State of Nevada
Department of Wildlife

BULL TROUT SPECIES MANAGEMENT PLAN FOR THE NEVADA PORTION OF THE JARBIDGE RIVER DRAINAGE BASIN

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SPECIES MANAGEMENT PLAN

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FOR THE NEVADA PORTION OF THE
JARBIDGE RIVER BASIN DRAINAGE

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TABLE OF CONTENTS

EXECUTIVE SUMMARY 1

INTRODUCTION 2

AGENCY RESPONSIBILITIES 4

SPECIES DESCRIPTION 6

CURRENT STATUS 7

LIFE HISTORY 7

HABITAT SUITABILITY 10

BULL TROUT SAMPLING AND DISTRIBUTION 12

LIMITING FACTORS 17

MANAGEMENT PRESCRIPTION STATEMENT 18

MANAGEMENT GOALS AND OBJECTIVES 21

BULL TROUT SPECIES MANAGEMENT PLAN IMPLEMENTATION SCHEDULE* 26

LITERATURE CITED 27

APPENDIX I JARBIDGE RIVER THERMOGRAPH SITES AND TEMPERATURE (º F) METRICS, NDOW 1998 – 2003. 30

APPENDIX II ELECTROFISHED SITES LOCATED ABOVE 7000 FEET IN THE EAST FORK AND WEST FORK OF THE JARBIDGE RIVER. 31

APPENDIX III BULL TROUT DENSITIES IN JARBIDGE STREAM HEADWATER AREAS 32

APPENDIX IV SUMMARY OF NDOW'S JARBIDGE BULL TROUT REDD SURVEYS 33

APPENDIX V MAP 1 WATER TEMPERATURE PROFILES (E. F. & W. F. JARBIDGE RIVER, ELKO CO.,NEVADA) 34

DRAFT

EXECUTIVE SUMMARY

The bull trout in the State of Nevada has been the focus of controversy for more than a decade. It is the position of the Nevada Department of Wildlife that the listing of the bull trout was unwarranted. Bull trout are naturally limited in distribution in the Jarbidge River Drainage due to natural conditions and their life history requirements. Our studies show that all accessible suitable habitats for bull trout in the Jarbidge River Drainage are currently occupied. Opportunities to expand bull trout occupied habitats by physical manipulations or changes in land use practices are limited.

The purpose of this Species Management Plan is to provide direction to the Department of Wildlife in its management activities. The focus of the plan is on the protection and enhancement of bull trout and their habitats. This will be accomplished through the monitoring of existing populations, by increasing our knowledge and understanding of bull trout, and through the protection and enhancement of habitat through interactions with land management agencies and private landowners. The management program proposed here represents reasonable conservation actions which we believe are consistent with proposed recovery activities and which are appropriate regardless of the status of bull trout in Nevada under the Endangered Species Act.

We look forward to the day when the Jarbidge River population of bull trout is no longer listed and a fishable population is secure in Nevada.

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INTRODUCTION

CURRENT DISTRIBUTION

The bull trout (*Salvelinus confluentus),* found in the Jarbidge River Drainage, is the southernmost population of the species. The bull trout's range extends north into Idaho, Montana, Oregon, Washington, British Columbia, and Alberta. It is also found in the southern areas of the Northwest Territories and Yukon (Reist et al. 1999). The species has been extirpated from California; the last sighting there was reported in the McCloud River in 1975 (Moyle 1975). The Dolly Varden [sic] bull trout was first documented in Nevada in 1934 (Miller and Morton 1952).

HISTORICAL PERSPECTIVE

Prior to the construction of a dam on the lower Bruneau River in 1890, chinook salmon made runs up the Bruneau River and its tributaries. The lack of a settlement in the area precluded published newspaper accounts of trout and salmon in the Jarbidge River before the dam era. A 1960 Deer Creek Cave archaeological dig recovered the remains of two or more Chinook salmon that yielded a radiocarbon date of 2585"150 years (M. Shutler and R. Shutler, Jr. 1963). It was surmised by the author and examiner of the fish remains that the Deer Creek Cave people must have relied principally on some food other than fish, due to the overall paucity of fish remains in the cave. Early Shoshoni Indians believed that a giant man-eating beast, known as Tsauhaubitts, inhabited the Jarbidge Mountains (Patterson et al. 1969). Minimal usage of the Jarbidge River drainage fishery resource by the early Shoshoni Indians might be inferred from their belief of a man-eating beast in the area and their adversity to camping in the canyon.

Extensive and possibly detrimental sheep grazing occurred in the upper reaches of the Jarbidge watershed prior to and following the formation of the Forest Reserve in 1909 until sheep grazing cessation in 1960 (McNeill et al. 1997). A gold rush in 1909 drew a peak of 1500 miners into Jarbidge Canyon. The various underground mines and mills used local timber resources. Cyanide ore processing was conducted just upslope and along the river from in town to two-miles upstream. In 1934, the river below the milling areas was declared unfit for fish, while in the upper five miles of river, rainbow trout were common and cutthroat trout were rare (Durrant 1934). The road went up the canyon to nearly the source of the river. Oddly enough, records of cutthroat trout stocking in the river indicate that fingerlings weren't planted until 1936 and again in 1939. The earliest recorded fish stockings in the river included brook trout (1919) and rainbow trout (1924).

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RECENT HISTORY

In 1990, the Nevada Department of Wildlife (NDOW) completed its first Bull Trout Species Management Plan (Johnson 1990). The 10-year plan emphasized population delineation, stream habitat inventory and temperature monitoring.

On October 30, 1992, three Montana environmental organizations petitioned the United States Fish and Wildlife Service (USFWS) to list the bull trout as “endangered” throughout their range.

In December 1993, NDOW and other interested parties joined the Bull Trout Task Force that had been formed at the request of the Boise District of the Bureau of Land Management. The Bull Trout Task Force sought to (1) document known bull trout distribution throughout the Jarbidge River drainage; (2) identify land use conflicts and solutions; and (3) identify inventory and monitoring needs. A major accomplishment of the Bull Trout Task Force was the identification and eventual removal of a culvert fish barrier near the mouth of Jack Creek. A bridge replaced it in November 1998.

In 1994, at the request of USFWS, NDOW completed a Bull Trout Status Report, which concluded that a protected listing for the Jarbidge River drainage population of bull trout was not warranted (Johnson 1994).

In June 1998, after a lengthy listing process, involving several Federal court cases, the bull trout populations in the Klamath and Columbia distinct population segments (DPS) were classified as “threatened”. Three other bull trout distinct population segments (including the Jarbidge DPS) were proposed for listing as “threatened.”

In August 1998, NDOW and the Humboldt-Toiyabe National Forest district (H-TNF) hosted the annual *Salvelinus Confluentus* Curiosity Society (SCCS) workshop. Biologists attending the workshop resurveyed a significant portion of the Jarbidge River drainage. That summer, NDOW also completed a resurvey of all known and potential bull trout occupied streams.

On July 22 and 23, 1998, an unauthorized attempt by Elko County to reopen a portion of a washed out road segment along the West Fork Jarbidge River resulted in disturbance to 900 feet of the river. USFWS immediately issued an emergency “endangered” listing for the Jarbidge River drainage bull trout population, effective August 11, 1998.

In March 1999, NDOW issued a revised Bull Trout Status Report, again concluding that a protected listing was not warranted. The report contended that the Jarbidge bull trout population was secure, though limited in distribution, due to the paucity of suitable habitat (Johnson 1999).

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On April 8, 1999, USFWS revised the status of the Jarbidge Distinct Population Segment of bull trout population to "threatened."

The original ten year NDOW Bull Trout Species Management Plan expired in December 2000. This document revises that plan to reflect new management emphasis and knowledge about the bull trout, a species of game fish now officially listed as "threatened."

AGENCY RESPONSIBILITIES

Nevada Department of Wildlife

Nevada Revised Statute 501.105 mandates the Nevada Board of Wildlife Commissioners to "establish broad policies and adopt regulations necessary for the preservation, protection, management, and restoration of wildlife and its habitat."

The Department of Wildlife's mission is "To protect, preserve, manage, and restore wildlife and its habitat for their aesthetic, scientific, educational, recreational, and economic benefits to citizens of Nevada and the United States…"

This management plan is guided by the agency's Comprehensive Strategic Plan 2004 Through 2009, Commission Policy P33 – Fisheries Management Program, the Fisheries Bureau Program Plan (1999) and the Fisheries Bureau's Fishery Management Concepts Policy and Procedures. Some key elements of these documents are listed below:

Strategic Plan

Desired outcome: Secure, stable and diverse native aquatic wildlife populations.

Goal: Nevada has a substantial and important natural heritage of endemic aquatic wildlife species and is ranked sixth nationally in species endemism, but is also ranked fourth nationally in endemic species at risk, a legacy of past land management practices and unique characteristics of our isolated aquatic habitats. Aggressive and innovative management is essential to preserve and protect the state's unique aquatic natural heritage. **NDOW will proactively manage native aquatic wildlife species using sound scientific principles to provide long term stability, avoid declines in status, and to recover State and Federal special status species.**

Desired outcome: Aquatic habitats that are in good ecological condition, representing Nevada's variety of natural and manmade aquatic habitat types.

Goal: Active management and restoration of Nevada's aquatic habitats is essential to preserve the state's natural heritage and maximize the potential for healthy aquatic ecosystems and angling opportunities. NDOW will pursue and support the management and restoration of aquatic habitats to ensure the maintenance of healthy sport fish and native aquatic species populations.

Objective: Actively support the management and restoration of key riparian aquatic habitat to benefit sport and native fish species, including native salmonids, as identified in fisheries management plans, species management plans and other planning documents.

Objective: Actively support and implement protection or restoration actions for important native aquatic species habitats identified in species management plans, conservation agreements, recovery plans and other planning processes.

<u>Commission Policy P-33 Fisheries Management Program</u>

Fisheries Management Planning

Fisheries and Species Management Plans are a primary vehicle to make management prescriptions for Nevada's waters. Plans can present a logical and scientific argument for specific management direction, as well as serve as an informational document for the public.

Native Trout Management

Six species of trout and char are native inhabitants of the State of Nevada: Bonneville cutthroat trout, bull trout, Lahontan cutthroat trout, mountain whitefish, redband trout and Yellowstone cutthroat trout. With the exception of Lahontan cutthroat trout, each has only a limited distribution in Nevada, but all are unique, and deserving of special management. In addition, most of these native species have received some degree of attention from the Endangered Species Act of 1973 as amended. Threatened and endangered species need active long term species management programs implemented in accordance with the Comprehensive Management System.

- Native trout survival will receive priority in management prescriptions for any waters within historic distributions.
- Waters in historic ranges which support native trout populations, or have potential for reintroduction of native trout, should be designated and managed as "wild" or "native" fisheries.
- Waters or reaches of waters managed as "wild" or "native" will not be stocked with hatchery trout.

DRAFT

- The Commission may consider special regulatory protections such as harvest or gear restrictions for waters managed for native trout, if biological information indicates such actions would assure species viability.
- Species management planning and interagency cooperation will focus on proactive management strategies. The Commission supports programs to manage all native game fishes, with the ultimate goal of species perpetuation, improvements in status and eventual delisting of federally protected species, as well as the prevention of future listing of species through proactive management strategies.

Cooperating Agencies

The habitat of the Jarbidge Distinct Population Segment (DPS) of bull trout includes the jurisdictions of two states, Idaho and Nevada, and numerous agencies. Successful restoration and conservation of this DPS will require both cooperation and coordination of efforts with the following:

- The Idaho Department of Fish and Game is mandated to preserve, protect, and manage wildlife for the people of Idaho.

- The Nevada Division of Environmental Protection is mandated to enforce provisions of water quality regulations.

- The USDA Forest Service is mandated to manage the land within the Humboldt - Toiyabe National Forest.

- The USDI Bureau of Land Management in Idaho is mandated to manage the public land within the Jarbidge DPS.

- The USDI Fish and Wildlife Service is mandated to carry out the provisions of the Endangered Species Act.

SPECIES DESCRIPTION

Distinguishing the bull trout from other, similar species can be difficult. The bull trout was not differentiated from the Dolly Varden (*Salvelinus malma)* until 1978 (Cavender 1978). In advocating the distinction, Cavender cited the bull trout's distinctive "size and shape of the head and jaws, head length, number of basibranchiostegal rays, and morphology of the gill rakers." Cavender believed the distinctive skeletal head of the bull trout to be more conducive to its piscivorous or fish-eating habit.

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Both the bull trout and the Dolly Varden are members of the char taxonomic group of fish, as are the brook trout, lake trout, and arctic char. Char are most easily distinguished from true trout and salmon, which they resemble, by the absence of teeth in the roof of the mouth. Other distinguishing characteristics are the presence of light-colored spots on a dark background (true trout and salmon have dark spots on a light background); the absence of spots on the dorsal fin; and their smaller scales.

Both the bull trout and the Dolly Varden have smallish, light colored (white, yellow, pink/red) spots over a darker (olive green) background above and a whitish belly. The dorsal and caudal fins are clear with no black spotting. The leading edges of the pectoral, pelvic and ventral fins have a distinctive all-white edge.

Brook trout, though similar, are typically more colorful than bull trout. Brook trout have dark wavy lines and spots on the dorsal fin and tail fin, and a black stripe following behind the white leading edges of the pectoral, pelvic, and ventral fins. The head, back and sides of the brook trout are greenish with wavy lines (vermiculations). The belly is generally white unless the specimen is a ripe male; then the belly and fins appear bright orange to red. Red spots, some of which are circled by blue rings, can also be seen on the sides of the brook trout.

The Jarbidge River bull trout are genetically most similar to the Boise River and Malheur River populations of bull trout according to geneticist Paul Spruell. Fin tissue from a sample of 43 bull trout was collected during the 1998 fish population surveys. Genetic analysis indicated distinct differences between samples of bull trout in the West Fork Jarbidge River, Dave Creek, and those from other tributaries of the East Fork Jarbidge River (Personal communication with Paul Spruell). This finding suggests that there has been little mixing of local bull trout populations. Additional genetic sampling and analysis are needed to develop a complete genetic map of the Jarbidge River System bull trout population.

CURRENT STATUS

The population of bull trout which resides in the Jarbidge River system of Nevada and Idaho, which is also known as the Jarbidge Distinct Population Segment, is classified as threatened under provisions of the Endangered Species Act.

In the state of Nevada, bull trout are classified as a gamefish, NAC 503.060.

LIFE HISTORY

Bull trout in the Jarbidge River drainage are part of a native fish assemblage that includes the ubiquitous redband trout (*Oncorynchus mykiss*) (Williams et al. 1995), mountain whitefish (*Prosopium williamsoni*), bridgelip sucker (*Catosomus columbianus),*

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speckled dace (*Rhinichthys osculus*), longnose dace (*R. cataractae*), and sculpin (*Cottus spp*.). A localized population of non-native brook trout (*Salvelinus fontinalis*) was discovered in the middle reaches of Bear Creek in the summer of 2002. Species of fish documented in the Idaho portion of the Jarbidge River drainage and not in the Nevada portion include redside shiner (*Richardsonius balteatus*) and possibly leopard dace (*R. falcatus*) and/or mountain sucker (*C. platyrhynchus) (*Partridge and Warren 2000). Archeological evidence indicates that Chinook salmon (*Oncorhynchus tshawytscha)* inhabited the Jarbidge River before the construction of impassible dams on the Snake River (Shutler and Shutler 1963). Due to its piscivorous habit, bull trout undoubtedly prey on all these species as well as their own young.

The bull trout is known to exist throughout the Jarbidge River drainage. Bull trout mature at 5-7 years of age and may exhibit alternate year spawning (various authors in Rieman and McIntyre 1993). Any particular bull trout occupied stream may contain the resident form, the fluvial form, or both. Resident bull trout spend their entire lives in cold headwater areas. The usually larger fluvial bull trout migrate from the lower portions of the East Fork, West Fork and Jarbidge River proper during late spring and early summer to spawn in various upstream reaches. The possibility that any particular bull trout population may contain only resident bull trout can't be discounted. However, because all bull trout occupied streams within the Jarbidge River drainage are interconnected; it is probable that fluvial (migrant) bull trout have moved into each of the local populations to spawn. Fluvial bull trout are known to show a high degree of fidelity to a spawning area.

The upstream migration of the fluvial bull trout coincides with increasing stream temperatures and declining stream discharge. The rate of migration and time of arrival at spawning areas are not precisely known. Presumed migrant bull trout have been found in likely spawning areas by early August; however, lower than normal summer water flow could cause fluvial bull trout to arrive in spawning areas earlier than August. Bull trout spawning has been observed during September in both Dave Creek (Johnson 1995 and Zoellick 2001) and in Jack Creek (Johnson 2003).

Bull trout spawning usually occurs when maximum temperatures fall to between 5°-9°C (41°-48.2°F) (Rieman and McIntyre 1993). In the Jarbidge River drainage, stream temperature data from juvenile/resident bull trout occupied areas show that this temperature drop usually occurs during the third week of September. Spawning in Dave Creek may occur earlier than in other areas, due to its cooler temperatures, which are the result of a coldwater (<6.7°C (44°F)) spring source. Egg incubation lasts from the time the eggs are deposited, in late summer or early fall, to emergence the following spring (Shephard et al. 1984).

After spawning, the adult fluvial bull trout return downstream at unknown rates. Fluvial bull trout were caught in Idaho Fish and Game's weirs in both the West Fork and East Fork during the fall of 1999 (Partridge and Warren 2000). Fluvial bull trout most

likely winter in the larger river reaches of the Jarbidge drainage, where they can utilize the deeper pools and feed on the abundant whitefish population. The movement of juvenile bull trout after they leave their natal streams in the Jarbidge River drainage is unknown and can only be inferred from other fluvial bull trout populations. Bull trout that will eventually become fluvial fish probably rear in their natal stream reaches for two to three years before migrating downstream to the larger environments of the Jarbidge River proper and its East and West Forks.

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HABITAT SUITABILITY

Bull trout habitat can be defined by general stream habitat parameters, of which thermal metrics are the most defining. The stream habitat conditions within the Jarbidge River drainage have been intensively surveyed and summarized over the years (Johnson 1994). Stream habitat conditions in the West Fork were rated as “very fair” in 1985 (NDOW 1985). The most recent stream habitat survey of the Humboldt-Toiyabe National Forest (H-TNF) portion of the West Fork and of Pine Creek revealed no obvious bull trout limitations (Parametrix 2002). The East Fork summer stream habitat was rated “good” (NDOW 1993). The only “poor” stream habitat conditions encountered in the Jarbidge River drainage were found on the H-TNF portion of Dorsey Creek and in the Buck Creek drainage. All other surveyed streams in the Jarbidge River drainage were rated as “fair” or “good”.

Many of the tributary streams of both the West Fork and East Fork are steep and stable Rosgen A2 type streams. These streams often have only their lowest reaches inhabited by fish. Natural upstream barriers that prevent fish passage include boulders, large piles of woody debris and water spills. A series of such blockages in lower Robinson Creek is believed to prevent bull trout access to spawning and rearing habitat in upper Robinson Creek, which has been determined to be as thermally suitable to bull trout spawning as the bull trout occupied Pine Creek.

There are eight local bull trout populations within the Jarbidge DPS. Within the East Fork Jarbidge River drainage, only the Robinson Creek drainage is vacant of bull trout (Johnson 1999). Within the West Fork drainage, bull trout have not been found in the redband trout occupied waters of Fox Creek, Bear Creek, or Buck Creek drainage. A combination of insufficient flow and/or unsuitable stream temperature is thought to prohibit bull trout occupancy in these streams. Similar conditions are thought to contribute to the lack of fish in Deer Creek, which is also a tributary of the West Fork Jarbidge River. The H-TNF portions of Columbet Creek and Dorsey Creek, which are tributary to the main stem of the Jarbidge River, were both found to be fish-less in 1992. The portions of streams on private land and on BLM land are less well known; they have never been surveyed as extensively as those on the H-TNF areas within the Jarbidge River drainage.

Bull trout juvenile rearing habitat characteristically occurs in the uppermost accessible reaches of streams having the coldest summer water temperatures. Findings from the Boise River drainage suggest that spawning and initial rearing occur almost exclusively in higher elevation headwater streams (Dunham and Rieman 1999). Higher densities of bull trout juveniles in streams tributary to Flathead Lake, Montana were associated with a water temperature of 12°C (53.6°F) or less (Shepherd et al. 1984). **In the Jarbidge River drainage, fish population sites with a density of at least two bull trout per 100 ft of sampled stream had a mean summer water temperature of 10.56°C (51°F) or less and a measured discharge of >1.0-cfs (Johnson 1994).**

Gamett (2002) determined that the mean summer temperature (July through September) was the most effective temperature metric for predicting bull trout abundance in the Little Lost River drainage of Idaho. There, bull trout could always be found in a reach where the mean summer temperature was <10ºC (50°F). Gamett's findings compare closely with data from the Jarbidge River drainage where bull trout were found at all but one of the seven sites that had a mean summer temperature of <50ºF (Appendix I). Although stream habitat and thermal habitat in lower Gods Pocket Creek is similar to two bull trout occupied tributaries of Slide Creek (Trib. A and Trib. B), bull trout have never been captured or observed in Gods Pocket Creek. Low stream flow (<1-cfc) could be the explanation. It's also possible that Lower Gods Pocket Creek is lacking bull trout due to its being part of the East Fork Jarbidge River drainage metapopulation. As previously noted, suitable unoccupied bull trout habitat exists in a metapopulation context (Dunham and Rieman 1999). Of the three sites having a mean summer temperature of just 50ºF, only Jack Creek has bull trout because upper Deer Creek and Fox Creek have insufficient summer flows.

As was reported for Montana bull trout streams (Rich 1996), thermograph records for bull trout occupied and unoccupied sites in the Jarbidge drainage indicate that the most northerly-facing upper reach streams have the coldest water and the highest densities of bull trout. In the Jarbidge drainage, the highest bull trout density sites (5.1-12.6 bt/100m²) were all above the 7200-ft elevation. This also coincided with the uppermost fish inhabited reaches of the West and East Forks, Dave Creek, and near the mouth of Tributaries A and B of Slide Creek. The four of these sites for which thermograph data exist had a maximum mean daily temperature of <10.6°C (51°F) (Appendix I). Other bull trout rearing habitats in upper Jack Creek, upper Pine Creek, Fall Creek and Slide Creek had a maximum mean daily temperature of 10.6°-12.8°C (51°- 55°F).

The warmest occupied bull trout-rearing habitat for which thermograph data has been collected occurred in upper Pine Creek. While the maximum mean daily temperature was only 11.9°C (53.4°F), the daily temperature reached a high of 15.7°C (60.3°F). The 3-day and 7-day mean maximum temperatures in upper Pine Creek were 15.1°C (59.2°F) and 14.9°C (58.8°F), respectively. In Montana's Flathead River Basin, Fraley and Shephard (1989) found that juvenile bull trout were rare in streams with summer water temperatures exceeding 15°C (59ºF). Bull trout in upper Pine Creek are rare (mean of 1.67 bt/100m²).

In British Columbia streams, a maximum temperature of 12°-13°C (53.6°-55.4°F) allowed rainbow trout densities to increase and bull trout densities to decrease (Haas 1999). In the Jarbidge River drainage, redband trout dominate bull trout where maximum temperatures exceed 12ºC (53.6°F). The only allopatric bull trout populations found to date occur in stream reaches located in the uppermost accessible portions of the East Fork and Dave Creek. In the upper West Fork, bull trout composition is 76% compared to a redband trout composition of 24%. In the Jarbidge River drainage, as in

British Columbia, the native rainbow trout outnumber bull trout in stream reaches having 3-day mean maximum temperatures >13°C (55.4°F). Adams (1994) found allopatric bull trout populations in the Weiser River drainage of Idaho where maximum daily temperatures ranged from 8° and 11°C (46.4°-51.8°F). Selong et al. (2001) found that a constant 12°C (53.6°F) temperature provided for juvenile bull trout (fed to satiation) optimum growth during a 60-day laboratory study. During the same study, at 20°C (68°F) juvenile bull trout survival was 79%. In Nevada, the warmest water temperature in which juvenile bull trout have been observed was 19ºC (66.2ºF). On July 16, 2003, several juvenile bull trout were found in a pool located downstream of Pine Creek.

The majority of the Jarbidge River drainage thermal habitat is currently only marginally suitable for optimum bull trout juvenile rearing and, except for Gods Pocket Creek, currently all suitable accessible habitats have been found in recent times to be occupied by bull trout (Johnson 1999).

Since all bull trout occupied stream reaches in the Jarbidge River drainage are interconnected, fluvial bull trout have access. Metapopulation structure implies that suitable habitats are often not occupied (Dunham and Rieman 1999). The possibility that individual fluvial fish may disperse to different habitats is supported by the presence of a 220-mm bull trout discovered in the thermally unsuitable upper Deer Creek on July 19, 2000. The pool the bull trout was found in registered 70°F (21.1°C) at 1545 hrs. No bull trout had previously been documented in Deer Creek. Subsequent thermograph studies in upper Deer Creek (above the pool where the bull trout was found) showed temperatures suitable for bull trout rearing, but inadequate stream flow (0.21-cfs).

Adult bull trout are known to be more temperature tolerant than juvenile bull trout. Adult bull trout were found in the lower West Fork during sampling conducted on August 5, 1998, even though thermographs registered a maximum temperature that day of 68.1°F (20.1°C) in Nevada and 68.4°F (20.2°C) in Idaho. In low water years, the lower reaches of both forks and the main Jarbidge River can become stressful for bull trout; maximum temperatures reached >75ºF (23.9 ºC) during August of both 1992 and 2001.

BULL TROUT SAMPLING AND DISTRIBUTION

The most utilized method of fish population sampling in the Jarbidge River drainage involves systematic, single-pass electrofishing during the summer and early fall. During the low water period it is possible to see and usually identify fish missed during the electrofishing. Single-pass electrofishing allows for rapid assessment of the fish species present, their distribution and their relative abundance in a stream (Jones and Stockwell 1995).

When single-pass electrofishing discovers a solitary bull trout in a stream, more intensive procedures can be employed to estimate actual bull trout numbers at a high

degree of confidence (Bonar and Bolding 1997). These procedures include electrofishing longer lengths of stream at the original sample site and sampling at additional sites. Intensive surveys have resulted in identifying bull trout occupied reaches in both Pine Creek and Jack Creek (Johnson 1999). The same intensive procedures were used in Robinson Creek to conclude with 90% confidence that bull trout were absent. Single-pass electrofishing, conducted above 7000 ft in the upper reaches of both the East Fork and the West Fork, has resulted in the capture of bull trout including juveniles in all but one instance (Appendix II).

Bull trout captured within the headwater areas in August ranged in size from 45 to 296 mm in total length (TL). The larger specimens of bull trout (230–296 mm TL) are likely fluvial migrants. They have been captured/observed in upper West Fork (1998), upper Pine Creek (1999), Jack Creek (1999 and 2003), upper East Fork (1998), Fall Creek (1993) and upper Dave Creek (1993). The largest bull trout captured in the Slide Creek drainage and in Cougar Creek measured 204 mm and 192 mm TL, respectively. They were believed to be juvenile fish aged III+. Most of the bull trout captured in headwater areas are aged I+, II+, and III+, as determined by length frequency analysis.

Spot Shocking

Another method that has been employed to detect bull trout in tributary streams is “spot shocking.” Spot shocking involves an electrofishing team moving upstream through a reach and electrofishing all likely fish-holding stream areas that can be accessed. Spot shocking was used to verify the presence or absence of bull trout in Deer Creek and Fox Creek (Johnson 2000 and 2001). While a single bull trout was found in upper Deer Creek in 2000, no bull trout were found in upper Deer Creek in 2001 or in Fox Creek in 2000.

In 2002, while spot shocking in Bear Creek to locate the upper limit of redband trout occupation, brook trout were discovered occupying <0.25 miles of the middle reach of the stream. Brook trout can be detrimental to bull trout, due to hybridization and the resultant loss of genetically “pure” bull trout. A combination of electrofishing and angling is being used to remove brook trout from Bear Creek. In 2002 and 2003, there were 30 and 24 brook trout removed respectively. The removal will continue annually until no brook trout are found. Brook trout were last stocked into the West Fork in 1959. Prior to the 2002 discovery, they were last documented in upper Bear Creek in 1963. A self-perpetuating population of brook trout does inhabit Emerald Lake, located at an elevation of 9400-ft, in the headwaters of the East Fork drainage. An elevation difference of 1760-ft over a straight-line distance of two miles separates the lake from the bull trout inhabited upper East Fork. Brook trout have never been known to inhabit the East Fork or its tributaries.

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After Dark Surveys

Young-of-year (YOY) bull trout have seldom been captured or seen during electrofishing surveys. Single YOY bull trout specimens were captured in West Fork (1985), Cougar Creek (1998), and East Fork (1999). After electrofishing failed to find YOY bull trout in Jack Creek and no redds or spawning bull trout were observed, an after dark, flashlight search along the water's edge for YOY bull trout was conducted in September 2003. In little more than an hour, two NDOW surveyors observed 27 YOY bull trout. Nighttime surveys of YOY bull trout have proved more effective than redd counts to gauge bull trout reproduction success. Timing observations to coincide with spawning is problematic, and the redds can be difficult to see, especially following spawning (Appendix IV).

Snorkel Surveys

NDOW conducted three years of intensive snorkel surveys in the West Fork (2000–2002) and in the East Fork (2003) in an attempt to assess early summer distribution patterns and the relative abundance of adult fluvial bull trout. The findings indicated that the majority of fluvial bull trout migrate upstream when the river flow is too fast for effective snorkeling. Dropping stream flows coincide with rising water temperatures. Fluvial bull trout have been found to stage at or near the junctions of colder spawning tributaries. They were even found to have entered lower Jack Creek in 2000. These fish were likely enroute to upstream spawning areas.

Swanberg (1997) found that peak upstream movements of fluvial bull trout in Montana's Blackfoot River occurred during June when water temperatures reached 17ºC (62.6°F). It is therefore likely that fluvial bull trout migrate from the Jarbidge River and its lower forks before late June due to similar stream warming. The West Fork just above Jarbidge Town reached 17ºC (62.6°F) before July 4 during 2001–2003. Just below the confluence of Pine Creek, the river exceeded 15.6ºC (60ºF) on July 4, 2002. By early July 2003, the snorkeled East Fork, from below Robinson Creek to above Cougar Creek, had warmed to between 18.3°C (65ºF) and 20°C (68ºF). No fluvial migrant bull trout were seen. A single juvenile bull trout was observed at the confluence of the Fall Creek 13.9°C (57ºF).

NDOW conducted snorkel surveys for post-spawn fluvial bull trout in the lower West Fork in mid-October 1997 in water temperatures ranging from 6.1°-10.6°C (43º-51ºF). No bull trout were observed, although other species were found. In October 2001, H-TNF contractors snorkel surveyed sites within eleven West Fork reaches, from the H-TNF boundary upstream to the upper limit of fish habitation, and failed to find any bull trout. Cold-water temperatures (38º-52ºF), which can cause the bull trout to hide, were cited as the reason for limited sightings (Parametrix 2002). Night snorkeling is generally suggested for conducting bull trout surveys when stream temperatures are ≤48ºF (Bonar et al. 1997).

Snorkeling surveys yielded similar results to electrofishing surveys with 75% of all bull trout observations on the H-TNF portion of the East Fork occurring at elevations above 6900 ft (Parametrix 2002). Similarly, the greatest bull trout juveniles densities have been found in Jack Creek, Pine Creek, Dave Creek, Slide Creek, Fall Creek and Cougar Creek, at elevations above 7000 ft. In the case of streams with natural fish barriers below 7000 ft (Jack Creek and Fall Creek), bull trout density is greatest near the upper limit of fish occupation (Appendix III).

Weirs and Box Traps

Idaho Fish and Game used weirs and box traps from late August through mid-October 1997 and from early September until the end of November in 1998 to assess downstream movement of fluvial bull trout in both the lower West Fork and lower East Fork. While only one juvenile bull trout was captured in the West Fork in August, five adult-sized fluvial bull trout were caught between late September and mid-November - three in the West Fork and two in the East Fork (Partridge and Warren 1999 and 2000). Since both traps were situated near the confluence of the East and West Forks, these bull trout may have been enroute to winter habitats in the main stem of the Jarbidge River. Bull trout wintering habitat is present in the West Fork below the town of Jarbidge and in the East Fork below Fall Creek confluence where pools with depths >2.5 ft exist at a frequency of 10 to 12 per mile. These likely wintering areas also coincide with the distribution of bull trout prey species such as mountain whitefish and sculpin. The winter distribution of bull trout in the Jarbidge River drainage has not been documented.

Recreational Angler Reports

Additional information regarding bull trout and their distribution comes from recreational anglers in the Jarbidge drainage. Angler use is estimated from fishing questionnaires returned by 10% of the angling public. In the four years preceding the cessation of trout stocking in the West Fork (1995–1998), the combined West Fork and East Fork angler use averaged 1544 days. During the four years after trout stocking stopped (1999–2002), combined use averaged 1327 days. The majority of combined angler use is known to occur in the more accessible West Fork (angler use reports prior to 2002 are believed to have erroneously placed some West Fork use into the East Fork). In 2002, 99% of the combined use was in the West Fork; 1% occurred in the East Fork.

Prior to March 1, 1998, the legal daily harvest and possession limits in Nevada were ten trout, of which all could have been bull trout. Random creel census data conducted by NDOW personnel from the 1960's through the 1980's revealed that 2.0% of the creeled fish were bull trout. Angler creel data from the East Fork during the 1970's and 1980's indicated that bull trout comprised 3.0% of the harvest. The higher percentage of bull trout harvested in the East Fork is probably due to the inclusion of hatchery rainbow trout and brook trout in the West Fork harvests. However, one party of

DRAFT

avid Jarbidge anglers insisted that when it was possible to drive up closer to the headwaters of West Fork, they caught more bull trout (the road to the Jarbidge Wilderness Boundary has been washed out since June 1995).

Eighty percent of the bull trout examined in the creel surveys were between six and nine inches long. The largest angler-caught bull trout recorded in Nevada was a 22-in., 4-lb. 6 oz. fish captured in the upper West Fork in October 1985.

Since March 1, 1998, the harvesting of bull trout has been prohibited in Nevada; angled bull trout must be released immediately. The no harvest prohibition was enacted to bring Nevada law in line with Idaho's bull trout regulations. Nevada fishing regulations and fishing regulation posters request anglers to report their bull trout catch to NDOW's Eastern Region Office. During the period from 1999 through 2001, there were 17 angler accounts of one or more bull trout captures. Seven anglers telephoned their bull trout catch data. Another four anglers who reported catching bull trout were contacted in the field. Three other reports of bull trout captures were taken from anglers who came into the Elko Office. NDOW personnel accounted for the three remaining capture reports. Reporting anglers used artificial flies (35%), artificial lures/spinners (29%), bait (29%), and either flies or bait (6%). Only one reported bull trout capture came from the East Fork. West Fork anglers reported 16 captures.

No anglers have been cited for possession of bull trout since the catch and release regulation went into effect. While the potential for unlawful bull trout removal is always present, there is no information to suggest that it is a problem. With the current no harvest regulation on bull trout, their numbers should increase over time.

Trout Stocking

The earliest recorded trout stocking in the West Fork was of brook trout fry in 1919. Trout stockings were made sporadically before 1947; after that, the practice became almost an annual event until terminated in 1998. During the same time period, the East Fork received only one brook trout fry plant, in 1919, and one juvenile rainbow trout plant in 1952. The West Fork received catchable-sized rainbow trout plants during most years from 1954–1998. Catchable brook trout stocking occurred in 1954 and from 1956–1959. Following a 1961 fish population survey of the West Fork, fish managers recommended that no more brook trout be stocked, due to their failure to establish themselves in the highly competitive river environment. A reduction in rainbow trout stocking was also recommended. Both recommendations were followed. As early as 1974, the fish manager realized that trout stocking was no longer necessary; however, a vocal pro-stocking citizenry led to the continued practice of stocking trout until 1998, albeit at reduced numbers. A 1985 analysis of the West Fork fish population concluded that only 9% of the 3,006 rainbow trout stocked that year remained in the river by October. Commission Policy Number P-33 (effective July 24, 1999) states that "Waters managed as wild or native will not be stocked with hatchery trout."

LIMITING FACTORS

Stream Temperature

The single most important factor limiting bull trout numbers in the Jarbidge River drainage is the paucity of cold stream habitat (<12ºC or <53.6°F) suitable for juvenile bull trout production (Map 1). As a result, juvenile bull trout have been restricted to the uppermost accessible coldwater reaches in the drainage. As streams warm to temperatures >12°C (53.6°F), the bull trout are increasingly less able to compete with the ubiquitous native rainbow trout.

A significant portion of the West Fork has been affected by over a century of human activities. These activities include road development and maintenance, historic mining and adit drainage, channelization and the removal of large woody debris where fish can shelter, residential development, and road/campground development on USFS lands (McNeill et al. 1997). Such activities reduce habitat complexity and are hypothesized to elevate seasonal water temperatures (USFWS 1999). However, thermograph records from similar elevations in each river fork in 2003 indicate the East Fork to be slightly warmer than the West Fork (Appendix I). Therefore, the human-caused changes to the West Fork appear to have left thermal conditions no worse currently than those found in the more lightly impacted East Fork. The predominantly north/south alignment of both river forks is probably a more important factor because it results in a lack of effective shade during the mid-day in summer (McNeill et al. 1997).

In 2001, in the West Fork water temperatures increased less than 2ºF from the bridge above the town of Jarbidge to just above Jack Creek (downstream about 2.9 miles.) In 1999, the daily maximum summer temperature increased only about 1ºF in the approximately two mile reach from Dry Gulch to above Pine Creek (Werdon 2000). The greatest recorded increase in stream temperature in the West Fork occurs between Pine Creek and Bonanza Gulch, a distance of less than one mile. In 2002, the maximum summer temperature increased about 3ºF from the Pine Creek campground area to above Bonanza Gulch. This reach has the highest density of campgrounds and two bridge crossings. This same reach was subjected to 1621 ft of stream channelization (Coffin 1979). Thoroughly surveying this reach might identify fish limiting factors that could be removed or ameliorated.

Stream Discharge

Optimum bull trout spawning sites, as inferred by the presence of juvenile bull trout, seem to require a stream discharge minimum of approximately 1cfs. Bull trout populations have not been found in the following low base flow streams: Upper Deer Creek, Fox Creek, lower Jenny Creek, and lower God's Pocket Creek. These streams

do provide habitat for limited numbers of juvenile redband trout and they have thermal conditions similar to less flow restricted bull trout occupied areas.

Natural Barriers

Natural rock/debris barriers define the upper limit of bull trout occupation in nearly all bull trout occupied streams in the Jarbidge drainage (Map 1). Adequate stream flow and thermal conditions to support juvenile bull trout can be found above natural barriers in Robinson Creek, Slide Creek, Fall Creek, Cougar Creek, upper West Fork, and Jack Creek, but no bull trout have been observed in these locations.

Angling

There is a concern by some that the inadvertent or intentional removal of bull trout by anglers is or could impact larger fluvial bull trout. While this activity is not known to be a limiting factor at this time, it is prudent to monitor the impact of these activities.

Human Disturbances

Human disturbances in the area include livestock grazing, road maintenance, water diversions, camping, off road vehicle use and residential development. While none of these are known to be limiting to the bull trout population at this time, it is prudent that their impacts be monitored.

Hybridization

There is some concern that brook trout populations located in Emerald Lake and Bear Creek pose a threat to bull trout through hybridization. There is no evidence that hybridization has occurred, despite a history of stocking brook trout in the Jarbidge River system or from these sources. While not considered to be a limiting factor at this time, actions should be taken to monitor or eliminate brook trout as appropriate.

MANAGEMENT PRESCRIPTION STATEMENT

Bull trout will be managed in accordance with the Fisheries Bureau Native Fishery Concept. While some might question the appropriateness of the wording of this concept relative to bull trout, it in fact clearly states that we consider the ultimate expression of a successful management program for our native game fish to be a fishable population. The Native Fishery Concept defined in The Fisheries Bureau Fishery Management Concepts Program and Procedure states:

DRAFT

"This concept applies to waters where management is primarily directed towards providing the angler with the opportunity to catch a native game fish species under a fishery totally supported by natural reproduction. Native fish considered under this concept include the Lahontan cutthroat trout, Bonneville cutthroat trout, Yellowstone cutthroat trout, redband trout, mountain whitefish, and bull trout, within their native range and habitats. Stocking of hatchery trout is restricted in these waters in accordance with Commission Policy P-33. Some waters under this concept may be designated Core or Conservation populations and have harvest restricted in accordance with species management plan objectives.

Management regulations are directed towards the capability of the resource to maintain the productivity of the fish population and may be more restrictive than the general statewide regulation. The maintenance of sustainable health populations will be a primary consideration."

Desired outcome: A secure and stable bull trout population, capable of supporting recreational fishing.

To achieve this desired outcome we will continue to increase our knowledge and understanding of bull trout in the Jarbidge River System. We will endeavor to utilize this knowledge to direct management and provide input to land use activities in the Jarbidge River System.

While opportunities to enhance the bull trout fishery in the Jarbidge River System in Nevada are limited, we will work with our partners and private landowners to identify opportunities to secure or enhance bull trout habitats.

Bull trout numbers should be consistent with and distributed among available habitats; be represented by multiple year classes and the various life history forms that are supportable by contemporary ecological conditions.

We will work with the U.S. Fish and Wildlife Service to establish a functional recovery team for the Jarbidge DPS. The goal of this team will be to identify and take the steps the team deems necessary to address or mitigate stated threats which were used to justify the listing of bull trout in Nevada. We will work with the team to develop recovery goals which are realistic and obtainable. The ultimate result of this process will be the de-listing of bull trout in Nevada.

We will petition to delist the Jarbidge River DPS, when in our judgment, sufficient progress has been made towards the mitigation or removal of the threats identified in the listing rule, or sufficient progress has been made towards the accomplishment of recovery goals.

DRAFT

We will work with all involved parties to develop a Conservation Agreement and Strategies for the Jarbidge River DPS once delisting is imminent, to secure the status of the bull trout fishery into the future.

DRAFT

MANAGEMENT GOALS AND OBJECTIVES

The following management goals, objectives and strategies will provide direction to the development of annual and four year work programs. Implementation will be dependent on available resources. Progress towards these goals and objectives will be evaluated on a periodic basis and adjustments made as necessary.

Goal: **To increase our knowledge and understanding of the bull trout fishery, in order to facilitate effective management decisions.**

Objective: To periodically assess the relative abundance of all bull trout.

Strategy: Develop protocols for population monitoring within the framework of the Jarbidge Bull Trout Recovery Team. The Idaho portion of the drainage should be included in these efforts.

Strategy: Conduct population monitoring using appropriate methods at a time before bull trout spawning.

Strategy: Develop marking methodologies to assist in the identification of larger bull trout contacted during surveys over time.

Objective: To develop and refine our knowledge of bull trout distribution.

Strategy: Utilize intensive electrofishing to ascertain the presence or absence of bull trout with statistical confidence (Bonar et al. 1997) in selected reaches of the Jarbidge River System.

Objective: To determine the relative abundance of fluvial bull trout on a periodic basis.

Strategy: Conduct snorkel surveys in the lower West Fork during or prior to their migration to upstream spawning areas.

Objective: To determine more accurately the time of migration, the time and place of spawning, and the wintering habitats of fluvial bull trout in the West Fork Jarbidge River.

Strategy: Conduct cumulative redd counts to infer adult abundance, once time and area of bull trout spawning are known for a stream.

Strategy: Utilize nighttime snorkel surveys during the fall to locate fluvial bull trout wintering areas.

DRAFT

Strategy: To utilize radio-telemetry technology to monitor movements of spawning age bull trout.

Objective: To determine the annual production of bull trout (YOY) in select streams.

Strategy: Utilize nighttime stream margin counts of YOY bull trout in index areas.

Objective: To assess levels of genetic variation within the Jarbidge DPS to define potential metapopulation dynamics.

Strategy: Utilize archived bull trout fin-clips and any samples collected in association with other management activities.

Goal: **To develop our knowledge and understanding of the Jarbidge River System in order to facilitate effective management decisions which secure or enhance bull trout habitats.**

Objective: To identify habitat and land use concerns and work with responsible parties to find solutions to these problems.

Objective: To identify stream improvement needs in channelized areas of the West Fork.

Strategy: To complete habitat surveys on streams located on the privately owned and Bureau of Land Management administered lands within the Jarbidge River drainage.

Strategy: To resurvey the stream habitat conditions on the H-TNF portion of streams within the Buck Creek Grazing Allotment.

Strategy: Utilize the H-TNF Service's GAWS Level III stream habitat methodology or Basin Survey methodology for these surveys.

Strategy: Seek private land easements when deemed necessary.

Strategy: Support land acquisitions from willing sellers.

Strategy : Provide technical assistance to private landowners willing to improve aquatic and riparian habitats.

Strategy: Support ongoing efforts aimed at West Fork river restoration through road realignment and bridge widening where feasible.

DRAFT

Strategy: Work with Nevada Department of Environmental Protection to address documentable water quality issues.

Objective: To locate and identify upstream barriers to fish occupation in the streams of the Jarbidge River drainage.

Strategy: Areas thought to be suitable but unoccupied will be evaluated and potential barriers identified.

Strategy: To conduct intensive electrofishing or snorkel surveys above potential barriers.

Objective: To characterize the thermal suitability of selected stream reaches for bull trout.

Strategy: Continue the use of recording thermographs in key areas requiring additional characterization and those not yet evaluated.

Objective: To evaluate the thermal impacts of changes in land use practices or enhancement activities designed to expand the thermal suitability of selected stream reaches.

Strategy: As recovery plan actions are proposed and implemented thermograph data will be collected to evaluate effectiveness.

Goal: **To provide leadership in decision making processes based on our knowledge of the bull trout fishery in the Jarbidge River System**.

Objective: To provide effective knowledge based input to fishery issues and land management planning processes that may affect fish/wildlife in the Jarbidge River drainage.

Strategy: To provide bull trout information and technical assistance to both private and government entities upon request.

Strategy: To continue NDOW's involvement with groups such as the *Salvelinus confluentus* Curiosity Society that seek to disseminate current bull trout scientific and management oriented information.

Strategy: To actively participate in the formation and activities of a Jarbidge Bull Trout DPS Recovery Team.

DRAFT

Goal: **To ensure the compatibility of recreational fishing activities and bull trout conservation.**

Objective: To monitor angler use and document bull trout catch and release information.

Strategy: Continue to track angler use through the Annual NDOW 10% Angler Questionnaire Survey.

Strategy: Continue to monitor bull trout captures by anglers through voluntary angler reports that include: date, location, fish length, method of fishing, and condition of fish at release.

Objective: To ensure that existing angler use and harvest regulations provide the appropriate level of protection for bull trout in the Jarbidge River System.

Strategy: Utilize information from all available sources to evaluate the suitability of existing regulations.

Strategy: If regulation changes are warranted, draft appropriate regulations in accordance with Fisheries Bureau Policies and Procedures.

Objective: To have a "bull trout aware" angling public.

Strategy: Continue to post (and replace as necessary) Jarbidge River drainage fishing regulations at key locations in the drainage.

Strategy: Utilize NDOW personnel contacts with Jarbidge anglers to assess their bull trout identification skills and provide education when needed.

Strategy: Remind anglers observed fishing in the Jarbidge River drainage of the fishing regulations and encourage them to report any bull trout captures to the NDOW-Elko Office.

Strategy: To develop an information and education program regarding bull trout management in the Jarbidge River System if existing measures are deemed insufficient.

Goal: **To delist the Jarbidge River DPS of bull trout.**

Objective: To prepare a petition to delist the Jarbidge River DPS when in our judgment sufficient progress has been made towards the mitigation or

DRAFT

removal of the threats identified in the listing rule or sufficient progress has been made towards the accomplishment of recovery goals.

Strategy: To periodically review and evaluate the progress towards the attainment of recovery goals or the removal or mitigation of threats.

Goal: **To secure the status of bull trout through appropriate conservation planning measures.**

Objective: To develop Conservation Agreement and Strategies (CA/CS) for bull trout in the Jarbidge River DPS.

Strategy: To develop a CA/CS for bull trout in the Jarbidge River with all involved parties once delisting is imminent.

Goal: **To secure the genetic integrity of bull trout in the West Fork of the Jarbidge River.**

Objective: To remove the potential threat presented by the closely related brook trout population in Bear Creek.

Strategy: To continue efforts to remove brook trout utilizing intensive electrofishing methodologies.

Strategy: To monitor over time the success of removal efforts.

Objective: To evaluate the level of threat posed by populations of brook trout in the area and take commensurate action.

Strategy: To evaluate the potential of brook trout to move from Emerald Lake into the East Fork of the Jarbidge River.

Strategy: To develop an appropriate monitoring or action plan if warranted.

DRAFT

BULL TROUT SPECIES MANAGEMENT PLAN IMPLEMENTATION SCHEDULE*										
Management Action	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Angler Harvest Evaluation	X	X	X	X	X	X	X	X	X	X
Regulation Signs	X	X	X	X	X	X	X	X	X	X
Regulation Evaluation					X		X		X	
Stream Temperature Evaluation	X	X	X	X	X	X	As needed			
Fish Barrier Evaluation	X	X	X							
Stream Habitat Evaluation				X	X					X
Spawning/redd Documentation		X	X	X	X	X	To be determined			
Nighttime Bull Trout YOY Surveys			X	X	X	X	To be determined			
Intensive Bull Trout Surveys	X	X	X	X	X	X	To be determined			
Fluvial Bull Trout Snorkel Surveys	X	X	X	X	X	X	To be determined			
Brook Trout Removal and Evaluation.	X	X	X	X	X	X				
Bull Trout Genetics Study	To be determined									
Bull Trout Migration Study	To be determined									
Coordination Activities	X	X	X	X	X	X	X	X	X	X
Federal Land Use Plans	This activity will be accomplished as needed.									
Technical Assistance	X	X	X	X	X	X	X	X	X	X
Bull Trout Workshops	X	X	X	X	X	X	X	X	X	X
Status Review	On Going									
Conservation Agreement	To be determined									

* The completion of many of these management actions and possibly any new actions are dependent on internal budgetary approval and agreement with the direction of the future Bull Trout Recovery Plan. The timing and duration of projects may change due to new information that may result in a change in activities.

DRAFT

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DRAFT

APPENDIX I Jarbidge River thermograph sites and temperature (º F) metrics, NDOW 1998 – 2003.

Stream Descriptor	Elevation (ft)	Mean August Max. Temp.	Max. Temp.	3-Day Max. Mean Temp.	7-Day Max. Mean Temp.	Max. Mean Daily Temp.	Mean Summer Temp. 6/21-9/22*
UPPER DAVE CR.	7600	43.00	44.16	43.97	43.40	41.68	41
UPPER WFJR	7400	51.10	52.98	52.70	52.26	50.69	48
WFJR-PINE CR. CG	6570	58.53	65.08	64.31	63.47	58.53	53
UPPER EFJR	7360	51.72	54.41	54.04	53.69	49.80	46
GODS POCKET CR.	6800	51.59	55.52	54.96	54.72	52.89	49
TRIB.B - SLIDE CR.	7400	52.70	55.87	54.85	54.64	50.59	48
SLIDE CR.	7160	53.80	56.66	55.92	55.39	51.72	48
FALL CR.	6560	53.99	57.15	56.50	55.84	53.12	48
UPPER JACK CR.	6720	54.54	57.54	57.20	57.06	54.65	50
LOWER JACK CR.	6320	55.70	58.67	58.10	57.46	56.11	52
UPPER ROBINSON CR.	7030	56.06	59.38	58.71	58.36	53.80	48
UPPER PINE CR.	7280	56.38	60.33	59.20	58.80	53.40	49
FOX CR.	7040	52.53	59.97	59.40	58.63	56.58	50
LOWER COUGAR CR.	6800	58.80	61.94	61.27	60.80	57.30	52
LOWER BEAR CR.	6040	60.00	65.08	64.50	63.35	60.53	53
UPPER DEER CR.	7380	55.10	62.26	61.51	60.43	54.84	50

*The mean summer temperatures are estimated for those sites where thermograph records began anywhere after 6/21 to before 7/30.

DRAFT

APPENDIX II Electrofished sites located above 7000 feet in the East Fork and West Fork of the Jarbidge River.

Stream	Year	Station	Elevation	Sample Length (ft)	BT C/M *	RB C/M *	Unknown Misses
East Fork	1958	A	7200	125	1/0	8/5	
East Fork	1993	R3S2	7280	100	1/0	2/1	
East Fork	1993	R3S3	7550	100	3/3	0/0	
East Fork	1998	R3S3	7550	100	6/6	0/0	
East Fork	1998	R3S2	7280	100	0/0	10/0	
East Fork	1999	Thermo-graph Site	7360	100	2/1	5/1	
West Fork	1954	B	7268	100	2	10	
West Fork	1961	G	7400	100	7	3	5
West Fork	1985	15	7080	100	2	5	
West Fork	1985	16	7400	235	9/1	4/1	
West Fork	1998	15	7080	250	7	23	20% Est. Missed
West Fork	1998	16	7400	100	7	2	Several Misses
West Fork	1998	17	7410	100	6	2	

* C/M = Captured/Missed

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APPENDIX III Bull Trout Densities in Jarbidge Stream Headwater Areas

Stream	Station Elevation (ft)	Year	Mean Width (m)	BT/100 m²	BT/Length Sampled (m)
East Fork	7550	1993	3.2	6.2	6/30.5
East Fork	7550	1998	5.9	6.6	12/30.5
East Fork	7360	1999	3.5	2.8	3/30.5
Slide Cr. Trib. A.	7240	1993	2.6	8.8	7/30.5
Slide Cr. Trib. B	7390	1993	1.3	12.6	5/30.5
Slide Creek	7120	1998	2.4	2.1	2/38.7
Dave Creek	7540	1993	4.0	2.5	3/30.5
Dave Creek	7540	1998	2.6	5.1	4/30.5
Fall Cr. Trib. A	6640	1998	2.0	6.6	4/30.5
Fall Cr. Trib. B	6810	1998	3.3	1.0	1/30.5
Cougar Creek	7160	1998	1.9	3.5	2/30.5
West Fork	7268	1954	n.d.	n.d.	2/30.5
West Fork	7410	1961	n.d.	n.d.	7/30.5
West Fork	7400	1985	2.5	5.6	10/71.6
West Fork	7120	1985	3.0	2.2	2/30.5
West Fork	7410	1998	3.2	6.1	6/30.5
West Fork	7400	1998	3.4	6.8	7/30.5
Jack Creek	6840	1999	2.0	3.5	7/100.0
Pine Creek	7280 -7675	1999	n.d.	n.d.	0-4/100.0

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Appendix IV Summary of NDOW'S Jarbidge Bull Trout Redd Surveys

1994 Lower Pine Creek on 9/28, Upper WFJR on 10/19, and Middle Jack Creek and upper Dave Creek on 10/20.
1995 Upper WFJR and Upper Dave Creek on 9/6[1].
1996 Middle Jack Creek and Upper Dave Creek on 8/27.
2002 Upper Jack Creek on 9/27, and Middle Dave Creek on 9/20, 25, and 26.
2003 Upper Jack Creek on 9/8, and Upper Dave Creek on 9/9[2]

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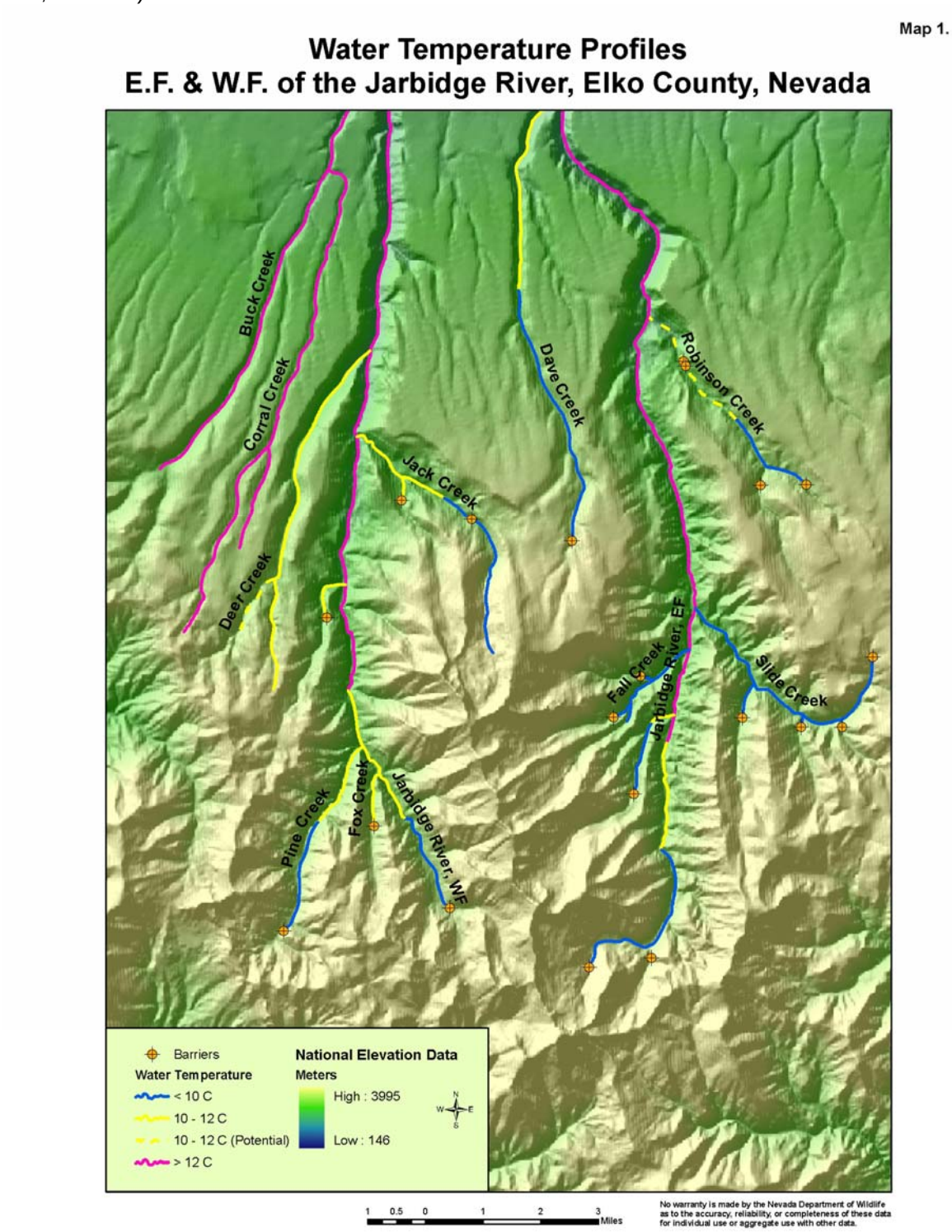
[1] A spawning pair of bull trout was observed and two possible redds were found in upper Dave Creek.

[2] An actively spawning pair of bull trout was observed in the Jack Creek road crossing.

Appendix V MAP 1 WATER TEMPERATURE PROFILES (E. F. & W. F. JARBIDGE RIVER, ELKO CO.,NEVADA)