Ref ID: 88770

Fssheries Investigation in backcountry tributaries of the Blackfoot Basin: streams

Introduction

Beginning in 2004, FWP fisheries crews performed a series of fisheries-based aquatic resource inventories in the "backcountry" (e.g roadless and wilderness areas) streams of the Blackfoot Basin. Fisheries surveys initially focused on the Dry Fork Basin (Pierce et al. 2006), and then in 2006-07 surveys expanded to the upper Monture and upper North Fork Basins. These combined surveys represent the first comprehensive fisheries inventory within this backcountry area of the Blackfoot Basin. We initiated these investigations in order to identify headwater fisheries (and related resources) and to supplement information related to native fish (bull trout and WSCT) within and downstream of this backcountry region. Additional stream surveys are planned for the summer of 2008.

Study area

Fisheries inventories emphasized the headwaters of Monture Creek and the North Fork. This area falls within a high glacial landscape in the northern-most portion of the Blackfoot Basin (Figure X). This northern mountain region represents a southern extension of a large contiguous wilderness complex that extends from Glacier National Park south through the Bob Marshall and Scapegoat wildernesses and adjacent "roadless" areas. A majority of the North Fork study area burned in the 1988 Canyon Creek wildfire. Within the study area, originate in glacial cirques and adjoining hillslope and lead southerly through glacial trough valleys before exiting the mountains as larger, colder tributaries of the Blackfoot River. These stream systems are the headwaters to critical native fish-bearing tributaries of the Blackfoot River. Both Monture Creek and the North Fork Blackfoot River are classified as "critical habitat" and "core areas" for fluvial bull trout, and both basins support Blackfoot River fluvial and stream-resident WSCT.

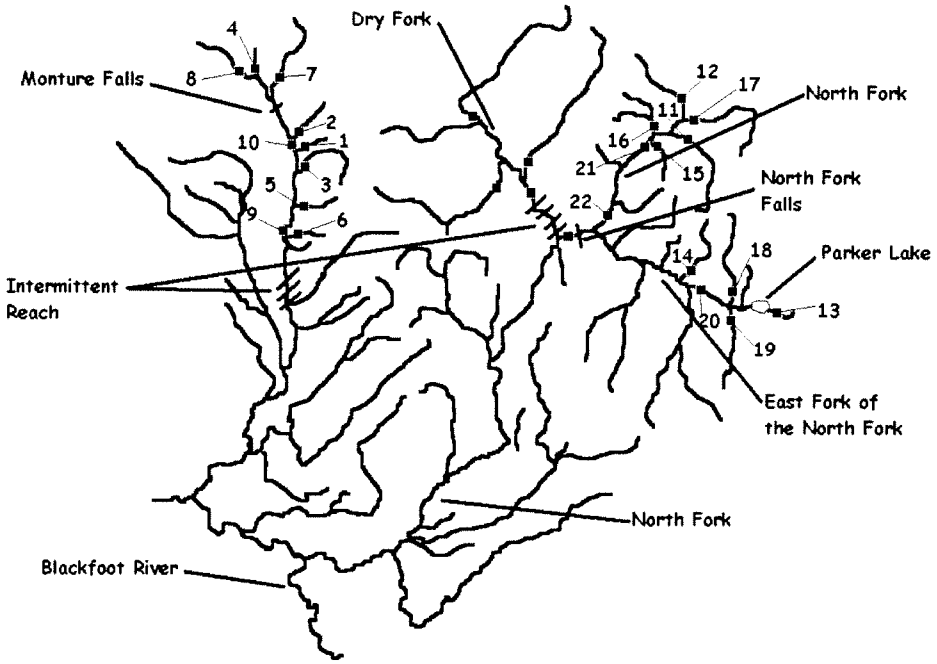

Figure X. Location map: Intermittent reaches and barriers falls and the 2006-07 backcountry stream survey sites. Numbers relate to survey sites and population statistics in Table X. Put Canyon Creek on map.

Within this area, we established 22 fish population-sampling locations on 19 streams (Figure X). We conducted surveys at 12 sites upstream of the North Fork Falls (stream-mile 26.9) and at one site in Canyon Creek (downstream of the North Fork Falls) and at 10 sites in the upper Monture Creek drainage. Seven surveys within Monture Creek drainage were undertaken between a naturally intermittent channel (stream-mile 12.5 and 15.0) and Monture Falls at stream-mile 25.0, and the remaining three surveys were taken upstream of Monture Falls (Figure X).

Results/ Discussion

Summary fish population survey results for stream are located in Table X. More detailed tributary descriptions of all the aquatic resource assessments follow the Discussion section.

Table X. Catch and size statistics and genetic sample results for 22 fish population survey sites, 2006-07.

Upper Monture Creek Drainage														
Sample # (see map)	Stream	Stream Order	Stream Mile	Location (T, R, S)	Date Sampled	Section Length (ft)	Spp.	Total Number Captured	<4.0 Inches Captured	Range of Lengths (in)	Mean Length (in)	CPUE (#/100ft)	CPUE <4.0 (#/100ft)	Genetics (n =)
1	Burnt Cabin Creek	1	0.2	17N,12W,8D	24-Aug-06	303	CT	3	3	2.7 - 3.0	2.8	1.0	1.0	NA
2	East Fork Monture Creek	1	0.2	17N,12W,8B	21-Aug-06	690	BV	16	0	5.9 - 9.6	7.6	2.3	0.0	Pure WCT (n = 16)
							CT	29	1	2.6 - 9.1	7.4	4.2	0.1	
							Spotted frogs present							
3	Hayden Creek	1	0.1	17N,12W,17D	22-Aug-06	396	BV	7	0	6.1 - 10.8	8.0	1.8	0.0	NA
							CT	3	0	5.8 - 8.3	6.9	0.8	0.0	
							Sculpins present							
4	Un-named Tributary to upper Monture Creek @ mile 27.3	1	0.5	18N,13W,25D	23-Aug-06	537	CT	5	0	6.1 - 7.6	7	0.9	0.0	NA
5	Wedge Creek	1	0.1	17N,12W,29A	22-Aug-06	312	No fish found							NA
6	Yellowjacket Creek	1	0.1	17N,12W,33D	22-Aug-06	300	CT	30	30	1.2 - 1.8	1.5	10.0	10.0	NA
7	Middle Fork Monture Creek	2	0.8	18N,12W,31B	23-Aug-06	300	CT	32	5	2.8 - 7.8	5.3	10.7	1.7	Pure WCT (n = 16)
							Sculpins common		Spotted frogs present					
8	Monture Creek	2	27.5	18N,13W,25C,D	23-Aug-06	300	CT	40	4	3.3 - 8.5	5.9	13.3	1.3	Pure WCT (n = 25)
							Sculpins common YOYs observed		Spotted frogs present					
9	Monture Creek	3	18.2	17N,12W,32D	22-Aug-06	471	BV	14	10	2.2 - 8.0	3.5	3.0	2.1	88% WCT x RBT
							CT	54	36	1.3 - 9.8	3.7	11.5	5.5	(n = 13)
							Sculpins common		Spotted frogs present					
10	Monture Creek	3	23	17N,12W,17B & 8C	21-Aug-06	596	BV	29	2	2.3 - 10.6	6.6	4.9	0.3	Pure WCT (n = 12)
							CT	29	4	3.3 - 9.4	6.8	4.9	0.7	
							Sculpins common		Spotted frogs present					

Upper North Fork Blackfoot River Drainage														
Sample # (see map)	Stream	Order	River Mile	Location (T, R, S)	Date Sampled	Section Length (ft)	Spp	Total Number Captured	<4.0 Inches Captured	Range of Lengths (in)	Mean Length (in)	CPUE (#/100ft)	CPUE <4.0 (#/100ft)	Genetics
11	Cooney Creek	1	0.4	17N,10W,1A	12-Jul-07	639	RB	1	0	7.9	7.9	0.2	0.0	Pending (RBT)
							No Sculpins observed							
12	Dobrota Creek	1	0.1	18N,9W,31C	13-Jul-07	1044	RB	28	0	4.6 - 10.7	7.7	2.7	0.0	Pending (RBT)
							No Sculpins observed							
13	East Fork of NFBLKFT	1	11.7	16N,9W,10D	10-Jul-06	330	No fish							RBTxYCT xWCT
14	Lost Pony Creek	1	0.8	16N,10W,1A & 6B	11-Jul-06	540	RB	14	8	1.3 - 6.3	3.5	2.6	1.5	RBTxYCTxWCT (n = 5)
							Spotted frogs present							
15	Theodore Creek	1	0.2	17N,10W,2D	12-Jul-07	450	No fish found							NA
							Spotted frogs present							
16	Broadus Creek	2	0.1	17N,10W,2A	12-Jul-07	280	RB	4	0	5.6 - 8.7	6.8	1.4	0.0	Pending (RBT)
							No sculpins observed							
17	NFBLKFT above falls	2	36	18N,9W,31C	13-Jul-07	660	RB	34	8	2.5 - 8.7	5.4	5.2	1.2	Pending (RBT)
							No Sculpins observed		Tadpoles present					
18	Scotty Creek	2	0.2	16N,9W,8D	12-Jul-06	403	RB*	42	20	2.1 - 8.1	4.2	10.4	5.0	RBTxYCTxWCT (n = 5)
							CT**	1	0	8.9	8.9	0.2	0.0	
							Toad	present						
19	Sourdough Creek	2	0.45	16N,9W,17A,D	12-Jul-06	651	RB	3	0	5.4 - 9.4	7.2	0.5	0.0	RBTxYCTxWCT (n = 3)
20	East Fork of NFBLKFT	3	7	16N,9W,7B	11-Jul-06	689	RB	32	21	2.0 - 9.1	4.0	4.6	3.0	RBTxYCTxWCT (n = 5)
							Toad	observed						
21	NFBLKFT above falls	3	27.2	17N,10W,28C	11-Jul-07	858	RB	2	0	7.8 - 11.9	9.8	0.2	0.0	Pending (RBT)
							Sculpins present							
22	NFBLKFT above falls	3	33.3	17N,10W,2D	12-Jul-07	2400	RB	28	0	5.5 - 13.2	8.6	1.2	0.0	Pending (RBT)
							No Sculpins observed		Spotted frogs present					

Discussion

Both Monture and the upper North Fork are geoclimatically similar, and both contain geologic barriers (waterfalls) that limit upstream fish passage. Despite environmental similarities, our surveys identify large differences between fisheries of upper Monture Creek verses the upper North Fork, and certain differences extent to geologically isolated areas upstream of natural barriers.

Between the intermittent reach and Monture Falls, upper Monture Creek supports both bull trout and WSCT. In this area, bull trout are dispersed throughout the mainstem of Monture Creek (and lower tributaries) downstream of Monture Falls; however, bull trout are absent upstream of Monture Falls. Genetics testing identified WSCT as introgressed (with rainbow trout) at the lower-most sampling site but identified no introgression in upstream samples. We found no brook trout in the study area upstream of the intermittent reach, which contrasts with the common presence of brook trout downstream of the intermittent reach. Genetic analyses upstream of Monture Fall found only genetically "pure" WSCT and no other fish species upstream of this geologic barrier. Upstream of Monture Creek Falls, only one lake supports fish and these were phenotypically identified as WSCT.

Similar to Monture Creek, previous North Fork survey identified bull trout below the North Fork Falls and the absence of brook trout. By contrast, stream surveys upstream of North Fork Falls identified predominately rainbow trout or rainbow introgressed with Yellowstone and WSCT. We failed to identify a westslope population upstream of the North Fork Falls and observations of native fish upstream of the North Fork Falls were limited to a single sculpin. It remains unclear whether WSCT were ever present upstream of the North Fork Falls; however, the observation of a sculpin may indicate the historic presence of native fish

We grouped the electofishing catch by 1st, 2nd and 3rd stream-order streams to help identify an observeade pattern in which non-native fish in the upper North Fork streams are present in much lower abundance compared to native fish within the upper Monture Basin (Figure X.). These differences suggest non-native species are poorly suited to this headwater ecosystems compared to native species. At least two fish-bearing lakes upstream of the North Fork Falls (Parker and Lower Twin Lakes) were historically stocked with contain hybrid swarms of WSCT, Yellowstone cutthroat trout and rainbow trout. Both lakes are directly connected to the tributary system. High densities of hybrids in Parker Lake further identify it as an upstream source to the tributary system upstream of the North Fork Falls.

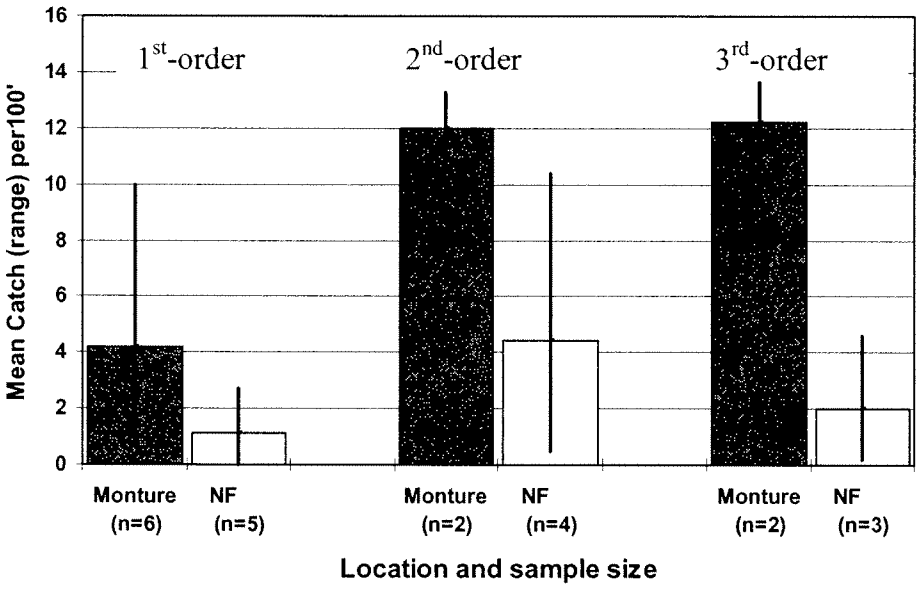

Figure X. Electrofishing catch comparison by stream-order between the upper Monture and upper North Fork Basins.

The upstream presence of these non-native Onchoynchus place WSCT in connected downstream waters at risk of hybridization, including tributaries of the Dry Fork. Genetic tests conducted in Cabin Creek identified mild introgression between WSCT and rainbow trout at this time. This suggests that intermittent channels in the lower Dry Fork may be slowing, but likely not preventing the introgression to the tributary populations found downstream of the North Fork Falls.

Results: Tributary descriptions

Monture Creek

Description

Monture Creek, a large 4th order tributary to the middle Blackfoot River, is a primary spawning and rearing tributary for fluvial bull trout and fluvial WSCT (WSCT). Monture Creek also serves as thermal refugia for fluvial bull trout during periods of Blackfoot River warming. Reproduction of WSCT and bull trout occurs primarily in the mid-to-upper basin. Fluvial rainbow trout and brown trout inhabit the lower portions of the drainage. Brook trout are found throughout the lower portions of the drainage; however, in our upper Monture Creek, brook trout have not identified as present.

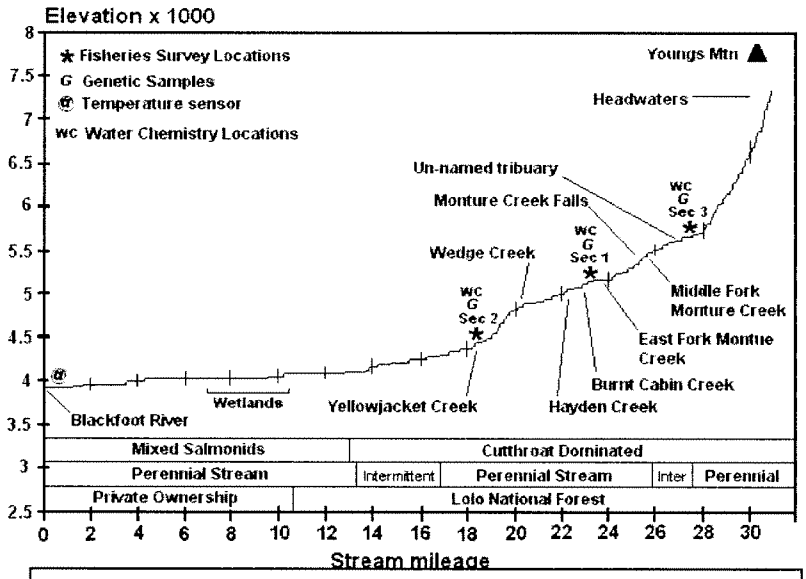

Figure Longitudinal profile for upper Monture Creek.

The upper Monture Creek, upstream from the Monture Creek trailhead (at stream-mile 13) is fed by at least 18 perennial streams and drains an area of ~ 65 m^2. Above the Monture Trailhead, upper Monture Creek lies entirely in Lolo National Forest land and this area is managed for wilderness values.

In 2006, we conducted fish population surveys at three locations on upper Monture Creek (miles 18.2, 23.0 and 27.5) and seven of its headwater tributaries. Riparian vegetation is primarily of alder, willow and rocky mountain maple, ferns and grasses beneath an over-story of Douglas fir, spruce, lodgepole pine and black cottonwood. The majority habitat features (stream-miles 18.2 and 23.0) consist of deep pools within bedrock and large boulders, overhanging vegetation and under-cut banks. Large woody debris recruitment at the two lower sites is light; however at stream-mile 27.5, LWD recruitment is high. Instream wood augments large, bouldery substrates and overhanging vegetation and creates high quality fish habitat.

Fish populations and other monitoring activities

Fish population surveys at three upper Monture Creek sampling sites found native salmonids (WSCT and bull trout) only. Sculpins were common and spotted frogs were present at all three locations. Sampling recorded a WSCT CPUE ranging from 4.9 to 13.3. Bull trout were identified downstream of Monture Falls (CPUE range, 3.0 - 4.9); however, bull trout were absent upstream of Monture Falls (Figure). Water chemistry readings were similar at all three locations recorded an average pH of 7.8, conductivity of 55.7uS and TDS at 27ppm. Genetic samples suggest mild introgression with RBT downstream of Monture Falls. However, genetic analyses upstream of Monture Falls (n=25) identified only genetically pure WSCT.

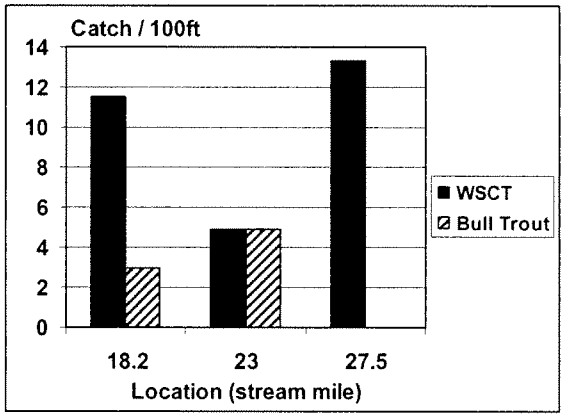

Figure CPUE for WSCT and Bull trout at 3 locations on Upper Monture Creek, 2006.

Middle Fork of Monture Creek

Description

The Middle Fork of Monture Creek is a small 2nd order tributary stream that drains three small cirque lakes each averaging about 6-acres in size. The Monture Lakes lie at elevations bewteen 7,217 and 7,702', and they drain the southern slopes of Moser Mountain (see lake survey section). Also fed by a small un-named tributary stream draining the western slopes of Foolhen Mountain, the Middle Fork drains a ~ 7-square mile basin just south of the Bob Marshall Wilderness Area. This area is located on Lolo National Forest and is managed for wilderness values.

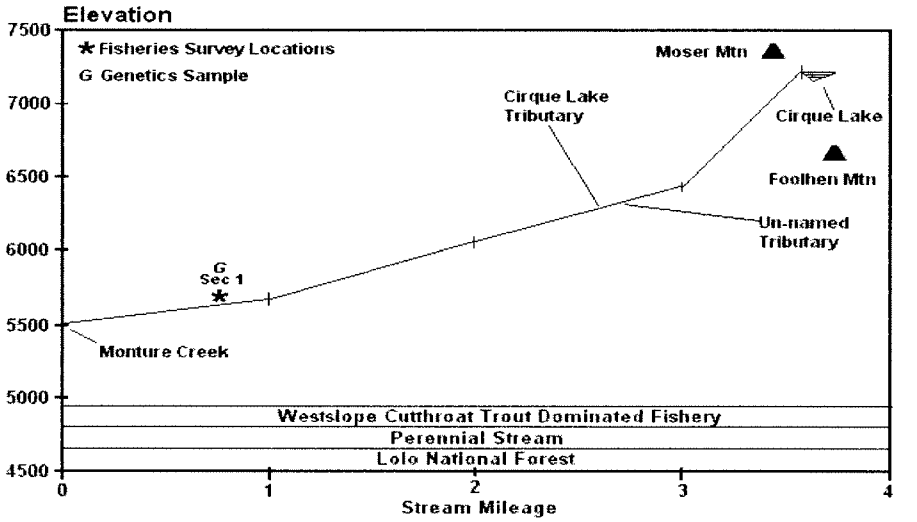

Figure Longitudinal profile for Middle Fork Monture Creek.

This Middle Fork is 3.6-miles in length and generates an estimated base-flow of 4-6cfs. Gradient is relatively steep near the headwaters descending ~ 788' the first 0.6-miles decreasing to an average of 377'/ mile between miles one and three and decreasing to 169'/mile in the lower mile. The Middle Fork enters Monture Creek at stream-mile 25.9, which is ~ 0.2 miles upstream of Monture Creek Falls.

Much of the riparian under-story vegetation at the survey section (mile 0.8) on Middle Fork Monture Creek is dense alder mixed with willow and rocky mountain maple, ferns and various grasses beneath a canopy of Douglas fir, Englemann spruce, lodgepole pine and black cottonwood stands. The channel supports a pool and riffle sequences with a predominately cobble and boulder substrate, overhanging vegetation and under-cut banks. Large woody debris recruitment to the stream channel at the survey location is light.

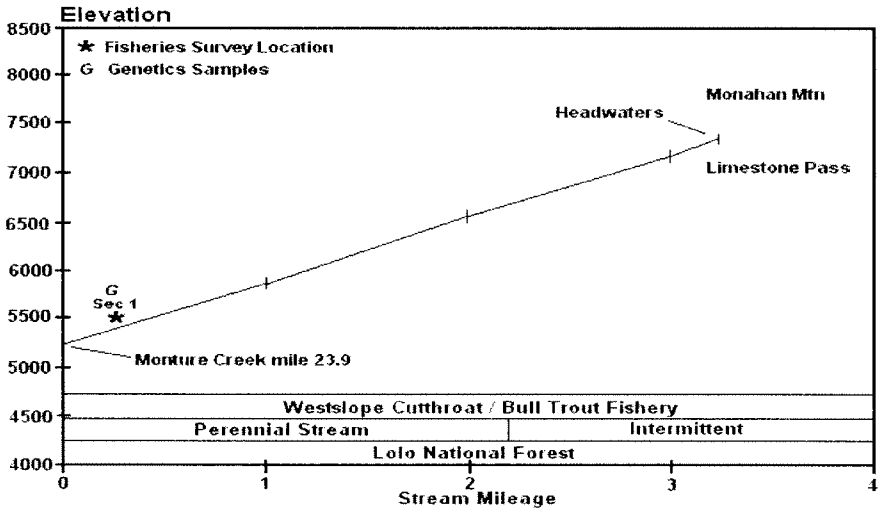

Figure Longitudinal profile for East Fork Monture Creek.

Fish populations and other monitoring activities

Our fish population survey on the Middle Fork Monture Creek in 2006 at stream-mile 0.8, found only WSCT. Sampling recorded a CPUE of 10.7. We identified sculpins as common and spotted frogs as present. Water chemistry readings recorded a pH level of 7.63, low conductivity of 42uS and TDS 20ppm. Genetic analyses (n=16) identified no introgression.

East Fork of Monture Creek

Description

The East Fork of Monture Creek drains the western slopes of Limestone Pass and the eastern slopes of Monahan Mountain. The East Fork is a small 1st order stream 3.2 miles in length, and it enters upper Monture Creek at stream-mile 23.9, about 1.9-miles downstream of Monture Creek Falls (Figure). The East Fork drains a small (3.0 m^2) basin, has an average stream gradient of 533'/ mile and generates an estimated base-flow of 4-

6cfs. The East Fork lies against the southern boundary of the Bob Marshall Wilderness (Lolo National Forest) and this basin is managed for wilderness values.

The riparian under-story vegetation along the lower portion of the survey section (mile 0.2) consists of a dense mix community of alder, willow, rocky mountain maple and young conifers, ferns and grasses beneath a canopy of Douglas fir, Englemann spruce, lodgepole pine and black cottonwood. In the upstream direction the bedrock walls constrict the channel. The channel classifies as a "Rosgen Aa" channel-type consisting of plunge pools composed of bedrock, boulder and cobble substrate with overhanging vegetation serving as habitat features. Large woody debris recruitment to the stream channel at the survey location is light.

Fish populations and other monitoring activities

We conducted only one fish population survey on the East Fork Monture Creek at stream-mile 0.2. Sampling recorded low numbers of bull trout and WSCT (CPUE = 2.3 and 4.2, respectively). No sculpins were observed, and spotted frogs were present. Water chemistry readings recorded a pH 7.92 and a low conductivity of 43uS and low TDS at 21ppm. Genetic analyses (n=28) identify the East Fork as supporting genetically pure WSCT.

Burnt Cabin Creek

Description

A small 1st order perennial tributary stream, Burnt Cabin Creek flows west 1.1-miles to its confluence with Monture Creek at stream-mile 23.0. Burnt Cabin Creek has a stream gradient of 1,213' / mile and generates an estimate base flow of 0.2 – 0.5 cfs from a small ~ 0.7 m^2 basin (Figure).

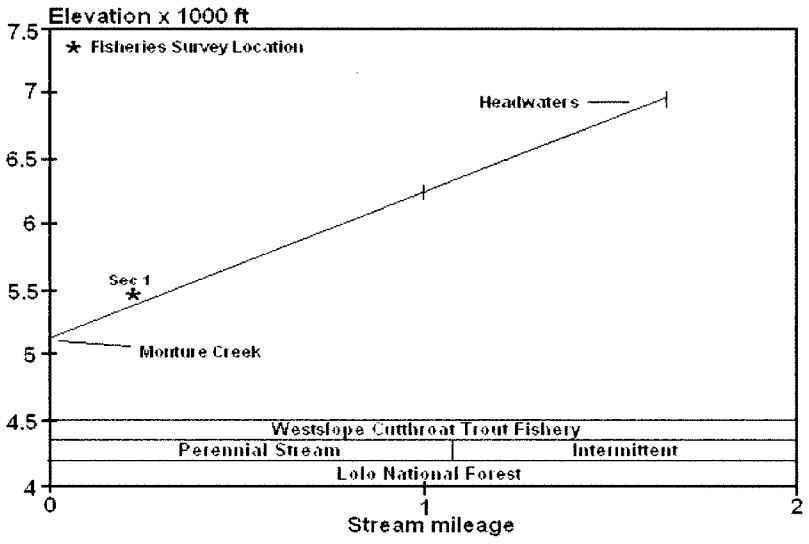

Figure Longitudinal profile for Burnt Cabin Creek

The riparian under-story is relatively dense with primarily rocky mountain maple, alder, ferns and bear grass beneath a mature canopy of lodgepole pine and Douglas fir and Englemann spruce. Large woody debris recruitment to the stream channel is moderate. Stream channel substrate is predominately cobble and boulders with gravel and small woody detritus near the mouth. The stream transitions to a more boulder and bedrock dominated channel as gradient increases in the upstream direction.

Fish Populations and other monitoring activities

We surveyed fisheries at stream-mile 0.1 and recorded moderated densities of YOY WSCT (CPUE =10). No adult fish or amphibians were sampled or observed. Water chemistry readings were 8.23pH, conductivity of 113uS and TDS TDS at 57ppm.

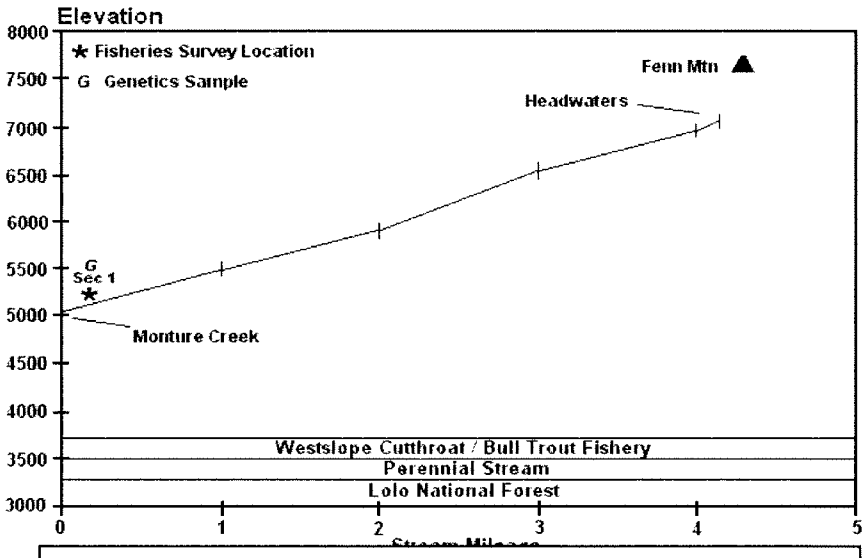

Figure Longitudinal profile for Hayden Creek.

Hayden Creek

Description

A small 1st order tributary stream that flows into upper Monture Creek at stream-mile 22.3, Hayden Creek has an average gradient of 495' / mile over its 4.1-mile length. It generates an estimated base-flow of 2 - 4cfs from a 4.0 m^2 and drains the northern slopes of Fenn Mountain. It lies within Lolo National Forest near the southern boundary of the Bob Marshall Wilderness and is managed for wilderness values.

Hayden Creek is classified as a steep "Rosgen Aa1" channel-type with cascading bedrock and boulder step-pools features. The riparian over-story vegetation is a dense forest of Douglas fir, larch and lodgepole pine above a mixed under-story of rocky mountain maple, alder, young conifers, and grasses growing among confined bedrock.

Fish Population and other monitoring activities

We survey fisheries at stream-mile 0.1 and identified low numbers of bull trout and WSCT (CPUE = 1.8 and 0.8, respectively). Sculpins were present, but no amphibians were found. Water Chemistry readings identified a pH of 7.62, very low conductivity of 44uS and very low TDS reading TDS of 21ppm.

Un-named Creek near Hahn Creek Pass

Description

We sampled and unnamed tributary that enters Monture Creek at stream-mile 27.2 and drains a small basin (1.8 m^2) near Hahn Creek Pass. It lies entirely on the Lolo National adjacent to the southern boundary of the Bob Marshall Wilderness. ~ 2.2 stream-miles in length, only the lower 0.7-mile of stream is perennial. Stream gradient is 325' in the lower mile, but increases significantly to 1200' / mile in the upper reaches (Figure). Base flow discharge was estimated at 0.5 –1.0 cfs.

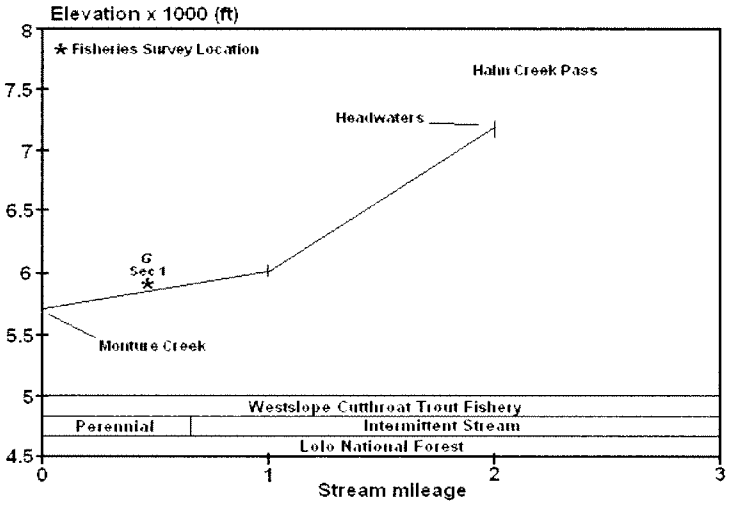

Figure Longitudinal profile for Un-named Creek.

The riparian under-story vegetation is primarily alder, rocky mountain maple and young conifers above a ground-cover of mixed with horsetail, forbs and various grasses beneath an canopy of lodgepole pine. Stream channel substrate is primarily boulder, bedrock and cobble with gravel and detritus. Large woody debris recruitment to the stream channel is moderate creating small plunge pools and cover for fish habitat.

Fish population and other monitoring activities

In 2006, we conducted a fish population survey at stream-mile 0.5. Sampling recorded low numbers of WSCT at a CPUE of 0.9 fish and these fish averaged 7 inches in length. No fish were found upstream of a bedrock nick point observed ~ 450' upstream of the survey section. No other fish species or amphibians were sampled or observed. Water chemistry data was collected recording: pH of 8.0, low conductivity of 48uS and low TDS of 24ppm.

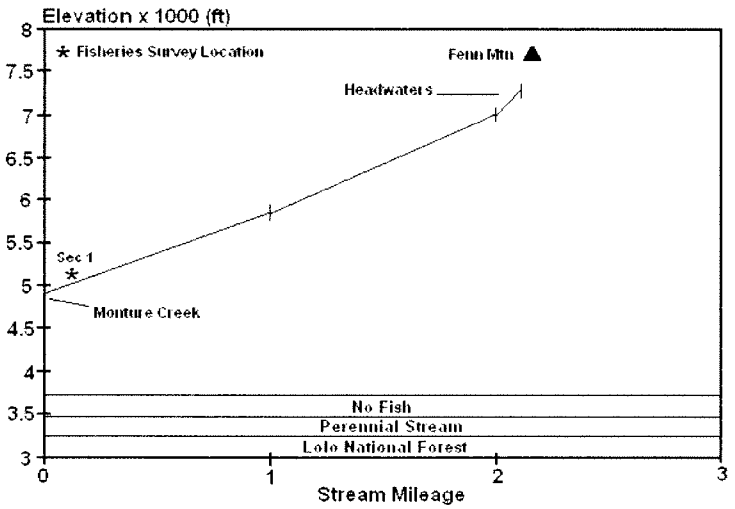

Figure Longitudinal profile for Wedge Creek.

Wedge Creek

Description

Wedge Creek is a high-gradient stream (mean gradient = 1,030' /mile), 2.1-mile length amd drain a small 1.9 m^2 basin as the southern slopes of Fenn Mountain. It lies within the Lolo National Forest just south of the Bob Marshall Wilderness.. Wedge Creek is a 1st order tributary stream that enters Monture Creek

at stream-mile 20.3 with an estimated base-flow of 0.5-1.0cfs. Wedge Creek is classified as a "Rosgen A1" channel-type, and it is characterized by high-gradient stream channels with cascading step pools created by a bedrock and boulders.

The riparian over-story vegetation is dense predominately Douglas fir, larch and lodgepole pine forest above a thin under-story of rocky mountain maple, young conifers, snowberry, ferns and grasses.

Fish population and other monitoring activities

In 2006, we conducted a fish population survey at stream mile 0.1 on Wedge Creek. No fish or amphibians were sampled or observed. Water chemistry reading identified a pH of 8.43, conductivity of 135uS and low TDS of 67ppm.

Yellowjacket Creek

Description

Yellowjacket Creek is a small 1st order stream that flows west 1.9 stream-miles to its confluence with Monture Creek at stream-mile 18.4. It drains ~ 0.9 mile^2 of Lolo National Forest land with an average stream gradient of 1,205' / mile and generates an estimated base-flow of 0.2 – 0.5 cfs.

The riparian under-story is relatively dense, primarily rocky mountain maple and alder, ferns and beargrass beneath a over-story of lodgepole pine and Douglas fir mixed with Englemann spruce. Large woody debris recruitment to the stream channel is moderate. Stream channel substrate is predominately cobble and boulders with gravel. The stream becomes boulder and bedrock dominated as gradient increases in the upstream direction.

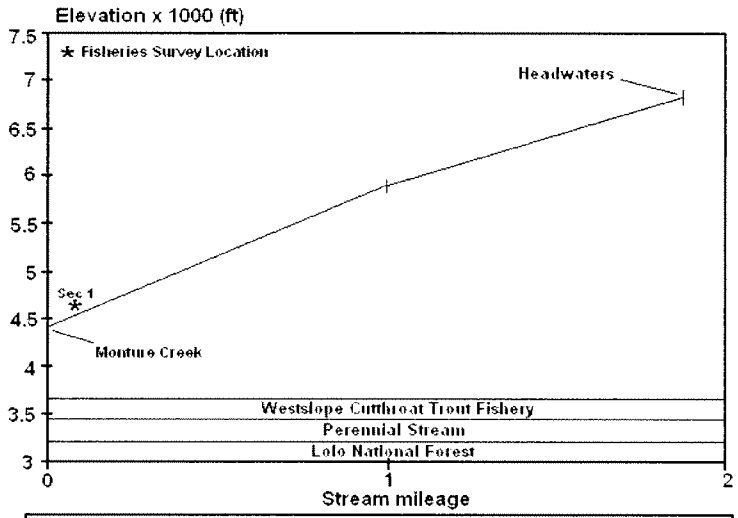

Figure Longitudinal profile for Yellowjacket Creek.

Fish populations and other monitoring activities

We conducted a fish population survey section at stream-mile 0.1 where we found only YOY WSCT at a CPUE of 10. No adult fish, other species or amphibians were observed. Water chemistry reading identified a pH of 8.23, conductivity of 113uS and TDS of 57ppm.

North Fork of the Blackfoot River

Description

The North Fork of the Blackfoot River is the largest tributary to the Blackfoot River. Beginning on the Continental Divide, the headwaters of the North Fork drain a glaciated region of the Scapegoat Wilderness. The North Fork flows west and southwest a total of 41.5-miles At stream-mile 22, the North Fork exits the Wilderness and and then enters Kleinschmidt Flats, a large glacial outwash plain, near stream-mile 12.0. The North Fork enters the middle Blackfoot River at river-mile 54.

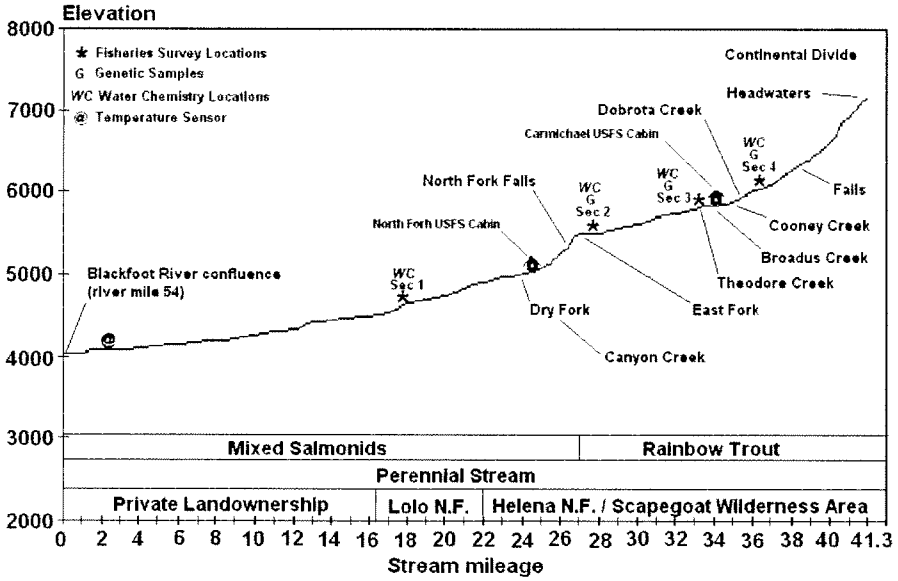

Figure Longitudinal profile for upper North Fork Blackfoot River.

In 2006-07, we conducted a series of fish population surveys above the North Fork Falls. These included three sites (stream-miles 27.2, 33.3 and 36) on the mainstem North Fork, two sites on the East Fork of the North Fork and seven smaller tributaries (Broadus, Cooney, Dobrota and Theodore, Pony, Scotty and Sourdough Creeks). We also surveyed Canyon Creek - a tributary to Dry Fork, which is located downstream of the North Fork Falls (Figure).

The upper North Fork is a relatively confined, geologically controlled channel with a moderate meander pattern and an average gradient change of 120'/mile. Substrates at the three survey locations are primarily cobble and gravel among erratic glacial boulders and large areas of exposed bedrock. In 1988, the Canyon Creek wildfire swept through the upper North Fork watershed. Among the existing deadfall, the riparian young riparian community consists of lodgepole pine, Douglas fir, Englemann spruce and black cottonwood, as well as a dense willow layer along the immediate shoreline. Over-hanging willow, large boulders and log-jams create instream habitat features. LWD retention in the North Fork channel is very high.

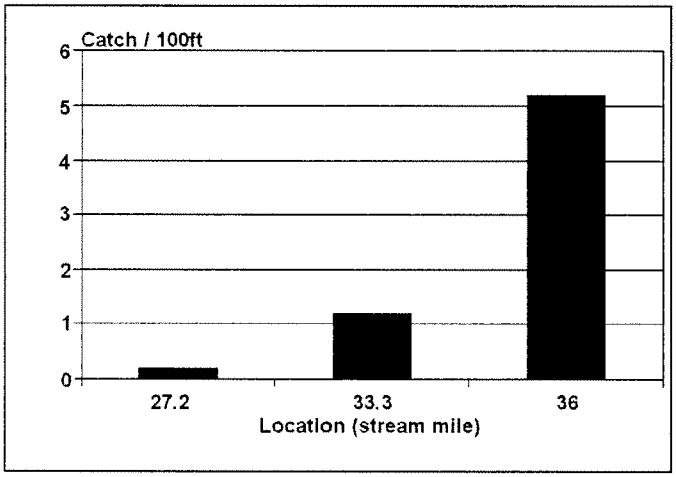

Figure CPUE for rainbow trout at three survey locations on upper North Fork Blackfoot River, 2007.

Fish Populations and other monitoring activities

Fish population surveys conducted on the upper North Fork Blackfoot River (miles 27.2, 33.3 and 36) recorded low numbers of rainbow trout (CPUE = 0.2, 1.2 and 5.2, respectively; Figure). Water chemistry readings at these three survey locations show conductivity and TDS decreasing in the upstream direction from 177 to 109uS, and from 89 to 55ppm, respectively. .

East Fork of North Fork Blackfoot River

Description

The East Fork of the North Fork is a 3rd order stream that originates ~1.5 stream-miles upstream of Parker Lake. From Parker Lake, the East Fork flows northwest ~13 miles to its confluence with the North Fork at stream-mile 27. The East Fork drains eight tributary streams over a ~67 m^2 basin, which includes the Helena and Lolo National Forests portions of the Scapegoat Wilderness (Figure).

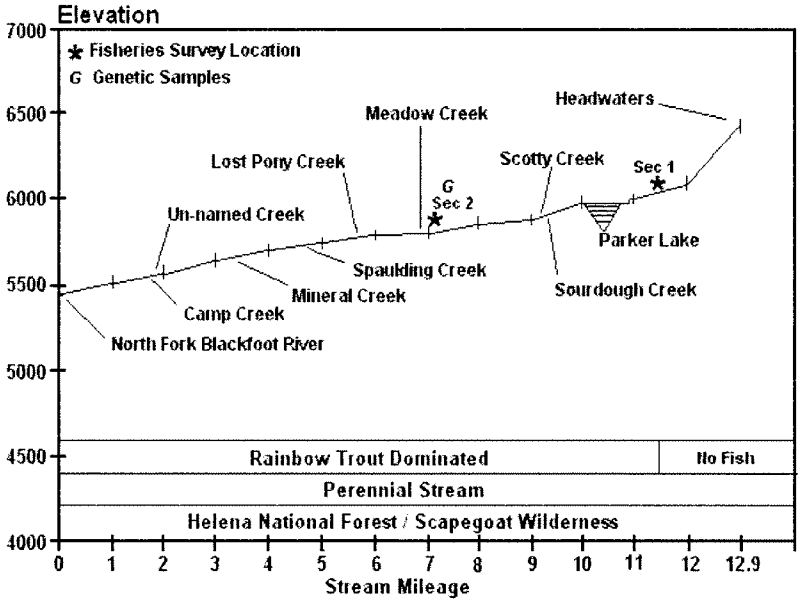

Figure Longitudinal profile for East Fork of North Fork Blackfoot River.

In 2006, we established two fish population surveys sections (stream miles 7.0 and 11.7) on the East Fork. The lower survey site falls within the 1988 Canyon Creek burn area, and it contained significant amounts of LWD within the channel. A dense forest of lodgepole pine has become established in the riparian zone along with a corridor of willow and alder, forbs and various grasses.

Outside of the burn area, the upper survey site (at stream- mile 11.7, above Parker Lake) the stream is lined with a dense under-story of alder and other shrubs, snowberry and various grasses beneath a over-story of mature lodgepole pine.

Fish populations and other monitoring activities

Although the East Fork was historically stocked with "undifferentiated" cutthroat trout during the 1940s and 1950s (FWP historic files), our 2006 sampling identified only low numbers of rainbow trout hybrids (CPUE = 4.6) at mile 7.0. Western toads were also observed. We found no fish or amphibians at stream-mile 11.7 above Parker Lake despite the high abundance of *Oncorhynchus* hybrids in Parker Lake. The presence rainbow trout hybrids below (at stream-mile 11.7) Parker Lake identify it and perhaps other nearby lakes (Meadow and West Twin Lakes) as source areas. Genetic analyses identified East Fork rainbow trout were introgressed with both Yellowstone cutthroat trout and WSCT (Appendix).

Broadus Creek

Description

Broadus Creek is a 2nd order tributary to the North Fork Blackfoot River. Located on Lolo National Forest land within the Scapegoat Wilderness, Broadus Creek drains a small (3.4 m^2 in conjunction with Eagle Creek) on the eastern slopes of Evans Peak. Broadus Creek flows east and south ~2.5 miles to its confluence with North Fork at stream-mile 34. Eagle Creek, a 1st order perennial stream, enters Broadus Creek at stream-mile 0.75. The

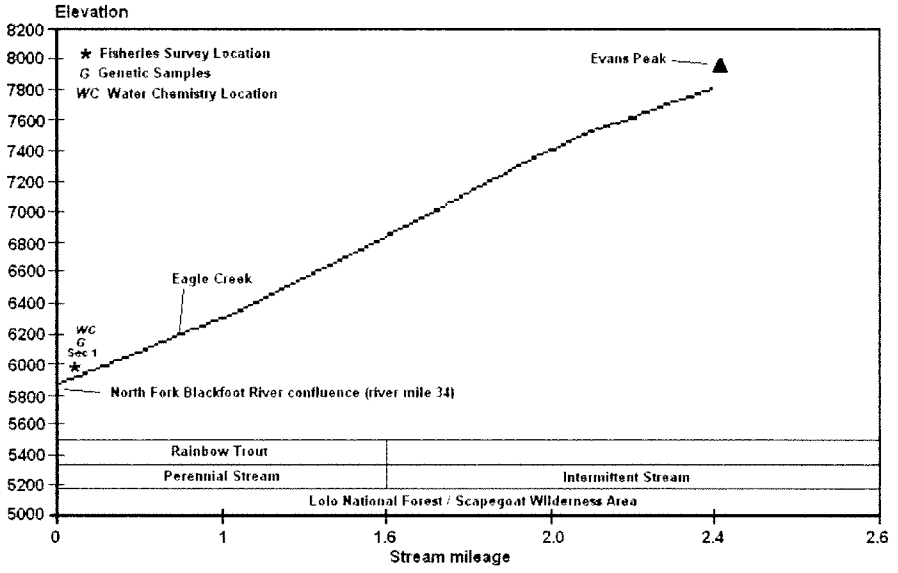

Figure Longitudinal profile for Broadus Creek.

upper mile of Broadus Creek is intermittent and has a gradient of 1,200' / mile and the lower 1.5 mile of stream perennial and descends 430'/ mile (Figure)

Broadus Creek is a "Rosgen Aa2" type-channel. This high gradient stream has a mix of boulder-bedrock substrates. LWD is recruited from burned snags off the steep surrounding cliffs. The banks are stable due to bedrock, but where allowed alder and a mixed community of grasses and forbs have taken hold. The young riparian forest is composed of lodgepole pine and spruce. Fish habitat is primarily in plunge and pockets pools. About 0.1 miles upstream of the mouth is a 12-foot tall waterfall.

Fish populations and other monitoring activities

In 2007, we surveyed up and downstream of waterfalls at mile 0.1 The survey identified rainbow trout in low abundance (CPUE =1.4) below the falls but the stream was absent of fish upstream of the falls. Water chemistry data was collected recording: moderate-high conductivity of 197uS and moderate TDS of 98ppm and water temperature of 50.5^{0}F.

Cooney Creek

Description

Cooney Creek is a 1st order tributary stream to the upper North Fork. Located on Lolo National Forest land within the Scapegoat Wilderness, Cooney Creek drains a small headwater basin (9.3 m^2) on northern slopes of Olson Peak and Galusha Peak. Cooney Creek flows northerly for about 5.5 miles to its confluence with the North Fork at stream-mile 34.9 near the Carmichael Guard Station. Stream gradient ranges from 91'/ mile near the mouth to 617' / mile in upper reaches (Figure). Numerous small un-named perennial and ephemeral streams enter Cooney Creek throughout its entire length.

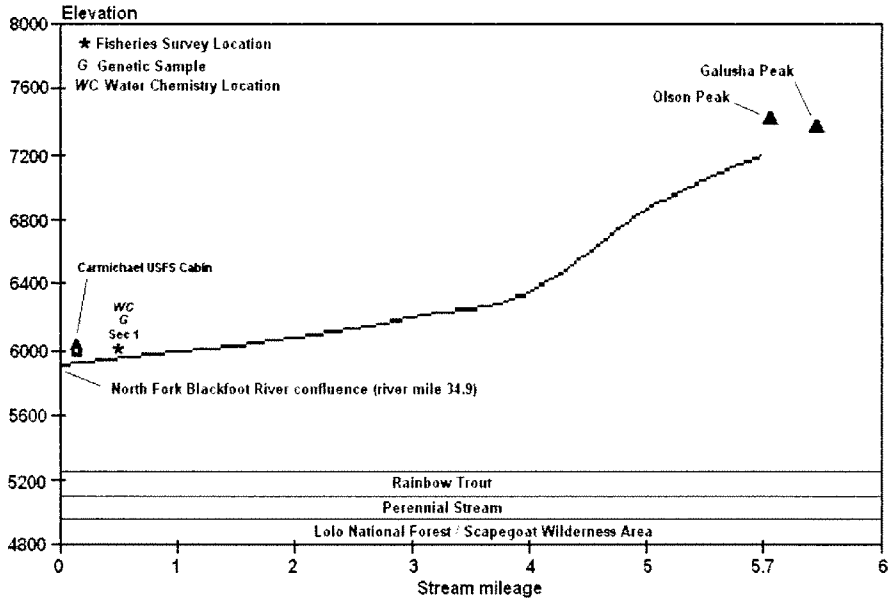

Figure Longitudinal profile for Cooney Creek

Cooney Creek classifies as a "Rosgen B3" type-channel with cobble and boulder and bedrock substrate. Shrubs (Alder and willow), forbs and grasses line the stream banks beneath a dense riparian forest composed of Englemann spruce and lodgepole pine. The surrounding slopes of Cooney Creek burned in 1988 Canyon Creek fire. Currently, LWD recruitment is extremely high due to avalanche activity.

Fish populations and other monitoring activities

A fisheries survey at stream-mile 0.4 recorded low numbers of rainbow trout (CPUE = 0.2), and no other fish species were present. Water chemistry readings identified moderate conductivity of 160uS and low TDS of 80ppm and a water temperature of 56.3^{0}F during the survey.

Dobrota Creek

Description

Dobrota Creek is a 1st order tributary to the North Fork, located on Lolo National Forest and within the Scapegoat Wilderness. Dobrota Creek drains a small basin (~6.1 m^2) on the southern slopes of Scapegoat Mountain. Dobrota Creek flows in a southerly direction for about 4.0 miles to its confluence with the North Fork at stream-mile 35.9 near the Carmichael Guard Station. The lower 2.0 miles of Dobrota Creek has an average gradient of 192' / mile, compared to 1,434'/mile in the upper 2.0 miles of stream (Figure).

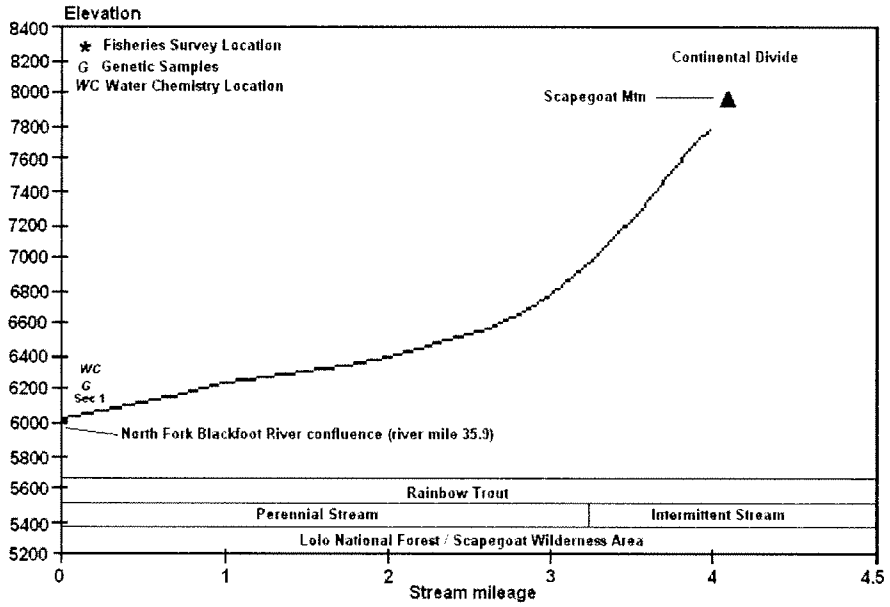

Figure Longitudinal profile for Dobrota Creek

The Canyon Creek fire burned this area intensely in 1988, resulting in a stand-replacement lodgepole pine forest. High rates of erosion are occurring in areas against steep hillsides where plant re-growth is slow. This erosion process, however, is recruiting high amounts of LWD from standing snags. The riparian plant communities are composed of willow, alder, young lodgepole pine and a robust mixture of grasses and forbs that contributes to bank stability. Dobrota Creek classifies as a "Rosgen B3" with cobble-dominated substrate along with gravel, boulders mix with large areas of bedrock. Because of the lack of overhanging vegetation, fish habitat is primarily localized to LWD plunge and scour pools and boulder pocket water.

Fish populations and other monitoring activities

A survey of fish populations at stream-mile 0.1 found low numbers of rainbow trout (CPUE = 2.7) and no other fish species were found. Genetic samples were collected and results are pending. Water chemistry recorded conductivity at 148uS, TDS of 74ppm and a water temperature of 52.9^{0}F during the survey.

Lost Pony Creek

Description

Lost Pony Creek is a 1st order perennial tributary to the middle reaches of the East Fork. Located in Helena National Forest and Scapegoat Wilderness, Lost Pony Creek drains a small basin (~3.6 m^2) on the southern slopes of Galusha Peak. Lost Pony flows southerly ~3.8 miles to its confluence with the East Fork at stream-mile 6.1. Stream gradients range from 208' / mile near the mouth to 750' / mile in the upper reaches. At stream-mile 0.85 the outlet stream from West Twin Lake enters with ~0.2-0.4cfs. Below this junction Lost Pony Creek has an estimated base-flow of 0.5cfs.

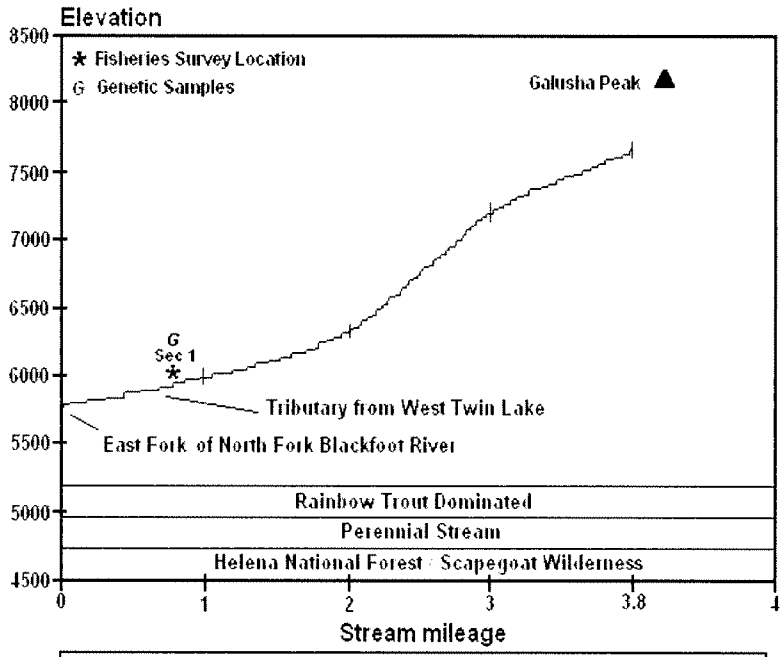

Figure Longitudinal profile for Lost Pony Creek.

The stream banks are stable as a result of very dense riparian shoreline vegetation composed of shrubs, sedges and grasses. Over hanging vegetation, LWD, alder roots and under-cut banks provide high quality fish

habitat. The Lost Pony Creek drainage was intensely burned in the 1988 Canyon Creek fire, resulting in the dense regeneration of the surrounding lodgepole pine forest.

Fish Populations and other monitoring activities

We surveyed fish population at stream-mile 0.8 and found low numbers of hybrid rainbow trout (CPUE = 2.6). No other fish species were found, but numerous spotted frogs were observed. Genetic analyses identify sampled fish as rainbow trout introgressed with Yellowstone cutthroat trout and WSCT with a predominant rainbow trout genetic contribution.

Scotty Creek

Description

Scotty Creek is a 2nd order tributary flowing south ~4.8 miles through Helena National Forest land to its confluence with the East Fork at stream-mile 9.3. The small watershed (~4.4 m^2) drains a small cirque lake and the slopes of Olson and Pyramid Peaks that lie along Red Ridge within the Scapegoat Wilderness Area. Stream gradients range from 710' / mile near the headwaters to 220'/ mile near the mouth (Figure).

Riparian vegetation is very dense and consists of willows and grasses within a regenerating lodgepole pine forest. The forest was severely burned during the 1988 Canyon Creek fire and is now recruiting high concentrations of LWD to the stream channel.

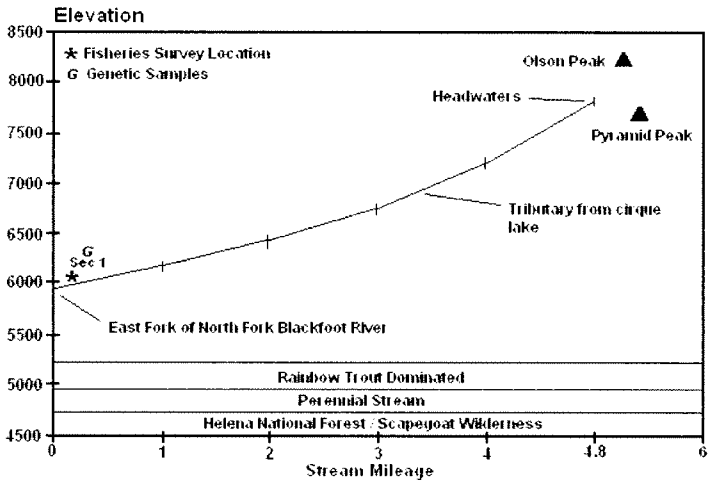

Figure Longitudinal profile for Scotty Creek.

Fish Populations and other monitoring activities

A fish population survey stream-mile 0.2 identified hybrid rainbow trout at low densities (CPUE = 0.4). One "cutthroat trout" was identified (CPUE = 0.2) in the field and numerous western toads were observed. Genetic analyses identify rainbow trout hybridized with Yellowstone cutthroat trout and minor genetic contribution of WSCT.

Sourdough Creek

Description

The Sourdough Creek, a 2nd order tributary, drains a small (~5.1 m^2) basin on the western slopes of Red Mountain, as well as a series of small cirque lakes before flowing north ~3.4 miles and joining the East Fork at stream-mile 9.4. Sourdough Creek lies entirely in Helen National Forest and Scapegoat Wildernes. Stream gradients average 185' / mile in the lower 2.0 miles of stream, and then increase to 1,060' / mile between stream-mile 2.0 and 3.0 before decreasing in the very headwaters (Figure).

The riparian under-story vegetation is dense shrub community (willow, alder and red-osier dogwood) and various forbs and grasses. Only the lower 0.1-mile of Sourdough Creek was affected by the 1988 Canyon Creek fire; thus, the

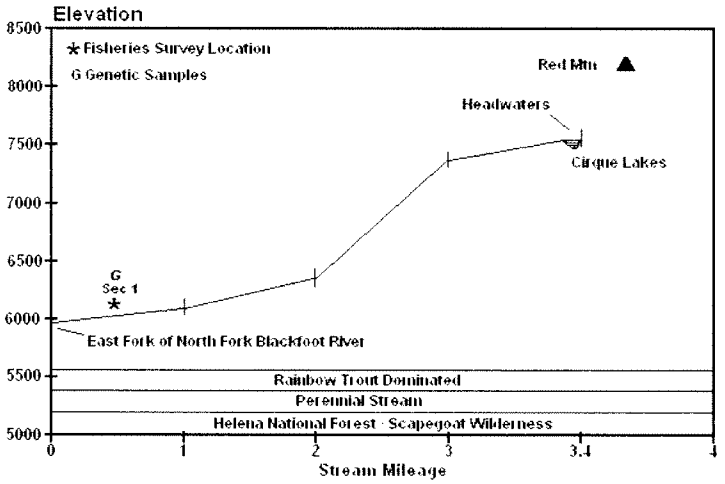

Figure Longitudinal profile for Sourdough Creek.

drainage supports a mature lodgepole pine and subalpine fir forest. Fish habitat consists of overhanging vegetation, under-cut banks and large boulder substrates. Larger woody debris recruitment in the majority of the stream channel is low compared to the nearby burn area.

Fish Populations and other monitoring activities

A fish population survey at stream-mile 0.45 recorded very low numbers of rainbow trout (CPUE = 0.5) and fish averaged 7.2 inches in length. No other fish species or amphibians were observed. Only three genetic samples were collected and these fish were identified as rainbow trout introgressed with Yellowstone cutthroat trout and WSCT.

Theodore Creek

Description

A small 1st order perennial tributary, Theodore Creek flows northerly ~2.4 miles through Lolo National Forest (Scapegoat Wilderness) before entering the upper North Fork at stream-mile 33.6. This high-gradient stream (mean gradient 530'/mile) drains as small basin (1.6 m^2) on the north-eastern slopes of Galusha Peak and generates an estimate base-flow of 0.5-1.0cfs (**Figure**).

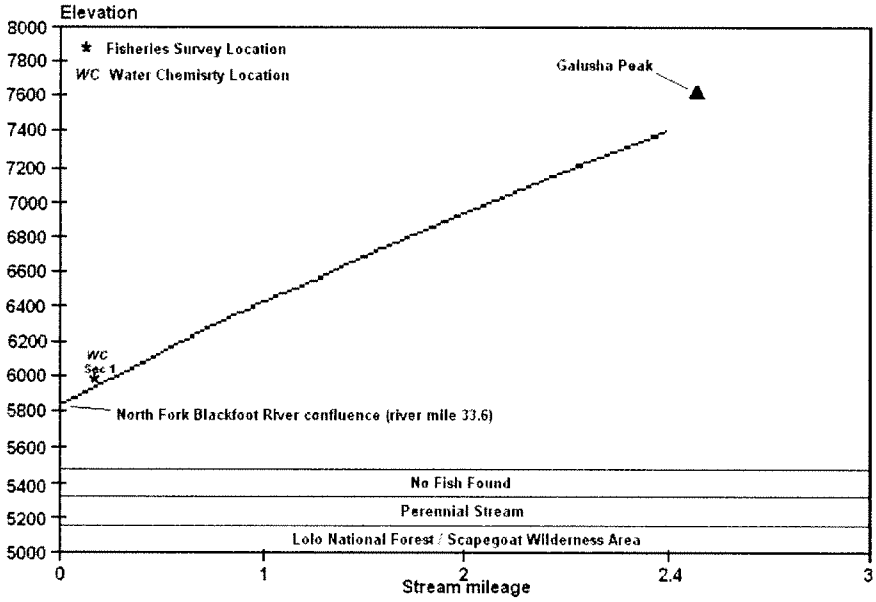

Figure Longitudinal profile for Theodore Creek.

The 1988 Canyon Creek fire burned the riparian plant community along Theodore Creek, which now consists of dense communities of young Englemann spruce, black cottonwood and lodgepole pine, along with willow, forbs and grasses at the stream margin. LWD recruitment to the channel is high and over-hanging shrubs contribute extensively to instream habitat features. The survey location on lower Theodore Creek falls into a "Rosgen C4" type-channel with a predominately gravel substrate.

Fish population and other monitoring activities

A fish populations survey at stream-mile 0.2 found no fish. Spotted frogs were observed. Water chemistry measurements recorded conductivity at 166uS, TDS at 83ppm and a water temperature at 56.8^{0}F during thesurvey.

Canyon Creek

Description

Canyon Creek is a tributary to the Dry Fork of the North Fork. The Dry Fork is a large glaciated basin that enters the North Fork downstream of the North Fork Falls. The headwaters of Canyon Creek begin in marsh within a cirque basin upstream of Canyon Lake. The upper Canyon Creek basin is proposed wilderness and the lower basin falls within the Scapegoat Wilderness area of the Lolo National Forest. Canyon Lake outlet stream joins with Conger Creek, a small tributary stream draining the slopes of Omar Mountain and Canyon Point, and together they form a 2nd-order stream that enters the Dry Fork of the North Fork Blackfoot River near rm 5.0. Approximately 5.6-miles in length, stream gradient decreases from 165' / mile at the headwaters to 40' / mile in the middle reaches before increasing to 184' / mile near the mouth (**Figure**). Canyon Creek flows northerly and contributes an estimated base-flow of ~5 to 10cfs to Dry Creek.

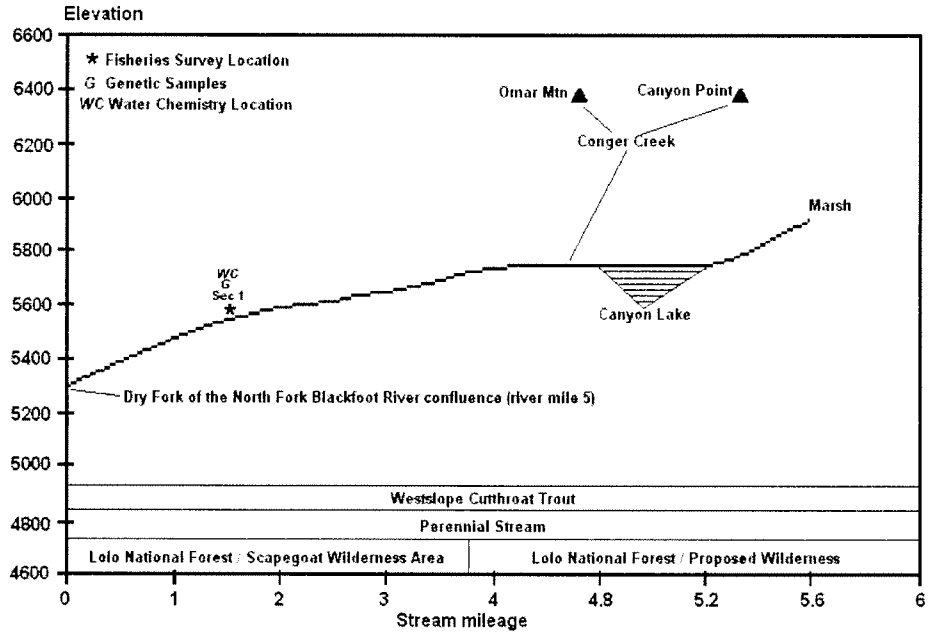

Figure Longitudinal profile for Canyon Creek.

The 1988 Canyon Creek forest fire burned the lower basin. A strong regeneration of lodgepole pine and high concentrations of LWD recruitment to the stream channel is now occurring. The middle to upper reaches of the drainage were unaffected by the fire, the stream banks are stable supporting dense over-story populations of lodgepole pine, Douglas fir, Englemann spruce above an under-story of willows, alders, rocky mountain maple, forbs, shrubs and various grasses. Large woody debris recruitment to the stream channel is moderate occurring at its natural pace. Stream channel classification at the survey location is predominately a "Rosgen B3" type channel with a substrate of cobble / gravel mixed with boulders. Log scour pools, overhanging vegetation, undercut banks and boulder pocket pools are primary habitat features.

Fish Population and other monitoring

We conducted a fish population survey on Canyon Creek at sm 1.5 in 2007. Fish sampling recorded a WSCT CPUE of 8.1. We failed to detect bull trout or other fish species. Bull trout were present in Canyon Lake in in the Frog tadpoles were present but no adults were observed. We collected 31 genetic samples at the survey site, results are still pending. Water chemistry readings are located in Appendix).