Ref# 80453
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FUTURE FISHERIES IMPROVEMENT PROGRAM
REPORT TO 1999 LEGISLATURE
and
FISH, WILDLIFE AND PARKS COMMISSION

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Prepared by:
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December, 1999

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MONTANA FISH, WILDLIFE AND PARKS
Fisheries Division

Future Fisheries Improvement Program
Summary 1995-98

The Future Fisheries Improvement Program (HB 349) provides funds for "the long term enhancement of streams and stream banks, in stream flows, water leasing, lease or purchase of stored water, and other voluntary programs that deal with wild fish and aquatic habitats." This report summarizes project funding and status of all projects that have been approved since the program began in 1995. The report also includes a brief narrative description of all projects approved since the last reporting period. Results of project monitoring are summarized in Appendix A.

Review Panel: Some review panel members have been replaced since the last report to the legislature. Panel members during this report period included: **Mike Volesky,** Executive Director, Montana Association of Conservation Districts, Helena; **Tom Melesnick,** commercial rancher, Belgrade; **Dave Cochran,** commercial rancher and irrigator, Ovando; **Buddy Drake,** Drake and Associates, Aquatic Habitat Consultants, Bozeman; **Steve McGuire,** licensed angler, Kalispell; **Shirley Cleary,** licensed angler, Helena; **Christopher Gourley,** student, Great Falls High School; **Senator Ken Mesaros,** Cascade; **Representative Cliff Trexler,** Corvallis; and **Julie Lapeyre,** Governor's Office, Natural Resource Policy Advisor, Helena.

The review panel met four times since the last report -- January 1997, July 1997, January 1998, and July 1998. Project proposal deadlines are January 1 and July 1 of each year.

Staffing: Mark Lere was hired to replace Bruce Rehwinkel (who retired) as the Future Fisheries Program Officer in November of 1997. Mark is responsible for reviewing project applications, visiting the sites of proposed projects, communicating department recommendations to the review panel, completing MEPA requirements, coordinating with consultants and contractors who design and perform restoration projects, developing project proposals, and working with landowners and other citizens who need help developing proposals.

Other program staff remain the same as reported last session. Brad Shepard (0.5 FTE, biologist) is responsible for project monitoring. Brad maintains a data base to track restoration project monitoring efforts and conducts field monitoring of approximately 20 projects. His monitoring report is attached (Appendix A). Eric Reiland is responsible for working with landowners to develop projects west of the Continental Divide. Eric is presently working in the upper Clark Fork and Rock Creek drainages. Glenn Phillips, Chief of the Habitat Protection Bureau, continues to be responsible for overall program administration.

Operating Budget: Operating expenses during FY-97, FY-98, and FY-99 are summarized in Table 1. The higher than normal salary and benefits during FY-98 are due to buy out costs

associated with a retirement.

Table 1. Future Fisheries Improvement Program operating expenses July 1, 1996-October 31, 1998.

Expense category	FY-97	FY-98	FY-99
Salaries and Benefits	68,769	97,895	27,674
Operating Expenses			
Services	11,390	9,303	-
Supplies & Materials	4,221	2,276	1,699
Communications	1,267	1,287	315
Travel	6,192	10,519	3,843
Repair & Maintenance	928	207	80
Education and Training	2,080	1,335	25
Miscellaneous	323	146	383
Total	95,170	122,968	34,019

Anticipated Expenses: House Bill 349 requires Fish, Wildlife and Parks to report "anticipated expenses for the ensuing 10 years implementation of the program." During the first three years of the program, we have committed, on average, about $760,000/yr to projects. There are approximately $860,000 uncommitted dollars remaining in the program budget. Additionally there is approximately $70,000 remaining from projects that were underspent or cancelled. If $380,000 (the average committed per funding cycle to date) is allocated to projects during the January 1999 funding cycle, there will be about $550,000 in program dollars that will carry forward into the next biennium and which will be added to the $1.47 million that is in the Governor's budget for the same time period. Over the next ten years we anticipate continuing to spend approximately $1.5 million per biennium or about $7.5 million over the next ten years.

Projects: To date the Future Fisheries Review Panel and Fish, Wildlife and Parks (FWP) have received 177 applications for funding; 142 of these were recommended for full or partial funding by the review panel (Table 2). The Fish, Wildlife and Parks Commission has approved all but one of the recommendations of the review panel -- approval of the remaining project is pending.

Additionally, both the review panel and the commission approved funding for the Tongue River project. The 1995 legislature earmarked $510,000 for projects to enhance fisheries in the Tongue River. These projects are to partially mitigate for fishery losses associated with the construction

of Tongue River Dam. The Tongue River projects are administered by the state of Montana, the Northern Cheyenne Tribe, and the United States Bureau of Reclamation.

Table 2. Summary of projects approved, program dollars committed, and matching dollars committed during each funding cycle.

Funding Cycle	Projects Approved	Program $ Committed	Matching $ Committed
Winter 96	30	$666,601	$1,722,289
Summer 96	18	164,278	172,416
Tongue River	1	510,000	115,000
Winter 97	27	435,807	767,052
Summer 97	18	266,617	1,677,408
Winter 98	23	320,520	712,300
Summer 98	26	483,397	410,187
Total	143	2,847,220	5,576,652

Table 3 summarizes the budget and status of projects that have been approved to date. Seventeen of the approved projects are to improve fish habitat in lakes, reservoirs or ponds and the remaining projects are for habitat improvements in rivers and streams.

Table 3. Future Fisheries Improvement Program project funding and status (Program funds allocated and spent as of December 1, 1998)

	PROJECT NUMBER, NAME & YEAR	PROGRAM FUNDS COMMITTED ($)	MATCHING FUNDS ($)	TOTAL FUNDS COMMITTED ($)	PROGRAM FUNDS SPENT ($)	EXPECTED YEAR OF COMPLETION
1	Cress Spring Creek Fence (1996W)	$5,328	$12,172[a,p]	$17,500	$5,328	Complete
2	Dunham Creek Fish Screen (1996W)	15,915	12,500[a,r]	28,415	14,800	Complete
3	O'Brien Creek Restoration (1996W)	8,500	13,000[a,l]	21,500	8,329	Complete
4	Gold Creek Pool Development (1996W)	25,652	29,000[o,r]	54,652	23,050	Complete
5	Rock Creek Restoration (1996W)	12,450	9,758[a]	22,208	12,450	Complete
6	Steel Creek Restoration (1996W)	10,000	19,325	29,325	9,415	Complete
7	Cottonwood Creek-Dreyer Diversion (1996W)	16,070	30,309[a,r]	46,379	16,070	Complete
8	Meadow Creek Fence (1996W)	2,000	2,000[s]	4,000	0	Cancelled
9	Sweathouse Creek Enhancement (1996W)	13,305	1,500[e]	14,805	9,609	Complete
10	Little Beaver Creek Riparian Fence (1996W)	1,966	1,200[a]	3,166	2,125	Complete
11	Upper Big Hole River Flow Enhancement (1996W)	20,000	45,000[a,r]	65,000	17,348	Complete
12	Whites Gulch Riparian Fence & Revegetation (1996W)	19,500	12,500[e,s]	32,000	12,838	Complete
13	Deep Creek Channel Restoration (1996W)	65,000	280,000[a,e,g]	345,000	57,000	1999
14	Lake Francis Shoreline Stabilization (1996W)	2,500	107,500[a,e,i]	110,000	2,500	Complete
15	Dick Creek Restoration (1996W)	6,800	0	6,800	6,520	Complete
16	Mol Heron Creek Flow Enhancement (1996W)	124,000	52,525[a]	176,525	103,369	1999
17	Fort Peck Breakwater - Spawning Reef (1996W)	12,500	920,000[i,q]	932,500	12,000	Complete
18	Nelson Reservoir Spawning Vegetation (1996W)	2,100	0	2,100	1,182	Complete
19	Nelson Reservoir Spawning Reef (1996W)	5,750	1,000[a]	6,750	0	1999
20	Fresno Reservoir Spawning Vegetation (1996W)	2,400	0	2,400	863	2000
21	Bear Paw Reservoir Spawning Enhancement (1996W)	1,200	0	1,200	1,200	Complete
22	Slemmons Pond Dam Removal (1996W)	5,000	10,000[m]	15,000	2,401	Complete

	PROJECT NUMBER, NAME & YEAR	PROGRAM FUNDS COMMITTED ($)	MATCHING FUNDS ($)	TOTAL FUNDS COMMITTED ($)	PROGRAM FUNDS SPENT ($)	EXPECTED YEAR OF COMPLETION
23	Big Hole River Channel Restoration (1996W)	62,500	7,500[a,k,p]	64,730	57,230	Complete
24	Ruby River Bank Stabilization (1996W)	16,340	7,000[a,r]	23,340	16,340	Complete
25	Elk Creek Restoration (1996W)	18,075	15,000[a,r]	33,075	0	2000
26	Dry Creek Rehab. & N. Fork Blackfoot (1996W)	76,250	2,000[a]	78,250	66,279	Complete
27	Madison Spring Creek Rehabilitation (1996W)	15,000	17,000[a]	32,000	15,000	Complete
28	Elk Creek Rehabilitation (1996W)	8,000	23,000[b,j,m,r]	31,000	8,000	Complete
29	Locke Creek flow enhancement (1996W)	2,500	1,500[a,p]	4,000	0	Cancelled
30	NCAT - Agrimet Flow enhancement (1996W)	90,000	90,000[k]	180,000	90,000	Complete
	SUBTOTAL 1996 winter funding cycle	**666601**	**1722289**	**2383620**	**571246**	
31	Prickly Pear Creek Fence & Bank Stabilization (1996S)	2,000	500[a]	2,500	2,637	Complete
32	St. Regis River Channel Restoration (1996S)	27,500	26,500[e,f]	54,500	26,622	Complete
33	Little Sheep Creek Channel Restoration (1996S)	10,729	20,620[s]	31,349	6,979	Complete
34	Cottonwood Creek (1996S)	18,200	22,500[r]	40,700	16,500	Complete
35	North Fork Fish Screens (1996S)	10,500	20,000[r]	30,500	10,500	Complete
36	Blackfoot River Bank Stabilization (1996S)	1,500	6,350[a]	7,850	1,500	Complete
37	Sun River Bank Stabilization (1996S)	10,800	19,200[a]	30,000	0	Cancelled
38	Blanchard Creek Riparian Fence (1996S)	8,000	0	8,000	8,144	Complete
39	Elk Creek Assessment (1996S)	7,300	1,000[a]	8,300	8,745	Complete
40	Beaverhead, Van Camp & Rattlesnake Slough (1996S)	22,923	9,500[a]	32,423	8,041	1999
41	Bitterroot River Fence (1996S)	5,625	3,244[a]	8,869	2,892	Complete
42	Blanchard Creek Feedlot Removal (1996S)	9,143	10,742[a]	19,885	0	2000
43	Echo Lake Bass Rearing Habitat (1996S)	1,414	1,200[c]	2,614	2,387	Complete
44	Magpie Creek Fish Passage (1996S)	5,000	5,000[a]	10,000	5,000	Complete

	PROJECT NUMBER, NAME & YEAR	PROGRAM FUNDS COMMITTED ($)	MATCHING FUNDS ($)	TOTAL FUNDS COMMITTED ($)	PROGRAM FUNDS SPENT ($)	EXPECTED YEAR OF COMPLETION
45	Teton River Bank Stabilization (1996S)	4,300	14,300[a,e,n]	18,600	1,700	Complete
46	Canyon Creek Bank Stabilization (1996S)	2,500	2,116[r]	4,616	0	1999
47	Missouri River Bank Stabilization (1996S)	15,000	7,800[a]	22,800	15,000	Complete
48	Meadow Creek Riparian Fence (1996S)	1,844	1,844[s]	3,688	0	1999
	SUBTOTAL 1996 summer funding cycle	**164278**	**172416**	**337194**	**116647**	
1	Elk Creek Channel Restoration (1997W)	55,800	84,500[a,g]	140,300	46,494	Complete
2	Fisher River Channel Restoration (1997W)	3,300	4,000[e,x]	7,300	2,288	Complete
3	Stinger Creek Channel Restoration (1997W)	40,000	32,000[a,k,r]	72,000	39,945	Complete
4	Middle Fork Rock Creek Riparian Fence (1997W)	26,000	26,000[a,s]	52,000	26,000	Complete
5	Clark Fork River Riparian Fence (1997W)	1,600	1,062[a]	2,662	1,668	Complete
6	Grantier Spring Creek Channel Restoration (1997W)	2,260	5,060[a]	7,320	2,260	Complete
7	Camp Creek Restoration (1997W)	39,300	65,000[a,u]	104,300	0	2000
8	Chamberlain Creek Diversion (1997W)	10,442	18,178[a,r]	28,620	10,442	Complete
9	O'Brien Creek Channel Restoration (1997W)	11,600	34,000[a,m,r,s]	45,600	12,708	Complete
10	N. F. Blackfoot Hoxworth/Williams Fish Screen (1997W)	14,500	24,000[a,p,r]	38,500	13,922	Complete
11	Monture Creek Fish Habitat Enhancement (1997W)	9,000	22,500[a,p,r]	31,500	8,921	Complete
12	Salmon Creek & Dry Creek Habitat Restoration (1997W)	37,384	63,000[a,k,p,r]	100,384	37,384	Complete
13	Mill Creek Channel Restoration (1997W)	38,246	32,000[a]	70,246	0	2000
14	Stone Creek Channel Restoration (1997W)	8,910	5,700[a,d,e]	14,610	8,909	Complete
15	Ruby River Channel Stabilization (1997W)	3,660	14,610[a]	18,270	3,660	Complete
16	Mol Heron Creek Fish Screen - supplement (1997W)	21,000	0	21,000	-0	1999
17	Black Butte Creek Riparian Fence & Stabilization (1997W)	4,500	7,500[a,n,s,x]	12,000	2,305	Complete
18	Missouri River Bank Stabilization (1997W)	20,430	18,842[a,j,r,x]	39,272	20,434	Complete

	PROJECT NUMBER, NAME & YEAR	PROGRAM FUNDS COMMITTED ($)	MATCHING FUNDS ($)	TOTAL FUNDS COMMITTED ($)	PROGRAM FUNDS SPENT ($)	EXPECTED YEAR OF COMPLETION
19	Sun River Bank Stabilization Survey (1997W)	6,000	6,000[a]	12,000	5,044	Complete
20	Elk Creek Bank Stabilization (1997W)	11,000	27,700[a,r]	38,700	0	1999
21	Big Spring Creek Restoration (1997W)	35,000	235,000[f,i]	270,000	35,000	1999
22	Dearborn River Chanel Stabilization (1997W)	4,000	5,000[a,r]	9,000	0	Cancelled
23	Townsend Ranch Streams Restoration (1997W)	10,000	28,500[n,s,x]	38,500	8,648	Complete
24	Bynum Reservoir Spawning Habitat (1997W)	9,900	3,400[t]	13,300	9,415	Complete
25	Hauser Reservoir Spawning Habitat (1997W)	4,400	500[t]	4,900	4,400	Complete
26	Dearborn River Bank Stabilization (1997W)	3,800	2,000[a]	5,800	0	1999
27	Fresno Reservoir Spawning Habitat (1997W)	3,775	1,000[t]	4,775	3,735	Complete
	SUBTOTAL 1997 winter funding cycle	**435807**	**767052**	**1202859**	**303582**	
28	Yellowstone River Bank Stabilization (1997S)	20,000	20,000[a,k]	40,000	20,000	Complete
29	Mud Creek Channel Restoration (1997S)	15,000	20,000[a,k,r,v]	35,000	14,950	Complete
30	Bitterroot River Riparian Fencing (1997S)	991	991[a]	1,982	0	1999
31	Rock Creek Channel Restoration (1997S)	20,000	625,000[s]	645,000	8,100	Complete
32	Cottonwood Creek Culvert to Bridge Conversion (1997S)	10,000	15,000[f,p,r]	25,000	0	1999
33	McCabe Creek Culvert to Bridge Conversion (1997S)	13,000	12,000[f,p,r]	25,000	0	1999
34	Johnson Creek Culvert to Bridge Conversion (1997S)	4,000	6,500[m,p,s]	10,500	4,000	Complete
35	Gilbert & Shanley Creeks Project Repair (1997S)	5,560	8,000[a,r]	13,560	5,612	Complete
36	Mill Coulee Bank Stabilization (1997S)	13,603	33,000[a,e,n]	46,603	14,420	Complete
37	Sun River Channel Survey (1997S)	5,000	0	5,000	5,500	Complete
38	Sun River Bank Stabilization (1997S)	11,963	13,034[a,e,n,r,x]	24,997	9,593	Complete
39	Canyon Creek Channel Restoration (1997S)	12,000	17,000[a,e,n,r]	29,000	10,089	1999
40	Boulder River Channel Stabilization (1997S)	10,000	65,438[a]	75,438	0	2000

	PROJECT NUMBER, NAME & YEAR	PROGRAM FUNDS COMMITTED ($)	MATCHING FUNDS ($)	TOTAL FUNDS COMMITTED ($)	PROGRAM FUNDS SPENT ($)	EXPECTED YEAR OF COMPLETION
41	Careless Creek Bank Stabilization (1997S)	2,000	435,700[a,h,n,x]	437,700	995	Complete
42	Cottonwood Creek Migration Barrier (1997S)	3,000	1,270[s]	4,270	0	Superseded with #51
43	Union Creek Riparian Fence & Offsite Water (1997S)	10,500	29,250[a,h]	39,750	0	1999
44	Muskrat Creek Migration Barrier (1997S)	10,000	25,225[k,s]	35,225	6,509	Complete
45	Yellowstone River Bank Stabilization (1997S)	100,000	350,000[a]	450,000	100,000	Complete
	SUBTOTAL 1997 summer funding cycle	**266617**	**1677408**	**1944025**	**199768**	
46	Bear Paw Lake Shoreline Rearing Habitat (1998W)	4,750	0	4,750	4,810	Complete
47	Beaverhead River Riparian Fencing (1998W)	15,000	20,000[a,r]	35,000	15,000	Complete
48	Big Creek Channel Restoration (1998W)	19,600	23,000[a,e,r]	42,600	19,600	Complete
49	Bynum Reservoir Spawning Habitat (1998W)	3,500	1,500[t]	5,000	3,500	Complete
50	Canyon Ferry Reservoir Spawning Habitat (1998W)	1,000	7,000[t]	8,000	0	1999
51	Cottonwood Creek Barrier - supplement (1998W)	6,000	6,000[s]	12,000	0	1999
52	Deep Creek Channel Restoration (1998W)	10,400	22,000[d,r]	32,400	10,304	Complete
53	East Fork Bull River Bank Stabilization (1998W)	5,325	1,775[e,r]	7,100	3,928	Complete
54	Highwood Creek Bank Stabilization (1998W)	31,920	24,150[a,e,r]	56,070	0	1999
55	Hughes Creek Channel Restoration (1998W)	5,000	125,000[k,s]	130,000	5,000	Complete
56	Kleinschmidt Creek Channel Restoration (1998W)	25,500	10,000[a]	35,500	0	Commission delay
57	Mill Creek Channel Restoration (1998W)	30,000	60,500[n,r]	90,500	0	2000
58	Missouri River Bank Stabilization (1998W)	34,629	19,600[a,j,k,p,r]	54,229	34,629	Complete
59	Mud Creek Channel Restoration (1998W)	20,000	24,000[a,r,v,x]	44,000	0	Cancelled
60	Spring Creek Murphy Diversion Fish Passage (1998W)	5,546	12,979[n,r]	18,525	0	1998
61	North Fork Blackfoot River Haggert Diversion (1998W)	13,300	21,300[a,r]	34,600	13,301	Complete
62	North Fork Blackfoot River Weaver Diversion (1998W)	4,500	6,500[a,r]	11,000	3,213	1998

	PROJECT NUMBER, NAME & YEAR	PROGRAM FUNDS COMMITTED ($)	MATCHING FUNDS ($)	TOTAL FUNDS COMMITTED ($)	PROGRAM FUNDS SPENT ($)	EXPECTED YEAR OF COMPLETION
63	Blackfoot River Bank Stabilization (1998W)	6,750	11,750[a,r]	18,500	4,423	1998
64	Ruby River Diversion Improvement (1998W)	25,000	154,031[a,g,n,r]	179,031	0	2001
65	Smith Pond Development (1998W)	30,000	65,000[r,u]	95,000	0	Cancelled
66	South Fork Dupuyer Creek Habitat Enhancement (1998W)	2,800	2,000[s]	4,800	0	1999
67	Sweathouse Creek Bank Stabilization (1998W)	10,000	82,575[a,r]	92,575	0	2000
68	Spring Coulee Riparian Fence & Stabilization (1998W)	10,000	11,640[a,n]	21,640	9,417	Complete
	SUBTOTAL 1998 winter funding cycle	**320520**	712300	**1032820**	**127125**	
69	Big Creek Flow Enhancement (1998S)	325,000	144,000[a,r]	469,000	0	1999
70	Bear Creek Channel Restoration (1998S)	15,000	48,200[a,h,m,o,r]	63,200	16,500	Complete
71	Blackfoot River Water Conservation (1998S)	3,050	9,175[a,n,r]	12,225	0	1998
72	Cottonwood & McCabe Cr. Bridges (supplement) (1998S)	8,625	10,675[f,p,r]	19,300	0	1999
73	McCabe Creek Habitat Enhancement (1998S)	5,000	14,000[a,p,r]	19,000	0	1999
74	Nevada Creek Douglas & Helmville Fish Ladders (1998S)	3,000	5,400[n,r]	8,400	3,000	Complete
75	Nevada Creek Quigley Fish Ladder (1998S)	2,980	12,980[a,n,r]	15,960	211	1999
76	Nevada Creek Fish Friendly Diversion & Fence (1998S)	2,590	15,370[a,n,r]	17,960	0	1999
77	Nevada Spring Creek Culvert to Bridge Conversion (1998S)	4,000	8,000[e,r]	12,000	2,290	1999
78	Rock Creek Channel Restoration (1998S)	27,660	35,540[a,k]	63,200	0	1999
79	Shanley Creek Diversion & Riparian Fence (1998S)	2,800	6,800[a,r]	9,600	0	1999
80	Wasson Creek Fish Friendly Diversion (1998S)	1,250	2,400[a,f,r]	3,650	0	1999
81	Careless Creek Bridge & Riparian Fence (1998S)	10,150	4,150[a]	8,300	0	1999
82	Cottonwood Creek Diversion (1998S)	2,000	3,500[e,n]	5,500	0	1999
83	Esp/Chamber Spring Creek Channel Restoration (1998S)	11,600	18,400[n,r]	30,000	0	1999
84	Prickly Pear Riparian Fence (1998S)	5,000	5,000[a]	10,000	0	1999

	PROJECT NUMBER, NAME & YEAR	PROGRAM FUNDS COMMITTED ($)	MATCHING FUNDS ($)	TOTAL FUNDS COMMITTED ($)	PROGRAM FUNDS SPENT ($)	EXPECTED YEAR OF COMPLETION
85	Red Lodge Creek Riparian Fence (1998S)	4,050	1,350[a,n]	5,400	0	Cancelled
86	Ross Fork Rock Creek Fish Ladder (1998S)	2,000	4,000[s]	6,000	0	1999
87	Saddle Brook Pond Restoration (1998S)	12,000	3,340[a,t]	15,340	0	1999
88	Shields River & Elk Creek Riparian Fence (1998S)	20,000	41,537[a,n]	61,537	3,960	1999
89	Smith Creek Riparian Fence (1998S)	2,595	1,670[a,n]	4,265	2,855	Complete
90	Spokane Creek Channel Restoration (1998S)	4,000	5,100[a,r,x]	9,100	0	1999
91	Stabach Creek Fish Barrier (1998S)	3,000	3,500[e,k]	6,500	0	1999
92	Sweetgrass Creek Riparian Fence (1998S)	2,500	2,500[a]	5,000	0	1999
93	Thompson Chain of Lakes Habitat Structures (1998S)	1,060	1,600[e]	2,660	0	1999
94	Tiber Reservoir Spawning Habitat (1998S)	2,487	2,000[a]	4,487	0	2002
	SUBTOTAL 1998 summer funding cycle	**483397**	**410187**	**887584**	**28816**	

a Applicant/private landowner
b Audubon
c Bassmasters
d BLM
e Conservation Districts
f Counties
g DEQ 319 grant
h DNRC
i Federal Aid (USFWS)
j Federation of Fly Fishers
k Foundation grants
l Milltown mitigation
m MPC
n NRCS
o Timber companies
p Trout Unlimited
q US Corp of Engineers
r USFWS
s USFS
t Walleye Unlimited
u MDOT
v Confederated Salish/Kootenai Tribe
x Other

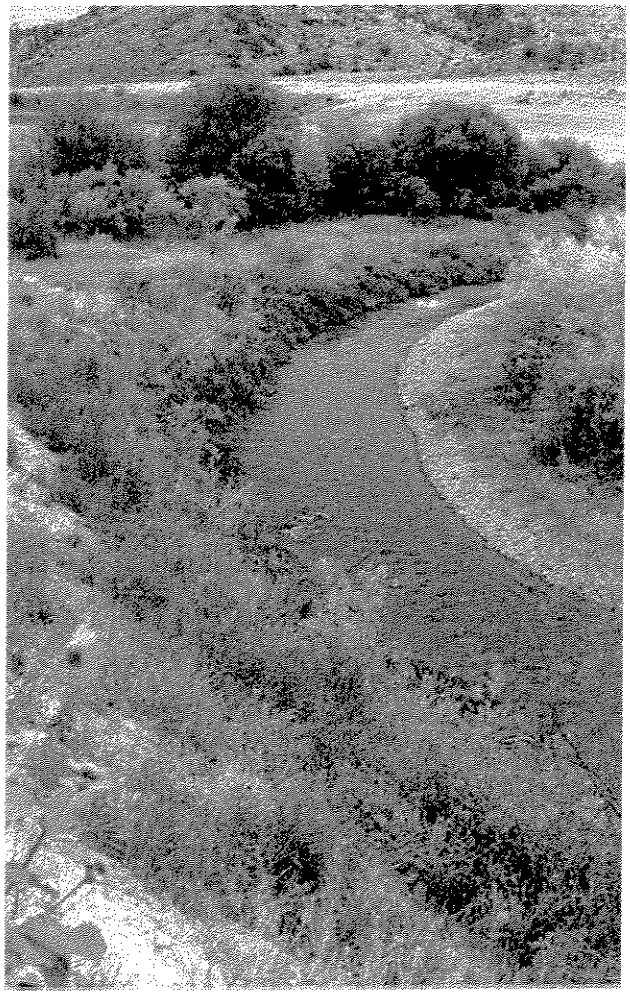

Photo illustration 1. Deep Creek (east of Townsend) during and after treatment of a steep eroding bank. Banks were back sloped and stabilized with juniper bundles cabled into the slope. Willows will eventually provide more permanent bank stability.

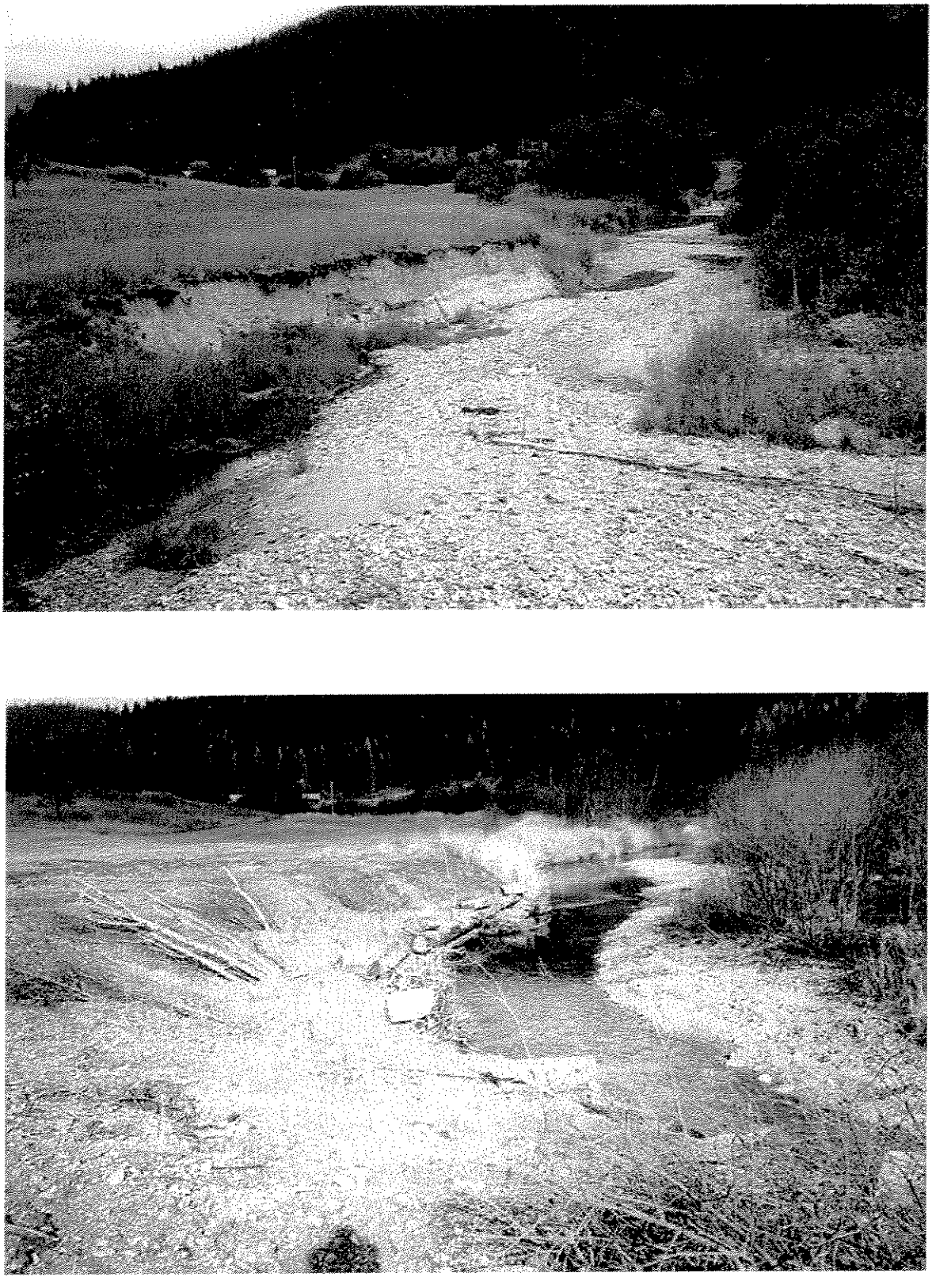

Photo illustration 2. Elk Creek (near Heron) before and immediately after restoration. The channel was reshaped and banks were stabilized using root wads, boulders, and log footers. The new channel is deeper and more diverse — providing better fish habitat.

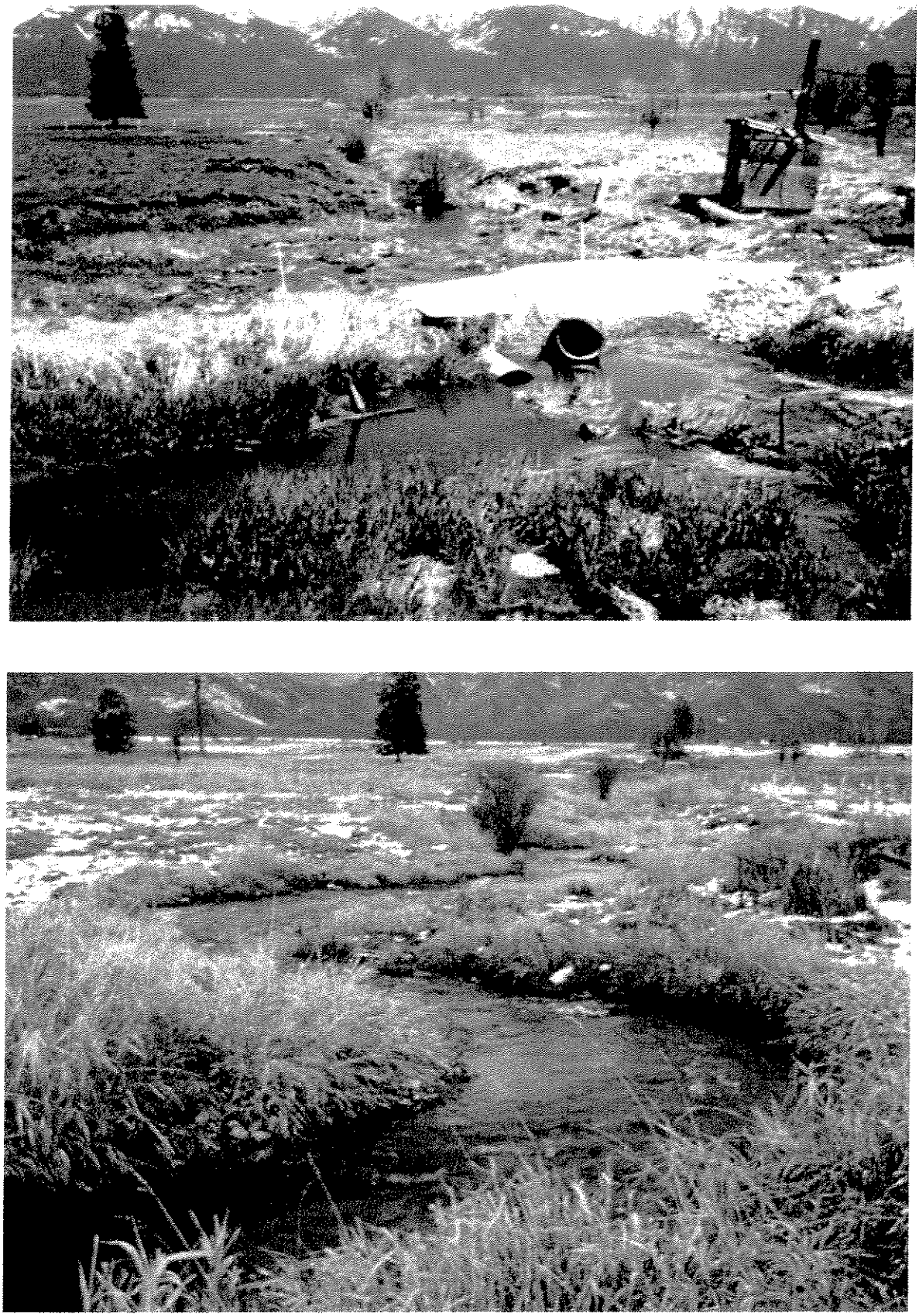

Photo illustration 3. Stinger Creek (near Ronan) before and after restoration. The channel was reshaped, deepened, and banks were stabilized with sod mats. The culvert and road crossing were removed to provide fish passage and riparian fencing was installed to protect the stream.

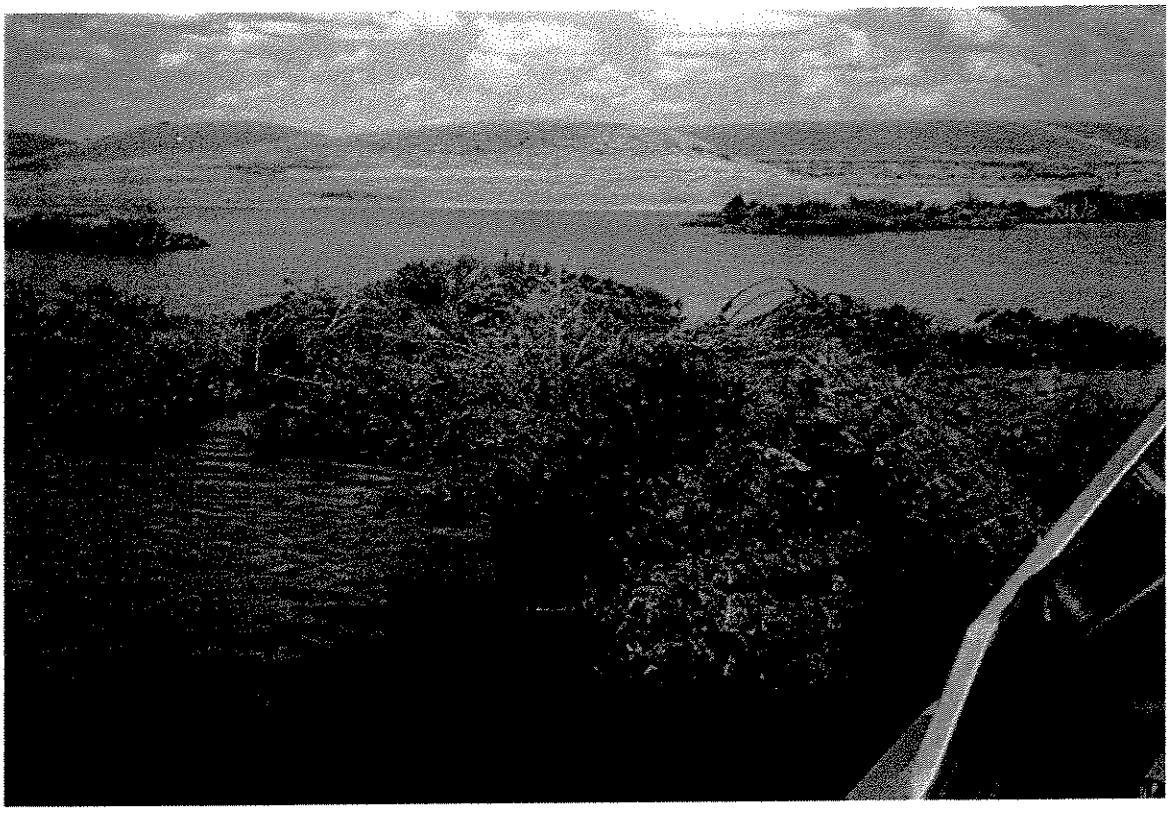

Photo illustration 4. (Top) Big Spring Creek (near Lewistown) showing a newly constructed meandering channel on the Brewery Flats fishing access site. The old channel (parallel to the road) was straightened when the railroad was built near the turn of the century. Stream length as a result of the project will increase from 2600 to 3950 feet. **(Bottom)** Christmas tree bundles placed in Fresno Reservoir to provide spawning habitat for yellow perch.

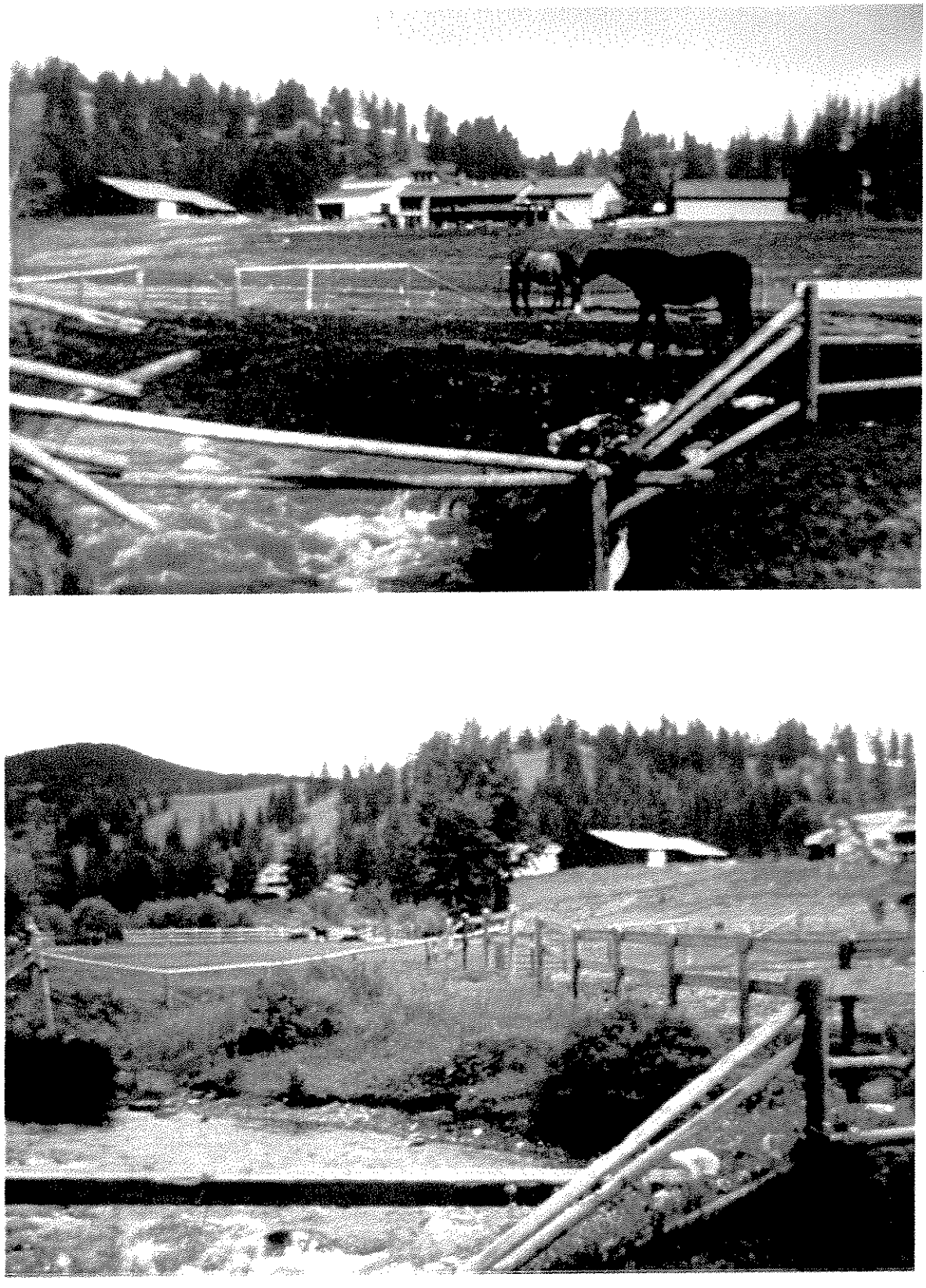

Photo illustration 5. O'Brien Creek (south of Missoula) before and after removal of a stream side corral and installation of riparian fencing. Banks were stabilized using natural vegetation.

Project Descriptions

Projects described below are those that were approved since the last legislative reporting period and are listed in pages 6-10 of Table 3.

1. **Elk Creek restoration.** Elk Creek (Sanders County) is a tributary to the Clark Fork River near Heron. The stream supports westslope cutthroat trout as well as brown and brook trout. The stream has become degraded due to a variety of adjacent land use practices; flooding has exacerbated the problem. Restoration measures included channel and bank reconstruction, erosion control, revegetation of stream banks, and riparian fencing. Twenty sites along 10.5 miles of stream were treated. **Completed.**

2. **Fisher River channel restoration**.This section of the Fisher River (Flathead County) near Kalispell suffers from severe erosion due shortening of the channel. The stream supports both rainbow and brook trout populations. This project involved restoring stream length by returning the stream to its previous channel. Approximately 400 ft of channel was treated. **Completed.**

3. **Stinger Creek restoration.** Stinger Creek (Lake County) is a small spring creek located near Ronan that supports rainbow, brown, and brook trout. The channel was historically channelized and riparian vegetation was destroyed by aerial spraying. This project involved restoring a natural meandering channel, re-establishing riparian vegetation, and fencing the riparian corridor. Approximately 1.5 miles of Stinger Creek (and 700' of Mud Creek) was restored. **Completed.**

4. **Middle Fork Rock Creek riparian fence.** Middle Fork Rock Creek (Granite County) located on National Forest was damaged by previous grazing practices. This project involved riparian fencing to exclude livestock from stream-side areas and off-stream water development to provide alternative watering. This is a bull trout spawning stream. Three miles of stream were treated. **Completed.**

5. **Clark Fork riparian fence.** Portions of the Clark Fork River (Missoula County) located on private property near Missoula suffer from trampling caused by cattle. This section of the river supports both brown and rainbow trout. The project involved fencing 0.9 miles of riparian corridor to protect the stream bank. **Completed.**

6. **Grantier Spring Creek restoration.** Grantier Spring Creek (Lewis and Clark County) is a small private spring creek that enters Poorman Creek near the confluence of Poorman Creek with the Blackfoot River. The stream has become degraded over the years due to channelization and grazing. The project involved restoring fish passage between the spring creek and Poorman Creek, and improving spawning habitat in both creeks by reconstructing the channel. About 500 ft of channel was treated. **Completed.**

7. **Camp Creek restoration.** Camp Creek (Ravalli County) was channelized many years ago

due to highway construction. The stream supports populations of westslope cutthroat and brook trout. This project involves reconstructing the stream and returning the stream to the old channel. The project will restore approximately 1.75 miles of stream. Costs will be shared with the Department of Transportation.

8. **Chamberlain Creek diversion improvements.** Chamberlain Creek (Powell County) had fish passage and dewatering problems associated with an irrigation diversion. The stream supports a resident population of cutthroat trout but was isolated from the Blackfoot River by the diversion. This project involved installation of a fish friendly diversion structure as well as water management measures that improved stream flow. **Completed.**

9. **O'Brien Creek restoration.** O'Brien Creek supports spawning runs of westslope cutthroat and rainbow trout from the Bitterroot River. The lower three miles of O'Brien Creek (Missoula County) suffered from lack of large woody debris for pool development, channelization, and riparian degradation caused by grazing and subdivision. This project included restoring pools and riparian conditions in the lower three miles of the creek. The project complemented an earlier project that focused on riparian fencing, off-stream water development and removal of culverts that were migration barriers. **Completed.**

10. **North Fork Blackfoot fish screen.** The North Fork of the Blackfoot River (Powell County) is a bull trout spawning stream. Monitoring has demonstrated that large numbers of juvenile bull trout as well as some adults were lost down irrigation diversions. This project involved installing a fish screen to prevent loss of fish into the diversion. **Completed.**

11. **Monture Creek restoration.** Monture Creek (Powell County) is an important bull trout spawning tributary for the Blackfoot River. Some reaches of the stream have marginal habitat for trout. This project involved placing log veins, root wads, and woody debris on outside bends to improve habitat diversity. The project also involved placement of willow clumps and sod to improve bank stability. Sites along 4.2 miles of stream were treated. **Completed.**

12. **Salmon Creek restoration.** The Salmon Creek, McDermott Creek, Coopers Lake, Dry Creek system (Powell County) supports populations of native cutthroat trout as well as bull trout. This project involved improvements in fish passage and streamflow, instream habitat restoration, improved riparian livestock management, and installation of fish screens on diversions. Treatments occurred over 1.5 miles of stream. **Completed.**

13. **Mill Creek restoration.** Mill Creek (Park County) supports a population of pure strain cutthroat trout. This project involves habitat enhancements along a one mile reach of stream that has been channelized. Improving this reach will enhance recruitment on public lands located both upstream and downstream of the project.

14. **Stone Creek restoration.** Stone Creek (Madison County) supports a population of pure strain cutthroat trout. This project included creation of over-wintering pools and revegetation of

the floodplain with woody vegetation and sedges (1.5 miles of stream was treated). **Completed.**

15. **Ruby River diversion stabilization.** The Ruby River Madison County) in the vicinity of the Bullerdick Ditch was in jeopardy of being captured by the ditch. This project involved installation of a new diversion structure, rock barbs, and additional bank stabilization measures to prevent this from occurring. **Completed.**

16. **Mol Heron Creek infiltration gallery.** Mol Heron Creek (Park County) is the site of an approved instream water lease. Mol Heron Creek supports a spawning run of Yellowstone Cutthroat Trout from the Yellowstone River. This project involves replacing an irrigation diversion dam with an infiltration gallery, thereby eliminating a migration barrier and allowing spawning fish to gain access to several additional miles of stream.

17. **Black Butte Creek restoration.** Black Butte Creek (Meagher County) supports a population of Westslope Cutthroat Trout. The stream was damaged -- primarily due to grazing practices. This project included riparian fencing, off-stream water development, and placement of root wad revetments and boulders to improve habitat diversity. Approximately 0.75 miles of stream was treated. **Completed.**

18. **Missouri River bank stabilization.** A section of the Missouri River (Lewis and Clark County) downstream of Craig suffered from eroding banks due to grazing. This project stabilized the bank using root wads, rock veins, back-sloping, revegetation, and fencing to exclude cattle. Approximately 2,250' of bank was be treated. **Completed.**

19. **Sun River inventory and design.** The Sun River (Cascade County) near the town of Sun River suffers from stream bank instability due to farming and ranching practices. The applicant seeks to stabilize stream banks along a ten mile reach of the Sun River. This project involved survey and design work to further develop treatments. **Completed.**

20. **Elk Creek restoration.** Fish habitat in the upper reaches of Elk Creek (Lewis and Clark County) near Augusta has been damaged as a result of changes in the hydrograph caused by forest fires. This project involves placing the stream back in its old channel and stabilizing banks with root wads and woody vegetation. Approximately 1.5 miles of stream will be treated.

21. **Big Spring Creek restoration.** A 2400' section of Big Spring Creek (Fergus County) near Lewistown was channelized just after the turn of the century. This section of stream is located on a FWP fishing access site (Brewery Flats). The project involves reconstructing a naturally meandering stream channel using modern stream restoration techniques. Approximately, 4,000' of new channel will be constructed .

22. **Dearborn River grade control.** An irrigation diversion on the Dearborn River (Lewis and Clark County) near its confluence with the South Fork of the Dearborn has been a barrier to fish migration. This problem was corrected in 1995 with a series of rock drop structures that

stabilized the grade. Unfortunately, ice scour and flooding has damaged these drops. This project involves changing the configuration of the structure into a vortex rock weir and removing gravel berms installed on one side of the river. **Cancelled.**

23. **Townsend Ranch stream rehab.** Three small streams on the Townsend Ranch (Meagher County) near White Sulphur Springs support populations of cutthroat trout. However, the streams have been damaged by grazing. This project involved riparian fencing, off-stream water development, and establishment of a series of pastures that will allow implementation of a rest rotation grazing system. Approximately 4.4 miles of stream was treated. **Completed.**

24. **Bynum Reservoir spawning structures.** Bynum Reservoir (Teton County) lacks adequate aquatic vegetation to serve as a spawning substrate for yellow perch. This project involved installation of four different types of artificial substrates. Use of the structures is being monitored by divers. **Completed.**

25. **Hauser reservoir spawning structures.** Hauser Reservoir (Lewis and Clark County), causeway arm, supports a population of yellow perch. It is thought that spawning substrate may be limiting the population. This project involved installing 25 structures constructed from juniper trees and rebar. Structures were placed in locations recommended by the area fishery biologist. **Completed.**

26. **Dearborn River bank stabilization.** A portion of the Dearborn River (Lewis and Clark County) downstream of the confluence with the South Fork of the Dearborn suffers from severe bank erosion. This project involves installation of a series of bank barbs to stabilize banks and eliminate erosion. Approximately 800' of bank will be treated.

27. **Fresno Reservoir spawning substrate.** Fresno Reservoir (Hill County) supports a population of yellow perch but reproduction success is marginal during most years. This project involved anchoring dead trees and root wads in known spawning locations. **Completed.**

28. **Yellowstone root wads.** A high eroding bank on the Yellowstone river (Park County) was a major source of sediment to the system. This project involved building a terrace below the bank and stabilizing the terrace with root wads and rock veins. Approximately, 1500' of bank was treated. **Completed.**

29. **Mud Creek restoration.** Mud Creek (Lake County) is a tributary to Crow Creek and is located near Ronan. Mud Creek was deteriorated from over grazing and channelization. This project involved reconstructing 8000' of channel, re-establishing riparian vegetation, and riparian fencing. **Completed.**

30. **Bitterroot fencing.** Portions of the Bitterroot River (Missoula County) have been damaged by grazing practices. This project involves constructing approximately 0.5 miles of riparian fencing.

31. **Rock Creek restoration.** A portion of Rock Creek (Mineral County) was degraded many years ago when the channel was shortened to irrigate a hay meadow. The property was subsequently purchased by the Forest Service. Over the years the channel has down cut and become unstable. This project includes restoring the natural meander pattern, re-establishing many of the original channel features, and stabilizing eroding stream banks. Approximately 1 mile of stream will be treated.

32. **Cottonwood Creek barrier removal.** Cottonwood Creek (Powell County), a tributary to the Blackfoot River, supports cutthroat and bull trout. This project involves replacing a culvert, which is a barrier to fish migration, with a bridge. This will allow spawning fish to gain access to the upper reaches of Cottonwood Creek for spawning and rearing.

33. **McCabe Creek barrier removal.** McCabe Creek (Powell County), a tributary to Monture Creek, supports a good population of cutthroat trout. This project involves replacing a culvert, which is a barrier to fish migration, with a bridge. This will open up the upper reaches of McCabe Creek for spawning and rearing.

34. **Johnson Creek barrier removal.** Johnson Creek (Missoula County), a tributary to the Blackfoot River, supports populations of bull trout and westslope cutthroat. This project involved replacing a culvert, which was a barrier to fish migration, with a bridge thereby allowing migrating spawning fish to gain access to the upper reaches. **Completed.**

35. **Gilbert and Shanley creeks maintenance.** Gilbert and Shanley creeks (Missoula and Powell Counties) were the sites of previous Future Fisheries projects. These projects were damaged during the flooding that occurred during 1997. This project involved repairing the damage. **Completed.**

36. **Mill Coulee restoration.** Mill Coulee (Cascade County) is a tributary to the Sun River near the town of Sun River. Erosion caused by land use practices and irrigation return flows caused Mill Coulee to become a major source of sediment to the Sun River. This project used back sloping, rock barbs, and revegetation to stabilize selected reaches over a three mile stretch of stream. **Completed.**

37. **Sun River, Simms to Fort Shaw.** The Sun River (Cascade County) between Simms and Fort Shaw suffers from erosion problems caused by land use practices. This project involved conducting an inventory to identify major sources of sediment and development of solutions. **Completed.**

38. **Sun River bank stabilization.** The Sun River (Cascade County) near the Thompson gravel mine is unstable and suffers from erosion. This project utilized root wads and barbs to control erosion and stabilize banks. **Completed.**

39. **Canyon Creek restoration.** Canyon Creek (Lewis and Clark County) in the vicinity of a

county bridge was degrading in some reaches and aggrading in others. These changes were partially due to failure of a large log jam just downstream of the bridge and channel widening completed by the county. This project involves stabilizing and restoring approximately 3500' of channel and installing a grade control to prevent head cutting.

40. **Boulder River migration barrier.** The Boulder River (Sweetgrass County) in the vicinity of the Ellis King Hawks Ditch is bulldozed annually to divert water into the ditch. The diversion is presently a barrier to fish migration during certain seasons. This project would create a series of rock grade controls that would allow for bed load transport and eliminate the need for annual equipment operation in the stream.

41. **Careless Creek bank stabilization.** Careless Creek (Golden Valley County) is a tributary to the Musselshell River and is located downstream of Deadman's Basin Reservoir. The stream has been severely degraded because regulated flows released into the channel were far greater than the stream had historically received. The problem has been alleviated by enlarging a nearby canal thereby greatly reducing releases into Careless Creek. This project involved stabilizing about 1500' of bank. The majority of the costs associated with this project are being covered from other funding sources; nearly 18 miles of stream will eventually be treated. **Completed.**

42. **Cottonwood Creek fish barrier.** Cottonwood Creek (Chouteau County) is located on the Lewis and Clark National Forest in the Highwood Mountains. The creek supports a genetically pure population of westslope cutthroat trout. This project involves installing a migration barrier to preserve the genetic integrity of the population (resubmitted for additional funding; see project 51).

43. **Union Creek riparian enhancement.** Union Creek (Missoula County) is a tributary to the Blackfoot River. The Creek is severely degraded as a result of grazing. This project involves stabilizing and revegetating the stream banks, riparian fencing, and off-site water development.

44. **Muskrat Creek barrier.** Muskrat Creek (Jefferson County) is a small stream located on the Helena National Forest that supports a genetically pure population of westslope cutthroat trout. This project involved installation of a migration barrier to protect the genetic integrity of the population. **Completed.**

45. **Yellowstone River bank restoration.** During the 1996 flood the Yellowstone River (Park County) captured Armstrong Spring Creek. This project was completed to isolate the river from the spring creek as well as to stabilize river banks on the Yellowstone. The spring creek is an important spawning tributary for Yellowstone River rainbow trout. Approximately 2 miles of stream were treated. **Completed.**

46. **Bear Paw Lake rearing habitat.** Bear Paw Lake (Hill County) is a small (45 acre) impoundment located in north central Montana that supports a popular smallmouth bass fishery. The local biologist believes that juvenile rearing habitat is limiting the fishery. Rocks were

placed along the east shore to provide rearing habitat for young smallmouth. **Completed.**

47. **Beaverhead River fencing.** The Beaverhead River (Beaverhead County) in the Dillon area has reaches where stream banks suffer from overgrazing. This project involved fencing 3 miles of the river on both sides, and providing water gaps for cattle. Limited grazing will be allowed in the riparian corridor that is consistent with riparian protection. **Completed.**

48. **Big Creek restoration.** Big Creek (Mineral County), a tributary to the St. Regis River near Superior, supports a resident bull trout population. The lower reaches are unstable due to removal of vegetation, channel straightening, and berming. These past activities are preventing the stream from gaining access to its floodplain. This project re-established the natural channel dimensions and active floodplain over approximately 1 mile of stream. A combination of root wads, rock grade controls, revegetation, and removal of berms was used to accomplish the project. **Completed.**

49. **Bynum perch spawning structures.** Bynum Reservoir (Teton County) supports natural reproducing populations of yellow perch and walleye. This project involved installation of Christmas tree structures to enhance spawning habitat. **Completed.**

50. **Canyon Ferry perch spawning structures.** Canyon Ferry Reservoir (Lewis and Clark and Broadwater Counties) supports a popular fishery for yellow perch. This project involves installation of Berkley Fish Hab structures to improve spawning and rearing habitat for yellow perch.

51. **Cottonwood Creek barrier.** Cottonwood Creek (Choteau County) supports a genetically pure strain of cutthroat trout in its upper reaches. This project involves installing a waterfall to act as a migration barrier to protect the cutthroat. The structure will be installed in a natural bedrock bottleneck.

52. **Deep Creek restoration.** Deep Creek (Deer Lodge County) is a tributary to the Big Hole River that provides important summer habitat and spawning habitat for fluvial arctic grayling -- a species of special concern. The project involved using bioengineering techniques, revegetation, and riparian fencing to stabilize banks and use of gravel plugs to reestablish a meander loop and restore stream length. A headgate was also replaced allowing more efficient use of water and leaving more water instream. Approximately 2500' of stream was treated. **Completed.**

53. **East Fork Bull River stabilization.** The East Fork of the Bull River (Sanders County) supports populations of both bull and cutthroat trout. The historic channel had become unstable and braided due to excessive riparian logging by a previous landowner. This project involved returning the stream to the old channel and stabilizing the banks. Approximately 0.5 miles of stream was treated. **Completed.**

54. **Highwood Creek restoration.** Highwood Creek (Chouteau County) located near the town of

Highwood supports a modest population of trout. The stream has been severely degraded by adjacent farming and grazing practices and suffered further degradation when the channel was straightened by the Corps of Engineers following the 1964 flood. This project involves restoring the natural dimensions of the channel and stabilizing banks and riparian areas with shrubs, rootwads and rock. A grazing management plan designed to protect riparian areas is being developed.

55. **Hughes Creek restoration.** Hughes Creek (Ravalli County) was historically damaged by placer mining. The Hughes Creek drainage supports both cutthroat and bull trout. This project restored the natural pattern, profile and dimensions to this severely damaged stream. Approximately, one mile of stream was treated. **Completed.**

56. **Kleinschmidt Creek restoration.** Kleinschmidt Creek (Powell County) is part of a spring creek complex that enters the North Fork of the Blackfoot River near its confluence with the mainstem Blackfoot. Portions of the spring creek complex located on adjacent property have previously been restored and are providing significant recruitment of westslope cutthroat to the river system. This project involves restoring approximately 2,000' of additional channel.

57. **Mill Creek restoration.** Mill Creek (Ravalli County) is a tributary to the Bitterroot River that supports important spawning runs of both rainbow and brown trout in its lower reaches. The stream was damaged by adjacent land use practices and damage was aggravated by recent flooding. This project involves stabilizing eroding banks using revegetation, root wads and rock vanes; reconstructing portions of the channel; and replacing riparian fencing. Approximately, one mile of stream will be treated.

58. **Missouri River bank stabilization.** The Missouri River (Lewis and Clark County) downstream of Craig is a nationally renowned trout stream. This project involved treating approximately 4000' of eroding bank using root wads, back sloping, rock vanes and revegetation. **Completed.**

59. **Mud Creek restoration.** Mud Creek (Lake County) is a badly degraded spring creek in the Mission Valley near Ronan. Over the years the stream has been ditched and straightened, and the riparian zone all but eliminated. We recently funded a restoration project on portions of this stream immediately downstream of this proposed project. This project would restore the natural pattern, profile, and dimensions to an additional mile of stream. **Cancelled.**

60. **Spring Creek Diversion.** Spring Creek (Powell County), a tributary to the North Fork of the Blackfoot, is an important juvenile bull trout rearing and cutthroat trout spawning stream. This project involves installing a fish friendly diversion structure that will improve fish passage and increase stream flows.

61. **North Fork Blackfoot bank restoration.** The North Fork of the Blackfoot River (Powell County) in the vicinity of the George Haggert property experienced severe deposition and bank

erosion during the 1997 flood. A previous restoration project at this location consisted of installing an infiltration gallery to prevent fish from being lost down an irrigation diversion. This project was completed to protect stream banks and keep the previous project functional. **Completed.**

62. **North Fork channel restoration.** The North Fork of the Blackfoot River (Powell County) in the area of the Weaver/Jacobson Diversion is unstable, and braided. The river has left its historic channel due to extensive aggradation. This project will return the river to its historic channel which has more complex high quality habitat.

63. **Blackfoot bank stabilization.** The Blackfoot River (Powell County) near the Phil Henault property suffers from unstable banks caused by grazing. This project involves installation of native material revetments and riparian fencing to stabilize approximately 1,000' of bank.

64. **Ruby River diversion improvements.** The Ruby River (Madison Co.) suffers from dewatering in some reaches. Additionally, several irrigation diversions are barriers to fish migration. This project includes replacement of old irrigation diversions with more fish friendly diversions. The increased efficiency of these new structures and a water management plan accepted by the irrigators will also result in improved base streamflow.

65. **Smith Pond.** Smith Pond (Powder County) would have been a new impoundment located near Broadus that would have provided public fishing for naturally reproducing populations of yellow perch and largemouth bass. There are presently very few fishing opportunities in the Broadus area. The project fell through due to complications. **Cancelled.**

66. **South fork Dupuyer Creek improvements.** South Fork Dupuyer Creek (Teton County) presently supports a small population of cutthroat trout. This project would create more overwintering habitat by creating a series of vortex rock weirs in the stream. Treatments would occur over a 2 mile reach.

67. **Sweathouse Creek restoration.** Sweathouse Creek (Ravalli County) supports spawning runs of brown trout from the Bitterroot River. This project would restore stream reaches that are channelized and eroding.

68. **Spring Coulee restoration.** Spring Coulee (Teton County) has become severely degraded over the years because it received water from a trans-basin irrigation reservoir at flows that far exceeded the natural flows that formed the original channel. The flow management situation has been corrected. This project involves stabilizing eroding banks using conifer tree revetments and willow plantings, and riparian fencing. Approximately 0.5 mile of stream was treated. **Completed.**

69. **Big Creek water lease.** Big Creek (Park County) is a tributary to the Yellowstone River that suffers from seasonal dewatering from irrigation. Big Creek supports a significant spawning

run of Yellowstone Cutthroat Trout but the stream is seasonally dewatered, leaving the redds high and dry. This project involves replacing a flood irrigation system on two ranches with a more efficient sprinkler system and leasing the water that is saved to provide greater in-stream flow. Approximately 11 cfs will be leased for in-stream purposes.

70. **Bear Creek restoration.** Bear Creek (Missoula County) has good potential for native fish recovery and is a tributary to the Blackfoot River. The stream was channelized in the past and also suffered from grazing and logging practices. This project involved reconstructing the stream to its natural geometry and improving adjacent land management practices. Approximately 0.5 miles of stream was treated. **Completed.**

71. **Blackfoot River off stream watering.** The Pocha ranch withdraws water from the Blackfoot River (Powell County) that is used exclusively for livestock watering. The watering canal also runs through a feed lot which degrades water quality. This project will develop of off stream watering tanks that will eliminate the need for the diversion and improve water quality.

72. **Cottonwood and McCabe creeks bridges (supplement).** Cottonwood and McCabe creeks (Powell County) have good potential for bull trout production. Culverts located on county roads are undersized and are presently barriers to fish migration. Funding for the project was approved last winter but it has since been determined that additional dollars are needed.

73. **McCabe Creek large woody debris.** McCabe Creek (Powell County) is located in a drainage that supports cutthroat trout but is degraded due to adjacent land management activities. This project involves adding large woody debris to the lower 2 miles of the stream to restore habitat complexity and improve fish habitat.

74. **Nevada Creek Douglas and Helmville fish ladders.** Nevada Creek (Powell County) is a tributary to the Blackfoot River and is located near Helmville. The creek has potential to support spawning runs of Blackfoot River fish but several irrigation diversions are presently barriers to fish migration. This project involves installing fish ladders on two of the diversions to provide fish passage.

75. **Nevada Creek Quigley fish ladder.** Nevada Creek (Powell County) is a tributary to the Blackfoot River and is located near Helmville. An irrigation diversion on the Quigley Ranch is presently a barrier to fish migration. This project involves replacing the old irrigation structure with one that is nearer to grade and installing a fish ladder to provide fish passage.

76. **Nevada Creek fish friendly diversion.** Nevada Creek (Powell County) on the Wineglass Ranch has been captured by an irrigation diversion and suffers from poor grazing management. This project involves replacing the existing diversion structure, returning the stream to its old channel, and development of a riparian grazing management system that will protect the stream.

77. **Nevada Spring Creek bridge.** Nevada Spring Creek (Powell County) is a tributary to

lower Nevada Creek . Fish passage is blocked due to a perched culvert. This project involves replacing the culvert crossing with a bridge crossing to restore fish passage.

78.. **Rock Spring Creek restoration.** Rock Creek (Powell County) is a tributary to the North Fork of the Blackfoot River and is an important spawning tributary for Blackfoot River fish. Rock Creek on the Brumit property is a spring creek and has become degraded from land management practices implemented by a previous owner. This project involves restoring approximately one mile of spring creek and implementation of a grazing management plan that will protect the stream from future damage.

79. **Shanley Creek fencing.** Shanley Creek (Powell County) is a tributary to Cottonwood Creek which, in turn, is a tributary to the Blackfoot River. Shanley Creek supports populations of cutthroat and brown trout. Shanley Creek on the Heart-Bar-Heart Ranch is degraded due to livestock grazing. This project involves construction of 1.6 miles of new fencing that will allow development of a grazing management plan that will protect the stream.

80. **Wasson Creek fish friendly diversion.** Wasson Creek (Powell County) is a tributary to upper Nevada Spring Creek and supports cutthroat and brown trout. This project involves replacing an old diversion with a fish friendly diversion structure and removal of a culvert that is presently a barrier to fish migration.

81. **Careless Creek bridge and fencing.** Careless Creek (Golden Valley County) is a tributary to the Musselshell River that receives the outflow from Deadman's Basin Reservoir. The stream was degraded because the flows from Deadman's Basin Reservoir were far greater than the channel had evolved to support. This application, which has two components, is a small part of a much larger project to restore Careless Creek. The project includes construction of a bridge on the Micks Ranch to lessen pressure on a riparian pasture and fencing and revegetation of approximately 1 mile of stream bank on the Zeier Ranch.

82. **Cottonwood Creek diversion.** Cottonwood Creek (Meagher County) is a tributary to the South Fork Musselshell River. This project involves replacing an old diversion structure with a more fish friendly diversion that will eliminate the need to enter the stream each year with heavy equipment.

83. **Esp/Chambers Spring Creek restoration.** Esp/Chambers Spring Creek (Sweet Grass County) is a small spring creek that enters the Yellowstone River ten miles east of Big Timber. The stream is presently inaccessible to Yellowstone River fish and is also degraded due to adjacent land management practices. This project includes removing barriers to migration, and restoring and fencing the stream. Approximately 1250' of stream will be treated.

84. **Prickly Pear Creek fencing.** Prickly Pear Creek (Lewis and Clark County) enters Lake Helena about 4 miles north of Helena. The stream has become degraded over the years due to adjacent land management practices. This project involves installation of riparian fencing and

development of a grazing management plan to protect stream banks. Approximately 5,800' of fencing will be installed.

85. **Red Lodge Creek fencing.** Applicant canceled project after funding was approved. **Cancelled.**

86. **Ross Fork fish ladder.** Ross Fork Rock Creek (Granite County) is located on the Beaverhead-Deer Lodge National Forest. The stream supports bull trout but an irrigation diversion on the creek is a barrier to fish migration. This project involves installation of a fish ladder on the diversion dam to allow movement of fish past the diversion and removal of debris and sediment from behind the dam.

87. **Saddle Brook pond restoration.** Saddle Brook Pond (Phillips County) is located on private property near Malta. The applicant proposes to dredge the pond to increase water depth for purposes of establishing a self sustaining yellow perch and bass fishery. The pond will be developed for handicapped access and childrens fishing.

88. **Shields River and Elk Creek fencing.** Shields River and Elk Creek (Park County) suffer riparian degradation due to grazing practices. This project involves riparian fencing and stock water development. Approximately 2.5 miles of the two streams involved will be treated.

89. **Smith Creek riparian fence.** Smith Creek (Ravalli County) located near Victor suffers from riparian degradation due to grazing practices. The stream supports both cutthroat and brook trout. Approximately 1,225 ft of riparian fencing was installed to protect the stream. **Completed.**

90. **Spokane Creek restoration.** Spokane Creek (Lewis and Clark County) is a small spring fed stream that enters Hauser Reservoir northeast of Helena. The stream receives spawning runs of brown trout and kokanee but is degraded due to adjacent land management practices. This project involves restoring the lower 1,500 ft of the stream immediately upstream of the reservoir. Treatments will include bank stabilization using tree revetments and willows and reconstruction of the channel to create more pool habitat.

91. **Stabach Creek fish barrier.** Stabach Creek (Broadwater County) is a high priority cutthroat trout recovery stream located in the Elkhorn Mountains. The lower reaches of Stabach Creek supports a spawning run of rainbow trout which are a threat to the native cutthroat. Brook trout are also colonizing the project area. This project involves construction of fish barriers, using perched culverts at county road crossings, to prevent non-native fishes from entering the area. Brook trout will be removed from the project area once the barriers are in place.

92. **Sweet Grass Creek fencing.** Sweet Grass Creek (Sweet Grass County), a tributary to the Yellowstone River near Greycliff, has become degraded due to grazing practices. The project includes installing of 0.9 miles of riparian fencing and development of a grazing management plan to protect the stream.

93. **Thompson lakes woody structures.** Thompson Chain of Lakes (Lincoln and Sanders counties) supports a yellow perch and largemouth bass fishery. This project involves placing approximately 70 stumps in the lakes to improve habitat diversity and provide cover for fish.

94. **Lake Elwell habitat structures.** Lake Elwell (Liberty County) supports a popular fishery for walleye and yellow perch. This project involves construction and placement of habitat structures fabricated from rebar and Christmas trees. A hundred structures will be built and placed over the next four years.

Appendix A

Future Fisheries Improvement Program Monitoring Report – 1998

by

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December 1998

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Introduction

This report summarizes the results of monitoring conducted to evaluate the effectiveness of selected habitat restoration projects funded through either the River Restoration Program (RRP) or the Future Fisheries Improvement Program (FFI). Monitoring was conducted to help answer the question; "Did the funded project improve target fish populations?" Monitoring is essential to understand what types of projects provide benefits to fish populations and which do not.

This report presents data collected for 65 projects. These data, as well as conclusions, are considered preliminary because it often takes five years or more for fish populations to fully respond to habitat improvement treatments (Hunt 1976) and some of these data have not yet been fully analyzed. Of the 65 projects evaluated, baseline data is reported for 24 (37%), preliminary results were inconclusive for 10 (15%), and preliminary data indicate fish populations are improving at 31 (48%) projects.

This report is organized first by the river basin where each project is located and then by the project name. Project code numbers presented in Table 3 of the main body of this report are cross-referenced in square brackets following the MDFWP CODE by referencing the number of the project and year. RRP projects were not included in Table 3, so they are not cross-referenced.

Beaverhead River Drainage

Stone Creek Rehabilitation

WATER NAME: Stone Creek – Beaverhead River
DATE PROVIDED BY: Brad Shepard and Dick Oswald, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: RRA-54-94 and FFI-16-97 [Table 3 reference: 14 (1997W)]

The Left Fork of Stone Creek from the Barretts Minearals, Inc. talc mine downstream (about 1.6 miles) was reclaimed from 1995 through 1997. Barretts Minerals moved most of an existing road that had been located along the entire length of the stream away from the stream channel. Other reclamation included rebuilding the stream channel, banks, and floodplain in several areas, adding pools, and controlling sediment delivery to the stream channel by construction catch basins and re-vegetating the riparian area. We conducted mark-recapture and depletion population estimates in the Left Fork prior to and following this reclamation. We also conducted depletion estimates during the same time periods in a 735 feet-long section within the Middle Fork of Stone Creek to act as a control. In 1994, prior to reclamation, a 1.6 mile portion of the Left Fork below the talc mine supported an estimated 88 westslope cutthroat trout 3.0 inches and longer (SD: 6.2). In 1995, immediately prior to reclamation, a 2,230 foot section above the mouth of the Left Fork supported an estimated 7 westslope cutthroat trout 3.0 inches and longer (SD: 0.4). In 1998, following reclamation, a 3,333 foot section of the Left Fork within the reclaimed area supported an estimated 349 westslope cutthroat trout 3.0 inches and longer (SD: 15.2). This represents approximately a ten-fold increase in the population of westslope cutthroat trout from pre-rehabilitation estimates (Figure 1). The estimated population of westslope

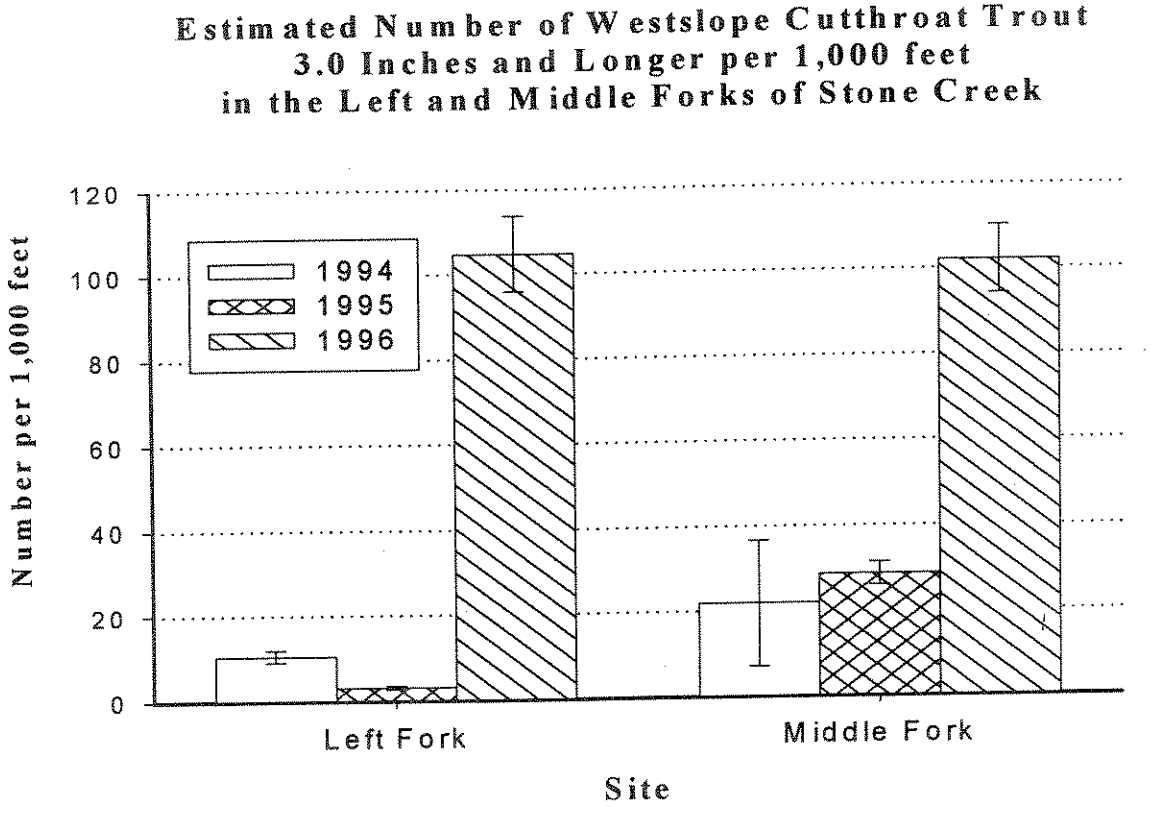

Figure 1. Estimated number of westslope cutthroat trout 3.0 inches and longer (standardized as number per 1,000 feet of stream) in the Left and Middle forks of Stone Creek in 1994, 1995, and 1998. Bars show 95% confidence intervals.

cutthroat trout 3.0 inches and longer in the control section of the Middle Fork was 16 (SD: 5.5) in 1994, 21 (SD: 1.0) in 1995, and 75 (SD: 3.0) in 1998. The 1998 estimate represented a three- to four-fold increase in the control section compared to a ten-fold increase in the treated Left Fork portion. We also captured numerous young-of-the-year fish in 1998 that were not included in estimates. We suspect that westslope cutthroat trout dispersed out of the Left Fork into other portions of the creek following the population expansion in the Left Fork. We made a single electrofishing pass in a 650 feet-long sample section in main Stone Creek immediately below the mouth of the Left Fork in 1994 and only captured two fish. In 1998 we estimated that 184 westslope cutthroat trout 3.0 inches and longer (SD: 7.9) occupied a 1,000 feet-long section of main Stone Creek immediately below the Left Fork. **We concluded that the channel restoration completed in the Left Fork increased the population of westslope cutthroat trout in this stream.**

Big Hole River Drainage

Deep Creek Channel Restoration

WATER NAME: Deep Creek – Big Hole River
DATE PROVIDED BY: Jim Magee, FWP
DETAILED REPORT CITATION: FWP files, Dillon
MFWP CODE: FFI-10-98 [Table 3 reference: 52 (1998W)]

A long meander loop in Deep Creek was cut off by high flows. The project reconnected and re-built the meander loop and was completed by June 1998. In October 1998 single electrofishing passes were conducted in two 1,000 feet-long sample sections in Deep Creek. One was located within the project area (Treatment) and another was located in an untreated section upstream from the project area (Control). Catches of most fish species were similar between the Treatment and Control sections by October, four months after completion of the project (Figure 2). Brook trout and white sucker catches in the Treatment section were still much below that of the Control section in October. Further sampling will be needed to determine the final fish capacity of the Treatment section. **Baseline data has been obtained, but no conclusions can yet be reached on this project.**

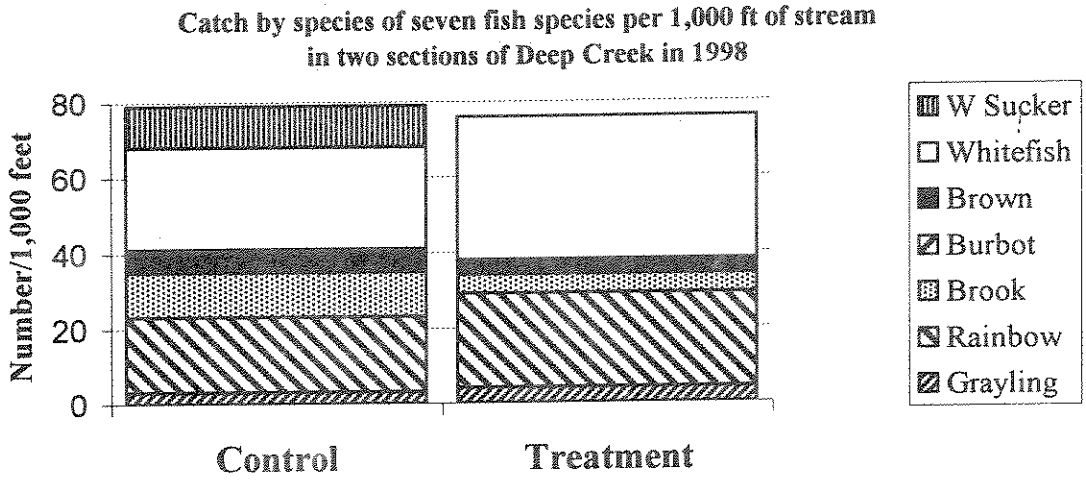

Figure 2. Catch of seven fish species per 1,000 feet of channel in restored (Treatment) and Control (untreated) sections of Deep Creek in October 1998.

Steel Creek Restoration

WATER NAME: Steel Creek – Big Hole River
DATE PROVIDED BY: Jim Magee, FWP
DETAILED REPORT CITATION: FWP files, Dillon
MFWP CODE: FFI-06-96 [Table 3 reference: 6 (1996W)]

A segment of the Steel Creek channel along the Big Hole River was restored in December 1996 by reconstructing some of the channel, stabilizing stream banks, planting willow, and removing an existing fence. Electrofishing surveys have been done in this portion of the Steel Creek channel since the late 1980's. Fall surveys were used to compare pre-treatment and post-treatment relative abundance of Arctic grayling, rainbow trout, brook trout, and burbot between 1996 (pre-treatment) and 1997 (post-treatment). Burbot and brook trout catches increased while catches of rainbow trout and grayling were similar between the two years (Figure 3). In 1998 high flows caused a new channel to form that captured at least 50% of the flow, consequently the treatment area received much less flow and was not sampled in 1998. **It appeared that burbot use of the rehabilitated portion of the stream bank increased, however, the change in channel configuration caused by high flows in 1998 may reduce use of the treated bank by fish.**

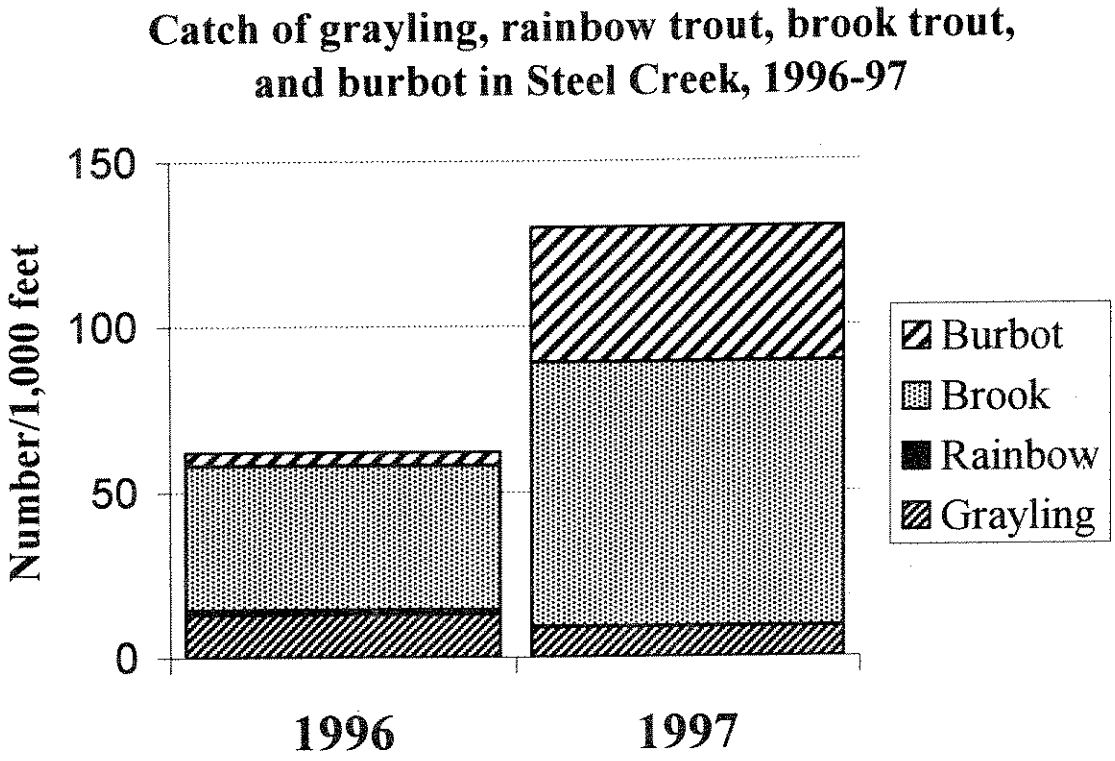

Figure 3. Catch of Arctic grayling, rainbow trout, brook trout, and burbot per 1,000 feet of stream in Steel Creek prior to restoration (1996) and immediately following restoration (1997).

Bitterroot River Drainage

Sweathouse Creek Enhancement and Restoration Phase I and II

WATER NAME: Sweathouse Creek – Bitterroot River
DATE PROVIDED BY: Chris Clancy, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: FFI-11-96 and FFI-24-98 [Table 3 reference: 9 (1996W); 67 (1998W)]

Two channel restoration projects were proposed for Sweathouse Creek. The first was on the Groff property and was completed the second was on the Dayton property and was denied. Mark-recapture electrofishing estimates were made in two 800 feet-long sample sections, one within the Groff and another within the Dayton property, on August 16 and 23, 1996. The Groff section supported an estimated 284 (SD: 63.9) brown trout 3.5 inches and longer and 100 (SD: 22.5) brook trout 4.0 inches and longer. The Dayton section supported an estimated168 (SD: 16.1) brook trout 4.0 inches and longer and 67 (SD: 107.4) westslope cutthroat trout 3.0 to 10.9 inches. These estimates will be repeated to determine the effects of the FFI projects. **Baseline data has been collected, but post-treatment data has not yet been obtained to evaluate the completed project.**

Bear Creek Channel Reconstruction

WATER NAME: Bear Creek – Blackfoot River
DATE PROVIDED BY: Ron Pierce, FWP
DETAILED REPORT CITATION: Pierce et al. (in prep.)
MFWP CODE: FFI-18-98 [Table 3 reference: 70 (1998W)]

In 1998 FFI funds helped reconstruct 1,870 feet of channel and restore habitat in an additional 2,000 feet of Bear Creek that had been degraded from channelization and improper logging and grazing practices in the riparian area. In 1998, post-project habitat evaluations and pre-project fish population monitoring was completed for the Bear Creek Channel Reconstruction Project. Post-project habitat data will be used to document persistence of constructed habitats through time by repeating these habitat surveys over time. Two fish population survey sections were sampled to provide baseline data prior to constructing the habitat project in lower Bear Creek. Depletion estimates conducted in these section prior to project construction found that rainbow trout predominated with relatively high numbers of rainbow trout over 4.0 inches estimated (Table 1). These estimates will be used to compare future fishery response for the project area. **No conclusions can yet be made for this project.**

Table 1. Estimated fish populations for two locations in Bear Creek in 1998 prior to re-construction of 1,870 feet of channel and improving habitats in another 2,000 feet of channel. Sample site at Mile 1.1 is within the re-constructed portion of the channel. Sample site at Mile 1.5 is within a riparian fence that excludes livestock and has had some habitat improvement done in the area.

Location Date	Section length (ft)	Species	Size class	Catch by pass Pass 1	Catch by pass Pass 2	Probability of capture	Estimated number per 1,000 feet (95% C.I.)
Mile 1.1 7/31/98	310	Rainbow	<4.0	8	0	1.00	26 ± 0
			>4.0	23	8	0.65	114 ± 29
		Brown	<4.0	4	2	0.50	26 ± 31
			>4.0	2	0	1.00	6 ± 0
		Brook	>4.0	3	0	1.00	10 ± 0
Mile 1.5 7/31/98	300	Rainbow	<4.0	6	1	0.83	22 ± 4
			>4.0	18	1	0.63	58 ± 2
		Brown	>4.0	2	0	1.00	6 ± 0
		Brook	<4.0	4	1	0.75	16 ± 6
			>4.0	16	1	0.94	52 ± 2

Blanchard Creek Fish Passage, Riparian Fencing, and Feedlot Removal

WATER NAME: Blanchard Creek –Clearwater River
DATE PROVIDED BY: Ron Pierce, FWP
DETAILED REPORT CITATION: Pierce et al. (1997) and Pierce et al. (in prep.)
MFWP CODE: RRA-45-94, FFI-48-96, and FFI-52-96 [Table 3 reference: 38 (1996S); 42 (1996S)]

Blanchard Creek, a small tributary to the Clearwater River, was historically de-watered for about a mile above its mouth by irrigation water withdrawals. Fish passage over two irrigation diversions and the crossing under Highway 200 was very poor and probably negatively impacted the fishery in the lower reaches of the tributary. A water lease has been in effect since 1993; however, the water right holder began passing more flow down the lower stream channel in 1991. Two diversion structures were modified in 1993 by adding fish ladders. The culvert under Highway 200 was also modified by the Montana DOT to facilitate fish passage. In addition, Plum Creek Timber Company and the DNRC improved management of livestock grazing within riparian areas. Blanchard Creek supports both rainbow trout, primarily in its lower reaches, and cutthroat trout, primarily in its upper reaches. Fish populations in lower Blanchard Creek in the area of the diversions and water lease (stream mile 0.1) have been monitored from 1990 to 1998. Brown and westslope cutthroat trout began inhabiting this sample section in 1992, following increases in flows through this section. Although their densities appeared to be highly variable between years, densities of young (< 4.0 inches) rainbow trout increased with increases in stream flows after 1991 with the highest estimated densities occurring during 1998 (Figure 4). Rainbow trout over 4.0 inches in length initially increased to densities over 200 per 1,000 feet, then declined slightly and stabilized at densities between 100-200 per 1,000 feet. **It appears that young rainbow trout have become more abundant in the treatment area following treatment.**

Chamberlain Creek Fish Passage and Irrigation Diversion

WATER NAME: Chamberlain Creek – Blackfoot River
DATE PROVIDED BY: Ron Pierce, FWP
DETAILED REPORT CITATION: Pierce et al. (1997), Pierce et al. (in prep.), and Schmetterling (in prep.)
MFWP CODE: FFI-09-97 [Table 3 reference: 8 (1997W)]

The upper reaches of Chamberlain Creek support relatively high densities of cutthroat trout. However, aquatic habitat in the lower portion of Chamberlain Creek (below Stream Mile 3.0) has been severely altered by channelization, de-watering, and poor management practices, including livestock grazing in riparian areas and increased sediment delivery to the stream channel related to road drainage problems. Consequently, densities of westslope cutthroat trout in this portion of Chamberlain Creek were severely depressed. Fish passage between Chamberlain Creek and the Blackfoot River was also inhibited by irrigation diversions. Since 1990, Chamberlain Creek has been the focus of a comprehensive fishery restoration effort. Road drainage problems have been fixed. Livestock management has been improved, especially around riparian areas. Water flows have been improved through leasing agreements. Irrigation diversions have been upgraded by consolidating several ditches and installing a fish ladder on the diversion that delivers water to these ditches. Chamberlain Creek supports a significant migration of Blackfoot River fluvial cutthroat trout with reproduction occurring in mid to upper stream reaches.

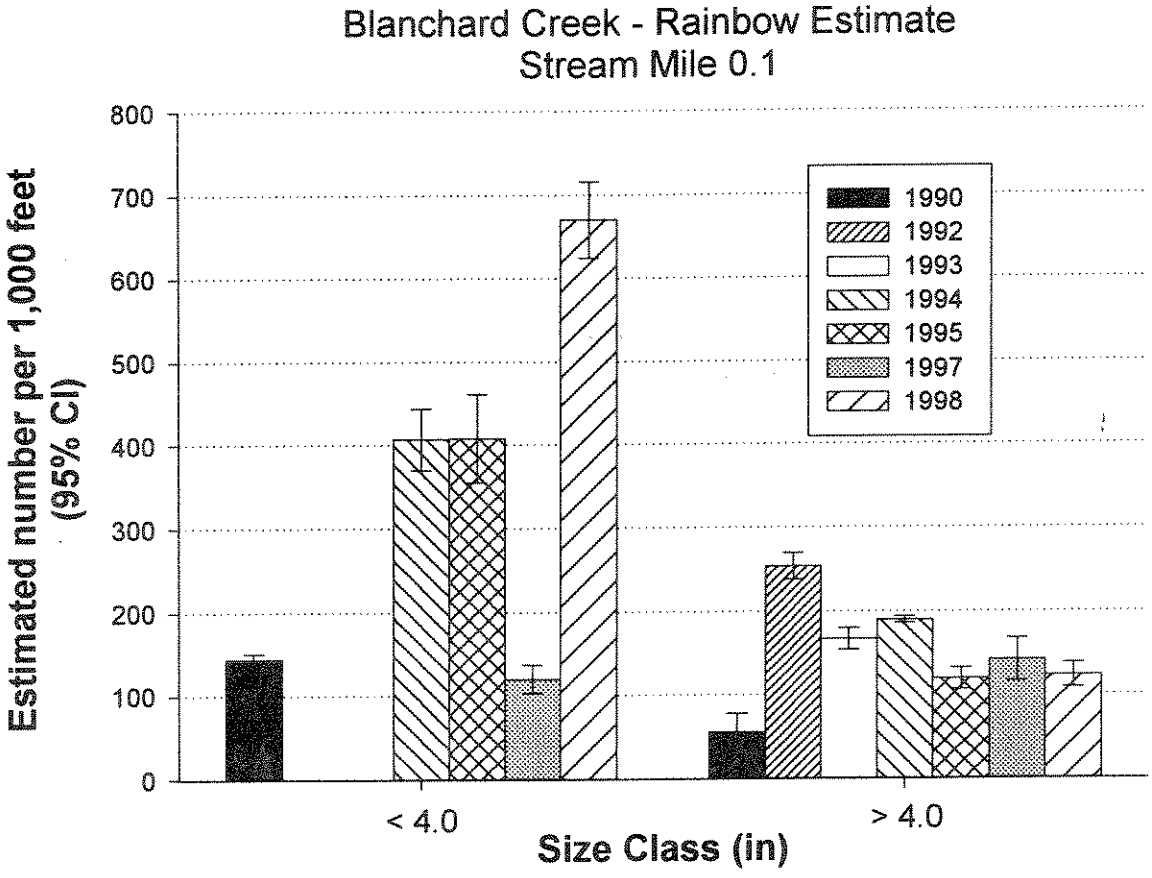

Figure 4. Estimated population of rainbow trout < 4.0 inches and 4.0 inches and longer at Stream Mile 0.1 in Blanchard Creek from 1990 to 1998 standardized to estimated number per 1,000 feet of stream length. Vertical bars represent 95% confidence intervals (95% CI).

In 1997 and 1998, fish populations were re-surveyed in four sample sections originally surveyed in 1989. A comparison of electrofishing catches between 1989 and 1998 indicated a substantial increase in catch of fish in the project area following the restoration activities (Figure 5). Four juvenile bull trout were captured in the lower 4.0 miles of Chamberlain Creek in 1997 and 1998 surveys. These were the first bull trout recorded in Chamberlain Creek in 18 years of sampling. In a radio telemetry study where spawning westslope cutthroat trout were tagged in the Blackfoot River during 1997 and 1998 and tracked, more radio tagged cutthroat trout moved into Chamberlain Creek to spawn than any other Blackfoot River tributary. A few adult westslope cutthroat trout moved more than 30 miles to spawn in Chamberlain Creek. We found 68 westslope cutthroat redds (spawning sites) in a two mile section of Chamberlain Creek during a 1998 redd survey. Several spawning adult cutthroat trout were located in pools created during restoration efforts. These adults apparently used these pools as holding sites prior to spawning.

One tagged fish spawned in the bottom end (tail-out) of one of these constructed pools. **Preliminary results suggest that rehabilitation work has led to increased spawning use of Chamberlain Creek by adult westslope cutthroat trout from the Blackfoot River; increased catches of rearing westslope cutthroat trout in the lower creek; and may have improved conditions in the lower creek so that bull trout can once again use this stream for rearing, and perhaps spawning.**

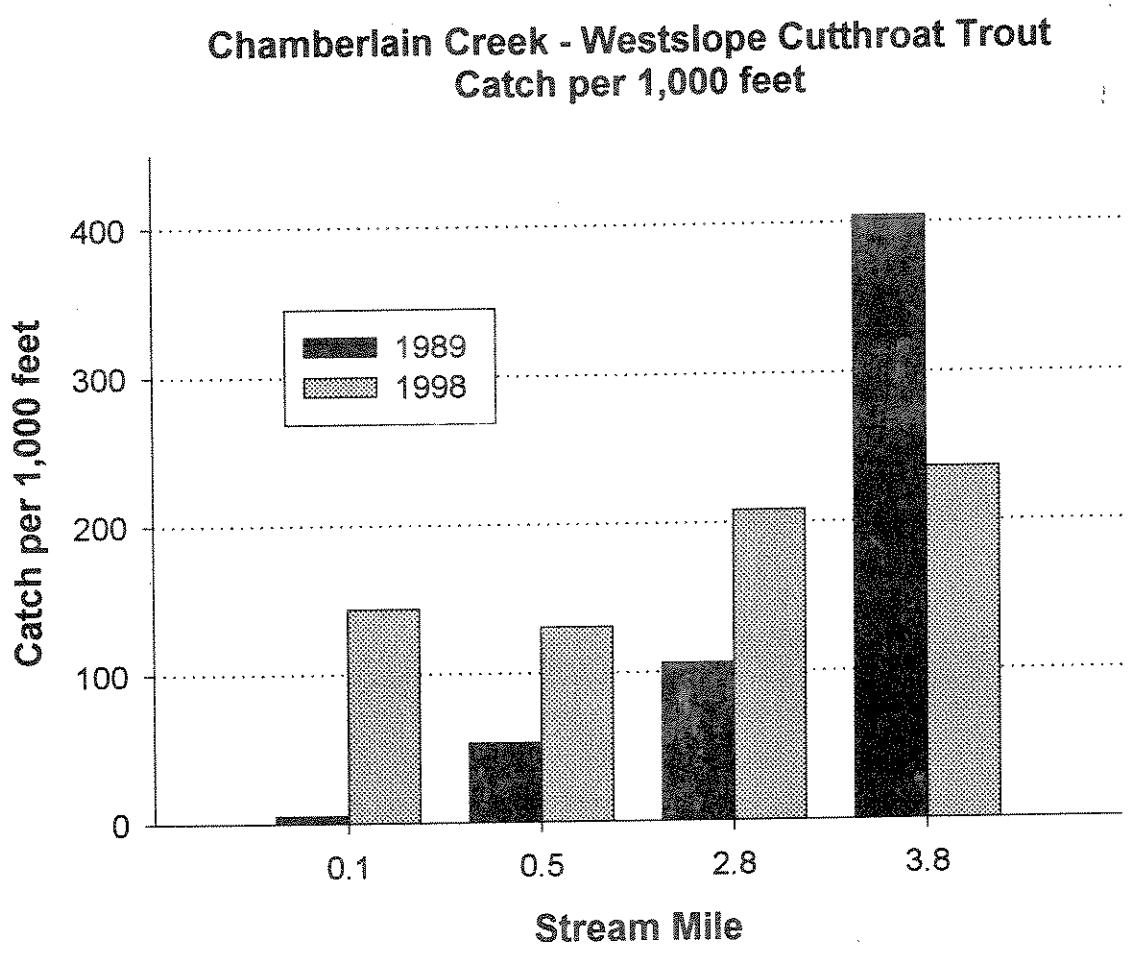

Figure 5. Catch of westslope cutthroat trout 4.0 inches and longer in four sections of Chamberlain Creek in 1989 (pre-treatment) and 1998 (post-treatment) standardized to the number per 1,000 feet of stream length.

Cottonwood Creek Fish Friendly Diversion, Dryer Diversion Lining-Cottonwood Creek, and Cottonwood Creek Fish Screen Improvement

WATER NAME: Cottonwood Creek – Blackfoot River
DATE PROVIDED BY: Ron Pierce, FWP
DETAILED REPORT CITATION: Pierce et al. (1997) and Pierce et al. (in prep.)
MFWP CODE: RRA-56-94, FFI-07-96, and FFI-44-96 [Table 3 reference: 7 (1996W); 34 (1996S)]

To help conserve native aquatic species in Cottonwood Creek several projects were undertaken. Fish ladders were installed on two major diversions, and two irrigation canal intakes were screened. A total 8,000 feet of irrigation canal was lined with an impermeable fabric to prevent water loss. An estimated 8,663 acre-feet of water salvaged by lining the ditch was annually leased for instream flow purposes. Associated with these projects were efforts to improve riparian livestock management and negotiate conservation easements in the middle reaches of Cottonwood Creek. Stream flow is being monitored as part of the lease effort, but is not reported here. Fish populations are now being monitored below the Dryer Diversion, a reach of Cottonwood Creek that historically was completely de-watered during the late irrigation season (July-October) prior to the water lease. Bull trout, westslope cutthroat trout, and brook trout were all captured during both 1997 and 1998 in the previously de-watered portion of Cottonwood Creek. Sculpin and tailed frogs were also found in this sample section during 1997. The estimated number of westslope cutthroat trout 4.0 inches and longer per 1,000 feet of stream increased dramatically from 29 (95% CI: 11) in 1997 to 68 (95% CI: 49) in 1998, although this increase was not statistically significant due to sampling problems. **The previously de-watered portion of Cottonwood Creek now supports bull, brook, and westslope cutthroat trout along with sculpins and tailed frogs. Abundance of westslope cutthroat trout in this portion of the creek appears to be increasing.**

Dunham Creek Fish Screen Project
WATER NAME: Dunham Creek (Monture Creek tributary) – Blackfoot River
DATE PROVIDED BY: Ron Pierce, FWP
DETAILED REPORT CITATION: Pierce et al. (1997), Schmetterling (in prep.), and Pierce et al. (in prep.)
MFWP CODE: FFI-02-96 [Table 3 reference: 2 (1996W)]

Dunham Creek, the largest tributary to Monture Creek, is an important but impaired spawning stream for Blackfoot River fluvial cutthroat trout and bull trout. Poor forest practices have resulted in approximately 1 mile of unstable channel. In addition, an unscreened irrigation canal, located below the spawning area, diverts the majority of the stream's flow during the latter half of the irrigation season. During 1995, the loss of westslope cutthroat, juvenile bull trout, and a spawned, radio-tagged bull trout into this canal were documented. In 1996, the canal was fitted with a 19 cfs. Mackay style self-cleaning fish screen. The screen is designed to prevent losses of all fish to the canal. In August 1996, prior to screen installation, a fish population sample section was established 0.1 mile (stream mile 2.3) upstream of the canal. From 1996 to 1998, cutthroat trout (fish >4.0 inches) increased from 20.3 (95% CI: 3.0) to 109 (95% CI: 100) per 1,000 feet. Bull trout (>4.0 inches) populations increased from 13 (95% CI: 5) per 1,000 feet in 1996 to 122 (95% CI: 52) per 1,000 feet in 1998. A radio-tagged fluvial adult westslope cutthroat trout migrated from the middle portion of the Blackfoot River into Dunham Creek in 1997. This fish

spent approximately two weeks in this stream and spawned approximately one mile upstream of the screened diversion before returning to the Blackfoot River. **Preliminary data suggests that the fish screen was effective in increasing numbers of juvenile westslope cutthroat and bull trout above the diversion; however, the true results will not be known until these juveniles return as adults to spawn. Preliminary sampling suggests very few fish are lost to this ditch during their downstream migration and adult fish are able to migrate above this diversion.**

Gold Creek Pool Development

WATER NAME: Gold Creek – Blackfoot River
DATE PROVIDED BY: Ron Pierce, FWP
DETAILED REPORT CITATION: Pierce et al. (1997), Schmetterling and Pierce (in review), and Pierce et al. (in prep.)
MFWP CODE: FFI-04-96 [Table 3 reference: 4 (1996W)]

Timber harvest of riparian conifers and the removal of large instream wood had reduced the diversity of stream habitat in the lower three miles of Gold Creek. Pool habitats comprised less than 1% of the stream's area in this segment of Gold Creek. In 1996, a habitat restoration project that focused on the placement of large woody debris was completed. Three types of monitoring have been undertaken regarding the Gold Creek Project: 1) monitoring of the habitat structures, 2) electrofishing, and 3) radio tracking of fluvial cutthroat trout and bull trout. Eight months after the project was completed, June 1997, an estimated 50-year flood event passed through the project area. This event provided an opportunity to evaluate the success and failure of specific restoration techniques by geomorphic channel type following a major flood event. Of the original 66 constructed structures 55 (85%) remained intact and stable following the flood event. Laterally confined reaches retained more pools than laterally extended reaches (Table 2).

Table 2. Percent retention of four types of habitat structures after an estimated 50-year flood event in Gold Creek by channel confinement.

Type of structure	Channel Type	% Retention
Debris Collector	Laterally confined	100
Log Plunge	Laterally confined	96
	Laterally extended	50
Lateral Scour	Laterally confined	83
	Laterally extended	75
Rock/Wood	Laterally confined	92
	Laterally extended	40

In 1996, control and treatment fish population surveys were established prior to the restoration project. A 569-feet-long section was electrofished in 1996 above the project area to serve as a control. In both 1996 (pre-treatment) and 1998 (post-treatment) a 400 feet-long section was electrofished within the project area. The relative catch of age 1 and older and young-of-the-year fish for each species was graphed (Figure 6). It appears that the treatment has increased

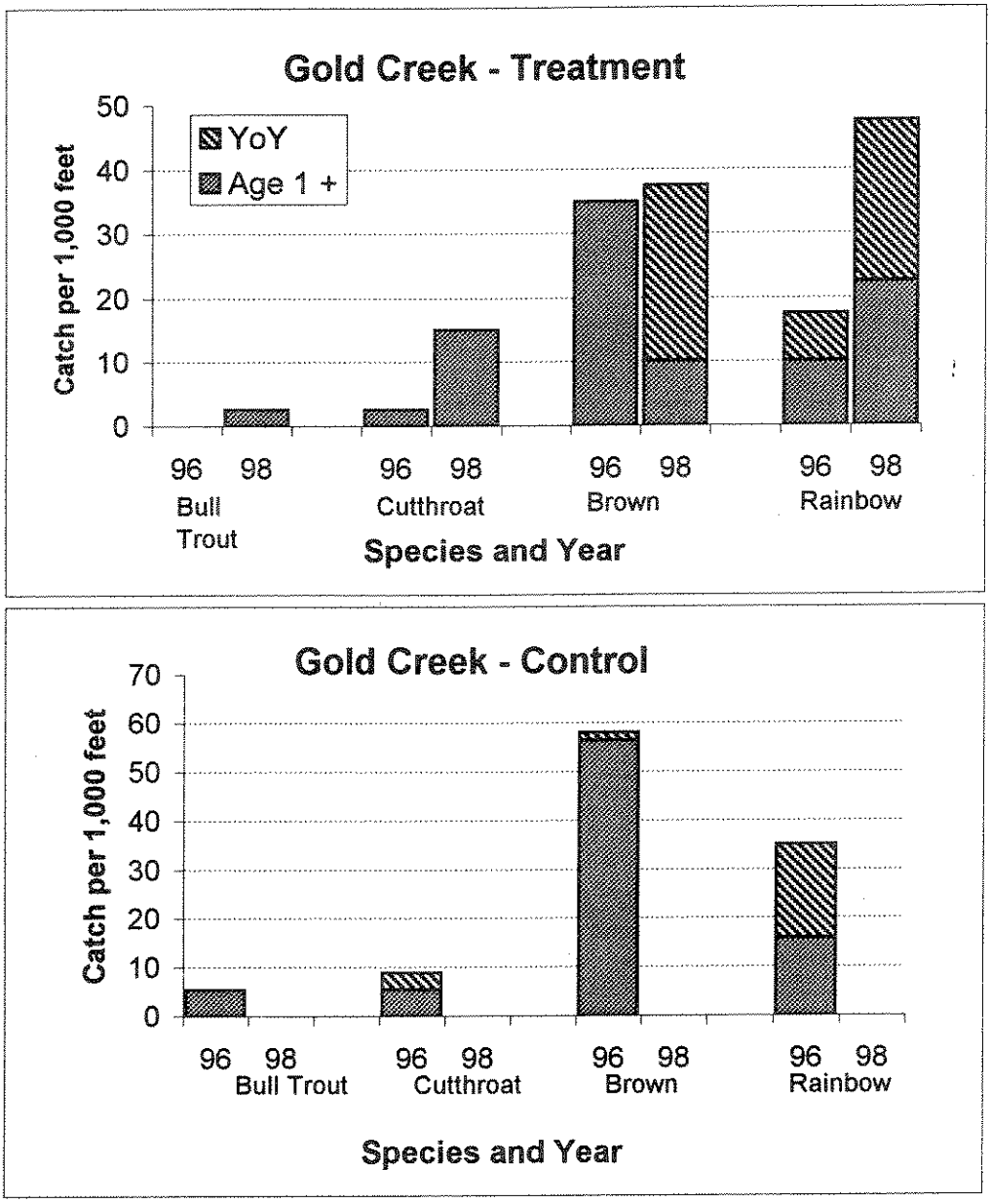

Figure 6. Relative abundance (Catch per 1,000 feet) of bull, westslope cutthroat, brown, and rainbow trout in treatment (top) and control (bottom) sections of Gold Creek in 1996 (pre-treatment) and 1998 (post-treatment).

abundance of all trout species in the treatment area. We will continue to monitor both treatment and control sections to verify that increased abundance is related to the treatment.

An adult bull trout implanted with a radio transmitter in the Blackfoot River used the project area portion of Gold Creek as a thermal refuge during the summers of 1997 and 1998. This bull trout moved out of Gold Creek and back into the Blackfoot River as water temperatures in the Blackfoot River declined during the early fall periods of both 1997 and 1998. In 1998, 5 adult cutthroat trout implanted with radio transmitters in the Blackfoot River moved into Gold Creek to spawn. Most of these fish spawned approximately 7 miles up from Gold Creek's mouth and used the complex pool habitats created in the project area for resting and holding habitat prior to spawning. **Preliminary data suggest that habitat structures in confined channel types remain in place following flood events better than structures placed in laterally extended types of channels and treated areas in lower Gold Creek support more fish following treatment than prior to treatment. Adult bull and westslope cutthroat trout from the Blackfoot River are using Gold Creek seasonally as a thermal refuge and for spawning.**

Kleinschmidt Creek Channel Restoration, Phase II

WATER NAME: Kleinschmidt Creek – Blackfoot River
DATE PROVIDED BY: Ron Pierce, FWP
DETAILED REPORT CITATION: Pierce (1991); Pierce et al. (1997); and Pierce et al. (in prep.)
MFWP CODE: FFI-14-98 [Table 3 reference: 56 (1998W)]

Kleinschmidt Creek, a spring creek to the North Fork Blackfoot River, has been severely degraded by channel straightening and improper livestock grazing. Whirling disease is present in this stream. Approximately 2,500 feet of channel have been restored through a previous channel restoration project. Phase II (pending conservation easements) will restore the remaining 5,300 feet of channel. Four types of project monitoring will be included in this project: 1) pre- and post project habitat surveys, 2) fishery response to habitat restoration, and 3) temperature studies, and 4) pre- and post-project whirling disease evaluations (sentinel fish cage studies plus macroinvertebrate including *Tubifex tubifex* sampling). We will only report on the initial results of the fish population monitoring here. Fish population surveys were undertaken in 1998 at two locations (stream mile 0.5 and 0.8). The downstream survey was located in a degraded section of channel. The upstream survey was completed in a section of channel restored in 1997. These population estimates found that there was very little difference between the two sites with about 130 brown trout under 4 inches per 1,000 feet of stream and about 30 brown trout 4 inches and longer per 1,000 feet of stream in both sections. **Preliminary data has not indicated that fish populations in the upper portion of Kleinschmidt Creek have increased in response to a channel restoration treatment compared to the lower untreated section.**

Monture Creek Stream Restoration
WATER NAME: Monture Creek – Blackfoot River
DATE PROVIDED BY: Ron Pierce, FWP
DETAILED REPORT CITATION: Pierce et al. (1997) and Pierce et al. (in prep.)
MFWP CODE: FFI-12-97 [Table 3 reference: 11 (1997W)]

Monture Creek, a large tributary to the middle Blackfoot River, is an important spawning stream used by fluvial bull and cutthroat trout inhabiting the lower Blackfoot River. From 1991 to 1998, improvements have been made in riparian livestock management along 9.3 miles (about 80%) of the mainstem of Monture Creek. In 1997 a cooperative stream restoration project placed large woody debris in two sections of stream, totaling 17,606 feet of channel. Three types of information were collected to monitor these projects: 1) woody debris frequency; 2) bull trout redd counts; and 3) estimating abundance of juvenile bull trout in five long-term sample sites. Woody debris frequency surveys were done in a 6,856-feet-long treated and 5,284-feet-long control section below Highway 200 and in a 10,750-feet-long treated and 3,784-feet-long control section above Highway 200. Woody debris frequencies were highest in the two treated segments and it appears that added debris has not led to the loss of any natural debris in the treated channel segments (Figure 7).

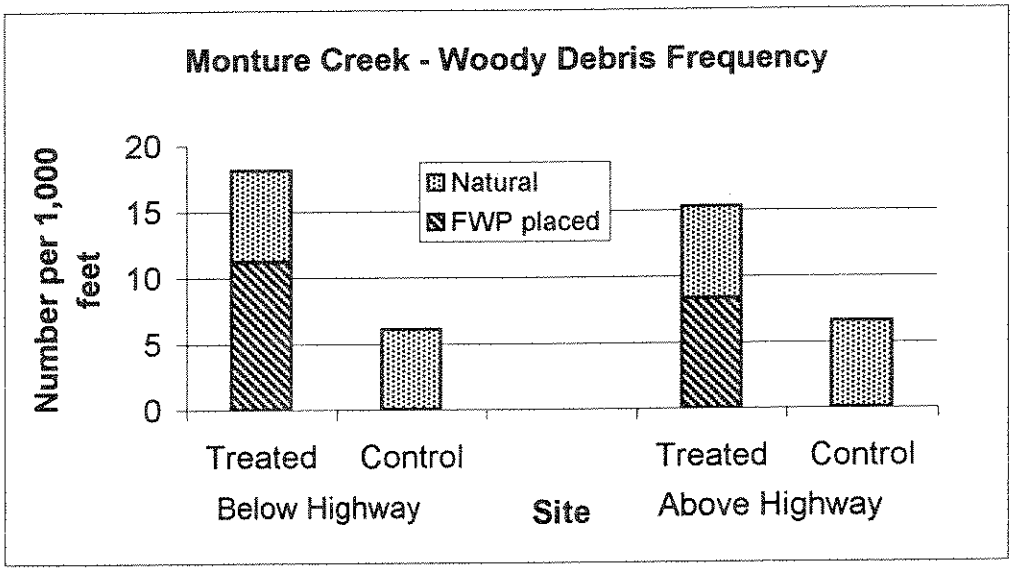

Figure 7. Frequency of natural and FWP placed woody debris in treated and control segments of Monture Creek above and below Highway 200 following debris placement in 1997.

Both redd (spawning site) counts and sampling of juvenile bull trout has shown that bull trout are responding to habitat restoration measures in Monture Creek. Numbers of bull trout redds have been steadily increasing from 1989 to 1997 and then have leveled off (Figure 8).

The relative abundance of juvenile bull trout has also increased dramatically from 1994 to 1998 throughout Monture Creek with the average catch per 1,000 feet increasing from 15.2 to 51.4 juveniles (Figure 9). The lower four sampling locations (Stream miles 0.4, 2.2, 5.4, and 8.6) are within areas of the channel where habitat restoration activities have been done. While it appears that the upper portion of the drainage is still the primary spawning and rearing area for bull trout, the lower area is now receiving some use and, hopefully, this use will increase. **Preliminary data suggest that bull trout use of Monture Creek is increasing. While the exact cause of this increase is not yet proven, the restoration of the lower creek has probably contributed to this increase.**

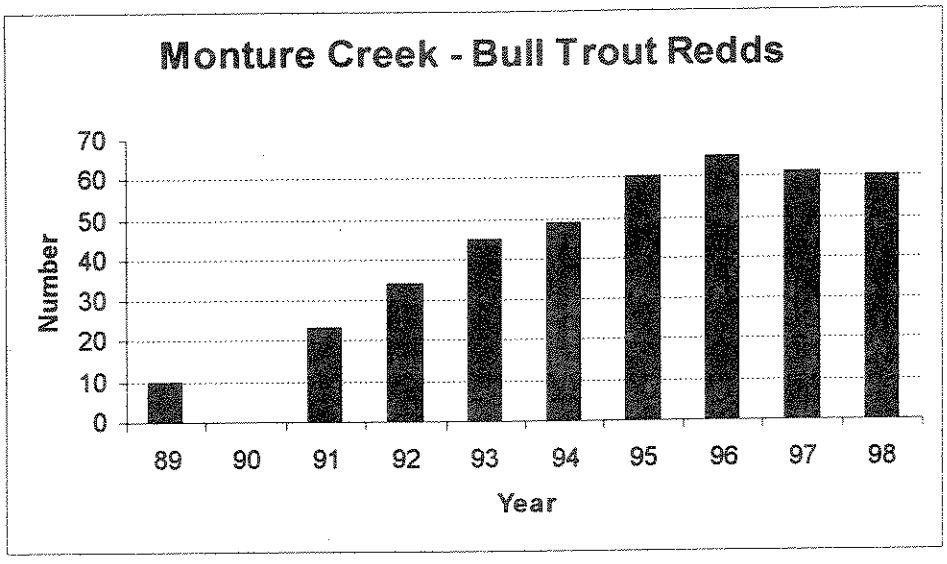

Figure 8. Counts of bull trout redds (spawning sites) in Monture Creek from 1989 to 1998.

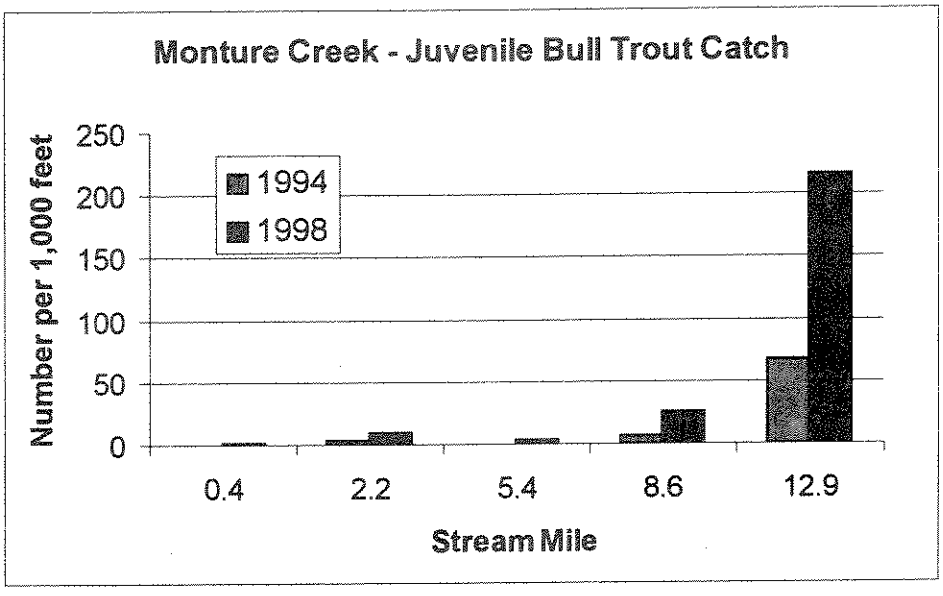

Figure 9. Relative abundance (catch per 1,000 feet) of juvenile bull trout in five sections of Monture Creek in 1994 (pre-treatment of added woody debris) and 1998 (post-treatment).

North Fork Blackfoot Fish Screen and Bank Restoration
WATER NAME: North Fork Blackfoot River – Blackfoot River
DATE PROVIDED BY: Ron Pierce, FWP

DETAILED REPORT CITATION: Pierce et al. (1997) and Pierce et al. (in prep.)
MFWP CODE: RRA-68-95, FFI-45-96, FFI-11-97 and FFI-18c-98 [Table 3 reference: 35 (1996S); 10 (1997W); 61 (1998W); 62 (1998W)]

The North Fork Blackfoot River is one of the most important spawning tributaries used by fluvial bull trout in the Blackfoot River Basin. Restoration efforts in this tributary have primarily been done in cooperation with irrigators to eliminate fish lost to irrigation canals. Fish screening devices have been installed on the five canals located between River Mile 8.0 and 15.3. Livestock management has also been improved along eight miles of the North Fork's riparian corridor. Conservation easements are currently in place along four miles of riparian corridor. In addition, 950 feet of unstable channel have been stabilized with native materials using the Rosgen (1996) techniques. Three levels of fish sampling have been undertaken on the North Fork Blackfoot River: 1) bull trout spawning surveys (redd counts); 2) pre-and post-project relative abundance of juvenile bull trout along channel shorelines; and 3) mark-recapture population estimates in the lower reach of the North Fork (from River Mile 2.1 to 5.9). In 1998, fishery surveys were also completed in four of the five irrigation canals below the fish screens. In general, monitoring has shown increased numbers of bull trout. The number of bull trout redds (spawning sites) have steadily increased since 1989 (Figure 10). Abundance of juvenile bull trout along shorelines has increased dramatically in the upper portion (Stream Mile 11.5 and 17.2) of the North Fork, but has not increased in the lower portion (Stream Mile 2.6 and 7.9; Figure 11). Estimated populations of both bull and westslope cutthroat trout appeared to increase slightly in the mid-1990's, but not significantly (Figure 12). No fish were collected in any of the sampling done during 1998 in irrigation ditches below the fish screens. **Preliminary data suggest ditch screening and habitat improvement measures made in the North Fork of the Blackfoot River are beginning to have a positive affect on numbers of bull trout.**

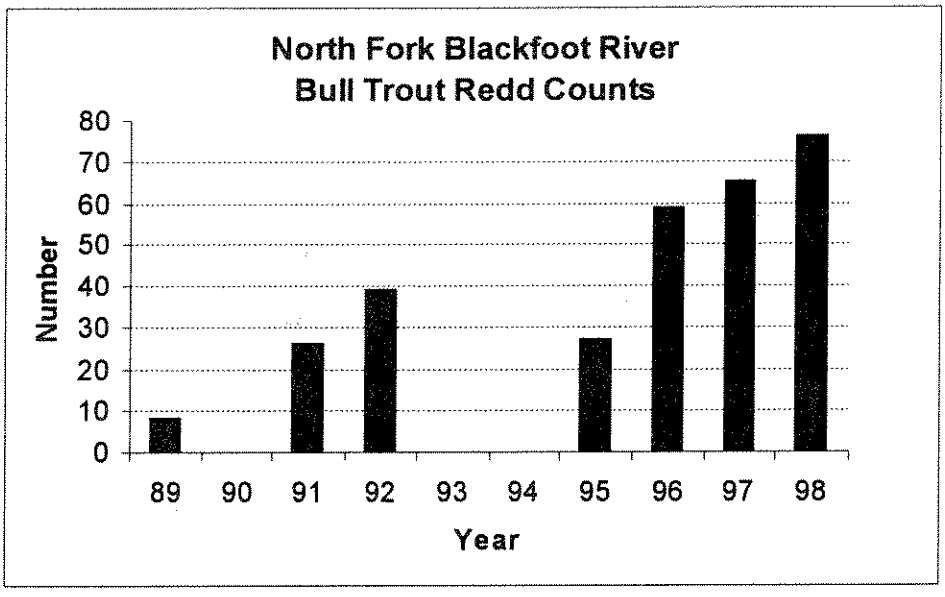

Figure 10. Numbers of bull trout redds counted in the North Fork of the Blackfoot River from 1989 to 1998. Counts were not made in 1990, 1993, or 1994.

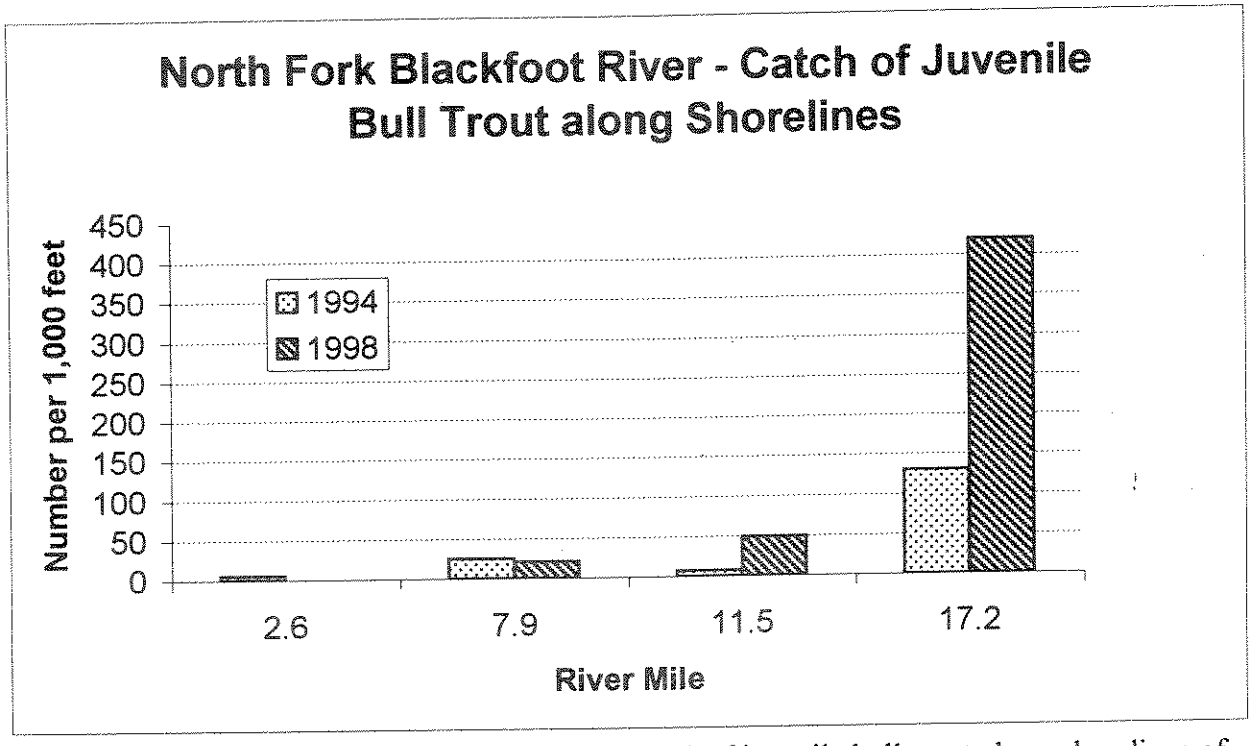

Figure 11. Relative abundance (catch per 1,000 feet) of juvenile bull trout along shorelines of the North Fork Blackfoot River in four locations in 1994 and 1998.

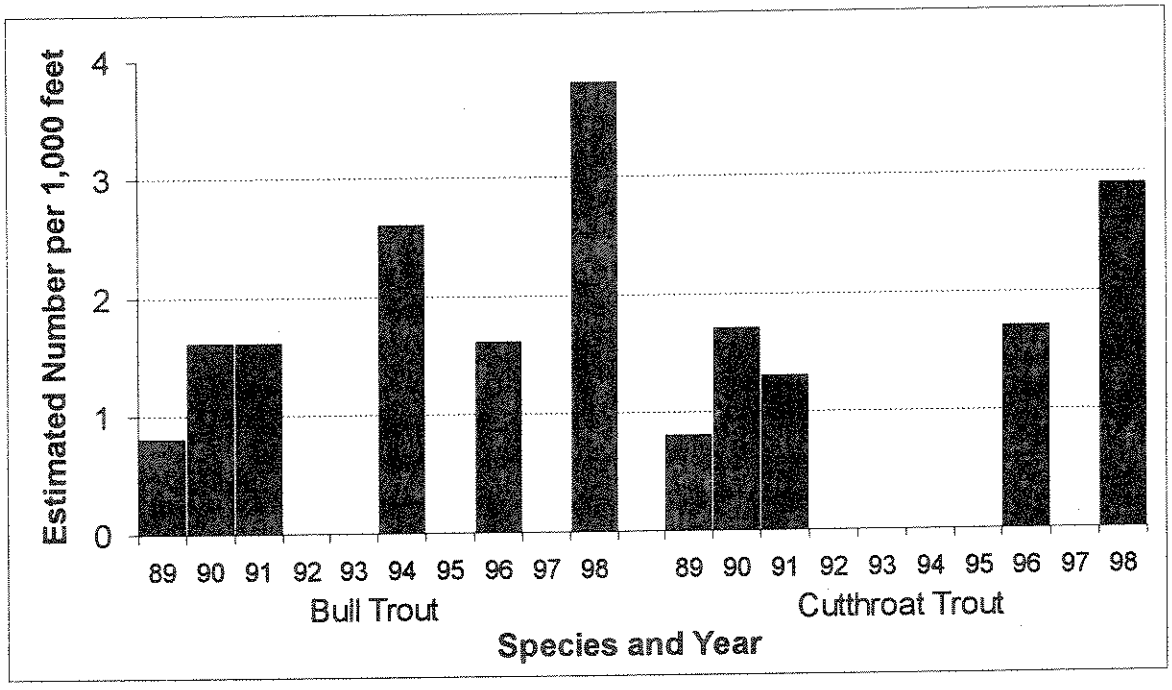

Figure 12. Estimated number of bull and westslope cutthroat trout 12 inches and longer in the North Fork of the Blackfoot River (River Mile 2.1 to 5.9) from 1989 to 1998.

O'Brien Creek Restoration Phase I and II

WATER NAME: O'Brien Creek – Bitterroot River
DATE PROVIDED BY: Ron Pierce, FWP
DETAILED REPORT CITATION: Pierce et al. (1997) and Pierce et al. (in prep.)
MFWP CODE: FFI-03-96 and FFI-10-97 [Table 3 reference: 3 (1996W); 9 (1997W)]

O'Brien Creek is a small tributary to the lower Bitterroot River located west of the Missoula City limits. In 1998, the lower 1,404 feet of O'Brien Creek was restored to a riffle/pool, step/pool system (B4 channel type; Rosgen 1996), by utilizing native materials such as rock and wood. A bridge replaced existing under-sized culverts at Blue Mountain Road. Beneath this bridge seven Rosgen vortex rock weirs were installed to control stream gradient, provide fish habitat, and allow fish passage under all flow conditions. In 1996 two fish population-monitoring sections were established in O'Brien Creek. One section is located within the project area (Treatment) of lower O'Brien Creek (mile 0.3), while the other is a control section located within Forest Service lands (mile 6.0). Baseline data indicated that these two sections supported very different fish communities and the lower section supported no fish over 6.0 inches in length (Table 3). **Baseline data has been collected to evaluate the response of fish populations to restoration projects in O'Brien Creek; however, no conclusions can be reached at this time.**

Table 3. Estimated numbers of fish at two locations in O'Brien Creek during 1998.

Location	Species	Size Class	Density/1000 feet (95% CI)
Treatment	Rainbow	<6.0 inches	128 ± 25
Treatment	Brown	<6.0 inches	56 ± 36
Control	Cutthroat	<6.0 inches	203 ± 64
		>6.0 inches	39 ± 7
Control	Brook	<6.0 inches	104 ± 52
		>6.0 inches	23 ± 4

Rock Creek Restoration, Dry Creek Restoration, and Rock Creek Restoration, Burmit Project

WATER NAME: Rock Creek – Blackfoot River
DATE PROVIDED BY: Ron Pierce, FWP
DETAILED REPORT CITATION: Peters (1990), Pierce (1991), Pierce et al. (1997), Pierce et al. (in prep.), and Koopal (1998)
MFWP CODE: FFI-05-96, FFI-33-96, and FFI-18-98 [Table 3 reference: 5 (1996W); 26 (1996W); 78 (1998S)]

Rock Creek, an 8.2 mile tributary to the lower North Fork of the Blackfoot River, has been the focus of extensive restoration efforts, with projects completed or currently pending on 5.5 miles of stream. Recent fish habitat and fish population surveys included: 1) 1998 habitat surveys, 2) 1998 temperature monitoring, and 3) 1998 fish population monitoring at two locations. Habitat

surveys were completed on approximately 18,000 feet of restored stream channel and an additional 6,200 feet of "unrestored" channel. Both the frequency of woody debris and proportion of habitat in pool were higher in restored areas (Treatment) than in "unrestored" (Control) segments (Table 4). The estimated number of brown trout per 1,000 feet of stream were much higher in the sample section at Stream Mile 0.7, which was within the area that had been restored in 1996, than in the section at Mile 1.7, where no restoration has yet occurred (Figure 13). **Preliminary data suggest that habitat restoration in Rock Creek has increased woody debris frequencies, increased the proportion of habitat in pool types, and may be increasing fish abundance.**

Table 4. Survey of frequency of woody debris (active and inactive) and percentage of pool area for two restored and two control segments of Rock Creek, 1998. Reach 1 was within the original Rock Creek Restoration project area. Reach 2 will be restored by the Rock Creek Restoration – Burmit Project. Reach 4 represents the post-project condition for the Dry Creek Restoration project.

Section	Length (ft)	Status	Location (mile)	Woody Debris (# stems/1000 feet) Placed	Pre-existing	Total	Pool Area (%)
Reach 1	6,428	Restored	0.0-1.2				
Pre-Project						14.7	20%
Post-Project				19.3		34.0	35%
Reach 2	2,507	Unrestored	1.3-1.9	-	0	0	5%
Reach 3	6,804	Unrestored	3.9-5.1	-	0	0	13%
Reach 4	11,366	Restored	5.1-8.2	16.3	4.3	20.6	33%

Boulder River Drainage

Muskrat Creek Migration Barrier

WATER NAME: Muskrat Creek – Boulder River
DATE PROVIDED BY: Brad Shepard and Ron Spoon, FWP
DETAILED REPORT CITATION: Shepard and Spoon (in prep.)
MFWP CODE: FFI-56-97 [Table 3 reference: 44 (1997S)]

Muskrat Creek supports a genetically pure population of westslope cutthroat trout. FWP, in cooperation with USDI Bureau of Land Management and the USDA Forest Service, have been recovering the existing population of westslope cutthroat trout in Muskrat Creek. The FFI project involved the construction of a permanent barrier to upstream fish movement near the Forest Service boundary. Captured westslope cutthroat trout inhabiting the lower portion of Muskrat Creek (from the Forest boundary up to a natural barrier to upstream fish movement located on BLM administered land) were transported above this natural barrier. We anticipate that these translocated fish will start a healthy population in the absence of competition and

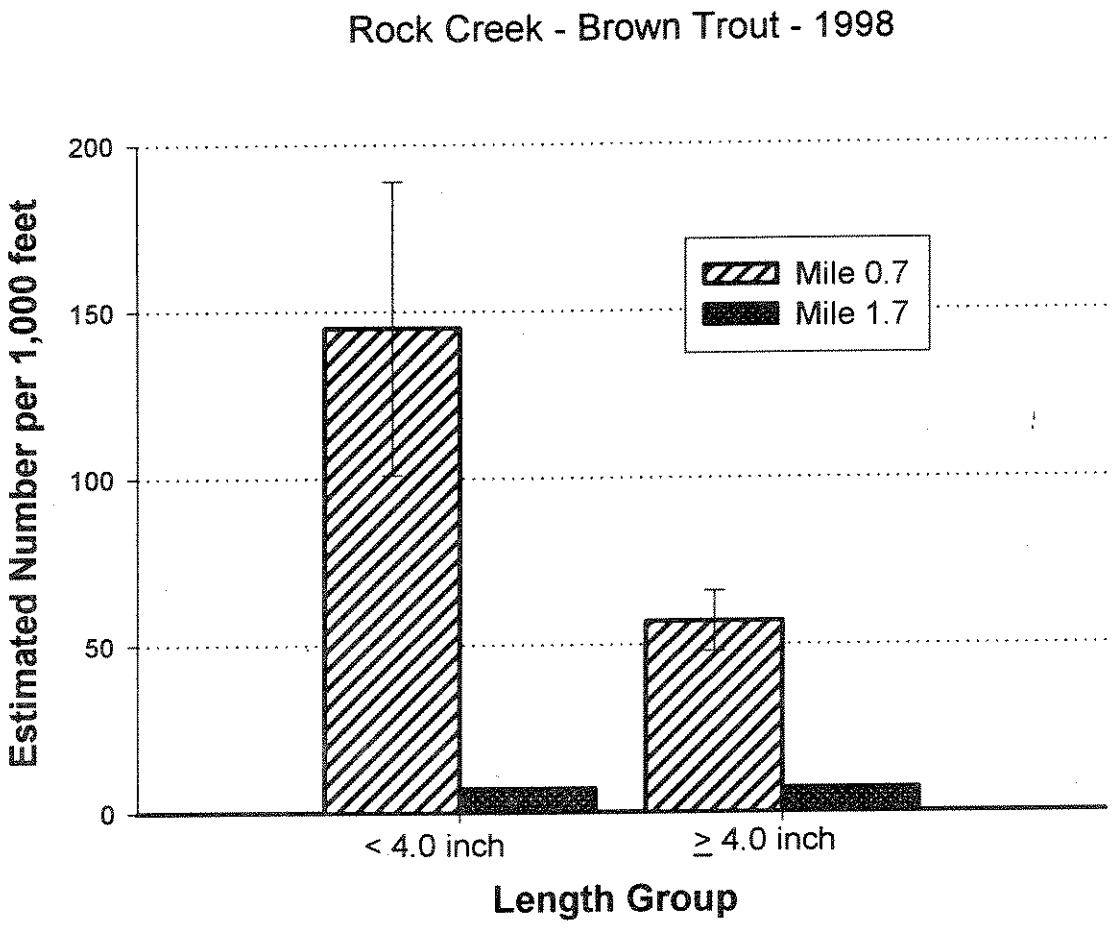

Figure 13. Estimated numbers (95% confidence intervals; vertical lines) of brown trout less than 4.0 inches long and 4.0 inches and longer in two sample sections in Rock Creek during August 1998. Mile 0.7 was within the original Rock Creek Restoration project area and shows post-project fish populations. Mile 1.7 was within the new Rock Creek Restoration – Burmit Project area and shows pre-project fish populations within this project area and acts as a Control for post-project evaluation of the original Rock Creek Restoration project at Stream Mile 0.7.

predation by brook trout. These translocated westslope cutthroat trout have at least six miles of habitat deemed suitable above the natural barrier. In addition, brook trout from the lower portion of the creek (permanent constructed barrier to the natural barrier) are being moved down below the constructed barrier. In 1997 we moved 48 westslope cutthroat trout above the natural barrier and almost 1,900 brook trout below the constructed barrier. In 1998 we moved another 99 westslope cutthroat trout above the natural barrier and transported almost 1,500 brook trout below the constructed barrier. **Observations at the constructed fish barrier indicate that brook trout cannot pass over the barrier, however, we will need to totally remove brook trout from above the barrier before we can ascertain with certainty that the barrier is effective.**

Clark's Fork River Drainage

Elk Creek Channel Restoration

WATER NAME: Elk Creek – Clark Fork River
DATE PROVIDED BY: Pat Saffel, FWP
DETAILED REPORT CITATION:
MFWP CODE: FFI-49-96 [Table 3 reference: 1 (1997W)]

The lower portion of Elk Creek, a tributary to the Clark Fork River near Heron, Montana, was rehabilitated in late 1997. Rehabilitation consisted of bank stabilization and channel reconstruction. The stream supports populations of brook and westslope cutthroat trout. The objective was to increase numbers of trout, especially westslope cutthroat trout. Monitoring of fish populations found that total populations went up in all sections between 1997 and 1998; however, numbers of estimated fish in the four treated sections were much higher than in the Control section (Figure 14). Since only one fish was found in the Control section prior to project construction, the population increased five times in the control section following project construction. Population increases in the treatment sections were double to quadruple pre-project levels following project construction. Very few westslope cutthroat trout were captured in the treatment portion of the stream prior to treatment. While brook trout appeared to be the species that benefited most from project construction, over 25% of the trout population in one of the treatment sections (upper bank stabilization) consisted of westslope cutthroat trout following project construction. More monitoring is needed to conclusively demonstrate effects of the treatments. **Preliminary data suggests that this FFI project has increased fish populations in the treatment areas.**

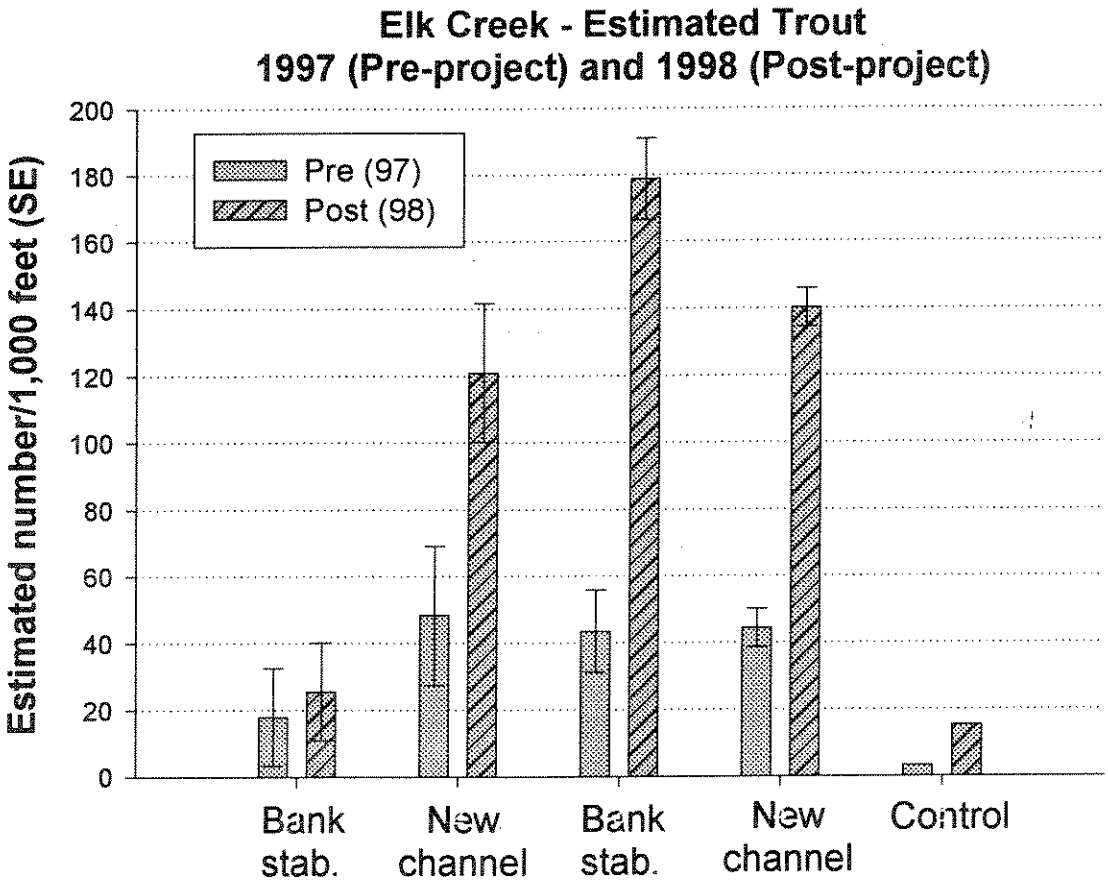

Figure 14. Estimated number of trout (westslope cutthroat and brook trout combined) and associated standard errors (SE) in five sections of Elk Creek in 1997 (pre-project) and in 1998 (post-project). Estimates were made in two bank stabilization treatment sections (Bank stab.), two sections where the channel was reconstructed (New channel), and one control section in a Wilderness Area (Control).

Middle Fork Rock Creek Riparian Fence

WATER NAME: Middle Fork Rock Creek – Clark Fork River
DATE PROVIDED BY: Steve Gerdes, Beaverhead-Deerlodge National Forest
DETAILED REPORT CITATION: Forest Service files, Phillipsburg, MT
MFWP CODE: FFI-04-97 [Table 3 reference: 4 (1997W)]

Forest Service stream habitat surveys were completed through the treatment area and in an upstream section within the Anaconda-Pintler Wilderness area. The mean proportion of stable banks was 83% for the Wilderness section and 57% for the Treatment section. The proportions of undercut banks were 21% for the Wilderness section and 8% for the Treatment section. We placed recording thermographs at the top and near the bottom ends of the treatment section in

1998. These thermographs recorded identical daily mean water temperatures from June 16 to November 2, 1998. In August 1997 single electrofishing passes were conducted in 100 foot-long sections in the Treatment and Wilderness portions of the Middle Fork. Only bull and westslope cutthroat trout were captured in the Wilderness sample section, while those two species and brook trout were captured in the Treatment sample section (Figure 15). Bull trout redd counts were done within the Treatment section in 1993, 1994, and 1996. Only one bull trout redd was observed during those three years of survey. **Baseline data has been collected to evaluate this treatment in the future.**

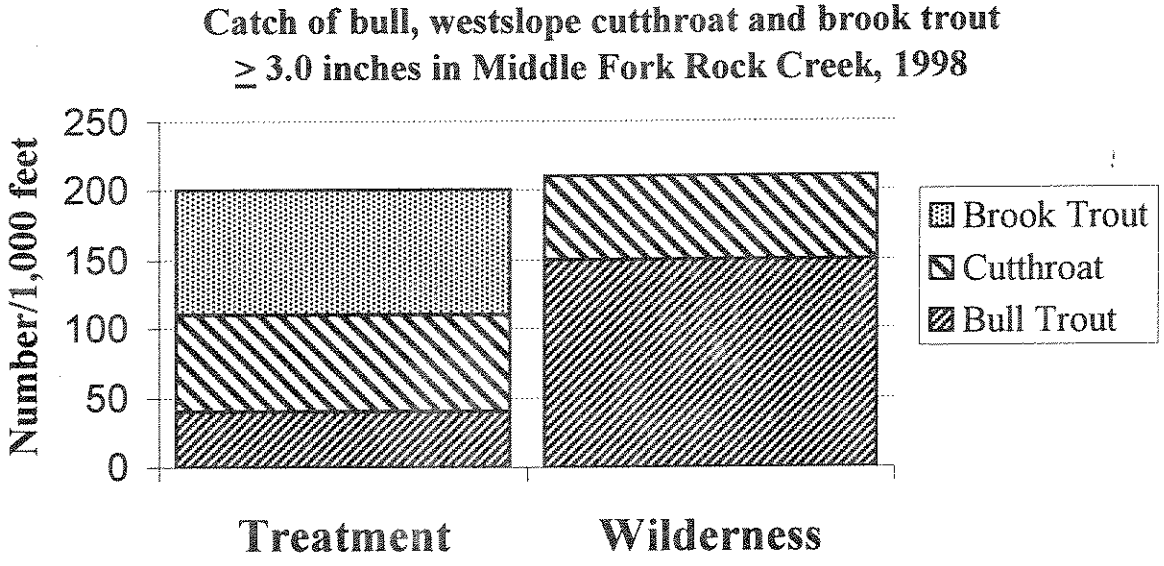

Figure 15. Catch of bull, westslope cutthroat, and brook trout 3.0 inches and longer, standardized to the number per 1,000 feet of stream length, captured in the Treatment and Wilderness sample sections of the Middle Fork of Rock Creek in August 1997.

Flathead River Drainage

Stinger Creek Channel Restoration

WATER NAME: Stinger Creek –Flathead River
DATE PROVIDED BY: Les Everts and Barry Hanson, Confederated Salish and Kootenai Tribes
DETAILED REPORT CITATION:
MFWP CODE: FFI-03-97 [Table 3 reference: 3 (1997W)]

Stinger Creek and its surrounding wetland complex was straightened and drained to develop agricultural lands and route water to an irrigation pump. This caused the channel to degrade and incise about 4 feet. The irrigation pump site had become a barrier to upstream fish movement. Overgrazing that had removed all woody riparian and channel incision contributed to bank erosion leading to an increased sediment load. Fish sampling demonstrated that brook trout were the only species present above the barrier, while the incised portion of the channel supported few

fish. Restoration activities took place during May and June of 1997. The stream channel was elevated to its historic floodplain and its sinuosity was re-established. Re-establishing the channel's sinuosity increased its length by 60 to 70 percent. A more appropriate channel width/depth was established eliminating bank erosion (estimated to have previously been 1,600 cubic feet/year). Riparian vegetation was transplanted and sprigged and cattle were removed from the riparian area. This portion of the stream has since been put into the Wetlands Reserve Program. Populations of brook trout have responded to the treatment by increasing in average size and number (Table 5). While increases in size were not statistically significant they are likely biologically significant. **Preliminary data suggest that the restoration has increased abundance of brook trout.**

Table 5. Pre-(4/17/97) and post-(6/15/98) treatment measurements and relative abundance of brook trout in Stinger Creek.

Variable	Pre-treatment	Post-treatment
Mean Length (in)	7.3	9.1
S.E. of Length	0.7	0.8
Mean Weight (lbs)	0.21	0.37
S.E. of Weight	0.07	0.07
Abundance (Catch per 1,000 ft)	14	44

Mud Creek Channel Reconstruction; Phase I and II

WATER NAME: Mud Creek –Flathead River
DATE PROVIDED BY: Les Everts and Barry Hanson, Confederated Salish and Kootenai Tribes
DETAILED REPORT CITATION:
MFWP CODE: FFI-34-97 and FFI-17-98 [Table 3 reference: 29 (1997S); 59 (1998W)]

Mud Creek had been channelized for water conveyance and agricultural purposes. Straightening the channel caused the channel to degrade and incise. The resulting gully eventually widened and stabilized with a high width-to-depth ratio. Cattle had removed all woody riparian vegetation. The over-widened shallow channel was very poor fish habitat and held few fish. Phase I restoration activities took place during June of 1997 and Phase II activities took place during March and April 1998. These activities re-established the floodplain and returned the channel to its appropriate width-depth ratio and sinuosity. The riparian area was fenced to exclude livestock and riparian vegetation was re-established. Trout population estimates conducted pre- and post- Phase I treatments on the entire treated reach showed that while sizes declined total population abundance increased dramatically following treatment (Table 6). In addition, rainbow trout were captured in this portion of the channel following treatment, while none were captured before the treatment. For Phase II only pre-treatment data has been collected to date (Table 7). **Preliminary data indicates that Phase I was successful in increasing abundance of brook and brown trout and led to rainbow trout using this portion of the stream. Baseline data has been collected to evaluate Phase II.**

Table 6. Pre- (3/15/97) and post- (8/25/98) Phase I treatment estimates of brook and brown trout length, weight, and estimated abundance of all trout in Mud Creek.

	Brook Trout		Brown Trout	
Variable	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
Mean length (in)	9.9	6.9	7.6	5.8
S.E. Length	1.6	0.3	-	0.8
Mean Weight (lbs)	0.84	0.16	0.17	0.14
S.E. Weight	0.39	0.01	-	0.06
Estimated trout population (#/1,000 ft)	Pre-treatment: 7.1 total trout per 1,000 feet Post-treatment: 242.0 total trout per 1,000 feet			

Table 7. Pre-treatment data collected for Phase II of Mud Creek restoration on November 4, 1997.

	Rainbow Trout		Brook Trout		Brown Trout	
Statistic	Length	Weight	Length	Weight	Length	Weight
Mean	233	190	191	73	158	46
Standard Error	19.1	51.9	7.1	10.7	14.5	18.0
Median	220	105	183	54	147	28
Mode	249	190	132	20	-	20
Standard Deviation	93.7	254.2	50.0	74.7	48.1	59.6
Sample Variance	8784.93	64609.36	2501.15	5581.82	2316.49	3546.56
Range	377	1086	250	392	169	208
Minimum	127	14	114	14	126	14
Maximum	504	1100	364	406	295	222
Count (% of total)	24	(29%)	49	(58%)	11	(13%)

Other species present: Longnose sucker (11), Largescale sucker (3), Yellow bullhead(2)

CPUE (trout/hr.): 104

Ronan Spring Creek Channel Reconstruction

WATER NAME: Ronan Spring Creek –Flathead River

DATE PROVIDED BY: Les Everts and Barry Hanson, Confederated Salish and Kootenai Tribes

DETAILED REPORT CITATION:

MFWP CODE: RRA-67-95

Ronan Spring Creeks' fishery has been negatively impacted do to unrestricted stock grazing and high sediment loads resulting in an over widened and silted in stream channel. Restoration activities took place August - December 1995. Restoration included rebuilding the streambanks, narrowing the channel, increasing length by increasing sinuosity, constructing sediment traps, placing spawning gravel, dredging fine sediments from the spring's source, fencing the riparian corridor, and planting riparian vegetation. Pre- and post-treatment snorkel counts of trout found that brook trout populations increased and rainbow trout began using the creek following the treatment (Table 8). **Snorkel counts indicate abundance of brook trout have increased and rainbow trout have begun using Ronan Spring Creek following its rehabilitation.**

Table 8. Pre- and post-treatment snorkel counts of trout in a 1,000 foot section of Ronan Spring Creek near its source. Confidence intervals are not developed for these counts, however, it is assumed 90 to 100% of the real population were observed under the snorkel conditions during surveys.

	Pre-treatment snorkel count		Post-treatment snorkel count	
Size	Brook Trout	Rainbow Trout	Brook Trout	Rainbow Trout
< 10 inches	66	0	86	12
> 10 inches	13	0	18	5
Totals	79	0	104	17

Gallatin River Drainage

Cress Spring Creek Fencing

WATER NAME: Cress Spring Creek – Gallatin River
DATE PROVIDED BY: Brad Shepard, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: FFI-01-96 [Table 3 reference: 1 (1996W)]

FFI funds were used to build a fence that excludes the riparian area along a portion of Cress Spring Creek from livestock grazing. Funds from other sources and landowner funds were used to enhance fish habitat in this portion of Cress Spring Creek. A mark-recapture population estimate was done in a 515 feet-long section of the improved portion of Cress Spring Creek on August 8, 1997. At that time we estimated that about 623 age 0, 47 age 1, and 20 age 2 and older brown trout inhabited this sample section. We captured 16 brown trout 15 inches and longer in this sample section. One brown trout just over 25 inches was captured. The length frequency illustrated the large number of young brown trout this section produced (Figure 16). We estimated that this improved section supported about 1,300 young (age 1 and younger) brown trout per 1,000 linear feet of stream (or about 4,300/acre). We assume that many of these young brown trout move down into the Gallatin River, but trapping during April of 1998 failed to catch any out-migrating fry. We believe we started trapping too late in 1998 to catch recently emerging brown trout fry. A thermograph recorded water temperatures during April and water temperatures averaged over 50 F for most of the month. **We conclude that the rehabilitation**

of Cress Spring Creek has produced more brown trout fry. We are presently uncertain how many of these additional fry are moving down into the Gallatin River, but we assume many are.

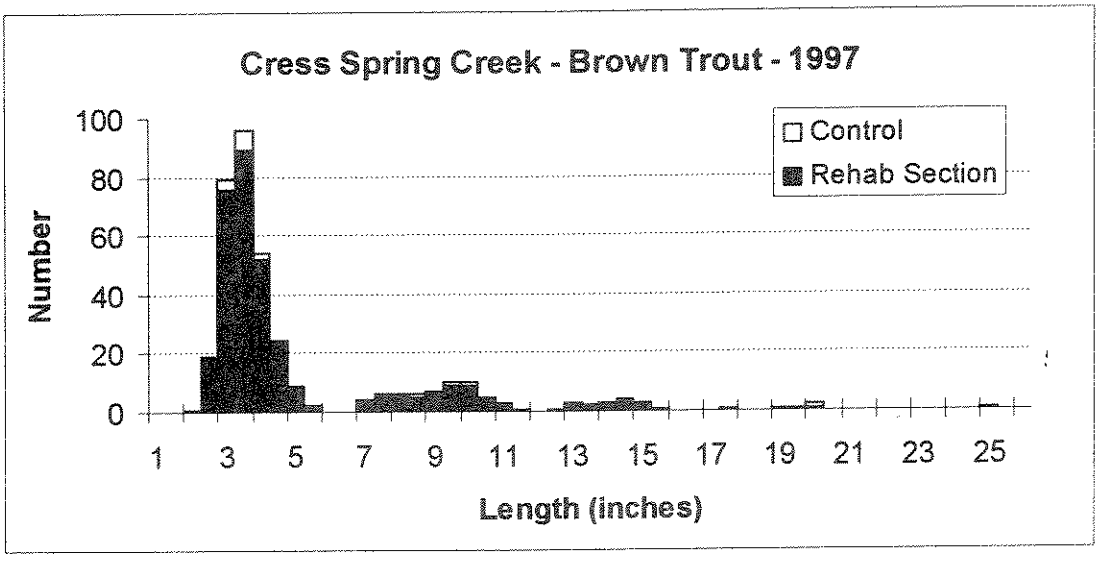

Figure 16. Length frequency of brown trout in a rehabilitated portion of Cress Spring Creek (crosshatched bars) and in a section of an untreated neighboring spring creek (open bars) in 1997.

Jefferson River Drainage

Hell's Canyon Creek Irrigation Modification

WATER NAME: Hell's Canyon Creek – Jefferson River
DATE PROVIDED BY: Ron Spoon, FWP
DETAILED REPORT CITATION: No report available (FWP files, Townsend, MT)
MFWP CODE: RRA-38-93

Improvements to an irrigation withdrawal system in Hell's Canyon Creek has led to the virtual elimination of juvenile trout lost to an irrigation ditch on lower Hell's Canyon Creek in 1997 and 1998. In 1997 and 1998 approximately 1,000 and 2,900 juvenile trout, respectively, were captured at a screen by-pass of this irrigation diversion that allowed these juveniles to move down stream and into the Jefferson River. In addition, flows in Hell's Canyon Creek below the irrigation diversion remained above 5 cfs in 1998. **Preliminary data suggest this project has eliminated the loss of juvenile trout to an irrigation ditch and provides flows that allow these juvenile trout to emigrate into the Jefferson River.**

Madison Spring Creek Rehabilitation

WATER NAME: Madison Spring Creek by $3 Bridge – Madison River
DATE PROVIDED BY: Brad Shepard, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: FFI-36-96 [Table 3 reference: 27 (1996W)]

The Madison River Ranch Association rehabilitated the lower portion of a spring creek that enters the Madison River immediately above the $3 Bridge from the west. We sampled two 500 feet-long sections of this spring creek in 1997 and 1998. One section was entirely within the rehabilitated portion of the creek. The other section was an untreated section located between the rehabilitated section and the Wade Lake road crossing. We made population estimates in the rehabilitated sample section in both 1997 and 1998. We completed single electrofishing passes in the untreated sample section in both 1997 and 1998. Only young brown trout were found in the sample sections. In 1997 we estimated that the rehabilitated sample section supported 184 (SE: 74) age 0 and 7 (SE: 1) age 1 brown trout, while in 1998 this section supported an estimated 592 (SE: 40.1) age 0, 8 age 1, and 1 age 2+ brown trout. This section supported about 380 age 0 brown trout per 1,000 linear feet (2,700/acre) in 1997 and about 1,180 (8,600/acre) in 1998. Catches of brown trout in one electrofishing pass were compared between the two sections (Figure 17). In 1998 the rehabilitated section supported more brown trout less than 3 inches per 1,000 feet of stream length than did the section above; however, the upper section still supported higher catches of fish over 3 inches. The rehabilitated section averaged only 6 feet wide while the untreated section averaged 20 feet wide. **We concluded that the channel rehabilitation was successful by allowing access to the spring creek by brown trout from the Madison River and providing important spawning and rearing habitat for young brown trout.**

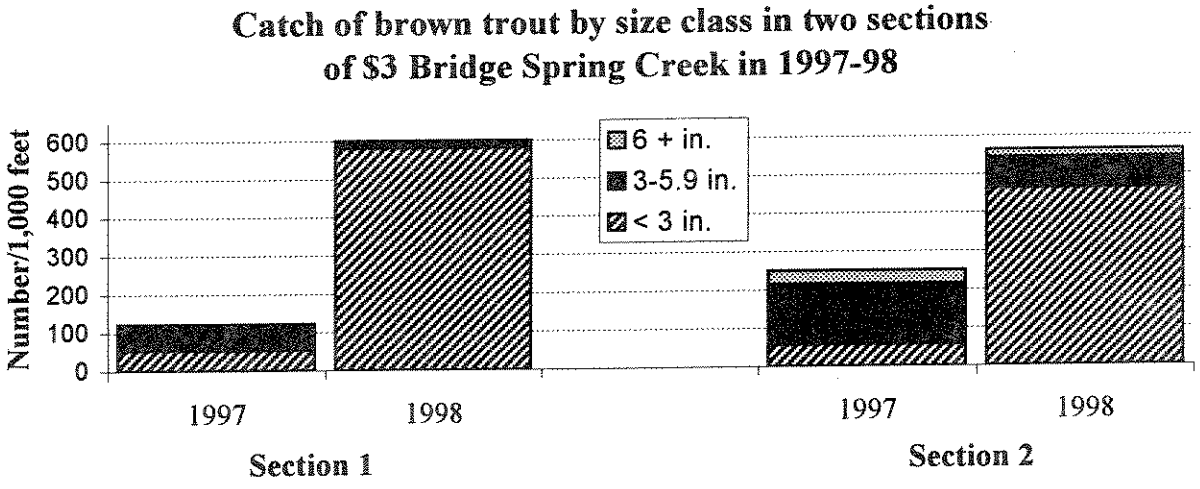

Figure 17. Catch of brown trout by size class in a single electrofishing pass in two sections of a spring creek entering the Madison River just below the $3 Bridge. Section 1 was rehabilitated to allow passage of adult fish from the Madison River and improving channel habitat. Section 2 was immediately above the rehabilitated section, but was not rehabilitated.

Milk River Drainage

Bear Paw Lake Smallmouth Bass Enhancement and Bank Stabilization

WATER NAME: Bear Paw Lake, Hill County
DATE PROVIDED BY: Kent Gilge, FWP
DETAILED REPORT CITATION: No detailed report is available for this study.
MFWP CODE: FFI-27-96 and FFI-01-98 [Table 3 reference: 21 (1996W); 46 (1998W)]

These two projects were very similar. The initial project (FFI-27-96) was a pilot project to determine if released young smallmouth bass would use rock placed as lakeshore stabilization structure for cover during their first year in the reservoir and thus increase their survival. The second project (FFI-01-98) was an expansion of the amount of shoreline protected with rock structure. Shoreline areas where no rock was placed (control) and where rock protection/habitat was added (treatment) were electrofished with a backpack shocker on May 1, 1998 and September 8, 1998. No smallmouth bass were captured along control shorelines during either sampling event. About 73 and 83 smallmouth bass per 1,000 feet of shoreline were captured in treatment areas in May and September, respectively. **Preliminary results suggest young smallmouth bass were using rock structure placed along shorelines and not using shoreline areas where no rock structure was available.**

Missouri River Drainage

Cottonwood Creek Barrier

WATER NAME: Cottonwood Creek, tributary to Arrow Creek (Missouri River)
DATE PROVIDED BY: Mike Enk, US Forest Service, Lewis and Clark Forest
DETAILED REPORT CITATION:
MFWP CODE: FFI-9-98 [Table 3 reference: 51 (1998W)]

Construction of this project is planned for 1999. This project will protect genetically pure native westslope cutthroat trout (WCT) from continued competition or potential hybridization with non-native trout. An electrofishing survey was conducted in fall of 1998 to assess the status of the WCT population, specifically to find evidence of successful recruitment of juvenile WCT in the presence of a burgeoning eastern brook trout population. About 0.25 mile of stream was electrofished by two backpack shocking crews (FS/FWP). Results are not directly comparable to a 1995 survey from the same area due to different timing and methodology, but several inferences can be drawn. Brook trout continue to outnumber cutthroat trout by nearly four to one. Brook trout may be extending their range further upstream into what has been a cutthroat stronghold. Age 1 and young-of-the-year cutthroat become more common (but never abundant) near the upper end of the surveyed reach where there were fewer large brook trout. However, young-of-the-year brook trout are very abundant throughout the reach and appear to occupy most of the available habitat. Adult brook trout were more abundant in 1995 than 1998, probably because the survey was conducted near the peak of brook trout spawning activity in 1998 when it appeared mature brook trout were moving upstream. All captured brook trout were removed during this year's sampling to take some competitive pressure off the WCT population. Next year, following construction of the barrier, brook trout will be eliminated above barrier. The

WCT population is expected to rebound rapidly. **Baseline data have been collected for this project.**

Highwood Creek Channel Rehabilitation

WATER NAME: Highwood Creek – Missouri River
DATE PROVIDED BY: Brad Shepard, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: FFI-12-98 [Table 3 reference: 54 (1998W)]

Depletion population estimates were done in 1997 and 1998 in two sections of Highwood Creek on the McGowan property. On April 15, 1997, prior to construction of a habitat restoration project not funded by FFI, a 1,250-feet-long section was sampled from 220 feet above the road ford downstream. This section supported an estimated 99 (SD: 6.7) brown trout, 16 (SD: 0.6) rainbow trout, and 39 (SD: 2.6) brook trout 6.0 inches and longer. In 1998, immediately following construction, we estimated that an 814-feet-long section of Highwood Creek below the road ford supported 122 (SD: 2.0) brook trout, 78 (SD: 0.9) brown trout, and 23 (SD: 0.2) rainbow trout 6.0 inches and longer. Almost all the trout captured were between 6 and 12 inches long. The biggest fish captured was a 17.1-inch long brown trout. Our observations indicated that extreme high flows caused by intense summer rains during June of 1998 had severely damaged many of the recently installed habitat restoration and bank stabilization structures. However, the preliminary results suggest the habitat restoration project had slightly increased populations of brown and rainbow trout 6.0 inches and longer and had dramatically, and significantly, increased populations of brook trout (Figure 18). **Baseline information has been collected to evaluate future channel restoration of Highwood Creek.**

Magpie Creek Fish Passage

WATER NAME: Magpie Creek – Canyon Ferry Reservoir - Missouri River
DATE PROVIDED BY: Ron Spoon, FWP
DETAILED REPORT CITATION: No report available (FWP files, Townsend, MT)
MFWP CODE: FFI-54-96 [Table 3 reference: 44 (1996S)]

Spawning site (redd) surveys conducted in Magpie Creek in 1997 and 1998 indicated that the FFI project that modified a culvert by inserting a fish ladder that allowed rainbow trout from Canyon Ferry Reservoir to ascend Magpie Creek through the culvert to spawn. In 1998 a total of 69 rainbow trout redds were observed in Magpie Creek and 8 of these redds were located above the culvert. Large (> 17 inches) adult rainbow trout were observed above this culvert on two occasions in May of 1998. The 1997 survey found only one redd, that was believed to have been constructed by smaller resident adults, observed above the culvert. Emigrating fry were trapped sporadically from July through September in 1997 and 1998. These data found that fry were emigrating from Magpie Creek to Canyon Ferry Reservoir, but only provided relative numbers of emigrating fry from the entire creek, not from above the culvert. Future fry trapping will document whether the relative numbers of fry that emigrate from Magpie Creek to Canyon Ferry Reservoir increase. **Preliminary data found that rainbow trout spawners from Canyon Ferry Reservoir were ascending Magpie Creek to spawn above the culvert retrofitted with a fish ladder.**

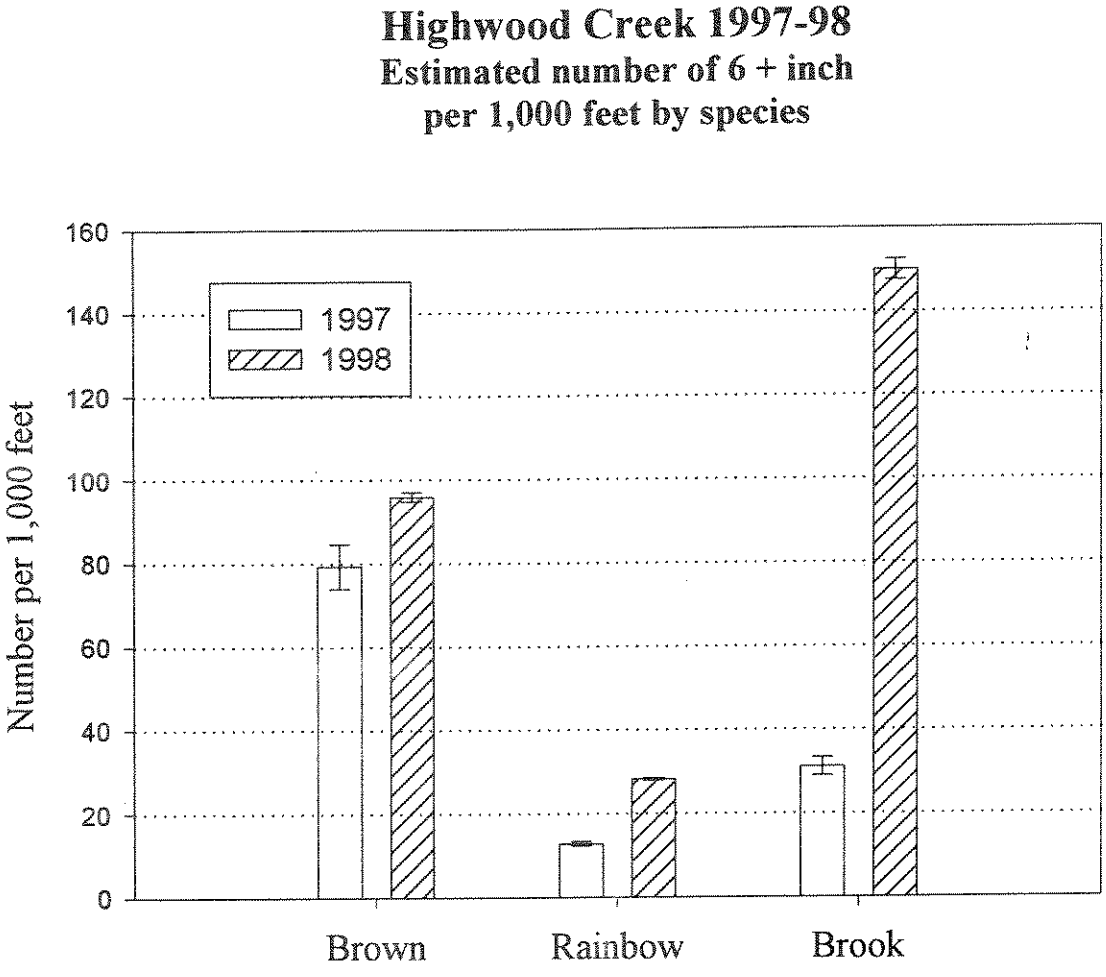

Figure 18. Estimated number of brown, rainbow, and brook trout 6 inches and longer per 1,000 feet of stream (vertical bars represent one standard deviation) in similar sections of Highwood Creek in 1997 (pre-treatment) and 1998 (post-treatment).

Missouri River Bank Stabilization – Range and Below Craig

WATER NAME: Missouri River
DATE PROVIDED BY: Brad Shepard, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: RRA-73-95, FFI-21-97 and FFI-16-98 [Table 3 reference: 18 (1997W); 58 (1998W)]

Several bank stabilization projects have been conducted on large rivers using FFI funding. It has proven to be extremely difficult to quantify the effects of these projects on fish populations. We attempted to quantify the relative effects of several bank stabilization projects completed on the Missouri River by assessing the relative catch of fish along various river banks at night using jet boat electrofishing and by conducting controlled angling sampling along various stream bank sections. We assessed six different areas: Range (old treated bank); Riprap (old riprap bank); Pivot (natural eroded bank); Sterling (treated bank); Judeman (new treatment bank below Craig); and Lehman (natural slightly eroded bank). Total catches of rainbow trout per 1,000 feet of bank were similar in all six areas, however, catches of smaller rainbow were higher along the Riprap and Judeman banks (Figure 19). Catches of brown trout varied widely with no apparent trend between treated and untreated areas (Figure 19). It appeared the riprap bank and the natural bank at Lehman's had higher densities of brown trout along them. The lowest densities of brown trout were seen along the natural eroded bank (Pivot). We were unable to document any differences between banks in our angling survey; however, this survey consisted of a single float down each bank. We caught no fish along any of the treated banks and only had six strikes catching one rainbow and two mountain whitefish in the entire survey. **It is too early to conclude these RRA and FFI bank stabilization projects have led to higher populations of fish. The data suggest that young rainbow trout are more abundant along banks with variable velocities.**

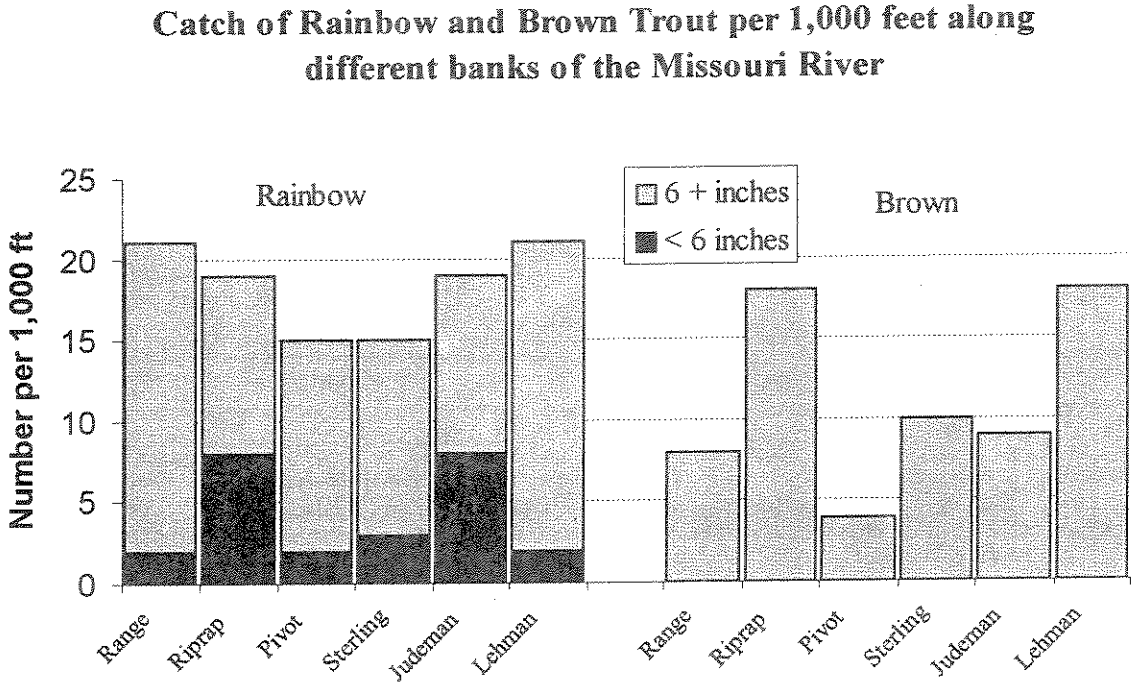

Figure 19. Relative catch (number caught per 1,000 feet of bank) of rainbow (left) and brown (right) trout along six different banks of the Missouri River near Craig, Montana. Range and Judeman banks were RRP and FFI projects. Pivot was a naturally eroding bank. Riprap was an old riprap project. Sterling was a privately funded bank stabilization project using "barbs". Lehman was a natural bank that was slightly eroded.

Missouri River Big Springs Spawning Channel

WATER NAME: Missouri River above Townsend
DATE PROVIDED BY: Ron Spoon, FWP
DETAILED REPORT CITATION: No report available (FWP files, Townsend, MT)
MFWP CODE: RRA-21-92

A spawning channel was constructed at Big Springs along the Missouri River in 1994 to increase spawning habitat for brown and rainbow trout inhabiting the Missouri River and Canyon Ferry Reservoir. Redd (spawning site) counts were made during the fall (to count brown trout redds) and spring (to count rainbow trout redds) from 1994 to 1998. No count was made during the spring of 1996 and counts of rainbow trout redds made during the springs of 1997 and 1998 were not complete counts due to turbid water making redd observation extremely difficult. In 1998, no counts of brown trout redds were made after November 19, so the count for brown trout in 1998 was an incomplete count. Both brown and rainbow trout were using the new spawning channel immediately following its construction (Table 9). The numbers of redds have declined somewhat after 1995; however, this area has been used as a source for taking brown trout eggs as part of the Toston Mitigation Project and that may explain the reduced number of redds. No significant changes in the constructed spawning channel have been observed since its construction in 1994. **The data indicate both brown and rainbow used this spawning channel immediately after its construction. The number of observed redds has declined in recent years and the reason for this decline is undetermined at this time.**

Table 9. Number of brown and rainbow trout redds observed in the Big Springs spawning channel of the Missouri River from 1994 to 1998.

		Number of Redds	
Year	Season (dates of surveys)	Browns	Rainbows
1994	Fall (10/25 – 12/23)	44	-
1995	Spring (2/16 – 5/8)	-	103[a/]
	Fall (11/6 – 12/20)	43	-
1996	Spring	-	NA[b/]
	Fall (10/26 – 12/18)	31	-
1997	Spring (4/2)	-	16[c/]
	Fall (11/3 – 12/16)	18	-
1998	Spring (3/17 – 4/15)	-	57[c/]
	Fall (10/28 – 11/19)	8[c/]	

[a/] Represents the minimum number due to sampling problems.
[b/] NA is not available. No count was made.
[c/] Incomplete counts due to turbidity limiting visibility or because surveys were not done through the spawning season.

White's Gulch Rehabilitation and Barrier

WATER NAME: White's Creek – Canyon Ferry Reservoir - Missouri River
DATE PROVIDED BY: Brad Shepard and Ron Spoon, FWP
DETAILED REPORT CITATION: Shepard and Spoon (in prep.)
MFWP CODE: RRA-74-95 and FFI-16-96 [Table 3 reference: 12 (1996W)]

White's Creek in White's Gulch supports a genetically pure population of westslope cutthroat trout. The RRA and FFI projects in White's Gulch were part of a large cooperative effort to rehabilitate White's Gulch from past mining impacts and conserve the existing population of westslope cutthroat trout. A major rainstorm in 1993 led to extremely high peak stream flows that caused several old settling and dredge ponds to breach. Breaching of these ponds caused significant down cutting of the channel. In 1993 we began removing brook trout from a portion of White's Creek above the area most heavily impacted by past placer and dredge mining. A temporary culvert barrier to upstream fish movement was installed prior to removing brook trout in 1993 from the upper creek. In 1994 and 1995 the dredge and placer mined portion of the White's Gulch valley and the stream channel were rehabilitated and a permanent fish barrier was placed below this rehabilitated segment of stream. From 1995 through 1998 fish surveys and brook trout removals were conducted from this permanent fish barrier up through the rehabilitated portion of the channel (Table 10). It can be seen that the capture frequencies (number per 1,000 feet of stream length sampled) of westslope cutthroat trout increased dramatically from 1995 through 1998 (Table 10). However, it appears that electrofishing has not yet effectively removed the majority of brook trout from the portion of White's Gulch between the permanent fish barrier and the rehabilitated area. It appears that brook trout electrofishing removals were relatively effective in the portion of the creek from the rehabilitated valley upstream from 1993 through 1995 (Table 10).

Table 10. Locations of sample sections, length of stream sampled and number of westslope cutthroat (WCT) and brook trout (EBT) captured. All captured brook trout were moved down stream out of the westslope cutthroat trout recovery area.

Year	Location	Distance sampled (feet)	Number captured (#/1,000 ft)	
			WCT	EBT
1993	Head of rehabilitated valley to road ford above White City	9,700	53 (5.5)	112 (11.6)
1994	Head of rehabilitated valley to Spring Gulch	3,490	58 (16.6)	50 (14.3)
1995	Head of rehabilitated valley to above Spring Gulch	8,140	117 (14.4)	22 (2.7)
1996	Permanent barrier up to just above Spring Gulch	6,075	153 (25.2)	142 (23.4)
1997	Permanent barrier up to Spring Gulch	6,450	453 (70.2)	135 (20.9)
1998	Permanent barrier up to above Spring Gulch	9,200	689 (74.9)	238 (25.9)

Length frequencies indicated that young westslope cutthroat trout were severely depressed until 1995 when several year classes were strong (Figure 20). We did not capture all young westslope cutthroat trout during each sampling event, especially in 1997 and 1998 when young-of-the-year cutthroat were extremely abundant. **Observations at the constructed fish barrier indicate that brook trout cannot pass over the barrier; however, we will need to totally remove brook trout from above the barrier before we can ascertain with certainty that the barrier is effective.**

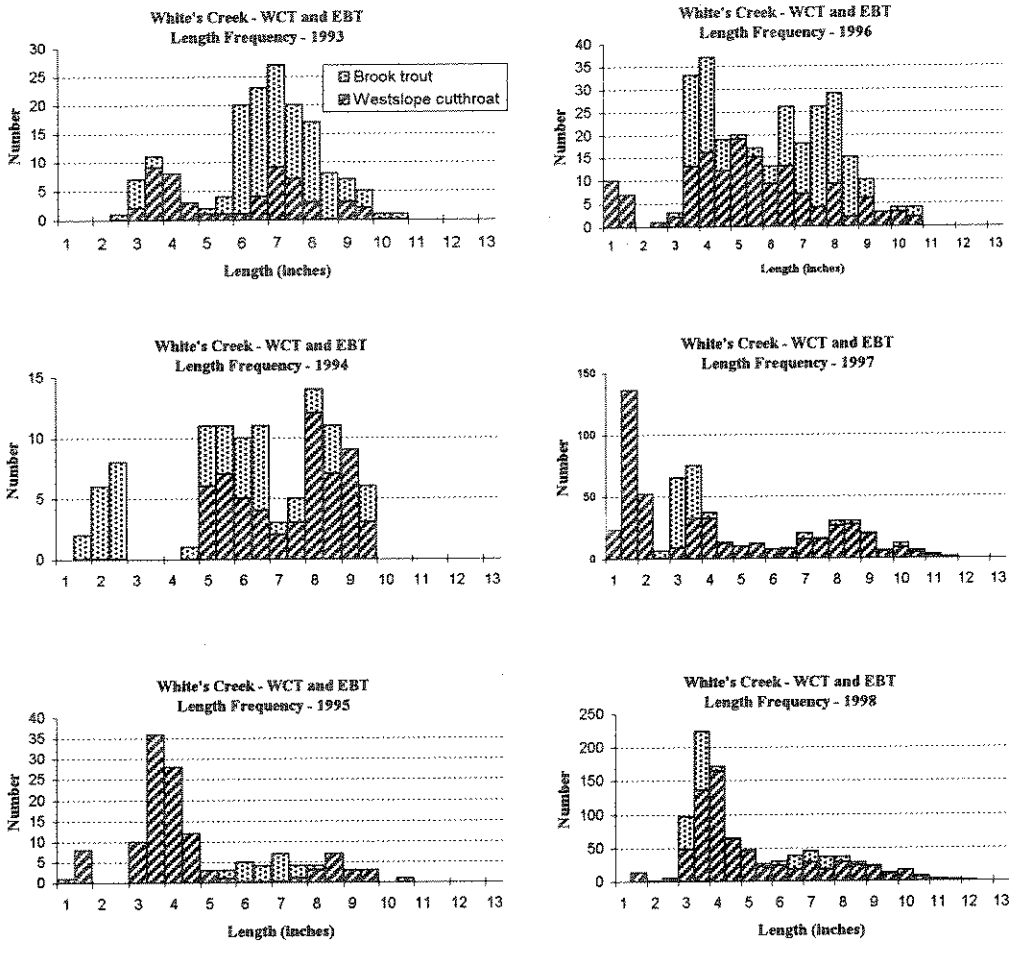

Figure 20. Length frequencies of westslope cutthroat and brook trout captured from White's Creek from 1993 through 1998. Young-of-the-year westslope cutthroat trout were not all captured during all years, but especially in 1997 and 1998.

Red Rock River Drainage

Little Sheep Creek Channel Reconstruction

WATER NAME: Middle Fork Little Sheep Creek – Red Rock River
DATE PROVIDED BY: Brad Shepard, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: FFI-43-96 [Table 3 reference: 33 (1996S)]

We conducted single electrofishing passes through three sample sections in the Middle Fork Little Sheep Creek to assess fish populations in 1997 and 1998, prior to and immediately following enhancement of a 1,250 feet-long portion of the creek. One section was below the enhancement area and no fish were captured during either year in this section. This lower section receives extremely low flows due to water infiltrating into the streambed. The middle section covered the entire 1,263 feet-long enhanced segment. In 1997, prior to construction of the project, three brook trout and no westslope cutthroat trout were captured in the enhanced section. In 1998, following enhancement, five brook trout and two westslope cutthroat trout were captured in the enhanced section. In 1997 five brook trout were captured in a 328 feet-long sample section located 0.25 mile above the enhancement section, while in 1998 only one brook trout was captured in this section. We also collect detailed habitat information for the lower two sections in 1997, prior to enhancement. **Preliminary results suggest that westslope cutthroat trout have started to use the enhanced portion of the stream and flows appeared higher in the enhanced portion in 1998 than in 1997.**

St. Regis River Drainage

Big Creek Channel Restoration

WATER NAME: Big Creek – St. Regis River
DATE PROVIDED BY: Brad Shepard, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: FFI-4-98 [Table 3 reference: 48 (1998W)]

On September 14, 1998 we attempted to estimate fish populations in a 2,080 feet-long section of Big Creek (a tributary to the St. Regis River) where a project is proposed to reconstruct a portion of the channel damaged by flood flows in 1997. We marked all fish captured during an electrofishing pass and attempted to "recapture" these fish during an underwater snorkel survey a day later. Unfortunately, fish were extremely difficult to find during the snorkel survey and we were unable to make a reliable estimate. We believe that the displacement of fish and disruption of their behavior from the electrofishing prevented us from observing very many fish during the snorkel survey. We suggest that the snorkel "recapture" survey must occur at least five to seven days following the electrofishing marking run to allow for marked fish to re-distribute and resume normal behaviors. We captured a total of 24 westslope cutthroat trout ranging in length from 2.7 to 7.8 inches, six brook trout, and two brown trout during the marking run. One brown trout was 11.9 inches long. We did not capture or observe any bull trout. We completed a single electrofishing pass in a 490 feet-long sample section just below the forks of Big Creek on September 15, 1998 and captured only two westslope cutthroat trout and two brook trout. We are unsure if fluvial bull trout from either the St. Regis or Clark Fork rivers use Big Creek for

spawning. **Preliminary baseline fish abundance data has been collected to evaluate this project.**

St. Regis River Restoration

WATER NAME: St. Regis River – Clark's Fork River
DATE PROVIDED BY: Brad Shepard, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: FFI-42-96 [Table 3 reference: 31 (1996S)]

On September 15, 1998 we attempted to estimate fish populations in a 1,640 feet-long section of the St. Regis River that was restored from flood damage in 1997. We marked all fish captured during an electrofishing pass and attempted to "recapture" these fish during an underwater snorkel survey one day later. We captured 18 westslope cutthroat trout, one brown trout, and three brook trout during the marking run. Unfortunately, fish were extremely difficult to find during the snorkel survey and we were unable to make a reliable estimate. We believe that the displacement of fish and disruption of their behavior from the electrofishing prevented us from observing very many fish during the snorkel survey. We suggest that the snorkel "recapture" survey must occur at least five to seven days following the electrofishing marking run to allow for marked fish to re-distribute and resume normal behaviors. **No conclusion could be reached on the effects of this project.**

Sun River Drainage

Elk Creek Rehabilitation; Elk Creek Bank Stabilization

WATER NAME: Elk Creek – Sun River
DATE PROVIDED BY: Brad Shepard, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: FFI-37-96 and FFI-23-97 [Table 3 reference: 28 (1996W); 20 (1997W)]

Two FFI projects have been completed on Elk Creek and another project is in progress. We conducted a single electrofishing pass down a 6,900 foot-long portion of Elk Creek from Bert Artz's corral downstream on October 24, 1997. This section included the Goff FFI project. In 1998 we made a mark-recapture electrofishing estimate down three adjacent sections of Elk Creek from Bert Atrz's corral downstream almost 2 miles. In 1998 we also made a single electrofishing pass in a 1,900 foot-long section above Bert Artz's corral. We captured 200 brown, 10 rainbow, and 21 brook trout along with mountain whitefish, white suckers, and sculpins in 1997. We recaptured several brown trout that had been tagged in the Sun River during the spring of 1997. Most of the larger (>15 inch) brown trout were mature and ready to spawn. In late-October 1997 we captured more brown trout longer than 15 inches than in late-August sampling of 1998 (Figure 21). These findings suggest this is an important spawning area that is used by some brown trout inhabiting the Sun River. The mark-recapture estimate made in August 1998 must be viewed with caution because it did not appear that marked fish redistributed well within the population for the recapture run. Our total estimate of brown trout 6.0 inches and longer was 635 (SD: 58.0) for the nearly two-mile sample section. Only 192 of these were 12 inches or longer. This estimate equates to 61 brown trout 6 inches and longer

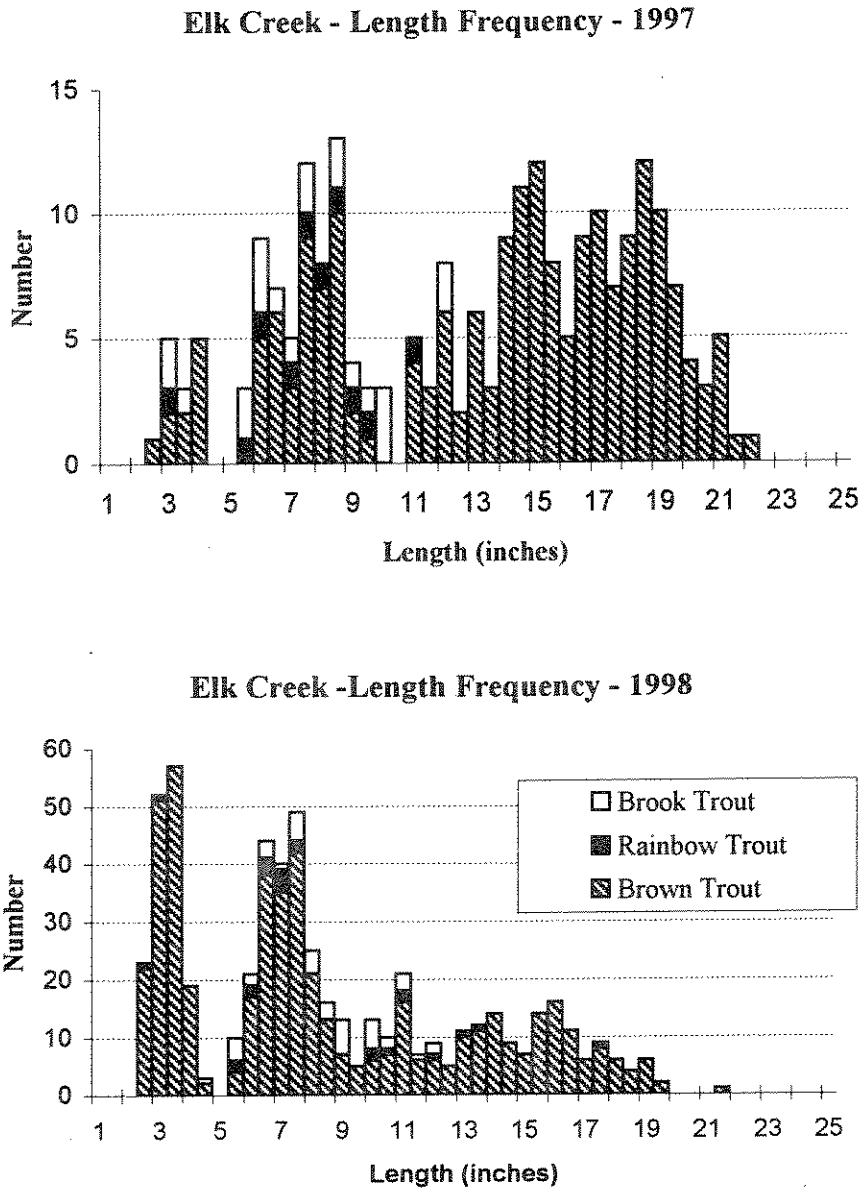

Figure 21. Length frequencies of brook, rainbow, and brown trout captured in Elk Creek in October 1997 (top) and August 1998 (bottom).

per 1,000 feet of stream or 19 brown trout 12 inches and longer per 1,000 feet of stream. We tried to sub-divide this overall estimate into three estimates to break out portions of the stream where FFI projects had influenced the habitat. Above the Sherrer headgate (Section 1) we estimated that there were about 250 (SD: 25.6) brown trout 6 inches and longer. Immediately below the headgate (Section 2) we estimated there were 286 (SD: 35.3) brown trout 6 inches and longer. We estimated 108 (SD: 13.1) brown trout 6 inches and longer occupied a presently untreated lower section. The rehabilitated section immediately below Sherrer's headgate had the

highest estimated density of brown trout (Figure 22). We are unsure if this high density was a result of the enhancement or whether spawning brown trout were "stacked up" below the diversion structure at the headgate on their upstream migration to spawn. We did capture numerous brown trout from the habitat structures installed below the diversion. **We concluded that lower Elk Creek maintains a good resident population of brown trout and has spawning habitat used by these resident browns as well as adult browns from the Sun River. Initial data suggests that enhancing spawning and adult cover habitat may result in higher numbers of resident fish and may increase recruitment of brown trout to the Sun River.**

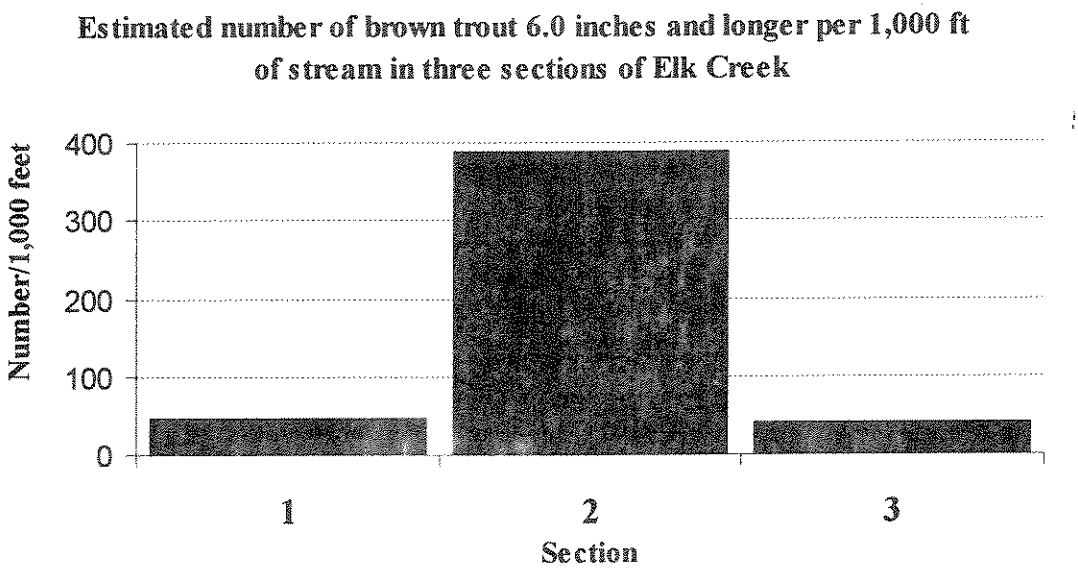

Figure 22. Estimated number of brown trout 6.0 inches and longer in three sections of Elk Creek standardized to the number of fish per 1,000 feet.

Mill Coulee Creek Channel Stabilization

WATER NAME: Mill Coulee Creek – Sun River
DATE PROVIDED BY: Brad Shepard, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: FFI-45-97 [Table 3 reference: 36 (1997S)]

Several sections were sampled in Mill Coulee Creek to compare the FFI project area to untreated areas and to determine whether Mill Coulee Creek was being used for spawning by fish from the Sun River. On October 28, 1997 a 656 feet-long section was sampled near the mouth of Mill Coulee Creek on Terry Clarke's property. A three-pass depletion estimate found this section supported 46 (SD: 9.5) brown trout 3.0 inches and longer of which 15 (SD: 0.4) were 6.0 to 11.9 inches (Figure 23). Only two rainbow trout were captured (7.0 and 7.2 inches) in this lower section and they were captured on the first pass. There were some large brown trout (> 12 inches) in this section that likely moved into Mill Coulee Creek from the Sun River to spawn.

On July 8, 1998 depletion population estimates were made in three sections: 1) a 446-feet-long section through the FFI project bank rehabilitation section; 2) a 328-feet-long section within a stable well-vegetated portion of Mill Coulee Creek near Pete Cumming's house; and 3) a 361-feet-long section on a section of State Land above Pete Cumming's house. Brown trout was the only trout species captured in these upper three sections. Estimated numbers of brown trout were similar for the lower three sections (Mouth, Rehab, and Cumming), while the estimated numbers were significantly higher in the State Land section. However, a single high quality pool located in the State Land section accounted for most of the brown trout captured in this section. The Rehab section contained more young brown trout than any other section. **Preliminary data suggest fish abundance in the FFI project area were similar to other sections of the creek and that this FFI project area supported more young brown trout than any other sampled section.**

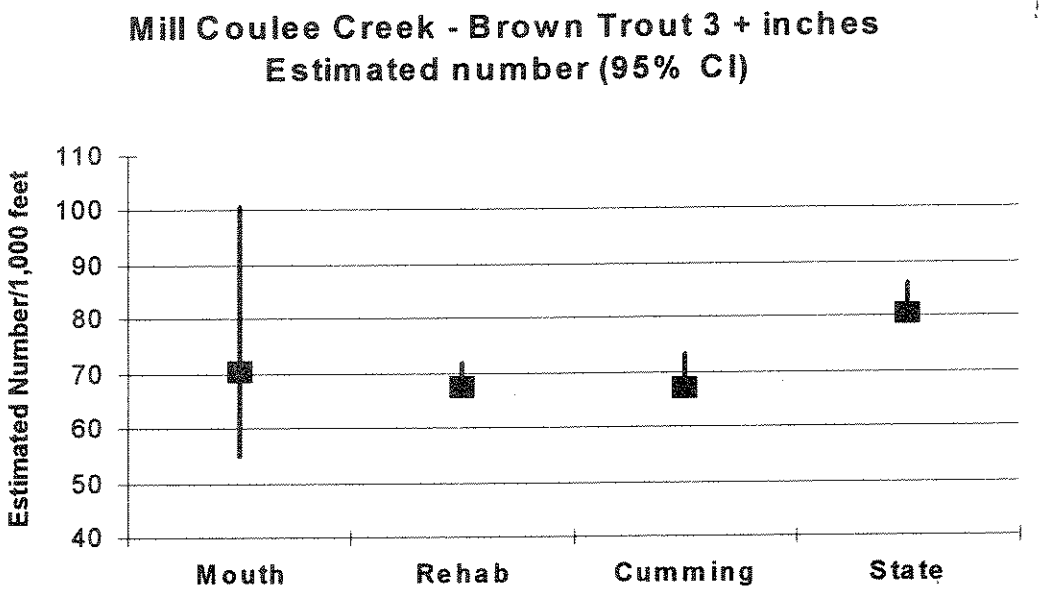

Figure 23. Estimated populations (solid squares) and 95% confidence intervals (vertical lines) of the number of brown trout (standardized to the number per 1,000 feet) in four sections of Mill Coulee Creek in 1997 and 1998. All fish in the Cumming and State sections were 6.0 inches and longer. The Mouth section was sampled in 1997 and all other sections were sampled in 1998.

Spring Coulee Bank Stabilization

WATER NAME: Spring Coulee Creek – Sun River
DATE PROVIDED BY: Brad Shepard, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: FFI-26-98 [Table 3 reference: 68 (1998W)]

We planned to conduct mark-recapture electrofishing estimates in three sample sections of Spring Coulee Creek on Mark Lee's property on July 1, 1998. Unfortunately, extremely high water temperatures led to handling stress of captured fish and we had to abandon our efforts to

conduct mark-recapture estimates. Due to high temperatures some captured fish died, so we quit sampling this stream. We completed a single electrofishing pass through three sections of Mr. Lee's property. The upper section was a 2,320-feet-long section at the upper end of the property. No rehabilitation has been completed, or is yet planned, for this section and we will use this section as our Control. The next 1,330-feet-long section included a portion of stream that had been previously rehabilitated using log drop structures. This middle section was fenced to exclude livestock grazing. This section was called the Old Treated section. The lower portion of the creek on Mr. Lee's land is planned for rehabilitation using FFI funds. We also sampled a 1,150-feet-long section from the Old Treated section down stream and called this the New Treated section. We captured 10 brown and 17 rainbow trout in the upper section (Control), six brown and five rainbow trout in the middle section (Old Treated), and five brown, four rainbow and three brook trout in the lowest section (New Treated that will be treated in 1998-99). The relative catch (number captured per 1,000 feet) of all trout were similar between the three sections and ranged between 9 and 11 fish (Figure 24). Brook trout were only captured in the lower section. Many of the rainbow and brown trout were very large (Figure 25). **The 1998 data provide baseline data on fish in Spring Coulee Creek and indicate relative abundance's were similar between untreated and treated sections and that this stream supports some large rainbow and brown trout.**

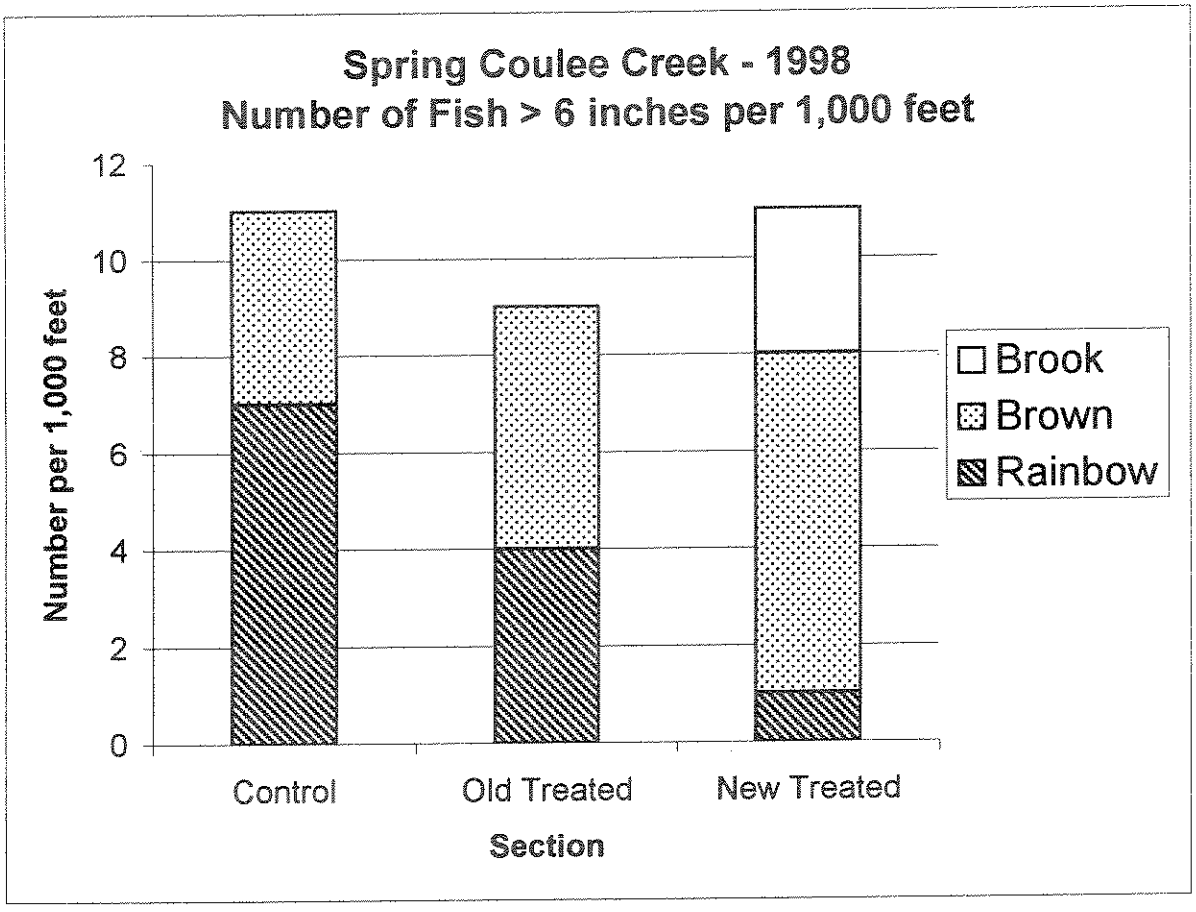

Figure 24. Relative catches (number per 1,000 feet) of rainbow, brown and brook trout in three sections of Spring Coulee Creek in 1998.

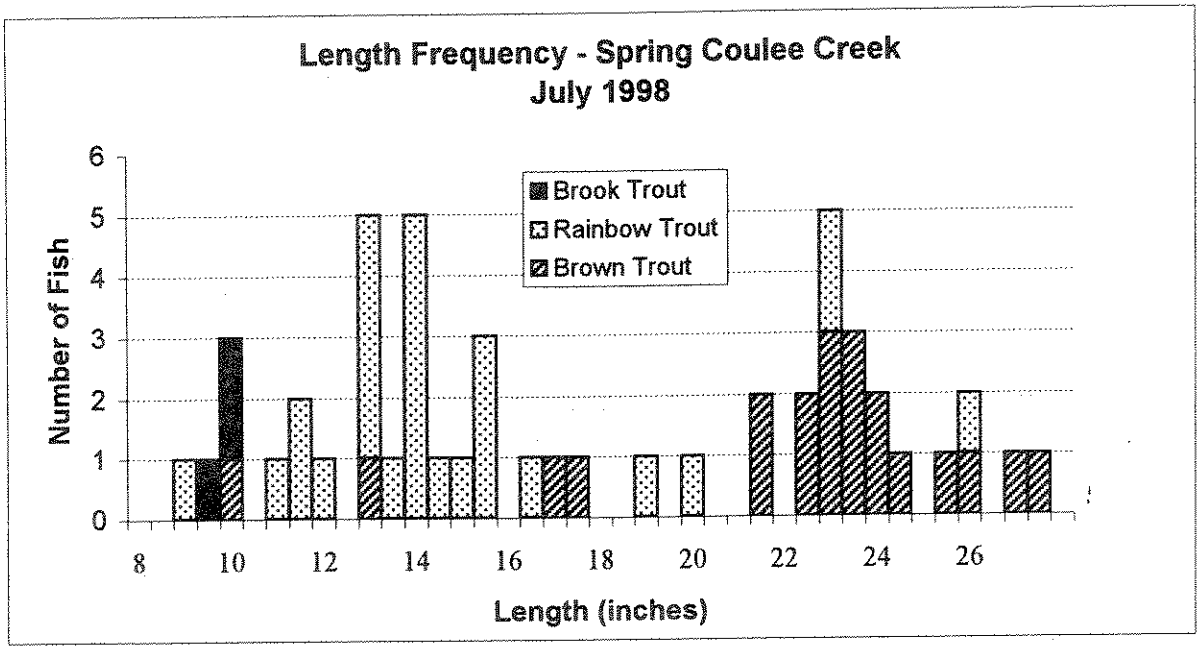

Figure 25. Length frequency for brown, rainbow, and brook trout in three sections of Spring Coulee Creek sampled in July 1998.

Sun River Inventory and Design - Simms to Fort Shaw; Bank Stabilization

WATER NAME: Sun River – Missouri River
DATE PROVIDED BY: Brad Shepard, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: FFI-22-97, FFI-46-97 and FFI-47-97 [Table 3 reference: 19 (1997W); 37 (1997S); 38 (1997S)]

A pilot study to determine the effort needed to estimate fish populations in four sections of the Sun River was conducted during Spring 1997. The four sections were located below Diversion (Alkali Flats Section; 5,275 feet); above the Montana Highway 287 Bridge near Augusta (Augusta Section; 14,390 feet); above the Fairfield Road bridge near Simms (Simms Section; 23,860 feet); and below the Montana Highway 200 bridge at the town of Sun River (Sun River Section; 25,230 feet). Single mark and single recapture electrofishing passes were made in the upper three sections (Alkali Flats, Augusta, and Simms) and a single mark run was made in the Sun River Section. Not enough marked trout were recaptured to make reliable estimates. Combining all trout to derive an estimate resulted in five recaptures for the Augusta Section and six recaptures for the Simms Section. A modified Petersen estimate for all trout estimated that 142 trout (95% CI: $\pm$ 124) 11 inches and longer inhabited the Augusta Section (9.8 per 1,000 feet). The Simms Section supported an estimated 309 (95% CI: $\pm$ 204) trout 11 inches and longer (13.0 per 1,000 feet). No estimate could be made in the Alkali Flats Section. Capture efficiencies were extremely poor in this section due to very deep water. Only 11 brown and two rainbow trout were captured during the marking run (2.1 and 0.4 brown and rainbow trout captured per 1,000 feet, respectively). A total of 29 brown and 5 rainbow trout were captured in the single electrofishing of the Sun River Section (1.1 and 0.2 per 1,000 feet, respectively). All the rainbow trout were longer than 12 inches, while nine brown trout were under 12 inches.

Sampling of these same areas in 1987 and 1988 found similar low abundance of fish (B. Gardner, FWP, Lewistown, files). **Preliminary data indicate that fish densities are relatively low in the Sun River and obtaining reliable mark-recapture population estimates would be difficult, probably requiring at least 30 person-days per section.**

Two Medicine River Drainage

South Fork Dupuyer Creek Vortex Weirs

WATER NAME: South Fork Dupuyer Creek - Two Medicine River
DATE PROVIDED BY: Mike Enk, US Forest Service, Lewis and Clark Forest
DETAILED REPORT CITATION:
MFWP CODE: FFI-23-98 [Table 3 reference: 66 (1998W)]

Construction of this project is planned for 1999. Its goal is to improve habitat for westslope cutthroat trout by restoring over-wintering pools and instream cover lost in episodic flood events. A FS/FWP crew made a pre-treatment population estimate in 1996 using a two-pass depletion population estimate. An estimated 57 (SD: 1.8) westslope cutthroat trout 6 inches and longer occupied a 1,000 feet-long section within the proposed treatment area. Twenty-nine cutthroat trout over 6 inches long were caught in this 1,000 feet-long stream section. The largest captured westslope cutthroat trout was 10.8 inches. **This data will serve as baseline of fish abundance in this proposed treatment area to compare to post-treatment estimates of fish abundance.**

Yellowstone River Drainage

Fleshman Creek Channel Improvement

WATER NAME: Fleshman Creek Channel – Yellowstone River
DATE PROVIDED BY: Joel Tohtz, FWP
DETAILED REPORT CITATION: Tohtz (1996)
MFWP CODE: RRA-30-92

Following the 1992 channel improvement of the lower portion of the Fleshman Creek channel of the Yellowstone River by the Joe Brooks Chapter of Trout Unlimited in cooperation with FWP's RRA program, 20,000 Yellowstone cutthroat trout embryos were planted in the lower Fleshman Creek channel on May 24, 1995. A hatching success of about 75% was estimated for six mesh bags that each contained 100 embryos that were used as an index to estimate hatching success from artificially constructed redds (spawning nests) that contained the remaining 19,400 embryos. If embryos planted in artificial redds hatched at the same rate as those in the mesh bags, a total of about 14,500 fry should have emerged from this plant. This study demonstrated that Yellowstone cutthroat trout could be successfully hatched in the improved segment of the Fleshman Creek channel. Plans to monitor spawning use and success in this channel have not yet occurred due to flood events that occurred in 1996 and 1997 in the Yellowstone River. **Some baseline data have been collected, but further evaluation needs to be done.**

Locke Creek Flow Enhancement

WATER NAME: Locke Creek – Yellowstone River
DATE PROVIDED BY: Leanne Hennessey, MSU
DETAILED REPORT CITATION: Hennessey (1998a and 1998b)
MFWP CODE: FFI-38-96 [Table 3 reference: 29 (1996W)]

Locke Creek supports a spawning run of Yellowstone cutthroat trout from the Yellowstone River. Genetic sampling of out-migrant Yellowstone cutthroat trout fry indicates there is not yet any evidence of introgression (hybridization) with rainbow trout in this spawning population of Yellowstone cutthroat trout (letter from Dr. Robb Leary to Brad Shepard on March 2, 1998, Montana Cooperative Fishery Research Unit files). The FFI project on this stream should improve base flows to provide juvenile cutthroat trout a better chance to emigrate to the Yellowstone River. Emigrating cutthroat trout fry were trapped near the mouth of Locke Creek, and three other tributaries to the Yellowstone River, from 1996 to 1998. This trapping documented the relative number of Yellowstone cutthroat trout fry Locke Creek contributed to the Yellowstone River compared to the three other streams that were also trapped. The magnitude of fry loss to two irrigation ditches was also assessed in 1996 and 1997. From to 6 to 1,800 Yellowstone cutthroat trout fry were captured leaving Locke Creek from 1996 to 1998 (Figure 26). In 1998 only 6 fry were trapped and flows were extremely low, while temperatures

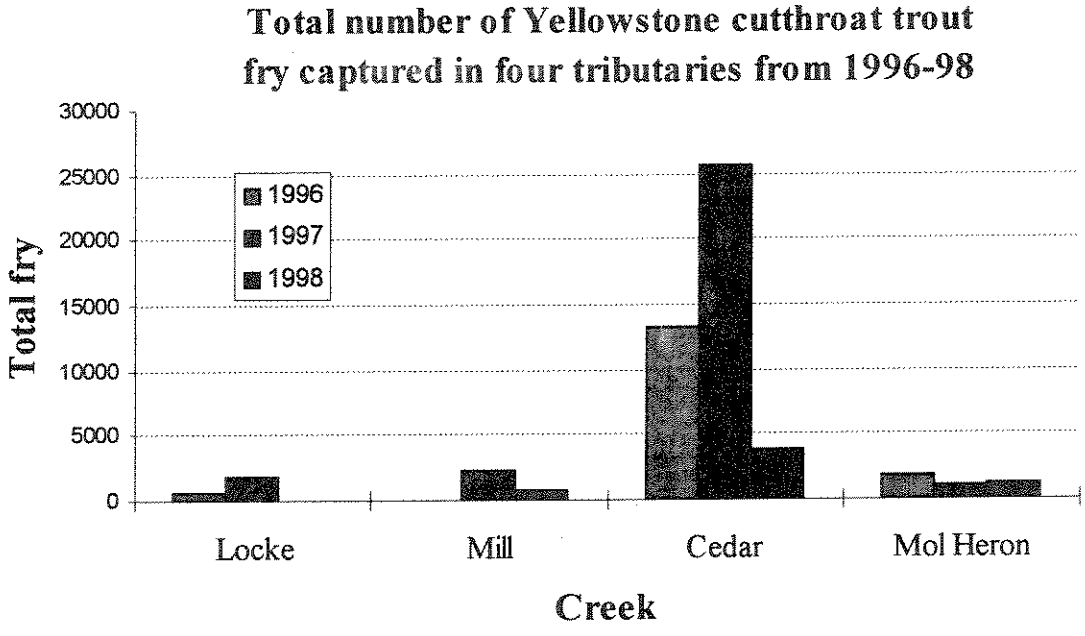

Figure 26. Total number of Yellowstone cutthroat trout fry captured emigrating from Locke, Mill, Cedar, and Mol Heron creeks from 1996 to 1998.

were extremely high in Locke Creek. The stream with the highest numbers of fry emigrating through fry traps was Cedar Creek, where a base flow water lease was in place during this sampling. Mill Creek also had a water lease in place during this sampling, but recruitment appeared to begin responding to increased flows in 1997. **We conclude that the proposed FFI**

project should increase recruitment of Yellowstone cutthroat trout to the Yellowstone River, provided base flows are increased and temperatures decreased as a result of the project.

Mill Creek Barrier and Mill Creek Restoration

WATER NAME: Mill Creek – Yellowstone River
DATE PROVIDED BY: Brad Shepard and Joel Tohtz, FWP
DETAILED REPORT CITATION: Shepard (in prep.)
MFWP CODE: RRA-64-95 and FFI-14-97 [Table 3 reference: 13 (1997W)]

Two mark-recapture population estimates were conducted in a portion of Mill Creek immediately above the fish barrier in 1997 and 1998. In September 1997 a 4,000 feet-long sample section was marked and recaptured using electrofishing. Unfortunately, stream flows were so high that our capture efficiencies were too low to make reliable estimates. In September 1998 we sampled a 4,900 feet-long section by marking fish by angling and "recapturing" fish by observing marked fish via underwater snorkel observations. We marked a total of 22 Yellowstone cutthroat trout 8 to 18 inches long. We observed a total of 46 Yellowstone cutthroat trout 8 to 18 inches long during the snorkel count, 10 of which had been previously marked. This resulted in a population estimate of 99 (SD: 19.8) for the 4,900 feet-long sample section. During the snorkel count we also observed 18 Yellowstone cutthroat trout less than 8 inches long, 18 brook trout, one rainbow trout, and 91 mountain whitefish. The landowner along this portion of the stream has indicated they will be submitting a proposal for FFI funding of a channel restoration project.

The primary purpose of the fish barrier was to prevent the upstream invasion of upper Mill Creek by rainbow trout that could potentially hybridize with genetically pure native Yellowstone cutthroat trout inhabiting the upper drainage. Unfortunately, we captured several trout that appeared to be either pure rainbow trout, or were hybrids between rainbow and Yellowstone cutthroat trout. Several of these fish have been sent in to the Salmon and Trout Genetics Laboratory for genetic analyses to confirm their genetic make-up. We also found that brook trout were present in main Mill Creek in this portion of the stream in relatively low numbers, however, a small spring creek that enters Mill Creek immediately above the barrier supported extremely high numbers of brook trout. **We do not know if the constructed barrier is effective in preventing the upstream invasion of rainbow trout into upper Mill Creek.**

Mol Heron Creek Flow Enhancement and Fish Screen

WATER NAME: Mol Heron Creek – Yellowstone River
DATE PROVIDED BY: Leanne Hennessey, MSU
DETAILED REPORT CITATION: Hennessey (1998a and 1998b)
MFWP CODE: FFI-21-96 and FFI-18-97 [Table 3 reference: 16 (1996W); 16 (1997W)]

Mol Heron Creek supports a spawning run of Yellowstone cutthroat trout from the Yellowstone River. Genetic sampling of out-migrant Yellowstone cutthroat trout fry indicates there has been some introgression (hybridization) with rainbow trout in this spawning population of Yellowstone cutthroat trout (letter from Dr. Robb Leary to Brad Shepard on March 2, 1998,

Montana Cooperative Fishery Research Unit files). The level of introgression is relatively low, but occurred in nearly half the sampled fry. The FFI project on this stream will accomplish three objectives. First, an existing irrigation diversion will be replaced to allow for easier upstream passage of adult cutthroat trout. Second, the number juvenile cutthroat trout presently lost to an irrigation ditch will be reduced by changing the way water is delivered to the ditch. Third, base flows will be released past the diversion to provide juvenile cutthroat trout a better chance to emigrate to the Yellowstone River. Emigrating cutthroat trout fry were trapped near the mouth of Mol Heron Creek, and three other tributaries to the Yellowstone River, from 1996 to 1998. This trapping documented the relative number of Yellowstone cutthroat trout fry Mol Heron Creek contributed to the Yellowstone River compared to the three other streams that were also trapped. The magnitude of fry loss to two irrigation ditches was also assessed in 1996 and 1997. From 1,000 to 2,000 Yellowstone cutthroat trout fry were captured leaving Mol Heron Creek from 1996 to 1998 (Figure 26). About 15% of the fry emigrating down Mol Heron Creek were lost to irrigation ditches in 1996 and 1997. The stream with the highest numbers of fry emigrating through fry traps was Cedar Creek, where a base flow water lease was in place during this sampling. Mill Creek also had a water lease in place during this sampling, but recruitment appeared to begin responding to increased flows in 1997. **We concluded that the proposed FFI project should increase recruitment of Yellowstone cutthroat trout to the Yellowstone River.**

Acknowledgements

Numerous biologists from various agencies and Indian tribes contributed to this report. I would especially like to thank Montana FWP biologists Pat Byorth, Chris Clancy, Bill Gardner, Kent Gilge, Grant Grisak, Paul Hamlin, Bill Hill, George Liknes, Steve Leathe, Jim Magee, Ron Pierce, Pat Saffel, Ron Spoon, and Joel Tohtz; U.S.D.A. Forest Service biologists Mike Enk, Brian Sanborn, and Steve Gerdes; and Kootenai and Salish Tribe biologists Les Everts and Barry Hanson. David Barnes, Greg Pavellas, Adam Sanhow, and Stan Van Sickle Dougheerty assisted with fieldwork.

References

Hennessey, L.E. 1998a. An evaluation of Yellowstone cutthroat trout fry recruitment related to water leases on four tributaries of the Yellowstone River. Master's thesis. Montana State University, Bozeman, Montana.

Hennessey, L.E. 1998b. An evaluation of Yellowstone cutthroat trout fry recruitment related to water leases on four tributaries of the Yellowstone River. Report to Montana Department of Fish, Wildlife and Parks by the Montana Cooperative Fishery Research Unit, Montana State University, Bozeman, Montana.

Hunt, R. L. 1976. A long-term evaluation of trout habitat development and its relation to improving management-related research. Transactions of the American Fisheries Society 105:361-364.

Koopal, M. 1998. Stream habitat analysis of select tributaries to the Blackfoot River, 1998. Report prepared for the Montana Fish, Wildlife and Parks, Missoula.

Peters, D. and R. Spoon. 1989. Preliminary fisheries inventory of the Big Blackfoot River. Montana Department of Fish, Wildlife and Parks, Missoula.

Peters, D. 1990. Inventory of fishery resources in the Blackfoot River and major tributaries, Montana Department of Fish, Wildlife and Parks, Missoula.

Pierce, R. 1991. A stream habitat and fisheries analysis for six tributaries to the Blackfoot River. Montana Department of Fish, Wildlife and Parks, Missoula.

Pierce, R., D. Peters and T. Swanberg. 1997. Blackfoot River restoration progress report. Montana Fish, Wildlife and Parks, Missoula.

Pierce, R., D. Schmetterling and D. McEvoy. (in prep.). Blackfoot River restoration and Monitoring Report 1996-1998. Montana Fish, Wildlife and Parks, Missoula.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado

Schmetterling, D., and R. Pierce. In Review. Success of instream habitat structures after a 50-year flood in Gold Creek, Montana. Ecological Applications.

Schmetterling, D. In-prep. 1998. Timing of seasonal fluvial westslope cutthroat trout movement an implications for management, Montana Fish, Wildlife and Parks, Missoula.

Shepard, B.B. (in prep.). Evaluation of River Restoration and Future Fisheries Improvement projects: 1992-1998. Montana Department of Fish, Wildlife and Parks, Helena, Montana.

Shepard, B.B., R. Spoon, and A. Harper. (in prep.). Restoration of native westslope cutthroat trout populations in Muskrat and White's creeks by physically removing non-native brook trout and enhancing habitat. Manuscript to be submitted as a Research Note to the North American Journal of Fisheries Management.

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

Tohtz, J. 1996. Fisheries investigations in the Yellowstone and Shields River basins, Park County, Montana. Progress Report for Federal Aid to Fisheries Projects F-78-R-1 and F-78-R-2, Montana Department of Fish, Wildlife and Parks, Bozeman, Montana.