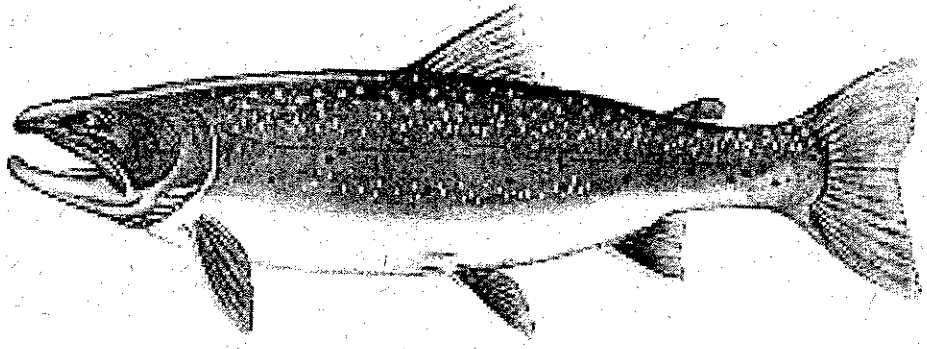
MIDDLE KOOTENAI RIVER DRAINAGE

BULL TROUT STATUS REPORT

(Between Kootenai Falls and Libby Dam)



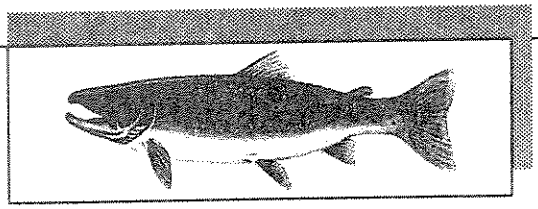
February 1996

Prepared for

The Montana Bull Trout Restoration Team

By

The Montana Bull Trout Scientific Group



Montana Bull Trout Restoration Team

Bonneville Power Administration

Confederated Salish & Kootenai Tribes

Department of State Lands

Montana Chapter American Fisheries Society

Montana Fish, Wildlife & Parks

National Wildlife Federation

Plum Creek Timber Co.

US Fish & Wildlife Service

US Forest Service

TO: Bull Trout Restoration Interested Parties

Bull trout, a native Montana fish, has been the subject of extensive study and broad discussion since Governor Racicot appointed the Bull Trout Restoration Team in early 1994.

The bull trout status reports reflect a portion of both the study and discussion which has occurred during the last two years. These status reports, prepared by the Bull Trout Scientific Group, are designed to provide information about bull trout populations, habitat needs, and threats.

Status Reports have been prepared for bull trout populations in 11 restoration/conservation areas:

- Bitterroot River
- Lower Clark Fork River, downstream of Thompson Falls
- Middle Clark Fork River from Thompson Falls to Milltown, including the lower Flathead River to Kerr Dam
- Upper Clark Fork River, including Rock Creek
- Blackfoot River
- Flathead Lake, including the North and Middle Forks of the Flathead River, Stillwater and Whitefish rivers
- South Fork Flathead River, upstream of Hungry Horse Dam
- Swan Lake/River
- Lower Kootenai River, below Kootenai Falls
- Middle Kootenai River, between Kootenai Falls and Libby Dam
- Upper Kootenai River/Lake Koocanusa, upstream of Libby Dam

Each of these 11 restoration/conservation areas consist of a number of critical populations. The areas have been delineated on the basis of natural barriers and dam-caused fragmentation of historically connected river systems.

These status reports are **working documents**; they are the result of a collaboration of biologists, hydrologists, and other scientists and have drawn on information and research done by people working within each management area.

These documents are intended to provide the most current and accurate information available to the Bull Trout Restoration Team (see Introduction, p. 1) and the local bull trout watershed groups, which will assist them in making informed decisions affecting

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the restoration and conservation of bull trout in Montana. It is hoped that the watershed groups will develop specific recovery actions to help restore bull trout in watersheds throughout western Montana.

The status reports describe risks to bull trout in each watershed. This description of threats and risks to the fish is the best scientific judgement of the Scientific Group and is based on information provided by the local biologists. New and additional information provided by the public, the watershed groups, and the field biologists will add to our understanding of these risks as recovery proceeds. A status review is a continuous process, hence the description of these reports as "working documents."

Likewise, the restoration goal described in each status report is based on the best science available. The goal describes what would be necessary to recover fully functioning bull trout populations in each watershed and may not reflect what is realistically practical in all watersheds, considering time, budget, local interest, and/or other overriding constraints. It is presented as a goal, not necessarily as an inflexible expected outcome.

It is the sincere hope of the Restoration Team and Scientific Group that these documents will assist the watershed groups in "going forth and doing good things" for bull trout.

As always, we welcome your comments regarding bull trout restoration. Please send your thoughts or call Glenn Marx, Governor's Office, Capitol Station, Helena, MT 50620 (444-5506) or Shelley Spalding, Montana Fish, Wildlife and Parks, P.O. Box 20071, Helena, MT 59620 (444-7409).

Sincerely,

Larry P. Peterman

Larry Peterman, Chairman
Bull Trout Restoration Team

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EXECUTIVE SUMMARY

This report addresses the historic and current status and distribution of bull trout, identifies major risks and describes key watersheds in the Kootenai RIver drainage between Libby Dam and Kootenai Falls.

Bull trout are one of six salmonids that were native to the Kootenai River drainage. It is believed bull trout were once widely distributed in the Kootenai River and its tributary streams. The present distribution of bull trout is reduced from historic levels in this drainage.

Risks

Forestry practices rank as the highest risk, largely because it is the dominant land use in all core areas. This risk to the bull trout population is elevated due to the limited number of core areas (Quartz, Pipe and Libby creek drainages) available due to fragmentation caused by Libby Dam. The threat from dam operations is considered high because of uncertainty about biological impacts associated with unnatural flow fluctuations and the gas super-saturation problems that may arise from spilling water. The effects of the dam as a barrier, restricting this migratory population to 29 miles of river, increases the likelihood of localized impacts becoming a higher risk.

Illegal harvest has been well documented in this management unit and is considered a high risk because of the well known and limited spawning areas. Introduced species are considered a high risk because of the presence of brook trout in all core areas.

Other high risks to bull trout in the middle Kootenai River drainage are environmental instability, thermal barriers, rural residential development, mining, transportation and angling.

Core Areas and Nodal Habitats

Core areas (those which currently support the strongest remaining populations of bull trout) are the Quartz, Pipe and Libby creek drainages. Other watersheds, specifically the Fisher River, are being considered as core areas and may be added to the list when more information becomes available.

Nodal habitats (containing critical overwintering areas, migratory corridors, and other critical habitat) are the Kootenai River between Libby Dam and Kootenai Falls.

Restoration Goal

The first component of the restoration goal is maintenance of the population genetic structure. This requires that all existing populations, including resident forms, will remain stable or increase from current numbers in the future.

Maintaining and increasing the connectivity between the Middle Kootenai River and its tributaries is considered imperative for the long-term survival of the species in this drainage. Otherwise it is believed that demographic factors, genetic factors, and natural or human-caused catastrophic events will act in concert to gradually cause the elimination of this population. A key component of the restoration goal for bull trout in the middle Kootenai River drainage is to maintain the self-reproducing migratory life form in the Kootenai River, which currently has access to tributary streams and spawns in core areas.

Specifically, a baseline of redd counts should be established in all drainages that presently support spawning migratory fish. If the total baseline exceeds 100 redds or 2,000 individuals in the middle Kootenai drainage, an increasing trend should be the goal. Baseline data available at this time indicate that about 100 redds are present annually. The goal is to increase the number of redds and the distribution of spawning to include more streams. Due to the limited number of spawning

tributaries available in the Middle Kootenai, particular attention shoudl be paid to Quartz, Libby and Pipe creeks and the Fisher River. Habitat conditions in Quartz Creek should be maintained and improved, and increasing spawning use of the Fisher River, Libby Creek and Pipe Creek should be a goal. Habitat improvement should also be a priority in any drainage where bull trout are known to exist.

It should be recognized that this goal is based on the best information currently available. However, the level of uncertainty is high. Modifications of this goal may be appropriate in the future as more information becomes available.

MIDDLE KOOTENAI RIVER DRAINAGE
BULL TROUT STATUS REPORT

INTRODUCTION

In January, 1994, the Governor of Montana established a Bull Trout Restoration Team to develop a restoration plan for bull trout (*Salvelinus confluentus*) in Montana. The Restoration Team created a Scientific Group to provide guidance on technical issues related to the restoration of this fish.

The Scientific Group reviewed the status of bull trout and the risks to the survival of the species in Montana. In addition, the Scientific Group prepared reports on three of the most significant issues in bull trout restoration: (1) Land use impacts, (2) removal and suppression of introduced species, and (3) the use of hatcheries and transplants in restoration. Because the threats facing bull trout vary widely in western Montana, separate reports were prepared for each of twelve major restoration/conservation areas, except Rock Creek which is included in the Upper Clark Fork report. Delineation of these areas was largely based on the fragmentation of historically connected systems (Figure 1). Loss of interconnectivity results from migration barriers or other habitat changes, such as dams, altered thermal regimes, or stream dewatering. Each of the twelve restoration/conservation areas presently contains core areas and nodal habitats for bull trout.

The Middle Kootenai River restoration area includes the Kootenai River, and all tributary systems, between Libby Dam and Kootenai Falls. This document addresses historic and current status and distribution of bull trout, describes major threats to its continued existence, and identifies core areas and associated nodal habitats for bull trout in this restoration area (Figure 2).

The Kootenai River drainage is an international watershed, with approximately two-thirds of the watershed within the province of British Columbia, Canada (Knudsen 1994). It is the second

largest tributary to the Columbia River and has an average annual flow measured near the Montana/Idaho border of 14,150 cfs (USGS 1995). The total drainage area is 14,000 mi^2, 27% of which is in Montana (Knudsen 1994).

The river originates in Kootenay National Park, near Banff, British Columbia, and flows south, entering Lake Koocanusa 42 miles north of the Montana border. Libby Dam, which created Lake Koocanusa, is located 17 miles upstream of Libby, Montana. Downstream of the dam, the river turns northwest and crosses the Montana/Idaho border near Troy, Montana. About 90% of the Kootenai watershed is coniferous forest. A small amount is agricultural land used mainly for pasture and forage production (Marotz et al. 1988).

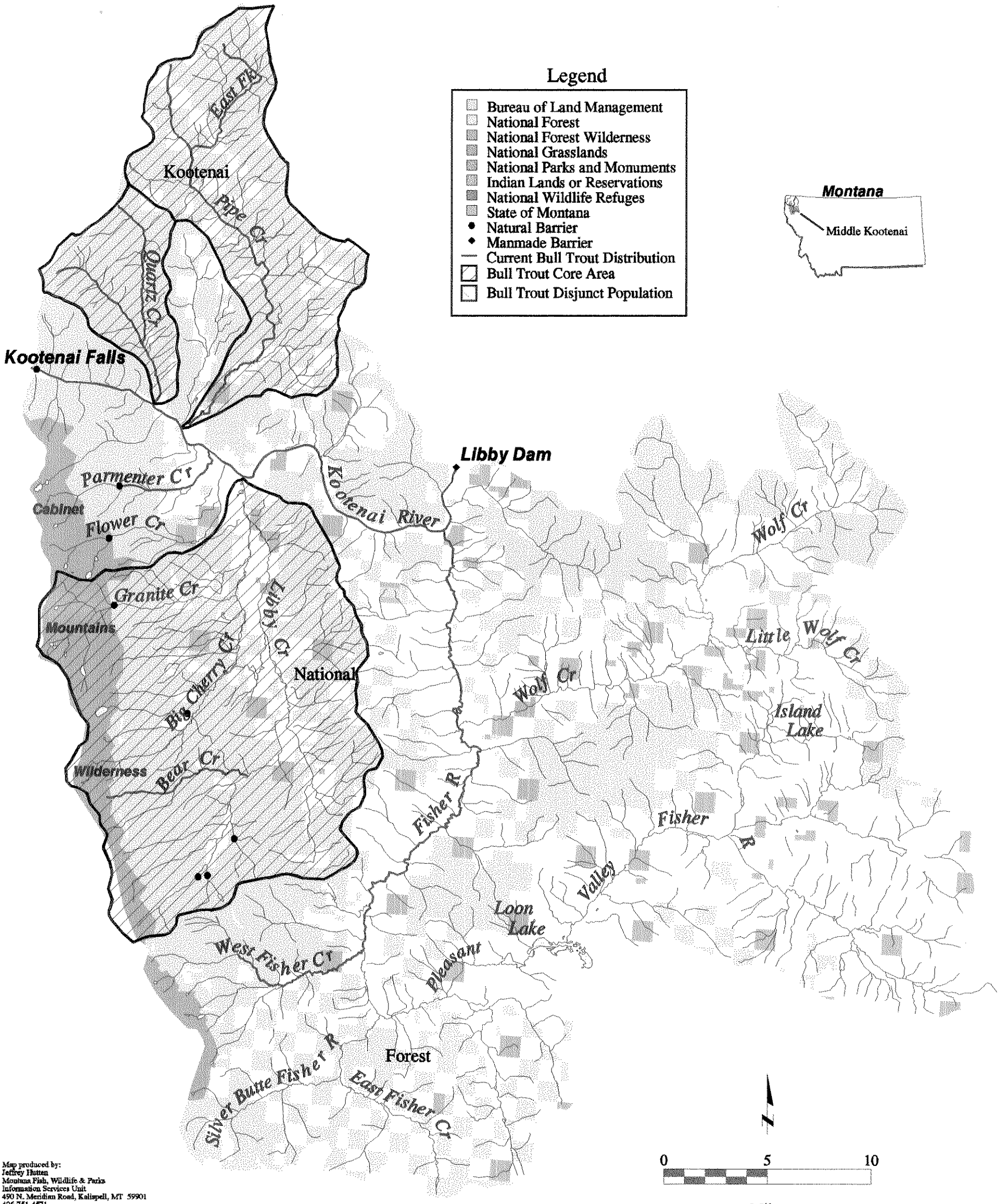
The Kootenai River basin remains sparsely populated. Fewer than 100,000 people live within the drainage upstream of Kootenay Lake. The forest products industry is the dominant industrial activity in the Kootenai basin. Other important industries are coal and hard rock mining and the production of hydroelectric energy (Knudsen 1994).

Two other bull trout recovery areas exist in the Kootenai River drainage downstream from Kootenai Falls and in Lake Koocanusa and the Kootenai drainage upstream from Libby Dam. These populations are addressed in the Lower and Upper Kootenai River drainage status reports. The three bull trout populations in these recovery areas are presently isolated by physical barriers to upstream migration and only downstream genetic exchange may occur.

Within the 29-mile reach between Kootenai Falls and Libby Dam, a migratory population of bull trout exists. One high quality spawning tributary, Quartz Creek, and several lesser quality spawning tributaries support this population.

Figure 1. Bull Trout Restoration/Conservation Areas in Montana

Figure 2. Bull trout distribution and core areas in the Middle Kootenai drainage.



Map produced by:
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Bull trout distribution and barriers information based on data collected up to November, 1995. Base layers from the Natural Resource Information System at the Montana State Library and digitized @ 1:100,000.

May 17, 1996
/GIS/JEFF/BULLTRT/BC2.CMP

Montana Fish, Wildlife & Parks

HISTORIC AND CURRENT STATUS OF BULL TROUT IN THE MIDDLE KOOTENAI RIVER DRAINAGE

Historic Distribution

Bull trout are one of six native salmonid species distributed throughout the Kootenai River drainage. Other native salmonids were westslope cutthroat trout (*Oncorhynchus clarki lewisi*), redband rainbow trout (*Oncorhynchus mykiss ssp.*), pygmy whitefish (*Prosopium coulteri*), and mountain whitefish (*Prosopium williamsoni*) (Brown 1971). Kokanee (*Oncorhynchus nerka*) are native to Kootenay Lake and spawned in tributaries in Idaho, and perhaps Montana.

It is not known whether Kootenai Falls was an upstream migration barrier prior to the construction of Libby Dam. High spring flows may have allowed seasonal fish passage. If this was the case, this population likely included migratory fish from both Kootenay Lake in British Columbia and Kootenai River fish which may have moved freely throughout the drainage. Resident bull trout may have been present historically since at least one population occurs now in Libby Creek. If upstream passage never occurred over Kootenai Falls, the bull trout population in the Kootenai drainage was isolated at this point. One-way gene flow likely occurred downstream.

Little quantitative information exists regarding historic bull trout abundance in the Kootenai River drainage. We recognize this as a major gap in our knowledge of bull trout in the drainage. Suckley (1861) reported collecting a bull trout from the Kootenay River, but the exact location of this collection is unknown. The ethnographic literature (reports describing the socio-economic systems of technologically primitive societies) provides some information about historic bull trout distribution. Char [bull trout], trout, and whitefish were the important fish varieties for the Kootenai[1] Indians (Schaeffer 1940). They were taken principally during the period of summer freshet. He mentions the upper Kootenai using basket traps for fishing in the tributaries of the Kootenai and Elk

[1]Kootenai is the spelling preferred by the tribe

rivers, where trout and char [bull trout] were taken when they were moving back into the main river in the autumn. Harpoons were used to catch bull trout during their downstream movement in September. Charr [bull trout] were caught in this way at the junctions of the Wigwam, or Lodgepole, with the Elk River (Schaeffer 1940). Smith (1984) reviewed the ethnographic literature for the Kootenai Indians. He recorded four sources of information that state that the Kootenais used bull trout as a food source (Boas 1918; Schaeffer 1940; Turney-High 1941; Ray 1942).

Bull trout age and growth data were analyzed in O'Brien Creek in 1950, Graves Creek in 1952 and Flower Creek in 1959 (Peters 1964). Opheim (1960) collected bull trout in Pipe Creek and Flower Creek in 1959. They were collected in Flower Creek in 1960, 1961, and 1962 and were estimated to comprise 5.5% of the fish population (by number) (Huston 1961, 1963).

Current Distribution

Currently, the bull trout in the middle Kootenai are isolated between Kootenai Falls and Libby Dam (Figure 1). Downstream gene flow likely occurs at Kootenai Falls and to a lesser extent at Libby Dam. The extent of movement upstream over Kootenai Falls is unknown, but thought to be minimal. A bull trout tagged in Quartz Creek was recaptured in Deep Creek, a historic spawning tributary in Idaho, confirming downstream fish passage over Kootenai Falls (Marotz et al. 1988). Entrainment studies at Libby Dam documented small numbers of bull trout passing through the dam. Only 6 of 13,186 fish captured below the dam were bull trout (Skaar et al 1996).

Biologists working on the Kootenai River have noticed increasing trends in bull trout numbers in electrofishing surveys. However, there is insufficient data to confirm this trend. It may be a result of bull trout congregating below Libby Dam (Mike Hensler, FWP, personal communication). It is expected that any actual increase in numbers may be the result of a closure on the harvest of bull trout by anglers or changes in the location of the sampling reach. Since the accidental introduction of kokanee into Lake Koocanusa, kokanee entrainment at Libby Dam has increased the food supply for bull trout downstream of the dam. In addition, severe water quality problems, including pulp mill

affluent, gypsum and mining wastes and silt from mines in the Kootenai River prior to impoundment limited the production of aquatic insects and fish. Correction of these problems has been an important factor contributing to the increased production of salmonids (May and Huston 1983).

Spawning and rearing of migratory bull trout have been documented in four tributaries draining into this portion of the Kootenai River. These migratory fish spend their adult lives in the Kootenai River. Resident populations exist in upper Libby and Flower Creeks. One fish was captured in Parmenter Creek. Quantitative data collection in these areas has recently been initiated.

Presently, the most important spawning and rearing areas for bull trout in this reach are in the Quartz Creek drainage (Table 1). Most of the redds have been observed in the West Fork of Quartz Creek. The remaining redds were observed in Quartz Creek downstream of the confluence with the West Fork. Biologists, using traps in Quartz Creek, estimated that there were approximately 250 fish using this spawning tributary, although only 25 - 35 spawning fish were trapped each year (B. Marotz, Montana Fish, Wildlife, and Parks, Kalispell, Montana, personal communication).

A hybridization rate of 25% with brook trout was detected from a sample of 24 fish collected in the river between Kootenai Falls and Libby Dam. Bull trout sampled from Kootenay Lake were not hybridized and had significant genetic differences from fish taken above the falls (Robb Leary, University of Montana, personal communication).

Table 1. Bull trout redd counts in tributaries of the Kootenai River. (FWP unpublished file data and USDA Forest Service unpublished file data).

YEAR	QUARTZ CREEK	W.FORK QUARTZ CREEK	PIPE CREEK
1985	--	16*	--
1987	6	14	--
1990	32	44	
1991	22	54	5
1992	4	13	11
1993	34	55	6
1994	37	27	7
1995	26	40	5

* totals for Quartz and W. Fk Quartz cks are summed.

Personnel from Montana Fish, Wildlife, and Parks (FWP) and the Kootenai Forest conducted bull trout spawning site inventories on several other tributaries to the Kootenai River between Libby Dam and Kootenai Falls. These included Pipe, Granite, Libby, Midas and Dunn creeks and the Fisher River drainage. Pipe Creek supports limited bull trout spawning (Table 1), but bull trout redd surveys in other streams have not identified any major concentrations to date (Table 2).

In the Fisher River, nine adult bull trout were captured in a migrant trap 11.5 miles upstream from the Kootenai River. A spawning pair constructed a redd just above the trap site. Migratory bull trout have been observed in the Libby Creek drainage and, during 1995, 5 bull trout redds were counted in Bear Creek, a Libby Creek tributary. Resident bull trout are also suspected to be present in tributaries to Libby Creek, such as Big Cherry Creek. During the late 1980's, several tributaries of Libby Creek were sampled and bull trout were found in Poorman Creek and Ramsey Creek but not in Little Cherry Creek (McGuire et al 1989).

Table 2. Bull trout redd surveys in various streams in the middle Kootenai bull trout management area.

STREAM	YEAR SURVEYED	# OF REDDS	MILES SURVEYED
Fisher River	1991[a]	0	9.5
	1992[b]	2	12.3
	1993[b]	12[c]	12.0
	1995[a]	3	12.0
Granite Creek	1991	0	6.0
Midas Creek	1991	0	2.0
Libby Creek	1991	0	5.0
	1995[d]	0	16.0
Dunn Creek	1992	0	0.25
	1993	0	0.5

a. Includes East, West and Silver Butte Forks, not mainstem.

b. Mainstem, East and West Fork Fisher River surveyed.

c. Not confirmed, possible brook trout redds.

d. Surveyed by USFS personnel.

The bull trout migration into Libby Creek and the Fisher River takes place later in the season (September - October) than the migration into Quartz Creek, which occurs from May - July. There is speculation that the later migration in Libby Creek and the Fisher River is the result of elevated temperatures that occur in these tributaries during mid-summer (Mike Hensler, FWP, personal communication). Bull trout are also suspected to occur in Midas and Dunn creeks based on the presence of redds. However, since these four drainages all support brook trout populations, the redds observed could have been brook trout or bull trout.

Redd counts were completed on 13 streams in the Fisher River drainage in 1993. A total of only 13 suspected bull trout redds - 4 in the East Fisher River, 8 in Silver Butte Fisher River, and 1 in the Fisher River were observed. The majority of the streams surveyed had obstacles to fish passage and very few suitable spawning sites due to high gradient, large stream bed substrate, low pool:riffle ratio, and subterranean water flow (USDA Forest Service, unpublished file data). Traps on the Fisher River in 1993 captured 11 bull trout (FWP unpublished file data).

CORE AREAS AND NODAL HABITATS

Core areas are drainages that currently contain the strongest remaining populations of bull trout. They are usually relatively undisturbed. These watersheds need to have the most stringent levels of protection and are the primary sources for recolonization.

Core areas for the Kootenai drainage between Libby Dam and Kootenai Falls include the Quartz, Pipe and Libby Creek drainages. The Fisher River may have been important bull trout habitat historically. More research is necessary in this drainage to determine its potential for bull trout restoration.

Nodal habitats are waters which provide migratory corridors, overwintering areas or are otherwise critical to the population at some point during its life history. Nodal habitat for this population is provided by the Kootenai River between Libby Dam and Kootenai Falls. During recent electrofishing efforts both juvenile and adult bull trout we captured in this reach.

RISKS TO BULL TROUT IN THE MIDDLE KOOTENAI RIVER DRAINAGE

The risks to bull trout in the Middle Kootenai River drainage are listed in Table 2. The risks were evaluated based on the degree to which a risk factor was presumed to contribute to the past and current decline of the species (designated as "CURRENT/HISTORIC" in the table) and the threat the risk factor poses to future restoration of the fish ("RESTORATION" in the table). The highest risks are denoted with a double asterisk and high risks are noted with an asterisk.

Forestry practices rank as the highest risk, largely because it is the dominant land use in all core areas. The risk is elevated due to the limited number of core areas (Quartz, Pipe and Libby creek drainages) available to this population due to fragmentation. The threat from dam operations is considered high because of uncertainties about biological impacts associated with unnatural flow fluctuations and the gas super-saturation problems that arise from spilling water. The effects of the dam as a barrier, restricting this migratory population to 25 miles of river, increases the likelihood of localized impacts becoming a higher risk.

Illegal harvest has been well documented in this management unit and is considered a high risk because of the well-known and limited spawning areas. Introduced species are considered a high risk because of the presence of brook trout in all core areas.

Table 3. Risks to bull trout. * = high risk ** = very high risk

RISK	CURRENT/HISTORIC	RESTORATION
Environmental Instability		
Drought	*	*
Landslide/Geology	*	*
Flood/Rain on Snow	*	*
Fire	*	*
Introduced Species		
Private Ponds		
Legal Introductions	*	**
Illegal Introductions	*	*
Fisheries Management		
Barriers		
Culverts		
Diversions		
Thermal	*	*
Dams	*	**
Habitat		
Rural Residential Development		
Mining	*	*
Grazing		
Agriculture		
Dam Operations	*	**
Forestry	*	**
Recreational Developments		
Transportation	*	*
Population		
Population Trend		
Distribution/Fragmentation		
Abundance		*
Biological Sampling		
Angling	*	*
Illegal Harvest	*	

Environmental Instability

Drought (high risk), Landslide/Geology (high risk), Flood/Rain on Snow (high risk), Fires (high risk)

There are two components to the risk from environmental instability. First, the likelihood of a catastrophic event occurring and, second, the risk to the bull trout population if such an event should occur.

The Middle Kootenai River drainage is at a relatively high risk from environmental instability due to climate, geology and aspect. This area of Montana receives high annual precipitation and frequent rain-on-snow events (rain-on-snow is a common term used to describe cloudy weather periods when warm winds and rain combine to produce rapid snowmelt. These events generally occur during early to mid-winter periods). Portions of the core areas are in watersheds with unstable soils and steep slopes. The Libby Creek drainage is highly unstable. Bedload deposition combined with low flow conditions result in dewatering.

Fire impacts could be high due to fragmentation of this population and the fact that most of the migratory spawning occurs in a single drainage. A forest fire occurred in the West Fork of Quartz Creek in 1994. Under current conditions, if a catastrophic event were to cause long lasting, severe damage to Quartz Creek, recolonization opportunity would be limited.

Introduced Species

The introduced fish species found in the middle Kootenai River drainage include: brook trout (*Salvelinus fontinalis*), coastal rainbow (*Oncorhynchus mykiss*), hybrids of westslope cutthroat and Yellowstone cutthroat (*Oncorhynchus clarki bouvieri*), kokanee, northern pike (*Esox lucius*), yellow perch (*Perca flavescens*), smallmouth bass (*Micropterus dolomieui*), largemouth bass (*Micropterus salmoides*), and pumpkinseed (*Lepomis gibbosus*).

Brook trout are believed to be the introduced species that is the greatest risk to bull trout. They are numerous in all core watersheds and are known to hybridize with bull trout. The offspring are generally sterile. The available data suggest this can be an unstable situation resulting in decline or replacement of bull trout (Leary et al. 1989). Northern pike and smallmouth bass are present only in Loon Lake and the Fisher River drainage. The risk associated with these two species is unknown. Overall, the threat from introduced species is high.

Private Ponds

There are several existing private pond permits in this management area and requests for new permits are increasing. The majority are in the Libby Creek and Granite Creek drainage and applicants often request authority to stock brook trout. Libby Creek already has a population of brook trout. Bull trout have not been documented to be present in the Granite Creek drainage, although the habitat appears to be suitable.

Legal Introductions (very high risk)

Most introduced species were distributed through agency stocking programs. It is the legacy of some of these past introductions that threaten bull trout today. All three core areas contain introduced brook trout populations.

At the present time, Montana Fish, Wildlife, and Parks stocks Kamloops rainbow, non-native coastal rainbow, kokanee, and westslope cutthroat trout into waters within this drainage. There is no evidence that this stocking program is detrimental to bull trout. However, large Kamloops trout below Libby Dam have the opportunity to feed on bull trout, particularly juveniles which are close to the dam. It appears that the majority of large rainbow trout below the dam are not stocked Kamloops, but rather wild rainbow trout of unknown origin.

There is a history of coastal rainbow trout being stocked in lakes in the middle Kootenai River drainage. Howard Lake continues to be stocked with Eagle Lake rainbow trout. Westslope

cutthroat trout, which are native to this area, are also being stocked. It is likely that native redband rainbow and westslope cutthroat were impacted more by introductions of coastal rainbow trout than were bull trout.

There are plans to hatch burbot at the FWP Libby field station. No long term plans have been devised, but this program should be reviewed.

One potential benefit to bull trout from the presence of introduced species is the food source provided by kokanee that are entrained through Libby Dam. Stocking programs in Canada have the potential to impact Kootenai River bull trout if the introduced species emigrate into the middle Kootenai River from the waters where they were stocked. Management decisions by Canadian and state of Idaho officials are outside the jurisdiction of Montana, so communication and consultation should be encouraged.

Illegal Introductions (high risk)

Northern pike, smallmouth bass and yellow perch were illegally introduced into Loon Lake, in the Fisher River drainage and, in general, brook trout have been transplanted throughout Lincoln County. It is likely that illegal introductions will continue and it is perceived to be a major threat.

Fisheries Management

Current fishing regulations in the Kootenai River are designed to protect large rainbow trout (The harvest regulations are three rainbow under 13" and one over 18"). Quartz Creek is closed to fishing after July 15 to protect spawning bull trout. In most cases rainbow trout are not known to be incompatible with bull trout. However, in this situation, there is a need to study the relationship between large rainbow trout and bull trout.

Barriers

Culverts

There are several culverts in the Libby Creek drainage that are barriers to fish passage. An assessment of barrier culverts should be completed to identify where modifications are necessary.

Diversions

A diversion is present in the Libby Creek drainage approximately 1/2 mile above Highway 2. This is a private diversion and, recently has not been known to be used to capacity. It is a fish passage barrier only when used to capacity, generally only in low water years. Bull trout have been found in the irrigation system.

Near the mouth of Libby Creek, a dam diverts stream flow, and probably fish, into the boiler plant of Stimson Lumber Company.

Thermal (high risk)

Rieman and McIntyre (1993) concluded that temperature is a critical habitat variable for bull trout. Temperatures in excess of 59° F are thought to limit bull trout distribution in many systems (Bjornn 1961; Fraley and Shepard 1989; Brown 1992). In Libby Creek, summer water temperatures have been recorded as high as 72° F and 81° F during 1992 and 1994, respectively.

The Fisher River is also known to have elevated temperatures (FWP file data).

Dams (very high risk)

Libby Dam isolates this portion of the population from a major portion of the historic spawning/rearing area. This increases the likelihood of local extinction due to other risks. Under current conditions, if an event were to cause local extinction, opportunities for recolonization are limited. Bull trout are known to pass downstream through Libby Dam, however, the survival rate of these fish is unknown. No upstream fish passage is possible.

Habitat

Rural Residential Development

Many of the streams in this area flow through private land. Presently, development is clustered along Libby Creek. The population around Libby is increasing, resulting in increased housing development along streams. Due to the proximity of this development to stream channels and core areas, rural residential development is considered to be a risk.

Mining (high risk)

Acid mine drainage from the Snowshoe Mine in the Libby Creek drainage has affected trout populations in three miles of Snowshoe Creek and 15 miles of Big Cherry Creek for over 70 years. Efforts are currently underway to reclaim this site but other abandoned mines may need similar attention (Knudsen 1994). Historic mining operations in the Fisher River drainage have

caused channel degradation. A total of 25 miles of Big Cherry Creek, Libby Creek and Snowshoe Creek suffer from impaired water quality as a result of mining activities (MT DHES 1994). Several other drainages in the basin have historic small mining operations.

The Noranda Minerals Corporation is proposing to develop a large copper and silver mine complex in the Libby Creek watershed. Ore production would be 20,000 tons/day, with 112 million tons of tailings produced during mine life. Tailings would be stored behind a 370 foot high dam in the Little Cherry Creek watershed (USFS et al. 1992). Little Cherry Creek would be relocated for several thousand feet. It may contain a population of pure redband rainbow trout (J. Huston, FWP, personal communication).

Because of risks from historic mines and proposed future mines, the current/historic and restoration risks are rated as high.

Grazing

The majority of grazing in this management area is in the Fisher River watershed and it still occurs in several tributaries. It is likely that less grazing will occur on public lands in this area in the future.

Agriculture

Most agricultural development in this drainage occurs in the Fisher River watershed. The dominant agricultural use is hay production. Water quality is impaired in a total of 76 stream miles in the Fisher River and Wolf Creek as a result of agricultural activities (MT DHES 1994).

Approximately 25 miles of the Pleasant Valley Fisher River suffers from chronic dewatering, and 14 miles of Libby Creek are periodically dewatered (FWP 1992a). Impacts due to historic and current agricultural practices do not present a major threat to the restoration of bull trout. The likelihood of increased agricultural activity in the future is low.

Dam Operations (very high risk)

Impoundment of the Kootenai River in 1972 by Libby Dam altered the aquatic environment in the river downstream from the dam. The operation of Libby Dam drastically alters downriver discharge patterns on a seasonal and, sometimes, daily basis. Peak discharge rates of 64,000 cfs (cubic feet per second) that formerly occurred during spring runoff have been replaced with regulated releases ranging from 4,000 - 10,000 cfs during summer, to 15,000 - 28,000 cfs during winter. During many months it is not uncommon for discharge rates to fluctuate widely between approximately 5,000 - 20,000 cfs (Knudsen 1994).

After the dam was built, flow regimes, temperature patterns, sediment loads, and water quality were markedly changed downstream of Libby Dam, resulting in changes in periphyton, aquatic insects, and fish populations (FWP 1983). Maximum discharge through the turbines is 28,000 cfs. Gas supersaturation is a problem when spilling occurs but this has not happened in over a decade (Knudsen 1994). Supersaturation can cause gas bubble disease in fish. Changes in river ecology as a result of dam operations could affect juvenile bull trout rearing and food supply.

Lack of peak flows since dam construction is allowing delta formation at the mouths of

some tributaries, which could impede upstream movement of bull trout spawners during low flows. Although migrant passage into these streams does not appear to be inhibited at present, continued deposition may eventually impede migration into some streams. Migrant bull trout may be especially sensitive because their fall spawning run coincides with low tributary flows and reduced water depths. A delta at the mouth of Quartz Creek is of particular concern because of the importance of that stream to migratory bull trout reproduction. Studies completed in 1988 concluded that this delta does not represent an impenetrable barrier. However adult bull trout returning to the river may become more vulnerable to predation. The delta should be monitored periodically to determine if the surface elevation is increasing (Marotz et al. 1988).

For a number of reasons, flow regimes from Libby Dam may be modified in the future. One reason is the placement of Kootenai River white sturgeon and Columbia and Snake River salmon on the U.S. Fish and Wildlife Service's Endangered Species List. The effects of white sturgeon restoration flows, and other flow modifications, on bull trout are unknown at this time, particularly since the exact flows that will be imposed are unknown.

Forestry (very high risk)

Past forestry practices (road construction, log skidding, riparian harvest, clearcutting) were often damaging to watersheds and were likely major contributing causes of the decline of bull trout. The effects of these practices include increased sediment in streams, increased peak flows, thermal modifications, loss if instream woody debris, and channel instability.

Virtually all drainages currently supporting bull trout are managed timber lands. There are

extensive corporate holdings by Plum Creek (formerly Champion International), particularly in the Fisher River drainage, as well as large blocks of Kootenai National Forest lands. According to the Environmental Impact Statement for the Kootenai National Forest Plan, almost two-thirds of the Kootenai National Forest, particularly the west half, has watershed problems. Frequent flooding and concentrated high water yields, sedimentation, and small slumps below clearcuts and roads occur (KNF 1987). Over 124 miles of five streams suffer impaired water quality as a result of timber harvest activity in this drainage (MT DHES 1994).

At the present time, in the Quartz Creek core area, only a portion of the West Fork of Quartz Creek remains unroaded. A forest fire burned in this drainage in 1994. The Kootenai National Forest has planned a salvage sale in this drainage to log the area that was burned (K. Horn, U.S. Forest Service, Missoula, Montana, personal communication). The sale will follow INFISH requirements (USFS 1995), but the risk to bull trout is high due to the proximity of the sale area to the few spawning and rearing areas in the drainage.

Current forestry practices are less damaging than past practices but the risk is still high because of the existing road system, mixed land ownership, lingering results of past activities, and inconsistent application of best management practices. Results of 1994 timber sale audits suggest impacts are still occurring (MT DSL 1994).

Recreational Developments

To date, little recreational development has occurred in the Middle Kootenai River drainage. A ski area is planned in the headwaters of Flower Creek. There are two reservoirs

located in the upper Flower Creek drainage and potential impacts from ski area development should not have major influence below these impoundments. Bull trout were captured in Flower Creek above the impoundments in the early 1960's (Huston 1961). Bull trout were not found during limited sampling in 1994 (Huston 1995).

Transportation (high risk)

Railroads are located along the middle portion of the Kootenai River, and up the Fisher River. The rerouting of the Great Northern Railroad in the late 1960's shortened the lengths of the Fisher River, Wolf Creek and Fortine Creek by over two miles (USACE 1971). Major portions of the first 10 miles of the Fisher River and large portions of Wolf Creek were also channelized. On portions of Swamp Creek east of Libby, there is a straightened, riprapped channel along Highway 2. Highway 2 also parallels the Kootenai River. The potential impact from spills, weed suppression, fire suppression and maintenance result in high current and historic restoration risks.

Population

Life History

The migratory form of bull trout exists in the Middle Kootenai River drainage. Resident populations also exist in some streams, including Libby Creek above the falls.

Population Trend

There is relatively little population trend data available for the middle Kootenai River drainage. Additional survey work is needed to adequately describe population trends. Recent electrofishing surveys resulted in the capture of more bull trout than in past surveys, however this may be a result of changed distribution of bull trout caused by increased food availability near the dam. We cannot assess risk based on population trend at this time.

Distribution/Fragmentation

Disruption of migratory corridors leads to the loss of the migratory bull trout form. Resident stocks living upstream from barriers are at an increased risk of extinction because there is little chance of recolonization following a catastrophic event (Rieman and McIntyre 1993).

Maintenance of the migratory form is needed for the long term survival of the species in this drainage. Although this form currently persists in this drainage, it has access to a limited number of tributaries. This population has also been fragmented due to construction of Libby Dam. The dam increases the risk of extinction in this reach by limiting genetic exchange to a downstream direction and restricting the range of the fish. In addition, large portions of the historic range are no longer available.

Abundance (high risk)

If a population of bull trout is small enough, fluctuations in it's numbers can lead to downward trends in the population long enough for it to go extinct. As a population is restricted in abundance, or as the variation in its birth rate or survival increases, the predicted mean time to extinction will decrease (Rieman and McIntyre 1993).

The abundance risk was judged to be high for bull trout in this basin because of their low numbers.

Biological Sampling (high risk)

Electrofishing of the Kootenai River poses some risk to large bull trout inhabiting this river. As a result of research on the impacts of electrofishing on fish, electrofishing techniques and equipment have been modified to minimize electrofishing risk. There is also a FWP policy limiting the use of electrofishing in waters containing species of special concern. Presently, streamflows permitting, electrofishing on the Kootenai River occurs annually in this reach and continuous DC is the only electrical waveform used. Overnight survival tests in live boxes have detected no short term mortality. Research is needed on the impact of electrofishing on bull trout under these conditions. The Scientific Group recommends that x-rays be used to evaluate electrofishing impacts on bull trout in the Kootenai River.

In the past, trapping of the spawning run into Quartz Creek may have prevented or

discouraged these fish from accessing their preferred spawning areas. If this cannot be remedied, trapping should be discontinued.

Angling (high risk)

The current/historic risk from angling is rated as high. The harvest of bull trout is no longer legal in this drainage. However, there is still some risk to bull trout from incidental hooking and handling mortality. Drainages that receive high fishing pressure, such as the Kootenai River, are more likely to have hooking mortality problems, especially when anglers target larger fish. A fishery for large rainbow is becoming more popular in the Kootenai River and many of the techniques used by anglers also capture bull trout. The Kootenai River received 29,854 angler days of fishing pressure in 1993, up from 25,213 angler days in 1991 (FWP 1992b; FWP 1994). More information is needed about angler catch of bull trout in this drainage.

Illegal Harvest (very high risk)

Accurate information on illegal harvest is difficult to obtain. However, information collected from FWP indicates that concentrations of large bull trout are targeted by poachers (Mack Long, FWP, personal communication). In areas where the population is small, the loss of even a few fish can be significant. Consequently, we judge this risk to bull trout restoration to be high.

RESTORATION GOAL

The first component of the restoration goal is maintenance of the population genetic structure. This requires that all existing populations will remain stable or increase from current numbers in the future.

Maintaining and increasing the connectivity between the Middle Kootenai River and its tributaries is considered imperative for the long-term survival of the species in this drainage. Otherwise it is believed that demographic factors, genetic factors, and natural or human-caused catastrophic events will act in concert to gradually cause the elimination of this population. Increasing the number of quality spawning tributaries is necessary. A key component of the restoration goal for bull trout in the middle Kootenai River drainage is to maintain the self-reproducing migratory life form in the Kootenai River which has access to tributary streams and spawns in core areas.

Specifically, a baseline of redd counts should be established in all drainages that presently support spawning migratory fish. If the total baseline exceeds 100 redds or 2000 individuals in the middle Kootenai drainage, an increasing trend should be the goal. The baseline data available at this time indicate that about 100 redds are present each year. The goal is to increase the number and distribution of redds. Habitat conditions in Quartz Creek should be maintained and improved, and increasing spawning in the Fisher River and Libby Creek should be a goal.

It should be recognized that this goal is based on the best information currently available. However, the level of uncertainty is high. Modifications of this goal may be appropriate in the future as more information becomes available.

SOURCES OF UNCERTAINTY, DATA NEEDS

Migratory Population

There is a need for information on the genetic structure of the bull trout population. There may have been a historic connection between the upper Kootenai River (above the falls) and the lower Kootenai (below the falls). What are the genetic consequences to bull trout from their isolation caused by Libby Dam?

We need more information about the Fisher River and Libby Creek. What measures are available to improve habitat conditions in these drainages?

What are the impacts of electrofishing on the adult bull trout in the Kootenai River? Are there other census techniques that are less disruptive?

Juvenile surveys should become part of the long-term monitoring plan in the future.

Historic mining districts in the Fisher River, Libby Creek and Granite Creek may have discharged mercury into the drainage. Tests should be done to identify whether elevated mercury levels are present.

The potential for competition between bull trout and kamloops rainbow trout is not well understood.

Spawning is suspected in the upper West Fork Fisher River. However, the precise location is unknown.

More information about the status of the bull trout population in Parmenter Creek and above the dams in Flower Creek is needed.

The extent of hybridization between bull trout and brook trout in Quartz Creek is unknown.

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APPENDIX A

ACRONYMS

FWP	Montana Fish, Wildlife, and Parks
MDHES	Montana Department of Health and Environmental Services
TMDL	Total Mean Daily Load
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey

GLOSSARY

aggrade: raise the grade or level of a river valley or streambed by depositing streambed material or material or debris

core area: a drainage that currently contains the strongest remaining populations of bull trout in a restoration area; usually relatively undisturbed habitat

cover: anything that provides visual isolation or physical protection for a fish, including vegetation that overhangs the water, undercut banks, rocks, logs and other woody debris, turbulent water surfaces, and deep water

disjunct population: a population found in a headwater lake, that appears to be self-reproducing, but is functionally isolated from the rest of the system

drainage: an area (basin) mostly bounded upstream by ridges or other topographic features, encompassing part or all of a watershed

entrainment: displacement of fish from a reservoir through an outlet from a dam or from a river into an irrigation ditch

escapement: adult fish which return to spawn

fragmentation: the breaking up of a larger population of fish into smaller disconnected subpopulations

fry: first-year fish

migratory: describes the life history pattern in which fish spawn and spend their early rearing years in specific tributaries, but migrate to larger rivers, lakes or reservoirs as adults during their non-spawning time

nodal habitat: waters which provide migratory corridors, overwintering areas, or other critical life history requirements

redd: a disturbed area in the gravel, or a nest, constructed by spawning fish in order to bury the fertilized eggs

resident: fish, which are often found in tributary or small headwater streams, where the fish spend their entire lives

risk: a factor which has contributed to the past or current decline of the species

restoration: the process by which the decline of a species is stopped or reversed, and threats to its survival are removed or decreased so that its long-term survival in nature can be ensured

Restoration Team:
a policy-level group with representatives from state and federal agencies, conservation organizations and private industry; created by Governor Racicot to establish a Bull Trout Restoration Plan for Montana

population: an interbreeding group of fish that spawn in a particular river system (or part of it) and are reproductively isolated

riparian area: lands adjacent to water such as creeks, streams and rivers and, where vegetation is strongly influenced by the presence of water

Scientific Group:
composed of agency, private and university scientists appointed by the Restoration Team to conduct technical analysis

threat: a factor which jeopardizes the future conservation of the species

watershed: a drainage basin which contributes water, organic matter, dissolved nutrients, and sediments to a river, stream or lake (USDA 1995)

Watershed Group:
a group of agency representatives, landowners and recreational and commercial users of a watershed, plus a liaison from the Scientific Group; created by the Restoration Team and charged with developing recovery actions to help restore bull trout

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