold, clear water (40° - 51°F), moderate gradient (<12%), and suitable stream flow (≥1 cfs) for spawning and rearing. These habitat conditions are limited in the Jarbidge River system, however, 1998 studies reiterate that where these suitable conditions exist, bull trout persist. Furthermore, these critical spawning and rearing areas are free from external threat other than stochastic events. Additionally, genetic evaluations also completed in 1998 reveal the presence of at least three distinct subpopulations in the system with adequate genetic diversity and metapopulation potential to counter the threat of stochasticism. Adult resident and migratory habitat in the main forks of the Jarbidge River are also occupied, again at the low densities characteristic of the species. Threats to these less critical habitats are minimal. Associated fish species in the Jarbidge River environs such as redband trout are also represented by proliferating populations, further corroborating stable habitat conditions and the absence of substantial threat. Listing bull trout will not increase in-stream flows, decrease water temperatures, modify stream gradients, or attenuate the effects of stochastic events. We believe the results of this study support the contention that the Jarbidge River bull trout population is neither threatened nor endangered, but instead is secure in a limited distribution due to a paucity of suitable habitat.

Introduction

Since 1992, the status of bull trout across its range has been either under review due to petitions filed under provisions of the Endangered Species Act of 1973 (ESA), or the subject of lawsuits filed by various concerned conservation groups. In 1994, the Division of Wildlife completed The Status Report Of The Bull Trout In Nevada (Johnson et. al. 1994) with partial funding from a contract with the U.S. Fish and Wildlife Service (USFWS). The conclusion of that report stated: "Based on the first stream survey records for the Jarbidge River drainage system and the most current survey results, bull trout continue to maintain a limited presence in the same locations. Given the present habitat condition of focal habitats, the current land management practices, negligible exploitation,

and wilderness land status, bull trout are expected to persist." That report contains a significant amount of historical data, including habitat survey data which is not duplicated in this report.

On June 10, 1998, the USFWS published a proposed rule to list the Jarbidge River Distinct Population Segment (DPS) of bull trout as threatened with a special rule. The bull trout was under a 120-day public review and comment period under the proposed rule when on August 11, 1998, the USFWS exercised its emergency authority to determine the Jarbidge River population segment to be endangered pursuant to the ESA. According to the USFWS, "The listing was prompted by the unauthorized disturbance of portions of the West Fork of the Jarbidge River by Elko County Road Department on July 21, 1998." In a letter sent to the USFWS on October 5, 1998, NDOW stated that the emergency listing was inappropriate based on the level of threat posed by the "unpermitted activities" and that a threatened status is not supportable based on information presented in the listing package. A final determination on the June 10, 1998 proposal will be made by the USFWS prior to expiration of the emergency rule on April 7, 1999.

The goal of this report is to present the findings of the 1998 survey of the Jarbidge River system, and to compare these findings to those of previous surveys. The result of this process, we believe, is the most accurate depiction of the status of the bull trout in the Jarbidge River system of Nevada.

Procedures

Sample site (SS) locations from previous surveys were determined from available records (Maps 1 - 2). The West Fork Jarbidge River, lower Jack Creek, Jenny Creek, Pine Creek, Sawmill Creek, Dave Creek, Fall Creek, and middle and upper Slide Creek were all surveyed on August 5, 1998.

A total of fourteen survey crews comprised of attendees to the *Salvelinus confluentus* Curiosity Society Workshop at Pole Creek Ranger Station assisted with the survey. A single pass survey technique utilizing backpack electrofishing gear sampled a minimum of 100 feet of stream at each station, with a range of 100 to 250 feet. Spot-shocking outside of sample areas was conducted by some groups searching for bull trout. All captured gamefish were identified and measured. All bull trout fork and/or total lengths are recorded in Appendix I. Some groups collected weights from these fish. Nongame fish were identified, enumerated and a sample measured. A fin clip tissue sample from each captured bull trout was collected and preserved according to provided instructions. Tissue samples were provided to Paul Spruell, Montana State University geneticist, for genetic analysis. Stream temperatures were recorded at each survey site. Prior to electrofishing at eleven lower West Fork Jarbidge River sample sites, two person snorkel teams recorded underwater counts of game fish seen through the sample site.

Later in August, a Division of Wildlife stream survey crew completed survey efforts of the Forest portion of the East Fork Jarbidge River, Cougar Creek and the lower two sample sites on Slide Creek. Fox Creek and the upper two sample sites on Jack Creek were surveyed in mid-September. A single pass electrofishing survey technique was used through the 100 ft. sample sites. All captured fish were measured and gamefish were weighed. Spot-shocking was used in some areas to determine the presence/absence of bull trout. One fin clip from a bull trout caught in Cougar Creek was preserved for bio-genetic analysis. Both air and stream temperatures were recorded at each sample site.

Minimum fish density estimates (fish/mile) at each sample site were determined from the number of each species captured and/or the number of each species that were seen but missed during electrofishing surveys. Minimum species population estimates were calculated from the average of individual sample site density estimates through the occupied range of the species.

On July 30-31, 1998, Onset® thermographs were set in upper West Fork Jarbidge River, Jack Creek, Slide Creek, and in an unnamed, Tributary B of Slide Creek. The thermographs were set to determine the suitability of these streams as juvenile bull trout rearing habitat. These thermographs were pulled on October 26-27, 1998.

The redband trout referred to in this report is putatively *Oncorhynchus mykiss gairdneri,* referred to as the interior redband trout. Sculpin are not easily identified to species in the field, so the common name sculpin for the genus *Cottus spp.* is used. Two species of dace are known to the system, the longnose dace, *Rhinichthys cataractae*, and the speckled dace, *Rhinichthys osculus*. Where ever possible these two species were recorded separately. The single recovery of a sucker was noted as *Catostomus spp.*

Maps of the Jarbidge River system were prepared to show occupied and unoccupied stream reaches. These maps were based on 1992,1993, and 1998, population surveys. Suitable and unsuitable stream reaches for bull trout occupation are also depicted. These determinations were based on observed and measured habitat parameters, including water flows, water temperatures and stream gradient (Maps 1-2).

Results

West Fork Jarbidge River

A total of 19 sites were sampled in Nevada (17) and Idaho (2), (Map 1). Game fish were found inhabiting all sample sites except SS-13 which happened to be within the recently (July 21, 1998) channelized reach of stream located above the confluence of Pine Creek. It should be noted that a NDOW crew subsequently cleared this site of fish prior to U.S. Forest Service rehabilitation efforts on November 20, 1998, and found 31 redband trout and 2 bull trout.

Bull trout were found at the three sample sites within the Jarbidge Wilderness Area and at 2 of 14 sample sites outside the wilderness area. An additional bull trout was seen by a snorkel team at the upstream of two sites in Idaho.

The mean bull trout density in the 1.9 miles of occupied stream within the wilderness area was calculated at 258.7 fish per mile. Bull trout density at an added sample site (S-17), located immediately above the confluence of Sawmill Creek, was 316.8 fish per mile. This added sample site was excluded from the mean bull trout density calculation because of its close proximity to the established sample site located 250 feet below the confluence of Sawmill Creek. Length frequency analysis separates the fish collected in the wilderness area into the following age classes: Age I (n=8); Age II (n=12); and Age IV (n=1). The bull trout seen by snorkelers or collected during electrofishing outside the wilderness area were of two age classes: Age III (n=3) and Age IV (n=2). The largest bull trout captured was 239 mm (TL) and the largest seen by snorkelers was approximately 229 mm (TL).

Calculated minimum bull trout densities and distribution was similar to what was found in past surveys of the West Fork Jarbidge River (Appendix II). The highest elevation sample sites have always had the greatest bull trout densities. The most favorable juvenile rearing and spawning habitat lies within the wilderness area. Densities of bull trout outside the wilderness area have always been low. The upper West Fork is a bull trout focal area, habitat where resident bull trout live year around and migratory bull trout use for spawning and early rearing.

Redband trout were the more numerous game fish at all except the upper most two sample sites where bull trout were most common. Thirty-five percent of the redband trout captured and seen by snorklers were 152 mm or larger in fork length. The largest redband trout was 239 mm total length. There appeared to be five age classes of redband trout.

Mountain whitefish were collected at 7 of 12 sample sites below Pine Creek to the state line and at both sample sites in Idaho. The minimum fish density estimate of mountain whitefish in Nevada was 54.2 fish per mile. Snorkelers saw an average of 204.9 mountain whitefish per mile at the two sample sites in Idaho. There were no Age 0 or Age I mountain whitefish seen or captured at any of the sample sites. The mean total length of six measured specimens was 264 mm, with a range of 175 - 325 mm. Deep pools are the preferred resting habitat for mountain whitefish, hence their occupation of the river below the confluence of Pine Creek and into Idaho where such habitat is available.

Hatchery rainbow trout were identified below the confluence of Pine Creek to the sample site just downstream of the confluence of Jack Creek. There were trout from 279 - 356 mm seen by snorkelers at the two Idaho sample sites and at two of three snorkeled sites between the confluence of Deer Creek and the confluence of Freighter Defeat draw that were likely planted rainbow trout.

Nongame fish species found in the river included sculpin, longnose dace, and suckers. Sculpin were found within the channelized reach above Pine Creek confluence and at all downstream sample sites. Captured sculpin ranged in total length from 24 mm to 101 mm. Length frequency analysis indicated at least four age groups: Age-I (40 mm); Age-II (65 mm); Age-III (85 mm); and Age-IV (100 mm). Longnose dace were captured at the three sample sites immediately above the state line and at the sample site 0.8 mile upstream of Jack Creek confluence. The five longnose dace captured represent the first record of the species in the Nevada portion of the river. Unidentified dace found at Idaho sample sites may have been longnose or speckled dace. A single unidentified sucker was captured at the state line sample site.

West Fork Jarbidge River
Fish Population Inventory
1998

Species	Size Range	Mean (mm)	Occupied Miles	Fish per Mile Range	Fish per Mile Mean	Minimum Population Estimate
BT	96-225	128	1.9	148-370	259	492
	172-215	188	12.1	0-70	7	87
RB	52-210	126	14	106-2270	1054	14759
HRB	210-313	243	16.0**	0-196	66	1056
MWF	195-310	271	12	0-188	54	650
SU		205	0.5		53	27
LD	66-110	92	8	0-53	19	151

* BT = bull trout; RB = redband trout; HRB = hatchery rainbow trout; MWF = mountain whitefish; SU = unidentified sucker; and LD = longnose dace
** Includes Idaho portion of river and Nevada below Pine Creek confluence.

Jack Creek and Jenny Creek

There were four sample sites in Jack Creek and one sample site up from the mouth of Jenny Creek (Map 1). No bull trout were seen or captured in either stream. Fish access into Jack Creek was restored in November, 1997 with the removal of a culvert barrier and replacement with a bridge.

The August daily maximum temperature average in Jack Creek below the confluence of Jenny Creek was 55.7°F in 1998. The peak August reading of 57.5°F, came on three dates. The maximum weekly and biweekly high temperatures were 57.5°F and 57.1°F, respectively. The warmest mean daily temperature in August was 54.1°F. The warmest mean daily temperature averaged over a week in early September was 55.4°F. In the Flathead River drainage of Montana, the highest densities of juvenile bull trout were found in reaches where maximum temperatures were 53.6°F or less.[1]

Redband trout were present at all four sample sites. Greatest densities were found at the lower three sample sites. The upper station was the upper limit of fish occupation due to a steep gradient (13%). Including both the number of trout caught and the number of trout seen but missed during electroshocking surveys, the number of fish per mile at SS-2 and SS-3 was each 1108.8. Redband trout densities at SS-1 and SS-4 were 422.4 and 105.6 fish per mile, respectively. The expanded redband trout population estimate over the 2.7 miles of occupied stream was 1853 trout or an average of 686.4 fish per mile. Redband trout density at SS-1 in Jenny Creek was 580.8 fish per mile. Redband trout occupy about 0.1 mile in Jenny Creek. Length frequency analysis of 31 captured trout indicated five age groups: Age I - 90 mm; Age II - 125 mm; Age III - 160 mm; Age IV - 215 mm; and Age V - 250 mm.

Sculpin were captured at S-1 and were present at a calculated density of 1320.0 fish per mile. Sculpin may have only recently been able to enter lower Jack Creek. Sculpin will probably only be able to inhabit 0.1 mile of Jack Creek due to gradient barriers.

Pine Creek

There were five sample sites in Pine Creek (Map 1). A single juvenile bull trout (110 mm TL) was captured in a small tributary located at SS-5.5. The lone occupant of the tributary was residing in 57.2°F water when the adjoining Pine Creek was 61.0°F. Survey efforts conducted in August, 1992 (a drought year), contacted a single adult bull trout downstream of SS-5. The recorded temperature was 59°F at 1140 hours.

Redband trout were captured at all five sample sites. The mean number of redband trout per mile was calculated at 640 and the expanded population estimate over the 3.7 miles of occupied stream was 2369. Length frequency analysis of 58 redband trout indicates four age classes (Age I through IV). No young-of-year fry were noted.

Sculpin were only found at SS-1 where there were 1584 fish per mile over an estimated 0.5 mile of occupied habitat.

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[1]Shipyard, B., K. Pratt, and P. Graham 1984. Life histories of westslope cutthroat and bull trout in the upper Flathead River Basin, Montana. Montana Dept. Fish , Wildlife, and Parks, Kalispell, Montana. 85p.

Fox Creek

There were four sample sites in Fox Creek (Map 1). No bull trout were captured in Fox Creek in either 1992 or 1998. Redband trout were found only at the lower two sample sites. Fox Creek is a steep (≥10%), Rosgen A2 type channel. The mean number of redband trout per mile through the 0.7 mile of occupied stream was calculated at 448.8. The mean fork length of eight captured fish was 99.6 mm. Using both captures and numbers of trout seen but missed during electroshocking surveys, the total estimated population was 314 redband trout.

Sawmill Creek

There was only one sample site in Sawmill Creek (Map 1). The lower 100 feet of Sawmill Creek was sampled and the only fish seen was a juvenile bull trout that was estimated to be 120 mm long. The afternoon water temperature were 54°F. Sawmill Creek has very little suitable habitat for fish due to the steep gradient of the channel. In 1954, only redband trout were electrofished in lower Sawmill Creek and no fish were sampled in 1992.

East Fork Jarbidge River

There were 12 sample sites along the Forest portion of the East Fork Jarbidge River (Map 2). Bull trout were only found at the uppermost sample site located just below the headwater forks.

There were an estimated 688.8 bull trout per mile at the uppermost sample site. Two bull trout were spot-shocked from above the confluence of the two headwater forks in the lower reach of the fork emanating from the East Fork and West Fork Jarbidge River drainage divide. The occupied range of bull trout was about 1.4 miles. This headwater area is a focal area for bull trout. The water temperature was 45°F at mid-morning. Downstream 0.9 mile the noon stream temperature was 54°F and although no bull trout were captured in 1998, there was one captured in 1993. The stream temperature was 57°F in mid-afternoon, less than 2 miles below the headwater forks. At 4 miles below the headwater forks the early afternoon stream temperature was 62°F. Water temperatures above 59°F are thought to limit bull trout distribution[2]. A survey high temperature of 65°F was recorded in mid-afternoon between the confluences of Slide Creek and Robinson Creek. The mean total length of eight captured bull trout was 187 mm (142 - 262 mm). These fish most probably represent four age groups, only the smallest of which might be considered a sub-adult.

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[2]Rieman B. E. and McIntyre J. D. 1993. Demographic and Habitat Requirements for Conservation of Bull Trout. General Technical Report-302, Boise, ID: USDA, Forest Service, Intermountain Research Station, 31p.

Redband trout and sculpin were found at all sample sites except the uppermost site in the drainage where bull trout were the only fish species present. An average of 75.0 % of the trout within a sample site were captured as determined by the number of trout that were seen but missed. Length frequency analysis indicates, that there were at least five year classes of redband trout in the sample of fish captured. Four captured young-of-year redband trout were from 18 mm to 40 mm. Redband trout YOY were seen or captured at four different sample sites.

The longnose dace capture represents the first recorded presence of the species in the portion of river on the Humboldt National Forest.

The surveyed sites outside the wilderness had minimal pool and no quality pool habitat and a limited amount of cover. Sample sites within the wilderness contained more pool and quality pool habitat and mostly a moderate amount of instream cover.

East Fork Jarbidge River
Fish Population Inventory
1998

Species	Size Range	Mean (mm)	Occupied Miles	Fish per Mile Range	Fish per Mile Mean	Minimum Population Estimate
BT	97-258	198	1.2	0-634	317	380
RB*	63-237	134	11.8	196-1162	522	5883
SC	38-115	77	11.8	53-2693	1384	15634
LD		68	2	0-53	26	53

* Redband trout data includes Age I and older fish.

Dave Creek

There were three survey sites on the Forest portion of Dave Creek (Map 2). Within the 1.9 miles of fish occupied stream on the Forest, redband trout were found at SS-1 and SS-2 and bull trout were present at SS-2 and SS-3. The uppermost 1.4 miles of Dave Creek can be considered a focal area for bull trout. Stream temperatures ranged from a mid-afternoon high of 50°F at SS-3 to an early-afternoon high of 56°F at SS-2. Including both captures and known misses, there were an average of 132.2 redband trout per mile and 237.6 bull trout per mile of occupied stream on the Forest. The estimated number of bull trout and redband trout on the Forest was 301 and 159, respectively. Spot-shocking between SS-2 and SS-3 and above SS-3 resulted in the capture of eight bull trout. A fin

clip tissue sample was collected from these eight bull trout along with five collected at SS-2 and SS-3 for genetic analysis. The mean fork length of the 13 bull trout was 168.3 mm, with a range of 140 - 213 mm. The mean fork length of three captured redband trout was 133.3 mm, with a range of 105 - 155 mm.

Slide Creek

There were six sample sites along Slide Creek and one sample site on each of the main tributaries of Slide Creek (Map 2). Bull trout were found at SS-4 in Slide Creek. Redband trout were common in Slide Creek and in the lowest reach of three tributary streams. Sculpin were present only in the lower reach of Slide Creek encompassing SS-1 through SS-3.

There was an average of 83 bull trout per mile at SS-4. The two captured juvenile bull trout averaged 112 mm TL. Fin-clip tissue samples were taken from both specimens for genetic analysis. The stream temperature at SS-4 in mid-afternoon was 55.4°F. On July 28, 1993, there was a single bull trout captured at SS-3. The afternoon stream temperature at SS-5 located in upper Slide Creek was 57°F. Late morning to noon stream temperatures at SS-1 in the three tributaries ranged from 49°F to 53°F. There were juvenile bull trout in both Tributary A and Tributary B during the 1993 summer survey of Slide Creek. The peak August stream temperature in 1998 within Tributary B and at a site located in Slide Creek below the confluence with Tributary A was 55.9°F and 56.7°F, respectively. The mean maximum weekly and biweekly temperatures in Tributary B were 54.5°F and 54.1°F, respectively. The mean maximum weekly and biweekly temperatures in Slide Creek were 55.5°F and 55.3°F, respectively. The mean daily average temperature in Slide Creek during the warmest week in Slide Creek was only 51.4°F.

There was an average of 506 redband trout per mile in Slide Creek. Lower God's Pocket Creek had 140 redband trout per mile and unnamed Tributary A and Tributary B had 264 and 158 redband trout per mile, respectively. An average of 14% of the redband trout seen were not caught. Length frequency analysis of 61 captured redband trout indicates five Age I and older age classes. Young-of-year trout were not evident in the stream during the early August survey period. There were an estimated 2,530 redband trout within the 5.0 miles of occupied habitat in Slide Creek. The fish inhabited portion of each tributary extends less than .25 miles, due to steep gradients.

There was an average of 282 sculpin per mile in the 2.0 miles of occupied stream. Eleven measured sculpin averaged 76 mm TL with a range of 43 - 100 mm.

Fall Creek

There were four areas of Fall Creek surveyed (Map 2). Both redband trout and bull trout inhabit Fall Creek and the two unnamed tributaries. Sculpin were found only in Fall Creek proper.

Bull trout were found at SS-2 in Fall Creek and at SS-1 in both tributaries. The density of bull trout at SS-2 in Fall Creek was 8.0 fish per mile. Bull trout density in the lower tributary (Tributary A) and upper tributary (Tributary B) was 141 and 53 fish per mile, respectively. Five captured bull trout averaged 137 mm TL with a range of 94 - 162 mm. Fin clips were taken from all captured bull trout for genetic analysis. The bull trout captured represented at least two age classes. The expanded bull trout minimum population estimate in the Fall Creek drainage was 92 fish.

Only redband trout were sampled in the tributaries in 1993. The upstream distribution of fish in the tributaries and in the main stem of Fall Creek above the confluence of Tributary B is limited by steep gradients. There are about 1.5 miles of suitable habitat in the main stem, 0.5 miles in Tributary A, and 0.3 miles in Tributary B. Afternoon stream temperature in the Tributary A and Tributary B was 51°F and 56°F, respectively. Redband trout were present at all four sample sites in the drainage at an average density of 51 redband trout per mile. The mean total length of seven captured redband trout was 114 mm with a range of 59 - 200 mm. The expanded redband trout population in the drainage was 106 fish.

There was an average of 170.8 sculpin per mile in Fall Creek and none were found in the tributaries.

Cougar Creek

There were three sample sites in Cougar Creek (Map 2). The two original sample sites having fish that were first surveyed in 1993 were resurveyed plus an additional sample site (SS-1.5) was surveyed in order to discern fish species distribution. This survey marks the first record of bull trout in Cougar Creek. During the August 24-25, 1993, survey of Cougar Creek only redband trout were found occupying the two lowest elevation sample sites.

Bull trout were collected at SS-2 where two young-of-year bull trout (45 and 49 mm TL) were collected within the sample area. An adult bull trout (180 mm TL) was spot-shocked above the end of SS-2 and a fin-clip was taken for genetic analysis. Steep gradient above SS-2 limits fish occupation (no fish were found at SS-3, 4, or 5 in 1993). There were an estimated 53 bull trout in the 1.5 miles of Cougar Creek that is suitable for fish occupation.

Redband trout were found at all three sample sites at an average density of 598.4 redband trout per mile. The mean size of 30 captured redband trout was 98 mm TL, with a range of 65 - 230 mm. Length frequency analysis indicated five age classes of redband trout. There were an estimated 898 redband trout in the 1.5 miles of Cougar Creek that is suitable for fish occupation.

The average total length of 13 sculpins was 64 mm (38 - 95 mm). There were 275 sculpin in the1.5 miles of Cougar Creek that is suitable for fish occupation.

Discussion

The results of the fish population surveys conducted in 1998 are similar to the results of previous surveys of the Jarbidge River drainage, see Appendix III and IV. Bull trout continue to occupy headwater reaches of both forks of the Jarbidge River and Dave Creek, in densities similar to those found in previous surveys. Within the Jarbidge Wilderness, portions of the East Fork tributaries of Fall Creek, Slide Creek, and Cougar Creek provide resident habitat for bull trout. The West Fork tributaries of Pine Creek and Sawmill Creek, also within the Jarbidge Wilderness, have reaches suitable for bull trout. The Jarbidge River system also continues to support a robust population of native redband trout and other native species.

Bull trout have been documented in Dave Creek since 1934; East Fork Jarbidge River since 1951; and West Fork Jarbidge River since 1954. Bull trout were first documented in Pine Creek in 1992, and in Slide Creek and Fall Creek in 1993. The 1998 surveys found bull trout in Cougar Creek (only redband trout were found in 1993). There is no historical evidence that suggests that the Jarbidge River bull trout population was ever more widely distributed than the contemporary distribution. Records as early as 1934 and 1957 for Dave Creek, 1954 for the West Fork Jarbidge River, and 1958 for the East Fork Jarbidge River, all suggest that bull trout have been limited primarily to the headwaters of each of the three systems, and were never common as compared to the abundant redband trout populations. This distribution pattern has remained stable throughout recent times. However, evidence shows bull trout will exploit suitable cold water habitats when conditions allow. Intermittent flows in the headwaters reach of the East Fork Jarbidge River were devoid of fish in 1993, however with improved conditions in 1998, fish had repopulated this area.

The average density of bull trout in the West Fork below the wilderness boundary to the state line was 7.2 bull trout per mile in 1998, compared to 2.9 bull trout per mile in 1985. Adult bull trout are able to tolerate warmer temperatures than juvenile fish, explaining the presence of a low density population of adults in the lower West Fork Jarbidge River. The 1998 survey failed to document bull trout in Jack Creek even though bull trout have historically inhabited this creek. A culvert fish barrier which was removed in 1997 may have prevented upstream migrations of bull trout into Jack Creek[3], as snorkelers counted six adult bull trout which appeared to be staged in the pool below the Jack Creek culvert in July, 1994[4]. Some question as to the thermal suitability of Jack Creek for bull trout habitation also exists, as summer water temperature data collected in August and September, 1998, recorded maximum weekly and biweekly temperatures which exceeded by 5°F those temperatures found in juvenile bull trout summer rearing habitat

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[3]Unpublished BLM Stream Survey Form. 1981. Boise District, Idaho. 1p.

[4]Zoellick, B.W., R. Armstrong, and J. Klott. Status of the Migratory Bull Trout Population in the Jarbidge River Drainage. Technical Bulletin No. 96-5, Idaho Bureau of Land Management, April, 1996

in the upper West Fork Jarbidge River. Jack Creek might still support a limited number of bull trout, but significant surveys will be required to document this.

As was the case in 1993, bull trout were only recovered in the cold headwaters of the East Fork Jarbidge River in 1998. Sampling failed to contact any bull trout in the middle and lower East Fork which is a relatively unaltered watershed that provides no better or worse habitat for native fishes than the reportedly "impacted" West Fork Jarbidge River. Further, more extensive, investigations should show a similar distribution of migratory adult bull trout considering the comparable redband populations in both forks. Redband densities showed a similar pattern between forks with the average number of redband trout in the East Fork Jarbidge River (11 sites excluding the uppermost site) at 521.8 fish per mile, and estimates for the West Fork at comparable elevations (SS-7 to SS-15) at an average of 614.3 redband trout per mile (excludes the channelized SS-13 where no gamefish were found). The 1998 surveys also revealed bull trout in increased numbers in the Fall Creek drainage, a heretofore undocumented population in Cougar Creek, and decreased numbers in the Slide Creek drainage. Slide Creek, which has a limited number of bull trout, had water temperatures which were only a couple degrees cooler than what was recorded in Jack Creek, indicating this too is marginal bull trout habitat.

Cold water habitat (≤51°F) for juvenile bull trout rearing is naturally limited in the Jarbidge River drainage. The paucity of the cold water habitat best explains the summer distribution pattern in the Jarbidge River drainage. Water temperatures in excess of 59°F limit bull trout distribution. Surveys show that summer and fall concentrations of bull trout are found in the cold water headwater habitats , and all available cold water habitats in the drainage are utilized by the bull trout. Bull trout have always been rare in the warmer downstream areas of both river forks and major tributaries in the drainage. However, these downstream reaches are considered nodal habitat for the migratory element of these bull trout populations. Upstream resident adults may also descend some distance from their headwater focal habitat when habitat conditions and fish densities allow.

Genetic evidence suggests there are a minimum of three subpopulations in the Jarbidge River drainage: West Fork Jarbidge River, East Fork Jarbidge River and Dave Creek. This is based on preliminary determinations made by Paul Spruell of Montana State University using tissue samples collected during the 1998 population surveys. Further sampling may reveal additional genetic diversity within the Jarbidge River system. We propose that the Jarbidge River bull trout population fits the definition of a metapopulation. A metapopulation is an interacting network of local subpopulations with varying frequencies of migration and gene flow among them. Local subpopulations may become extinct, but can be reestablished by individuals from other subpopulations. Metapopulations provide a mechanism for reducing risk because the simultaneous loss of all subpopulations is unlikely. The genetic diversity evident within this metapopulation helps insure adaptability of the population and insures its persistence.

Conclusion

Bull trout in the Jarbidge River system were found to occupy all suitable habitats available at the time of the survey in numbers comparable to past population surveys. There is no evidence that the Jarbidge River bull trout population was ever more extensive than what current fishery data suggests. Bull trout are known to have persisted in the same locales in the Jarbidge River system during historic times, with the possible exception of Jack Creek where the current distribution is in question. The West Fork Jarbidge River fishery has recovered from a period of mining pollution that from all historical accounts rendered the lower river unfit for fish.

The limited bull trout population of the Jarbidge River system appears stable and will continue in perpetuity as long as cold water habitats persist for bull trout spawning and rearing. The fact that most of the bull trout occupied cold water habitats are remote and in the Jarbidge Wilderness, leaves nature to maintain these areas in suitable condition for bull trout. Man related impacts in these remote stream reaches are non-existent, as are other non-stochastic threats. The metapopulation characteristics of the drainage would potentially mitigate site specific stochastic events by providing a source of fish to recolonize. Nor do significant threats to the population exist in main stem reaches of each river. No brook trout were found in this survey or any of the recent surveys, alleviating any concern of hybridization. Harvest is no longer an issue as current fishing regulations in both Idaho and Nevada prevent the take of bull trout. Essentially, the Jarbidge River bull trout population is stable, distributed to the extent natural habitat conditions allow, and free from imminent threat.

Acknowledgments

A special thanks is due the *Salvelinus confluentus* Curiosity Society for assistance in the completion of the 1998 survey. This group provided some fourteen skilled survey teams. In return they were afforded the opportunity to experience the rugged beauty of the Jarbidge Wilderness Area.

APPENDIX I

Bull Trout Length By Sample Site
August, 98

Stream	Sample Site	Bull Trout Lengths (mm) FL or TL
W.F. Jarbidge River	17	120, 130, 130, 135, 135, 140
	16	95, 125, 135, 135, 145, 150, 225
	15	96, 106, 107, 109, 110, 117, 123
	8	172, 176
	3	210
Pine Creek	5.5 Trib.	110
E.F. Jarbidge River	12	97, 182, 212, 212, 230, 258
	Above 12	142, 282
Dave Creek	2	158, 170, 172
	2 - 3	157, 213
	3	147, 192
	Above 3	140, 145, 152, 153, 171, 198
Fall Creek	2	134
Trib. A	1	135, 150, 155
Trib. B	1	98
Slide Creek	4	101, 112
Cougar Creek	2	49, 45
	Above 2	170

Total Lengths

APPENDIX II

West Fork Jarbidge River
Fish Surveys and Bull Trout Site Location Comparisons

Mo/Yr	Sample Sites	Site I.D. w/ BT	Reach	Elevation (Feet)	Mean BT/Mi
08/54	5	B	upper	7268	105.6
08/72	4	4	lower	5910	35.2
11/74	6	0	lower		-
09/75	7	0	lower		-
10/79	10*	Natural A	lower	6600	21.1
		Channelized F	lower	6160	36.4
10/80	6*	Channelized A	lower	6600	2.9
		Natural E	lower	6250	81.2
10/61	7	G	upper	7400	528.0
10/85	16	16	upper	7360	224.7
		15	upper	7120	105.6
		11	lower	6320	40.6
08/98	17	17	upper	7400	316.8
		16	upper	7360	369.6
		15	upper	7120	147.8
		8	lower	5980	70.4
		3	lower	5520	29.8

* The 1979 and 1980 surveys were initiated to evaluate fish population response to USFS sanctioned channelization that was completed on 3,104 feet of river located between Pine Creek Campground and Mahoney Range Station during August-September, 1979.

APPENDIX III

Jarbidge River Drainage Bull Trout Trend Data

Stream	Year	SS's W/ Fish	SS's with Bull Trout	Mean No. per Mile	Occupied Miles	Total Number
West Fork Jarbidge River	1954	* Minimum population estimate due to the fact there was no sampling in the headwaters.				
Above Snowslide Gulch		2	1	52.8	1.9	100
Below Snowslide Gulch		3	0	0	0	0
West Fork Jarbidge River	1961					
Above Snowslide Gulch		1	1	369.6	1.9	702
Below Snowslide Gulch		6	0	0	0	0
West Fork Jarbidge River	1985					
Above the Wilderness		2	2	164.95	1.9	313
Below the Wilderness		14	1	2.9	13.1	38
West Fork Jarbidge River	1998					
Above the Wilderness		3	3	278.08	1.9	528
Below the Wilderness		14	2	7.16	13.1	94
Jack Creek	1992	4	1	52.8	1	53
	1997&1998	4	0	0	0	0
Sawmill Creek	1954	1	0	0	0	0
	1992	1	0	0	0	0
	1998	1	1	52.8	0.1	5
Pine Creek	1992	4	0			Obs. 1
	1998	4	0			Obs. 1
East Fork Jarbidge River	1957	3	2	22.88	13.1	300
East Fork Jarbidge River	1993	13	2	184.8	1.4	180
East Fork Jarbidge River	1998	12	1	316.8	1.4	444
Dave Creek	1993	3	2	132	1.4	172
Dave Creek	1998	3	2	237.6	1.4	333
Fall Creek	1993	2	1	105.6	0.5	53
Unnamed tributaries		2	0	0	0	0
Fall Creek	1998	2	1	8.1	0.5	4
Unnamed tributaries		2	2	96.8	0.5	48
Slide Creek	1993	6	1	52.8	1	53
Unnamed tributaries		3	2	316.8	0.5	158
Slide Creek	1998	6	1	83.15	1	83
Unnamed tributaries		3	0	0	0	0
Cougar Creek	1993	2	0	0	0	0
Cougar Creek	1998	3	1	105.6	0.5	53

APPENDIX IV

BULL TROUT ENCOUNTERS DURING THE 1998 SURVEY OF JARBIDGE RIVER STREAMS

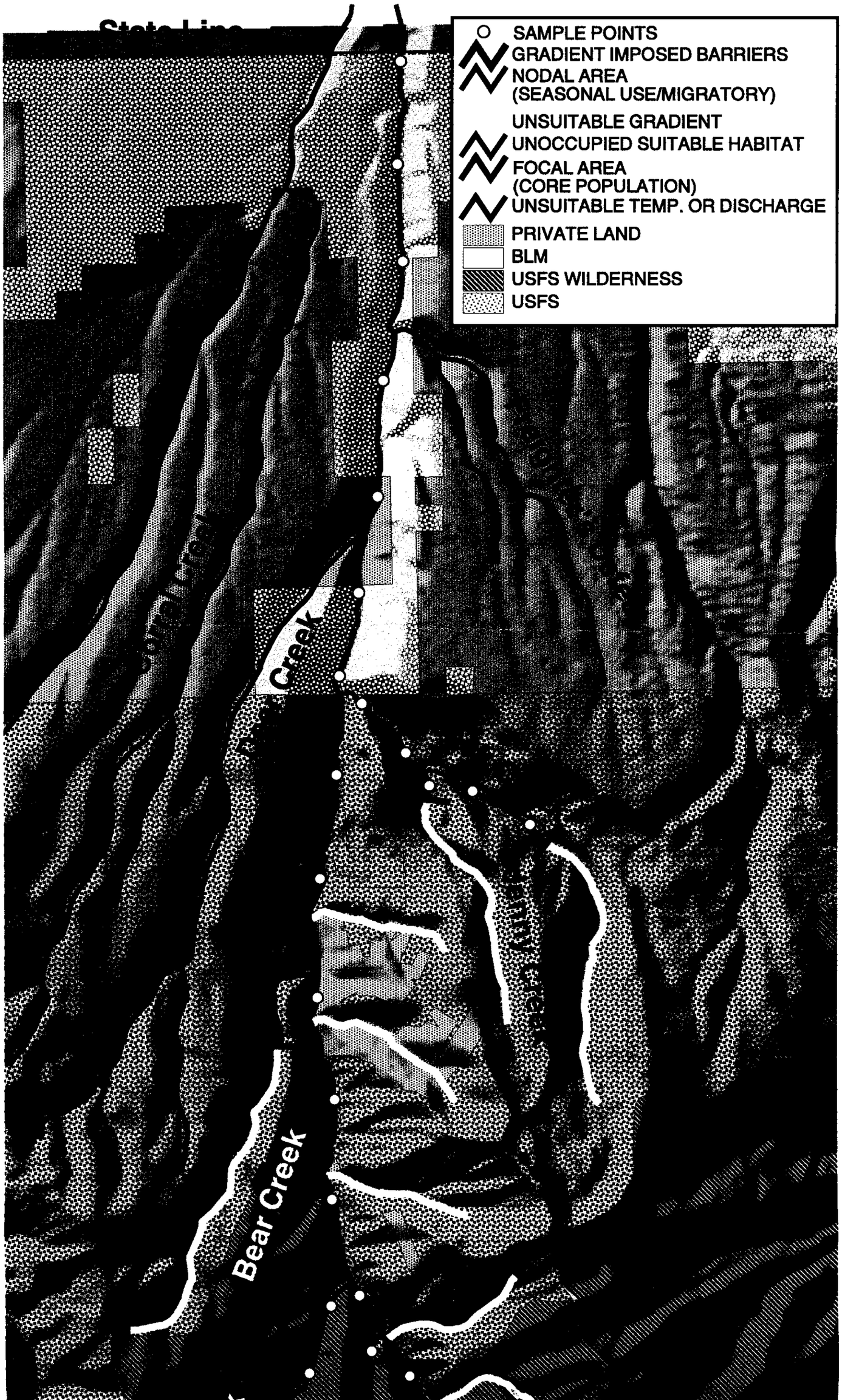
STREAM	DATE	STATION	ELEVATION	CAUGHT	MISSED	TOTAL	LENGTH (ft)	BT/MI
W.F. Jarbidge River	08/05	ID 2	5120	0	1	1	145	36.4
	08/05	NV 1	5360	1	?	1	200	26.4
	08/05	NV 8	6000	2	1	3	225	70.4
	08/05	NV 15	7080	7	?	7	250	147.8
	08/05	NV 16	7400	7	?	7	100	369.6
	08/05	NV 17 *	7440	6	?	6	100	316.8
Sawmill Creek	08/05	1	7400	0	1	1	100	52.8
Pine Creek	08/05	5.5 trib.	7560	1	0	1	0	0
Dave Creek	08/05	2	7280	3	2	5	100	264
	08/05	3	7560	2	2	4	100	211.2
Fall Creek	08/05	Above 2	6640	1	?	1	spot-shock	
Tributary A	08/05	1	6640	3	1	4	150	140.8
Tributary B	08/05	1	6840	1	0	1	100	52.8
E.F. Jarbidge River	08/12	12	7600	6	6	12	100	633.6
Cougar Creek	08/25	2	6960	2	0	2	100	105.6
TOTALS				42		56	1770	

* This sample site was just upstream of S-16 and was not surveyed in 1985.

BULL TROUT ENCOUNTERS DURING THE MOST RECENT PAST SURVEYS IN JARBIDGE RIVER STREAMS

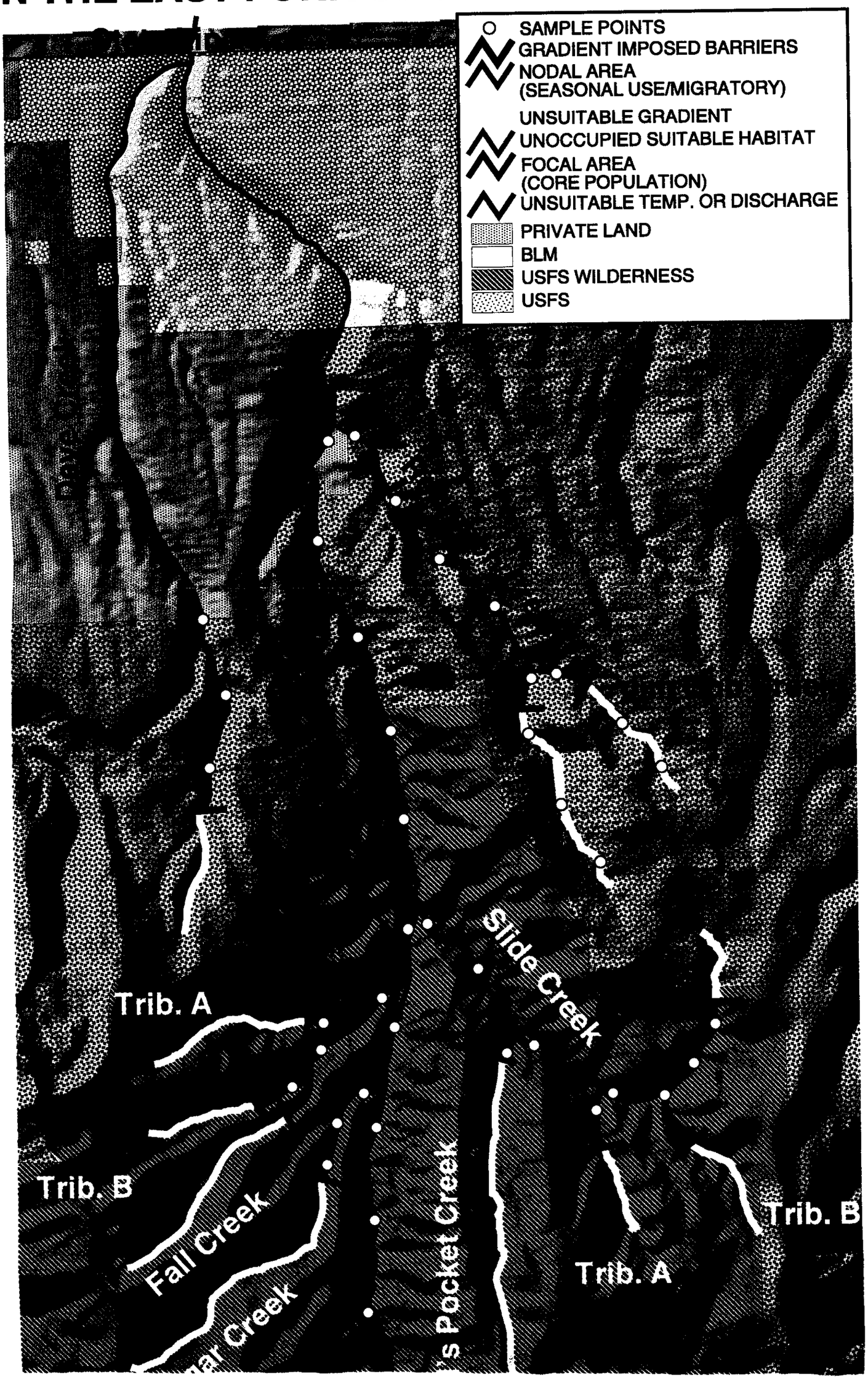
STREAM	DATE	STATION	ELEVATION	CAUGHT	MISSED	TOTAL	LENGTH (ft)	BT/MI
W.F. Jarbidge River	09/85	11	6300	1	0	1	130	40.6
	09/85	15	7080	2	0	2	100	105.2
	10/85	16	7400	9	1	10	235	224.7
Jack Creek	09/92	2	6200	1	0	1	100	52.8
Pine Creek	08/92	Below 5	7400	1	0	1		
Dave Creek	08/93	2	7280	2	0	2	100	105.6
	08/93	3	7540	3	0	3	100	158.4
Fall Creek	08/93	2	6640	0	2	2	100	105.6
Slide Creek	07/93	3	6830	1	0	1	100	52.8
Tributary A	08/93	1	7240	4	3	7	100	369.6
Tributary B	08/93	1	7390	5	0	5	100	264
E.F. Jarbidge River	09/93	11	7280	1	0	1	100	52.8
	09/93	12	7600	3	3	6	100	316.8
TOTALS				33		42	1365	

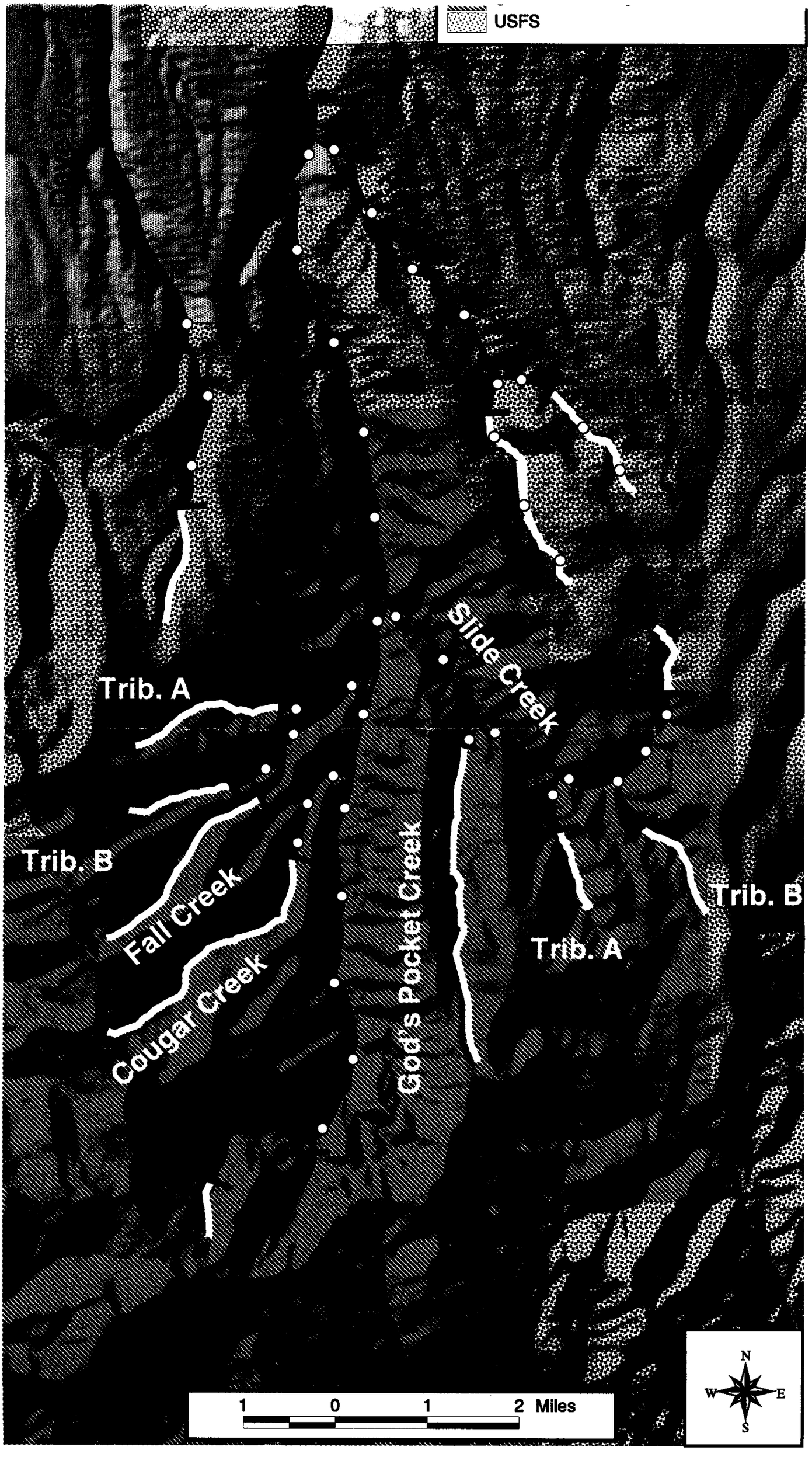
Map 1 - STREAM STATUS AND POPULATION DISTRIBUTION OF BULL TROUT IN THE WEST FORK OF THE JARBIDGE RIVER



USFS
Creek
Bear Creek
Pine Creek
N
E
S
W
1
0
1
2 Miles

Map 2 - STREAM STATUS AND POPULATION DISTRIBUTION OF BULL TROUT IN THE EAST FORK OF THE JARBIDGE RIVER




USFS
Trib. A
Trib. B
Fall Creek
Cougar Creek
God's Pocket Creek
Slide Creek
Trib. A
Trib. B
1 0 1 2 Miles
N
W
E
S