MIDDLE CLARK FORK RIVER
AND
MISSOULA AREA

2004 FISHERIES STATUS REPORT

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CHAPTER 1

FISH POPULATION ESTIMATES ON THE MIDDLE CLARK FORK RIVER MAIN STEM

Introduction

Mark-recapture population estimates are a common and reliable method for monitoring trends in adult salmonid abundance, size structure and species composition in main stem river systems. Montana Fish, Wildlife and Parks (MFWP) has used a boat mounted electrofishing system to sample and monitor several sections of the middle Clark Fork River of west-central Montana for the past two decades. In 1999-2004, we sampled two of the six established long term monitoring sections on the main stem Clark Fork River to monitor trout population abundance and health. In this report, monitoring data for the Milltown (through East Missoula) and Superior (through the town of Superior) sections are reported.

Methods

We used a boom suspended electrofishing unit mounted on an 18 foot aluminum jet boat to sample fish in the Superior and Milltown sections of the Clark Fork River in 1999-2004. The Milltown section was sampled in June of 1999, 2001, 2002 and 2004. The Superior section was sampled in October of 1999. Electrofishing was conducted from upstream to downstream using smooth DC from a system comprised of a Coffelt VVP-15 rectifier and 5000 Watt generator. In each section, trout >7 inches were netted, anesthetized, identified to species, measured, marked with an anal fin clip and examined for hooking scars and cranial deformities. Trout were then released within the reach where they were captured.

When possible, we waited at least four days after marking runs before initiating recapture. On recapture runs, all fish were again measured and given a lower caudal fin clip to prevent sampling individual fish multiple times. Rainbow trout (*Oncorhynchus mykiss*), westslope cutthroat trout (*Oncorhynchus clarki lewisi*), and hybrids were identified by physical characteristics including spotting patterns and coloration. Only westslope cutthroat trout considered pure by visual identification were used to calculate estimates for westslope cutthroat trout. Fish believed to be hybrids were considered rainbow trout when calculating population estimates. In the Milltown section, northern pike (*Esox lucius*) were marked with colored floy tags and any fish captured on recapture runs were eradicated.

Superior Section

The Superior monitoring section on the main stem Clark Fork River extends for ~ 4.3 miles from the mouth of Cedar Creek (T16N R26W Section 3) to the Interstate-90 bridge (T17N R26W Section 29). We sampled this reach at night on October 4-7, 1999 (marking runs) and on October 12-14, 1999 (recapture). River discharge was at normal base flow (~ 2500 cfs) during the entire sampling period.

Milltown Section

We attempted to monitor the Milltown section annually to assess acute and chronic impacts of elevated toxic pollutants, drought and the recent introduction and establishment of northern pike.

The Milltown monitoring section includes ~ 3.6 miles from the railroad bridge just downstream of Milltown Dam (T13N R18W Section 20) to a large riffle gradient brake downstream of the Interstate-90 bridge (T13N R29W Section 24). We sampled the Milltown section during the day on the descending limb of the hydrograph (in June) when discharge is between 4,000 and 8,000 cfs. Electrofishing efficiency decreases substantially when flows are outside this range.

In 1999, we marked fish on June 23 and experienced mechanical problems that limited the number of fish marked. Marking runs were continued on June 28 and the recapture runs were completed on June 29. Because of low sampling effort and the assumption of random mixing of marked and unmarked fish may have been violated, the validity of this estimate may be in question. However, recapture efficiency and confidence intervals were within acceptable ranges for species where estimates were achieved.

In 2000, no sampling was attempted in the Milltown section due to low flow conditions. In 2001, sampling was attempted, but recapture runs could not be completed due to low discharge. We completed sampling and obtained valid population estimates in 2002 and 2004 as river discharge was within the desired range. We sampled the Milltown section on June 26-27 (marking) and July 2-3 (recapture) in 2002 and on June 9-10 (marking) and June 14-15 (recapture) in 2004.

Population Estimates

Population estimates were calculated using the modified Petersen mark recapture equation and standard equation for calculating variance:

$$N = \frac{(M+1)(C+1)}{R+1} - 1$$

$$V(N) = \frac{(M+1)(C+1)(M-R)(C-R)}{(R+1)^2 (R+2)}$$

where: N = population point estimate
M = the number of marked fish
C = the number of fish captured in the recapture sample
R = the number of marked fish captured in the recapture sample
V (N) = variance for point estimate

Confidence intervals (CI) were calculated using the equation $N \pm 1.96 (V(N))^{-2}$ and calculated at the 95% confidence level.

Results

Superior Section - 1999

Valid population estimates were obtained in the Superior section for rainbow trout and westslope cutthroat trout during fall sampling in 1999 (Table 1). Densities of catchable (> 7 in or 178 mm) rainbow trout were estimated at 373 per mile (+/- 54 per mile 95% CI). Densities of catchable westslope cutthroat trout were estimated at 34 per mile (+/- 11 per mile 95% CI). An estimate was obtained for bull trout (*Salvelinus confluentus*), but was not considered valid due to small

sample size. Only two brown trout (*Salmo trutta*) were captured during the electrofishing estimates. Although quantitative estimates could not be achieved, mountain whitefish (*Prosopium williamsoni*), largescale sucker (*Catostomus macrocheilus*) and longnose sucker (*Catostomus catostomus*) populations were abundant.

Rainbow trout captured in the Superior section averaged 332 mm total length TL (SD 79.9) and had a visible hooking scar rate of 8.6%. Westslope cutthroat trout captured in this section averaged 335 mm TL (SD 62.3) and had a hooking scar rate of 46.5%. Size distributions for these populations are shown in Figures 1 and 2. No cranial deformities were noted in any fish sampled, suggesting no obvious evidence of whirling disease infection.

Table 1. Population estimates, parameters, and confidence intervals for catchable trout (> 7 inches) sampled in the Clark Fork River Superior section in 1999.

SPECIES	M	C	R	POINT ESTIMATE	95% CI	ESTIMATE PER MILE	95% CI PER MILE
RBT	496	322	99	1604	+/- 232	373	+/- 54
WCT	62	36	15	145	+/- 45	34	+/- 11
BULL*	4	3	1	9	+/- 6	2.1	+/- 1.4
BROWN	2	-	-	-	-	-	-

* Sample sizes for bull trout were lower than recommended for a valid estimate

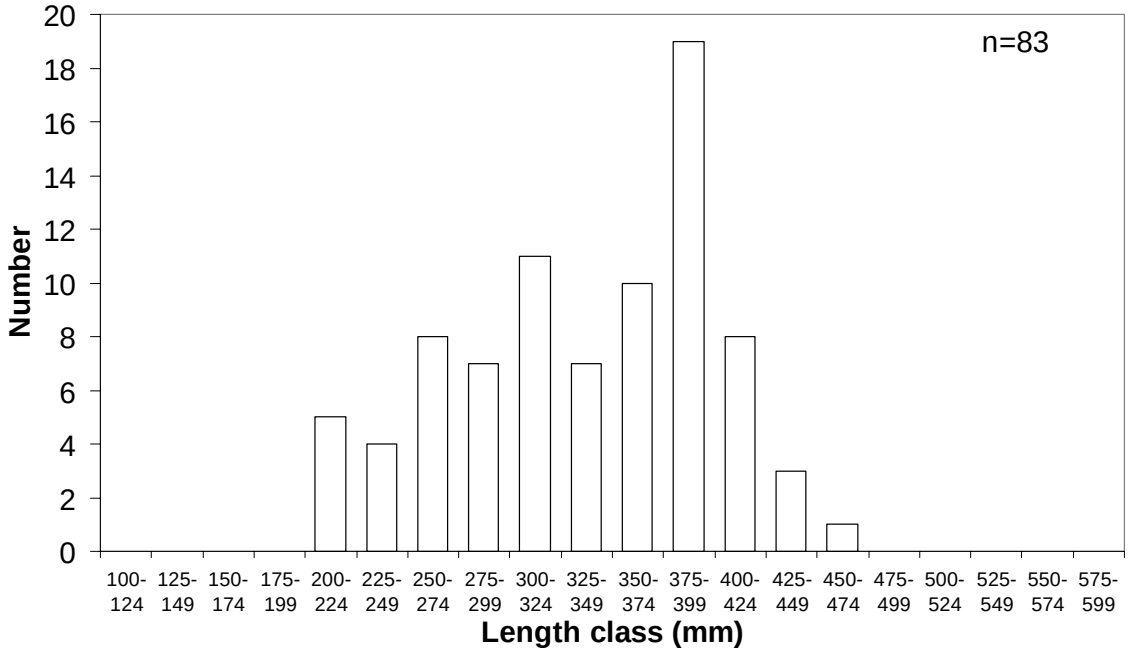

Figure 1. Length frequency histogram for westslope cutthroat trout captured in the Clark Fork River Superior section in October 1999.

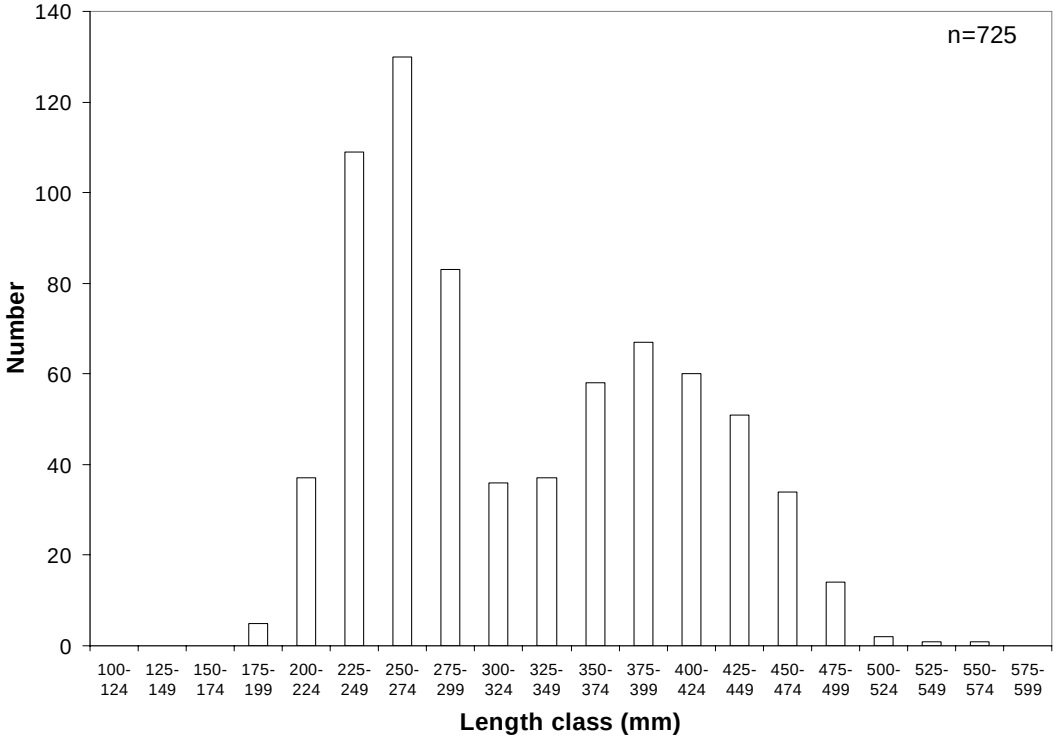

Figure 2. Length-frequency histogram for rainbow trout in the Clark Fork River Superior section in 1999.

Milltown Section - 1999

Valid population estimates were obtained for rainbow trout, westslope cutthroat trout, brown trout and northern pike in the Milltown section during June 1999 (Table 2). Densities of catchable (>7 in or 178 mm) trout in the Milltown section were estimated at 148 per mile (+/- 57 CI) for rainbow trout, 20 per mile (+/- 12 CI) for westslope cutthroat trout and 45 per mile (+/- 22 CI) for brown trout. Northern pike were established in the section at a density of 19 per mile (+/- 9 CI). We captured three bull trout (470-620 mm), but could not calculate an estimate. Rainbow trout in the Milltown section averaged 294 mm TL (SD 88.3), westslope cutthroat trout averaged 311 mm TL (SD 54.8) and brown trout averaged 334 mm TL (SD 111) mm. Typical length frequency distributions for these species are shown for 2002 (Figure 3), when a larger sample was collected.

The incidence of cranial deformities for rainbow trout in 1999 was 0.5% (1 fish of 183 total). Hooking scar rates were 7.7% for rainbow trout, 18.1% for westslope cutthroat trout and <1% for brown trout.

Table 2. Population estimates, parameters, and confidence intervals for catchable trout (> 7 inches) and northern pike (> 18 inches) sampled in the Clark Fork River Milltown section in 1999.

SPECIES	M	C	R	POINT ESTIMATE	95% CI	ESTIMATE PER MILE	95% CI PER MILE
RBT	137	61	15	534	+/- 206	148	+/- 57
WCT	23	14	4	71	+/- 42	20	+/- 12
BROWN	53	23	7	161	+/- 80	45	+/- 22
N. PIKE	32	14	6	70	+/- 32	19	+/- 9

Milltown Section – 2000-2001

In 2000 and 2001, western Montana experienced drought conditions and Clark Fork River discharge was too low to allow for valid population estimates. No sampling was attempted in 2000. In 2001, we completed one marking run but could not complete recapture efforts due to low flows.

Data collected in 2001 did provide information on trout condition, disease infection rates and size structure, and verified the continued presence of adult northern pike in the section. Visible hooking scar rates were <10% for westslope cutthroat trout and rainbow trout. Visible symptoms of whirling disease (primarily sloped cranium) were evident in rainbow trout and rainbow trout x westslope cutthroat trout hybrids at a frequency of ~ 4%.

Milltown Section – 2002

Population estimates were obtained for rainbow trout, westslope cutthroat trout, brown trout and northern pike in the Milltown Section in 2002 (Table 3). River flows and temperatures were preferable for efficient marking and recapture runs. Densities of catchable (> 7 in or 178 mm) trout were estimated at follows: rainbow trout 404 per mile (+/- 63 per mile 95% CI), westslope cutthroat trout 21 per mile (+/- 7 per mile 95% CI), brown trout 113 per mile (+/- 23 per mile 95% CI). Trout size distributions are displayed in Figure 3.

Table 3. Population estimates, parameters, and confidence intervals for catchable trout (> 7 inches) and northern pike (> 18 inches) sampled in the Clark Fork River Milltown section in 2002.

SPECIES	M	C	R	POINT ESTIMATE	95% CI	ESTIMATE PER MILE	95% CI PER MILE
RBT	420	296	85	1453	+/- 230	404	+/- 63
WCT	26	30	10	75	+/- 26	21	+/- 7
BROWN	122	135	40	407	+/- 84	113	+/- 23
N. PIKE	52	51	9	275	+/- 132	76	+/- 37

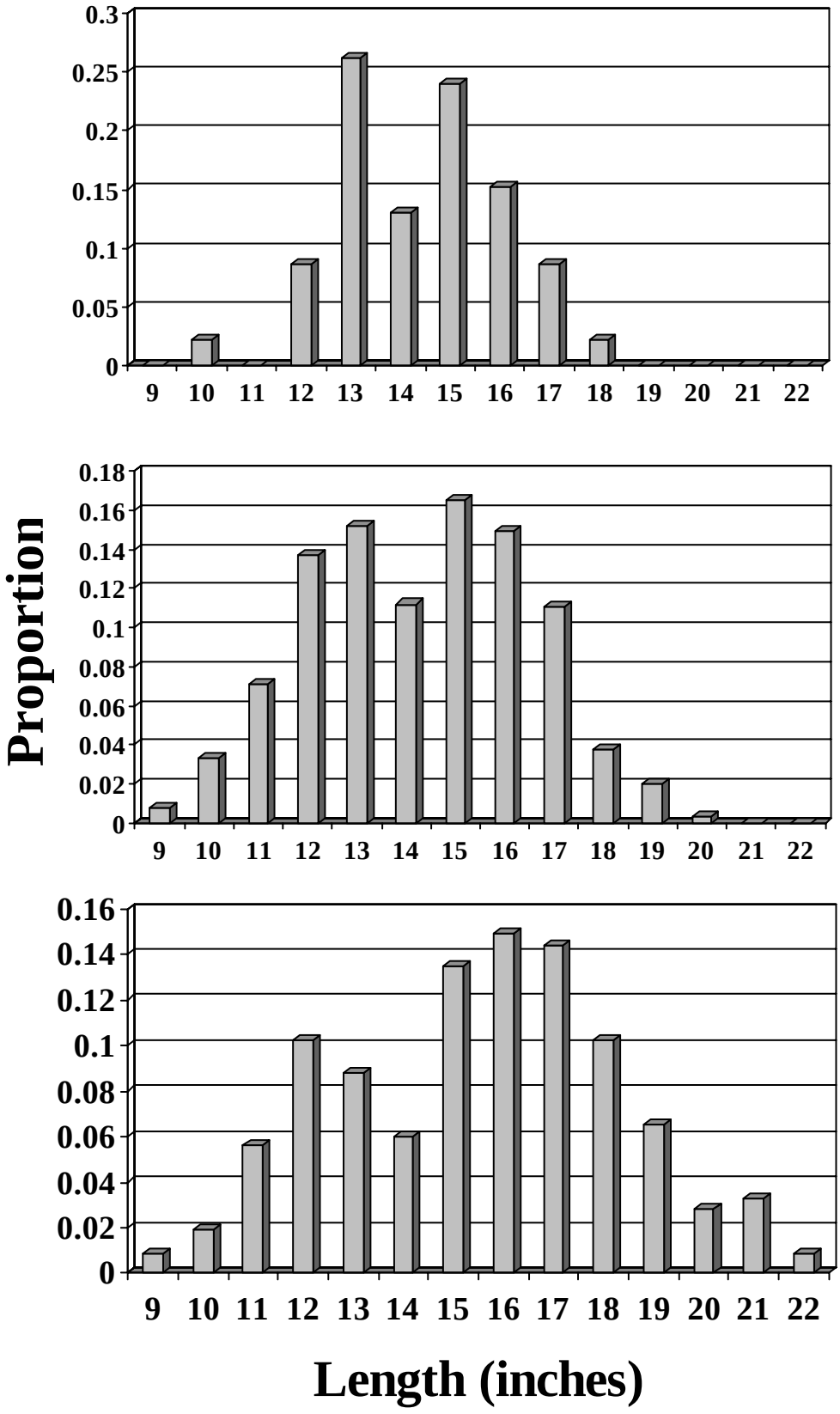

Figure 3. Typical length frequency histograms for westslope cutthroat trout (top, n=46), rainbow trout (middle, n=631) and brown trout (bottom, n=217) sampled in the Clark Fork River Milltown section (2002).

Northern pike densities had increased to 76 per mile (+/- 37 per mile 95% CI). The length range for northern pike (Figure 4) was 18-36 inches (457-914 mm). Estimates were unusually high for brown trout relative to long term monitoring data. We only sampled 3 bull trout in 4 days of electrofishing and no population estimate was possible. Although quantitative estimates could not be achieved, mountain whitefish and sucker populations were abundant.

In 2002, 5.6% of rainbow trout had obvious cranial deformities, which indicate an increase in whirling disease infection. Hooking scar rates, based on observation of obvious scars on the maxilla and premaxilla, were 9.3 % for rainbow trout, 28.0% for westslope cutthroat trout and 4.1% for brown trout.

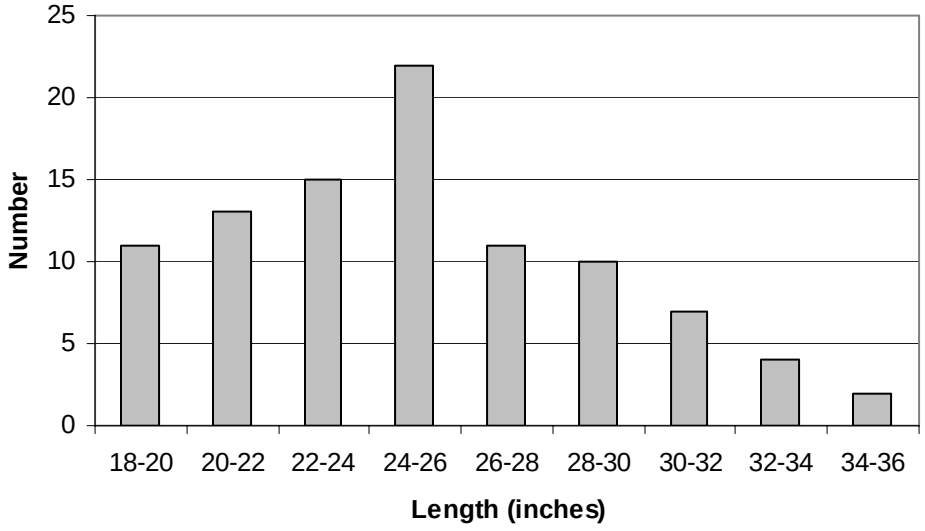

Figure 4. Typical size distribution for northern pike sampled in the Clark Fork River Milltown section (2002).

Milltown Section – 2004

Population estimates were obtained for rainbow trout, westslope cutthroat trout, and brown trout in the Milltown Section in 2004 (Table 4). Although we were also able to estimate northern pike numbers, our estimates and efficiency were poor (wide confidence intervals). River flows were low (4600-5200 cfs), but adequate for completion of the population estimate. Densities of catchable (> 7 in or 178 mm) trout were estimated at follows: rainbow trout 185 per mile (+/- 37 per mile 95% CI), westslope cutthroat trout 10 per mile (+/- 5 per mile 95% CI), brown trout 55 per mile (+/- 11 per mile 95% CI). Northern pike densities had decreased to 19 per mile (+/- 17 per mile 95% CI). We only sampled 2 bull trout in 4 days of electrofishing and no population estimate was possible. Although quantitative estimates could not be achieved, mountain whitefish and sucker populations were abundant.

In 2004, 9.0% of rainbow trout had obvious cranial deformities, which continued an increasing trend in whirling disease infection rates since 1999. Hooking scar rates, based on observation of obvious scars on the maxilla and premaxilla, were 11.3 % for rainbow trout, 29.2% for westslope cutthroat trout and 7.1% for brown trout.

Table 4. Population estimates, parameters, and confidence intervals for catchable trout (> 7 inches) and northern pike (> 18 inches) sampled in the Clark Fork River Milltown section in 2004.

SPECIES	M	C	R	POINT ESTIMATE	95% CI	ESTIMATE PER MILE	95% CI PER MILE
RBT	252	157	59	665	+/- 134	185	+/- 37
WCT	17	14	6	38	+/- 19	10	+/- 5
BROWN	120	65	39	199	+/- 39	55	+/- 11
N. PIKE	14	13	2	69	+/- 61	19	+/- 17

Discussion

Superior Section Population Monitoring

Fish population estimates in the Superior section in 1999 suggest no significant changes in rainbow trout (Figure 5) or westslope cutthroat trout density (Figure 6) relative to past population estimates. Berg (1992) estimated densities of catchable rainbow trout (>7 in) to be between 219 and 532 fish per mile in the Superior section from 1985 to 1989. The 1999 estimate is within this range of point estimates. Brown trout abundances were extremely low as in previous sampling efforts (Berg 1992). Brown trout densities are likely remain low in this reach of the Clark Fork due to limited main stem side channel and large tributary spawning habitat availability, but results were also biased by the timing of our sampling; adult brown trout were presumed to be in tributaries spawning in fall.

Estimated westslope cutthroat trout density (34/mile) was the highest measured in the period of record (1984-1999, Figure 6). Berg (1997) estimated westslope cutthroat trout densities between 15 and 27 trout per mile in 1988-89. We could not test whether this was a significant increase because variance calculations and confidence limits are lacking in Berg's (1999) synopsis. Mountain whitefish and sucker species continue to be very abundant in this reach and bull trout persist at extremely low levels (see below).

Rainbow trout have remained the most abundant trout species in the middle Clark Fork River (> 70% of the trout species composition) and in angler creels within the Superior section (MFWP 1995). However, westslope cutthroat trout have responded to restrictive angling regulations and are becoming more prevalent. Anglers have reported a disproportionate increase in catch rate for this species because westslope cutthroat trout are much more susceptible to angling than rainbow trout (Peters and Schmetterling 1996; Angler Survey Chapter of this report). Increases in westslope cutthroat trout abundance is likely due to catch-and-release regulations instituted in the mid-1990s. This is a consistent trend among main stem rivers in west-central Montana (MFWP, unpublished data).

In the Clark Fork River, favorable flow conditions throughout the 1990's and regulation changes from a five to three fish limit for rainbow trout were expected to prompt an increase in rainbow trout abundance. Benefits of catch-and-release practices by most anglers have also undoubtedly carried over to rainbow trout. Unlike westslope cutthroat trout, the lack of a consistent increase in rainbow trout in response to regulation changes suggests that problems other than harvest (e.g., juvenile recruitment) may be limiting rainbow trout in the lower Clark Fork River. Degraded tributary habitat and fish passage barriers in the lower reaches of these tributaries are

suspected to be limiting factors for all fluvial trout species in the lower Clark Fork River. Whirling disease may also become a contributing factor (see below).

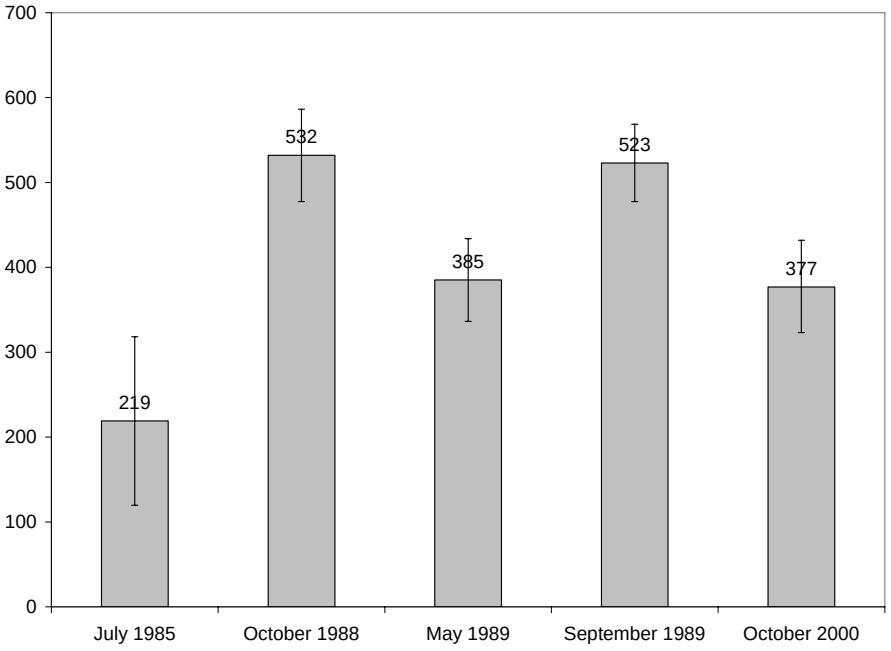

Figure 5. Population estimates and 95% confidence intervals for catchable rainbow trout in the Clark Fork River Superior section in 1985-2000.

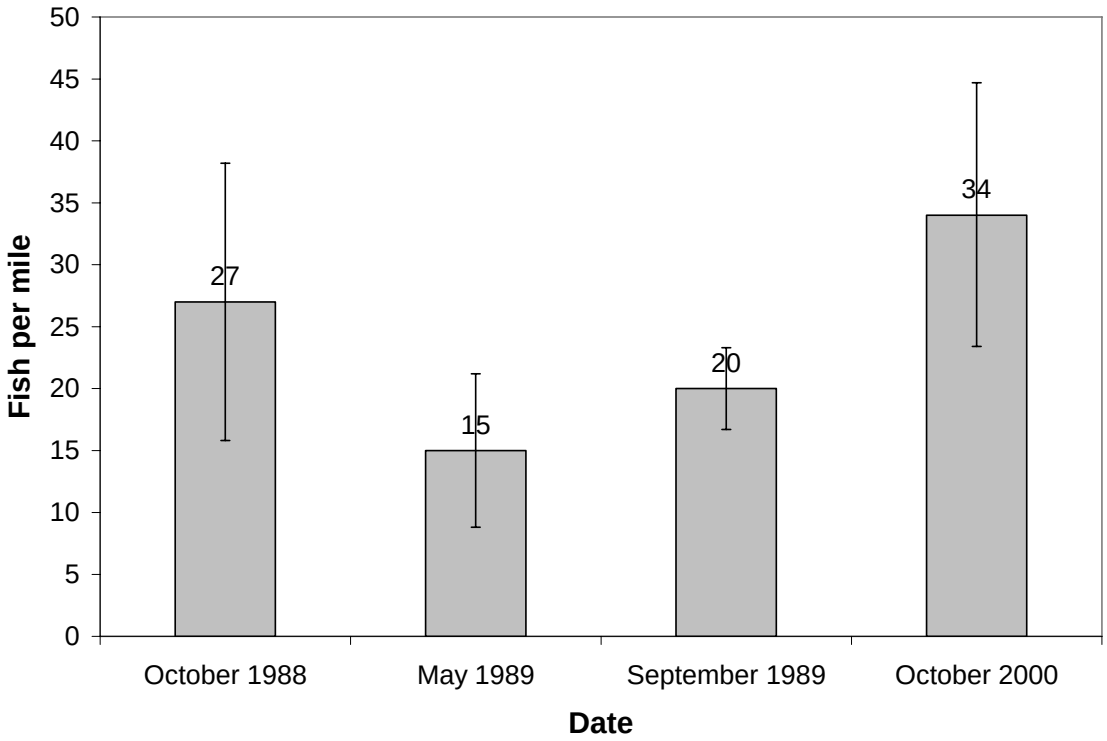

Figure 6. Population estimates and 95% confidence intervals for catchable westslope cutthroat trout (>7 in) in the Clark Fork River Superior section in 1988-2000.

Milltown Section Population Monitoring

Milltown section population monitoring in 1999-2004 indicated fluctuating fluvial trout densities (Figures 7 and 8). Variable trout densities in this portion of the Clark Fork River are attributed to a number of interacting biotic and abiotic factors including drought, periods of elevated water contaminants and inconsistent recruitment. The recent emergence of northern pike in Milltown Reservoir and the associated river system is also likely contributing to continued depression of fluvial trout populations.

Rainbow trout and brown trout populations appear to fluctuate below carrying capacity in the Clark Fork River in response to environmental influences such as periods of elevated dissolved contaminant levels and drought. For instance, rainbow trout densities estimated in 1996 and 1999 were the lowest in the period of record (Figure 7). Brown trout abundance was also low and Berg (1999) noted poor fish condition. Major population declines were observed in 1996 after ice flow and high flow events in the Clark Fork and Blackfoot Rivers upstream of Milltown Dam mobilized high concentrations of heavy metals in the Clark Fork River downstream of the dam (Berg 1999). During this event, copper levels were elevated to nearly 17 times higher than the baseline value for acute levels (Montana DEQ, unpublished data, 1997). Fish population declines were attributed to toxic (acute) levels of copper and arsenic associated with mining wastes previously deposited in the system. By 2002, rainbow trout and brown trout populations had apparently recovered; rainbow trout densities were estimated to be near long term averages and brown trout densities were at the highest levels on record. Subsequent declines in brown trout and rainbow trout abundance from 2002 to 2004 were consistent with other nearby river sections during this severe drought period (Pierce et al. 2004, Chris Clancy, MFWP, pers. comm.).

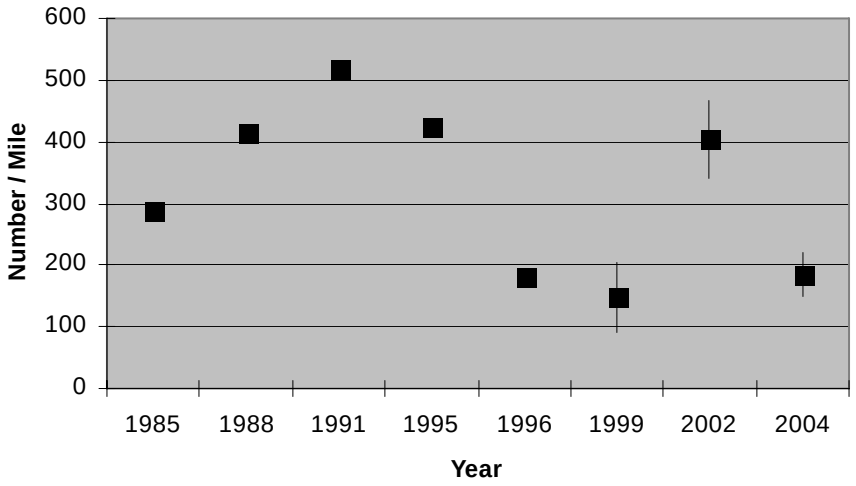

Figure 7. Population estimates and 95% confidence intervals for catchable rainbow trout (>7 in) in the Clark Fork River Milltown section, 1985-2004. Data from 1985-1996 are from Berg (1999).

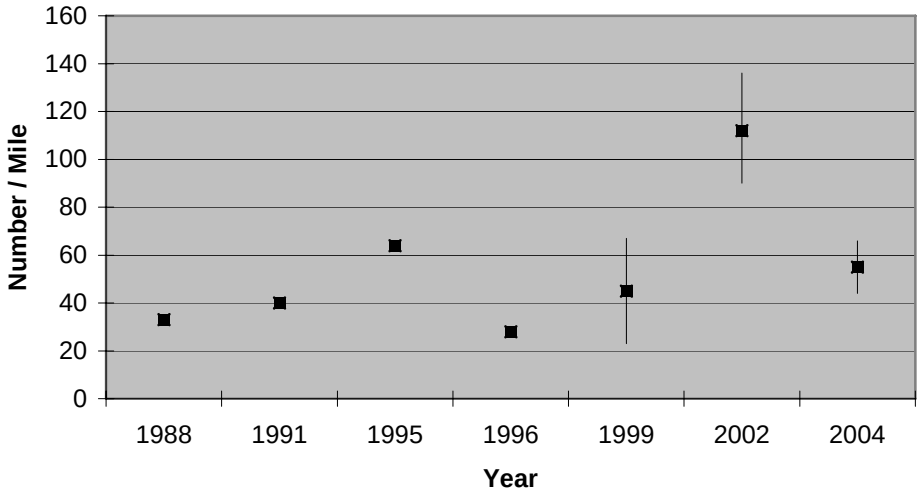

Figure 8. Population estimates and 95% confidence intervals for catchable brown trout (> 7 in) in the Clark Fork River Milltown section, 1985-2004. Data from 1988-1996 are from Berg (1999).

Similar to the Superior section and other main stem rivers in west-central Montana, westslope cutthroat trout have responded to catch-and-release regulations and should continue to increase as habitat enhancement and restoration projects are implemented. Berg (1997) was not able to estimate westslope cutthroat trout abundance in the Milltown section in 1984-1991 due to low abundance. Despite continued low abundance, we were able to complete valid estimates in 1999, 2002 and 2004 in this section (Figure 9). Bull trout status is described below (page 13).

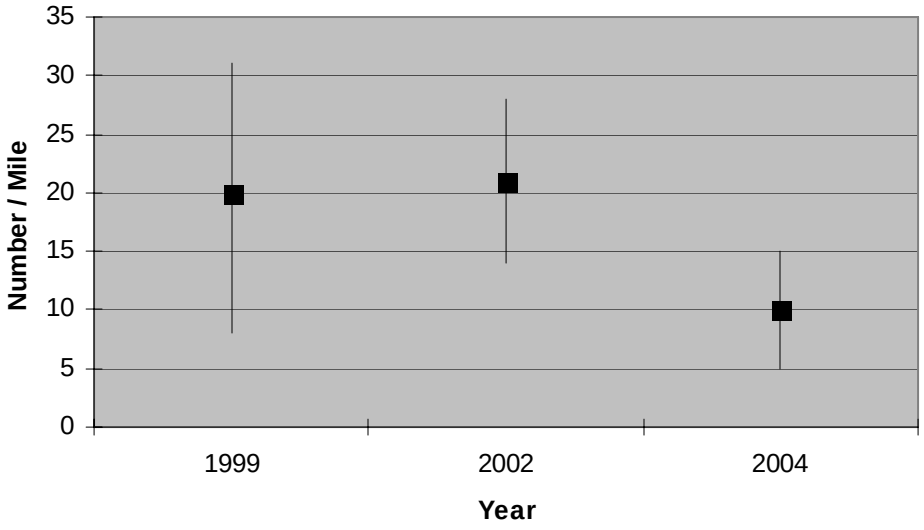

Figure 9. Population estimates and 95% confidence intervals for catchable westslope cutthroat trout (> 7 in) in the Clark Fork River Milltown section, 1999-2004.

Like lower reaches, the Milltown portion of the Clark Fork River appears to be a recruitment-limited fishery (Berg 1999). This is a significant limitation as the Clark Fork River supports only wild trout populations under MFWP's wild trout policy for streams and rivers (no stocking). In addition to the upstream and downstream (seasonal) fish passage barrier created by Milltown Dam, many of the tributaries supporting recruitment in this section of river are highly degraded and have fish migration barriers in their lower reaches, which limit the ability of fluvial fish to access spawning, rearing and refuge habitat. Schmetterling (*In review*) and Swanberg (1997) moved westslope cutthroat and bull trout over Milltown Dam and found (through radio telemetry) that these fish migrated up the Blackfoot and Clark Fork Rivers up to 140 km to spawn. These data suggest that Milltown Dam is a major impediment for adult fluvial trout attempting to return to natal tributaries. It is anticipated that fish passage improvements at Milltown Dam, reduction in northern pike abundance and a range of tributary enhancements will increase native and non-native fluvial trout populations in the Middle Clark Fork River.

Northern Pike

Northern pike abundance has fluctuated since this species was first detected in the Clark Fork River downstream of Milltown Dam in 1999 (Figure 10). Northern pike apparently moved downstream from the Clearwater River drainage (via the Blackfoot River) where they were illegally introduced in the early 1990s. The Clark Fork River population (downstream of Milltown Dam) is assumed to be an emigrant population from Milltown Reservoir, where northern pike are able to reproduce effectively. Fluctuating population abundance in the Milltown river section has generally been consistent with estimated abundance in the reservoir since 1999. Following a rapid population increase in the reservoir in 1999-2001, northern pike suppression efforts (including netting and summer drawdowns) in Milltown Reservoir have been intensified (2002-2004) and apparently reduced abundance significantly (>85%; David Schmetterling, MFWP, pers. comm.). We observed a similar decline in northern pike abundance in the Milltown river section in 2004. Increased angling pressure may have also contributed in reducing northern pike abundance in the river.

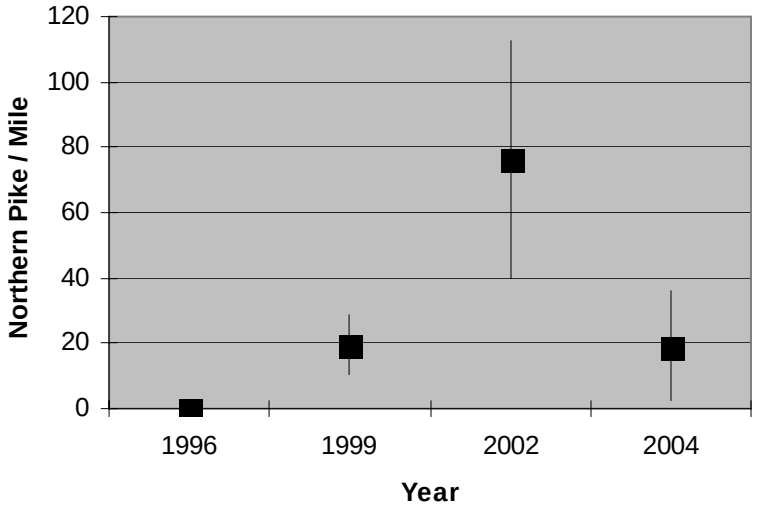

Figure 10. Northern pike abundance estimates (with 95% confidence interval) in the Clark Fork River Milltown section, 1996-2004.

Bull Trout

Fluvial bull trout populations continue to exist at extremely low abundances in the middle Clark Fork River. We can no longer obtain a valid estimate in most monitoring sections, but densities appear to be 1-2 adults per mile in most river reaches. Recent tributary surveys indicate that only five streams in the Clark Fork River reach between confluences of the Blackfoot and Flathead Rivers may still support migratory populations. The overall decline in number of populations and abundance is surely related to upstream fish passage and habitat degradation problems in tributaries, installation of hydroelectric facilities on the main stem and overharvest. However, it is not known why remaining populations (which have good habitat condition and connectivity) have not responded to protective angling restrictions and recovery efforts. Similar streams in the Blackfoot River drainage where these measures were employed have experienced rapid increases in bull trout abundance (Pierce et al. 2002). We suspect that overharvest and main stem river conditions are contributing to the continued suppression of fluvial bull trout. We have undertaken telemetry, harvest assessment and monitoring activities to address these concerns.

Whirling Disease

The incidence of whirling disease was assessed by recording the frequency of cranial deformities in rainbow trout during monitoring surveys (Figure 11). Other species were not assessed due to smaller sample sizes and lower susceptibility to the disease. This is not a diagnostic technique, but provides an indication of the severity of contamination. Laboratory assays for the disease will provide a better indication of the level of infection in the Clark Fork River and allow us to directly monitor its severity.

Whirling disease appears to be moving in a downstream direction, consistent with trends in infection of the Blackfoot River drainage (Pierce et al. 2002). The increased rate of cranial deformities in rainbow trout in the Milltown section in 1999-2004 indicates that the severity of the disease is increasing. It is not known what long term effect whirling disease will have on middle Clark Fork River trout populations or whether we will be able to distinguish impacts from other problems such as elevated toxic metal levels, drought, and northern pike predation.

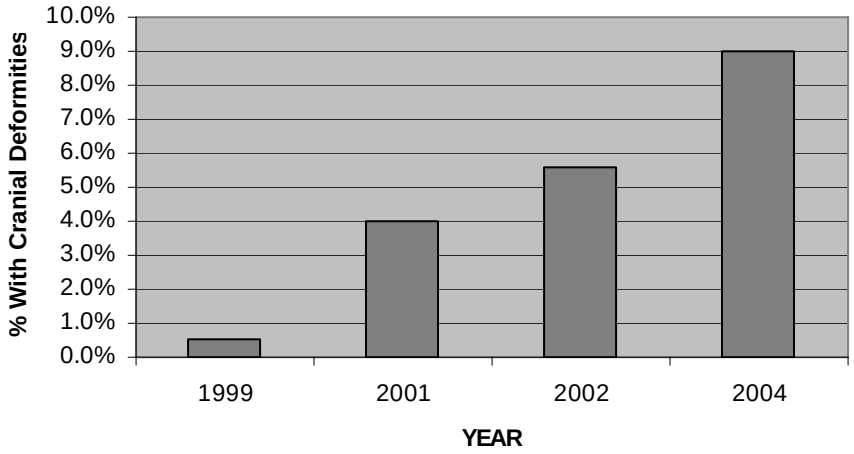

Figure 11. Percent of catchable rainbow trout with cranial deformities in the Milltown Section (1999-2004).

Hooking Scar Rates

Visible hooking scars serve as an index of catch-and-release fishing pressure and catch rates. Increased incidence of hooking scars reflect increases in fishing pressure in monitoring reaches (Table 5). Fishing pressure on the middle Clark Fork River increased 45% from 1991-2003 (MFWP 1992, MFWP 2004). Westslope cutthroat trout exhibited a disproportionately high hooking scar rate relative to other trout species in both river monitoring sections. This is consistent with numerous studies demonstrating the high susceptibility of cutthroat trout to angling (see Varley 1984).

Table 5. Comparison of trout hooking scar rates for Clark Fork River population estimate sections in 1999-2004.

River Section	Year	Rainbow Trout	Westslope Cutthroat Trout	Brown Trout
Superior	1999	8.6%	46.5%	-
Milltown	1999	7.7%	18.1%	3.4%
Milltown	2001	9.8%	23.8%	3.7%
Milltown	2002	9.3%	28.0%	4.1%
Milltown	2004	11.3%	29.2%	7.1%

High incidence of hooking scars also reflects the prevalence of catch-and-release angling on the Clark Fork River and other west-central Montana waters. Although some losses due to harvest are negated by catch-and-release fishing, there is generally a 5-10% mortality rate associated with capture and handling of released trout (Taylor and White 1992).

Literature Cited

Berg, R.K. 1999. A compilation of fishery survey information for the middle Clark Fork River drainage 1984-96. Montana Fish, Wildlife & Parks, Missoula, Montana.

Montana Fish, Wildlife & Parks. 1992. Montana statewide angling pressure 1991. Montana Fish, Wildlife & Parks, Helena, Montana.

Montana Fish, Wildlife & Parks. 2004. Montana statewide angling pressure 2003. Montana Fish, Wildlife & Parks, Helena, Montana.

Peters, D. and D. Schmetterling. 1996. Clark Fork River creel census: Rock Creek to Flathead River. Statewide Fisheries Investigation, F-78-R-2. Montana Fish, Wildlife & Parks, Missoula, Montana. 23 pp.

Pierce, R.W., R. Anderson and C. Podner. 2004. The Big Blackfoot River restoration progress report for 2002 and 2003. Montana Fish, Wildlife & Parks, Missoula, Montana.

Pierce, R.W., C. Podner, and J. McFee. 2002. The Blackfoot River fisheries inventory, restoration and monitoring progress report for 2001. Montana Fish, Wildlife & Parks, Missoula, Montana.

Schmetterling, D.A. *In review*. Reestablishing connectivity in a fragmented river system: movements of westslope cutthroat trout and bull trout after transport over Milltown Dam, Montana. North American Journal of Fisheries Management

Swanberg, T.R. 1997. Movements of bull trout (*Salvelinus confluentus*) in the Clark Fork River system after transport upstream of Milltown Dam. Northwest Science 71(4)313-317.

Taylor, M.J. and K.R. White. 1992. A meta-analysis of hooking mortality of nonanadromous trout. North American Journal of Fisheries Management 12:760-767.

Varley, J.D. 1984. The use of restrictive regulations in managing wild salmonids in Yellowstone National Park, with particular reference to cutthroat trout, *Salmo clarki*. Pages 145-156 in J.M. Walton and D.B. Houston, eds. Proceedings of the Olympic wild fish conference, Peninsula College, Fisheries Technology Program, Port Angeles, Washington.

CHAPTER 2

FISH SPECIES COMPOSITION AND DISTRIBUTION IN MIDDLE CLARK FORK RIVER AND LOWER BITTERROOT RIVER TRIBUTARIES

Introduction

Tributaries of the middle Clark Fork River, defined as the reach from the mouth of Rock Creek to the mouth of the Flathead River, support a moderately diverse fish and amphibian community that is dominated by native and introduced salmonids. In this investigation, we completed basin-wide electrofishing surveys of tributaries to gain information on species distribution, genetic composition and population abundance.

Methods

Fish sampling surveys were conducted in tributary stream reaches throughout the middle Clark Fork River drainage and the lower Bitterroot River drainage. Tributaries of the Bitterroot River included Lolo Creek and those downstream to the Clark Fork River confluence. Electrofishing was completed by two or three person crews in 1999-2004 during March-October, but predominantly in July and August. We attempted to collect longitudinal samples within each drainage that represented all fish-bearing reaches. Sites were selected based on location, stream morphology and accessibility. Single pass sampling sections varied in length from 'spot shocking' used primarily to obtain a genetic sample to over 500 m where fish abundance was low. At most sites, we attempted to sample 100 m of continuous habitat in tributary streams to obtain representative samples covering multiple replicates of the major habitat types.

Sampling was completed using either a Smith Root model 12-B battery powered backpack electrofisher or a Coffelt gas powered backpack unit using direct current at appropriate settings. Fish sampled were anesthetized, identified to species (when possible), measured and returned to the stream when recovered. At most sites, *Oncorhynchus* genetic samples were taken using the methods described in the *Oncorhynchus* Genetic Sampling chapter of this report. We also noted the presence of amphibians and sculpins (*Cottus spp*.) at each site where they were observed. However, the lack of observing a species in our surveys should not be interpreted as absence at a site. Water temperature, overall habitat conditions and any obvious habitat problems were also noted on data sheets.

Results and Discussion

More than 460 electrofishing sampling sections were completed on 140 Clark Fork River and Bitterroot River tributaries in 1999-2004. This represents approximately 95% of the fish bearing tributary reaches in the drainage. Summarized results of these surveys are presented in Tables 1-5. Table 1 includes sampling from 41 direct tributaries of the middle Clark Fork River. Tables 2-5 display results from tributaries within the four

largest drainages in the study area; Ninemile Creek, Fish Creek, the St. Regis River and Lolo Creek , respectively. Fish and amphibian species composition varied significantly among streams and longitudinally within streams. Fish density was also variable, but our data only represent relative abundance at the time of sampling because variables such as fish migration, discharge, water conductivity and personnel significantly affect capture efficiency. Although any estimates of actual fish abundance using single pass electrofishing should be considered unreliable, our surveys provided a 'snapshot' approximation of relative abundance at each site.

Survey distribution and methods were designed primarily to determine the distribution and spatial interaction of salmonid species. Specific sampling results are not reported here and more comprehensive analyses will not be completed until the remaining 5% of unsampled reaches in the drainage are finished. However, several trends are apparent with respect to salmonids in tributary sampling. Trout residing in tributaries were generally < 275 mm, indicating stream-resident populations and juvenile migratory fish. Spawning by fluvial rainbow trout, westslope cutthroat trout, bull trout and/or brown trout has been documented in most tributaries where connectivity and upstream fish passage from the Clark Fork River are still intact. We did not encounter adult, fluvial fish due to the timing of our sampling. Fish species composition varied among tributary drainages, but native trout (westslope cutthroat trout and bull trout) generally dominated upper portions of tributary watersheds and introduced trout were more abundant in lower portions where they had gained access through historic stocking or immigration from the main stem river system. However, where habitat had been seriously altered and degraded in upper tributary streams, introduced fish (particularly brook trout, *Salvelinus fontinalis*) appeared to out-compete native trout.

Patterns in species composition were somewhat consistent among the streams sampled. Westslope cutthroat trout are nearly ubiquitous in middle Clark Fork River tributaries. They appear to be absent only in streams with severe habitat degradation or dewatering. However, there is a range in genetic purity within and among these populations due to hybridization with rainbow trout and Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*). Most westslope cutthroat trout we observed appeared to be stream-resident in tributary reaches. The fluvial component of most populations has been lost due to unintentional installation of upstream migration barriers (i.e., transportation crossings) and efforts are underway in many tributaries to re-establish connectivity with the Clark Fork River. Similarly, fluvial bull trout populations have declined dramatically. Bull trout were only detected in nine tributary drainages in our study area (see *Bull Trout Redd Counts* report chapter). It is believed that habitat alterations have had a tremendous impact on bull trout populations because of their strict habitat requirements and nearly obligate fluvial life history. Bull trout are also extremely vulnerable to overharvest and illegal harvest because of the timing and location of staging and spawning.

Fluvial brown trout and rainbow trout dominated portions of larger (3^{rd} and 4^{th} order) streams within 3-4 miles of the stream mouth. Other tributary systems that supported these fluvial non-native trout populations typically had warmer summer water temperatures, lower stream gradient and altered habitat than those that supported solely native trout. Some obvious hybridization between westslope cutthroat trout and rainbow trout was observed where these populations overlapped, but the degree of hybridization is believed to be determined by a number of interacting factors including stream gradient,

water temperature, habitat quality and discharge. The species composition of mountain lakes also appears to be influencing community composition downstream. As with brook trout, rainbow trout and Yellowstone cutthroat trout were consistently found in upper tributary reaches located downstream of high elevation lakes which support self-sustaining wild populations. These lake populations were introduced by well-intending managers and fisherman in the early and mid twentieth century with the hopes of improving lake fisheries.

Oncorhynchus genetic samples were collected from >90% of streams where previous sampling had not been completed. Methods and results of these analyses are reported in an accompanying chapter of this report. Genetic testing is important for identifying where genetically pure westslope cutthroat trout populations still remain. In addition, it is helpful in confirming *Oncorhynchus* species distribution and composition as juvenile westslope cutthroat trout, Yellowstone cutthroat trout and rainbow trout are difficult to differentiate. However, in comparing limited genetic testing results with our field identification of *Oncorhynchus* species, we found that visual identification was accurate in most cases.

Brook trout were present in many first and second order stream reaches that were at lower (near Clark Fork River) elevations. Brook trout seemed to dominate in smaller streams with high groundwater activity, degraded habitat and/or lakes upstream with viable wild brook trout source populations. Brook trout appear to decrease the density of westlope cutthroat trout where the species are sympatric and have displaced them in several tributary reaches. Brook trout hybridization with bull trout was also evident in two tributaries (Grant Creek and Rattlesnake Creek) where smaller (<400 mm) bull trout adults exist.

We found few fish species other than trout in the tributaries sampled in our survey. Sculpins (*Cottus* spp.) and mountain whitefish (*Prosopium williamsoni*) were the only other fish that were sampled routinely in tributaries. Mountain whitefish is a very abundant fluvial species that spawns in lower reaches of major tributary streams. We found abundant juveniles at sites near the mouth of several large tributaries. Sculpin distribution and abundance was not consistent, however, and further analysis of their distribution and status is ongoing (David Schmetterling, MFWP, pers. comm.). Tailed frogs (*Ascaphus truei*) and spotted frogs (*Rana pretiosa*) were noted at many of the sites throughout the drainage.

Future Direction

Results presented in this report represent a cursory summary of fish sampling results in most middle Clark Fork River and lower Bitterroot River tributaries. When remaining reaches are sampled and *Oncorhynchus* genetic analyses are completed, more comprehensive evaluation of these data will be undertaken. These investigations will focus on the observed trends and patterns in species distribution, genetic composition and population abundances among and within tributaries. In addition, surveys of high elevation lake fish populations and evaluation of fish passage conditions will be important for evaluation of results. These data will be a cornerstone of a fisheries management and native fish conservation plan for the watershed.

Appendix I Fish species codes for Tables 1-5.

RBT	Rainbow Trout
WCT	Westslope Cutthroat Trout
RBxCT	Rainbow Trout x Westslope Cutthroat Trout Hybrid
ONC	Unknown *Oncorhynchus* species
YCT	Yellowstone Cutthroat Trout
DV	Bull Trout
LL	Brown Trout
EBT	Brook Trout
MFW	Mountain Whitefish
RSS	Redside Shiner
LNS	Longnose Sucker
SCUL	Sculpin spp.
LND	Longnose Dace
NPM	Northern Pikeminnow

Table 1. Summary of fish sampling on Clark Fork River tributaries, 1999-2004

Stream Name	Section	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # Captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
Albert Creek	1	14N,21W,16	2nd road crossing, downstream from culvert	9/14/2000	~ 20m	WCT	21	57-165	100				Add 50 YOY WCT, high densities of WCT
	2	14N,21W,16	2nd road crossing, downstream from culvert	7/16/2004	~125m	WCT	23	71-187	~100				Culvert barrier in section 15
	3	14N,21W,16/17	100 m upstream of Rd 5568 creek crossing	7/16/2004	~125m	WCT	15	76-198	104				
	4	14N,21W,18	Fords across stream	9/14/2000	~ 25m	DV	9	107-248	166				high densities of WCT/DV. 4 fords in area, great spawning habitat.
	4	14N,21W,18	Fords across stream	9/14/2000	~ 25m	WCT	25	52-196	132				Plus 100 YOY WCT, Dry in section 15 and 16 on 9/14
	5	14N,22W,13	Campground @ Rd mile 3.9	7/16/2004	~150m	DV	14	90-177	112		X		
	5	14N,22W,13	Campground @ Rd mile 3.9	7/16/2004	~150m	WCT	39	58-210	121.5		X		
	6	14N,22W,13	Ford across stream, near trailhead	9/14/2000	~ 25m	DV	2	105-111	108				Good spawning habitat/extremely high densities of WCT. .
	6	14N,22W,13	Ford across stream, near trailhead	9/14/2000	~ 25m	WCT	27	44-203	131				Several fords that should be addressed
	7	14N,22W,23	Just downstream of USFS trailhead	7/16/2004	~150m	DV	9	81-197	150		X		
	7	14N,22W,23	Just downstream of USFS trailhead	7/16/2004	~150m	WCT	19	70-219	144		X		
Allen Creek	1	12N,18W,24	Section 24ca (see map on data sheet)	8/17/2002	~200m	WCT	28	58-148	109				Good habitat, high densities of WCT
	2	12N,17W,19	~1.25 Mi. downstream of site 1	8/17/2002	~200m	WCT	13	67-153	112				
Cedar Creek	1	16N,27W,22	~2 Mi. up from Rd. intersection	8/2/2002	~200m	WCT	22	62-232	126	X	X		
	1	16N,27W,22	~2 Mi. up from Rd. intersection	8/2/2002	~200m	DV	11	39-210	70	X	X		This site had many DV yoy, likely spawning area
	2	15N,27W,8	At Bridge Xing	8/2/2002	~200m	WCT	18	58-221	151	X	X		Primarily B4 channel in sections 2-4
	2	15N,27W,8	At Bridge Xing	8/2/2002	~200m	DV	3	42-212	150	X	X		
	3	15N,27W,8	At Bridge Xing	8/2/2002	~175m	WCT	26	67-240	135	X	X		
	3	15N,27W,8	At Bridge Xing	8/2/2002	~175m	DV	4	96-141	118	X	X		
	4	16N,27W,22	CCR mine site	8/2/2002	~175m	WCT	7	65-235	134	X	X		
	4	16N,27W,22	CCR mine site	8/2/2002	~175m	DV	13	91-197	123	X	X		
	5	16N,27W,22	~.5 Mi below forks	8/9/2002	~200m	WCT	18	78-256	131	X			
	5	16N,27W,22	~.5 Mi below forks	8/9/2002	~200m	DV	2	197-227	212	X			
	6	16N,27W,22	Bear gulch	8/9/2002	~200m	WCT	14	92-178	122	X			
	6	16N,27W,22	Bear gulch	8/9/2002	~200m	DV	2	187-203	195	X			
	6	16N,27W,22	Bear gulch	8/9/2002	~200m	MWF	1	172	172	X			
	7	16N,26W,4	~1 Mi. above I-90	8/9/2002	~150m	WCT	10	112-285	153	X			
	7	16N,26W,4	~1 Mi. above I-90	8/9/2002	~150m	DV	1	266	266	X			
	7	16N,26W,5	~1 Mi. above I-90	8/9/2002	~150m	MWF	2	89-101	95	X			
Cramer Creek	1	12N,16W,35	mouth of west fork	7/21/1999	~100m	WCT	4	95-190	133.75	X			Spoon 1980 found no EBT above mining, EBT now in upper sections
	1	12N,16W,35	mouth of west fork	7/21/1999	~100m	EBT	23	60-230	111.3	X			
	2	12N,15W,30	above tailings in section 30	7/21/1999	~100m	WCT	13	125-220	172.8	X			
	2	12N,15W,30	above tailings in section 30	7/21/1999	~100m	EBT	14	60-210	157.5	X			
	3	12N,15W,20	lower section of 20	7/21/1999	~100m	WCT	13	62-185	115.2	X			
	3	12N,15W,20	lower section of 20	7/21/1999	~100m	EBT	13	55-185	125.4	X			EBT now in upper sections, Spoon found none up there in 1980
	4	12N,15W,20	upper section of 20	7/21/1999	~100m	WCT	26	70-175	117.9	X			WCT abundant
	4	12N,15W,20	upper section of 20	7/21/1999	~100m	EBT	8	105-150	128.1	X			
Crystal Creek	1	12N,18W,11	Plum Cr., middle of sec. 11	9/15/2000	> 100m	WCT	38	48-210	128		X		Diversion needs to be screened. Stream dry below perched culvert.
	1	12N,18W,11	Plum Cr., middle of sec. 11	9/15/2000	> 100m	EBT	18	53-205	106		X		Stream dry below perched culvert near mouth
	2	12N,18W,9/10	Boarder of sec 9-10. PC/FS land	7/24/2002	~200m	WCT	20	50-168	100		X		Good LWD
	2	12N,18W,9/10	Boarder of sec 9-10. PC/FS land	7/24/2002	~200m	EBT	2	125-152	138		X		
	3	12N,18W,10	Just above private land	7/24/2002	~200m	WCT	8	75-205	134		X		
	3	12N,18W,10	Just above private land	7/24/2002	~200m	EBT	10	75-165	85		X		
Crystal Spring Cr. (Crystal Cr Ranch)	1	12N,18W,2	Lower section- upstream to footbridge	10/1/2001	~ 60m	LL	9	80-240	129.4	X			Low efficiency on trout spp.
	1	12N,18W,2	Lower section- upstream to footbridge	10/1/2001	~ 60m	RBT	2	185-190	187.5	X			
	1	12N,18W,2	Lower section- upstream to footbridge	10/1/2001	~ 60m	LNS	22	75-185	145.2	X			
	1	12N,18W,2	Lower section- upstream to footbridge	10/1/2001	~ 60m	RSS	5	70-90	82	X			
	1	12N,18W,2	Lower section- upstream to footbridge	10/1/2001	~ 60m	SCUL	3	95-120	108.3	X			
	2	12N,18W,2	Upper- To just below pond	10/1/2001	~ 60m	LL	32	85-365	158.4	X			
	2	12N,18W,2	Upper- To just below pond	10/1/2001	~ 60m	WCT	1		185	X			
	2	12N,18W,2	Upper- To just below pond	10/1/2001	~ 60m	EBT	3	130-185	148.3	X			
	2	12N,18W,2	Upper- To just below pond	10/1/2001	~ 60m	RBT	5	85-165	110	X			
	2	12N,18W,2	Upper- To just below pond	10/1/2001	~ 60m	LNS	20	70-165	116	X			
	2	12N,18W,2	Upper- To just below pond	10/1/2001	~ 60m	NPM	1		105	X			
	2	12N,18W,2	Upper- To just below pond	10/1/2001	~ 60m	RSS	1		70	X			
Deep Creek (Missoula)	1	13N,21W,7	Gilman creek, plum creek land upstream of old bridge	9/12/2000	> 50m	WCT	32	40-240	115.3				Extremely high densities of WCT, section 7 road crossing, bridge
	2	13N,21W, 5	Deep creek crossing, plum creek land	9/12/2000	> 50m	WCT	28	50-250	102.25				high densities of WCT throughout, culvert crossings sect 5,7,8 OK
	3	13N,21W,8	Deep Creek crossing, private section 8	9/12/2000	> 50m	WCT	10	50-125	70.3				No water from section 4 downstream-no fish
Deep Creek (Superior)	1	16N,25W, 34	Forest Service, lower boundary	5/22/2000	~ 30m	No fish	0	0	0		X		high flows, extremely low efficiencies
	2	16N,25W, 26	Stream crossing w/in forest service boundary	5/22/2000	~ 30m	No fish	0	0	0		X		Dry in lower sections in late summer
	3	16N,25W,25	Fork in road, deep. Mouth of north fork eddy creek	5/22/2000	160m	WCT	13	46-126	89.5		X		
	4	16N,25W,30	Road crossing section 30	5/22/2000	145m	WCT	12	72-164	102.6		X		
Deer Creek (East of Msla)	1	12N,18W,6	0.5 miles below forks	7/9/1999	~ 60m	WCT	22	57-182	107.7		X		Excellent habitat, simgle pass, 5 tailed frogs
	2	12N,18W,6	0.5 miles below forks	7/9/1999	~ 50m	WCT	39	62-188	114.2		X		Excellent habitat, single pass, 5 tailed frogs, 1 ripe male
	3	12N,18W,32	1.1 mi upstream of site 5, near power lines - estimate section	8/3/2004	90m	WCT	178	-	-		X		Annual depletion estimates since 2003
	4	12N,18W,28	Lower end ~ 100 m above county Rd crossing - estimate section	8/3/2004	90m	WCT	109	-	-		X		Annual depletion estimates since 2003
	5	12N,18W,28	County road crossing, upstream	7/9/1999	~ 30m	WCT	40	73-225	114.9		X		county road upstream, 1 ripe male

Table 1. Summary of fish sampling on Clark Fork River tributaries, 1999-2004 (Page 2)

Stream Name	Section	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # Captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
Dirty Ike Creek	1	12N,17W,15	~1 Mi up Dirty Ike Cr. Rd. (unmarked)	8/8/2002	~200m	WCT	18	59-191	103				Spot shocking. Very dense veg, Low fish densities.
	2	12N,17W,15	Rd. xing ~1.25 Mi upstream of site 1	8/8/2002	~200m	WCT	10	65-207	132				Dewaters above sec. 15 in upper reaches
Donovan Creek	1	12N,17W,8	Access private land (Halverson). 5715 Donovan Cr. Rd	8/12/2002	~150m	WCT	17	76-357	161		X		Private land in sec. 1 contains numerous diversions and "pools"
	1	12N,17W,8	Access private land (Halverson). 5715 Donovan Cr. Rd	8/12/2002	~150m	EBT	8	59-200	144		X		
	2	12N,17W,8	Pine Tree Ln. 6670- Private	8/12/2002	~125m	WCT	13	73-217	127		X		
	2	12N,17W,8	Pine Tree Ln. 6670- Private	8/12/2002	~125m	EBT	17	46-221	120		X		
	3	12N,17W,8	1.3 miles above frontage rd	8/25/2000	> 100m	WCT	23	40-255	135		X		Mostly riffle habitat, no riparian vegetation
	3	12N,17W,8	1.3 miles above frontage rd	8/25/2000	> 100m	EBT	25	60-220	111		X		
	4	12N,17W,8	6245 Pine Cone Dr.	8/25/2000	> 100m	WCT	25	45-250	121		X		Good habitat, good riparian vegetation
	4	12N,17W,8	6245 Pine Cone Dr.	8/25/2000	> 100m	EBT	15	50-220	123		X		
Dry Creek	1	17N,27W,28	FS road crossing, upstream of bridge	7/25/2000	~ 150m	LL	10	95-265	201.9	X			abundant brown trout, mod. Sculpins, densities low overall
	1	17N,27W,28	FS road crossing, upstream of bridge	7/25/2000	~ 150m	RBxCT	8	72-245	164.3	X			subdivision in section 27, mouth of Dry fork dry,
	1	17N,27W,28	FS road crossing, upstream of bridge	7/25/2000	~ 150m	EBT	2	132-140	136	X			culvert at Ann Arbor gulch perched
	2	17N,27W, 31	Mouth of wilson gulch	7/25/2000	~ 125m	LL	12	84-294	210	X			
	2	17N,27W, 31	Mouth of wilson gulch	7/25/2000	~ 125m	WCT	23	85-217	165.3	X			
	2	17N,27W, 31	Mouth of wilson gulch	7/25/2000	~ 125m	EBT	2	102-174	138	X			
	3	17N,27W,3	Ann Arbor upstream of culvert barrier	7/25/2000	~ 30m	WCT	7	90-153	115	X			
	4	17N,27W,3	Mainstem dry, ann arbor mouth	7/25/2000	~ 100m	WCT	9	101-233	152	X			
	4	17N,27W,3	Mainstem dry, ann arbor mouth	7/25/2000	~ 100m	EBT	2	141-222	101.5	X			
	5	17N,27W,4	upstream of culvert on 4th of July gulch	7/25/2000	~ 40m	WCT	8	52-150	112.9	X			
	6	17N,27W,9	Torino Creek, tributary	7/25/2000	~ 75m	EBT	11	79-170	125.4	X			
	7	17N,27W,4	Torino Creek, downstream of culvert	7/25/2000	spotshock	WCT	8	76-222	160.8	X			
	7	17N,27W,4	Torino Creek, downstream of culvert	7/25/2000	spotshock	EBT	3	113-158	136.3	X			
	8	17N,27W,27/34	Dry creek, 0.5 miles upstream, trailhead	7/25/2000	> 100m	WCT/YCT	13	85-203	135	X			
First Creek	1	16N,25W,10	Crossing in section 10,	8/30/1999	~ 100m	WCT	12	77-180	114.5				low shocking efficiency and low densities
	2	16N,25W,9,10	0.25 miles downstream of powerlines	5/24/2000	~ 150m	WCT	2	155-162	158.5				
	3	16N,25W,2,3	up overgrown spur road just after crossing in section 10	5/24/2000	> 200m	WCT	12	122-186	140.8				
Flat Creek	1	17N,26W,12	~6mi up Flat Crk	6/1/2000	100m	WCT	4	60-165	115.2				Private lands "hosed"
	1	17N,26W,12	~6mi up Flat Crk	6/1/2000	100m	EBT	16	70-250	155				Riparian areas severly altered
	2	17N,26W,22	25m below private Rd.	6/1/2000	130m	EBT	1	120	120				
	1	17N,26W,13,14	Just above mine	6/21/2002	~175m	EBT	2	40-215	127.5				Poor shocking efficiency and conductivity
	2	17N,26W,12	~125m beow dam to dam	6/21/2002	~125m	WCT	3	217-243	233				Good LWD in sections 2 and 3
	2	17N,26W,12	~125m beow dam to dam	6/21/2002	~125m	EBT	1	163	163				
	3	17N,26W,12	Above dam ~150m	6/21/2002	~150m	WCT	4	185-200	192.5				
	3	17N,26W,12	Above dam ~150m	6/21/2002	~150m	EBT	3	90-135	106.6				
Grant Creek	1	13N,19W,5	Expo Pky bridge upstream approx. 95m (large log jam)	7/7/2001	> 100m	WCT	16	72-272	187.8				High density and high condition factor on all fish
	1	13N,19W,5	Expo Pky bridge upstream approx. 95m (large log jam)	7/7/2001	> 100m	EBT	17	52-248	137.1				Low efficiency electrofishing, many YOY of mixed species
	2	13N,19W,5	Downstream 50m from I-90 culvert	7/7/2001	50m	WCT	27	77-255	158				
	2	13N,19W,5	Downstream 50m from I-90 culvert	7/7/2001	50m	EBT	17	120-265	167.6				
	3	13N,19W,13	Mullan Rd. Crossing upstream 50m	7/7/2001	50m	SCUL	1	55	55	X			Intermittent section, Ditch-like
	4	13N,19W,5	Broadway St. crossing, above and below culvert	7/7/2001	~200m	WCT	5	100-210	132	X			DV observed jumping into culvert
	4	13N,19W,5	Broadway St. crossing, above and below culvert	7/7/2001	~200m	LL	1	160	160	X			
	5	14N,19W,32	Irrigation headgate up through bird sanctuary	7/25/2001	~150m	WCT	28	83-255	149.6	X			High fish densities,burn marks, high fish condition
	5	14N,19W,32	Irrigation headgate up through bird sanctuary	7/25/2001	~150m	EBT	25	45-200	138.2	X			
	6	14N,19W,21	Road 698 Bridge, Snowbowl Rd.	7/25/2001	~100m	WCT	11	98-182	126	X			
	6	14N,19W,21	Road 698 Bridge, Snowbowl Rd.	7/25/2001	~100m	EBT	2	204-230	217	X			
	6	14N,19W,21	Road 698 Bridge, Snowbowl Rd.	7/25/2001	~100m	DV	2	230-270	250	X			Both presumed hybrids
	7	14N,19W,15	150m upstream of bridge on Road	7/25/2001	~150m	WCT	22	65-241	148	X			
	7	14N,19W,15	150m upstream of bridge on Road	7/25/2001	~150m	DV	6	152-212	195.6	X			One presumed hybrid
	8	14N,19W,10	Approx. 500m Upstream of Dexter Roberts' house	7/25/2001	> 50m	WCT	15	98-230	156.8	X			Excellent habitat. WCT and DV only
	8	14N,19W,10	Approx. 500m Upstream of Dexter Roberts' house	7/25/2001	> 50m	DV	7	151-226	178.2	X			
	9	15N,19W,35	~ 3.5 miles upstream of Dexter's house, waterfall	7/25/2001	> 50m	WCT	11	97-210	145	X			Waterfall apparaently natural barrier
Greenough Creek	1	12N,17W,30	Road crossing, upstream of culvert, USFS	9/15/2000	50m	WCT	21	46-170	106.2				Section 1 culvert a selective barrier, velocity
	2	12N,17W,25	Road crossing section 25, USFS	9/15/2000	50m	WCT	12	85-190	123.75				
Johnson Creek	1	17N,25W,36	Bottom of section 36, road crossing	8/30/1999	> 100m	No fish	0	0	0				145 seconds of shocking time
	2	17N,25W,36	Top of section 36, road crossing	8/30/1999	~ 80m	WCT	15	75-230	124.5		X		site 2 243 seconds of shocking time
	3	17N,25W,30	Road crossing in section 30	8/30/1999	~ 50m	WCT	10	75-180	122.8		X		site 3 197 seconds of shocking time. culvert perched, needs baffles
	4	17N,25W,26	Section 20, road crossing	8/30/1999	~ 20m	WCT	10	88-231	160.3		X		132 seconds of shocking time. Culvert misaligned, needs baffles.
Kendall Creek	1	12N,17W,8	Past Plum Cr. Gate ~300m -Highest point before Rd. leaves Cr.	8/20/2002	~150m	WCT	29	60-154	94		X	X	Possible barriers in both sections from Rd. Xings.
	2	12N,17W,5	Private land~125m below Rd. Xing to Xing	8/20/2002	~150m	WCT	43	68-200	113		X	X	High fish densities in both sections
	2	12N,17W,5	Private land~125m below Rd. Xing to Xing	8/20/2002	~150m	RBT	1	145	145		X	X	Hybridization suspected
Lavalle Creek	1	14N,19W,23	Hanson ranch upstream ~3000'	5/10/2002	~900m	WCT	14	72-176	111.6				
	2	14N,19W,13	Anderson place. Site below culvert	5/10/2002	~450m	WCT	11	79-160	121.6				

Table 1. Summary of fish sampling on Clark Fork River tributaries, 1999-2004 (Page 3)

Stream Name	Section	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # Captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
Marshall Creek	1	13N,18W,6	Above pond at Moye's place	7/6/1999	~22m	WCT	23	77-185	117.2				Population above pond pure W. cutthroat
	2	13N,18W,6	50 yds. Below pond	7/6/1999	~30m	WCT	21	90-205	129.1				Population below pond ~95% pure
	3	13N,18W,6	Lower end of Moye's field - estimate section	8/2/2004	90m	WCT	197	-	-				Depletion estimates completed each year
	4	13N,18W,7	Just below Rd. 2122 junction	7/6/1999	> 30m	WCT	25	85-200	108.8				
	5	13N,18W,7	Just below Rd. 2122 junction - estimate section	8/2/2004	90m	WCT	175	-	-				Depletion estimates completed each year
	6	13N,18W,7	Just above lower County Rd Crossing - estimate section	8/2/2004	90m	WCT	59	-	-				Depletion estimates completed each year
	7	13N,18W,18	Pump station area approx. .3 mile from mouth - estimate section	8/2/2004	90m	WCT	61	-	-				Depletion estimates completed each year
	8	13N,18W,18	Pump station approx. .3 mile from mouth	7/6/1999	~30m	WCT	8	75-125	~100				Road infringing on stream in several lower sections
Meadow Cr.	1	15N,26W,24	Up locked FS gate off Rd. By abandoned mine	7/29/2002	~200m	WCT	10	98-182	141		X		stream dewatered in lower reaches
	2	15N,26W,26	~.5 Mi above site 1	7/29/2002	~200m	WCT	21	55-151	97		X		Better habitat above mine in sec. 2
Mill Creek	1	15N, 20W, 36	down 150 meters from large culvert (spring hill road)	7/26/2000	~ 150m	RBT	11	105-246	143.3				culvert barrier at all flows. High densities of brown trout. No genetics
	1	15N, 20W, 36	down 150 meters from large culvert (spring hill road)	7/26/2000	~ 150m	LL	27	46-385	183.7				
	2	15N,20W,18	near mouth of cottonwood gulch	7/26/2000	~ 50m	LL	19	106-286	179.2				High gradient, plunge-pool High densities brown trout, moderate EBT.
	2	15N,20W,18	near mouth of cottonwood gulch	7/26/2000	~ 50m	EBT	6	122-213	172				
	3	15N,20W,6	mouth of Bear cr. up to culvert under bear creek road	7/26/2000	~ 100m	WCT	12	75-147	116.6				moderate densities of WCT, high densities EBT, low gradient. Cattle in creek.
	3	15N,20W,6	mouth of Bear cr. up to culvert under bear creek road	7/26/2000	~ 100m	EBT	17	101-194	138.9				Upstream is hosed from grazing
	4	15N,20W,36	bear creek, 1st culvert on spur road, upstream of culvert	7/26/2000	~ 100m	EBT	28	78-180	140.5				EBT dominated, low gradient. Cattle, no WCT.
	5	15N,20W,25	2nd road crossing, bear creek	9/11/2000	~ 75m	WCT	7	62-192	118.7				
	5	15N,20W,25	2nd road crossing, bear creek	9/11/2000	~ 75m	EBT	40	50-210	129.5				Plus 30 EBT not measured
	6	15N,20W,6	upstream of bear cr. culvert on mill creek	9/11/2000	spotshock	WCT	7	77-212	106.6				
Nemote Creek	1	15N,24W,13,14	Miller creek crossing	9/29/1999	> 50m	WCT	32	45-195	95				high densities of WCT, approx. 200 seconds, Plus 21 WCT not Meas
	2	15N,24W,17	Mainstem crossing, section 17	9/29/1999	> 50m	WCT	3	57-72	65.7				channel blown out, dry upstream, low densities. Approx. 350 sec
	3	15N,24W,21	South fork, plum creek land	9/29/1999	> 50m	WCT	23	47-175	119.8				shocked at crossing down, only 1 fish likely dries up. Approx. 200 sec
	4	15N,24W,15	USFS land section 15	9/29/1999	> 50m	WCT	9	135-195	160				grazing impacts in entire section, low fish densities. Approx. 374 sec.
	5	15N,24W,19	0.25 miles up from road crossing, south fork	9/11/2000	spotshock	WCT	14	45-175	108.9				extremely high densities of WCT
	6	15N,24W,16	sheridan creek road crossing, down culvert	9/11/2000	spotshock	WCT	16	40-170	114.5				high densities of WCT
Pattee Creek	1	12N,18W,4	Site is located off Takima St. and Pattee canyon St. intersection	4/24/2002	200m	WCT	10	113-228	138				
	2	12N,19W,2	Located under culvert @ intersection of Pattee and Lupine Dr.	4/24/2002	~ 70m	WCT	8	70-180	130				
Petty Creek	1	13N,23W,36	South fork, first road crossing	8/5/1999	> 50m	WCT	6	121-210	160.3	X	X		
	1	13N,23W,36	South fork, first road crossing	8/5/1999	> 50m	EBT	22	51-195	126.9	X	X		
	2	12N,23W,2	South Fork - USFS	7/9/2004	~125m	WCT	25	65-239	112.6		X		Culvert in section36/31 looks OK for passage
	2	12N,23W,2	South Fork - USFS	7/9/2004	~125m	EBT	23	45-225	151.6		X		
	3	12N,23W,3	Upper South Fork - Plum Creek	7/9/2004	~150m	WCT	30	65-201	110		X		Good habitat, poor trail system, site on PC
	3	12N,23W,3	Upper South Fork - Plum Creek	7/9/2004	~150m	EBT	9	52-169	107.5		X		
	4	13N,22W,31	Lower East Fork	8/5/1999	~100m	WCT	6	70-210	142.5	X	X		
	4	13N,22W,31	Lower East Fork	8/5/1999	~100m	EBT	34	45-235	129	X	X		> 20 young of the year EBT
	5	13N,22W,31	Lower East Fork	7/9/2004	~150m	WCT	2	115-151	133		X		Low fish densities, culvert OK
	5	13N,22W,31	Lower East Fork	7/9/2004	~150m	EBT	2	120-150	135		X		Low fish densities, culvert OK
	6	13N,22W,28/29	Middle East Fork	7/9/2004	~150m	WCT	18	58-172	112	X	X		Better habitat, falls at top of site
	6	13N,22W,28/29	Middle East Fork	7/9/2004	~150m	EBT	5	90-141	123	X	X		Better habitat, falls at top of site
	7	13N,22W,30	Mainstem, just downstream of Mike Creek	8/5/1999	> 50m	WCT	16	64--270	181.6	X	X		1 hybrid
	7	13N,22W,30	Mainstem, just downstream of Mike Creek	8/5/1999	> 50m	EBT	16	105-225	134.8	X	X		Plus 12 YOY Ebt not measured
	8	13N,22W,30	Mouth of Mike Creek	8/5/1999	> 50m	WCT	8	66-228	198	X	X		
	8	13N,22W,30	Mouth of Mike Creek	8/5/1999	> 50m	EBT	4	46-245	170.7	X	X		Plus 3 YOY Ebt not measured
	9	13N,22W,19	Bill's Creek	7/7/2004	>125m	WCT	13	58-170	94		X		
	9	13N,22W,19	Bill's Creek	7/7/2004	>125m	EBT	4	82-159	112.5		X		
	10	13N,23W,23/24	John's Creek	7/7/2004	150m	WCT	12	65-170	117		X		
	10	13N,23W,23/24	John's Creek	7/7/2004	150m	EBT	9	73-170	130		X		
	11	13N,23W,10/11	Gus Creek	7/7/2004	125m	EBT	10	88-190	~120				
	12	13N,23W,10	Ed's Creek	7/7/2004	125m	WCT	1	178	178	X	X		
	12	13N,23W,10	Ed's Creek	7/7/2004	125m	EBT	23	71-210	121	X	X		
	13	14N,23W,27	Lower West Fork	8/5/1999	> 50 m	WCT	5	104-137	117	X	X		numerous EBT and Tailed frogs
	14	14N,23W,30	Upper West Fork	7/7/2004	>150m	WCT	17	86-255	149	X	X		
	14	14N,23W,30	Upper West Fork	7/7/2004	>150m	EBT	24	71-170	107	X	X		
	15	14N,23W,36	Lower Mainstem	8/5/1999	> 50m	WCT	16	104-315	180.6	X	X		one hybrid
	15	14N,23W,36	Lower Mainstem	8/5/1999	> 50m	EBT	10	60-215	140.3	X	X		
	15	14N,23W,36	Lower Mainstem	8/5/1999	> 50m	DV	1	70	70	X	X		
	16	14N,22W,31	Spring Gulch	7/12/2004	~150m	WCT	10	61-81	72		X		Looks hybridized
	17	14N, 22W,30	Lower Mainstem	8/5/1999	> 50m	WCT	28	69-295	148.3	X	X		5 hybrids
	17	14N, 22W,30	Lower Mainstem	8/5/1999	> 50m	RBT	1	231	231	X	X		
	17	14N, 22W,30	Lower Mainstem	8/5/1999	> 50m	EBT	13	58-215	135	X	X		
	18	14N,22W,19	Madison Gulch	7/12/2004	~125m	WCT	11	59-85	70				Looks like hybridized
Quartz Creek	2	14N,26W,3	Where Rd. intersects Cr.	7/30/2002	~200m	WCT	6	81-227	146		X		
	3	14N,26W,2	1 Mi. below site 2	7/30/2002	~150m	WCT	17	84-226	147		X		
	4	15N,25W,32	2.5 Mi. below site 3	7/30/2002	~150m	WCT	8	83-165	111		X		

Table 1. Summary of fish sampling on Clark Fork River tributaries, 1999-2004 (Page 4)

Stream Name	Section	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # Captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
Rattlesnake Creek	1	14N,18W,11	Upper mainstem bridge crossing	9/23/1999	~120m	WCT	12	107-255	194.9	X	X		Low shocking efficiency
	1	14N,18W,11	Upper mainstem bridge crossing	9/23/1999	~120m	EBT	9	110-220	146.3	X	X		
	1	14N,18W,11	Upper mainstem bridge crossing	9/23/1999	~120m	DV	1	201	201	X	X		
	2	14N,18W,15	Just above Beescove Cr.	9/23/1999	~120m	WCT	15	90-256	151.3	X	X		
	2	14N,18W,15	Just above Beescove Cr.	9/23/1999	~120m	EBT	34	157-230	122.2	X	X		
	2	14N,18W,15	Just above Beescove Cr.	9/23/1999	~120m	DV	20	65-285	144.6	X	X		2 hybrid DV included
	3	14N,18W,15	Mouth of Beescove (bottom of section)	8/20/2004	200m	WCT	36	30-342		X	X	X	Upper Bull trout/WCT CPUE Section
	3	14N,18W,15	Mouth of Beescove (bottom of section)	8/20/2004	200m	DV	11	62-318		X	X	X	Upper Bull trout/WCT CPUE Section
	3	14N,18W,15	Mouth of Beescove (bottom of section)	8/20/2004	200m	EBT/DV	4	58-154		X	X	X	Upper Bull trout/WCT CPUE Section
	3	14N,18W,15	Mouth of Beescove (bottom of section)	8/20/2004	200m	EBT	36	58-218		X	X	X	Upper Bull trout/WCT CPUE Section
	4	14N,18W,21	Between Beescove Cr. and Pilcher Cr.	9/23/1999	> 100m	WCT	18	82-178	120.8	X	X		2-3 DV Redds observed
	4	14N,18W,21	Between Beescove Cr. and Pilcher Cr.	9/23/1999	> 100m	DV	7	78--320	153.4	X	X		
	4	14N,18W,21	Between Beescove Cr. and Pilcher Cr.	9/23/1999	> 100m	EBT	36	60-222	114.9	X	X		
	5	14N,18W,20	Between Beescove Cr. and Pilcher Cr.	9/23/1999	Spotshock	WCT	10	95-212	130	X	X		Not species composition, only DV and WCT saved
	5	14N,18W,20	Between Beescove Cr. and Pilcher Cr.	9/23/1999	Spotshock	DV	6	66-415	198.1	X	X		
	5	14N,18W,20	Between Beescove Cr. and Pilcher Cr.	9/23/1999	Spotshock	LL	1	142	142	X	X		
	6	14N,18W,20	~ 150 m downstream of Pilcher mouth (top of section)	8/20/2004	200m	WCT	35	32-330		X	X	X	Middle Bull trout/WCT CPUE Section
	6	14N,18W,20	~ 150 m downstream of Pilcher mouth (top of section)	8/20/2004	200m	DV	11	55-433		X	X	X	Middle Bull trout/WCT CPUE Section
	6	14N,18W,20	~ 150 m downstream of Pilcher mouth (top of section)	8/20/2004	200m	EBT	30	55-211		X	X	X	Middle Bull trout/WCT CPUE Section
	7	14N,19W,35	Horse bridge upstream 200 m	8/20/2004	200m	WCT/RBT	123	41-368		X	X	X	Lower Bull trout/WCT CPUE Section - WCT & RBT not distinguished
	7	14N,19W,35	Horse bridge upstream 200 m	8/20/2004	200m	DV	14	62-550	144	X	X	X	Lower Bull trout/WCT CPUE Section
	7	14N,19W,35	Horse bridge upsream 200 m	8/20/2004	200m	EBT	7	113-225	150	X	X	X	Lower Bull trout/WCT CPUE Section
	7	14N,19W,35	Horse bridge upsream 200 m	8/20/2004	200m	LL	4	71-184	141	X	X	X	Lower Bull trout/WCT CPUE Section
	8	13N,19W,2	Just upstream of Rattlesnake dam	7/3/2002	Spotshock	WCT	25	59-164	104	X	X		Most WCT looked hybridized
	8	13N,19W,2	Just upstream of Rattlesnake dam	7/3/2002	Spotshock	DV	3	59-111	91	X	X		
	8	13N,19W,2	Just upstream of Rattlesnake dam	7/3/2002	Spotshock	EBT	1	108	108	X	X		
Rock Creek (near Missoula)	1	14N,21W,18	old crossing	9/14/2000	~ 100m	WCT	23	40-182	115.2				Extremely high densities of WCT
	2	14N,21W,19	old stream crossing, now just a trail	9/14/2000	~ 70m	WCT	15	99-191	132.6				Extremely high densities of WCT. Stream very overgrown w/ vegetation
	3	14N,21W,30/25	Forest Service boundary. Upstream of crossing, culvert	9/14/2000	~ 70m	WCT	21	66-166	113.4				High densities of WCT, lots of wood. Dry in sections 20, 21, 22 on 9/14
Rock Creek (near Fish Creek)	1	15N,25W,11	Lower road crossing	7/23/1999	~ 60m	No fish	0	0	0		X		channel dry in upper half sect 11, reappeared at lowest road Xing sect 1
	2	15N,25W,15	Plum Creek Bridge	7/23/1999	~ 50m	WCT	8	62-202	130.6		X		230 second of shocking time, 52 degrees F
	3	15N,25W,16	Road crossing, section 16	7/23/1999	~ 75m	WCT	10	52-150	102.8		X		shocking time 373 seconds.
	4	15N,25W,11	Chicken Creek	7/23/1999	Spotshock	WCT	7	35-130	57.9		X		tributary to lower chicken creek
Roman Creek	1	15N,21W,15	Site begins upstream of culvert @ locked gate. (FS 16311)	8/6/2002	~200m	WCT	23	56-198	117		X		no fish in 150 m located 0.75 mile upstream of site 1
	2	15N,21W,21	~150m below culvert	8/6/2002	~150m	WCT	12	61-185	101		X		
Second Creek	1	16N,24W,14	1.9 miles up road #283, second creek road	5/24/2000	~ 100m	WCT	11	98-186	131		X		
	2	16N, 24W,13	Down from culvert, 2.1 miles up from forks	6/1/2000	~180m	WCT	10	89-182	123.9		X		culvert at forks is crushed and blocked at the inlet, bad alignment
	3	16N,24W,24/25	Downsteam of culvert at forks	6/1/2000	~ 300m	WCT	1	212	212		X		Forest service notified
Seven Mile Creek	1	19N,27W,34	Thinglestad's, Private	5/2/2002	~100m	WCT	14	75-164	109		X		High water condition, low shocking efficiency
	2	19N,27W,27	USFS land	5/2/2002	~300m	WCT	12	43-133	91		X		
Siegel Creek	1	18N,25W,36	spot shocked ~ 300 m up to Rd. Xing	6/20/2000	~ 300m	WCT	20	45-240	120				Sections 35,21 dry, upper culvert a barrier - spawners stacked below
Sixmile Creek	1	15N,21W,7	.5 Mi. from end of Rd. Reach begins at tree fort on river Left	8/5/2002	~200m	WCT	18	55-175	117		X		Good habitat
	1	15N,21W,7	.5 Mi. from end of Rd. Reach begins at tree fort on river Left	8/5/2002	~200m	EBT	1	152	152		X		
	2	15N,22W,12	~1 Mi. downstream of sec.1 by intersection of Rd.	8/5/2002	~200m	WCT	16	93-154	116		X		
	2	15N,22W,12	~1 Mi. downstream of sec.1 by intersection of Rd.	8/5/2002	~200m	EBT	14	79-201	126		X		
	3	15N,22W,14	19755; Six mile Rd., ~200 below bridge	8/5/2002	~200m	WCT	14	77-164	114		X		
	3	15N,22W,14	19755; Six mile Rd., ~200 below bridge	8/5/2002	~200m	EBT	~40	NA	NA		X		
	3	15N,22W,14	19755; Six mile Rd., ~200 below bridge	8/5/2002	~200m	RBT	4	65-104	83		X		
	3	15N,22W,14	19755; Six mile Rd., ~200 below bridge	8/5/2002	~200m	LL	1	152	152		X		
Slowey Gulch	1	18N,26W,30	Junction of Slowey Gulch Rd. and Fourmile Rd.	7/16/2002	~200m	WCT	14	45-163	102		X		
	2	18N,26W,30	~.3 Mi up Slowey Gulch Rd. Start above culvert	7/16/2002	~175m	WCT	15	59-115	88		X		Stream dry below Little Pittsburg mine
	3	18N,26W,20	1.2 Mi up Slowey Rd. from site 2. Start where creek crosses Rd.	7/16/2002	~150m	No fish					X		
	4	18N,26W,36	Just below mine	7/16/2002	~150m	WCT	15	102-152	123		X		
Swartz Creek	1	11N, 18W,5	Just above mouth on west fork	7/6/1999	~55m	WCT	16	52-173	95.13		X		18 tailed frogs sampled
	1	11N, 18W,5	Just above mouth on west fork	7/6/1999	~55m	EBT	6	95-234	132.3		X		
	2	11N,18W,5	100 yards upstream of west fork	7/6/1999	~ 125m	WCT	14	55-206	125.3		X		high water and very low efficiency, abundant tailed frogs
	2	11N,18W,5	100 yards upstream of west fork	7/6/1999	~ 125m	EBT	20	90-225	133.8		X		
	3	11N,18W,8	mouth of the middle fork	7/6/1999	~ 50m	WCT	17	60-135	93.7	X	X		
	3	11N,18W,8	mouth of the middle fork	7/6/1999	~ 50m	EBT	2	87(2)	87	X	X		culvert looks good
	4	11N,18W,4	upper road crossing at section 18	7/6/1999	~ 30m	WCT	13	55-190	115	X	X		
	4	11N,18W,4	upper road crossing at section 18	7/6/1999	~ 30m	EBT	6	83-160	121.3	X	X		
	5	11N,18W,18	upstream of handley's bridge	7/6/1999	> 50m	WCT	6	100-275	200	X	X		Brown trout had white/black fin margins
	5	11N,18W,18	upstream of handley's bridge	7/6/1999	> 50m	EBT	20	90-200	137.5	X	X		
	5	11N,18W,18	upstream of handley's bridge	7/6/1999	> 50m	LL	13	90-300	221.2	X	X		

Table 1. Summary of fish sampling on Clark Fork River tributaries, 1999-2004 (Page 5)

Stream Name	Section	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # Captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
Tamarack Creek	1	18N,27W,8&9	3/4 mi upstream from HWY 135, rip-rap d.stream of cattleguard	9/20/1999	~114m	EBT	88	55-246	107.1				unstable banks from livestock, LWD recruitement good
	2	19N,27W,32	Across from Long Gulch sign upstream from elec. Fence	9/20/1999	~105m	WCT	10	57-183	103.3		X	X	"Hosed" from livestock, banks degraded, perched culvert, High sediment
	3	19N,27W,19	~1mi. Up FSRd.1194 from FSRd.284. Shocked above of culvert	9/20/1999	~87m	WCT	36	47-196	106.1		X	X	almost a perched culvert
	4	19N,28W,25	6 mile marker on F.S. Rd. 284	9/20/1999	~76m	WCT	47	55-220	101.3				Good LWD recruitment
Trout Creek	1	16N,26W,23	Just above private land, mainstem	8/4/2000	~ 90m	MWF	15+	88-118	95.6	X			high MWF densities, high sculpin populations
	1	16N,26W,23	Just above private land, mainstem	8/4/2000	~ 90m	LL	2	222-228	225	X			
	1	16N,26W,23	Just above private land, mainstem	8/4/2000	~ 90m	EBT	7	20-200	113.9	X			
	1	16N,26W,23	Just above private land, mainstem	8/4/2000	~ 90m	RBT	18	93-225	141.7	X			
	1	16N,26W,23	Just above private land, mainstem	8/4/2000	~ 90m	WCT	2	130-140	135	X			
	2	15N,26W,5	Van Ness creek mouth	8/4/2000	~ 90m	WCT	5	86-250	181.8	X			Inefficient shocking, 56 degrees F
	2	15N,26W,5	Van Ness creek mouth	8/4/2000	~ 90m	RBT	3	132-177	161.3	X			Crossing dual culvert, partial barrier
	2	15N,26W,5	Van Ness creek mouth	8/4/2000	~ 90m	RBxCT	2	184-193	188.5	X			
	2	15N,26W,5	Van Ness creek mouth	8/4/2000	~ 90m	EBT	5	106-176	139.2	X			
	2	15N,26W,5	Van Ness creek mouth	8/4/2000	~ 90m	MWF	1	111	111	X			
	3	15N,26W,19	Windfall creek, crossing bridge	8/4/2000	~ 75m	WCT	12	107-191	141.8	X		X	1 spotted frog, crossing is a bridge, old mining claim
	4	15N,27W,24	Deep Creek near mouth	8/5/2004	125m	WCT	25	69-170			X		
	5	15N,27W,24	road crossing mainstem, section 24	8/4/2000	~ 90m	WCT	6	80-270	170	X			very low efficiencies, high sculpin population
	5	15N,27W,24	road crossing mainstem, section 24	8/4/2000	~ 90m	RBxCT	2	140-158	149	X			
	5	15N,27W,24	road crossing mainstem, section 24	8/4/2000	~ 90m	EBT	2	140-156	148	X			
	6	14N,27W,1	Upper Cement Gulch	8/5/2004	150m	No Fish					X		Steep habitat >10%, good habitat
	7	15N,27W,36	Lower Cement Gulch	8/5/2004	150m	No Fish					X		Lower gradient, excellent looking habitat
	8	15N,27W,35	Upper main stem Trout Cr (below Prospect Gulch)	8/5/2004	~125m	WCT	5	87-240					
	8	15N,27W,35	Upper main stem Trout Cr (below Prospect Gulch)	8/5/2004	~125m	DV	3	100-213					
	8	15N,27W,35	Upper main stem Trout Cr (below Prospect Gulch)	8/5/2004	~125m	DVxEBT	4	100-260					
	8	15N,27W,35	Upper main stem Trout Cr (below Prospect Gulch)	8/5/2004	~125m	EBT	29	45-187					
	9	15N,27W,35	Lower end of Prspect Gulch	8/5/2004	125m	No Fish							Gradient > 20%
	10	14N,27W,8/17	Hoodoo Creek, Trout Creek road crossing	9/17/2000	~ 150m	EBT	29	52-165	118.7	X			high density EBT low gradient, meadow ~150 YOY EBT
	11	14N,27W,9	Hoodoo Creek crossing	9/17/2000	~ 100m	EBT	24	46-203	126.4	X			high gradient, abundant EBT, culvert both velocity and perched barrier
	12	14N,27W,11	Road crossing south fork trout creek	9/17/2000	~ 150m	EBT	16	135-220	181.1	X			approx. 75 yoy's
	12	14N,27W,11	Road crossing south fork trout creek	9/17/2000	~ 150m	YCT	5	203-222	211.6	X			EBT abundant, WCT rare, all resembled yellowstone, ~same age class
	13	14N,27W,10	Tributary from Hoodoo Lake	9/17/2000	~ 30m	EBT	12	91-170	131.2	X			EBT moderate. High gradient, culvert misaligned , perched 6"
	14	14N,27W,4	North Fork Trout Creek	9/17/2000	~ 100m	EBT	18	84-210	139.5	X			EBT abundant, high gradient, should have WCT. Crossings are bridges
	15	15N,27W,33	1.0 upstream on North Fork from crossing	9/17/2000	~ 60m	EBT	9	95-170	133.8	X			low density of fish, high gradient
Turah Cr.	1	13N,18W,2	50m below interstate 90	5/9/1999	spotshock	WCT	2	143-165	102		X		
	1	13N,18W,2	50m below interstate 90	5/9/1999	spotshock	EBT	8	85-170	133		X		
	2	13N,18W,2	30m above interstate 90	5/9/1999	spotshock	WCT	1	105	105		X		
	2	13N,18W,2	30m above interstate 90	5/9/1999	spotshock	EBT	33	65-162	109		X		
	3	13N,18W,2	.25mi above I-90	5/9/1999	spotshock	WCT	6	62-127	87		X		Section 3 has large pond and irrigation diversions (Burton Property)
	3	13N,18W,2	.25mi above I-90	5/9/1999	spotshock	EBT	7	85-140	103		X		
	4	13N,18W,36	Above Dr. Burton's property	9/25/2002	spotshock	WCT	5	96-190	165		X		
	4	13N,18W,36	Above Dr. Burton's property	9/25/2002	spotshock	EBT	6	52-135	101		X		
Wallace Cr.	1	12N,16W,19	Reach starts where wallace cr. Rd. forks	8/8/2002	~200m	No fish					X		NA
	2	12N,17W,24	Reach starts ~200m Below dam	8/8/2002	~200m	WCT	24	39-172	90		X		No fish present above old dam
	3	12N,17W,24	~1.5 Mi up Wallace Cr. Rd. (Private)	8/8/2002	~200m	MWF	7	NA	NA		X		Lower reaches hosed, dewatered
	4	12N,17W,24	~1mi above site 3 (private)	8/8/2002	~200m	WCT	11	81-138	107		X		
West Mountain Cr.	1	15N,23W,20	Shour Property; Access last house on W. Mtn. Rd.	8/5/2002	~200m	WCT	28	68-184	109				Good habitat, Creek subs out in bottom half of sec. 20
	2	15N,23W 29	~200m above culvert on Rd. Xing	8/5/2002	~150m	WCT	35	42-197	96				Possible barrier between W. Mtn. Rd culvert and I-90 culvert

Table 2. Summary of fish sampling in Ninemile Creek drainage, 2001-2004

Stream Name	Site	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
Barrette Cr.	1	16N,23W,20	Rd 5520 xing	08/19/01	~ 100m	EBT	8	79-106	90				Fairly good habitat, section 20. Need upper site, hike in site.
	1	16N,23W,20	Rd 5520 xing	08/19/01	~ 100m	RBT	6	71-182	103				
	1	16N,23W,20	Rd 5520 xing	08/19/01	~ 100m	LL	3	81-109	96				
	2	16N,23W,19	~ 1 miupstream of Rd 5520 crossing	09/02/03	~200m	WCT	1	112	112		X		
	2	16N,23W,19	~ 1 miupstream of Rd 5520 crossing	09/02/03	~ 200m	EBT	14	53-141	105		X		
Beecher Cr.	1	17N,23W,16	Lowest Rd. xing (9 mile rd)	08/23/01	~ 100m	WCT	9	76-141	103	X			Good crossing, bridge. Many YOY's mixed sps. Moderate densities of fish. Pats Creek dry.
	1	17N,23W,16	Lowest Rd. xing (9 mile rd)	08/23/01	~ 100m	EBT	8	40-210	131	X			
	2	17N,23W,9	West Fk. Beecher Cr. foothills xing	08/23/01	~ 100m	WCT	9	62-156	104	X			culvert is a selective barrier, perched 6"(undersized). High densities of EBT, moderate densities of WCT.
	2	17N,23W,9	West Fk. Beecher Cr. foothills xing	08/23/01	~ 100m	EBT	23	52-175	131	X			
	3	17N,23W,10	East Fork of Beecher, foothills xing	08/20/01	~ 100m	WCT	8	57-126	89	X			crossing high amount of siddecast, WCT only above culvert.
	3	17N,23W,10	Below culvert, E.Fork Beecher	08/28/03	~150m	WCT	7	69-133	111				Culvert long, Steep. Barrier
Big Blue Cr.	1	17N,23W,30	Upper most Rd. xing 5498	09/18/01	~ 100m	WCT	4	75-155	114				Low fish densiteis, new bridge crossing. Water clarity still unclear because of culvert replacement.
	1	17N,23W,30	Upper most Rd. xing 5498	09/18/01	~ 100m	EBT	4	89-175	111				
	2	17N,23W,30	Lowest Rd. xing (9 mile rd)	09/18/01	~ 100m	RBT	4	87-137	93				Low gradient. Low fish densities, all non-natives.
	2	17N,23W,30	Lowest Rd. xing (9 mile rd)	09/18/01	~ 100m	LL	3	95-139	114				
	2	17N,23W,30	Lowest Rd. xing (9 mile rd)	09/18/01	~ 100m	EBT	7	87-210	131				
	3	17N,23W,19	Foothills Rd. 5498 to Xing.	08/21/02	~150m	WCT	21	56-174	111				Good habitat
	3	17N,23W,19	Foothills Rd. 5498 to Xing.	08/21/02	~150m	EBT	18	48-175	122				High EBT populations
	4	17N,24W,25	Down ~1mi from site 1.Hike down from Rd	08/21/02	~175m	WCT	12	66-158	89				
	4	17N,24W,25	Down ~1mi from site 1.Hike down from Rd	08/21/02	~175m	EBT	16	76-173	103				
Bird Cr.	1	16N,23W,11	Xing of Rd 5520, section 11	08/18/01	~ 100m	RBT	8	71-135	95				Fair habitat. Culvert looks ok. Possible selective barrier, lower section of bird PRIVATE
	1	16N,23W,11	Xing of Rd 5520, section 11	08/18/01	~ 100m	EBT	9	57-126	94				
	1	16N,23W,11	Rd. 5520 Xing. Upstream of culvert	09/03/02	~150m	WCT	10	86-170	121				Low fish densities, good looking habitat, culvert a barrier.
	1	16N,23W,11	Rd. 5520 Xing. Upstream of culvert	09/03/02	~150m	EBT	4	92-145	109				
	1	16N,23W,11	Below culvert on Rd. xing 5520	09/02/03	~200m	WCT	6	98-182	133				Culvert perched 6 inches (selective barrier)
	1	16N,23W,11	Below culvert on Rd. xing 5520	09/02/03	~200m	EBT	32	55-156	124				Culvert perched 6 inches (selective barrier)
Burnt Fork Cr.	1	17N,24W,22	Lowest Rd. xing (9 mile rd)	08/20/01	~ 100m	WCT	8	51-111	86				Burnt to a crisp. Good habitat
	1	17N,24W,22	Lowest Rd. xing (9 mile rd)	08/20/01	~ 100m	RBT	8	40-90	61				
	1	17N,24W,22	Lowest Rd. xing (9 mile rd)	08/20/01	~ 100m	EBT	7	60-123	81				
	2	17N,24W,15	West Fk Burnt FK. Below Foothills xing	08/23/01	~ 100m	WCT	9	100-150	118				Low densities . Culvert perched 1.0', velocity problems
	3	17N,24W,14	East Fk Burnt Fk, foothills xing	08/20/01	~ 100m	WCT	8	103-174	130				New culvert. Good habitat upstream of culvert. Moderate densities of WCT.
	3	17N,24W,14	East Fk Burnt Fk, foothills xing	08/20/01	~ 100m	EBT	2	52-104	78				
Butler Cr.	1	16N,22W,19	Bridge xing on rd. 5507	08/06/01	~ 300m	RBCT	1	92	92				Good habitat. High densities of EBT. 30 YOY's
	1	16N,22W,19	Bridge xing on rd. 5507	08/06/01	~ 300m	EBT	17	42-192	116				
	2	15N,22W,35	Bridge xing on 9-mile rd; rd 412	08/06/01	~ 150m	EBT	10	54-140	92				All non-natives
	2	15N,22W,35	Bridge xing on 9-mile rd; rd 412	08/06/01	~150m	LL	2	121	121				
	2	15N,22W,35	Bridge xing on 9-mile rd; rd 412	08/06/01	~150m	RBT	1	96	96				
	3	16N,22W,20	Downstream of Dam	09/03/02	~100m	WCT	52	55-192	123				Rock Step/pool. High WCT densities
	4	16N,22W,20	Downstream of Dam	09/03/02	~100m	WCT	19	61-192	121				Above dam- lower WCT densities. Rock step/pool
Camp Cr.	1	17N,24W,24	Uppermost xing on foothills Rd.	09/20/01	~ 100m	EBT	12	59-114	83		X		good habitat. Culvert replacement looks good.
	2	17N,24W,24	Spur Rd. 5501 at Xing	09/20/01	~ 100m	EBT	9	63-114	81		X		Low densities of fish. Excellent habitat, road decomissioned before it crosses camp creek.
	2	17N,24W,24	Spur Rd. 5501 at Xing	09/20/01	~ 100m	RBT	3	79-143	108		X		
	3	17N,24W,25	Main 9 mile rd xing	09/20/01	~ 100m	EBT	3	64-83	75		X		High amount of algea. Fair habitat. Extremely low fish densities, besides YOY's
	3	17N,24W,25	Main 9 mile rd xing	09/20/01	~ 100m	RBT	4	48-104	65		X		
Cedar Cr.	1	16N,23W,4	Xing on Rd. 5515	08/21/01	~ 100m	RBT	11	53-125	88	X			Culvert needs to be assessed. Upper part of Cedar Cr drainage needs to be sampled. Lower section is
	1	16N,23W,4	Xing on Rd. 5515	08/21/01	~ 100m	EBT	10	87-131	103	X			on private, also need samples.
	1	16N,23W,4	Xing on Rd. 5515	08/21/01	~ 100m	LL	3	97-105	101	X			
	1	16N,23W,34	Below USFS land on Bar One Ranch	06/25/02	~200m	No fish	N/A	N/A	N/A				Marginal habitat. Landowner claims no dewatering?
	2	16N,23W,4	~.5mi upstream of FS Rd. 5515 xing	06/25/02	~200m	RBT	2	95-114	104				Good habitat, shouldn't dewater.Spot shocked pools. >200m
	2	16N,23W,4	~.5mi upstream of FS Rd. 5515 xing	06/25/02	~200m	EBT	2	157-172	164				
Devil's Cr.	1	17N,25W,13	Rd. 9920 Xing	08/17/01		No fish							< than 2 cfs

Table 2. Summary of fish sampling in Ninemile Creek drainage, 2001-2004 (Page 2)

Stream Name	Section	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
Eustache Cr.	1	17N,25W,2	Upstream ~175m from xing on Rd. 97	08/01/01	~ 100m	No fish	N/A	N/A	N/A		X		
	2	17N,25W,11	Downstream ~250m from xing on Rd. 97	08/01/01	~ 100m	No fish	N/A	N/A	N/A		X		Culvert: complete barrier. 25', Perched.
	3	17N,25W,13	spur Rd. to the right	08/01/01	~ 100m	WCT	15	60-129	81		X		Moderate densite of WCT, site 1 and 2 up/down of uppermost culvert.
	3	17N,25W,13	spur Rd. to the right	08/01/01	~ 100m	EBT	1	100	100		X		
	4	17N,24W,18	~275m upstream of confluence of St.Louis	08/01/01	~ 100m	WCT	9	40-201	126		X		Moderate densities of WCT. Rare Ebt, good habitat, large deep pools.
	4	17N,24W,18	~275m upstream of confluence of St.Louis	08/01/01	~ 100m	RBT	1	82	82		X		
	4	17N,24W,18	~275m upstream of confluence of St.Louis	08/01/01	~ 100m	EBT	2	98-145	122		X		
	5	17N,25W,13	~1mi upstream of site 4	09/03/02	~100m	WCT	9	73-140	105		X		Little habitat diversity
	5	17N,25W,13	~1mi upstream of site 4	09/03/02	~100m	EBT	1	150	150		X		
Fire Cr.	1	16N,23W,29	Access Fire Cr. Ranch. Irrigation diversion	06/20/02	~200m	EBT	12	75-170	114		X		Not Fire Cr. In fact, an irrigation diversion
	1	16N,23W,29	Access Fire Cr. Ranch. Irrigation diversion	06/20/02	~200m	LL	2	150-155	152		X		Good LWD all sections
	2	16N,23W,30	Ist culvert on Fire Cr	06/20/02	~200m	No fish	N/A	N/A	N/A		X		
	3	16N,23W,30	~1mi upstream of site 2	06/20/02	~200m	EBT	1	110	110				
Josephine Cr.	1,2,3	16N,23W	Dry, No data sheet	08/23/01	N/A	N/A	N/A	N/A	N/A				Josephine Creek was dry throughout
	1	16N,23W,9	Up private Dr., sec. 9	09/02/03	100m	WCT	3	-	-				
	1	16N,23W,9	Up private Dr., sec. 9	09/02/03	100m	EBT	37	-	-				
Kennedy Cr.	1	16N,23W,27	Dry		N/A	N/A	N/A	N/A	N/A				
	1	16N,23W,27	Dry		N/A	N/A	N/A	N/A	N/A				
	2	16N,22W,13	Dry		N/A	N/A	N/A	N/A	N/A				
	2	16N,22W,13	Dry		N/A	N/A	N/A	N/A	N/A				
	1	16N,23W,23	Kennedy Cr. Rd.; private land at end of Rd.	08/21/02	~150m	EBT	26	47-162	96		X	X	Poor habitat- residential "backyard". EBT dominate degredated habitat
	2	16N,23W,13	~.75mi up from site 1. By F.S gate	08/21/02	~200m	WCT	22	60-146	94		X	X	Habitat getting better as distance from residential increases
	2	16N,23W,13	~.75mi up from site 1. By F.S gate	08/21/02	~200m	EBT	4	72-92	82		X	X	
	3	16N,23W,23	Above culvert in Y in Rd.	08/21/02	~200m	EBT	~20				X	X	No lengths taken
	4	16N,23W,18	~1mi. Up from F.S gate. Above Irr. Div.	08/21/02	~175m	WCT	24	52-167	84		X	X	Old mine- good habitat otherwise. Sampled above diversion. likely barrier.
Little Bear Cr.	1	17N,24W,4	Rd. Xing 5520	08/18/01	N/A	No fish	N/A	N/A	N/A				Lower Little Bear Cr. Restricted travel.
Little Blue Cr.	1,2	17N,23W	xing of main 9 mile rd, xing 5500	08/17/01	N/A	N/A	N/A	N/A	N/A				DRY, all sections of little blue were dry
Marion Cr.	1	16N,23W,7	Main 9 mile rd xing	08/23/01	N/A	dry	N/A	N/A	N/A				This section of Marion Creek was dry, irrigation, private
	2	16N,23W,5	Little Marion cr. xing, section 5	08/23/01	N/A	dry	N/A	N/A	N/A				Little Marion Cr. was dry
	3	16N,23W 33	PC land, Marion Cr. xing	08/23/01	~ 100m	EBT	8	59-135	86				Fair habitat, logging, low densities of fish
Martina Cr.	1	17N,24W,29	Rd. Xing 5520	08/18/01	N/A	dry	N/A	N/A	N/A				Xing was dry. Need contact of landowner in lower Martina Cr.
Mattie V Cr.	1	17N,24W,27	1st culvert xing	07/30/01	~ 75m	WCT	1	129	129				Good habitat, large amount of LWD. Step pools, low densities of fish.
	1	17N,24W,27	1st culvert xing	07/30/01	~ 75m	EBT	9	72-144	110				
	2	17N,24W,27	RD xing on Rd # 16832	07/30/01	~150m	WCT	7	79-124	103				Good habitat. Extremely low fish densities, culvert possible selective barrier. Less than bankfull width
	2	17N,24W,27	RD xing on Rd # 16832	07/30/01	~150m	EBT	4	84-110	99				
	3	17N,24W,27	3rd xing upstream of the mouth	07/30/01	~100m	No fish	N/A	N/A	N/A				N/A
McCormick Cr.	1	16N,23W,15	Bridge xing rd. 392	08/22/01	~100m	HYB(rbct)	6	79-124	93				High densities, all species. No genetics taken, hybrids. Aprrox. 150 YOY's.
	1	16N,23W,15	Bridge xing rd. 392	08/22/01	~100m	RBT	8	39-101	72				
	1	16N,23W,15	Bridge xing rd. 392	08/22/01	~100m	LL	2	89-126	108				
	1	16N,23W,15	Bridge xing rd. 392	08/22/01	~100m	EBT	10	56-142	103				
	2	16N,23W,12	Bridge xing to private land, section1/12	08/22/01	~100m	WCT	18	65-145	90				
	2	16N,23W,12	Bridge xing to private land, section1/12	08/22/01	~100m	EBT	5	79-130	105				High density of fish. Xing to private land is a bridge. WCT appeared slightly hybridized.
	3	16N,23W,10	Little Mccormick crossing, DRY	08/22/01	N/A	N/A	N/A	N/A	N/A				Little McCormick Cr. was dry
	1	16N,23W,15	F.S Rd.392 to F.S boundry; upstream	08/02/02	~150m	WCT	33	47-168	98		X	X	High densities, many species
	1	16N,23W,15	F.S Rd.392 to F.S boundry; upstream	08/02/02	~150m	EBT	9	41-151	91		X	X	
	1	16N,23W,15	F.S Rd.392 to F.S boundry; upstream	08/02/02	~150m	LL	2	160-202	181		X	X	
Moncure Cr.	1	16N,23W,19	Xing of Rd 5520, section 19	08/19/01	~90m	RBT	10	85-131	103				Culvert xing was ok, moderate densities of WCT
	1	16N,23W,19	Xing of Rd 5520, section 19	08/19/01	~100m	EBT	4	68-107	93				
	1	16N,23W,19	Xing of Rd 5520, section 19	08/19/01	~100m	LL	5	87-126	104				
	2	16N,24W,24	Upper Rd xing 18163, switchback	08/19/01	~100m	N/A	N/A	N/A	N/A				DRY

Table 2. Summary of fish sampling in Ninemile Creek drainage, 2001-2004 (Page 3)

Stream Name	Section	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
Nine Mile Cr. (main stem)													
	1	15N,22W,17	Kreis property ~ 3 mi above mouth	10/01/03	~ 400m	RBT	66	42-165	-				WCT & RBT poorly differentiaited
	1	15N,22W,17	Kreis property ~ 3 mi above mouth	10/01/03	~ 400m	LL	38	60-462	-				
	1	15N,22W,17	Kreis property ~ 3 mi above mouth	10/01/03	~ 400m	MWF	>50	-	-				Spawning congregation
	1	15N,22W,17	Kreis property ~ 3 mi above mouth	10/01/03	~ 400m	WCT	1	103	103				WCT & RBT poorly differentiaited
	1	15N,22W,17	Kreis property ~ 3 mi above mouth	10/01/03	~ 400m	LND	2	48-54	51				
	2	15N,22W,7	Xing on Rd5511, main 9 mile RD	08/25/01	~100m	EBT	4	89-207	155	?			Many MWF
	2	15N,22W,7	Xing on Rd5511, main 9 mile RD	08/25/01	~100m	RBT	11	109-317	238	?			
	2	15N,22W,7	Xing on Rd5511, main 9 mile RD	08/25/01	~100m	LL	9	103-419	224	?			
	3	15N,22W,7	400 yds downstream from bridge, section7	08/25/01	~100m	LL	10,+25	107-407	261	?			Good habitat, Possible some problems B/C of homes.
	3	15N,22W,7	400 yds downstream from bridge, section7	08/25/01	~100m	RBT	6	109-401	241	?			
	4	16N,23W,17	Jan Dershams house, down from bridge	08/14/01	~ 75m	RBT	12	40-335	142	?			Lots of YOY's, Directly behind house, High densities of fish, mixed species. Lots of wood, deep pools
	4	16N,23W,17	Jan Dershams house, down from bridge	08/14/01	~ 75m	LL	13	60-481	225	?			
	4	16N,23W,17	Jan Dershams house, down from bridge	08/14/01	~ 75m	WCT	2	280-370	325	?			
	4	16N,23W,17	Jan Dershams house, down from bridge	08/14/01	~ 75m	MWF	2	220-335	278	?			
	5	16N,23W,17	500 yds upstream of house	08/14/01	~100m	RBT	8	90-325	196	?			
	5	16N,23W,17	500 yds upstream of house	08/14/01	~100m	LL	10	105-455	331	?			
	5	16N,23W,17	500 yds upstream of house	08/14/01	~100m	EBT	2	219-235	227	?			
	5	16N,23W,17	500 yds upstream of house	08/14/01	~100m	LNS	1	107	107	?			
	6	16N,23W,17	AT headgate of dersham ditch	08/14/01	spotshock	LL	~50			?			YOY's
	6	16N,23W,17	AT headgate of dersham ditch	08/14/01	spotshock	RBT	~50			?			YOY's
	7	16N,24W,1	350yds from Audiono bridge	08/20/01	~ 75m	LL	14	118-241	161	?			High fish densities, good habitat, Non genetics, Many YOY's
	7	16N,24W,1	350yds from Audiono bridge	08/20/01	~ 75m	EBT	9	86-171	138	?			
	7	16N,24W,1	350yds from Audiono bridge	08/20/01	~ 75m	RBT	16	60-155	100	?			
	7	16N,24W,1	350yds from Audiono bridge	08/20/01	~ 75m	MWF	4	83-91	88	?			
	8	16N,24W,1	0.25mi up from Audino bridge	08/20/01	~100m	RBT	8	139-265	194	?			Good stream habitat, good pool:riffle ratio. Banks need vegetation, good fish densities.
	8	16N,24W,1	0.25mi up from Audino bridge	08/20/01	~100m	EBT	3	121-175	147	?			
	8	16N,24W,1	0.25mi up from Audino bridge	08/20/01	~100m	LL	3	191-256	222	?			
	9	16N,24W,1	0.50 mi up from Audino bridge	08/20/01	spot	mixed				?			Extremely deep pool, many fish
	10	17N,24W,22	Mile post 17/18, spur road off to left	08/30/01	~ 75m	RBT	8	56-121	79	?			Fair habitat, good pool:riffle ratio.
	10	17N,24W,22	Mile post 17/18, spur road off to left	08/30/01	~ 75m	LL	6	94-164	127	?			
	10	17N,24W,22	Mile post 17/18, spur road off to left	08/30/01	~ 75m	EBT	2	131-146	138	?			
	11	17N,24W,21	1.0 mile upstream of little burnt fork	08/30/01	~ 50m	EBT	6	45-210	151	?			Habitat looks good, old ford.
	11	17N,24W,21	1.0 mile upstream of little burnt fork	08/30/01	~ 50m	RBT	7	87-110	99	?			
Pine Cr.	1	16N,23W,6	9-mile road crossing	08/25/01	~100m	RBT	8	75-169	111				Pine Creek had some of the highest flows of any tributarie to nine mile creek. There were moderate
	1	16N,23W,6	9-mile road crossing	08/25/01	~100m	HYB(rbct)	5	87-142	116				densities of all species in sampling section 1. Dominated by non-natives.
	1	16N,23W,6	9-mile road crossing	08/25/01	~100m	LL	5	87-126	104				
	1	16N,23W,6	9-mile road crossing	08/25/01	~100m	EBT	10	71-186	110				
	2	17N,23W,32	Old spur road, section 32	08/25/01	~100m	HYB(rbct)	4	89-146	114				Good habitat. Moderate densities of all fish species that are listed.
	2	17N,23W,32	Old spur road, section 32	08/25/01	~100m	RBT	4	85-161	111				
	2	17N,23W,32	Old spur road, section 32	08/25/01	~100m	EBT	7	69-141	110				
	3	17N,23W,29	Spur road off 5500, FS land, section 29	08/25/01	~100m	HYB(rbct)	9	71-126	97				Good habitat. Moderate densities of all fish species that are listed. Low gradient.
	3	17N,23W,29	Spur road off 5500, FS land, section 29	08/25/01	~100m	EBT	6	55-117	87				
Sawpit Cr.	1	17N,24W,20	Xing of Rd 5520	08/17/01	N/A	N/A	N/A	N/A	N/A				DRY
Soldier Cr.	1	17N,24W,24	Crossing on Foothills rd, above culvert	09/20/01	~100m	EBT	10	63-105	83	X			New culvert, good habitat upstream of crossing.
	2	17N,24W,26	0.50 mi spur road, rd 5501	09/20/01	~100m	EBT	6	53-110	82	X			Good habitat, dense cover. Spur road 0.11 mi after soldier
	2	17N,24W,26	0.50 mi spur road, rd 5501	09/20/01	~100m	RBT	7	43-131	81	X			
	3	17N,24W,26	Crossing main 9mile road	09/20/01	~100m	EBT	7	58-112	76	X			Good habitat, low fish densities.
	3	17N,24W,26	Crossing main 9mile road	09/20/01	~100m	RBT	7	46-79	57	X			
St. Louis Cr.	1	17N,24W,18	Lowest culvert crossing,	08/01/01	~100m	WCT	9	68-150	97	X	X	X	Moderate densities of WCT. Culvert not a barrier. Aligned correctly.
	1	17N,24W,18	Lowest culvert crossing,	08/01/01	~100m	EBT	6	52-146	113	X	X	X	
	2	17N,24W,8	End of spur rd #17432, 300' upstream	08/01/01	~100m	WCT	15	60-135	99	X	X	X	High densities of WCT. No other fish. Good habitat.
	3	17N,24W,8	Uppermost xing on foothills rd	08/01/01	~ 75m	WCT	13	61-172	127	X	X	X	High densities of WCT, good habitat. Culvert is a barrier.
Stoney Cr.	1	15N,22W,5	Rd. Xing 5489, ~150m up from culvert	08/06/01	~ 150m	WCT	14	66-150	101	X			Culvert excellent; fish appeared hybridized
	2	15N,22W,33	Rd. Xing 456, culvert	08/06/01	~100m	WCT	15	56-171	107	X			Culvert good. High densities. Good habitat
Twin Cr.	1	17N,24W,26	xing closest to the mouth	07/30/01	~ 75m	EBT	12	40-147	83		X	X	Culvert looks fine, low fish densities, fair habitat
	2	17N,24W,27	Rd xing section 27, above culvert	07/30/01	~ 50m	EBT	18	32-170	95		X	X	Culvert looks okay
	3	17N,24W,27	uppermost Rd xing, section 27	07/30/01	~ 100m	N/A	N/A	N/A	N/A				N/A

Table 3. Summary of fish sampling on Fish Creek, 1999-2004

Stream Name	Section #	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # Captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
Bear Creek	1	13N,24W,2	PC land, 1st road crossing	8/4/1999	~ 80 m	WCT	42	62-215	104.2	X	X	X	760 sec. Shocking time, widths=7,8,8,7,9 ft
	2	13N,24W11	2nd road crossing, PC land	8/4/1999	~ 30 m	WCT	16	43-115	86.1	X	X	X	180 sec. Shocking time, 10deg C, wid=3.5,4 ft
	3	13N,24W,35	near mouth, bear point	8/4/1999	~ 300 m	WCT	7	80-230	149.1	X	X	X	section 3, Inefficient with backpack shocker (approx. 25 cfs), low densities of fish. The
	3	13N,24W,35	near mouth, bear point	8/4/1999	~ 300 m	DV	7	130-173	152.7	X	X	X	16 additional EBT were between the sizes of 48-60 mm.
	3	13N,24W,35	near mouth, bear point	8/4/1999	~ 300 m	RBxCT	1	142	142	X	X	X	
	3	13N,24W,35	near mouth, bear point	8/4/1999	~ 300 m	EBT	19 (+16)	60-300	177.7	X	X	X	
Burdette Creek	1	12N,23W,9	Trail xing, lower section 9	6/14/2000	~ 150 m	WCT	31	70-200	136.3	X	X		552 sec of shocking time, spawning observed in all sections, rosgen C5 channel type
	1	12N,23W,9	Trail xing, lower section 9	6/14/2000	~ 150 m	RBxCT	1	180	180	X	X		
	1	12N,23W,9	Trail xing, lower section 9	6/14/2000	~ 150 m	EBT	11	120-230	172.2	X	X		
	1	12N,23W,9	Trail xing, lower section 9	6/14/2000	~ 150 m	SCUL	12	50-115	86.5	X	X		sculpins and ebt are found in moderate populations in section 1
	2	12N,23W,35	Confluence of tributary in section 35	6/14/2000	~ 95 m	WCT	33	55-275	141.6	X	X		sculpins located in this area in rare numbers, section 2 dominated by B4c rosgen
	2	12N,23W,35	Confluence of tributary in section 35	6/14/2000	~ 95 m	EBT	6	90-200	137.5	X	X		channel type
	3	12N,23W,25	Just upstream of trails end	6/14/2000	~ 75 m	WCT	16	85-180	128.1	X	X		230 seconds of shocking time, section 3 B4c rosgen channel type
	3	12N,23W,25	Just upstream of trails end	6/14/2000	~ 75 m	EBT	5	100-165	119.2	X	X		
Cache Creek	1	12N,24W,13		7/13/2000	~ 400 m	WCT	13	60-295	119.3	X	X	X	moderate densities of sculpins and tailed frogs, temperature 15 degrees C.
	1	12N,24W,13	middle of section 23	7/13/2000	~ 400 m	DV	6	48-160	97.3	X	X	X	
	1	12N,24W,13	middle of section 23	7/13/2000	~ 400 m	EBT	12	95-180	131.1	X	X	X	
	2	12N,24W,24	Lower end sect 24	7/13/2000	~ 300 m	WCT	16	60-200	109.4	X	X	X	temperature 16 degrees C, moderated spotted frogs
	2	12N,24W,24	Lower end sect 24	7/13/2000	~ 300 m	DV	3	50-180	93.3	X	X	X	
	2	12N,24W,24	Lower end sect 24	7/13/2000	~ 300 m	EBT	16	70-210	115.6	X	X	X	
	3	12N,24W,19	Whites creek, ~ 3/4 mile above mouth	7/9/2000	~ 150 m	WCT	17	66-170	124.5	X	X	X	moderate densities, temperature 10 degrees C
	3	12N,24W,19	Whites creek, ~ 3/4 mile above mouth	7/9/2000	~ 150 m	RBxCT	1	160	160	X	X	X	
	3	12N,24W,19	Whites creek, ~ 3/4 mile above mouth	7/9/2000	~ 150 m	EBT	4	99-165	129	X	X	X	
Deer Creek	1	13N,24W,7	Lowest road crossing	5/20/1999	~ 100 m	WCT	2	97-183	140				section 1 heavily overgrown with algae on 5/20
	1	13N,24W,7	Lowest road crossing	5/20/1999	~ 100 m	EBT	7	100-212	136				
	2	13N,24W,9	Road crossing	5/20/1999	~ 50 m	WCT	9	87-145	118.3				7deg C, great spawning habitat, observed spawn
	3	13N,24W,10	Road crossing, above culvert	5/20/1999	~ 30 m	WCT	8	45-135	88.5				above perched culvert, moose
	4	13N,24W,8	1.5 miles from mouth, near spur road	5/20/1999	~ 100 m	WCT	19	65-205	126.3				10deg C, 419 sec shocking
Fletcher Gulch (N. Fork)	1	14N,26W,29	Fletcher Gul. (~.25mi up Fletcher Gul)	7/22/2004	125 m	WCT	20	82-205	132		X		
French Creek (N. Fork)	1	14N,26W,21	~.5mi up French Crk from confl.	7/22/2004	135 m	WCT	3	130-145	140				Definite wct/rbt and rbt hybrids. Possible stocking French L..
	1	14N,26W,21	~.5mi up French Crk from confl.	7/22/2004	135 m	RBT	5	68-173	141				
	1	14N,26W,21	~.5mi up French Crk from confl.	7/22/2004	135 m	RBxCT	2	124-140	132				
Greenwood Creek (N. Fork)	1	14N,26W,15	~.75mi up Greenwood Crk	7/22/2004	100 m	NO FISH							High gradient section
	2	14N,26W,15,22	~100m above Tr. #103 (lower site)	7/22/2004	150 m	WCT	12	59-135	95.1				
	2	14N,26W,15,22	~100m above Tr. #103 (lower site)	7/22/2004	150 m	DV	1	500	20"				
Indian Creek	1	13N,26W,2	Middle Fk. Indian, .25mi above W. Fk confl.	7/30/2004	150 m	WCT	13	80-210	136.2				
	2	13N,26W,35,36	W. Fk Indian Crk. Tr. #121 xing sec 35-36	7/30/2004	125 m	WCT	16	55-187	119.8		X		big falls just above tr. #121-no passage.
	3	13N,26W,36	E. Fk Indian crk, .25mi above confl.	7/30/2004	125 m	WCT	14	35-172	88.6				Fire last year, changed channel
	4	13N,26W,36	Mainstem Indian crk., Tr #121 xing up	7/30/2004	150 m	WCT	24	61-178	120.9		X		
Oriole Creek	1	12N,24W,22	Road xing down from culvert barrier	7/9/2000	~ 40 m	WCT	11	75-158	118.4		X		relatively high densities of WCT
	2	12N,24W,22	upstream of culvert barrier	7/9/2000	~. 60 m	WCT	10	60-174	127.3		X		Culvert is an upstream migration barrier, high desities of WCT, moderate densities
	2	12N,24W,22	upstream of culvert barrier	7/9/2000	~ 60 m	EBT	1	152	152		X		tailed frogs
	3	12N,24W,27	approx. .25 miles up from road 4212 xing	7/9/2000	~ 70 m	WCT	17	58-160	114.1		X		flows approx. 2 cfs
Lupine Creek	1	12N,24W,12	.25 miles below major trib	7/11/2000	~ 150 m	WCT	18	82-162	114.3	X			hike in area, approx. 3 cfs
	1	12N,24W,12	.25 miles below major trib	7/11/2000	~ 150 m	EBT	5	123-160	139.2	X			
	2	12N,24W,11	downstream of N/S draw	7/11/2000	~ 100 m	WCT	15	68-170	127.2	X			moderate sculpins
	2	12N,24W,11	downstream of N/S draw	7/11/2000	~ 100 m	EBT	22	73-189	138.9	X			
	3	12N,24W,15	.25 miles above private section	7/11/2000	~ 100 m	WCT	14	107-195	148.4	X			moderate sculpins, approx. 5 cfs
	3	12N,24W,15	.25 miles above private section	7/11/2000	~ 100 m	EBT	25	60-175	164.2	X			
Montana Creek (Cache Creek)	1	12N,24W,10	upper xing, road 4218	7/9/2000	~ 100 m	WCT	16	49-189	110.7	X		X	moderate densities,approx. 15 cfs, low shocking efficiency
	2	12N,24W,11	upper xing O'neil creek	7/9/2000	~ 100 m	NO FISH	0	0	0	X		X	habitat looks good, looks perennial must have natural barrier
	3	12N,24W,18	MT creek lowest site	7/9/2000	~ 200 m	WCT	12	58-170	111.2	X		X	low densities, #2 Cache creek

Table 3. Summary of fish sampling on Fish Creek, 1999-2004 (Page 2)

Stream Name	Section #	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # Captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
North Fork Fish Creek	1	14N,26W,22	Greenwood cabins to Greenwood Cr confl	7/20/2004	150 m	WCT	24	61-178	122.1				
	1	14N,26W,22	Greenwood cabins to Greenwood Cr confl	7/20/2004	150 m	DV	12	90-207	117				2 adult DV shocked in this section
	2	14N,26W,26	Start reach at Crater Crk confluence	7/20/2004	150 m	WCT	16	70-210	110.2				
	2	14N,26W,26	Start reach at Crater Crk confluence	7/20/2004	150 m	DV	3	103-195	152				low densities of spp
	3	14N,26W,21,28	~1mi above French Crk (Buckos pocket)	7/22/2004	150 m	WCT	22	59-220	125		X		
	3	14N,26W,21,28	~1mi above French Crk (Buckos pocket)	7/22/2004	150 m	DV	9	140-216	171.3		X		
	4	14N,26W,29	~.25mi below Fletcher Gulch	7/22/2004	150 m	WCT	17	53-150	101		X		
	5	14N,26W,36	~1mi above confluence w/ Straight Crk	7/27/2004	150 m	WCT	15	71-134	90.2				
	5	14N,26W,36	~1mi above confluence w/ Straight Crk	7/27/2004	150 m	EBT	1	110	110	X	X		
Straight Creek	1	13N,26W,9	Base of Straight Peak	8/31/2004	100 m	WCT	45	85-197	119		X		
	2	13N,26W,11	Above falls, Creek crossing of Tr.#99	8/31/2004	100 m	WCT	32	72-235	138				
Surveyors Creek	1	12N,25W,35	.25 miles above south fork, xing PC land	7/7/2000	~ 100 m	WCT	9	86-149	106.2	X	X		low fish densities, walked 1/3 mile above culvert at site 1, no barriers
	2	12N,25W,35	below road xing on norht fork	7/7/2000	~ 100 m	WCT	17	90-137	102	X	X		
	3	12N,25W,36	below road xing north fork	7/7/2000	~ 100 m	WCT	9	47-140	107.5	X	X		low fish densities.
	3	12N,25W,36	below road crossing, north fork	7/7/2000	~ 100 m	EBT	5	45-158	104.4	X	X		
	4	12N,25W,31	mainstem, below road on PC	7/7/2000	~ 150 m	WCT	10	64-212	101.3	X	X		
	4	12N,25W,31	mainstem, below road on PC	7/7/2000	~ 150 m	EBT	2	128-165	146.5	X	X		
Thompson Creek	1	13N,24W,13	lower end of section 13	9/8/1999	~ 60 m	WCT	24	46-198	111.3	X			approx. 400 seconds of shocking time. 48 degrees F, sculpins in moderate populatins
	1	13N,24W,13	lower end of section 13	9/8/1999	~ 60 m	EBT	7	103-136	121.4	X			
	2	13N,24W,14	road crossing section 14	9/8/1999	~ 75 m	WCT	8	147-245	180	X			42 degrees F.
	2	13N,24W,14	road crossing section 14	9/8/1999	~ 75 m	EBT	16	60-205	104.5	X			
	3	13N,24W,26	road crossing section 26	9/8/1999	~ 75 m	WCT	7	85-182	145.3	X			40 degrees F, moderate populations of scul.
Trail Creek	1	14N,25W,26	Downstream of culvert 1	5/6/1999	~ 50 m	WCT	21	57-148	94				single pass
	2	14N,25W,26	Upstream of culvert 1	5/6/1999	~ 50 m	WCT	7	51-87	65.9				single pass
	3	14N,25W,35	Upstream of culvert 2	5/6/1999	~ 50 m	WCT	12	86-135	109.25				2 ripe males, one with underbite
West Fork Fish Creek	1	13N,26W,27	~2mi up W. Fk trail #101 past Indian crk trail	7/29/2004	150 m	WCT	15	120-230	163.2		X		
	1	13N,26W,27	~2mi up W. Fk trail #101 past Indian crk trail	7/29/2004	150 m	DV	12	46-178	136.7		X		good habitat. 1 DV ~20" observed at top of site
	2	13N,26W,26	~1mi below site 1	7/29/2004	200 m	WCT	10	112-215	167.2		X		
	2	13N,26W,26	~1mi below site 1	7/29/2004	200 m	DV	29	50-190	128.2		X		high dv densities, low wct densities
	3	13N,26W,24	Junction of trail # 101 and 510	8/19/2004	100 m	WCT	14	95-181	133	X			
	3	13N,26W,24	Junction of trail # 101 and 510	8/19/2004	100 m	DV	11	89-194	143	X			
	4	13N,25W,18	~.75mi above Fire crk	8/19/2004	150 m	WCT	11	76-217	146	X	X		
	4	13N,25W,18	~.75mi above Fire crk	8/19/2004	150 m	DV	4	99-170	131.7	X	X		
Wig Creek	1	12N,24W,29	mouth below natural falls	5/25/1999	spot	WCT	9	65-172	117.3				spot shocking, temp 10 degrees C
	1	12N,24W,29	mouth below natural falls	5/25/1999	spot	DV	1	160	160				
	2	12N,24W, 29	above falls, downstream of culvert	5/25/1999	spot	WCT	1	120	120				stopped shocking due to fluvial spawning activity, culvert is partial barrier selective,
	3	12N,24W,29	above culvert, barrier	5/25/1999	spot	WCT	3	115-425	220				small fish, ripe female
	4	12N,24W,31	below wig cr lodge, upstream crossing	7/21/1999	~50 m	WCT	17	75-200	113.8				12 degrees C, 358 shocking time

Table 4. Summary of St. Regis River drainage fish sampling, 2001-2004

Stream Name	Section	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
Big Cr. (E. Fork)	1	18N,30W,9	Above McKinney Cr. On Rd. # 386	8/16/2002	~200m	WCT	9	80-243	147	X	X	X	Thick understory. Good habitat
	1	18N,30W,9	Above McKinney Cr. On Rd. # 386	8/16/2002	~200m	EBT	17	48-207	133	X	X	X	Thick understory. Good habitat
	2	18N,30W,17	~1mi. Above site 1. below lodgepole Cr.	8/16/2002	~200m	WCT	8	73-205	135	X	X	X	
	2	18N,30W,17	~1mi. Above site 1. below lodgepole Cr.	8/16/2002	~200m	EBT	25	54-267	153				
Big Cr. (M. Fork)	1	19N,30W,27	~1mi. Above confluence w/ St. Regis.	8/15/2002	~200m	WCT	13	77-177	116	X	X		Possible hybrids in lower drainage
	1	19N,30W,27	~1mi. Above confluence w/ St. Regis.	8/15/2002	~200m	RBT	1	109	109	X	X		
	1	19N,30W,27	~1mi. Above confluence w/ St. Regis.	8/15/2002	~200m	EBT	2	69-126	97	X	X		
	2	19N,30W,33	Below all forks of Big Cr.	8/15/2002	~200m	WCT	15	68-141	91	X	X		
	2	19N,30W,33	Below all forks of Big Cr.	8/15/2002	~200m	EBT	14	48-235	104	X	X		
	3	19N,30W,32	.5 mi. above confluence	8/15/2002	~200m	WCT	28	76-133	138	X	X		
	3	19N,30W,32	.5 mi. above confluence	8/15/2002	~200m	EBT	1	245	245	X	X		
	4	18N,30W,13	Between sections 12,13	8/15/2002	~150m	WCT	22	77-210	138	X	X		
Big Cr. (W. Fork)	1	19N,30W,30	Directly below end of Rd.	8/15/2002	~150m	WCT	13	98-202	145	X	X	X	Large culvert between sites 1&2 on old Rd. Xing.
	1	19N,30W,30	Directly below end of Rd.	8/15/2002	~150m	EBT	8	42-251	125	X	X	X	Probably not a barrier during high water events
	1	19N,30W,30	Directly below end of Rd.	8/15/2002	~150m	LL	1	312	312	X	X	X	
	2	19N,31W,36	~1.5 mi up from site 1. Above big culvert	8/15/2002	~125m	WCT	18	80-253	129	X	X	X	Good habitat in upper drainage.
	2	19N,31W,36	~1.5 mi up from site 1. Above big culvert	8/15/2002	~125m	EBT	7	79-267	155	X	X	X	
Borax Cr.	1	19N,32W,4	Before underpass on I-90 on frontage rd.	8/30/2002	~200m	WCT	23	68-267mm	139	X	X	X	Probable barrier at "culvert/tunnel"
Brimstone Cr.	1	20N,31W,25	Up Randolph Cr. Rd. past substation.	8/30/2002	~200m	WCT	25	54-159	76		X	X	8" hanging culvert at bottom of site
	2	19N,32W,3	Frontage rd. W to tunnel at rd. crossing	8/30/2002	~200m	WCT	33	69-198	110		X	X	Healthy WCT Populations at both sites
Cook Cr.	1	19N,30W,11	Up F.S. Rd. 3811 to power lines	8/28/2002	~200m	no fish							Access difficult
	2	19N,30W,14	Private Rd. below last house on Rd.	8/28/2002	~200m	EBT	13	81-125	94	X	X	X	low densities of WCT
	3	19N,30W,22	Below confluence of Cook/Savenac Cr.	8/28/2002	~200m	WCT	7	99-184	130	X	X	X	
	3	19N,30W,22	Below confluence of Cook/Savenac Cr.	8/28/2002	~200m	LL	1	232	232	X	X	X	
	3	19N,30W,22	Below confluence of Cook/Savenac Cr.	8/28/2002	~200m	EBT	27	42-220	123	X	X	X	
Deer Cr.	1	18N,30W,22	~200m above last Rd. xing on Deer Cr	8/14/2002	~200m	WCT	24	91-181	131	X	X		Good access. More WCT found at higher sites.
	2	18N,30W,2	~1mi. Upstream of site 3, by Up Up Cr.	8/14/2002	~200m	WCT	13	89-256	160	X	X		
	2	18N,30W,2	~1mi. Upstream of site 3, by Up Up Cr.	8/14/2002	~200m	EBT	10	52-257	156	X	X		
	3	18N,30W,36	~.5mi. Up from mouth of St. Regis R.	8/14/2002	~200m	WCT	2	135-186	160	X	X		
	3	18N,30W,36	~.5mi. Up from mouth of St. Regis R.	8/14/2002	~200m	EBT	12	95-193	132	X	X		
	3	18N,30W,36	~.5mi. Up from mouth of St. Regis R.	8/14/2002	~200m	MWF	1	89	89	X	X		
	4	18N,30W,2	~1mi. Above site 3. Through campground	8/14/2002	~150m	WCT	8	81-167	120	X	X		
	4	18N,30W,2	~1mi. Above site 3. Through campground	8/14/2002	~150m	EBT	11	76-235	154	X	X		
Denna Mora Cr.	1	19N,32W,10	~1.5mi up Rd. Above culvert by private	8/22/2002	~200m	WCT	7	77-210	152	X	X		Low densities of fish. Good habitat. New Const.
	2	19N,32W,11	~100m above confluence of St. Regis R.	8/22/2002	~200m	WCT	9	67-177	112	X	X		of culvert and roads
	2	19N,32W,11	~100m above confluence of St. Regis R.	8/22/2002	~200m	EBT	6	72-156	114	X	X		
Dominion Cr.	1	19N,31W,18	~.5mi. Up from confluence with St. Regis	8/16/2002	~200m	WCT	19	62-147	100				Hanging Culvert ~1.5' at Rd. X-ing between sites.
	1	19N,31W,19	~.5mi. Up from confluence with St. Regis	8/16/2002	~200m	EBT	1	100	100				Possible barrier. Culvert is ~12-15' long.
	2	19N,31W,19	~1mi Above site 1. Rd. intersects Cr.	8/16/2002	~200m	WCT	22	62-189	111				
Hanakar Cr.	1	19N,32W,3	From confluence of St.Regis R. up	8/22/2002	~250m	WCT	8	67-169	110		X	X	
	2	19N,32W,10	~1mi up Rd.	8/22/2002	~100m	no fish							No aquatic life in section 2. Looks like good habitat.
Henderson Cr.	1	19N,29W,4	Start where Frontage Rd. crosses Cr.	8/14/2002	~200m	WCT	7	76-165	119	X	X	X	
	1	19N,29W,4	Start where Frontage Rd. crosses Cr.	8/14/2002	~200m	EBT	8	68-186	113	X	X	X	
	1	19N,29W,4	Start where Frontage Rd. crosses Cr.	8/14/2002	~200m	LL	1	98	98	X	X	X	
	2	19N,29W,5	Hike upstream ~1mi. From site 1	8/14/2002	~200m	WCT	23	63-152	86		X	X	Good habitat. Thick understory
	2	19N,29W,5	Hike upstream ~1mi. From site 1	8/14/2002	~200m	EBT	5	45-172	114		X	X	

Table 4. Summary of St. Regis River drainage fish sampling, 2001-2004 (Page 2)

Stream Name	Section	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
Little Joe Cr.	1	17N,28W,3	~.5mi. Up S. Fk. Little Joe Cr.	11/12/1999	~225m	WCT	22	86-289	196	?	X		No WCT genetics taken
(South Fork)	1	17N,28W,3	~.5mi. Up S. Fk. Little Joe Cr.	11/12/1999	~225m	DV	8	118-309	208	?	X		
Little Joe Cr.	1	17N,28W,4	~1mi. Upstream on N. Fk. Little joe Cr.	11/12/1999	~75m	WCT	21	95-264	184	?	X		
(North Fork)	1	17N,28W,4	~1mi. Upstream on N. Fk. Little joe Cr.	11/12/1999	~75m	EBT	4	194-230	211	?	X		
	1	17N,28W,4	~1mi. Upstream on N. Fk. Little joe Cr.	11/12/1999	~75m	DV	2	156-168	162	?	X		
	2	17N,28W,5	~2.1mi. Upstream on N. Fk. Little Joe Cr.	11/12/1999	~80m	WCT	6	182-240	210	?	X		
	3	17N,28W,7	~4mi. Upstream on N. Fk. Little Joe Cr.	8/29/2002	~200m	WCT	44	60-217	130	?	X		LWD/step pool. High densities of fish
	3	17N,28W,7	~4mi. Upstream on N. Fk. Little Joe Cr.	8/29/2002	~200m	DV	3	92-104	96	?	X		
	4	17N,28W,5	~2 mi. upstream on N. Fk. Little Joe Cr.	8/29/2002	~200m	WCT	16	80-240	147	?	X		Rock Controlled, some LWD. Lower fish densities
	4	17N,28W,5	~2 mi. upstream on N. Fk. Little Joe Cr.	8/29/2002	~200m	DV	13	108-232	168	?	X		
McManus Cr.	1	19N,30W,5	Rd. xing under power lines	9/4/2002	~100m	EBT	18	91-125	106	X			Low gradient. Impacted habitat throughout
	2	19N,30W,7	Rd. 288 xing	9/4/2002	~150m	EBT	17	63-230	126	X			
	3	19N,30W,20	Immediately above I-90	9/4/2002	~150m	WCT	7	78-146	111	X			
	3	19N,30W,20	Immediately above I-90	9/4/2002	~150m	EBT	19	49-190	111	X			
Rainy Cr.	1	19N,32W,13	~.5mi.up from confluence of St. Regis R.	8/16/2002	~175m	WCT	11	83-226	141	X		X	Good habitat. Dense stands of thuja spp.
	1	19N,32W,13	~.5mi.up from confluence of St. Regis R.	8/16/2002	~175m	EBT	5	100-181	145	X		X	
	2	19N,32W,14	~1mi. Up from site 1	8/16/2002	~200m	WCT	18	68-187	126	X		X	
	2	19N,32W,14	~1mi. Up from site 1	8/16/2002	~200m	EBT	9	88-212	138	X		X	
Randolph Cr.	1	20N,31W,30	Just above Taft substation. Above culvert	8/30/2002	~200m	WCT	13	64-175	105		X	X	Culvert -start of site 1 not a barrier: "stepped culvert"
	1	20N,31W,30	Just above Taft substation. Above culvert	8/30/2002	~200m	EBT	18	65-169	104		X	X	
	2	20N,31W,6	1.9mi. Below site 1. Before Y in Rd.	8/30/2002	~200m	WCT	19	76-196	126		X	X	
	2	20N,31W,6	1.9mi. Below site 1. Before Y in Rd.	8/30/2002	~200m	EBT	11	88-215	149		X	X	
Rivers Cr.	1	19N,30W,5	First switchback on Rivers Rd.	8/15/2002	~200m	WCT	2	128-147	137				Low densities, low flows. Likely intermittent.
Savenac Cr.	1	19N,30W,10	F.S. Rd. 3811, by power lines	8/28/2002	~200m	WCT	10	85-211	143	X			Low densities and low shocking effeciences
	1	19N,30W,10	F.S. Rd. 3811, by power lines	8/28/2002	~200m	EBT	6	67-180	120	X			
	2	19N,30W,3	~1mi. Above site 1. below lodgepole Cr.	8/28/2002	~200m	WCT	7	111-251	156	X			
	2	19N,30W,3	~1mi. Above site 1. below lodgepole Cr.	8/28/2002	~200m	EBT	10	101-170	139	X			
Silver Cr.	1	19N,31W,14	Near mouth below culvert barrier	7/14/2001	~150m	WCT	24	72-191	101	X	X		
	1	19N,31W,14	Near mouth below culvert barrier	7/14/2001	~150m	EBT	6	109-129	116	X	X		
	1	19N,31W,14	Near mouth below culvert barrier	7/14/2001	~150m	MWF	1	184	184	X	X		
	2	19N,31W,14	Old wooden bridge xing. ~1mi from mouth	7/14/2001	~200m	WCT	14	60-245	127	X	X		Low fish densities
	2	19N,31W,14	Old wooden bridge xing. ~1mi from mouth	7/14/2001	~200m	EBT	5	138-233	184	X	X		
	3	19N,31W,22	At forks	7/14/2001	~100m	WCT	15	62-212	145	X	X		
	3	19N,31W,22	At forks	7/14/2001	~100m	EBT	6	96-241	141	X	X		
St. Regis R. (upper)	1	20N,32W,32	Upstream from bridge of first xing	8/22/2002	~150m	WCT	23	62-224	116	X	X	X	Good habitat
	1	20N,32W,32	Upstream from bridge of first xing	8/22/2002	~150m	EBT	13	84-220	131	X	X	X	
	2	20N,32W,32	Access from lookout pass. Lower Rd.	8/22/2002	~175m	WCT	44	55-214	115	X	X	X	
	2	20N,32W,32	Access from lookout pass. Lower Rd.	8/22/2002	~175m	EBT	6	118-163	136	X	X	X	
Timber Cr. (W. Fork)	1	19N,30W,16	Up F.S. Rd. 288 to Rd. Xing	8/30/2002	~150m	no fish							Intermittent at times
Timber Cr. (E. Fork)	1	19N,30W,9	County Rd. before Jct w/ F.S. Rd.16161	8/28/2002	~200m	EBT	~30	no data		X		X	Difficult access. Culvert at site 1 hanging ~1'

Table 4. Summary of St. Regis River drainage fish sampling, 2001-2004 (Page 3)

Stream Name	Section	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
Twelvemile Cr.	3	18N,29W,36	E. Fk. Twelve mile Cr.	7/21/2000	~100m	EBT	10	94-170	124	X			Data missing for 2 sites near mouth
	4	18N,29W,23	Confluence w/ Flat Rock Cr.; then up	7/21/2000	~250m	WCT	26	80-235	144	X			Relatively high densities
	4	18N,29W,23	Confluence w/ Flat Rock Cr.; then up	7/21/2000	~250m	EBT	6	148-250	184	X			
	5	18N,29W,1	2nd bridge crossing downstream from	7/21/2000	~150m	WCT	13	112-225	163	X			High densities, abundant sculpins
	5	18N,29W,1	Mineral Mtn. Rd.	7/21/2000	~150m	EBT	8	85-166	142	X			
	6	20N,29W,22	Switchback. Head end of Twelve Mile Cr.	7/21/2000	~100m	WCT	11	90-160	120	X			sampled above and below culvert in this section
	6	20N,29W,22	Switchback. Head end of Twelve Mile Cr.	7/21/2000	~100m	EBT	2	125-140	132	X			
	7	19N,29W,24	Walk 20 min. up from Trailhead	9/17/2000	~100m	WCT	8	51-152	106	X			Sculpin and EBT numerous. Good habitat
	7	19N,29W,24	Walk 20 min. up from Trailhead	9/17/2000	~100m	EBT	28	55-245	136	X			
Twin Cr. (West Fork)	1	19N,29W,24	Up cotton Ln. from W. Twin Rd.	8/27/2002	~200m	WCT	13	82-179	129	X	X		Dewatered. Impacted by power lines
	1	19N,29W,24	Up cotton Ln. from W. Twin Rd.	8/27/2002	~200m	EBT	12	96-238	177	X	X		
Twin Cr. (East Fork)	1	19N,29W,18	Gated F.S. land. ~200m below culvert	8/27/2002	~175m	WCT	23	76-191	125		X	X	Distinct separation of WCT/EBT habitat
	1	19N,29W,18	Gated F.S. land. ~200m below culvert	8/27/2002	~175m	EBT	1	177	177		X	X	Lower reaches heavily impacted. Numerous EBT
	2	19N,29W,19	Above private house. Out of pastureland	8/27/2002	~200m	WCT	15	60-117	84		X	X	
	2	19N,29W,19	Above private house. Out of pastureland	8/27/2002	~200m	EBT	11	79-165	109		X	X	
Two Mile Cr.	1	17N,28W,3	Uppermost Rd. xing Rd. 431	8/31/2001	~90m	WCT	12	72-224	118	X			High densities of WCT. Good habitat
	2	18N,29W,31	Cr. Directly adjacent to Rd. 431. 3.5 Mi up	8/31/2001	~90m	WCT	9	39-130	88	X			WCT looked hybridized
	3	18N,29W,29	Near mouth- Dry due to irrigation	8/31/2001		Dry				X			
	4	18N,29W,3	Coyle Cr. Near mouth	8/31/2001	~100m	WCT	11	62-192	128	X			
Ward Cr.	1	18N,29W,30	~200m below bridge to bridge	8/13/2002	~200m	WCT	41	45-197	114	X	X	X	Good habitat
	2	18N,29W,29	Cedar Cr.-Above culvert on Rd. Xing	8/13/2002	~125m	WCT	14	56-102	76	X	X	X	Good habitat. Culvert on Rd. xing ~30m squashed.
	3	18N,29W,28	Unnamed Cr.-Above culvert on Rd. Xing	8/13/2002	~100m	WCT	11	41-97	73	X	X	X	Hanging culvert ~2.5' . 35m long. Slightly squashed
	4	18N,29W,27	Below fork in F.S. Rd. 3816	8/13/2002	~200m	WCT	12	55-117	88	X	X	X	Numerous sculpin. Beaver ponds in progess
	5	18N,29W,32	~1mi. Up Ward Cr. Rd.	8/13/2002	~200m	WCT	19	75-238	127	X	X	X	

Table 5. Summary of fish sampling on lower Bitterroot River tributaries 2000-2004

Stream Name	Section #	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # Captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs	Additional Comments
Bear Creek	1	12N,22W,26	Up Bear Crk Rd. ~.75mi	7/7/2003	~200m	WCT	3	103-135	149				Good habitat
	1	12N,22W,26	Up Bear Crk Rd. ~.75mi	7/7/2003	~200m	RBT	10	50-185	105				Good habitat
	1	12N,22W,26	Up Bear Crk Rd. ~.75mi	7/7/2003	~200m	EBT	10	89-203	139				Good habitat
	1	12N,22W,26	Up Bear Crk Rd. ~.75mi	7/7/2003	~200m	LL	5	80-211	144				Good habitat
	2	12N,22W,24	~1mi upstream from site 1	7/7/2003	~200m	WCT	17	60-223	125				Description is ~200m below bridge on spur rd. to bridge
	2	12N,22W,24	~1mi upstream from site 1	7/7/2003	~200m	RBT	4	64-83	73				Description is ~200m below bridge on spur rd. to bridge
	2	12N,22W,24	~1mi upstream from site 1	7/7/2003	~200m	EBT	26	70-230					Description is ~200m below bridge on spur rd. to bridge
	2	12N,22W,24	~1mi upstream from site 1	7/7/2003	~200m	LL	4	80-160	133				Description is ~200m below bridge on spur rd. to bridge
	2	12N,22W,24	~1mi upstream from site 1	7/7/2003	~200m	ONC	1	50	50				Description is ~200m below bridge on spur rd. to bridge
	3	12N,22W,13	~1mi upstream of site 2	7/7/2003	~150m	WCT	17	48-172	114		X		Thick vegetation, spot shocking
	3	12N,22W,13	~1mi upstream of site 2	7/7/2003	~150m	EBT	6	60-180	141		X		Thick vegetation, spot shocking
	3	12N,22W,13	~1mi upstream of site 2	7/7/2003	~150m	LL	1	225	225		X		Thick vegetation, spot shocking
Camp Creek	1	12N,22W,25	Access Rd. by gravel banks, past FS gate, ~1mi up camp cr.	7/8/2003	~150m	WCT	25	58-175	116				Perched culvert at top of site 1. Possible complete barrier
	2	12N,22W,24	~.75mi up from site 1. Access by foot	7/8/2003	~100m	WCT	15	79-136	110				
Chief Joseph Gulch	1	12N,23W,25	Mouth of Chief Joseph Gulch	9/17/2003	200m	WCT	4	90-104	96				Upper drainage lacking water
	1	12N,23W,25	Mouth of Chief Joseph Gulch	9/17/2003	200m	ONC.FRY	5	40-52	45				Difficult access everywhere except mouth
Cloudburst Creek	1	12N,23W,35	Access logging Rd. from sec. 33. Drop into crk from rd.	9/12/2003	~200m	WCT	4	78-152	104		X		Very difficult access. "hosed" by Plum Crk.
	1	12N,23W,35	Access logging Rd. from sec. 33. Drop into crk from rd.	9/12/2003	~200m	EBT	24	52--275	128		X		Very difficult access. "hosed" by Plum Crk.
	1	12N,23W,35	Access logging Rd. from sec. 33. Drop into crk from rd.	9/12/2003	~200m	DV	1	115			X		Very difficult access. "hosed" by Plum Crk.
	2	11N,23W,2	~1mi past site 1	9/12/2003	~300m	WCT	8	123-200	147				low fish densities, lots of ebt, Difficult access again
	2	11N,23W,2	~1mi past site 1	9/12/2003	~300m	LL	2	162-219	191				low fish densities, lots of ebt, Difficult access again
	2	11N,23W,2	~1mi past site 1	9/12/2003	~300m	EBT	22	50-201	112				low fish densities, lots of ebt, Difficult access again
	3	12N,23W,26/27	Access Rt. 12 at mouth	9/12/2003	~200m	WCT	15	68-215	114				
	3	12N,23W,26/27	Access Rt. 12 at mouth	9/12/2003	~200m	LL	6	80-196	148				
	3	12N,23W,26/27	Access Rt. 12 at mouth	9/12/2003	~200m	ONC	6	48-65	53				
	3	12N,23W,26/27	Access Rt. 12 at mouth	9/12/2003	~200m	EBT	20	58-194	124				
	3	12N,23W,26/27	Access Rt. 12 at mouth	9/12/2003	~200m	DV/EBT	1	131					
Cooper Creek	1	11N,22W,9	~1mi downstream from site 2, Rd. 2175	7/23/2003	~150m	WCT	16	74-149	102		X	X	
	2	11N,22W,16	Below Rd. xing 2175, ~200m below confluence of two stems	7/23/2003	~150m	WCT	20	88-144	107				
Davis Creek	1	12N,22W,20	Private land. Site started .25mi from mouth	8/29/2003	150m	WCT	3	71-113	94				Spot shocking. No second site; low flows at upper reaches.
	1	12N,22W,20	Private land. Site started .25mi from mouth	8/29/2003	150m	ONC	4	38-42	40				
East Fork Lolo Creek	1	11N,22W,21	Site is ~1mi. Below confluence of Lost Park Crk.	8/7/2003	~150m	WCT	11	75-193	110				Poor shocking efficiency, high flows, low conductivity
	1	11N,22W,21	Site is ~1mi. Below confluence of Lost Park Crk.	8/7/2003	~150m	LL	2	225-260	243				Poor shocking efficiency, high flows, low conductivity
	1	11N,22W,21	Site is ~1mi. Below confluence of Lost Park Crk.	8/7/2003	~150m	EBT	3	111-174	135				Poor shocking efficiency, high flows, low conductivity
	2	11N,22W,27	.5mi above confluence of Lost Park Crk.	8/7/2003	~175m	WCT	22	63-176	125				
	2	11N,22W,27	.5mi above confluence of Lost Park Crk.	8/7/2003	~175m	EBT	23	60-168	115				
	3	11N,22W,25	Start of site is at gate on boarder of P.C and F.S land	8/7/2003	~200m	WCT	29	69-191	119				good habitat
	3	11N,22W,25	Start of site is at gate on boarder of P.C and F.S land	8/7/2003	~200m	EBT	12	100-190	141				good habitat
Granite Creek	1	11N,24W,1	~.5mi up Rd. 9942	8/26/2003	~150m	WCT	24	60-182	111				
	1	11N,24W,1	~.5mi up Rd. 9942	8/26/2003	~150m	EBT	36	49-151	102				
	2	11N,24W,15	~3mi. Upstream from site 1	8/26/2003	~175m	DV/EBT	1	160					Some WCT afflicted with parasites. Good DV numbers
	2	11N,24W,15	~3mi. Upstream from site 1	8/26/2003	~175m	DV	4	106-160	128				
	2	11N,24W,15	~3mi. Upstream from site 1	8/26/2003	~175m	WCT	13	41-149	84				
	2	11N,24W,15	~3mi. Upstream from site 1	8/26/2003	~175m	EBT	28	40-193	94				
	3	11N,24W,28	1.2mi from Idaho boarder	8/26/2003	~200m	DV	5	115-135	123		X		low densities of fish
	3	11N,24W,28	1.2mi from Idaho boarder	8/26/2003	~200m	WCT	9	58-159	123		X		
	3	11N,24W,28	1.2mi from Idaho boarder	8/26/2003	~200m	EBT	2	180-280	230		X		
Graves Creek	1	12N,22W,17,18	1st crossing, culvert crossing section 17/18	9/4/2001	~100m	RBT	7	109-259mm	166	X			High densities of fish, low densities WCT/DV.
	1	12N,22W,17,18	1st crossing, culvert crossing section 17/18	9/4/2001	~100m	LL	4	59-169mm	130	X			Heavy riparian grazing
	1	12N,22W,17,18	1st crossing, culvert crossing section 17/18	9/4/2001	~100m	EBT	4	60-215mm	144	X			
	2	12N,22W,7	Below forks (~1.25mi. Above Ist site)	8/11/2003	~200m	WCT	14	85-178	128		X	X	
	2	12N,22W,7	Below forks (~1.25mi. Above Ist site)	8/11/2003	~200m	EBT	8	75-198	133		X	X	
	3	13N,22W,32	Uppermost Rd. access. (refer to map)	8/11/2003	~50m	WCT	8	88-165	122		X		
	3	13N,22W,32	Uppermost Rd. access. (refer to map)	8/11/2003	~50m	EBT	7	110-166	152		X		
Hayes Creek	1	12N,20W,9	USFS downstream limit (By Gray's land)	6/11/2002	150m	WCT	16	55-170	109				Hanging culvert at bottom of shocking section-barrier
	2	12N,20W,9	~1mi. Upstream of Rd. (50m up trail #3.07)	6/19/2002	170m	WCT	18	50-160	105		X		Spot shocking
Howard Creek	1	12N,23W,25	Above culvert at Trailhead, below N. Fk T.H. Rd.	8/4/2003	~175m	WCT	21	80-190	116		X		Lots of LWD and shade. Culvert not a barrier
	1	12N,23W,25	Above culvert at Trailhead, below N. Fk T.H. Rd.	8/4/2003	~175m	EBT	8	100-245	171		X		
	1	12N,23W,25	Above culvert at Trailhead, below N. Fk T.H. Rd.	8/4/2003	~175m	LL	2	120-135	128		X		
	1	12N,23W,25	Above culvert at Trailhead, below N. Fk T.H. Rd.	8/4/2003	~175m	RBT	1	238			X		
	2	12N,23W,22	~1.5mi. Above site #1	8/4/2003	~200m	WCT	13	92-152	114				
	2	12N,23W,22	~1.5mi. Above site #1	8/4/2003	~200m	LL	11	113-180	149				
	2	12N,23W,22	~1.5mi. Above site #1	8/4/2003	~200m	EBT	18	80-170	125				
	3	12N,23W,20	Below Teepee Crk. Rd.	8/4/2003	~175m	WCT	33	65-175	109				
	3	12N,23W,20	Below Teepee Crk. Rd.	8/4/2003	~175m	EBT	46	50-204	107				
	4	12N,23W,23	North Fork Crk. PC land. Just below T.H.	8/4/2003	~125m	WCT	13	59-185	112				Low gradient with no barriers and low cfs
	4	12N,23W,23	North Fork Crk. PC land. Just below T.H.	8/4/2003	~125m	EBT	5	50-185	100				
John Creek	1	11N,21W,1	Private-Kim Grenager's land. Boarders Plum Creek land	8/29/2003	~150m	no fish					X	X	Creek does not connect to Lolo Crk - irrigation
	2	11N,21W,1	Private-Above culvert in N.W. portion in Sec.1	8/29/2003	~100m	no fish					X	X	Culvert xing at upper reach poor

Table 5. Summary of fish sampling on lower Bitterroot River tributaries 2000-2004 (Page 2)

Stream Name	Section #	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # Captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs Frogs	Additional Comments
Lee Creek	1	11N,23W,19	Lee Creek Rd. above campground	8/5/2003	~200m	WCT	10	61-115	82				Low densities
	1	11N,23W,19	Lee Creek Rd. above campground	8/5/2003	~200m	EBT	7	48-132	97				
	2	11N,23W,30	Mile marker 2 up Lee crk. rd.	8/5/2003	~150m	EBT	20	50-150				X	no WCT in upper reaches
	3	11N,23W,19	Below site 1 at campground	8/5/2003	~350m	WCT	15	80-144	110				
	3	11N,23W,19	Below site 1 at campground	8/5/2003	~350m	LL	1	270					
	3	11N,23W,19	Below site 1 at campground	8/5/2003	~350m	EBT	28	50-210					
Lolo Creek	1	11N,21W,33	Just below driveway bridge for O/Z Ranch	8/27/2002	~100m	RBT	34	40-205	~90			X	
	1	11N,21W,33	Just below driveway bridge for O/Z Ranch	8/27/2002	~100m	LL	14	75-466	180			X	
	1	11N,21W,33	Just below driveway bridge for O/Z Ranch	8/27/2002	~100m	MWF	9	100-360	222			X	Many whitefish present, not netted
	1	11N,21W,33	Just below driveway bridge for O/Z Ranch	8/27/2002	~100m	WCT	2	-	-			X	
	1	11N,21W,33	Just below driveway bridge for O/Z Ranch	8/27/2002	~100m	LND	1	~60	~60			X	
	2	11N,21W,32	Upper portion of O/Z Ranch near S. Fork Mouth	8/27/2002	~100m	RBT	14	50-240	89			X	Includes unknown Oncorhynchus and RBxCT
	2	11N,21W,32	Upper portion of O/Z Ranch near S. Fork Mouth	8/27/2002	~100m	LL	12	67-300	169			X	Many larger LL present, but not captured
	2	11N,21W,32	Upper portion of O/Z Ranch near S. Fork Mouth	8/27/2002	~100m	MWF	4	62-410	230			X	
	2	11N,21W,32	Upper portion of O/Z Ranch near S. Fork Mouth	8/27/2002	~100m	LNS	1	188	188			X	
	2	11N,21W,32	Upper portion of O/Z Ranch near S. Fork Mouth	8/27/2002	~100m	LND	2	56-64	60			X	
Lost Park Creek	1	11N,23W,28	.5mi past confluence of Lost park and E.Fk Lolo	8/5/2003	~200m	WCT	23	78-173	122				White parasitic worms on all WCT behind pectoral fin
	1	11N,23W,28	.5mi past confluence of Lost park and E.Fk Lolo	8/5/2003	~200m	EBT	16	90-204	129				White parasitic worms on all WCT behind pectoral fin
	1	11N,23W,28	.5mi past confluence of Lost park and E.Fk Lolo	8/5/2003	~200m	LL	2	195-207	201				White parasitic worms on all WCT behind pectoral fin
	2	11N,23W,4	Site started at washout of Rd.	8/7/2003	~200m	WCT	15	65-194	144				No parasites on WCT. Rd washed out
	2	11N,23W,4	Site started at washout of Rd.	8/7/2003	~200m	EBT	5	180-198	188				No parasites on WCT. Rd washed out
Marshall Creek	1	11N,22W,2	Access Elk Meadows Rd. #451	7/23/2003	100m	EBT	15						All sites dominated by EBT
	2	11N,22W,11	Access Elk Meadows Rd. #451	7/23/2003	150m	EBT	25						
	3	11N,22W,11	Access Elk Meadows Rd. #451	7/23/2003	100m	EBT	20						
Martin Creek	1	11N,23W,4	Boarder of PC and FS land	9/17/2003	~200m	WCT	1	98					Thick understory and poor habitat
	1	11N,23W,4	Boarder of PC and FS land	9/17/2003	~200m	EBT	5	80-104	88				
	2	12N,23W,32	Just above mouth of Martin	9/17/2003	~200m	WCT	3	81-90	85				Better habitat, no ebts. Upper reaches hard to access and low water
Mill Creek	1	11N,21W,3	Plum Creek land, Rd. xing	8/14/2003	~150m	WCT	39	58-172	122		X		Boulder step pool. (Diversion with no headgate, 4 WCT in ditch in ~30ft)
	1	11N,21W,3	Plum Creek land, Rd. xing	8/14/2003	~150m	EBT	14	50-200	151		X		Boulder step pool. (Diversion with no headgate, 4 WCT in ditch in ~30ft)
	2	11N,21W,10	Trail junction 1310 and 309, trail crosses creek	8/14/2003	~150m	WCT	41	43-186	115				Step pool, High gradient. Lots of LWD
	3	11N,21W,9/10	Edge of section 9/10. ~.5 mi above site 2	8/14/2003	~100m	WCT	23	88-161	121			X	Step pool, High gradient. Lots of LWD
Miller Creek	1	12N,20W,18	Road crossing of road 464	9/25/2000	~100 m	WCT	8	41-146	81				
	1	12N,20W,18	Road crossing of road 464	9/25/2000	~100 m	EBT	1	112	112				
	2	12N,20W,16	Holloman creek crossing	9/25/2000	~100 m	WCT	10	96-212	159				
	2	12N,20W,16	Holloman creek crossing	9/25/2000	~100 m	EBT	6	75-105	89				
	3	12N,20W,18	Holloman creek down from culvert	9/25/2000	~100 m	WCT	7	49-153	92				
	4	12N,20W,8	Plant creek road crossing	9/25/2000	~100 m	WCT	28	52-200	145				
	4	12N,20W,8	Plant creek road crossing	9/25/2000	~100 m	EBT	~ 30						high density WCT, mod. dens EBT, rd xing a selective barrier, perched 8"/velocity
	5	12N,20W,19	Lone Mtn. Rd Crossing	10/25/1996	~88m	WCT	48	78-296	172				25 hybrid WCT/RBT included in total
	5	12N,20W,19	Lone Mtn. Rd Crossing	10/25/1996	~88m	RBT	2	180-190	185				
	5	12N,20W,19	Lone Mtn. Rd Crossing	10/25/1996	~88m	EBT	2	165-230	198				
	5	12N,20W,19	Lone Mtn. Rd Crossing	10/25/1996	~88m	LL	2	203-228	216				
	6	12N,19W,35	PC land, from bridge upstream ~45m	10/25/1996	~45m	WCT	34	57-215	130				12 hybrid WCT/RBT included in total
	6	12N,19W,35	PC land, from bridge upstream ~45m	10/25/1996	~45m	EBT	37	76-212	117				
	7	11N,19W,1-2	Joe Walluillig's place	10/28/1996	~56m	WCT	23	58-270	177				19 hybrid WCT/RBT included in total
	7	11N,19W,1-2	Joe Walluillig's place	10/28/1996	~56m	EBT	31	70-220	133				entrenched channel, GR/SA substrate
	8	11N,18W,18	Holloman's confluence, downstream	10/28/1996	~82m	WCT	29	65-187	129				20 hybrid WCT/RBT included in total
	8	11N,18W,18	Holloman's confluence, downstream	10/28/1996	~82m	EBT	51	90-212	131				Good LWD
Mormon Creek	1	11N,20W,	Xing on RD 2155, section 8/17	7/23/2001	~150m	WCT	8	yes	63-185				Low conductivity/efficiency. Excellent habitat, culvert narrow but OK- Aligned
	1	11N,20W,	Xing on RD 2155, section 8/17	7/23/2001	~150m	DV	4	yes	84-224				flush with bottom, not a barrier. Low densities of fish.
	1	11N,20W,	Xing on RD 2155, section 8/17	7/23/2001	~150m	EBT	7	none	135-200				
	2	11N,20W,	Steep bank Down to creek~1.5 mi from site 1	7/23/2001	~150m	WCT	9	yes	116-192				Good habitat, low conductivity, high gradient
	3	11N,20W,4	Private land. Access Mormom Crk. Rd. HW 93	7/11/2003	~200m	WCT	9	98-149	125			X	Better conductivity
	3	11N,20W,4	Private land. Access Mormom Crk. Rd. HW 93	7/11/2003	~200m	EBT	28	32-240	130			X	Better conductivity
	4	11N,20W,17	thru gate on Mormon Crk. Rd. to end of Rd. (culvert-culvert)	7/11/2003	~200m	DV	4	105-210	160		X		DV possibly hybridizing with ebt. Low conductivity
	4	11N,20W,17	thru gate on Mormon Crk. Rd. to end of Rd. (culvert-culvert)	7/11/2003	~200m	WCT	17	70-203	102				
	4	11N,20W,17	thru gate on Mormon Crk. Rd. to end of Rd. (culvert-culvert)	7/11/2003	~200m	EBT	11	108-190	150				
	5	11N,20W,13	~2mi down closed logging Rd. just before trailhead	7/11/2003	~200m	WCT	7	88-141	101				spot shocking. Low conductivity, low densities of fish.
O'Brien Creek	1	13N,20W,29	Goodrich property	7/22/1999	~70m	WCT	4	100-209	157	X			Several yoy EBT in sec. Riparian ver removed + retaining walls
	1	13N,20W,29	Goodrich property	7/22/1999	~70m	RBT	3	108-220	163	X			
	1	13N,20W,29	Goodrich property	7/22/1999	~70m	EBT	5	97-241	156	X			
	2	13N,20W,29	Upstream property	7/22/1999	~65m	WCT	9	115-295	215				Riparian intact-low sampling efficiency
	2	13N,20W,29	Upstream property	7/22/1999	~65m	RBxCT	2	188-245	217				
	2	13N,20W,29	Upstream property	7/22/1999	~65m	RBT	2	196-275	236				
	2	13N,20W,29	Upstream property	7/22/1999	~65m	EBT	6	90-220	188				
	3	13N,20W,30	Just above USFS gate	4/19/2004	100m	WCT	33	54-269	115		X		
	3	13N,20W,30	Just above USFS gate	4/19/2004	100m	RBT	8	65-398	189		X		
	3	13N,20W,30	Just above USFS gate	4/19/2004	100m	ONC	14	50-100	72		X		
	3	13N,20W,30	Just above USFS gate	4/19/2004	100m	EBT	6	78-214	109		X		

Table 5. Summary of fish sampling on lower Bitterroot River tributaries 2000-2004 (Page 3)

Stream Name	Section #	Location (T,R,S)	Physical Description of Location	Date Sampled	Section Length	Species	Total # Captured	Range of Lengths (mm)	Mean Length (mm)	Sculpins Present	Tailed Frogs	Spotted Frogs Frogs	Additional Comments
South Fork Lolo Creek	1	11N,21W,6	Rd. 451 xing by Trailhead. Ist xing	7/22/2003	200m	WCT	7	70-143	114				Poor shocking efficiency, low conductivity, spot shocking the margins
	1	11N,21W,6	Rd. 451 xing by Trailhead. Ist xing	7/22/2003	200m	LL	7	80-219	150				Poor shocking efficiency, low conductivity, spot shocking the margins
	1	11N,21W,6	Rd. 451 xing by Trailhead. Ist xing	7/22/2003	200m	EBT	12	80-182	142				Poor shocking efficiency, low conductivity, spot shocking the margins
	1	11N,21W,6	Rd. 451 xing by Trailhead. Ist xing	7/22/2003	200m	EBT/DV	1	155					Poor shocking efficiency, low conductivity, spot shocking the margins
	2	11N,21W,6	Hike up S. Fk. Lolo TH ~.75mi to juction of Cedar Crk.	7/22/2003	150m	WCT	11	70-207	114				Poor shocking efficiency, low conductivity, spot shocking the margins
	2	11N,21W,6	Hike up S. Fk. Lolo TH ~.75mi to juction of Cedar Crk.	7/22/2003	150m	LL	3	185-330	235				Poor shocking efficiency, low conductivity, spot shocking the margins
	3	11N,21W,19	~3mi. Up S. Fk. Lolo Trail to Lantern Crk.	8/20/2003	150m	WCT	29	69-218	152				Better habitat and shocking efficiency
	3	11N,21W,19	~3mi. Up S. Fk. Lolo Trail to Lantern Crk.	8/20/2003	150m	DV	3	113-151	134				Better habitat and shocking efficiency
	4	11N,21W,30	~4mi. Up S. Fk. Lolo Trail to Falls Crk.	8/20/2003	150m	WCT	43	58-220	148			X	Better habitat and shocking efficiency
	4	11N,21W,30	~4mi. Up S. Fk. Lolo Trail to Falls Crk.	8/20/2003	150m	DV	3	115-189	160				Better habitat and shocking efficiency
Tevis Creek	1	11N,21W,5	Access O/Z ranch, Northeast corner of sec. 5. Past Ist gate	7/22/2003	~200m	WCT	22	51-153	95		X		
	2	11N,21W,8	FS land. ~.5mi above site 1	7/22/2003	~200m	WCT	10	78-121	92		X		
West Fork Butte Creek	1	11N,22W,2	Gated F.S. Rd. Site is at gate	7/23/2003	~150m	WCT	15	54-163	110		X		More Onch. Spp then other sites higher up in drainage
	1	11N,22W,2	Gated F.S. Rd. Site is at gate	7/23/2003	~150m	LL	2	78-250	164		X		More Onch. Spp then other sites higher up in drainage
	1	11N,22W,2	Gated F.S. Rd. Site is at gate	7/23/2003	~150m	EBT	8	90-141	111		X		More Onch. Spp then other sites higher up in drainage
	2	11N,22W,4	Access from Rd. 2175	7/29/2003	~175m	WCT	15	60-141	93		X		lower densities of EBTs
	2	11N,22W,4	Access from Rd. 2175	7/29/2003	~175m	EBT	16	68-140	95		X		lower densities of EBTs
	3	11N,22W,8	Access from Rd. 2175. Northeast corner of Sec. 8	7/29/2003	~200m	WCT	9	78-195	131			X	many EBT in this uppermost site
	3	11N,22W,8	Access from Rd. 2175. Northeast corner of Sec. 8	7/29/2003	~200m	EBT	59	60-157	111			X	many EBT in this uppermost site
West Fork Lolo Creek	1	11N,23W,35	2.5mi down from pass creek adjacent to RT 12	9/4/2001	~100m	WCT	7	yes	97-164mm	X			Low densities of WCT, good habitat. A lot of sidecast
	2	11N,24W,25	Bridge xing on spur RD 150 yds down mm4	9/4/2001	~100m	WCT	19	yes	81-191mm	X			low gradient, high amount of EBT/WCT. High amount of fine sediments
	2	11N,24W,25	Bridge xing on spur RD 150 yds down mm4	9/4/2001	~100m	EBT	10	none	56-211mm	X			
	3	11N,24W,19	Directly upstream of xing at Lee Cr campground	9/4/2001	~100m	WCT	14	yes	49-156mm	X			Crossing is good (bridge). Moderate/High densities. Many YOY's, mixed species
	3	11N,24W,19	Directly upstream of xing at Lee Cr campground	9/4/2001	~100m	EBT	5	none	62-186mm	X			
	3	11N,24W,19	Directly upstream of xing at Lee Cr campground	9/4/2001	~100m	LL	2	none	62-122mm	X			
Woodman Creek	1	12N,21W,29	O/Z Land. Access FS Rd. ~.5mi from house, just above pond	7/11/2003	~175m	WCT	13	62-265	116				Culvert at site 1 not a barrier
	1	12N,21W,29	O/Z Land. Access FS Rd. ~.5mi from house, just above pond	7/11/2003	~175m	EBT	2	138-168	153				
	1	12N,21W,29	O/Z Land. Access FS Rd. ~.5mi from house, just above pond	7/11/2003	~175m	RBT	3	51-187	138				
	2	12N,21W,20	~1Mi past site 1, above 2nd xin(	7/11/2003	~150m	WCT	11	133-191	159				Culvert at bottom of site 2 selective barrier (Double culvert).

CHAPTER 3

ONCORHYNCHUS GENETIC SAMPLING IN MIDDLE CLARK FORK RIVER AND LOWER BITTERROOT RIVER TRIBUTARIES

Surveys and Analyses to Identify Genetically Pure Westslope Cutthroat Trout Populations

Background

Hybridization with closely related, introduced salmonids is one of the greatest threats to westslope cutthroat trout (WCT) and other native salmonid populations (Allendorf et al. 2001). In the case of westslope cutthroat trout populations in Montana (upper Columbia and Missouri River drainages), Yellowstone cutthroat trout (YCT) and rainbow trout (RBT) have historically been introduced in lakes, rivers and streams to supplement sport fisheries. Hybrids of these introduced species and native westslope cutthroat trout have been identified in most locations where populations are sympatric. Other westslope cutthroat trout populations have concurrently been isolated by various anthropogenic or natural barriers that prevent hybridization. Although these (often physical) barriers help ensure genetic purity of westslope cutthroat trout populations in the short term, they often prevent genetic exchange among local populations and suppress migratory life history expressions (Rieman and Dunham 2000). Therefore, management and conservation of westslope cutthroat trout populations requires a balance of connectivity and isolation across different drainages and spatial scales (Schmetterling, *In review*).

Identification of genetically pure (unhybridized) westslope cutthroat trout populations is one of the basic requirements of native fish restoration and conservation planning in western Montana watersheds. In this ongoing analysis, we began systematically collecting and testing *Oncorhynchus* genetic material from tributary drainages of the middle Clark Fork River system. This information was collected to assist in developing conservation plans, prioritizing fisheries enhancement projects and evaluating fish passage issues.

Methods

Samples were collected by backpack electrofishing tributary streams of the middle Clark Fork River and the lower Bitterroot River in 1999-2004. The distribution and number of sample sites per stream varied depending on the spatial scale, access and observed species composition based on morphological characteristics. For example, genetic samples were not collected at sites that supported predominantly rainbow trout. We attempted to collect a series of longitudinal samples within each drainage or tributary (e.g., low, med and high in the drainage) supporting predominately westslope cutthroat trout. However, small inaccessible streams generally had fewer sites. At each sample site, we collected multiple size classes whenever possible to represent different age classes and generations.

The target sample size for each population (usually several sites within each drainage or tributary) was a minimum of 25 randomly selected (*Oncorhynchus* spp.) individuals. This sample size is based on the probability of detecting hybridization with 95% confidence given a known number of markers analyzed (See Table 1 and Appendix 1). In the Clark Fork River drainage, hybridization with rainbow trout (RBT, 6 diagnostic loci) is currently a much greater risk than with Yellowstone cutthroat trout (YCT, 4 diagnostic loci). Power of detecting hybridization does not increase substantially with sample sizes greater than 25 in the case of WCTxRBT.

Table 1. Number of diagnostic loci available for paired comparisons of WCT, YCT, and RBT using allozyme electrophoresis and paired interspersed nuclear elements (PINES).

Analysis	Comparison	Number Diagnostic Loci
Allozymes	WCT : YCT	12
	WCT : RBT	6
	RBT : YCT	10
PINES	WCT : YCT	4
	WCT : RBT	6
	RBT : YCT	4

For this analysis, genetic samples were collected strictly to estimate genetic purity by determining the proportion of diagnostic markers that are characteristic of westslope cutthroat trout, Yellowstone cutthroat trout and rainbow trout. This was accomplished for most samples by collecting a small portion of the anal fin for PINE (Paired Interspersed Nuclear Elements) analyses. In some cases, whole fish were collected for allozyme (protein) analysis (Marshall and Deer Creeks only). Collection of fin clips is preferred in most cases because the technique is non-lethal and samples are easier to store for long periods. Whole fish must be frozen, while fin clips are stored in 90% ethanol. Regardless of method, all samples were submitted to the University of Montana Wild Trout and Salmon Genetics laboratory for analysis.

When genetic testing indicated discrete differences in levels of hybridization among sites in a longitudinal sample, we often returned to these sites to increase power of detecting hybridization (by increasing sample size) in suspected 'pure' reaches. For instance, in drainages where a low level of hybridization was detected, upstream sites often exhibited only markers characteristic of westslope cutthroat trout while lower sites contained hybrids. In these instances, we returned to upper sites to supplement sample sizes (to reach 25) and increase power of detection for hybridizing species.

Results and Discussion

In 1999-2004, we collected genetic samples from > 300 sites on 110 tributaries (2^{nd} order or larger) of the Clark Fork and lower Bitterroot Rivers. Of the 46 stream reaches analyzed, 30 (65%) exhibited only westslope cutthroat trout markers (stream name in bold) and are presumed genetically pure (Table 2). Twenty-two of these populations exist upstream of complete upstream fish passage barriers that help to isolate them from hybridizing species (i.e., rainbow trout) that are present in downstream reaches. Yellowstone cutthroat trout markers were not detected in any of our samples and typically appear in headwater stream populations located downstream of previously stocked lakes. Eight other populations are not physically isolated from rainbow trout, but exhibit only westslope cutthroat trout markers (Crystal, Deer, Nemote (upper), Deer (Fish Cr.), Oriole, Trail, Straight (upper), North Fork Little Joe, Twelvemile (upper) and Siegel Creeks). These populations have apparently remained 'pure' through other behavioral or environmental isolating mechanisms. Because of low sample sizes and power of detection, additional samples will be collected from Deer (Fish Cr.), Little Park, First and Straight (upper) Creeks to reach the 95% confidence level.

Table 2. Results of *Onchorynchus g*enetic testing in Clark Fork River tributaries in 1999-2004 using PINES analysis. Percent WCT denotes the contribution of westslope cutthroat trout alleles as a percentage of the entire sample.

Stream	No. Sites	n	Upstream Boundary	Downstream Boundary	Power[#] (%)	% WCT	Hyb. Species
Swartz Creek	5	51	T11N R18W S24 /25 (headwaters)	T12N R17W S34 (near mouth)	99	85	RBT
Crystal Cr.	3	27	T12N R18W S16 (headwaters)	T12N R18W S11 (near mouth)	98	**100**	-
Greenough Creek	2	25	T12N R17W S35 /36 (headwaters)	T12N R17W S29 (near mouth)	97	**100**	-
Deer Creek	3	51	T12N R18W S6 (headwaters)	T13N R18W S28 Deer Cr. Rd Xing	99	**100**	-
Marshall Cr.	2	24	T14N R18W S33 (headwaters)	T13N R18W S6 (Moye pond)	94	**100**	-
Marshall Cr.	2	31	T13N R18W S6 (Moye pond)	T13N R18W S18 (mouth)	99	95	RBT
Hayes Cr	2	27	T12N R20W S6 (headwaters)	T12N R20W S9 (USFS boundary)	98	97	RBT
Little Park Cr (Miller Cr trib)	1	13**	T12N R18W S28 (headwaters)	T12N R19W S25 (culvert - mouth)	84	**100**	-
Rattlesnake Cr.	1	24	T13N R19W S2 Mtn Water Dam	T13N R19W S2 USFS Bridge	~ 95	61	RBT
Pattee Creek	3	23	T12N R19W S2 (headwaters)	T12N R19W S4	~95	**100**	-
Lavalle Cr.	2	24	T15N R19W S32 (headwaters)	T14N R20W S26 (I-90)	94	**100**	-
Deep Creek	3	24	T13N R21W S20 (headwaters)	T13N R21W S4 (to intermittent)	97	95	RBT
Albert Creek	3	22	T13N R22W S3 (headwaters)	T14N R21W S17 (Dry section)	93	**100**	-
Rock Creek	3	25	T14N R21W S2 (headwaters)	T14N R21W S21 (to intermittant)	97	**100**	
West Mtn Cr	2	27	T15N R23W S3 (headwaters)	T15N R23W S29 (near mouth)	98	**100**	-
Nemote Cr.	4	27	T15N R24W S9/ 22 (headwaters)	T15N R25W S24 (forks confl.)	96	**100**	-
Nemote Cr.	2	15	T15N R25W S24 (forks confl.)	T15N R25W S16 (frontage road)	~70	93	RBT
Johnson Cr.	3	25	T17N R25W S20 (headwaters)	T17N R25W S31	96	**100**	-
Deep Cr. (Sup)	2	25	T16N R24W S30 (headwaters)	T16N R25W S34	95	**100**	-
First Cr.	3	17**	T17N R25W S36 (headwaters)	T16N R25W S16	75	**100**	-
Second Cr.	2	27	T16N R24W S13/14 (Head)	T16N R24W S22	98	**100**	
Cedar Creek	3	27	T15N R27W S20 (headwaters)	T16N R27W S27 (above OregonG)	98	99	RBT

** Additional samples have been collected and will be tested to increase power of detection.

Power or percentage chance of detecting 1% hybridization given sample size and number of diagnostic loci.

Note: samples in bold were composed of only westslope cutthroat trout markers and are presumed genetically pure.

Table 2. (Continued)

Stream	No. Sites	n	Upstream Boundary	Downstream Boundary	Power[#] (%)	% WCT	Hyb. Species
Slowey Gulch	3	23	T18N R27W S30 (near headwaters)	T17N R27W S1 (Little Pitsburgh)	94	**100**	
Dry Creek	6	43	T16N R28W S9 (headwater forks)	T17N R27W S28 (dry reach)	99	98	RBT
Rock Cr.	3	24	T14N R25W S17 (headwaters)	T14N R25W S1 (above barrier)	94	**100**	-
Sevenmile Creek	2	26	T19N R27W S27 (lower USFS)	T18N R27W S2 (above barrier)	96	**100**	-
Tamarack Cr.	3	25	T19N R28W S12 /22 (headwaters)	T18N R27W S9 (above barrier)	96	**100**	-
Siegel Cr.	2	24	T18N R31W S1 (headwaters)	T19N R31W S27	94	**100**	-
Deer Cr. (Fish Cr. trib)	4	12**	T13N R24W S11 (headwaters)	T13N R24W S7	62	**100****	-
Oriole Cr. (Fish Cr. trib)	3	26	T12N R24W S27 (headwaters)	T12N R24W S22 (below rd xing)	96	**100**	-
Trail Cr. (Fish Cr. trib)	3	25	T14N R25W S26 (headwaters)	T14N R25W S35 (below rd xings)	95	**100**	-
Surveyors Cr. (Fish Cr. trib)	2	16	T12N R25W S34 (headwaters)	T12N R25W S36 (Above rd xings)	72	**100****	-
Surveyors Cr. (Fish Cr. trib)	2	16	T12N R25W S36 (below rd xings)	T12N R25W S36 (near mouth)	72	>90	RBT
Straight Cr. (Fish Cr. trib)	4	18**	T13N R26W S17 (headwaters)	T13N R26W S2	~89	**100****	-
Straight Cr. (Fish Cr. trib)	1	7	T13N R26W S2	T13N R26W S1 (near mouth)	~60	>90	RBT
Quartz Cr	3	27	T14N R26W S3 (headwaters)	T15N R25W S32 (dewatered section)	98	**100**	-
Meadow Cr	2	27	T15N R26W S26 (headwaters)	T15N R26W S19 (dewatered reach)	98	**100**	-
St. Regis Mainstem	3	15	T19N R30W S27 (Haugan)	T18N R28W S25 (mouth)	88	49	RBT
N.F. Little Joe Cr (St. Regis R. trib)	2	26	T17N R29W S14 (headwaters)	T17N R28W S5 (above intermit.)	96	**100**	-
Twomile Cr (St. Regis R. trib)	3	27	T17N R28W S10 (headwaters)	T18N R27W S31 (near mouth)	98	92	RBT
Henderson Cr (St. Regis R. trib)	2	27	T18N R29W S18 (headwaters)	T18N R29W S4 (near mouth)	98	98	RBT
Deer Cr (St. Regis R. trib)	3	27	T18N R30W S22 (headwaters)	T19N R30W S36 (near mouth)	98	95	RBT
Twelvemile Cr. (St. Regis R. trib)	3	23	T20N R29W S22 (headwaters)	T20N R29W S36 (upper forks)	~95	**100**	-
Twelvemile Cr. (St. Regis R. trib)	3	9	T19N R29W S1	T19N R29W S34 (mouth)	<80	<90	RBT
Silver Cr. (St. Regis R. trib)	2	25	T19N R31W S33 (headwaters)	T19N R31W S14 (above barrier)	96	**100**	-
Silver Cr. (St. Regis R. trib)	1	13	T19N R31W S14 (below barrier)	T19N R31W S14 (mouth)	~75	93	RBT

** Additional samples have been collected and will be tested to increase power of detection.

Power or percentage chance of detecting 1% hybridization given sample size and number of diagnostic loci.

Note: samples in bold were composed of only westslope cutthroat trout markers and are presumed genetically pure.

The fifteen stream reaches that exhibited rainbow trout markers are all directly connected to waters supporting predominately rainbow trout. It is not known why some (non-isolated) westslope cutthroat trout populations hybridize with rainbow trout and others don not, but factors such as spawning behavior, water temperature, gradient, level of habitat degradation and discharge have been suggested (Schmetterling**,** *In review*). Others maintain that hybridization may be imminent when fish movement and genetic exchange are possible (Robb Leary, University of Montana Wild Trout and Salmon Genetics Laboratory, personal communication). However, eight populations in our survey have apparently remained genetically pure despite nearly a century of open access by rainbow trout populations.

Table 2 displays genetic testing results from 1999-2004. These results, when combined with previous sampling (since 1980) begin to provide a picture of the genetic status of westslope cutthroat trout populations in the middle Clark Fork River drainage (Figures 1 & 2). Many of the main stem river and major tributary stream sections shown in blue (<90% WCT markers) have not been tested, but support abundant rainbow trout populations based on morphological characteristics.

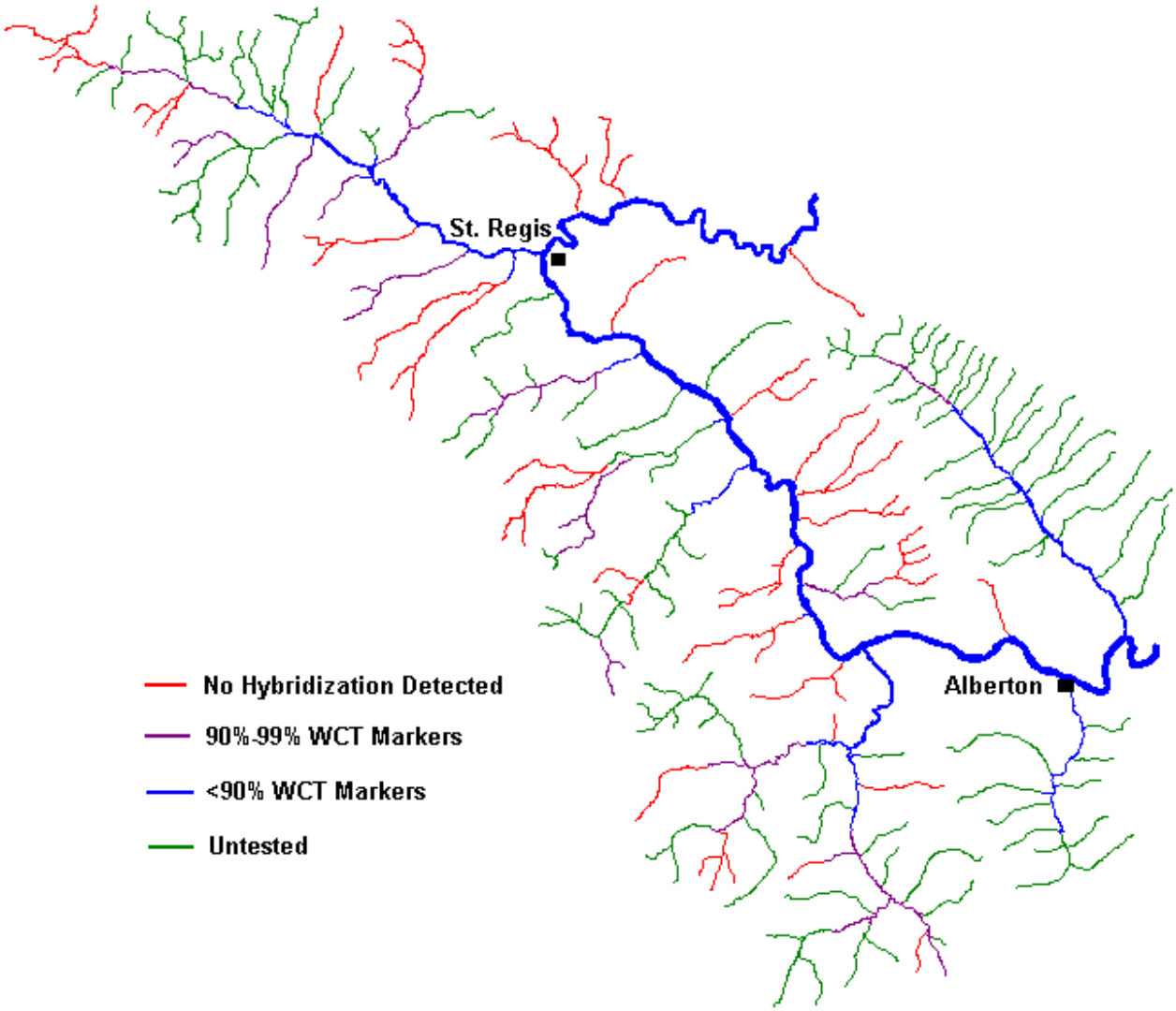

Figure 1. *Oncorhynchus* genetic composition in the Middle Clark Fork River drainage (lower portion).

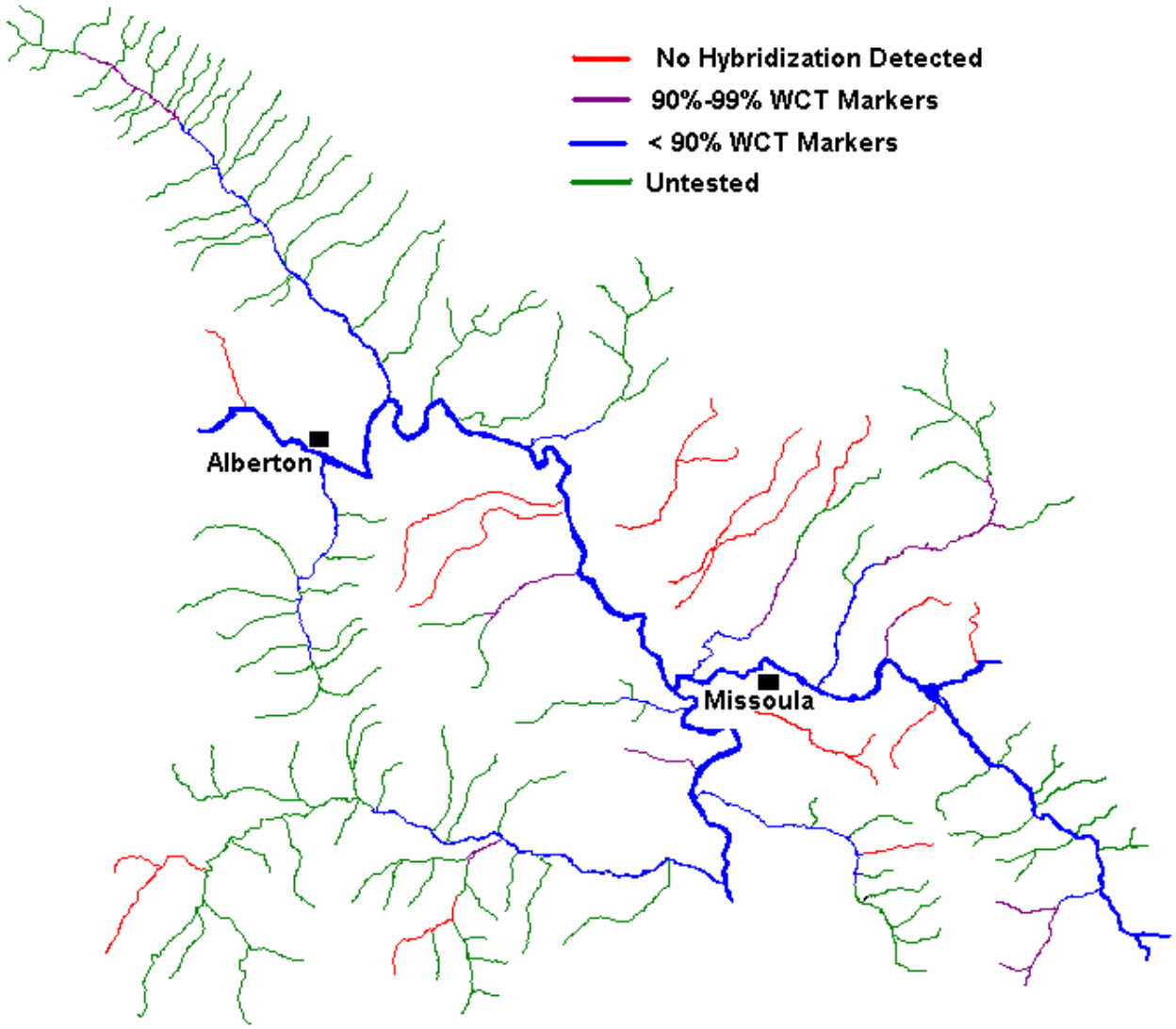

Figure 2. *Oncorhynchus* genetic composition in the Middle Clark Fork River drainage (upper portion).

In addition to analyzed samples listed in Table 2, many others have been collected since 1999, but not analyzed due to funding shortages (Table 3). Genetic samples have been collected from nearly all streams listed as 'untested' (green) in Figures 1 and 2. Samples will continue to be collected, prioritized and analyzed throughout the middle Clark Fork system as resources allow. These results will be critical as we develop fisheries management plans for the drainage that balance native fish conservation and enhancement of salmonids sport fisheries.

Table 3. List of genetic samples collected from middle Clark Fork River tributaries in 1999-2004 that have not been analyzed.

Stream	Sample Size	Stream	Sample Size
		NINEMILE CREEK DRAINAGE	
Allen Creek	27	Beecher Creek	24
Cedar Creek	30	Big Blue Creek	27
Dirty Ike Creek	25	Burnt Fork Creek	23
Donovan Creek	27	Butler Creek	30
Kendall Creek	27	Eustache Creek	31
Mill Creek	24	Kennedy Creek	27
Roman Creek	26	Mattie V Creek	8
Sixmile Creek	37	McCormick Creek	25
Trout Creek	21	St. Louis Creek	33
Turah Creek	15	Stoney Creek	29
Wallace Creek	26		
		PETTY CREEK DRAINAGE	
FISH CREEK DRAINAGE		Main Stem	50
Bear Creek	24	Bills Creek (Petty)	10
Burdette Creek	27	East Fork Petty Creek	10
Fletcher Gulch (N Fork)	10	John's Creek (Petty)	10
French Creek (N Fork)	10	South Fork Petty Creek	25
Greenwood Creek (N Fork)	10	West Fork Petty Creek	10
Indian Creek	39		
Lupine Creek	25	**LOLO CREEK DRAINAGE**	
Montana/Cache Creek	41	Bear Creek	30
North Fork Fish Creek	50	Camp Creek	27
Straight Creek	8	Cloudburst Creek	27
Thompson Creek	23	East Fork Lolo Creek	57
West Fork Fish Creek	40	Granite Creek	27
Wig Creek	25	Grave Creek	28
		Howard Creek	34
ST. REGIS R. DRAINAGE		Mill Creek	30
Big Creek	70	Mormon Creek	27
Brimstone Creek	27	South Fork Lolo Creek	92
Dominion Creek	27	Tevas Creek	27
E. Twin Creek	27	West Fork Lolo Creek	50
Hanaker/Dena Mora Creek	24	Woodman Gulch	26
Rainy Creek	25		
Savenac/Cook Creek	24		
Upper main stem	27	**TOTAL**	**1,722**

Literature Cited

Allendorf, F.W., R.F. Leary, P. Spruell and J.K. Wenburg. 2001. The problems with hybrids: setting conservation guidelines. Trends in Ecology and Evolution 16(11): 613-622.

Rieman, B.E. and J.B. Dunham. 2000. Metapopulations and Salmonids: a synthesis of life history patterns and empirical observations. Ecology of Freshwater Fish 9:51-54.

Schmetterling, D.A. *In review*. Spatial and temporal dynamics of hybridization between rainbow and westslope cutthroat trout in the Blackfoot River drainage of Montana.

Appendix 1. Probability of detecting one percent hybridization with one to 10 diagnostic loci and sample sizes of one and 25 and in subsequent increments of five up to 50 individuals (table provided by Robb Leary, University of Montana Wild Trout and Salmon Genetics Laboratory).

Number of Fish (N)	Number of diagnostic loci									
	1	2	3	4	5	6	7	8	9	10
1	.020	.039	.059	.077	.096	.114	.131	.149	.166	.182
2	.039	.077	.114	.149	.182	.214	.245	.275	.304	.331
3	.059	.114	.166	.214	.260	.304	.344	.383	.419	.453
4	.077	.149	.214	.275	.331	.383	.430	.474	.515	.553
5	.096	.182	.260	.331	.395	.453	.505	.553	.595	.634
6	.114	.214	.304	.383	.453	.515	.590	.619	.662	.701
7	.131	.245	.344	.430	.505	.570	.627	.676	.718	.755
8	.149	.275	.383	.474	.553	.619	.676	.724	.765	.800
9	.166	.304	.419	.515	.595	.662	.718	.765	.804	.836
10	.182	.331	.453	.553	.634	.701	.755	.800	.836	.866
11	.198	.357	.485	.587	.669	.735	.787	.830	.863	.890
12	.214	.383	.515	.619	.701	.765	.815	.855	.886	.910
13	.230	.407	.543	.648	.729	.792	.840	.877	.905	.927
14	.245	.430	.570	.676	.755	.815	.861	.895	.921	.940
15	.260	.453	.595	.701	.779	.836	.879	.910	.934	.951
16	.275	.474	.619	.724	.800	.855	.895	.924	.945	.960
17	.289	.495	.641	.745	.819	.871	.909	.935	.954	.967
18	.304	.515	.662	.765	.836	.886	.921	.945	.962	.973
19	.317	.534	.682	.783	.852	.899	.931	.953	.968	.978
20	.331	.553	.701	.800	.866	.910	.940	.960	.973	.982
21	.344	.570	.718	.815	.879	.921	.948	.966	.978	.985
22	.357	.587	.735	.830	.890	.930	.955	.971	.981	.988
23	.370	.603	.750	.843	.901	.938	.961	.975	.984	.990
24	.383	.619	.765	.855	.910	.945	.966	.979	.987	.992
25	.395	.634	.799	.866	.919	.951	.970	.982	.989	.993
30	.453	.701	.836	.910	.951	.973	.985	.992	.996	.998
35	.505	.755	.879	.940	.970	.985	.993	.996	.998	.999
40	.553	.800	.910	.960	.982	.992	.996	.998	.999	1.000
45	.595	.836	.934	.973	.989	.996	.998	.999	1.000	1.000
50	.634	.866	.951	.982	.993	.998	.999	1.000	1.000	1.000

CHAPTER 4

BULL TROUT REDD COUNTS IN MIDDLE CLARK FORK RIVER TRIBUTARIES

Background

Redd counts are a common tool for monitoring escapement of adult fluvial bull trout (Dunham et al. 2001; Spalding 1997). Redds, or nests, are excavated by spawning females and can be counted by trained personnel in consistent stream sections to serve as an index of adult abundance, level of spawning activity and as an indication of anticipated recruitment in the succeeding generation. However, redd abundance does not represent total expected offspring abundance as stock-recruitment curves have not been developed for this species in Montana. Riemen and Meyers (1997) recommend 10 years of monitoring in index reaches to identify trends in population abundance.

In western Montana, bull trout generally spawn during the first three weeks of September and have high fidelity to natal tributaries (Fraley and Shepard 1989). Fluvial bull trout redds are easy to identify as adults (>16 in) and redds (> 3 ft long) are large (Kondolf and Wolman 1993; Fraley and Shepard 1989). Typical redds constructed by stream-resident adults (those that spend their entire life in a tributary stream) can be more difficult to identify due to smaller average adult body size, redd size and stream substrates utilized.

Investigations in the Swan River drainage in northwest Montana (Baxter 1997) indicated that bull trout selected spawning sites that were within or immediately downstream of reaches that gained subsurface water (upwelling areas). Bull trout spawning typically occurs in areas influenced by groundwater (Allan 1980; Fraley and Shepard 1989). These areas tend to remain open during harsh winter conditions when adjacent stream reaches ice over or accumulate anchor ice (Deleray et al. 1999). High groundwater exchange keeps eggs from freezing and helps prevent suffocation.

Bull trout typically spawn in reaches with gradients of less than two percent (Fraley and Shepard 1989). Water depths at the upstream edge of adfluvial bull trout redds ranged from 4-24 inches (mean 12 inches) and water velocities ranged from 0.3 – 2.0 ft/sec (mean 1.0 ft/sec) in the Flathead Drainage (Fraley et al. 1981; Kitano et al. 1994).

Electrofishing surveys throughout tributaries of the middle Clark Fork River basin (Rock Creek confluence to Flathead River confluence) in 1999-2004 indicated that as few as four fluvial bull trout populations remain. Historically and as late as the mid-1900s, bull trout were found in most major middle Clark Fork River tributaries (MFWP historical files). In 1999-2004, bull trout were detected in Rattlesnake Creek, Grant Creek, Albert Creek, Petty Creek, Fish Creek (West Fork, North Fork and Cache Creek), Trout Creek, Cedar Creek and the St. Regis River (Little Joe Creek) drainages. The Petty Creek population is not considered viable because of extremely low densities, hybridization and severe habitat degradation. Albert Creek, Trout Creek and Grant Creek support small populations that likely have a limited migratory component due to severe dewatering in

lower reaches and barriers to upstream migration. The remaining four populations are considered 'fluvial' based on observation of migratory adults, higher juvenile densities and large redds typical of migratory fish.

Bull trout redd count (index) sections were established in Rattlesnake Creek, Fish Creek, Cedar Creek and Little Joe Creek in 1999-2002 to monitor (primarily) fluvial populations. All of these streams support intact, complex habitat with excellent water quality. Fish Creek and Rattlesnake Creek are unique in that most of the upper portions lie in undeveloped roadless areas (proposed Great Burn Wilderness and Rattlesnake Wilderness and Recreation Area, respectively). Not coincidentally, recent surveys suggest that these two drainages support the most abundant remaining bull trout populations in the middle Clark Fork River drainage.

Methods

We completed redd surveys in prospective spawning areas throughout the four tributaries that still support viable fluvial bull trout populations. Locations of initial surveys were based on historical and anecdotal information, bull trout spawning habitat requirements, and the distribution of juvenile bull trout from electrofishing surveys. Redd counts were conducted during the period of September 24 – October 10, which is within 2-3 weeks after the spawning period ends.

Experienced field crews completed surveys by walking the channel and visually searching for redds. Redds were identified by the presence of a pit or depression and associated tail area of clean (bright) gravel (Spalding 1997). The total number of redds in a particular reach was totaled to determine a 'count' for monitoring purposes. Only definitive redds were included in counts. All redds were > 3 ft in length from head of pit to tail, which represents primarily fluvial adults as average body size of stream-resident adults (and presumably redd and substrate sizes) are significantly smaller than migratory fish. Index reaches, which encompass key spawning areas with the highest concentrations of redds, were established in each tributary to serve as annual redd count sections. Basin-wide surveys of tributaries are rotated annually (one stream per year) to confirm that index reaches are representative of spawning activity in each drainage.

Establishing bull trout redd monitoring sections was particularly important in Rattlesnake Creek. Redd counts are being used to track fluvial bull trout population response after fish passage upgrades and other fishery enhancements were completed in 2001-2003. However, Rattlesnake Creek is unique among the four monitoring streams in that it has retained relatively abundant fluvial and stream-resident bull trout population components. In this stream, it is not possible to distinguish redds constructed by fluvial fish from those of large (>20 in) resident fish. Therefore, the total redd count represents both components.

Results and Discussion

Rattlesnake Creek

Two reaches of 1.0 mi and 2.25 mi were selected in 2000 as redd count index sections because they contained all of the redds located in the drainage (Figure 1). Redd counts were completed each year in the period of September 24-29.

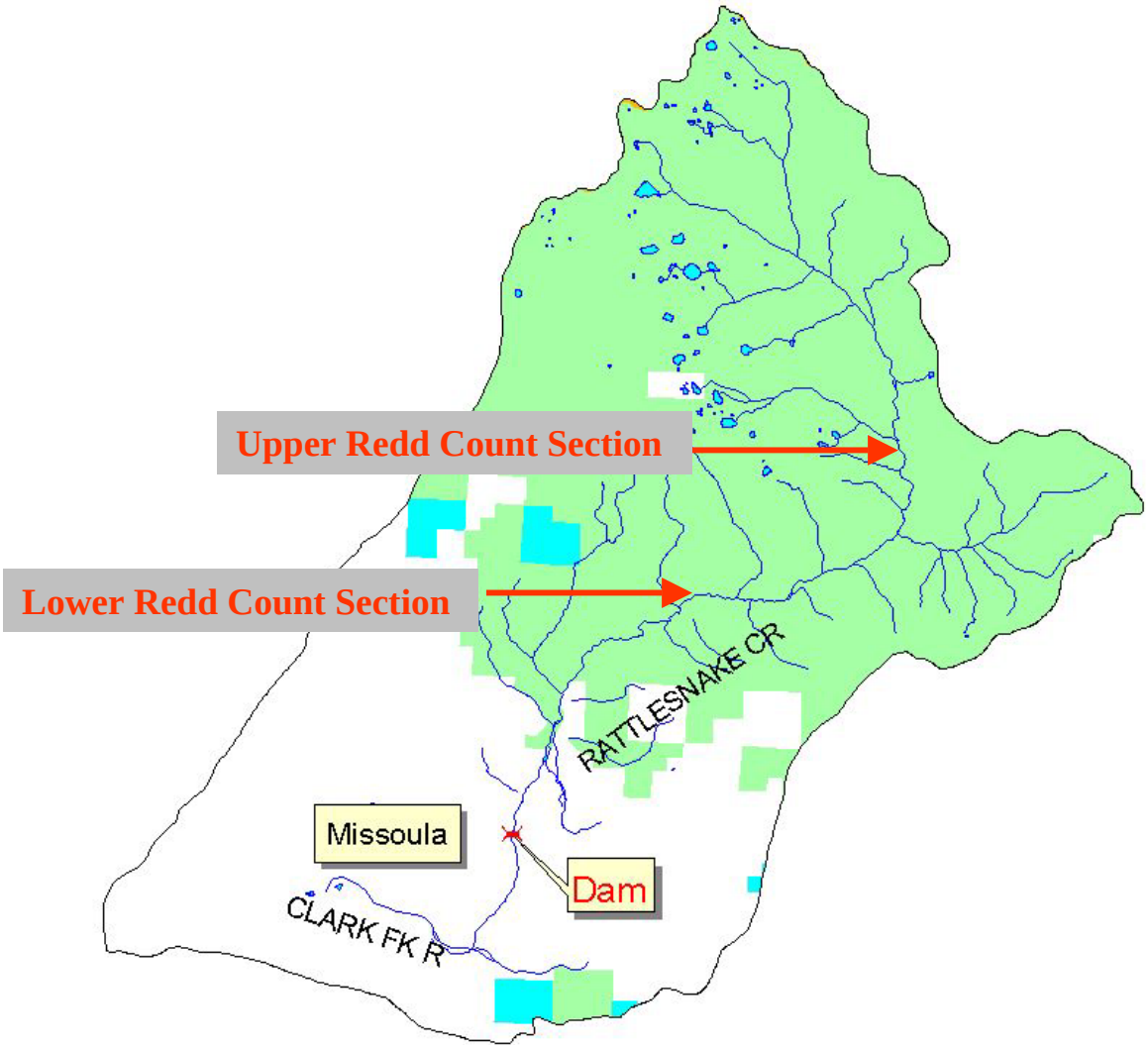

Figure 1. Location of bull trout redd count sections in Rattlesnake Creek.

Bull trout redd counts from 1999-2004 suggest a significant positive response to upstream fish passage provided at Mountain Water Company (MWC) Dam (Table 1). Counts completed in 1999 and 2000 are considered a baseline for pre-project spawning activity by large resident bull trout since spawning areas were not accessible to fluvial adults during this period. The abundance of redds was enhanced in 2001 and 2002 by

manually transporting 26 and 28 adults (respectively) over MWC Dam. In 2003-2004, upstream fish passage at the dam was provided by a fish ladder constructed around the east portion of the spillway. Fluvial bull trout population size and redd abundance in Rattlesnake Creek is expected to increase further with continued access to spawning areas and affiliated enhancement activities that reduce anthropogenic mortality (e.g., screening irrigation diversions and protective fishing regulations). Redd counts were incomplete and presumably invalid for index Section I in 2004 due to a high flow event that occurred near the end of the spawning period (early September). Two redds that were observed prior to increased discharge during spawning were no longer visible in our redd counts on September 24.

Table 1. Bull trout redd abundance in Rattlesnake Creek monitoring sections.

		SECTION I	SECTION II	TOTAL
1999	(9/28/99)	12	No Count	12[a]
2000	(9/29/00)	8	4	12
2001	(9/27/01)	24	6	30[b]
2002	(9/27/02)	19	10	29[b]
2003	(9/26/03)	29	4	33[c]
2004	(9/24/04)	6[d] (partial count)	7	13[cd]

a The upper monitoring section was not established until 2000.
b In 2001-2002, adult bull trout were transported over Mountain Water Company Dam, which contributed to increased redd numbers.
c In 2003-2004, upstream fish passage was provided by the permanent fish ladder.
d In 2004, identification of most redds in section I was not possible due to unusually high fall flows.

The validity of redd count sections as indices of total redd abundance was evaluated using basin-wide surveys and radio telemetry. Redd surveys completed throughout the upper Rattlesnake Creek drainage in 1999 and 2000 indicated that redds were concentrated in our selected index reaches. In fact, no redds were located outside these reaches. Radio telemetry also confirmed the validity of selected redd count locations. All five telemetered bull trout captured and transported over MWC Dam in 2001 and 2002 spawned within the lower redd count section (Section I).

Fish Creek

Fish creek is a large tributary that enters the Clark Fork River in the Alberton Gorge. Most of its upper reaches lie in roadless areas and proposed wilderness that cannot be accessed with motorized vehicles. Although many tributaries appear to have the capacity to support bull trout, we only found redds and high densities of juveniles in the West Fork and North Fork. In 2000-2001, two reaches in each fork were selected as redd count monitoring sites (Figure 2). The approximate lengths of these sites are 2.75 mi (North Fork I), 3.25 mi (North Fork II), 2.25 mi (West Fork I) and 2 mi (West Fork II). These reaches contained >90% of the bull trout redds located in our surveys (Table 2). Bull trout spawn in other sections of the drainage, but at levels that appear too low for useful long term monitoring.

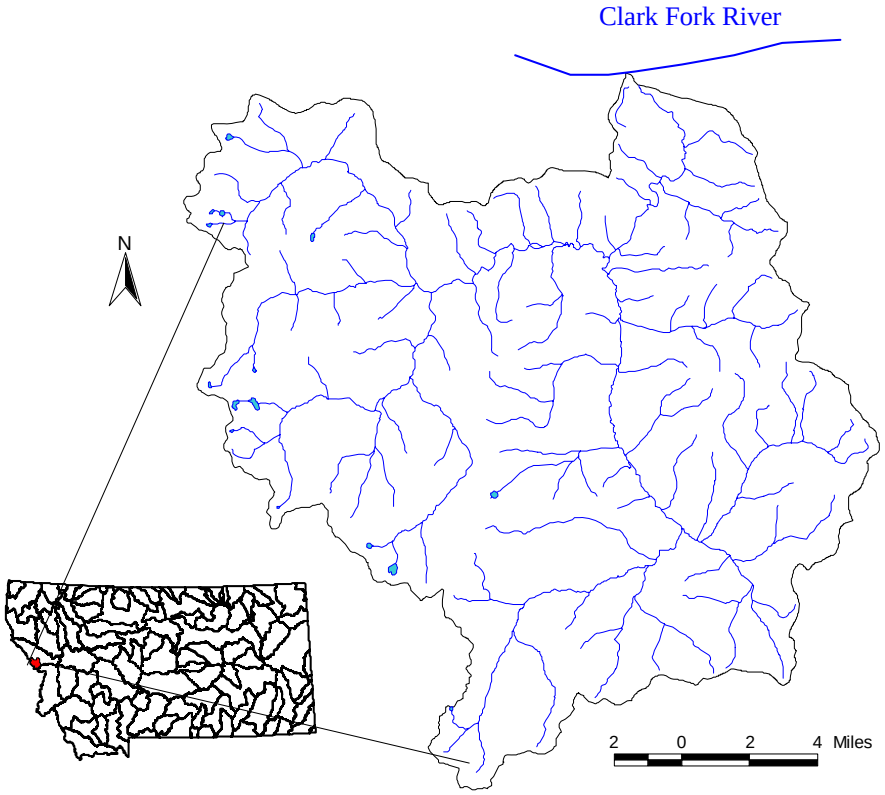

Figure 2. Location of redd count monitoring sections in the Fish Creek drainage (in red).

Redd abundance was surprisingly low, even in selected monitoring sections. This is likely due to the drought conditions in 2001-2004, but likely also reflects the influence of overharvest and the presence of impassible dams on the lower Clark Fork River. Natural stream dewatering influenced the distribution of redds in 2001 as the most heavily used North Fork spawning reaches of 2000 were completely dry or inaccessible. It is unclear whether the drought conditions affected the total number of redds or the number of repeat spawning adults over consecutive years. Annual monitoring sections selected include

reaches with the best perceived spawning habitat during high flow and low flow periods. Continued monitoring during higher water conditions and occasionally repeating basin-wide counts should help us to assess the impacts of the drought and the location of annual monitoring sections.

Table 2. Bull trout redd abundance in Fish Creek monitoring sections.

		NORTH FORK		WEST FORK	
		Section I	**Section II**	**Section I**	**Section II**
2000	(<10/5)	13	2	No Count	No Count
2001	(<10/5)	0 *	4 *	2	6
2002	(<10/5)	2 *	0	2	4
2003	(9/28-9/30)	1*	5	3	11
2004	(9/27/04)	3*	4	3	3

* Drought conditions - many reaches dry or inaccessible

We searched for redds in several other Fish Creek tributaries suspected of supporting bull trout, but none were observed. Redd surveys were completed throughout Cache Creek in 2000 and 2001 where discharges were > ~5 cfs and habitat was suitable for spawning. No definitive redds were observed, although electrofishing surveys indicate low abundance of bull trout. Cedar Log and Straight Creeks have incised, high gradient channels with multiple waterfalls. No bull trout redds were located in 2001 redd count surveys and no juvenile bull trout have been sampled in electrofishing assessments conducted on these streams.

Cedar Creek

Basin-wide redd surveys were completed in Cedar Creek in 2002 and 2003. All areas presumed capable of supporting spawning (based on substrate, gradient, and discharge) were surveyed. Two redd count monitoring sections of 2.5 mi and 3.5 mi were chosen based on the distribution of redds. Areas immediately upstream of redd count monitoring sections (Upper Lost Creek, Oregon Gulch, Cedar Creek) may be capable of supporting spawning in higher water years and will be re-surveyed to determine if additional monitoring sections are needed.

Redd abundance in Cedar Creek is low, but is sufficient to sustain a viable population (Table 3). Drought conditions in 2004 likely contributed to low redd abundance. Cedar Creek is unique in that only native fish species (bull trout, westslope cutthroat trout, mountain whitefish and sculpins) were detected in all electrofishing sampling sites throughout the drainage. Viable introduced trout populations likely only inhabitat reaches near the stream mouth that were not sampled.

Table 3. Bull trout redd abundance in Cedar Creek monitoring sections.

		Section I	Section II	TOTAL
2002	(10-3-02)	7	3	10
2003	(9-26-03)	8	4	12
2004	(9-28-04)	2	0	2

Little Joe Creek

Electrofishing surveys suggested that juvenile bull trout were present throughout most of Little Joe Creek. Both forks of Little Joe Creek have similar hydrology and geomorphology, with high habitat complexity. Initial redd surveys in 2002-2003 conducted by MFWP and Lolo National Forest personnel included a subsample of predicted spawning reaches and indicated that fluvial redds were spread sporadically throughout upper portions of the stream. Proposed redd count sections of 2.25 mi (South Fork) and 3.5 mi (North Fork) were established in 2003 based on these initial surveys (Table 4). However, in 2004 we located 11 redds outside of our monitoring sections in the South Fork. In 2005, we will complete a basin-wide survey and adjust the boundaries of redd count monitoring sections.

The density of redds in Little Joe Creek is similar to the other Middle Clark Fork monitoring streams. However, the absence of bull trout in all other tributaries within the St. Regis River drainage is alarming. It is not known why bull trout populations in adjacent tributaries within this drainage have disappeared when habitat and ecological conditions appear to be similar.

Table 4. Bull trout redd abundance in Little Joe Creek monitoring sections.

		Section I (South Fork)	Section II (North Fork)
2002	(~10/1)	7	no count
2003	(9/25 - 9/30)	6	12
2004	(9/29 – 10/4)	4 (+ 11 in new section)	6

Summary

Although redd counts only serve as an index of population abundance in the Clark Fork River and its tributaries, both the number of identifiable spawning streams and abundance of redds indicate that bull trout populations are severely depressed. These data are consistent with projected adult densities from main stem Clark Fork River population estimates (1-2 adults per river mile) over the past two decades (Berg 1999; Knotek et al. 1993). Regardless of drought impacts and the possibility that we did not detect some spawning populations, it is clear that the number of remaining populations and spatial distribution of bull trout is a small fraction of the historic and desired condition. Immediate steps should be taken to secure and enhance remaining populations before extinction becomes a legitimate risk.

Literature Cited

Allan, J.H. 1980. Life history notes on the Dolly Varden char (*Salvelinus malma*) in the upper Clearwater River, Alberta. Manuscript report. Alberts Energy and Natural Resources, Fish and Wildlife Division, Red Deer, Alberta.

Baxter, C.V. 1997. Geomorphology, land use, and groundwater-surface water interaction: a multi-scale, hierarchical analysis of the distribution and abundance of bull trout (*Salvelinus confluentus*) spawning. M.S. Thesis. University of Montana, Missoula, Montana.

Berg, R.K. 1999. A compilation of fishery survey information for the middle Clark Fork Riverdrainage 1984-96. Montana Fish, Wildlife & Parks, Missoula, Montana.

Deleray, M., W.L. Knotek, S. Rumsey and T.M. Weaver. 1999. Flathead Lake and River system fisheries status report. Montana Fish, Wildlife and Parks, Kalispell, Montana. 200 pp.

Dunham, J., B. Rieman, & K. Davis 2001. Sources and magnitude of sampling error in redd counts for bull trout. North American Journal of Fisheries Management 21:343-352.

Fraley, J.J., D. Read and P.J. Graham. 1981. Flathead River fisheries study. Montana Department of Fish, Wildlife and Parks, Kalispell, Montana.

Fraley, J. J., & B. B. Shepard. 1989. Life history, ecology, and population status of migratory bull trout (Salvelinus confluentus) in the Flathead Lake and River system, Montana. Northwest Science 63:133-143.

Kitano, S., K. Maekawa, S. Nakano, and K.D. Fausch. 1994. Spawning behavior of bull trout in the Flathead Drainage, Montana, with special reference to hybridization with brook trout. Transactions of the American Fisheries Society 123:988-992.

Knotek, W.L. 2003. Middle Clark Fork River drainage fisheries investigations. Federal Aid Report for F-78-R6 and F-113-R1/R2. Montana Fish, Wildlife and Parks, Missoula, Montana.

Kondolf, G. M., & M. G. Wolman. 1993. The sizes of salmonid spawning gravels. Water Resources Research 29:2275-2285.

Spalding, S. 1997. Montana bull trout redd survey manual – including annotated bibliography. Montana Fish, Wildlife and Parks, Helena, Montana. 8 pp.

CHAPTER 5

ANGLER SURVEYS IN NATIVE TROUT STAGING AND SPAWNING AREAS WITHIN THE MIDDLE CLARK FORK RIVER DRAINAGE

Background

The middle Clark Fork River system in west-central Montana provides a valuable wild trout fishery comprised of introduced rainbow trout, brown trout and brook trout and native populations of bull trout and westlope cutthroat trout (Berg 1999; Knotek 2003). Recent fishery recovery efforts in the drainage have focused on native fluvial stocks.

The distribution and abundance of fluvial bull trout and westslope cutthroat trout in the middle Clark Fork watershed have been significantly reduced over the past century. Montana Fish, Wildlife and Parks (MFWP) fisheries surveys in 1999-2003 suggest that as few as four fluvial bull trout populations remain in the 120 mile reach from the Blackfoot River confluence to the Flathead River confluence (see Fish Species Composition and Distribution chapter). Abundance of adult bull trout in the main stem river reflects this scarcity as population estimates on several reaches of the middle Clark Fork River since 1984 indicate that average adult densities are 1-2 per river mile (Berg 1999; Knotek 2003). Although fluvial westslope cutthroat trout densities are also far below historic levels, these populations have increased since the institution of catch and release fishing regulations in 1990 (Berg 1999; Knotek 2003). Factors contributing to the decline of native trout populations in the middle Clark Fork River system include physical habitat degradation, loss of stream connectivity, water quality degradation, introduction of non-native salmonids and angling.

The impact of angling mortality (harvest and delayed mortality) continues to be a concern for fluvial bull trout populations in the middle Clark Fork River system. Several recent telemetry studies in the upper Clark Fork Basin indicate that intentional and unintentional harvest is responsible for at least 10%-15% of annual fluvial bull trout mortality (Knotek et al. 2004; Pierce et al. 2004; Schmetterling 2003; Swanberg 1997a; Swanberg 1997b). Patterns of angler use, combined with bull trout behavior and life history make this species particularly susceptible to illegal harvest and potentially high rates of delayed (catch and release) mortality.

Angler use has increased appreciably since 1991 on the main stem river (Figure 1). This trend has been exacerbated by the location of developed public access sites and the pattern of angler use. Public access has been provided at most of the key staging areas (particularly tributary stream mouths) resulting in heavy use by anglers in the summer when fluvial trout are staging to spawn or seeking thermal refuge. Although bull trout and westslope cutthroat trout comprise only a small proportion of the salmonids inhabiting these areas, they are more susceptible to angling than the predominant introduced trout species; rainbow trout and brown trout (Berg 1999; MacPhee 1966; MFWP unpublished data).

With these issues in mind, we developed a user survey that targeted anglers in key fluvial bull trout and westslope cutthroat trout staging and spawning areas in the middle Clark Fork drainage in 2004. The survey was designed to assess regulation compliance, fish identification skills, angling methods, angler demographics, basic catch statistics and angler

perceptions of crowding and river access availability. A parallel, concurrent survey was completed at similar sites in the Blackfoot River drainage (Pierce et al. 2005).

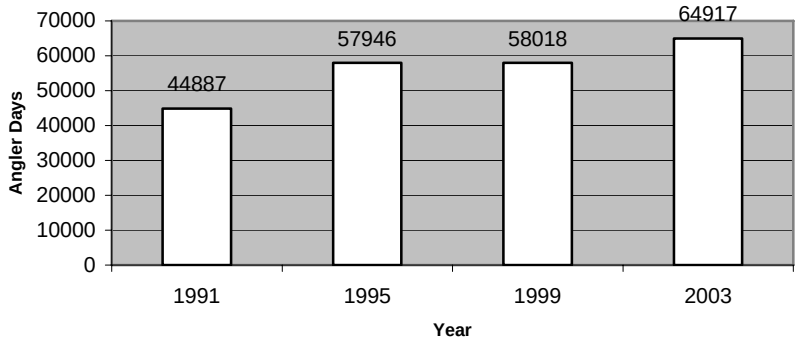

Figure 1. Estimated angler use on the middle Clark Fork River from 1991-2003 from MFWP statewide mail surveys**.**

Methods

Angler surveys were completed between May 28 and October 5, 2004 at 15 sites in the middle Clark Fork River system (Figure 2). We selected sites that were the most accessible and heavily used angling locations in critical bull trout and westslope cutthroat trout habitats. These locations included all major bull trout spawning tributaries and staging areas (mainly tributary mouths) that had been identified in 1999-2003 through electrofishing surveys, bull trout telemetry studies and bull trout redd surveys.

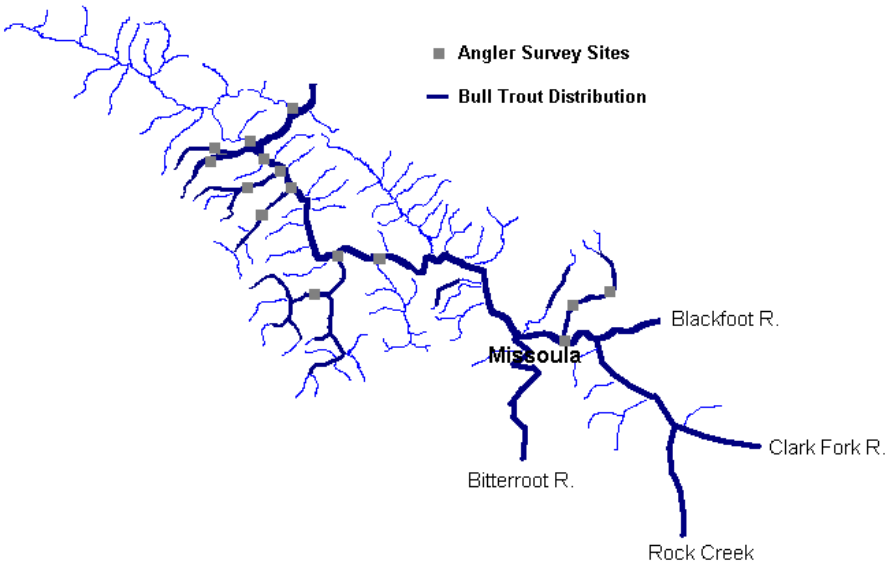

Figure 2. Location of angler survey sites on the middle Clark Fork River system in 2004.

Because we did not intend to estimate the amount of use, it was not necessary to conform to a structured randomized or stratified sampling scheme typically used in traditional creel surveys or recreation use surveys (e.g., Kneeshaw 2000; Peters and Schmetterling 1996). Although we attempted to visit every site on each sampling day, survey technicians were instructed to maximize the number of angler contacts. Within each week, we typically conducted surveys on both weekend days, at least two week days and any major holidays. All interviews were conducted from shore. Sampling from shore biased our sample toward bank anglers at sites on the main stem where float fishing is common. However, many float anglers were interviewed when they stopped to fish our sampling locations. Bank anglers were those that accessed the river by walking or wading from the bank. Float anglers were those that accessed the river with some type of boat. All surveyed anglers were asked if they intended to harvest fish. Those that did not were assumed to be catch-and-release anglers.

Prospective anglers at our predetermined sampling sites were approached by technicians in MFWP uniform and asked if they were willing to be interviewed. All individuals that were fishing or intending to fish were interviewed. When parties of anglers were encountered, anglers were interviewed individually when possible. Angler interviews consisted of five major components: 1) background and demographic information, 2) fishing methods, 3) fish identification, 4) knowledge of regulations and compliance, 5) catch information, and 6) perceptions of access and level of use (crowding). A copy of the actual survey form is in Appendix I. For the fish identification portion of the survey, we developed a single sheet with five colored illustrations depicting the five common trout species in western Montana: westslope cutthroat trout, rainbow trout, bull trout, brown trout and brook trout (Appendix II). These are the same color plates used in the Montana fishing regulations. Anglers were given the sheet and asked to identify each of the trout species. A correct or incorrect response for each species was recorded by the survey technician.

Results and Discussion

We interviewed 284 anglers in 559 visits to 13 of the 15 sampling sites selected on the middle Clark Fork River system (Table 1). The majority of our sample was collected on Fish Creek (n=150) and at major stream mouths (n=101), which approximates the observed relative amount of use of these sites by anglers. In considering data in Table 1, it should be recognized that sites such as Fish Creek and Trout Creek are several miles long and stream mouths encompass a limited area (typically 100 yd radius). We did not contact any anglers on the North Fork of Little Joe Creek or in upper Cedar Creek. Rattlesnake Creek sites were visited less frequently because they are geographically separate from the other sites.

Because we were most interested in tributary sites and specific main stem river locations, our sample was mostly comprised of bank anglers (232 or 81.7%). The remaining ‘float’ anglers (52 or 18.3%) accessed the river and were fishing from drift boats, rafts, canoes, jet boats and personal inflatable crafts. Our sampling scheme was also biased toward unguided anglers (267 or 94.7%) as guided trips typically cover longer reaches of the main stem in boats (with fewer shore stops) and are not readily accessible for interviews. Guided anglers were fishing all of the main stem sites that we sampled, but were less likely to be sampled than bank anglers unless they came ashore before or after fishing our sampling sites.

Table 1. Location and number of angler interviews conducted at sites in the middle Clark Fork River drainage in 2004.

Site	# Visits	# Interviews	# Interviews / Visit
Mouth of Tamarack Creek	37	11	0.30
Mouth of St. Regis River	44	29	0.66
South Fork Little Joe Creek	41	1	0.02
North Fork Little Joe Creek	41	0	0.0
Mouth of Dry Creek	39	12	0.31
Mouth of Cedar Creek	44	3	0.07
Cedar Creek	42	0	0.0
Mouth of Trout Creek	44	22	0.50
Trout Creek	43	16	0.37
Mouth of Fish Creek	47	5	0.11
Fish Creek	45	150	3.33
Mouth of Petty Creek	42	29	0.69
Mouth of Rattlesnake Creek	21	2	0.10
Lower Rattlesnake Creek	15	2	0.13
Upper Rattlesnake Creek	14	2	0.14

The composition of anglers we interviewed was roughly half Montana residents (49%) and half non-residents (51%). Non-resident anglers were predominantly from Washington (30%) and Idaho (21%), although states throughout the nation were represented. The residency composition of anglers in 2004 represents a shift from predominantly Montana (resident) anglers in 1995 (Peters and Schmetterling 1996; Figure 3*)*. This does not likely reflect a decrease in the *number* of resident anglers, but rather an increase in the number and proportion of non-resident anglers. Most anglers were adult males, but women (~10%) and children (<5%) were also included in our sample.

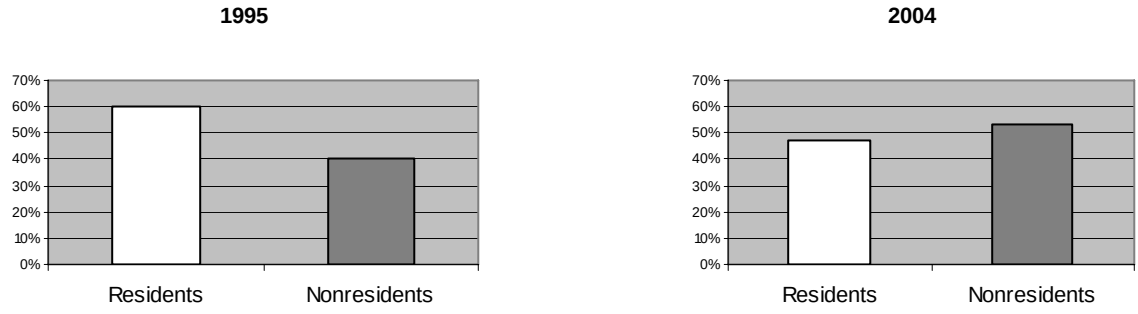

Figure 3. Proportion of resident and non-resident anglers in 1995 (Peters and Schmetterling 1996) and 2004 on the middle Clark Fork River.

Angling Methods

The majority of anglers in our survey were fly-fishing (74%), with a smaller number using bait (9%), hardware (lures,10%) or some combination of these methods (8%; Figure 4). Most anglers (57%) were using barbed hooks (all gear types). When gear types were evaluated based on residency and means of access (float vs. bank angling), results varied among angler types, but showed similar trends. A higher proportion of non-residents (86%) were fly fishing compared with residents (60%). Similarly, float anglers were more likely to be fly fishing (96%) than bank anglers (68%). The trend from hardware and bait fishing to fly fishing was consistent among bank and float anglers from 1995-2004 (Figure 5). However, anglers intending to harvest fish utilized all gear types in 2004: bait (31 %), flies (24%), hardware (24%), and combination of methods (21%).

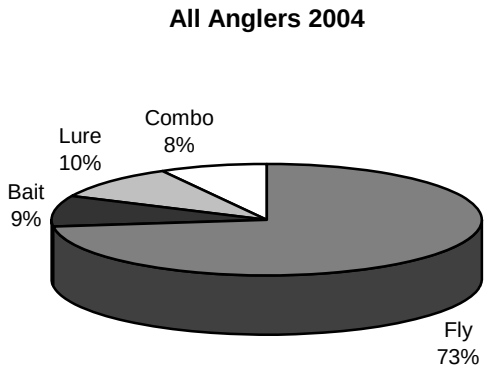

Figure 4. Gear types used by anglers on the Middle Clark Fork River system in 2004.

Angler Catch

A total of 219 anglers had expended at least 0.25 hr fishing when surveyed in 2004. These anglers caught 513 trout in 663 hrs for an overall reported catch rate of 0.77 trout per hr. Only 13 trout (2.5%) were kept and 18% of anglers intending to harvest fish had trout in their possession when surveyed. This catch rate and rate of harvest are consistent with previous surveys on the Clark Fork River (Peters and Schmetterling 1996) and other major western Montana rivers such as the Blackfoot River (Schmetterling and Bohneman 2000; Peters and Workman 1996) and the Bitterroot River (Chris Clancy, MFWP, pers. comm.).

Surprisingly, westslope cutthroat trout dominated the catch by anglers in our survey. This was primarily attributed to two factors. First, there were a disproportionately large number of interviews on Fish Creek, which supports a fish community dominated by native trout. Second, both westslope cutthroat trout and bull trout are far more susceptible to angling than sympatric introduced trout species (MacPhee 1966; MFWP, unpublished data). The relative catch rates of both these species was much greater than their relative abundance in our survey

reaches. One obvious problem with these data is that determining species composition in (predominantly) catch and release fisheries depends on correct identification of different trout species. As described below, this is often not a valid assumption. Therefore, relative trout catch rates in our survey should be interpreted cautiously.

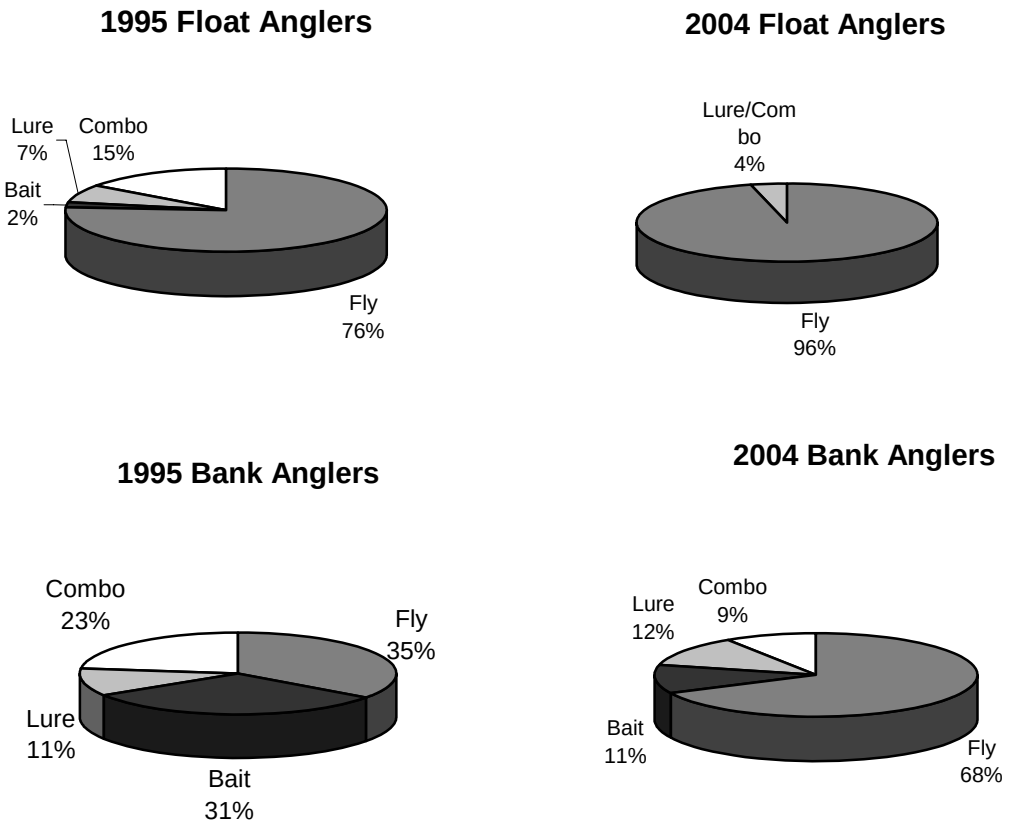

Figure 5. Gear types used by float anglers and bank anglers on the Middle Clark Fork River system in 1995 (Peters and Schmetterling 1996) and 2004.

Catch statistics for the two sites on Fish Creek are also displayed in Table 2 to illustrate the bias these sites introduce into the overall sample. The overall catch rate for Fish Creek was 0.83 trout per hr among 152 anglers and 343 hrs fished. When Fish Creek sites are removed from the total sample, relative catch rates are more representative of the middle Clark Fork River fishery as a whole (primarily a rainbow trout fishery; Peters and Schmetterling 1996).

Fish Identification

Anglers were asked to identify the five common trout species in the Clark Fork River system based on a series of colored illustrations (Appendix II). Overall, anglers' ability to differentiate among species was poor; only 42% correctly identified all five species (Table 3). Those anglers intending to keep fish (n=62) were particularly deficient, with 13% correctly identifying all five species. Approximately 51% of catch-and-release anglers (n=216) were

successful in identifying all five trout. There was no disparity between Montana residents (42.4% success) and non-residents (42.5%) in the fish identification test.

Table 2. Reported angler catch by anglers surveyed on the middle Clark Fork River system in 2004.

	Number Caught	% of Total	% Released
All Sites			
W. cutthroat trout	312	60.8%	100%
Rainbow trout	183	35.7%	94.5%
Brown trout	8	1.6%	75%
Broook trout	6	1.2%	83%
Bull trout	4	0.8%	100%
Fish Creek			
W. cutthroat trout	239	83.6%	100%
Rainbow trout	41	14.3%	97.6%
Brown trout	2	0.7%	100%
Brook trout	2	0.7%	100%
Bull trout	2	0.7%	100%

Anglers' ability to identify individual trout species varied by species (Table 3). Nearly all anglers were able to identify rainbow trout, as it is the most common trout species in western Montana (and North America) and has easily recognizable characteristics. Success in identifying native trout species, westslope cutthroat trout and bull trout, was not as high. Success in identifying each species was relatively consistent among angler sub-categories (e.g., Montana resident vs. non-resident), with the exception of anglers intending to harvest fish. Anglers planning to keep fish had more difficulty identifying all species except rainbow trout.

Table 3. Angler success (by sub-category) in identifying the common trout species in the middle Clark Fork River system in 2004.

	All Anglers	Anglers Keeping Fish	Catch & Release Anglers	Montana Residents	Non-Residents
Correctly Identified All 5 Trout Species	42%	13%	51%	42%	43%
Individual Species					
Bull trout	59%	47%	63%	58%	60%
W. cutthroat trout	74%	63%	77%	76%	72%
Rainbow trout	97%	98%	97%	96%	99%
Brook trout	55%	31%	62%	54%	54%
Brown trout	68%	42%	76%	69%	68%

Many anglers had difficulty identifying bull trout. Most often, this species was confused with brown trout or brook trout and vice versa. Diagnostic characteristics of these three species are not as obvious as those of rainbow trout and cutthroat trout. This is particularly true in field situations when colors are often faded (e.g., juvenile and non-spawning fish) and when individuals are less than 10 inches in length. In addition, anglers don't handle these species as frequently as rainbow trout and westslope cutthroat trout in larger waters of the middle Clark Fork system.

Although most anglers were able to identify westslope cutthroat trout, this species is often confused with rainbow trout (the other *Oncorhynchus* species present). All subspecies of cutthroat trout have a bold red slash under the jaw that helps to distinguish them. However, many anglers in our survey pointed out that the Clark Fork River system has a large proportion of rainbow trout x westslope cutthroat trout hybrids (with varying degrees of introgression) that makes identification difficult. We have also found that most unhybridized rainbow trout have a weak slash under the jaw (MFWP, unpublished data). Therefore, anglers should use a combination of characteristics including strength of jaw slash, spotting pattern, coloration and scale size to consistently distinguish westslope cutthroat trout from rainbow trout.

Anglers' inability to identify most trout species in western Montana is well documented (Schmetterling and Long 1999; Schmetterling et al. 2000). Our results were generally consistent with the findings of these previous studies. These and other investigations continue to suggest the need for targeted angler education efforts in native fish recovery areas. Anglers that successfully identified bull trout or westslope cutthroat trout in our survey were asked how they learned to identify these species and listed as many answers as appropriate (Table 4). Most anglers learned to identify trout through information that MFWP provided (fishing regulations, signs, posters), past angling experience and/or family members and friends. These results were similar to Schmetterling et al. (2000). Schmetterling and Long (1999) also reported that success in fish identification was positively related to years of angling experience.

Table 4. Reported mechanisms by which anglers on the Middle Clark Fork River system learned to identify trout.

How Anglers Learned to Identify Trout	Number of Responses
MFWP Fishing Regulations	47
Past Angling Experience	39
MFWP Signs, Billboards, etc.	27
Friend	26
Parent/Family Member	24
Book	24
School/Education Program/Previous Survey	12
Guides	6

Knowledge of Regulations and Compliance

Despite poor fish identification skills among all angler groups, fishing regulation compliance was extremely high (>99%). Most anglers had purchased a fishing license (99.7%), had a copy of the Montana Fishing Regulations with them (76%) and knew the special regulations for bull trout (80%) and westslope cutthroat trout (60%). There was some disparity in angling regulation compliance and knowledge of regulations among angler groups (Table 5), but it likely did not significantly affect the level of compliance since most anglers were fly fishing (74%) and intended to release all of their catch (78%). Anglers intending to harvest fish had the highest rate of violations (7.9%). However, lower regulation compliance may be an inherent risk for this angling group as there is much more opportunity for error relative to anglers that release fish. Most violations that occurred involved special gear restrictions (using bait in artificial lures only area) or creel restrictions (over limit or illegal size). We observed no violations involving illegally harvested native trout.

Table 5. Regulation compliance and knowledge of fishing regulations among angler groups on the Clark Fork River system in 2004.

	Have License	Have Regulations	Know Special WCT Regs	Know Special Bull Trout Regs	Caught Violating Regulations
All Anglers	99.7%	76.3%	60.1%	79.7%	2.8%
MT Residents	100%	84.1%	70.1%	86.8%	4.1%
Non-residents	99.3%	68.1%	49.6%	72.3%	1.4%
Anglers Keeping Fish	98.4%	87.1%	72.6%	85.5%	7.9%
Catch & Release Anglers	100%	73.3%	56.6%	78.1%	1.4%

Anglers' Perceptions of Current Angling and Recreation Use

Anglers interviewed in our study were asked to rate the amount of use by anglers and other recreationists at the location they were fishing and to quantify how many of each type of user they had observed. Most anglers (79%) felt that use was very light or light for the area they were fishing (Figure 6). However, there was a significant negative relationship between the average number of users observed and the degree of perceived crowding (Table 6). This suggests that anglers perceptions of the amount of use generally corresponded with what was actually experienced.

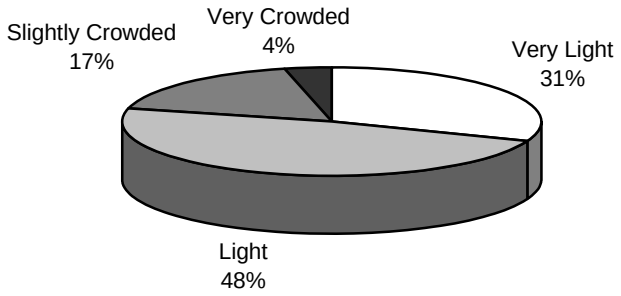

Figure 6. Anglers' perception of the amount of use by anglers and recreationists at the location they were fishing on the middle Clark Fork River system in summer 2004.

In the quantification of other users observed by surveyed anglers (Table 6), float anglers included those observed fishing from jet boats, drift boats, rafts, canoes and personal inflatable crafts. Other recreationists included any other individuals on the river or banks that were not angling. Although most anglers were not disappointed with the amount of angling and recreational use at the sites we surveyed, the relationship between perceived level of use and number of users observed gives an idea of what the anglers we surveyed are willing to tolerate. However, these results should be interpreted with caution as on-site surveys are biased toward anglers that are still using the resource (Manning 1999). Crowding statistics are also biased by recreationists' expectation of experience (Shelby et al. 1983).

Table 6. Reported number and type of recreationists observed by anglers asked to rate level of use at the location they were fishing on the middle Clark Fork River system in summer 2004.

		Total and Average Number of Users Observed by Surveyed Anglers		
Level of Use Reported	**Number Responses**	**Bank Anglers**	**Float Anglers**	**Other Recreationists**
very light	85 (31%)	39 (0.5)	107 (1.3)	56 (0.7)
light	132 (48%)	202 (1.5)	212 (1.6)	266 (2.0)
slightly crowded	48 (17%)	155 (3.2)	140 (2.9)	222 (4.6)
very crowded	10 (4%)	65 (6.5)	29 (2.9)	63 (6.3)
TOTAL	275	461 (1.7)	488 (1.8)	607 (2.2)

Fish Creek supports the most angling use of any tributary in our study area and is a key spawning and rearing stream for native trout. Angler surveys from Fish Creek made up 55% of our total sample. Because of the significance of Fish Creek and its reputation as a popular fishery, results for this stream alone are also presented. Angler perceptions of level of use and

trends in surveyed angler responses with respect to relative number of users observed on Fish Creek (Table 7) were similar to those for all sites combined.

Table 7. Reported number and type of recreationists observed by anglers asked to rate level of use at the location they were fishing on Fish Creek in summer 2004.

		Total and Average Number of Users Observed By Surveyed Anglers		
Level of Use Reported	**Number Responses**	**Bank Anglers**	**Float Anglers**	**Other Recreationists**
very light	41 (27%)	24 (0.6)	5 (0.1)	23 (0.6)
light	74 (49%)	186 (2.5)	13 (0.2)	216 (2.9)
slightly crowded	28 (19%)	145 (5.2)	58 (2.1)	199 (7.1)
very crowded	8 (5%)	85 (10.6)	0 (0.0)	63 (7.9)
TOTAL	151	440 (2.9)	76 (0.5)	501 (3.3)

Public Access

Anglers were asked to rate the availability of public access on the river or stream they were fishing. Results suggest that most anglers were satisfied with the level of public access currently available (Figure 7). The exception was the Huson area, which several anglers mentioned specifically in comments regarding desired access points. Results were very similar when only anglers interviewed on Fish Creek were considered: 95% indicated that access was about right, 4% felt there was too much, and 1 % answered not enough public access.

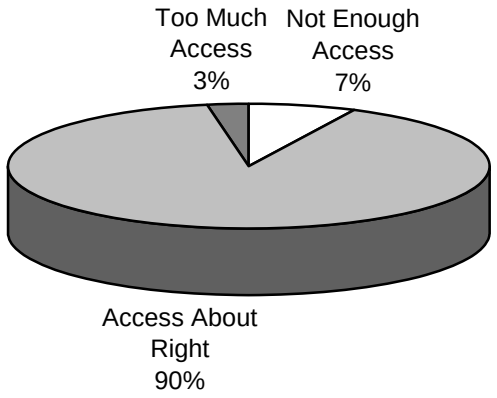

Figure 7. Anglers' perception of access availability on the middle Clark Fork River system in 2004.

Project Summary and Management Implications

The impact of angling mortality continues to be a concern as managers attempt to recover fluvial bull trout and westslope cutthroat trout populations. In this survey, we found that a significant shift to catch-and-release fly fishing is occurring among the angling constituency. Overall regulation compliance was high and no native trout were harvested by anglers that we surveyed. However, fish identification continues to be a problem, particularly for anglers intending to harvest fish. Most anglers that we surveyed were satisfied with the level of current angling use and public access, but results implied that there are limits.

Despite high regulation compliance in our survey and trends of increased catch-and-release fly fishing, telemetry data and continued enforcement cases involving illegally harvested native trout indicate that efforts discouraging harvest should continue. The basis of the perceived problem involves increasing numbers of anglers that are provided access and are focused on native trout staging and spawning areas (traditionally premier fishing locations for all trout species). Native fluvial trout, particularly bull trout, are concentrated in these areas when angling pressure is highest (summer/early fall) and are extremely vulnerable to angling relative to other trout species. Because of low overall densities, bull trout and westslope cutthroat trout are still a minority of trout caught at main stem sites. Though these species are caught infrequently, catch rate is very high relative to actual abundance. In the case of adult fluvial bull trout, angled fish will likely be the largest individuals caught on a trip or in the season. This is believed to subject the fish to a higher likelihood of harvest or longer period of stress during capture and release. The indirect impact (mortality) due to catch-and-release angling needs to be evaluated.

Table 8. Suggested priority areas for education and enforcement efforts in the middle Clark Fork river system based on 2004 angler surveys.

Suggested Priority for Education & Enforcement	Site	Anglers per Survey Visit	% Anglers Harvesting	% Anglers in Violation
1	St. Regis R. Mouth	0.66	27.6%	17.2%
1	Fish Creek	3.33	19.3%	1.3%
1	Fish Creek Mouth	0.11	20.0%	40.0%
2	Petty Creek Mouth	0.69	20.7%	3.4%
2	Trout Creek Mouth	0.50	31.8%	0.0%
2	Trout Creek	0.37	43.8%	0.0%
2	Tamarack Creek Mouth	0.30	18.2%	0.0%
3	Dry Creek Mouth	0.31	0.0%	0.0%
3	Cedar Creek Mouth	0.07	0.0%	0.0%
3	S. Fork Little Joe Cr.	0.02	0.0%	0.0%
3	N. Fork Little Joe Cr.	0.00	0.0%	0.0%
3	Cedar Creek	0.00	0.0%	0.0%

Note: Rattlesnake Creek sites are also priority areas for education and enforcement, but were not included due to small sample size in our survey.

This survey and other fisheries data collected on the middle Clark Fork River system suggest that angler education and enforcement efforts should focus on specific angler groups and locations. Specifically, anglers harvesting fish at major stream mouths and on Fish Creek and Trout Creek should be targeted. Table 8 provides a recommended prioritization of the sites that we surveyed. Rattlesnake Creek sites are also priority areas for enforcement and angler education, but were not included in Table 8 because we conducted few interviews at these locations. Native fish issues also need to be better incorporated into river recreation planning, river management and development of public access sites. Without this coordinated approach, ongoing native fish restoration and recovery actions may be compromised.

Literature Cited

Berg, R.K. 1999. A compilation of fishery survey information for the middle Clark Fork River drainage. Montana Fish, Wildlife and Parks, Missoula, Montana.

Carnefix, G. 2002. Movement patterns of fluvial bull trout in relation to habitat parameters in the Rock Creek Drainage, Missoula and Granite Counties, Montana. M.S. thesis. University of Montana, Missoula, Montana. 185 pp.

Knotek, W.L. 2003. Middle Clark Fork River drainage fisheries investigations. Federal Aid Report for F-78-R6 and F-113-R1/R2. Montana Fish, Wildlife and Parks, Missoula, Montana.

Kneeshaw, K. 2000. Recreational use of the Alberton Gorge – lower Clark Fork River summer season 2000. Montana Fish, Wildlife and Parks, Misoula, MT.

Knotek, W.L., R. Rashap and D. Schmetterling. 2004. Rattlesnake Creek: Fisheries assessment and enhancement 1999-2003. Montana Fish, Wildlife and Parks, Missoula, Montana. 49 pp.

MacPhee, C. 1966. Influence of differential angling mortality and stream gradient on fish abundance in a trout-sculpin biotope. Transactions of the American Fisheries Society 95:381-387.

Manning, R.E. 1999. Studies in Outdoor Recreation: Search and Research for Satisfaction, Second Edition. Corvallis, OR: Oregon State University Press.

Peters, D. and D. Schmetterling. 1996. Clark Fork River creel census: Rock Creek to Flathead River. Statewide Fisheries Investigations, Project F-78-R-2. Montana Fish, Wildlife and Parks, Missoula, Montana. 23 pp.

Peters, D. and D. Workman. 1996. 1994 Blackfoot River user survey. Montana Fish, Wildlife & Parks, Missoula, Montana. 14 pp.

Pierce, R., R. Anderson, and C. Podner. 2004. The Big Blackfoot River restoration progress report for 2002 and 2003. Montana Fish, Wildlife and Parks, Missoula, Montana. 95 pp.

Schmetterling, D.A. 2003. Reconnecting a fragmented river: movements of westslope cutthroat trout and bull trout after transport upstream of Milltown Dam, Montana. North American Journal of Fisheries Management 23:721-731.

Schmetterling, D.A. and M.J. Bohneman. 2000. 1999 Blackfoot River creel census. Montana Fish, Wildlife and Parks, Missoula, Montana. 13 pp.

Schmetterling, D.A. and M.H. Long. 1999. Montana anglers' inability to identify bull trout and other salmonids. Fisheries 24(7):24-27.

Schmetterling, D.A., M.H. Long and B.J. Cummings. 2000. Educational strategies to improve Montana Anglers' ability to identify salmonids. Bull Trout II Conference Proceedings.

Shelby, B., T.A. Heberlein, J.J. Vaske, and G. Alfano. 1983. Expectations, preferences, and feeling crowded in recreation activities. Leisure Sciences 6(1):1-14.

Swanberg, T.R. 1997a. Movements of bull trout (*Salvelinus confluentus*) in the Clark Fork River System after transport upstream of Milltown Dam. Northwest Science 71(4):313-317.

Swanberg, T.R. 1997b. Movements of and habitat use by fluvial bull trout in the Blackfoot River, Montana. Transactions of the American Fisheries Society 126:735-746.