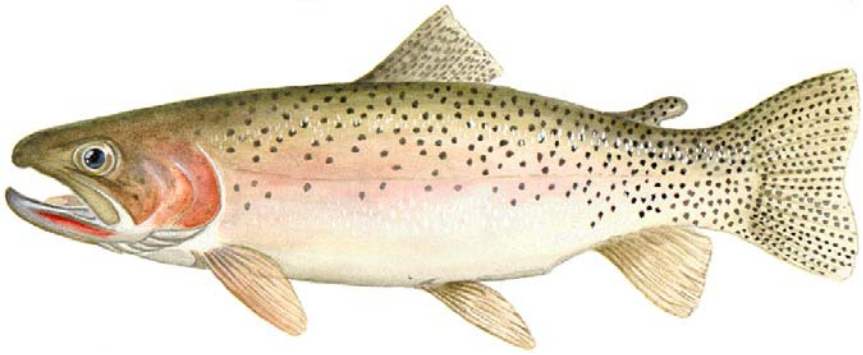
NORTHCENTRAL MONTANA COOPERATIVE WESTSLOPE CUTTHROAT TROUT RESTORATION PROJECT

2002 ANNUAL REPORT



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ABSTRACT

Information within the Status and Restoration Strategies for Westslope Cutthroat Trout in Northcentral Montana (Tews et al. 2000) was used to guide restoration efforts over the last two years. Overall, there was a 26% decrease in stream miles inhabited by pure westslope cutthroat trout (WCT) in northcentral Montana from 2000 to 2002. Over seventy-five percent of the total change (Δ) in miles of pure WCT across all drainages was a decrease (-62.5 miles) in known distribution based on new genetic information. Increased precision from larger sample sizes most likely "teased" out low levels (<5% in most cases) of hybridization that already existed. The Judith basin showed the largest decrease in miles of pure WCT (25 miles). The Judith Basin is relatively pristine and remote and was thought to harbor numerous pure WCT populations. Additional genetic information has revealed that the lack of barriers in the Judith (South Fork in particular) has resulted in widespread introgression with rainbow trout. Conversely, many populations of WCT in the Belt Creek drainage remained pure and secure because of numerous physical barriers to non-native fishes. Another category that showed differences between 2000 and 2002 was the discovery of new stream sites and upstream populations (14% of change in stream miles). Eleven and a half miles of new stream, including three previously unknown pure populations of WCT, were discovered between 2000 and 2002. Two stream-to-stream transfers of WCT have occurred since the 2000 SRS: from Deep Creek (Smith) to Petty Creek (Sun) and nearly pure WCT (99.6%) were transferred from upper Whiterock Creek (Two Medicine) to Lonesome Creek (Two Medicine) in 2002. In addition, the Gold Run Creek (Belt) populations range was extended 0.25 miles upstream past several barriers. As a follow-up to piscicide treatment, five trap nets were placed in Hound Creek Reservoir and a box trap was placed at the mouth of Tyrell Creek on 17 May 2002. No brook trout or suckers were recovered in these traps (2 months sampling) or during an electrofishing survey of Tyrell Creek during August. WCT will be stocked in this private system following development of a Candidate Conservation Agreement w/ Assurances with the U.S. Fish and Wildlife Service and private landowners. Other recovery actions in 2002 included, creation of a barrier on Big Coulee Creek (Highwood) by blasting out a four foot shelf of rock, creation of a concrete barrier on Chamberlain Creek (Belt), and MEPA compliance and permitting for a Pilgrim Creek (Belt) barrier. Numerous fisheries surveys were completed in northcentral Montana; fishery variables collected included, disease, abundance, biomass, and genetics. Dan Gustafson of Montana State University and MFWP staff collected invertebrate samples from Harley Creek (Belt), North Fork Ford Creek (Sun), and Middle Fork Camas Creek. Invertebrate samples were collected from headwater streams that may receive replicated populations of WCT. Major projects planned for 2003 include fish transfers from Cottonwood Creek (Smith) to Middle Camas Creek (Smith), Deep Creek (Smith) to Petty Creek (Sun), Whiterock Creek (Two Medicine) to Lonesome Creek (Two Medicine) and barrier projects on the South Fork Judith, Lake Creek (Smith), and Pilgrim Creek (Belt). Based on new genetic information, 57 genetically pure WCT populations probably existed in 143 miles of stream in northcentral Montana before restoration work began in 2000. Restoration projects in years 2000 to 2002 created 1 new population and expanded pure WCT distribution by 3.25 miles, representing a 2.3% increase in miles of stream occupied by pure WCT. In addition, the security of 3 existing pure populations of WCT was improved by barrier projects.

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INTRODUCTION

Westslope cutthroat trout (WCT) were first described by Lewis and Clark in 1805 near Great Falls, Montana. WCT are recognized as one of 14 interior subspecies of cutthroat trout and are found in Alberta, Idaho, Washington and Montana. In Montana, WCT occupy the Upper Missouri east of the Continental Divide and the Upper Columbia Basin west of the divide (Behnke 1992). Although still widespread, WCT distribution and numbers have declined significantly in the past 100 years due to a variety of causes, including loss of habitat, competition and predation from non-native fish species, and hybridization (Shepard et al. 2003, Shepard et al. 1997, McIntyre and Rieman 1995, Liknes 1984, Hanzel 1959). Genetically unaltered WCT currently occupy less than 8% of their historic habitat across their entire range (Shepard et al. 2003).

The marked decrease in WCT density and distribution led to them being listed in 1972 as a State Species of Special Concern by the Montana Department of Fish, Wildlife and Parks (MFWP). WCT were petitioned for listing as threatened under the Endangered Species Act in June 1997.

In 1999, with the help of a technical committee formed in 1994 and a steering committee formed in 1996, the state of Montana developed a statewide WCT Conservation Agreement. The Conservation Agreement was signed by several state and federal agencies as well as some non-government organizations. In 2000, a document was developed which described the status and restoration strategies (SRS) necessary for restoration of WCT in northcentral Montana (Tews et al. 2000). The strategies in the SRS were based on goals and objectives developed in the Conservation Agreement.

Strategies for restoration of WCT in northcentral Montana outlined in the 2000 SRS included: 1) preservation of all existing pure populations, 2) creation of two large populations (>50 miles of stream) as proposed in the conservation agreement, and 3) establishment of 2 – 4 additional secure viable populations (minimum of 2,500 individuals) each, in the Southern Tributaries and the East Front. Tools available to implement these strategies include, creation of new barriers to protect pure populations, removal or eradication of non-native species, and replication of existing pure populations in either empty headwater habitats or habitats made empty through application of piscicides.

In April of 2000, following an extensive status review, the U.S. Fish and Wildlife Service (USFWS) determined that westslope cutthroat trout were “not warranted” for federal listing. That finding was challenged in federal court, and the court remanded the not warranted finding back to the USFWS for additional review. In 2003, after additional review, the USFWS determined that WCT are not likely to become a threatened or endangered species in the foreseeable future, therefore listing was not warranted.

In 2001, a challenge cost share agreement was established between MFWP and the United States Forest Service (USFS). The agreement was formed to help implement new restoration efforts for WCT in northcentral Montana and coordinate existing efforts described in the SRS. The Wildlife Conservation and Restoration Program (WCRP), a new federal program established to provide states with Federal aid funding to conserve declining fish and wildlife and their habitats,

also provided funding in 2002. This report and much of the WCT restoration work it includes is a direct result of funding from the "challenge cost share" and WCRP programs.

This report describes the current status of WCT in northcentral Montana relative to the status of WCT in 2000 (SRS) and presents data on individual streams organized by drainages or regions. Detailed data is included in several appendices.

STUDY AREA

The general study area includes the following drainages: Arrow, Belt, Highwood, Judith, Musselshell, Smith, Sun, Teton, Two Medicine, and Upper Missouri. These drainages are found within MFWP region 4 and most WCT populations are located on National Forest Lands within Lewis and Clark and Helena National Forests (Figure 1).

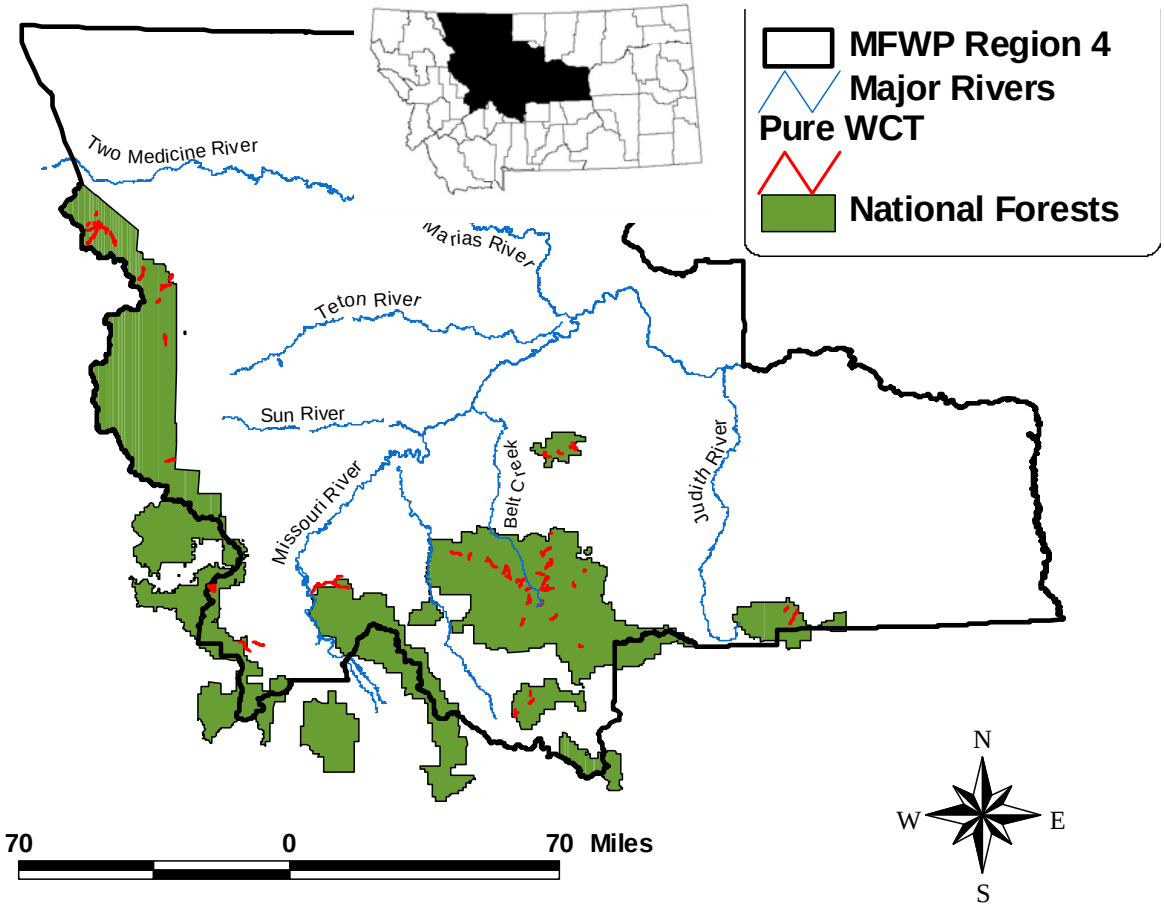

Figure 1. Northcentral Montana WCT study area.

PROCEDURES

Fish populations were sampled with Smith Root Model 12-B and 12-A battery powered backpack electrofishing units. Population estimates followed the methods of Leathe (1983). On larger streams, two backpack units were used side by side to increase electrofishing efficiency. When the probability of capture during the second pass was less than 0.8, additional passes were made to reduce underestimates of trout population size as described by Riley and Fausch (1992). Small streams were electrofished in either an upstream direction or downstream direction with a block net at the downstream end. Depletion estimates were calculated using Microfish 3.0 (Van Deventer and Platts 1985). Caudal fins from cutthroat trout were clipped (hole punch size) for PINES PCR genetic analysis and preserved in 95% ethanol. Adipose fins were clipped on trout that were sampled for genetics to prevent re-sampling the same fish during future collections. Allozyme genetic samples were collected from some streams in prior years. Allozyme samples require the sacrifice of whole fish and are therefore used much less frequently since the advent of PINES. On some streams, temperature was recorded every 1 – 2 hours with Onset continuous recording data loggers. Specific conductivity/TDS was measured with a temperature compensated Oakton TDSTestr3, TDSTestr1, or ECTestr with a range of 0 – 1990 µS/cm.

RESULTS AND DISCUSSION

Revision of WCT Distribution in Central Montana

Information within the 2000 SRS was used to guide restoration efforts over the last two years and provides a context with which to judge recent WCT restoration and protection efforts in northcentral Montana. It is important to stress that the purity and range of WCT populations described in the 2000 SRS was developed through professional judgment based on temporally and spatially limited sampling information. Moreover, estimated miles were in many cases developed by local biologists using maps and limited ground-truthing. The following results are presented as a rough estimate of WCT restoration progress in central Montana over the last two years, it is not intended as a precise accounting of miles or purity.

Data collected over the last two years has allowed us to make more precise estimates of the range and purity of WCT in northcentral Montana. Unfortunately, these data have shown that many populations deemed pure in 2000, are actually slightly hybridized (Table 1). Overall, there was a 26% decrease in pure WCT inhabited stream miles across all drainages in northcentral Montana. The Judith basin showed the largest decrease in miles of pure WCT (25 miles). The Judith Basin is relatively pristine and remote and was thought to harbor numerous pure WCT populations. Additional genetic information has revealed that the lack of barriers in the Judith (South Fork in particular) has resulted in widespread introgression with rainbow trout. Conversely, many populations of WCT in the Belt Creek drainage remained pure and secure because of physical barriers to non-native fishes. However, Belt Creek WCT populations are generally small and vulnerable to genetic risks associated with small population size (e.g. bottlenecks, founder effects). Teton and Highwood drainages had large overall percentage drops in stream miles with pure WCT: 45% and 33% respectively. Any decrease in purity in small drainages such as the Teton and Highwood might appear to have little effect on the status of

WCT as a whole but could, through the loss of rare alleles, negatively affect the species ability to survive stochastic and anthropogenic perturbations.

Table 2 identifies changes in stream miles containing pure WCT because of new information or management actions. Seventy-eight percent of the total change (Δ) in miles of pure WCT was a decrease (-62.5 miles) based on new genetic information. Increased precision from larger genetic sample sizes most likely "teased" out low levels of hybridization that already existed. It is unlikely, but possible that populations may have become hybridized between initial sampling and sampling in the years since 2000 (especially samples which have not been updated for greater than 5 years). Sixty-five percent of the populations with decreased purity because of new genetic data dropped less than 5% (i.e. 100% to 98%; Appendix A). The other category that showed differences between 2000 and 2002 was the discovery of new stream sites and upstream populations (14% of change in stream miles). Nine miles of new stream, including three previously unknown pure populations of WCT were discovered between 2000 and 2002 (Table 2; Appendix B). New stream sites are newly discovered streams with pure WCT. New upstream information indicates when a new sample site upstream of an old site reveals pure individuals that have been protected from hybridization through physical or biological isolation (Table 2; Appendix B). The fact that new sites have been found in northcentral Montana (a relatively well documented region) is encouraging but future discoveries of other new sites inhabited by pure WCT will likely be rare. Very little of the total change in WCT inhabited miles was the result of fish transfers (replication) or upstream expansion (< 5%) (Table 2; Appendix B). The only stream-to-stream transfer since the 2000 SRS of 100% pure WCT was from Deep Creek (Smith) to Petty Creek (Sun) in 2002. Nearly pure WCT (99.6%) were transferred from upper Whiterock Creek (Two Medicine) to Lonesome Creek (Two Medicine) in 2002. These fish were not included in overall accounting but may prove to be pure after future genetic testing. Eighty-four of the 143 miles of stream with pure WCT (approximately 60%) has not had additional genetic testing since the 2000 SRS (Table 2; Appendix E).

Table 1. Net change in miles of stream occupied by genetically pure WCT from 2000 to 2002. 2000 data were obtained from Status Assessment and Restoration Strategies Report (Tews et al. 2000). Numbers in parentheses represent WCT populations.

Drainage	**Miles of 100% Pure WCT/ 2000 SRS**	**Miles of 100% Pure WCT/ 2002**	**Difference**	**Percent Change**
Arrow	3 (2)	3 (2)	0	0.00%
Belt	56 (25)	44.25 (21)	-11.75	-20.98%
Highwood	3 (2)	2 (1)	-1	-33.33%
Judith	33 (11)	8.5 (5)	-24.5	-14.24%
Musselshell	7 (2)	7 (2)	0	0.00%
Smith	20 (8)	16 (8)	-4	-20.00%
Sun		3 (1)	3	+
Teton	10 (6)	5.5 (3)	-4.5	-45.00%
Two Medicine	42 (11)	42 (11)	0	0.00%
Upper Missouri	20 (5)	12 (4)	-8	-40.00%
Total	**194**	**143.25**	**-50.75**	**-26.16%**

*Numbers in parentheses represent populations of pure WCT

Table 2. Change in miles of stream occupied by genetically pure WCT. Changes are attributed to seven activity categories. Percentages are for each category based on total Δ between years.

Activity	Miles Stream 2000	Miles Stream Current	Difference	Percent of Total Change (Δ80.25 miles)
Decrease From Pure Because of New Data	62.5	0	-62.5	77.88%
New Stream Site & New Upstream Information	0	11.5	11.5	14.33%
Cartography Change	4	1	-3	3.74%
New Replicated Populations	0	3	3	3.74%
New Upstream Expansion	0	0.25	0.25	0.31%
Confirmed Pure WCT	43.25	43.25	0	0.00%
No New Information	84.25	84.25	0	0.00%
Total	**194**	**143.25**	**-50.75**	**100%**

Restoration Projects, 2000 - 2002

The following tables and text present the highlights of recovery efforts during the past two years. Specifics related to recovery efforts and biological monitoring since the 2000 SRS have been presented in MFWP annual coldwater reports (Tews et al. 1999 and 2000; Tews et al. 2001).

For the purpose of this report, recovery efforts will be presented in three categories: 1) creation of fish barriers, 2) brook trout suppression/eradication, and 3) WCT transfers (replication or expansion opportunities). These methodologies were outlined in the 2000 SRS (Tews et al. 2000) as well as the 1999 Memorandum of Understanding and Conservation Agreement (MFWP 1999). These efforts focus on protecting existing pure populations through creation of barriers to upstream movement of non-native fishes, maintaining status quo of populations by suppression of non-native fishes, and increasing the range of pure populations through transfer to headwater habitats devoid of fishes or into piscicide treated habitats. A decision was made not to suppress non-native brook trout in streams with WCT introgressed with rainbow trout. This decision was made necessary because of limited resources and the presence of numerous populations of pure cutthroat threatened by brook trout. If additional resources become available, efforts to suppress brook trout in nearly pure populations of WCT may be initiated. Table 3 shows fish barriers that have been built or are in the planning stages since 2000. Table 4 shows brook trout suppression efforts since the 2000. Table 5 shows headwater transfers, replication, and expansion efforts since 2000. WCT populations in northcentral Montana are for the most part small isolets at the headwaters of small streams. Either natural or man-made barriers protect these small extant populations of WCT. These barriers are key to protecting them for the short term. Long-term efforts to maintain these populations require replication or extension of fishes in new or expanded habitats. Finding adequate empty habitats with barriers or potential habitats with adequate barrier sites is difficult and requires adequate survey information from remote areas throughout the project area. Table 6 identifies possible replication or expansion sites in northcentral Montana

Table 3. Fish barriers planned or constructed since the 2000 SRS.

Stream	Preliminary Barrier Design	Type	NEPA/MEPA	Funding	Construction
Big Coulee (Highwood)	Summer 2002	Blasted bedrock	Summer 2002	Summer 1999	Fall 2002
*Chamberlain Cr. (Belt)	Fall 2001	Concrete	Summer 2001	2000	Summer 2002
*Cottonwood Cr. (Arrow)	Fall 1999	Concrete	Spring 1998	1998	2001
Cottonwood Cr. (Upper Missouri)	1998	Concrete/Natural	1998	1999	2000
Judith River, S. Fk. (Judith)	Fall 2002	Concrete	Winter 2003 Initiate	Winter 2003	2003-2004
Lake Cr. (Smith)	Spring 2003	NC	NC	NC	NC
Little Belt Cr., M. Fk. (Belt)	Letter to forest roads engineer	Culvert	NC	NC	NC
Pilgrim Cr. (Belt)	Fall 1999	Boulder	Winter 2003	N/A	Summer 2003

Projects with a * indicate the project is completed. NC-Not Complete

Table 4. Brook trout suppression and removal efforts since the 2000 SRS

Stream	Suppression or Removal	Non-Native Fish Species Present	Miles	MEPA	Dates
Big Coulee (Highwood)	Suppression	EB	1	1999	1997-Present
Chamberlain Cr. (Belt)	Suppression	EB	5	1999	1997-Present
Cottonwood Cr. (Arrow)	Removal	EB	6	1999	2001-2003
Cottonwood Cr. (Upper Missouri)	Removal	EB, RB	6	2003	2003
Daniels Cr. (Smith)	Suppression	EB	1	NC	2003
James (Belt)	Suppression	EB	2	2001	2001
Judith River, S. Fk. (Judith)	Removal to barrier	RB, EB, HYB	4	Post barrier construction	2003-2004
Lake Cr. (Smith)	Removal	RB x WCT x YCT	1 w/ Lake	2003	2004-2005
Little Belt Cr., M. Fk. (Belt)	Suppression	EB	1	1999	1997-Present
Whiterock Cr. (Two Medicine)	Suppression	EB	1	2001	Ongoing
Tyrell Cr. (Smith)	Removal	EB	4	2000	September 2000- 2002

EB = Brook trout; HYB = Hybrid; RB = Rainbow trout; WCT = Westslope cutthroat trout; YCT = Yellowstone cutthroat trout

Table 5. Headwater transfers and range expansion efforts since the 2000 SRS

Recipient Stream (Drainage)	Donor Stream (Drainage)	Survey information			MEPA	Completion Date (# Fish Transferred)	Protected Length (mi)
		Amphib	Insect	Disease			
Camas Cr., M. Fk. (Smith)	Cottonwood Cr. (Smith)	2001	Fall 2002	Summer 2000	Spring 2003	Summer 2003	2.5
Falls Cr. (Sun)	NC	NC	NC	NC	NC	NC	4
Ford Cr., N. Fk. (Sun)	Running Wolf Cr., N. Fk. (Judith)	Summer 2003	Summer 2002	Fall 2002	Spring 2003	Summer 2003	3
Gold Run, Upper, Upper (Belt) *	Upper Gold Run above barrier	Fall 2000	N/A	N/A	Winter 2001	Summer 2000 (20) Summer 2001 (25)	0.56
Little Camas Cr. (Smith)	NC	NC	NC	NC	NC	NC	1
Lonesome Cr. (Two Medicine) *	Whiterock Cr. (Two Medicine)	Summer 2000	Summer 2000	Summer 2001	Spring 2002	Summer 2002 (50)	2
Petty Cr. (Sun) *	N. Fk. Deep Cr. (Smith)	Summer 1998	Summer 1998	Summer 1998	Spring 2002	Summer 2003 (122)	3
South Badger Cr. (Two Medicine)	Midvale Cr. (Two Medicine)	NC	Summer 2000	NC	NC	NC	6 -11
Tyrell Cr., Hound Cr. Reservoir (Smith)	?	NC	NC	NC	NC	NC	4

Projects with a * indicate the project is completed or nearly completed. NC = Not Complete

Table 6. Possible replication or expansion sites for WCT in northcentral Montana. Drainages with an * are outside the historical range of WCT

Stream	Drainage	Legal	Ownership	Fishes Present	Barrier Type	Length (miles)	Comments
Crawford Creek	Belt	T14N R7E Sec.12	Public (some private upstream)	EB, HYB, RB, WCT	Partial	1	May have pure population at headwaters
Falls Creek, East and West Forks	Dearborn	T17N R7W SEC.15	Public	EB, RB	Full	3	Additional barrier 4 miles downstream
Cottonwood Creek, West Fork	Judith	T12N R18E Sec.2	Public	None	Full	3	Needs additional fish and habitat survey
Cross Creek	Judith	T11N R11E Sec.7	Public	None	Full	1	Limited habitat
Lost Fork	Judith	T13N R11E Sec.31	Public	EB, HYB, RB, WCT	None	8	Will require large barrier and piscicide application
Big Elk Creek, Middle Fork	Musselshell*	T6N R12E Sec.31	Public	None	Full	2	
Blacktail Creek	Musselshell*	T6N R11E Sec.36	Public	None	Full	1	
Lebo Fork	Musselshell*	T6N R12E Sec.31	Public	None	Full	3	
Big Camas Creek	Smith	T9N R4E Sec.15	Public	EB, HYB, RB, WCT, YCT	Full	3.3	Will require piscicide application; includes lake
Deadman Creek	Smith	T12N R8E Sec.22	Public	HYB, RB, WCT	None	2	
Deep Creek, South Fork	Smith	T16N R4E Sec.30	Public	None	Full	2	
Jumping Creek	Smith	T12N R7E Sec.2	Public	EB, HYB, WCT	Partial	4	Need additional fish and habitat surveys
Little Camas Creek	Smith	T9N R4E Sec.15	Public	None	Full	1.5	Culvert barrier, small stream
Stringer Creek	Smith	T14N R6E Sec.36	Public	None	Full	1	
Tenderfoot Creek	Smith	T14N R3E Sec.25	Public	HYB, RB, WCT	None	3	Will require piscicide application

Stream	Drainage	Legal	Ownership	Fishes Present	Barrier Type	Length (miles)	Comments
Tyrell Creek	Smith	T15N R1W Sec.35	Private	None	Full	3	Private, CCAA required, chemically treated to remove non-native fishes in 2000
Blubber Creek	Sun	T19N R7W Sec.21	Private	RB	Full	2	Private, CCAA required
North Fork Ford Creek	Sun	T19N R9W Sec.11	Public	None	Full	5	In progress
Rock Creek	Sun	T23N R10 Sec.7	Public	None	Full	10	
Willow Creek	Sun	T21N R6W Sec.29	Public	None	Full	2	
Deep Creek, South Fork	Teton	T23N R8W Sec.27	Public	None	Full	5	
Badger Creek, South	Two Medicine	T29N R11 Sec.30	Public	None	Full	11	May require piscicide, need fish surveys
Birch Creek, Middle Fork	Two Medicine	T27N R10W Sec.4	Public	RB	Full	5	
Pike Creek	Two Medicine	T30N R13W Sec.28	Public	None	Full	1	Limited habitat
Cottonwood Creek	Upper Missouri	T14N R3W Sec.26	Public	EB, RB	Artificial	6	In progress
Elkhorn Creek	Upper Missouri	T13N R2W Sec.6	Public	HYB, RB, WCT	Artificial	8	Will require piscicide application
Willow Creek	Upper Missouri	T13N R3W Sec.12	Public	None	Partial	4	

EB = Brook trout; HYB = Hybrid; RB = Rainbow trout; WCT = Westslope cutthroat trout; YCT = Yellowstone cutthroat trout

Summary of Survey and Restoration Efforts by Drainage

Statistics of fish sampled during 2002 are listed in Appendix F. Information on specific conductance or total dissolved solids was collected at fish sampling locations (Appendix G). Streams were sampled by both USFS and MFWP crews. MFWP, USFS and USFWS personnel took tissue from *Oncorhynchus* sp. for genetic testing on about 25 streams region-wide (Appendix H). Genetic test results were received from 49 streams (Appendix I). Highlights of WCT sampling are discussed below.

Arrow Creek Drainage

Cottonwood Creek – Crews from MFWP and USFS removed brook trout from above a fish barrier (constructed 2001) on two occasions in 2002 (29-31 July and 7-8 October 2002). Two to three crews using backpack electrofishing units made two passes in areas below a natural barrier on Cottonwood Creek and one pass above the partial natural barrier. Very few brook trout were removed compared to previous years. In addition, during the October sampling large numbers of WCT young of the year were observed throughout Cottonwood Creek above the newly constructed barrier. We are optimistic that electrofishing will eliminate brook trout from this system. A separate report will detail changes in the Cottonwood Creek fishery since suppression efforts and barrier construction (Shepard et al. *in preparation*).

Belt Creek Drainage

Bender Creek – Genetic samples were collected from 25 WCT on 12 July 2002. Results indicate that this small population of fish is currently genetically pure. This small isolet (< 0.5 miles long) likely does not have enough fish to donate for replication elsewhere. However, some of these fish and/or gametes could be used create a composite WCT population.

Carpenter Creek - Carpenter Creek was spot shocked on 24 June 2002 to assess spawning condition of fish. Four ripe males were found out of 19 fish captured.

Chamberlain Creek – On 25 July 2002 two crews from the USFS and MFWP obtained population estimates at two sites on Chamberlain Creek (upstream of the old fish barrier). The lower site is approximately 1,300 ft. above the old barrier. The upper site is immediately upstream of the new fish barrier constructed during summer, 2002. The lower and upper sites had 70 and 80 WCT > four inches/1000 ft., respectively (Table 7). These numbers are down from 2001 (82/1000 ft.; lower and 152/1000 ft.; upper), 2000 (142/1000 ft.; lower), and 1999 (172/1000 ft.; lower)(Figure 2). Decreasing numbers of WCT is most likely due to drought. No brook trout were found during population surveys in 2002. The old barrier will be removed in 2003 when the bridge spanning Chamberlain Creek is replaced.

Jefferson Creek - Twenty-five genetic samples were collected on 27 September 2002. The majority of fish collected were brook trout (71) indicating the degree of displacement of WCT by brook trout that has already occurred in the stream.

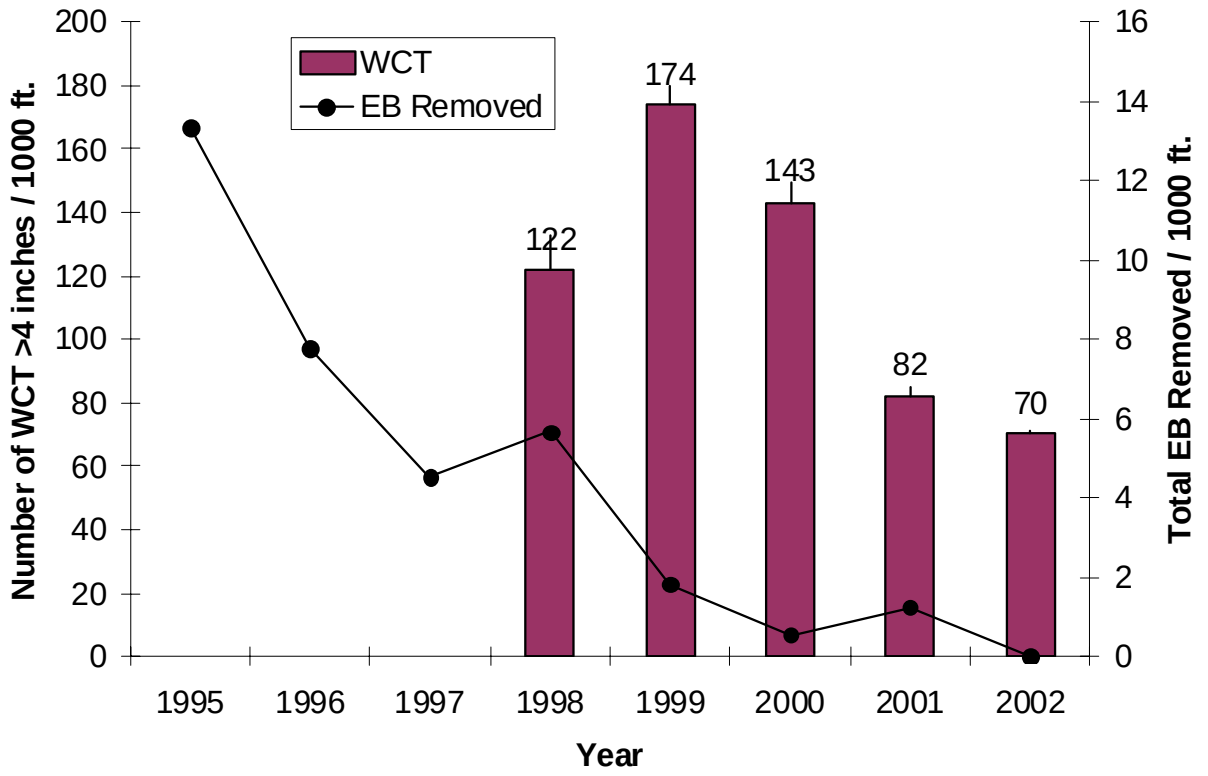

Figure 2. Abundance of WCT in Chamberlain Creek from 1995-2002. Estimates were obtained using the maximum-likelihood method. A barrier was built downstream of sampling sections in 1996. Numbers of EB removed are relative values based on suppression efforts that vary between years.

Crawford Creek – Ten fish sampled in 2002 from upper Crawford Creek tested as pure WCT in 2002. The stream was surveyed and a small barrier was found high in the drainage. Additional genetic testing above and below the barrier will indicate whether this is a pure population; if so a barrier could be built, non-native fishes removed and the stream could then recolonize from pure fish upstream.

Gold Run Creek – Twenty-five fish were moved upstream of barrier number six on Gold Run Creek on 11 July 2002. In 2001, 20 fish were moved above barrier number five. The move extends the range of the Gold Run population approximately 0.25 miles to a total of 0.50 miles upstream of the primary barrier. Additional genetic samples (25) were collected from Gold Run fish above the primary barrier on 29 August 2002.

Harley Creek – Upper Harley Creek above a series of barriers is fishless and was considered for a possible headwater transfer of Graveyard Creek fish. Montana State University and MFWP personnel collected invertebrates in preparation for a fish transfer on 23 August 2002. Harley Creek was surveyed on 30 September 2002 during low water after several years of drought. The majority of stream channel was intermittent with approximately 90 % of the thalweg dry. Several of the deeper pools had standing water. Upper Harley Creek is not a good candidate for replication because of these factors.

Lost Creek – Genetic samples collected on 18 July 2002 revealed that the Lost Creek WCT population is hybridized with YCT. This population was originally thought to be pure.

Middle Fork Little Belt Creek– Brook trout were removed from the Middle Fork of Little Belt Creek on the 22 and 23 of July 2002. Suppression in the Middle Fork is part of an ongoing effort to relieve non-native trout pressure on a pure WCT population partially protected by a beaver dam complex and culvert. Suppression efforts appear to be helping WCT maintain a foothold in the Middle Fork (Figure 3). Efforts are underway to replace the old culvert (partial barrier) with a new culvert barrier effective at all flows.

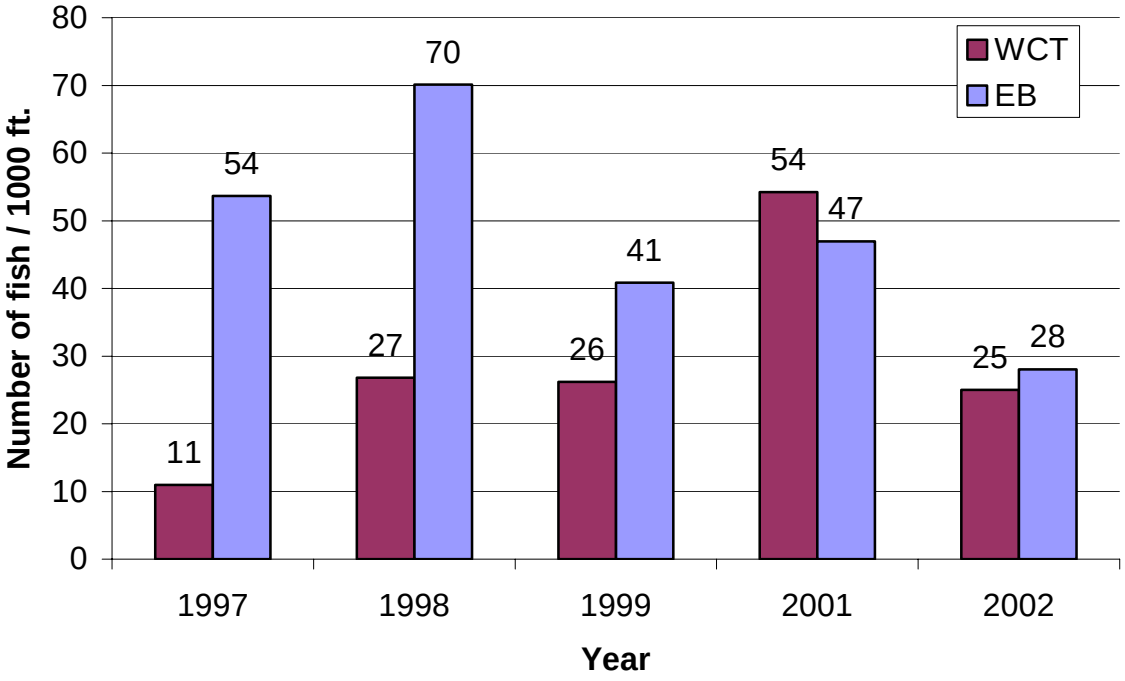

Figure 3. Relative abundance of all WCT and EB (all sizes) captured in the Middle Fork of Belt Creek. Numbers above bars are relative abundance of all fish caught during suppression efforts normalized to fish/1000 ft. Suppression efforts began in 1997.

North Fork Little Belt Creek– Crews from the USFS and MFWP completed distribution surveys of the North Fork of Little Belt Creek above the barrier protecting WCT. Surveys were conducted on multiple dates during June 2002. Figure 4 shows the current distribution of pure WCT in the North Fork of Little Belt Creek.

Genetic samples were collected from 25 fish in O'Brien Creek on 25 June 2002. Genetic samples were collected from 44 fish in Pilgrim Creek on 3 October 2002. Results are pending for these samples.

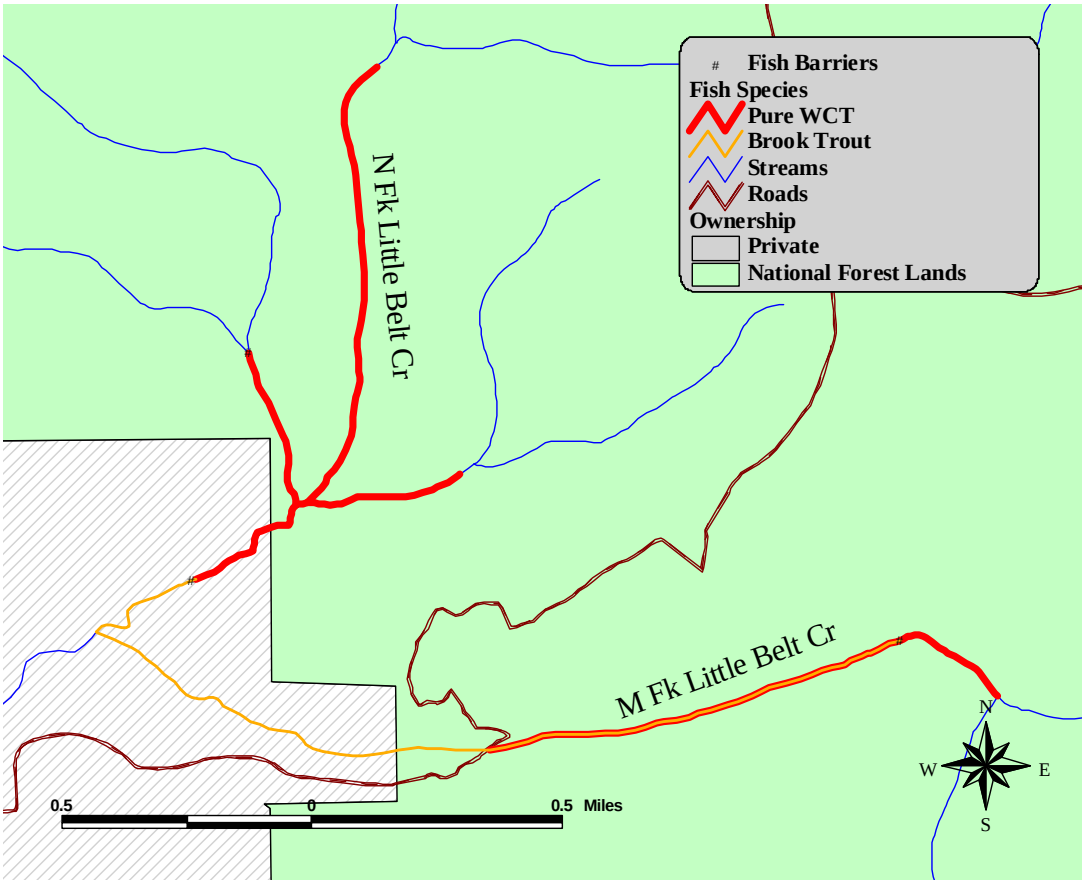

Figure 4. Map showing distribution of WCT and brook trout in the Middle and North Forks of Little Belt Creek.

Highwood Drainage

Big Coulee Creek –Numbers of westslope cutthroat have decreased dramatically in Big Coulee the last three years. Figure 5 shows relative abundance of WCT and brook trout in Big Coulee from 1997-2002. Negative effects of drought, competition with brook trout, and grazing have put the last population of WCT in the Highwood drainage in peril. In addition, some illegal harvest of WCT may be occurring at a hunting camp near the upper barrier on Big Coulee Creek. Brook trout were removed from Big Coulee Creek on 9 occasions from 24 June 2002 to 1 October 2002. In addition, a waterfall barrier was created approximately 0.23 miles upstream of the confluence with Highwood Creek (Figure 6). The barrier was created by blasting out a 4-foot bedrock shelf. It is hoped that revised grazing plans, the newly created barrier, brook trout suppression and efforts to educate the public through signage will help this population of WCT recover. Disease samples were collected from Big Coulee on 1 October 2002 in preparation for a possible future transfer. Fish distribution surveys were completed in other tributaries of Highwood Creek, including, Deer Creek, McMurtry Creek, Pohlod Creek, Rat Creek, Shoulder Creek, Skunk Creek, Stoner Creek, and a small unnamed tributary (Figure 6; Appendix F).

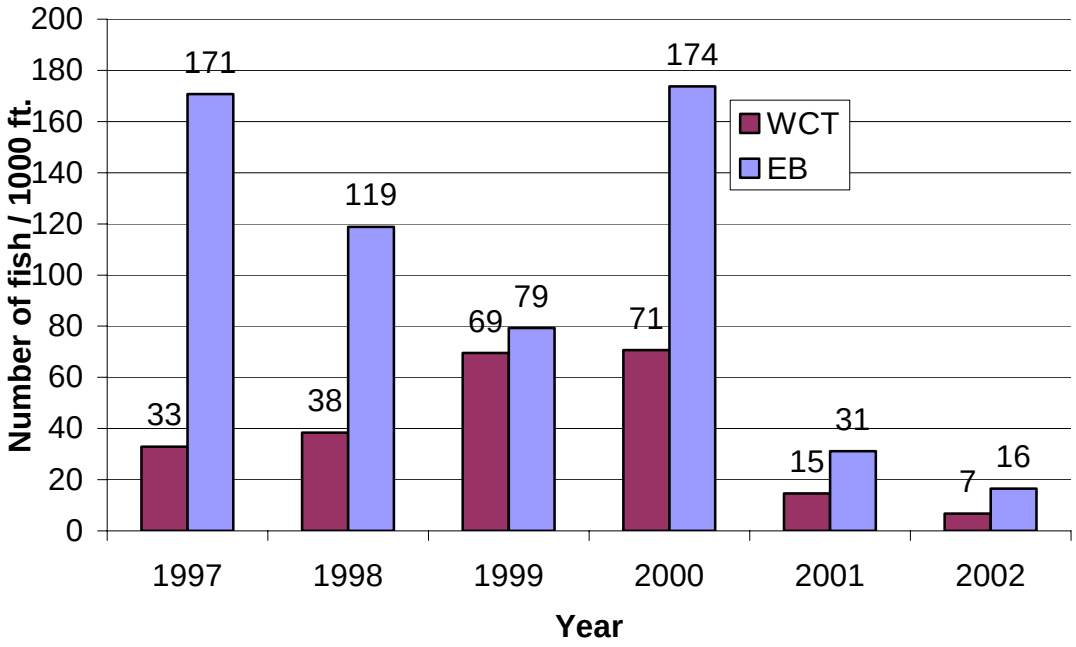

Figure 5. Relative abundance of all WCT and EB (all sizes) captured in Big Coulee Creek. Numbers above bars are relative abundance of all fish caught during suppression efforts normalized to fish/1000 ft. Suppression efforts began in 1997.

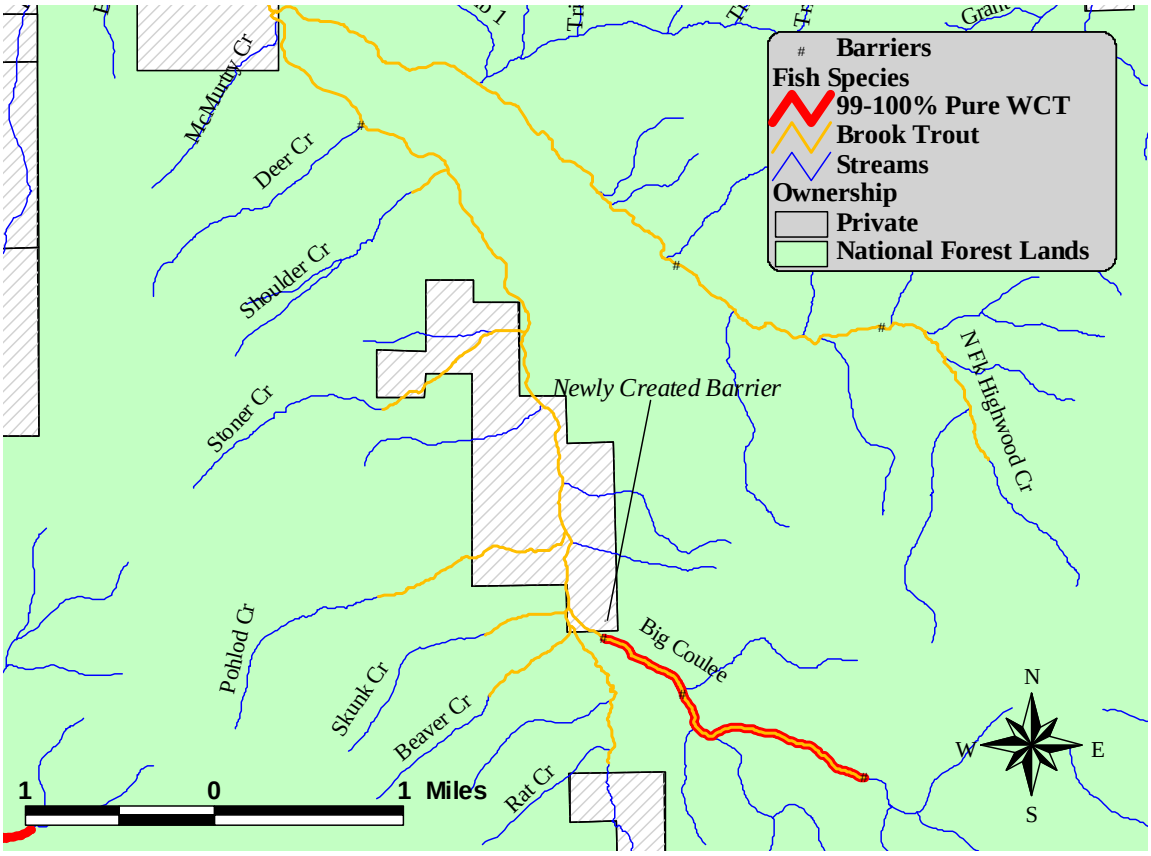

Figure 6. Map showing distribution of WCT and brook trout in the Upper Highwood Creek drainage.

Rocky Mountain Front Drainages

Blubber Creek – A fish distribution survey was conducted on Blubber Creek (Sun) on 27 August 2002. The survey was initiated after landowners indicated the possible presence of WCT above a 90 ft. cascade and waterfall barrier complex. An area of stream shocked below the barrier held primarily brook trout with some rainbow trout. Spot shocking above the barrier indicated that rainbow trout were the only species present.

Ford Creek – Disease samples were taken from 18 brown trout 14 brook trout and 4 *Oncorhynchus* sp. below the confluence of North Fork Ford Creek and Ford Creek (Sun). A barrier ¼ mile upstream of the confluence prevents upstream fish movement. Disease samples were collected in preparation for the replication of the North Fork Running Wolf Creek (Judith) WCT population in North Fork Ford Creek (Sun) above the barrier. Dan Gustafson of Montana State University collected invertebrate samples from North Fork Ford on 30 August 2002. Results from these surveys and an amphibian survey to be completed in 2003 will be included in

an Environmental Assessment that is currently being prepared. The proposed transfer will create approximately three additional miles of stream inhabited by native WCT.

Lost Shirt Creek – Genetics samples were taken from 25 fish in Lost Shirt Creek (Two Medicine) on 14 August 2002. Samples collected in 1993 at the mouth of Lost Shirt Creek indicated WCT were 93 % hybridized with rainbow trout. In 2003, genetics samples were collected from Lost Shirt Creek at the uppermost extent of fish habitat. No fish barriers were found on Lost Shirt Creek during sampling.

Midvale Creek - Robbin Wagner of the USFWS, sampled WCT in Midvale Creek (Two Medicine), near East Glacier Park. Genetic tests indicate pure WCT are found in this stream (Appendix I). The headwaters of this drainage are largely un-explored and further surveys are needed.

Sidney Creek - Genetics samples were taken from 24 fish in Sidney Creek (Two Medicine) on 13 August 2002. Genetics samples taken from WCT in 2001 tested 100% pure. Results from 2002 indicate that the few remaining Sidney Creek fish are pure and should be replicated before they completely disappear (Appendix I).

Whiterock Creek – On 13 August 2002, 50 Whiterock Creek (Two Medicine) WCT were moved above a barrier into a fishless area of Lonesome Creek (Badger). The Whiterock Creek WCT population was replicated because of continued threats of hybridization with non-native rainbow trout and competition with brook trout. Though Whiterock Creek fish did not test pure (99.6%), they were deemed a unique and valuable population because they were likely the last nearly pure WCT in the South Fork Two Medicine Drainage. The transfer should create approximately three additional inhabited miles of stream. Inputs of sediment from trail crossings also threaten the viability and continued persistence of WCT along the length of Whiterock Creek. During fish collection for the transfer a robust population of WCT was found above the last upstream trail crossing, very few WCT were found below the crossing. USFS personnel are currently improving drainage features on trails in the area to help reduce sediment inputs.

Smith River

Calf Creek – Densities of fish in Calf Creek were estimated using electrofishing equipment on 17 July 2002 (USFS). Of the 76 rainbow trout (*Oncorhynchus* sp.) sampled, six fish showed evidence (throat slashes) of hybridization with WCT. Evidence suggests this stream is a spawning and nursery stream for rainbow trout from Sheep Cr. and possibly the Smith River.

Daniels Creek – Genetic samples were collected from 25 WCT at the upper end of Daniels Creek on 10 October 2002. Genetic samples of 23 fish taken from Daniels Creek in 2001 indicated a purity of 99.6%. An irrigation diversion acts as a partial barrier in Daniels Creek. However, small numbers of brook trout and rainbow trout may pass the diversion at certain flows. The efficiency of the diversion barrier on Daniels will be investigated in 2003. The additional samples were collected to confirm whether the Daniels Creek fish are slightly hybridized. If pure, Daniels Creek fish should be considered for replication, perhaps in South Fork Deep Creek (Smith). Brook trout will be suppressed in Daniels Creek in 2003.

North Fork Deep Creek – One hundred twenty two WCT were collected from the North Fork of Deep Creek for replication above a barrier in a fishless area of Petty Creek (Sun). The transfer was completed on 8 July 2002 by helicopter. At least one more transfer of a similar number of fish will be attempted in 2003. The transfer will create approximately three additional miles of stream inhabited by native WCT.

Fourmile Creek – In 2000, 50 Richardson Creek WCT were transferred to Upper Four Mile Creek. The Richardson Creek WCT population was rapidly disappearing and in immediate need of additional suitable habitat. Fourmile Creek was surveyed in spring of 2002 to obtain an indication of the previous transfers success. On 25 June 2002 a crew electrofished 673 feet of stream above and directly below the stocking site. Electrofishing conditions were poor because of high spring snowmelt conditions. Further fisheries and habitat surveys will need to be completed in 2003 before additional transfer efforts.

Middle Fork Big Camas Creek– Disease samples were taken from 32 brook trout and 11 cutthroat trout collected from Big Camas Creek on 5 June 2002. These trout tested negative for all pathogens except *R. salmoninarium,* which was ELISA positive and PCR negative (Jim Peterson, 2002). ELISA tests for this pathogen have been positive in wild fish throughout central Montana. Dan Gustafson of Montana State University collected invertebrate samples on 18 October 2002. A Draft Environmental Assessment (EA) was prepared for a wild fish transfer of WCT from Cottonwood Creek (Smith) to Big Camas Creek. Two barriers fragment fish habitat in Middle Camas Creek. These barriers could possibly be modified to allow fish passage, which would improve the habitat by connecting a 2-mile stream reach (Archie Harper, personal communications 2002, Helena National Forest).

There is a barrier on Big Camas Creek immediately upstream of its confluence with Middle Fork Big Camas. Fish near Camas Lake, upstream of this barrier, are 100% Yellowstone cutthroat trout (Appendix I). There is an opportunity above this barrier for chemical treatment and restocking with WCT.

Tenderfoot Creek Tributaries- Genetics tests from three major tributaries of Tenderfoot Creek, including, Fisher Creek, Rugby Creek and Urvi Creek found that fish with WCT characteristics were all hybridized with rainbow trout. Urvi Creek contained >90% WCT while the other two populations were approximately 70% WCT (Appendix I). It is unlikely that any pure WCT populations remain in the Tenderfoot system; Upper Tenderfoot Creek, South Fork Tenderfoot Creek, Balsinger Creek and Iron Mines Creek have previously been identified as hybrid populations (Tews et. al 2000). Genetics samples need to be tested from the headwaters of Balsinger Creek and additional surveys are needed on a few other streams, including Reynolds Creek.

Judith Drainage

Alpine Gulch - was surveyed by consultants hired by the Bureau of Land Management. No fish were captured but local residents saw fish in the stream before the current drought.

Cottonwood Creek – Genetic samples were collected from the East and West Forks of Cottonwood Creek in the Snowy Mountains. Previous genetic samples collected in 1996 at the

confluence of the East and West Forks indicated a low level of introgression with rainbow trout (98% WCT). The purpose of the survey in 2002 was twofold, firstly, collection of genetic information of fish at the uppermost extent of their habitat in both forks, secondly to ascertain general habitat conditions and survey for barriers to upstream fish movement. Twenty-five genetic samples were collected from fish in the East Fork approximately one mile from the headwaters. Twenty-five genetic samples were collected from the West Fork of Cottonwood Creek below a series of barriers approximately 1.5 miles upstream of the confluence of the E. and W. Forks. The genetic results from the West Fork samples indicate they are a pure population. If these fish are pure, a move above the barrier series could extend their range over a mile. Habitat surveys of the West Fork of Cottonwood will be completed in 2003.

Dry Wolf Creek – A two-pass estimate above the campground found 59 WCT and 77 brook trout per 1000 ft. (Table 7). This is a decline from last year's estimates of 75 and 114 respectively (Horton et al. 2003). Trout estimates were the lowest seen since 1999. Mean total lengths were similar to last year. This is the second consecutive year where brook trout estimates exceeded WCT estimates by more than 20%. Previous estimates were very similar for both species.

Recent genetic tests on Placer Creek, a tributary to Dry Wolf Creek, found the WCT contained 10% YCT genes (Appendix I). Therefore, brook trout suppression will no longer take place on Placer Creek.

Elk Creek – Genetic samples were collected from 5 WCT in Elk Creek (Judith) on 7 August 2002. Results received 17 March 2003 indicated that the Elk Creek fish were slightly hybridized (98.2% WCT). The majority of fish collected were brook trout (38). Previous genetic results from four samples collected in 1994 indicated that Elk Creek supported a small population of pure WCT.

North Fork Running Wolf Creek – Population estimates were completed on two sections of this stream (Table 7). One estimate was from the best habitat found in the stream and the other estimate was done in marginal habitat in the uppermost stream reach. An average of the estimates indicates the uppermost 1.5 miles of North Fork Running Wolf Creek has about 600 – 700 WCT >= 4 inches. Small WCT occupy this small spring fed stream. Probably less than 100 fish exceeded 6 inches in 2002. The largest WCT captured was less than 7 inches long (Appendix F) and was similar to the maximum size captured in 2001 (Horton et. al 2003). Other Judith WCT streams contain much larger fish (Appendix F). In 1995 and 1999 several 8 – 9 inch long WCT were sampled in North Fork Running Wolf (USFS files, Lewis and Clark Forest). In the 1990's a 25 fish sample tested as genetically pure WCT. This year an additional 25 genetic samples were tested and were pure WCT (Appendix I). Plans are being developed to transfer fish from this population to the fishless headwaters of North Fork Ford Creek in the Sun drainage.

South Fork Judith River – Population estimates were completed on three sections of the Judith River, below Dry Pole Creek, above Bluff Mountain Creek and downstream of Deadhorse Creek (Figure 7). Dry Pole Creek has been monitored for several years and Bluff Mountain and Deadhorse Creek are new monitoring sites added for long-term TMDL and genetic monitoring. The downstream section (below Dry Pole Creek) is further discussed in a companion report (Horton et al. in preparation). *Oncorhynchus* sp. in both sections appeared to be hybrid swarms of rainbow trout and WCT. Shepard (2001) found primarily WCT when he sampled near Cross

Creek, 1 mile downstream from the Deadhorse Creek section. The Bluff Mountain section held more trout than the Deadhorse section (Table 7) and had similar numbers to those found just below Russian Creek in 2001 (Horton et. al 2003). Genetic samples PCR and allozyme) were taken at both sites to further determine the genetic composition of the populations. Three brook trout were found in the South Fork Judith below Deadhorse Creek.

Genetic tests have confirmed that it is unlikely that pure WCT are present in the South Fork Judith drainage. Bluff Mountain Creek, Cross Creek, Cabin Creek, Deadhorse Creek, Upper Russian Creek, and Corral Creek all are slightly hybridized (Appendix I). Big Hill Creek warrants further investigation because only one of 25 fish had a marker that was not indicative of WCT.

Smith Creek – Genetics samples were collected from seven fish (*Oncorhynchus* sp.) on 7 August 2002. Previous samples collected on Smith Creek have not yet been processed in the laboratory. However, coloration and morphology indicate fishes in Smith Creek are comprised of heavily hybridized (WCT X RB) individuals.

Continuous recording StowAway temperature loggers were placed in the South Fork Judith downstream of Big Hill Creek, Russian Creek, Bluff Mountain Creek and Dry Pole Creek (Figure 7). Temperatures were much higher at the station below Dry Pole than elsewhere (Appendix J, K).

Musselshell Drainage

Halfmoon Creek – This stream had an excellent WCT population (Appendix F). Genetic samples were taken to increase sample size to 50.

Table 7. Depletion removal population estimates for fish >= 4 inches from small northcentral Montana streams in 2002.

Stream legal section length	Drainage	Date	Species	#/1000 ft (95% CI)	Average total length (inches)	Probability of capture
Lost Creek T16N R9E Sec. 29NW (505 feet)	Belt	7/18/2002	Westslope cutthroat trout	123 (119 – 129)	6.1	0.83
Chamberlain Creek, T13N R8E Sec.2SE (Lower) (328 feet)	Belt	7/25/2002	Westslope cutthroat trout	70 (69 - 71)	5.9	0.96
Chamberlain Creek, T13N R8E Sec.2SE (Upper) (492 feet)	Belt	7/25/2002	Westslope cutthroat trout	85 (84 – 86)	6.5	0.95

Stream legal section length	Drainage	Date	Species	#/1000 ft (95% CI)	Average total length (inches)	Probability of capture
Dry Wolf Creek T14N R9E Sec.13 (492 feet)	Judith	9/3/2002	Westslope cutthroat trout	59 (59 – 61)	7.1	0.91
			Brook trout	77 (77 – 81)	6.0	0.88
Judith River, S. Fk. (above Bluff Mountain Creek T11N R11E Sec.4 (754 feet)	Judith	8/6/2002	*Oncorhynchus* sp.	155 (154 – 157)	6.2	0.90
Judith River, S. Fk. (below Deadhorse Creek) T11N R11 Sec.18 (656 feet)	Judith	9/9/2002	*Oncorhynchus* sp.	99 (98 – 104)	6.7	0.85
Running Wolf Creek, N. Fk. T14N R10E Sec.16 (328 feet)	Judith	8/2/2002	Westslope cutthroat trout	125 (125 – 131)	5.1	0.89
Running Wolf Creek, N. Fk. T14N R10E Sec.17 (Headwaters) (328 feet)	Judith	8/2/2002	Westslope cutthroat trout	43 (43 – 44)	5.3	0.93

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Code numbers of waters referred to in report

14	1000	Cow Cr.
14	2880	Lee Cr.
14	3200	Lost Shirt Cr.
14	3560	Midvale Cr.
14	5080	Sidney Cr.
14	6600	Whiterock Cr.
16	0220	Big Coulee Cr.
16	0400	Bluff Mountain Cr.
16	0720	Cabin Cr.
16	0760	Cottonwood Cr. (Highwoods)
16	0880	Corral Cr.
16	0980	Cross Cr.
16	1100	Deadhorse Cr.
16	1280	Dry Wolf Cr.
16	1340	E. Fk. Spring Cr.
16	1400	Cottonwood Cr., E. Fk. (Snowies)
16	1460	Elk Cr.
16	2140	Lost Fk. Judith
16	2702	Running Wolf Cr., N. Fk.
16	2760	Placer Cr.
16	3180	Russian Cr.
16	3480	Smith Cr.
16	3520	South Fk. Judith
16	4050	Cottonwood Cr., W. Fk. (Snowies)
17	0200	Balsinger Cr.
17	0432	Beaver Cr.
17	1168	Calf Cr.
17	1184	Camas Cr.
17	1248	Carpenter Cr.
17	1424	Chamberlain Cr.
17	2160	Deer Cr.
17	2531	Calf Cr., E. Fk.
17	2532	Calf Cr., E. Fk. Trib.
17	2624	Elkhorn Cr.
17	2768	Fisher Cr.
17	2816	Fourmile Cr.
17	3015	Gold Run Cr.
17	3824	Jefferson Cr.
17	3872	Jumping Cr.
17	4096	Little Belt Cr.
17	4138	Little Camas Cr.
17	4374	Lost Cr.
17	4645	Middle Fk. Camas Cr.
17	5280	Deep Cr., N. Fk.
17	5584	O'Brien Cr.
17	5888	Pilgrim Cr.
17	5904	Pohlod Cr.
17	6372	Rugby Cr.
17	6688	Shoulder Cr.
17	6752	Skelly Gulch
17	7360	Stoner Cr.
17	7632	Threemile Cr.
17	7958	Tyrell Cr.
17	7995	Urvi Cr.
17	9140	Hound Cr. Reservoir
18	2940	Halfmoon Cr.
19	0300	Lee Cr.
20	0950	Blubber Cr.
21	2150	Ford Cr.

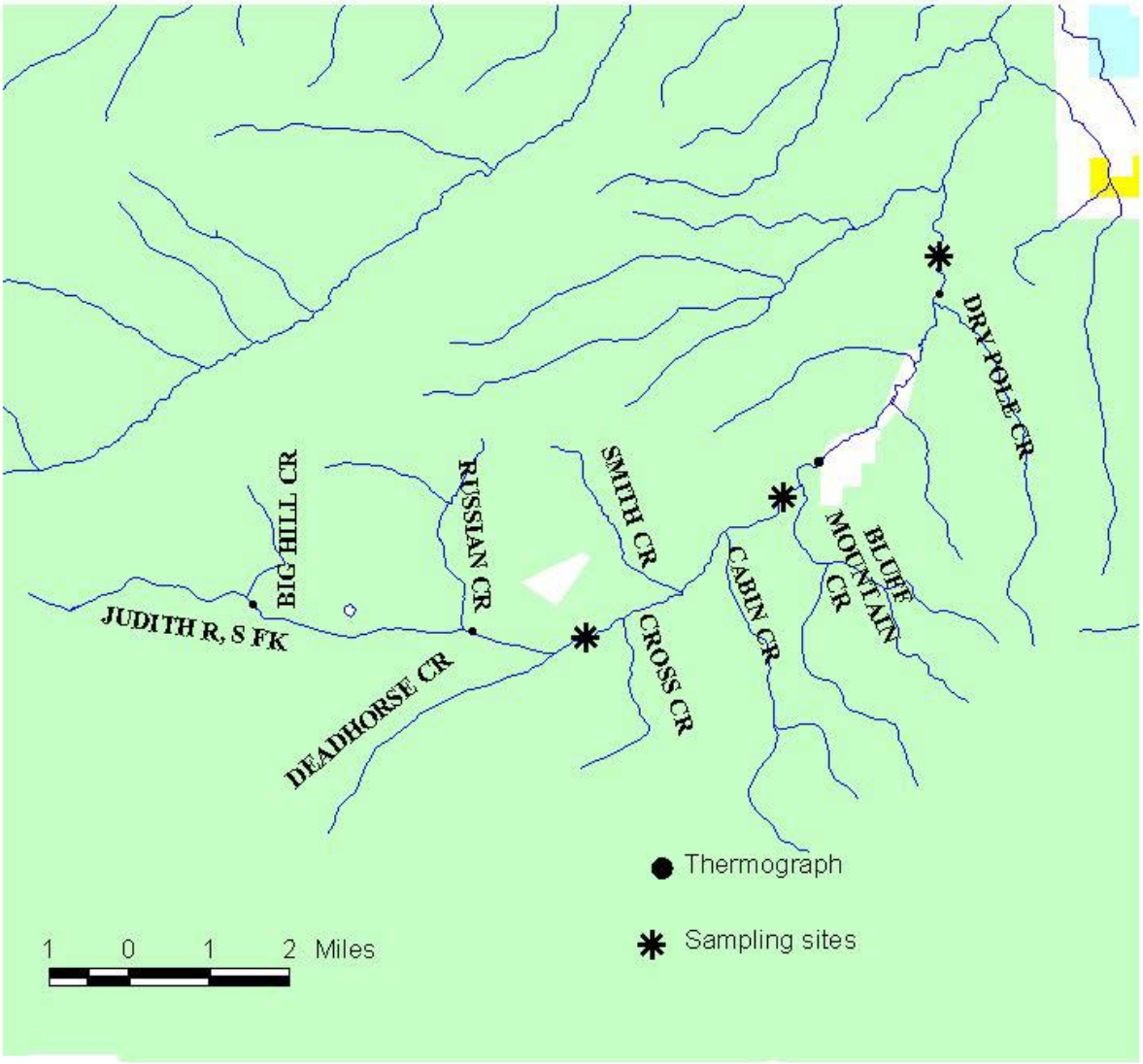


Figure 7. South Fork Judith River

Appendix A. Decrease since the 2000 SRS in miles of stream with genetically pure WCT because of new genetic information. Many sample sizes are at least 25 (95 % chance of detecting 1% of introgression).

Drainage	Stream	Miles Stream	Purity 2000	Purity Current	Sampled
Belt					
	Harley Cr., Lower	1.00	100.00%	Hybrid Swarm	1999
	James Cr.	2.00	100.00%	95.67%	2001
	Lost Cr.	1.00	100.00%	94.50%	2002
	Lost Cr.	1.00	100.00%	94.50%	2002
	Oti Park Cr.	5.00	100.00%	96.80%	2001
	Sawmill Cr.	3.00	100.00%	98.30%	2001
	Spruce Cr.	0.50	100.00%	99.20%	1999
		13.50			
Highwood					
	Highwood Cr., N. Fk.	1.00	100.00%	82.00%	1999
		1.00			
Judith					
	Big Hill Cr.	2.00	100.00%	99.70%	2000
	Bluff Mtn. Cr.	5.00	100.00%	92.00%	2000
	Cross Cr.	1.00	100.00%	96.60%	2000
	Deadhorse Cr.	4.00	100.00%	94.00%	2000
	Elk Cr.	1.00	100.00%	98.20%	2002
	Judith River, S. Fk., Upper	11.00	100.00%	98.00%	2000
	Placer Cr.	3.00	100.00%	90.00%	1999
	Russian Cr., Upper	0.50	100.00%	97.50%	2002
		27.50			
Smith					
	Daniels Cr.	3.00	100.00%	99.60%	2001
		3.00			
Teton					
	Cow Cr.	1.50	100.00%	99.50%	2000
	Teton River, E. Fk.	1.50	100.00%	96.40%	2001
	Waldron Cr., N. Fk.	1.50	100.00%	99.00%	2000
		4.50			
Two Medicine					
	Whiterock Cr.,	3.00	100.00%	99.60%	2001
	Woods Cr., E. Fk	2.00	100.00%	98.00%	2001
		5.00			
Upper Missouri					
	Elkhorn Cr., N. Fk. and S. Fk.	8.00	100.00%	87.60%	2002
		8.00			
Grand Total		**62.50**			

Appendix B. Increase in miles of stream with genetically pure WCT since the 2000 SRS report. With the exception of Jumping Cr. (7) sample sizes are ≥ 25 (95% chance of detecting 1% of introgression). Note: *Lonesome Cr. 99.60% pure was included in this table because it was replicated as a core population and future genetic tests may indicate it is actually pure.

Drainage	Stream	Activity	Miles	Genetic
Belt				
	Bender Cr.	New Stream Site	0.50	100.00%
	Crawford Cr., Upper	New Upstream Information	1.00	100.00%
	Gold Run Cr., Upper, Upper	Upstream Expansion	0.25	100.00%
			1.75	
Judith				
	Spring Cr., E. Fk.	New Stream Site	2.50	100.00%
			2.50	
Smith				
	Jumping Cr.	New Stream Site	2.00	100.00%
			2.00	
Sun				
	Petty Cr.	Replicated Population	3.00	100.00%
			3.00	
Two Medicine				
	Lonesome Cr.	Replicated Population	2.00	99.60%*
	Midvale Cr.	New Stream Site	4.00	100.00%
	Sidney Cr. , Above Barrier	New Upstream Information	1.00	100.00%
			7.00	
Grand Total			**16.75**	

Appendix C. Stream miles confirmed to be genetically pure WCT because of additional or new genetic information.

Drainage	Stream	Miles	Collection Date	Collection Date
Arrow				
	Cottonwood Cr.	2.00	1995	2001
		2.00		
Belt				
	Carpenter Cr.	3.00	1997	2000
	Chamberlain Cr.	5.00	1998	1999
	Gold Run Cr., Upper	0.25	1999	2001
	Graveyard Gulch	1.50	1995	1999
	Harley Cr., Upper	1.00	1996	1999
	Harley Cr., Upper, Trib.	1.00	1999	1999
	Little Belt Cr., M. Fk.	1.00	Assumed	2001
	Little Belt Cr., M. Fk.	1.00	1997	2001
		13.75		
Highwood				
	Big Coulee Cr.	2.00	1998	2002
		2.00		
Musselshell				
	Half Moon	5.00	1994	2002
		5.00		
Smith				
	Cottonwood Cr., E. Fk	4.50	1992	2000
	Deep Cr., N. Fk	2.00	1985	2000
	Deep Cr., N. Fk, Upper	2.00	2000	2000
		8.50		

Teton				
	Green Gulch, Upper	2.00	1993	2000
	Willow Cr., N. Fk.	1.50	1990	2001
		3.50		
Upper Missouri				
	Skelly Gulch	3.50	1991	2002
	Three Mile Cr.	5.00	1996	1999
		8.50		
Grand Total		**43.25**		

Appendix D. Change in miles of stream with pure and nearly pure WCT because of new information from upstream sites or adjustments in map distance.

Drainage	Stream	Miles 2000	Purity	Collection	Miles Current	Purity	Recent	Activity
Belt								
	Crawford Cr.				1.00	100.00%	2001	New Upstream Information
	Crawford Cr., Lower	2.00	67.00%	1997	1.00	67.00%	1997	Distance Change New Upstream Info.
Judith								
	Cottonwood Cr., W. Fk.				0.50	100.00%	2002	New Upstream Information
	Russian Cr., Trib				0.50	97.50%	2002	New Upstream Information
Smith								
	Big Camas Cr.	3.30	96.00%	1991	1.30	96.00%	1991	Distance Change New Upstream Info.
	Big Camas Cr., Upper				2.00	0.00%	2001	New Upstream Information
	Deep Cr., S. Fk.	2.00	97.00%	1988	2.00	95.50%	2000	Decrease From Nearly Pure Because of New
	Fourmile Cr., Upper	4.00	100.00%	Transfer	1.00	100.00%	2000	Cartography Change
Two Medicine								
	Sidney Cr.	2.00	98.00%	1992	1.00	98.00%	1992	Distance Change New Upstream Info.
	Sidney Cr., Above Barrier				1.00	100.00%	2001	New Upstream Information

Appendix E. Genetically pure streams in 2000 that have had no new genetic information.

Drainage	Stream	Miles	Genetic
Arrow			
	Boyd Cr.	1.00	100.00%
		1.00	
Belt			
	Belt Cr., Upper	6.00	100.00%
	Gold Run Cr.	3.00	100.00%
	Horn Cr.	2.00	100.00%
	Little Belt Cr., N. Fk., Lower	1.00	100.00%
	Little Belt Cr., N. Fk., Upper	1.50	100.00%
	Logging Cr.	2.00	100.00%
	O'Brien Cr.	2.25	100.00%
	Pilgrim Cr., Upper	5.00	100.00%
	Shorty Cr.	1.00	100.00%
	Tillinghast Cr.,	5.00	100.00%
		28.75	
Judith			
	Harrison Cr., Upper	3.00	100.00%
	Running Wolf Cr., N. Fk	2.00	100.00%
	Snow Cr.	0.50	100.00%
		5.50	
Musselshell			
	Collar Gulch	2.00	100.00%
		2.00	
Smith			
	Deadman Cr. N. Fk.	1.50	100.00%
	French Cr., Lower/Upper	1.50	100.00%
	Richardson Cr.	1.50	100.00%
		4.50	
Teton			
	Rierdon Gulch, Upper	2.00	100.00%
		2.00	
Two Medicine			
	Badger Cabin Cr.	2.00	100.00%
	Birch Cr., S. Fk.	4.00	100.00%
	Dupuyer Cr., M. Fk., Above dam	2.00	100.00%
	Dupuyer Cr., S. Fk., Upper	3.00	100.00%
	Lee Cr.	2.00	100.00%
	North Badger Cr.	20.00	100.00%
	Red Poacher Cr.	2.00	100.00%
	Rival Cr.	1.00	100.00%
	South Badger Cr.	1.00	100.00%
		37.00	
Upper Missouri			
	Page Gulch	1.50	100.00%
	Rooster Bill	2.00	100.00%
		3.50	
Grand Total		**84.25**	

Appendix F. Statistics of fish captured during stream surveys in 2002. Samples were collected by MFWP and the USFS.

Water Date (length)	Legal (location)	Species	N	Total length (inches) Min	Max	Avg.	Weight (lbs.) Min	Max	Avg.
Alpine Gulch 9/19/02 (spot-shocked)	T16N R19E Sec.12, 13 (Judith)	No fish							
Beaver Cr. 7/17/02 (distribution survey)	T19N R9E Sec.9 (Highwood)	Brook trout	23	1.6	5.9	3.8			
Bender 7/12/02 (492 feet) (genetic testing)	T15N R8E Sec.23SE (Belt)	Brook trout Westslope cutthroat trout	3 28	5.8 2.2	5.9 8.0	5.9 5.5			
Big Camas Cr. 6/05/02 (spot-shocked)	T9N R4E Sec.16N (Smith)	Brook trout Cutthroat trout	35 10	2.9 3.4	9.1 9.0	5.8 6.5			
Big Coulee Cr., (below campground) 6/24/02 (2,133 feet) (brook trout suppression)	T20N R8E Sec.9NE (Highwood)	Brook trout Westslope cutthroat trout	179 9	- 2.4	- 8.3	- 4.1			
7/15/02	T20N R8E Sec.9NE (Highwood)	Brook trout Westslope cutthroat trout	166 10	- 3.1	- 4.9	- 4.0			
8/05/02	T20N R8E Sec.9NE (Highwood)	Brook trout Westslope cutthroat trout	176 26	- 3.3	- 5.6	- 3.9			
Big Coulee Cr., (above campground) 8/07/02 (1230 feet) (brook trout suppression)	T20N R8E Sec.9NE (Highwood)	Brook trout Westslope cutthroat trout	76 8	- 5.1	- 7.6	- 6.4			
cont. upstream 8/21/02 (2,400 feet) (brook trout suppression)	T20N R8E Sec.9NE (Highwood)	Brook trout Westslope cutthroat trout	26 20	- 0.8	- 7.4	- 5.2			
cont. upstream 8/22/02 (2,133 feet) (brook trout suppression)	T20N R8E Sec.4NE (Highwood)	Westslope cutthroat trout	15	3.9	7.3	6.5			
Big Coulee Cr., (above road) 8/22/02 (459 feet) (brook trout suppression)	T20N R8E Sec.4NE (Highwood)	Brook trout	93	-	-	-			
Big Coulee Cr.,	T20N R8E	Brook trout	143	-	-	-			

Water Date (length)	Legal (location)	Species	N	Total length (inches) Min	Max	Avg.	Weight (lbs.) Min	Max	Avg.
(above road) 10/01/02 (656 feet) (fish disease testing)	Sec.4NE (Highwood)								
Blubber Cr., Above Barrier 8/27/02 (spot shocked)	T19N R8W Sec.36 (Sun)	*Oncorhynchus* sp. (no WCT)	7	5.1	6.7	6.3			
Carpenter Cr. 6/24/02 (328 feet) (spawning survey)	T14N R8E Sec.15 (Belt)	Westslope cutthroat trout	19	2.8	8.2	4.9			
Chamberlain Cr., (below bridge/barrier) 6/12/02 (151 feet) (spawning survey)	T13N R8E Sec.11N (Belt)	Brook trout Westslope cutthroat trout	10 6	4.6 6.2	8.2 11.3	6.1 8.4			
Chamberlain Cr., (lower) 7/25/02 (328 feet) (monitoring)	T13N R8E Sec.2SE (Belt)	Westslope cutthroat trout	39	2.0	8.7	4.8			
Chamberlain Cr., (upper) 7/25/02 (492 feet)	T13N R8E Sec.2SE (Belt)	Westslope cutthroat trout	46	2.3	9.6	6.2			
Calf Cr. 7/17/02 (492 feet)	T13N R6E Sec.34SW (Smith)	Brook trout *Oncorhynchus* sp. (probably WCT hybrids)	11 86	3.0 2.3	8.1 9.0	4.8 4.0			
Cottonwood Cr., E. Fk. 9/17/02 (1312 feet) (genetic testing)	T12N R19E Sec.19SW (Judith)	Westslope cutthroat trout	28	2.6	11.3	8.6	0.20	0.65	0.29
Cottonwood Cr., W. Fk. 9/18/02 (279 feet) (genetic testing)	T12N R18E Sec.10E (Judith)	Westslope cutthroat trout	25	6.0	11.2	8.1	0.07	0.50	0.19
Cottonwood Cr., Trib. 7/29/02 (2,953 feet) (brook trout suppression)	T19N R10E Sec.5 (Arrow)	Brook trout Westslope cutthroat trout	14 94	4.2 3.1	6.0 8.3	5.3 5.4			
Cottonwood Cr., (headwaters) 7/31/02 (1,640 feet) (brook trout suppression)	T19N R10E Sec.5 (Arrow)	Brook trout Westslope cutthroat trout	1 136	8.1 3.2	8.1 8.1	8.1 4.9			

Water Date (length)	Legal (location)	Species	N	Total length (inches) Min	Max	Avg.	Weight (lbs.) Min	Max	Avg.
Cottonwood Cr., (middle) 7/29/02 (1,640 feet) (brook trout suppression)	T19N R10E Sec.5 (Arrow)	Brook trout	7	1.8	9.1	3.9			
		Westslope cutthroat trout	217	2.7	8.3	4.7			
Daniels Cr., 10/10/02 (1,640 feet) (genetic testing)	T 12N R7E Sec.14NW (Smith)	Westslope cutthroat trout	25	2.4	7.7	4.8			
Deep Cr., N. Fk. 7/08/02 (656) (fish transfer)	T15N R5E Sec.19E (Smith)	Westslope cutthroat trout	140	4.3	8.3	6.5			
Deer Cr. 7/16/02 (distribution survey)	T20N R9E Sec.29	Brook trout	4	4.4	7.1	5.3			
Dry Wolf Cr. 9/03/02 (492 feet) (population estimate)	T14N R9E Sec.13 (Judith)	Brook trout	48	2.4	9.4	5.3	0.01	0.42	0.09
		Westslope cutthroat trout	31	3.7	11.6	6.9	0.01	0.68	0.17
Elk Cr. 8/7/02 (2,625 feet) (genetic testing)	T13N R9E Sec.32NW (Judith)	Brook trout	38	3.0	6.9	4.4			
		Westslope cutthroat trout	5	4.9	6.9	5.6			
Fourmile Cr. 6/25/02 (673 feet) (range extension survey)	T8N R7E Sec.33SE (Smith)	Westslope cutthroat trout	1	-	-	-			
Ford Cr. 11/25/02 (656) (disease testing)	T19N R9W Sec.11 (Sun)	Brown trout	18	5.7	>12	7.9			
		Brook trout	14	5	9.8	7.8			
		Oncorhynchus sp.	4	6.1	8.7	7.5			
Gold Run Cr. 7/11/02 (328) (range extension)	T15N R9E Sec.18NE (Belt)	Westslope cutthroat trout	26	1.7	6.5	5.0			
Gold Run Cr. 8/29/02 (492) (genetic testing)	T15N R9E Sec.18NE (Belt)	Westslope cutthroat trout	31	4.0	7.5	5.8			
Half Moon Cr. 9/04/02 (630 feet)	T12N R19E Sec.14NE (Musselshell)	Westslope cutthroat trout	54	3.4	10.0	6.6	0.01	0.25	0.10
Indian Cr. 9/09/02 (656 feet) (distribution survey)	T7N R9E Sec.25,26 (Musselshell)	Brook trout	20	3.0	9.0	4.4			

Water Date (length)	Legal (location)	Species	N	Total length (inches) Min	Max	Avg.	Weight (lbs.) Min	Max	Avg.
Jefferson Cr. 9/27/02 (1,476 feet) (brook trout suppression)	T13N R9E Sec.6 (Belt)	Brook trout Westslope cutthroat trout	71 27	- 2.9	- 8.1	- 5.4			
Little Belt Cr., Middle Fk. 7/22/02 (328 feet) (brook trout suppression)	T19N R9E Sec.18 (Belt)	Brook trout Westslope cutthroat trout	43 6	- 6.1	- 7.7	- 6.9			
cont. upstream 7/22/02 (393 feet) (brook trout suppression)	T19N R9E Sec.18 (Belt)	Brook trout Westslope cutthroat trout	43 6	- 6.1	- 7.7	- 6.9			
cont. upstream 7/23/02 (1,968 feet) (brook trout suppression)	T19N R9E Sec.18 (Belt)	Brook trout Westslope cutthroat trout	46 56	- 2.0	- 7.6	- 5.0			
Little Belt Cr., N. Fk. 6/18/02 (distance unknown) (genetic testing)	T 19N R 8E Sec.12 (Belt)	Westslope cutthroat trout	30	2.0	8.5	4.9			
Lost Cr. 7/18/02 (505 feet) (genetic testing)	T16N R9E Sec.29NW (Belt)	Westslope cutthroat trout	79	2.9	9.2	5.1			
Lost Shirt Cr. 8/14/02 (5,280 feet) (genetic testing)	T29N R12E Sec.18 (Two Medicine)	Westslope cutthroat trout	26	1.8	8.4	4.2			
McMurtry Cr. 7/16/02 (distribution survey)	T20N R9E Sec.29 (Highwood)	No fish							
Running Wolf Cr., N. Fk. 8/02/02 (328 feet) (population estimate)	T14N R10E Sec.17 (Judith, upper limit)	Westslope cutthroat trout	14	4.6	6.0	5.3			
8/02/02 (328 feet) (population estimate)	T14N R10E Sec.16 (Judith, upper limit)	Westslope cutthroat trout	53	2.6	6.9	4.6			
O'Brien Cr. 6/25/02 (1,050 feet) (genetic testing)	T13N R 8E Sec.43 (Belt)	Westslope cutthroat trout	26	2.8	9.1	5.6			

Water Date (length)	Legal (location)	Species	N	Total length (inches) Min	Max	Avg.	Weight (lbs.) Min	Max	Avg.
Pilgrim Cr. 10/03/02 (656 feet) (genetic testing)	T14N R6E Sec.2NW (Belt)	Westslope cutthroat trout	44	2.4	8.1	5.3			
Pohlod Cr. 7/19/02 (230 feet) (distribution survey)	T19N R9E Sec.4 (Highwood)	Brook trout	24	1.6	6.5	4.0			
cont. upstream 7/18/02 (230 feet) (distribution survey)	T19N R9E Sec.5	Brook trout	22	3.7	7.6	4.7			
Rat Cr. 7/1702 (distribution survey)	T19N R9E Sec.9 (Highwood)	No fish							
Russian Cr. 6/06/02 (1,089 feet)	T11N R10E Sec.2 (Judith)	Westslope cutthroat trout	5	4.6	9.9	7.3			
Russian Cr. Trib. 6/06/02 (1,305 feet)	T11N R10E Sec.2 (Judith)	Westslope cutthroat trout	42	2.9	9.5	6.5	0.02	0.34	0.11
Shoulder Cr. 7/16/02 (distribution survey)	T20N R9E Sec.29 (Highwood)	Brook trout	6	4.5	7.7	5.4			
Sidney Cr. 8/13/02 (5,280 feet) (genetic testing)	T29N R12W (Two Medicine)	Westslope cutthroat trout	30	2.0	7.9	4.4			
Skunk Cr. 7/18/02 (distribution survey)	T19N R9E Sec 9 (Highwood)	Brook trout	23	4.2	7.3	5.0			
Stoner Cr. 7/19/02 (230 feet)	T20N R9E Sec. 32SE (Highwood)	Brook trout	11	4.3	6.0	4.9			
Smith Cr. 8/07/02 (spot-shocked)	T11N R11E Sec.6, 7 (Judith)	Oncorhynchus sp.	12	1.3	8.2	4.1			
Tributary B 7/17/02 (distribution survey)	T19N R9E Sec.9 (Highwood)	No fish							
Judith River, S. Fk. 8/06/02 (754 feet)	T11N R11E Sec.4 (above Bluff Mountain)	Mottled sculpin Mountain whitefish Oncorhynchus sp.	11 1 190	2.4 11.0 2.2	5.3 11.0 9.8	3.7 11.0 5.2	0.01	0.24	0.06
9/09/02 (656 feet)	T11N R11E Sec.18 (Below Deadhorse)	Brook trout Mottled sculpin *Oncorhynchus* sp.	3 1 71	2.3 5.9 1.5	10.2 5.9 11.0	5.1 5.9 6.3	0.01 0.11 0.01	0.42 0.11 0.46	0.21 0.11 0.10

Water Date (length)	Legal (location)	Species	N	Total length (inches) Min	Max	Avg.	Weight (lbs.) Min	Max	Avg.
Whiterock Cr. 8/12/02 (1,968 feet) (transfer/genetic testing)	T29N R12W Sec.3 (Two Medicine)	Westslope cutthroat trout	103	2.0	9.4	4.9	0.01	0.26	0.06

Appendix G. Specific conductance and temperature for streams sampled in 2002. Samples were collected by MFWP and the USFS.

Stream name	Drainage	Date Sampled	Cond. (µS/cm)	Temp. (˚F)
Cottonwood Cr.	Arrow	10/7/02	110	45
Cottonwood Cr., (headwaters)	Arrow	7/31/02	150	58
Cottonwood Cr., (middle)	Arrow	7/29/02	106	62
Cottonwood Cr., (tributary)	Arrow	7/29/02	120	61
Bender	Belt	2/12/02	76	53
Carpenter Cr.	Belt	6/24/02	50	48
Chamberlain Cr., (below bridge/barrier)	Belt	6/12/02	61	38
Chamberlain Cr., (lower)	Belt	7/25/02	130	48
Chamberlain Cr., (upper)	Belt	7/25/02	76	47
Gold Run Cr.	Belt	7/11/02	76	51
Gold Run Cr.	Belt	8/29/02	150	52
Jefferson Cr.	Belt	9/27/02	260	41
Little Belt Cr., M. Fk.	Belt	7/22/02	150	52
cont. upstream	Belt	7/22/02	121	54
cont. upstream	Belt	7/23/02	106	49
Little Belt Cr., N. Fk.	Belt	6/18/02	76	48
Lost Cr.	Belt	7/18/02	136	52
O'Brien Cr.	Belt	6/25/02	45	46
Pilgrim Cr.	Belt	10/03/02	300	42
Beaver Cr.	Highwood	7/17/02	200	60
Big Coulee Cr., (above campground)	Highwood	8/07/02	136	52
cont. upstream	Highwood	8/21/02	106	50
cont. upstream	Highwood	8/22/02	73	50
cont. upstream	Highwood	7/18/02	91	57
Big Coulee Cr., (above road)	Highwood	8/22/02	258	60
Big Coulee Cr., (above road)	Highwood	10/01/02	167	40
Big Coulee Cr., (below campground)	Highwood	6/24/02	45	53
Big Coulee Cr., (below campground)	Highwood	7/15/02	136	58
Big Coulee Cr., (below campground)	Highwood	8/05/02	152	53
Deer Cr.	Highwood	7/16/02	230	54
McMurtry Cr.	Highwood	7/16/02	300	58
Pohlod Cr.	Highwood	7/19/02	136	65
Rat Cr.	Highwood	7/17/02	220	54
Shoulder Cr.	Highwood	7/16/02	270	65
Skunk Cr.	Highwood	7/19/02	190	60
Stoner Cr.	Highwood	7/19/02	167	52
Tributary B	Highwood	7/17/02	360	64
Alpine Gulch	Judith	9/19/02	320	-
Cottonwood Cr., E. Fk.	Judith	9/17/02	310	47
Cottonwood Cr., W. Fk.	Judith	9/18/02	260	43
Dry Wolf Cr.	Judith	9/3/2002	110	45

Stream name	Drainage	Date Sampled	Cond. (µS/cm)	Temp. (˚F)
Elk Cr.	Judith	8/7/02	310	49
Judith River, S. Fk., (above Bluff Mtn. Cr.)	Judith	8/06/02	160	57
Judith River, S. Fk., (below Deadhorse Cr.)	Judith	9/09/02	240	45
Running Wolf Cr., N. Fk.	Judith	8/2/202	240	48
Russian Cr.	Judith	6/6/202	290	44
Russian Cr., (trib.)	Judith	6/6/02	130	44
Smith Cr.	Judith	8/7/2002	200	52
Halfmoon Cr.	Musselshell	9/4/02	250	-
Calf Cr.	Smith	7/17/02	61	58
Daniels Cr.	Smith	10/10/02	70	41
Deep Cr., N. Fk.	Smith	7/08/02	167	56
Fourmile Cr.	Smith	6/25/02	20	48
Ford Cr.	Sun	11/25/02	140	34
Blubber Cr.	Sun	8/27/02	350	52
Lost Shirt Cr.	Two Medicine	8/14/02	182	45
Sidney Cr.	Two Medicine	8/13/02	260	49
Whiterock Cr.	Two Medicine	8/12/02	258	54

*TDS (Total Dissolved Solids) measurements collected in the field were converted to specific conductance using the formula Cond. = TDS/0.66

Appendix H. Genetic samples taken by MFWP and USFS personnel in 2002.

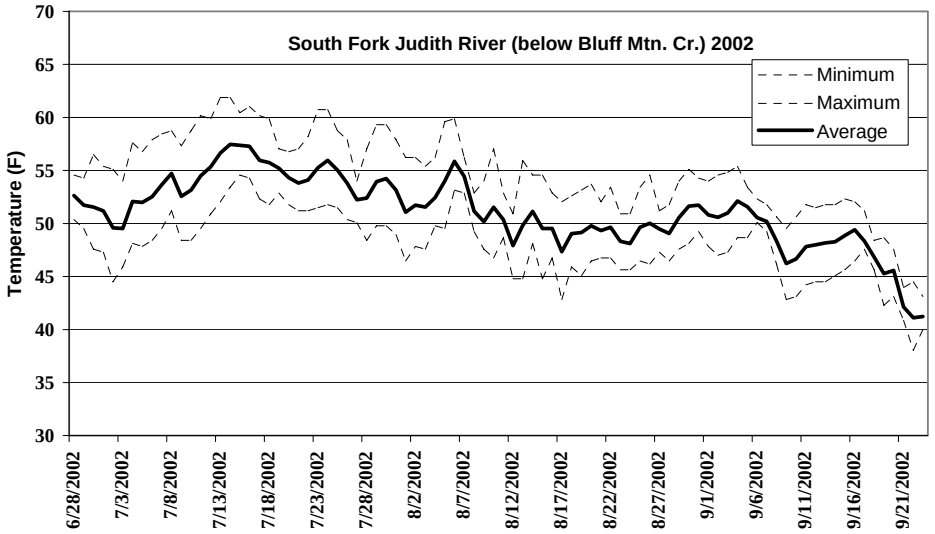
Stream	Drainage	# Fish	Date sampled	Testing date
Cottonwood Cr.	Arrow	25	7/29/02	FY 2003
Bender Cr.	Belt	25	7/12/02	FY 2003
Gold Run Cr., (AB)	Belt	25	8/29/02	FY 2003
Jefferson Cr.	Belt	25	9/27/02	FY 2003
Little Belt Cr., N. Fk.	Belt	25	6/18/02	FY 2003
Lost Cr.	Belt	50	7/18/02	FY 2003
O'Brien Cr., Upper	Belt	25	6/25/02	FY 2003
Pilgrim Cr.	Belt	44	10/03/02	FY 2003
Half Moon Cr	Flatwillow	25	9/4/02	FY 2003
Big Coulee Cr.	Highwood	40	8/07/02	FY 2003
Cottonwood Cr., E. Fk.	Judith	25	9/18/02	FY 2003
Cottonwood Cr., W. Fk.	Judith	25	9/18/02	FY 2003
Elk Cr.	Judith	5	8/6/2002	FY 2003
Judith R., S. Fk.	Judith	10	8/06/02	FY 2003
Judith R., S. Fk.	Judith	25	9/13/02	FY 2003
Russian Cr. (Trib.)	Judith	25	6/6/2002	FY 2003
Smith Cr.	Judith	7	8/7/2002	FY 2003
Elkhorn Cr.	Missouri	46	9/26/02	25 in FY 2003
Skelly Gulch	Missouri	40	9/25/02	FY 2003
Daniels Cr.	Smith	25	10/10/02	FY 2003
Lee Cr., E. Fk	St. Mary	25	9/26/02	FY 2003
Lost Shirt Cr.	Two Medicine	25	8/14/02	FY 2003
Midvale Cr.	Two Medicine	25	9/24/02	FY 2003
Sidney Cr., (AB)	Two Medicine	24	8/13/02	FY 2003
Whiterock Cr.	Two Medicine	50	08/13/02	FY 2003

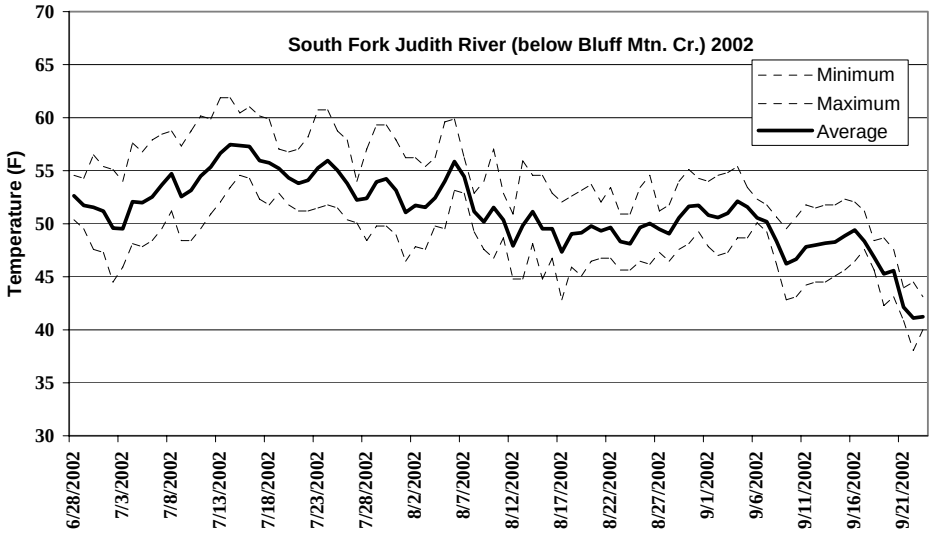
Appendix I. Results of Region 4 genetics samples run in 2002. Samples were collected by MFWP, USFS and USFWS.

Stream	Drainage	# Fish	Date sampled	Test	Result
Cottonwood Cr.	Arrow	15	7/31/2002	PCR	100% WCT
Little Belt Cr., M. Fk.	Belt	15	7/23/2001	PCR	100% WCT
Lost Cr.	Belt	49	7/18/2002		94.5% WCT x 5.5% YCT
Bender Cr.	Belt	25	7/12/2002	PCR	100% WCT
Carpenter Cr.	Belt	10	9/26/2000	Allozyme	100% WCT
Crawford Cr.	Belt	10	6/28/2001	PCR	100% WCT
Gold Run Cr.	Belt	10	7/26/2001	PCR	100% WCT
Graveyard Cr.	Belt	25	10/14-11/18/1999	Allozyme	100% WCT
James Cr.	Belt	10	7/13/2001	PCR	95.67% WCT x 4.33% RB
Oti Park	Belt	25	6/15/2001	PCR	96.8% WCT x 3.2% RB
Sawmill Cr.	Belt	25	10/13/1999,6/14/2001	PCR	98.3% WCT x 1.8% RB
Spruce Cr.	Belt	10	6/17/1999	PCR	99.2% WCT x 0.8% RB
Big Coulee Cr.	Highwood	40	8/7/2002	PCR	100% WCT
Cottonwood Cr., W. Fk.	Judith	25	9/18/2002		100% WCT
Big Hill Cr.	Judith	25	6/12/2000	PCR	99.7% WCT
Big Spring Cr., E. Fk.	Judith	25	7/27/1999	PCR	100% WCT
Bluff Mtn. Cr.	Judith	20	2000	PCR	92% WCT x 8% RB
Corral Cr.	Judith	10	6/12/2000	PCR	98.2% WCT x 1.8% RB
Cross Cr.	Judith	20	7/25/2000	PCR	96.6% WCT x 3.4% RB
Deadhorse Cr.	Judith	20	7/25/2000	PCR	94% WCT
Elk Cr.	Judith	5	8/7/2002	PCR	98.2% WCT x 1.8% RB
Judith R., S. Fk.	Judith	19	6/15/2000	PCR	97.5% WCT x 2% RB x 0.5% YCT
Placer Cr.	Judith	14	8/3/1999	PCR	90% WCT x 10% YCT
Running Wolf, N. Fk.	Judith	25	9/12/2001	PCR	100% WCT
Russian Cr., (trib.)	Judith	25	6/6/2002	PCR	97.5% WCT x 2% RB x 0.5% YCT
Skelly Gulch	Missouri	39	9/25/2002	PCR	100% WCT
Three Mile Cr.	Missouri	30	1999	Allozyme	100% WCT
Halfmoon Canyon	Musselshell	25	9/4/2002	PCR	100% WCT
Twin Cabins Cr.	Smith	9	6/19/2001		88% WCT x YCT 10% x RB 2%
Big Camas Cr.	Smith	10	8/1/2001	PCR	100% YCT
Cottonwood Cr.	Smith	40	9/19/2000	Allozyme	100% WCT
Daniels Cr.	Smith	23	7/3-7/6/2001	PCR	99.6% WCT
Deep Cr, N. Fk.	Smith	30	7/18/2000	Allozyme	100% WCT
Deep Cr, N. Fk., (mid)	Smith	25	7/21/2000	Allozyme	100% WCT
Deep Cr., S. Fk.	Smith	23	7/19/2000	PCR	95.5% WCT x 4.5% RB
Eagle Cr.	Smith	5	10/19/2000	Allozyme	52% WCT x 48% RB
Fisher Cr., W. Fk.	Smith	10	8/21/2001	PCR	70% WCT x 29% RB x 1% YCT
Jumping Cr.	Smith	7	8/30/2001	PCR	100% WCT
Rugby Cr.	Smith	10	8/22/2001	PCR	72.7% WCT x 27.3% RB
Urvi Cr.	Smith	24	6/20/2001	PCR	93.7% WCT x 6.3% RB
Lee Cr., E. Fk.	St. Mary	25	9/26/2002	PCR	97.7% WCT x 2.3% RB
Green Gulch	Teton	20	8/8/2000	PCR	100% WCT
Cow Cr.	Teton	17	5/5/2000	PCR	99.5% WCT
Teton R., E. Fk.	Teton	25	8/16/2001	PCR	96.4% WCT
Willow Cr., N. Fk	Teton	20	07/3/2001	PCR	100% WCT
Midvale Cr.	Two Medicine	25	9/24/2002	PCR	100% WCT
Sidney Cr., (AB)	Two Medicine	25	8/8/2001	PCR	100% WCT
Whiterock Cr.	Two Medicine	50	8/7/2001	PCR	99.6% WCT
Woods Cr., E. Fk.	Two Medicine	25	8/8/2001	PCR	98% WCT

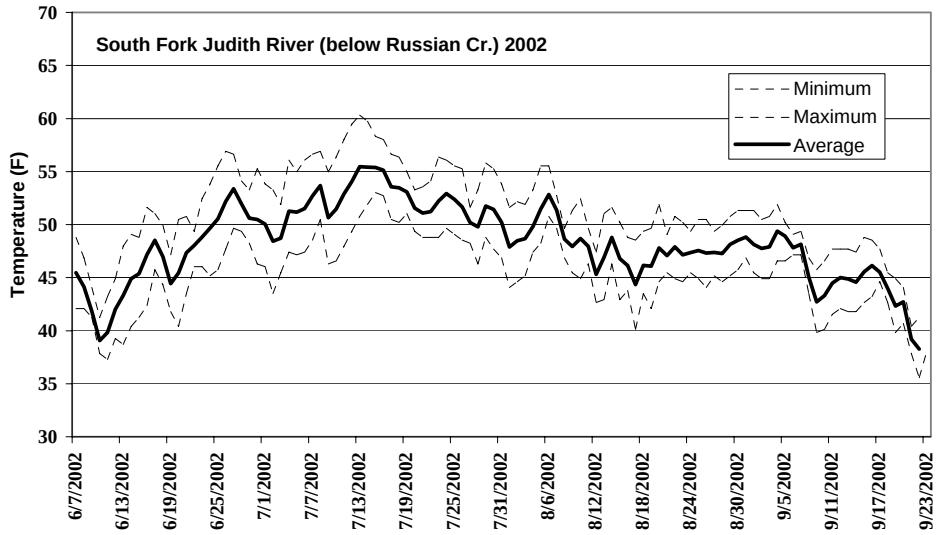
RB = Rainbow trout; YCT = Yellowstone cutthroat trout; WCT = Westslope cutthroat trout

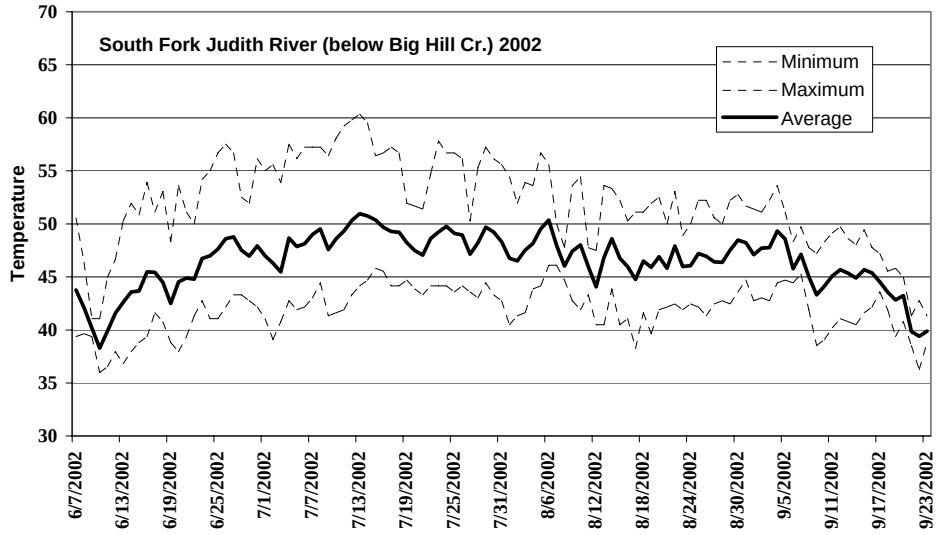
Appendix J. Temperature on four sections of the South Fork Judith.





Appendix J. continued. Temperatures on four sections of the South Fork Judith.





Appendix K. Thermal gradient on South Fork Judith.