FUTURE FISHERIES IMPROVEMENT PROGRAM

REPORT TO THE 2011 LEGISLATURE
AND
FISH, WILDLIFE AND PARKS COMMISSION

Montana Fish, Wildlife & Parks

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Clockwise starting from upper center-

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Acknowledgement sign installed following completion of a channel restoration project on Fleshman Creek, a tributary to the Yellowstone River located near Livingston. The project received funds trough the Future Fisheries Improvement Program.

Excavator removing an earthen berm located in the floodplain of Sauerkraut Creek. The berm was created as a result of past placer mining activities. This reach of altered stream was restored using funds from the Bull Trout and Cutthroat Trout Enhancement Program (HB647). Sauerkraut Creek is a tributary to the Blackfoot River located near the town of Lincoln.

Westslope cutthroat trout from a restored reach of Upper Willow Creek, a tributary to Rock Creek located near the town of Philipsburg . A reach of Upper Willow Creek was restored using Future Fisheries funds.

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MONTANA FISH, WILDLIFE AND PARKS
Fisheries Bureau
Habitat Section

FUTURE FISHERIES IMPROVEMENT PROGRAM
And
BULL TROUT AND CUTTHROAT TROUT ENHANCEMENT PROGRAM

SUMMARY REPORT 2009-2010

INTRODUCTION

The Future Fisheries Improvement Program (HB349, enacted in 1995) 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.*" The Future Fisheries Improvement Program was supplemented in 1999 when the legislature enacted the Bull Trout and Cutthroat Trout Enhancement Program (HB647), which "*provides for the enhancement of Montana bull trout and cutthroat trout populations through voluntary enhancement of spawning areas and other habitat for the natural reproduction of bull trout and cutthroat trout.*"

The enabling legislation for the Future Fisheries Improvement Program calls for Montana Fish, Wildlife and Parks to "*present a detailed report to each regular session of the legislature on the progress of the future fisheries improvement program. The legislative report must include the department's program activities and expenses since the last report and the project schedules and anticipated expenses for the ensuing 10 years' implementation of the future fisheries improvement program.*"

This report summarizes the status of all projects that have been approved since the Future Fisheries Improvement and Bull Trout and Cutthroat Trout Enhancement programs began in 1995 and 1999, respectively. The report also provides a brief narrative description of all projects approved since the last reporting period and identifies the funding source (HB 349 or HB 647) for each of these described projects. Projects that restore habitat damaged by past mining activities and funded since the last reporting period also are identified – Little McCormick, St. Louis and Mattie V creeks in Missoula County, Sauerkraut Creek in Lewis and Clark County and Oregon Gulch in Mineral County. A summary of activities and expenditures associated with the two programs since the last reporting period, as well as project schedules and anticipated expenses for the ensuing 10 years also are provided. Additionally, examples of successfully completed projects funded or partially funded through the two programs are displayed using

before and after photographs. Finally, monitoring results for numerous selected projects are summarized in detail in **Appendix A.**

APPOINTED FUTURE FISHERIES REVIEW PANEL MEMBERS

The enabling legislation calls for the establishment of a Future Fisheries review panel and identifies specific categories of representation, including but not limited to the following:

a) One member who is a representative of conservation districts;
b) One member with expertise in commercial agriculture;
c) One member with expertise in irrigated agriculture;
d) One member from the private sector who is a fisheries restoration professional;
e) Two members who are licensed Montana anglers;
f) One member of the house of representatives, chosen by the speaker of the house;
g) One member of the senate, chosen by the committee on committees;
h) One member with expertise in silviculture;
i) One member who is a Montana high school student;
j) One member with expertise in mining reclamation techniques;
k) One member with expertise in fisheries; and
l) One ex-officio member from the Montana Department of Transportation who has experience in highway impacts mitigation.

Panel members are selected by the Governor or a Governor's designee. Members serve a two year term on the panel and may be re-appointed for additional terms. Members of the review panel serving during this report period are shown in **Table 1**.

Table 1. Future Fisheries review panel members for the period 2009 through 2010.

Category	9/2010	12/2009	6/2009	12/2008
Fisheries biologist	G. Munther	G. Munther	B. Mabbott	B. Mabbott
Rancher, irrigated agriculture	J. Stone	J. Stone	J. Stone	J. Stone
Commercial rancher	A. Johnstone	A. Johnstone	A. Johnstone	A. Johnstone
Mine reclamation	M. Miller	M. Miller	M. Miller	M. Miller
Conservation district	A. Schwend	A. Schwend	A. Schwend	A. Schwend
Restoration professional	W. Gavin	W. Gavin	W. Gavin	T. Sylte
Silviculture - Forestry	G. Frank	G. Frank	G. Frank	R. Steiner
Licensed angler	R. Arnold	R. Arnold	R. Arnold	C. Strainer
Licensed angler	C. Fisher	C. Fisher	C. Fisher	G. Golie
High school student	E. Evensen	E. Evensen	C. Taske	C. Taske
Senator	S. Gallus	S. Gallus	S. Gallus	S. Gallus
Representative	K. Van Dyke	K. Van Dyke	K. Van Dyke	K. Van Dyke
MDT ex-officio	B. Gundrum	T. Martin	T. Martin	T. Martin
Hydrologist	C. Dalby	C. Dalby	C. Dalby	C. Dalby

Panel members during the report period included **Brent Mabbott**, fishery biologist, Butte - replaced by **Greg Munther**, fishery biologist, Missoula; **Jim Stone**, irrigator and rancher, Ovando; **Alan Johnstone**, irrigator and commercial rancher, Wisall; **Dr. Marvin Miller (Chair)**, Bureau of Mines and Geology, Butte; **Ann Schwend**, Ruby Valley Conservation District Supervisor, Sheridan; **Traci Sylte**, stream restoration professional, Missoula - replaced by **Will Gavin**, stream restoration professional, Bozeman; **Ron Steiner**, Plum Creek Timber Company, Columbia Falls – replaced by **Gary Frank**, DNRC, Missoula; **Chris Strainer**, licensed Montana angler, Helena - replaced by **Rick Arnold**, licensed Montana angler, Bozeman; **George Golie**, licensed Montana angler, Great Falls – replaced by **Corey Fisher**, licensed Montana angler, Missoula; **Cale Taske**, high school student, Billings – replaced by **Eric Evensen**, high school student, Choteau; **Senator Steve Gallus**, Butte; **Representative Kendall Van Dyke**, Billings: **Tom Martin** (ex-officio), Montana Department of Transportation, Helena - replaced by **Bonnie Gundrum**, MDT, Helena; and **Chuck Dalby**, hydrologist, Helena.

The Future Fisheries Review Panel met to review proposals and formulate funding recommendations four times since the last report period – January 2009, July 2009, January 2010 and June 2010. During 2009, applications for funding to the Future Fisheries Improvement Program were due before January 1 and July 1 to be considered for the subsequent funding period. In 2010, the application due dates were moved backward one month to December 1 and June 1 to allow for additional time to complete associated environmental assessments prior to final funding decisions being made by the Montana Fish, Wildlife and Parks Commission. The Commission took final action on all proposals recommended for funding or partial funding by the review panel during their regularly scheduled public meetings held in March (for the winter funding cycle) and September (for the summer funding cycle).

Starting in the summer 2010, all submitted applications are being posted on Montana Fish, Wildlife and Parks (FWP) website to provide greater opportunity for public review and comment. Opportunities for public involvement now include attending public meetings of the Future Fisheries Review Panel, attending public meetings of the Montana Fish, Wildlife and Parks Commission, submitting comments on applications that are posted on FWP's website, and/or submitting comments on draft environmental assessments prepared for individual projects.

PROGRAM GOALS

The overall goal for the program is identified in the enabling legislation as "*Providing for the protection and enhancement on Montana fisheries through voluntary enhancement of spawning streams and other habitats for the natural reproduction of fish and growth of populations of wild fish*." The Future Fisheries review panel developed more detailed goals in 1995 with the determination that potential projects must accomplish one or more of the following goals in order to be considered for funding: 1) Improve or maintain fish passage; 2) Restore or protect naturally

functioning stream channels or banks; 3) Restore or protect naturally functioning riparian areas; 4) Prevent loss of fish into diversions; 5) Restore or protect essential habitats for spawning; 6) Enhance stream flow in dewatered stream reaches to improve fisheries; 7) Improve or protect genetically pure native fish populations; or 8) Improve fishing in a lake or reservoir.

PROGRAM STAFFING (HB 349)

The enabling legislation for both the Future Fisheries Improvement Program and the Bull Trout and Cutthroat Trout Enhancement Program authorized the use of program funds for FTE's. HB 349 stated, "*In order to implement (the program) the department may expend revenue from the future fisheries improvement program for up to two additional full-time employees.*" Subsequently, the Department allocated two FTE's to the program. Base license dollars have been utilized to fund these two FTE's and their operations rather than using funds allocated to the Program.

Mark Lere and Linnaea Schroeer were employed as Program staff (HB349) during the report period. Mark has been the Future Fisheries Program Officer since November 1997. He is responsible for reviewing project applications, visiting the sites of proposed projects, acting as staff for the review panel, communicating Department recommendations to the review panel, completing Montana Environmental Protection Act requirements, developing project proposals, coordinating with consultants and contractors who design and perform restoration projects, working with landowners and other citizens who need help in developing project proposals, implementation monitoring and maintaining a comprehensive program database. Linnaea, employed since early 2008, is responsible for gathering and compiling monitoring data associated with measuring the effectiveness and land use compliance of completed projects, as well as preparing the monitoring section of this report (**Appendix A**). She is also responsible for developing and overseeing new habitat projects, with a focus within the Smith River drainage.

PROGRAM STAFFING (HB647)

HB 647 states, "*In order to implement (the program), the department may expend revenue from the bull trout and cutthroat trout enhancement program for one additional FTE and one contractor to assist the review panel.*" The Department has used HB 647 program funds to fill this FTE, which was split among individuals who, as a part of their positions, are required to organize, complete or maintain projects that are eligible for funding under the Bull Trout and Cutthroat Enhancement Program. A contractor was not hired for the report period.

Individuals employed under HB647 for fiscal years 2010 and 2011 included David Moser (0.25 FTE), who is responsible for westslope cutthroat trout restoration efforts in MFWP Region 4 – Great Falls management area; Carol Endicott (0.25 FTE), who is responsible for developing and overseeing new habitat restoration projects for Yellowstone cutthroat trout in the upper and mid-Yellowstone River drainages located in MFWP Regions 3 and 5 – Bozeman and Billings respective management areas; and three individuals who were short term temporary employees

responsible for maintaining fish screens installed in the Bitterroot drainage during the irrigation season (0.10 FTE). Expenditures for operations associated with the Bull Trout and Cutthroat Trout Enhancement Program (HB 647) since the last report (covering from 11/1/08 through 10/31/10) totaled $49,422.75 ($40,675.98 - 02022, EI131; $8,559.63 - 02022, EI150; $187.14 - 02022 EI170).

PROGRAM APPROPRIATIONS

Table 2 provides a summary of appropriations made to the two programs (HB 349 and HB 647) since their inception. This summary includes $510,000.00 specifically earmarked by the 1995 legislature (26306, EI25) for the purpose of constructing a fish screen on the T&Y Diversion to prevent the loss of fish down the irrigation canal. River Restoration dollars (re-directed to HB 349) are derived from a $0.50 earmark on resident fishing licenses and a $1.00 earmark on non-resident fishing licenses. RIT dollars (HB 647) are derived from appropriations from the Resource Indemnity Trust Fund. Since Program inception, appropriations have totaled $6,994.000.00 in Future Fisheries dollars (HB349) and $5,299,655.00 in Bull trout and cutthroat trout enhancement dollars (HB 647), averaging $847,250.00 per biennium (8 biennia) and $883,276.00 per biennium (6 biennia), respectively.

TABLE 2. A summary of legislative appropriations made to the Future Fisheries Improvement Program and the Bull Trout and Cutthroat Trout Enhancement Program (BT/CTT).

SESSION	FUND AND SUBCLASS	AMOUNT
1995	General License, 26306, E125	$510,000.00
	River Restoration, HB5, 26301	$290,000.00
	General License, HB349, 02409, ET30	$220,000.00
	General License, HB349, 02409, ET2	$1,250,000.00
1997	River Restoration, 02149, 28466	$70,000.00
	General License, 02409, E131	$1,310,000.00
1999	River Restoration, 02149, E190	$300,000.00
	General License, 02409, E190	$1,170,000.00
	General License, HB647, 02409, 380I1 (BT/CTT)	$750,000.00[a]
2001	River Restoration, 02149, EI115	$260,000.00
	General License, 02409, EI115	$750,000.00
	RIT, 02022, EI115 (BT/CTT)	$850,000.00
2003	River Restoration, 02149, EI131	$210,000.00
	RIT, 02022, EI131 (BT/CTT)	$700,000.00
2005	River Restoration, 02149, EI150	$190,000.00
	RIT, 02022, EI150 (BT/CTT)	$1,000,000.00

SESSION	FUND AND SUBCLASS	AMOUNT
2007	River Restoration, 02149, EI170	$314,000.00
	RIT, 02022, EI170 (BT/CTT)	$1,000,000.00
2009	River Restoration, 02149, EI109	$150,000.00
	RIT, 02022, EI109 (BT/CTT)	$999,655.00

[a] Beginning in FY-2000, this appropriation was sued to pay for the one FTE and operating expenses that are eligible for the HB 647 source of funding. Additionally, $198,465.00 was spent on habitat projects approved through the program.

PROGRAM PROJECTS AND EXPENDITURES

As of October 31, 2010, the Future Fisheries Review Panel and the Fish, Wildlife and Parks Commission have fully or partially approved funding for 590 projects since the Program began in 1995. Of these, 440 have been completed, 15 are ongoing, 41 are pending and 94 have been cancelled for various reasons (**Table 3**). All Program funding committed to cancelled projects was subsequently reallocated to become available for new habitat projects. Since program inception, approval of Program funded projects has generated approximately $34 million in matching contributions.

TABLE 3. The status of projects funded by the Future Fisheries Improvement Program, by year, as of October 31, 2010.

YEAR	# COMPLETE	# ONGOING	# PENDING	# CANCELLED	TOTAL
1996	41			7	48
1997	39			6	45
1998	39			10	49
1999	43			7	50
2000	36			8	44
2001	27			8	35
2002	34			7	41
2003	32			9	41
2004	31	1		7	39
2005	27			4	31
2006	26	1	1	12	40
2007	32	1	2	1	36
2008	15	3	4	5	27
2009	15	5	9	2	31
2010	3	4	25	1	33
TOTALS	**440**	**15**	**41**	**94**	**590**

Table 4 details all projects that have been approved by the Montana Fish, Wildlife and Parks Commission, excluding cancelled projects, since Program inception. Of these, 343 of the approved projects were funded under HB 349 (Future Fisheries Improvement Program) and 153 of the approved projects were funded under HB 647 (Bull Trout and Cutthroat Trout Enhancement Program). As general categories, the types of projects that the Program has funded since inception are displayed in **Figure 1**. Approximately three quarters of committed Program funds have been directed nearly equally among the categories of riparian restoration and protection, channel restoration, and fish passage. The remaining quarter of the committed funds were directed toward the categories of bank stabilization (8.4%), in-stream flow enhancement (8%), lake and reservoir habitat enhancement (7.7%), as well as 1.8% that didn't fall within any of the above generalized categories.

Narrative descriptions of all projects approved since the last reporting period are presented on pages 20 through 32. Examples of successfully completed projects that show before and after photographs are displayed on pages 33 through 39. **Table 5** details all projects that remain active and includes all expenditures associated with the Program since the last report (November 1, 2008 through October 31, 2010).

ANTICIPATED EXPENSES FOR ENSUING 10 YEARS

Since Program inception (last 15 years), the Montana Fish, Wildlife and Parks Commission has committed, on average, approximately $0.74 million per year to Program habitat enhancement projects. Expenditures for the two report periods November 1, 2006 through October 31, 2008; and November 1, 2008 through October 31 2010 have totaled approximately $1.6 million and $1.56 million, respectively. Assuming appropriations to the Program remain at similar levels as in the past 3 biennia ($1.2 to $1.3 million), we would anticipate expending the total amount appropriated ($1.1 to $1.3 million) per biennium or $5.5 to $6.5 million over the next 10 years. We expect to receive more funding requests for good habitat projects than the Program will receive in appropriations over the next 10 years, assuming appropriations remain at similar levels.

TABLE 4. A listing Future Fisheries Improvement Program Projects and status as of October 17, 2010. Cancelled projects have been removed from this Table. Projects highlighted in bold and italicized were eligible for funding under House Bill 647.

FFI#		PROJECT NUMBER, NAME & YEAR	APPLICANT	EXPECTED YEAR OF COMPLETION
		1996 WINTER FUNDING CYCLE		
001-96	1	Cress Spring Creek Fence	Landowner	Complete
002-96	2	Dunham Creek Fish Screen	FWP/Landowner	Complete
003-96	3	O'Brien Creek Restoration	FWP/Landowner	Complete
004-96	4	Gold Creek Pool Development	FWP/Landowner	Complete
005-96	5	Rock Creek Restoration	Consult/Landowner	Complete
006-96	6	Steel Creek Restoration	FWP/Landowner	Complete
007-96	7	Cottonwood Creek-Dreyer Diversion	FWP/Landowner	Complete
011-96	8	Sweathouse Creek Enhancement	Landowners	Complete
013-96	9	Little Beaver Creek Riparian Fence	Landowner	Complete
014-96	10	Upper Big Hole River Flow Enhancement	USFWS/Landowner	Complete
016-96	11	Whites Gulch Riparian Fence & Revegetation	USFS	Complete
017-96	12	Deep Creek Channel Restoration	FWP/Landowners	Complete
018-96	13	Lake Francis Shoreline Stabilization	Cons. District	Complete
020-96	14	Dick Creek Restoration	USFWS/Landowner	Complete
021-96	15	Mol Heron Creek Flow Enhancement	Landowner	Complete (supplemented by 018-97)
022-96	16	Fort Peck Breakwater - Spawning Reef	ACOE	Complete
024-96	17	Nelson Reservoir Spawning Vegetation	FWP	Complete
025-96	18	Nelson Reservoir Spawning Reef	FWP	Complete
027-96	19	Bear Paw Reservoir Spawning Enhancement	FWP	Complete
028-96	20	Slemmons Pond Dam Removal	FWP	Complete
030-96	21	Big Hole River Channel Restoration	TU/Landowner	Complete
031-96	22	Ruby River Bank Stabilization	FWP/Landowner	Complete
033-96	23	Dry Creek Rehab. & N. Fork Blackfoot	TU/Landowner	Complete
036-96	24	Madison Spring Creek Rehabilitation	Consult/Landowner	Complete
037-96	25	Elk Creek Rehabilitation	USFWS/Landowner	Complete
039-96	26	NCAT - Agrimet Flow enhancement	NCAT	Complete
		1996 SUMMER FUNDING CYCLE		
041-96	27	Prickly Pear Creek Fence & Bank Stabilization	Landowner	Complete
042-96	28	St. Regis River Channel Restoration	FWP/Landowner	Complete
043-96	29	Little Sheep Creek Channel Restoration	USFS	Complete
044-96	30	Cottonwood Creek	FWP	Complete
045-96	31	North Fork Fish Screens	FWP/Landowner	Complete
046-96	32	Blackfoot River Bank Stabilization	Consult/Landowner	Complete
048-96	33	Blanchard Creek Riparian Fence	DNRC	Complete
049-96	34	Elk Creek Assessment	Watershed group	Complete
050-96	35	Beaverhead, Van Camp & Rattlesnake Slough	Landowner	Complete
051-96	36	Bitterroot River Fence	Landowner	Complete
053-96	37	Echo Lake Bass Rearing Habitat	Bassmasters	Complete
054-96	38	Magpie Creek Fish Passage	Landowner	Complete
055-96	39	Teton River Bank Stabilization	Cons. District	Complete
056-96	40	Canyon Creek Bank Stabilization	Landowner	Complete

057-96	41	Missouri River Bank Stabilization	Landowner	Complete
		1997 WINTER FUNDING CYCLE		
001-97	1	Elk Creek Channel Restoration	Watershed group	Complete
002-97	2	Fisher River Channel Restoration	Cons. District	Complete
003-97	3	Stinger Creek Channel Restoration	Cons. Foundation	Complete
004-97	4	Middle Fork Rock Creek Riparian Fence	USFS	Complete
005-97	5	Clark Fork River Riparian Fence	Landowner	Complete
006-97	6	Grantier Spring Creek Channel Restoration	Landowner	Complete
007-97	7	Camp Creek Restoration	TU/Landowners	Complete (adds to 006-1999)
009-97	8	Chamberlain Creek Diversion	FWP/Landowner	Complete
010-97	9	O"Brien Creek Channel Restoration	FWP/Landowners	Complete
011-97	10	N. F. Blackfoot Hoxworth/Williams Fish Screen	FWP/Landowners	Complete
012-97	11	Monture Creek Fish Habitat Enhancement	FWP/Landowner	Complete
013-97	12	Salmon Creek & Dry Creek Habitat Restoration	FWP/Landowner	Complete
016-97	13	Stone Creek Channel Restoration	FWP/Landowner	Complete
017-97	14	Ruby River Channel Stabilization	FWP/Landowner	Complete
018-97	15	Mol Heron Creek Fish Screen - supplement	Landowner	Complete (adds to 021-96)
020-97	16	Black Butte Creek Riparian Fence & Stabilization	USFS/Landowner	Complete
021-97	17	Missouri River Bank Stabilization	TU/Landowner	Complete
022-97	18	Sun River Bank Stabilization Survey	Consult/Landowner	Complete
023-97	19	Elk Creek Bank Stabilization	Consult/Landowner	Complete
024-97	20	Big Spring Creek Restoration	FWP	Complete
026-97	21	Townsend Ranch Streams Restoration	USFS/Landowner	Complete
027-97	22	Bynum Reservoir Spawning Habitat	WU	Complete
028-97	23	Hauser Reservoir Spawning Habitat	WU	Complete
031-97	24	Fresno Reservoir Spawning Habitat	FWP	Complete
		1997 SUMMER FUNDING CYCLE		
033-97	25	Yellowstone River Bank Stabilization	FWP/Landowner	Complete
034-97	26	Mud Creek Channel Restoration	Cons. Foundation	Complete
036-97	27	Rock Creek Channel Restoration	USFS	Complete
037-97	28	Cottonwood Creek Culvert to Bridge Conversion	FWP/County	Complete
038-97	29	McCabe Creek Culvert to Bridge Conversion	FWP/County	Complete
039-97	30	Johnson Creek Culvert to Bridge Conversion	FWP/Landowners	Complete
040-97	31	Gilbert & Shanley Creeks Project Repair	FWP/Landowners	Complete
045-97	32	Mill Coulee Bank Stabilization	Consult/Landowner	Complete
046-97	33	Sun River Channel Survey	Cons. Dist./Consult	Complete
047-97	34	Sun River Bank Stabilization	Consult/Landowner	Complete
050-97	35	Canyon Creek Channel Restoration	NRCS/Landowner	Complete
051-97	36	Boulder River Channel Stabilization	Consult/Landowner	Complete
052-97	37	Careless Creek Bank Stabilization	NRCS/Landowner	Complete
055-97	38	Muskrat Creek Migration Barrier	FWP/USFS/BLM	Complete
056-97	39	Yellowstone River Bank Stabilization	FWP/Landowner	Complete
		1998 WINTER FUNDING CYCLE		
001-98	1	Bear Paw Lake Shoreline Rearing Habitat	FWP	Complete
003-98	2	Beaverhead River Riparian Fencing	USFWS/Landowner	Complete
004-98	3	Big Creek Channel Restoration	Cons. Dist./Consult	Complete
006-98	4	Bynum Reservoir Spawning Habitat	WU	Complete
007-98	5	Canyon Ferry Reservoir Spawning Habitat	WU	Complete

010-98	6	Deep Creek Channel Restoration	FWP/Landowner	Complete
011-98	7	East Fork Bull River Bank Stabilization	FWP/Landowner	Complete
012-98	8	Highwood Creek Bank Stabilization	Consult/Landowner	Complete
013-98	9	Hughes Creek Channel Restoration	USFS	Complete
014-98	10	Kleinschmidt Creek Channel Restoration	Consult/Landowner	Complete
016-98	11	Missouri River Bank Stabilization	TU/Landowner	Complete
018a-98	12	Spring Creek Murphy Diversion Fish Passage	FWP/Landowner	Complete
018b-98	13	North Fork Blackfoot River Haggert Diversion	FWP/Landowner	Complete
018c-98	14	North Fork Blackfoot River Weaver Diversion	FWP/Landowner	Complete
018d-98	15	Blackfoot River Bank Stabilization	FWP/Landowner	Complete
026-98	16	Spring Coulee Riparian Fence & Stabilization	Consult/Landowners	Complete
		1998 SUMMER FUNDING CYCLE		
027-98	17	Big Creek Flow Enhancement	Landowners	Complete
028-98	18	Bear Creek Channel Restoration	TU/Landowner	Complete
029-98	19	Blackfoot River Water Conservation	FWP/Landowner	Complete
030-98	20	Cottonwood & McCabe Cr. Bridges (supplement)	FWP/County	Complete
031-98	21	McCabe Creek Habitat Enhancement	FWP/Landowner	Complete
033-98	22	Nevada Creek Douglas & Helmville Fish Ladders	FWP/Landowner	Complete
034-98	23	Nevada Creek Quigley Fish Ladder	FWP/Landowner	Complete
035-98	24	Nevada Creek Fish Friendly Diversion & Fence	FWP/Landowner	Complete
036-98	25	Nevada Spring Creek Culvert to Bridge Conversion	FWP/Landowner	Complete
037-98	26	Rock Creek Channel Restoration	TU/Landowner	Complete
038-98	27	Shanley Creek Diversion & Riparian Fence	FWP/Landowner	Complete
039-98	28	Wasson Creek Fish Friendly Diversion	FWP/Landowner	Complete
042-98	29	Careless Creek Bridge & Riparian Fence	NRCS/Landowners	Complete
045-98	30	Esp/Chamber Spring Creek Channel Restoration	CD/FWP/Owners	Complete
051-98	31	Ross Fork Rock Creek Fish Ladder	USFS	Complete
052-98	32	Saddle Brook Pond Restoration	WU	Complete
053-98	33	Shields River & Elk Creek Riparian Fence	CD/Watershed Grp.	Complete
054-98	34	Smith Creek Riparian Fence	Landowner	Complete
055-98	35	Spokane Creek Channel Restoration	USFWS/Landowner	Complete
056-98	36	Staubach Creek Fish Barrier	FWP	Complete
057-98	37	Sweetgrass Creek Riparian Fence	Landowner	Complete
059-98	38	Thompson Chain of Lakes Habitat Structures	Bassmasters	Complete
060-98	39	Tiber Reservoir Spawning Habitat	Sportsmen's Club	Complete
		1999 WINTER FUNDING CYCLE		
001-99	1	Big Hole River Stock Water	CD/FWP	Complete
002-99	2	Big Hole River Stock Water	Landowner/FWP	Complete
004-99	3	Butler Creek Fence and Stockwater	Landowner/FWP	Complete
005-99	4	Bynum Reservoir Spawning Habitat	WU	Complete
006-99	5	Camp Creek Channel Restoration	Consult/Landowner	Complete (adds to 007-97)
007-99	6	Coal Creek Riparian Fencing	DNRC	Complete
008-99	7	Cottonwood Creek Bank Stabilization	Landowner/CD	Complete
010-99	8	Douglas Creek Fish Passage	FWP	Complete
012-99	9	Elk Creek (Scherrer) Channel Restoration	Landowner/FWS	Complete
014-99	10	Horseshoe Lake Spawning Habitat	Bassmasters	Complete
018-99	11	Prickly Pear Creek Bank Stabilization	Consult/Landowner	Complete

020-99	12	Rock Creek Water Salvage & Channel Restoration	Landowner/FWP	Complete (supplemented by 015-01)
021-99	13	Ruby River Feedlot Relocation	Landowner/NRCS	Complete
023-99	14	Smith River Stock Water	Landowner/CD	Complete
024-99	15	Sun River Bank Stabilization	Consult/CD	Complete
025-99	16	Tenmile Creek Riparian Habitat	Watershed Group	Complete
026-99	17	Warren Creek Channel Restoration	USFWS	Complete
027-99	18	S. Fork Willow Creek Riparian Fence	Landowner/FWP	Complete
028-99	19	Yellowstone River Huntley Fish Passage	Irrigation District	Complete
		1999 SUMMER FUNDING CYCLE		
030-99	***20***	***Bad Canyon Creek Non-native Fish Removal***	***FWP***	***Complete***
031-99	21	Beaverhead/Poindexter Bank Stabilization	Landowner/FWP	Complete
033-99	***22***	***Big Coulee Creek Fish Barrier***	***FWP***	***Complete***
035-99	23	Canyon Ferry Reservoir Spawning Habitat	FWP	Complete
037-99	***24***	***Cottonwood Creek Fish Barrier***	***FWP***	***Complete***
038-99	***25***	***Cottonwood Creek Fish Ladder Repair***	***TU/FWP***	***Complete***
039-99	***26***	***Daisy Dean Creek Off-site Water and Fencing***	***CDWatershed group***	***Complete***
041-99	27	Elk Creek (Artz) Channel Restoration	Landowner/FWS	Complete
042-99	***28***	***Grave Cr Diversion Repair and Fish Screen***	***CD/FWP***	***Complete***
045-99	29	Little Prickly Pear Cr. Fish Screen	FWP/Landowner	Complete
047-99	30	Lost Creek Corral Relocation	Landowner/FWP	Complete
049-99	***31***	***Monture Creek Habitat Restoration***	***TU/Landowner***	***Complete***
050-99	32	Ninemile Creek Bank Stabilization & Fencing	Landowner	Complete
051-99	33	O-Brien Creek Grade Control Repair	FWP	Complete
052-99	***34***	***Pearson Creek Habitat Restoration***	***TU/Landowner***	***Complete***
053-99	***35***	***Prospect Creek Channel Restoration***	***Watershed group***	***Complete***
054-99	36	Racetrack Creek Riparian Fence & Channel Restoration	Landowner/FWP	Complete
057-99	37	Ronan Spring Cr. Channel Restoration	Community Found.	Complete
058-99	38	Salmo Reservoir Lake Aeration	FWP	Complete
059-99	39	Shields River Bank Stabilization	CD	Complete
060-99	40	Shields River Bank Stabilization	CD	Complete
061-99	41	S. Fk. Smith River Off-Site Water & Fence	Landowner/CD	Complete
063-99	***42***	***Spring Creek Fish Barrier***	***FWP/Landowner***	***Complete***
066-99	43	Staubach Creek Native Fish Protection	FWP/Landowner	Complete
		2000 WINTER FUNDING CYCLE		
002-00	1	Basin Creek Culvert Replacement	CT Foundation	Complete
004-00	2	Upper Big Hole River Offstream Water	Big Hole Watershed	Complete
005-00	3	Bitterroot River Riparian Fence	Landowner	Complete
007-00	4	Bynum Reservoir Spawning Habitat	Walleye Unlimited	Complete
008-00	5	Canyon Creek Riparian Fence	Landowner	Complete
009-00	6	Cottonwood Creek Channel Restoration	NRCS/Landowner	Complete
010-00	***7***	***Cottonwood Creek Fish Barrier***	***USFS***	***Complete***
012-00	8	Dupuyer Creek Channel Restoration	USFWS/Landowner	Complete
013-00	9	East Fork Bull River Channel Restoration	Landowner	Complete
015-00	10	Flint Creek Off-site Water and Riparian Fencing	FWP/Landowner	Complete
017-00	11	Lost Creek Headgate Repair & Channel Restoration	FWP/Landowner	Complete
018-00	***12***	***McCabe Creek Irrigation Efficiency***	***USFWS***	***Complete***
023-00	13	Prickly Pear Creek Channel Restoration	FWP/Landowner	Complete
024-00	***14***	***Prospect Creek Channel Restoration***	***Watershed group***	***Complete***

027-00	15	Ruby Creek Flow Enhancement	USFWS/Landowner	Complete
028-00	16	S.F. Musselshell River Fish Passage	DNRC	Complete
030-00	17	Stillwater River Side Channel Restoration	Landowner	Complete
031-00	18	Sun River Channel Restoration	Consultant	Complete
032-00	19	Sweathouse Creek Fish Screen	FWP/Landowner	Complete
033-00	20	Tenmile Creek Riparian Restoration	Watershed Group	Complete
035-00	21	Virginia Creek Channel Restoration	Landowner	Complete
036-00	22	Warren Creek Channel Restoration	FWP	Complete
037-00	***23***	***West Fork Wilson Creek Fish Barrier***	***FWP***	***Complete***
038-00	24	Yellowstone River Riparian Restoration	Consultant	Complete
		2000 SUMMER FUNDING CYCLE		
041-00	25	Big Creek Fish Screen	Landowner	Complete
042-00	***26***	***Bitterroot River Fish Screen***	***Ditch Company***	***Complete (adds to 033-2002)***
043-00	***27***	***Butler Creek Fish Passage***	***FWP***	***Complete***
044-00	28	Canyon Ferry Perch Spawning Habitat	FWP	Complete
045-00	***29***	***Dempsey Creek Corral Relocation***	***Cons. District***	***Complete***
046-00	30	Kolb Spring Creek Channel Restoration & Fencing	FWP/Landowner	Complete
051-00	***31***	***O'Brien Creek Riparian Fencing***	***FWP***	***Complete***
052-00	32	Poorman Creek Channel Restoration	Consultant	Complete
053-00	33	Silver Butte Fisher Creek Bank Stabilization	NRCS	Complete
056-00	34	Tongue River Riparian Fencing	FWP/Landowner	Complete
058-00	35	Wolf Creek Fish Passage	FWP	Complete
059-00	36	Region 6 Pond Aeration	FWP	Complete
		2001 WINTER FUNDING CYCLE		
005-01	1	Dunkleberg Creek Habitat Enhancement	Landowner/TU	Complete
006-01	2	Elk Creek Channel Restoration	USFWS/Landowner	Complete
007-01	3	Hauser Reservoir Perch Spawning Habitat	FWP	Complete
008-01	***4***	***Marshall and Deer Creeks Fish Screens***	***FWP***	***Complete***
009-01	***5***	***Mill Creek Culvert Replacement***	***Landowners***	***Complete (adds to 020-04)***
010-01	6	Missouri River Riparian Restoration	Landowner/TU	Complete
011-01	7	Pinltar Creek Flow Enhancement	USFWS	Complete
012-01	***8***	***Poorman Creek Flow Enhancement***	***TU/FWP***	***Complete (adds to 047-2002)***
013-01	9	Rattlesnake Creek Side Channel Stabilization	Landowner	Complete
014-01	***10***	***Rock Creek Channel Restoration***	***TU/Landowner***	***Complete***
015-01	11	Rock Creek Supplemental Funding	FWP/Landowner	Complete (adds to 020-99)
016-01	12	Shields River Bank Stabilization	DNRC	Complete
017-01	13	Sixmile Creek Diversion Repair	FWP/Landowners	Complete
020-01	14	Teton River Diversion Stabilization	Watershed group	Complete
022-01	15	White Pine Creek Channel Stabilization	Watershed Group	Complete
023-01	***16***	***Non-native Fish Removal***	***FWP***	***Complete***
		2001 SPECIAL DROUGHT FUNDING CYCLE		
024-01	17	Big Hole River Soil Moisture Meters	Watershed Group	Complete
025-01	18	Blackfoot River Soil Moisture Meters	Watershed Group	Complete
028-01	***19***	***Locke Creek Irrigation Conversion and Lease***	***FWP/Landowner***	***Complete***

		2001 SUMMER FUNDING CYCLE		
031-01	***20***	***Antelope Creek Riparian Fence***	***Landowner/FWP***	***Complete***
032-01	21	Antelope Creek riparian fence and off-site water	Landowner/FWP	Complete
034-01	22	Bitterroot River Riparian Fence	Landowner	Complete
035-01	23	Big Otter Creek Corral Relocation	Landowner	Complete
037-01	24	Boulder River Fish Ladder	Trout Unlimited	Complete
039-01	***25***	***Dunham Creek Channel Restoration***	***FWP***	***Complete***
042-01	26	Nevada Spring Creek Channel Restoration	Landowner/consultant	Complete
049-01	27	Region 6 Pond aeration	FWP	Complete
		2002 WINTER FUNDING CYCLE		
001-02	1	Alderman Spring Creek channel restoration	Landowner/ Consultant	Complete
002-02	2	Beaver Creek diversion repair	FWP	Complete
003-02	***3***	***Beaver Creek channel restoration***	***FWP***	***Complete***
004-02	4	Big Timber Creek channel stabilization	Landowner/ Consultant	Complete
005-02	5	Canyon Ferry perch spawning habitat	FWP	Complete
006-02	6	Chicken Creek flume installation	Landowner/FWP	Complete
007-02	***7***	***Cottonwood Creek off-stream livestock water***	***State forest***	***Complete***
008-02	8	East Boulder River off-stream livestock water	Watershed Group	Complete
009-02	9	Elk Creek spring corral bypass	Cons. District/ Landowner	Complete
011-02	10	Esp-Chambers Spring Creek off-stream water repair	FWP	Complete
012-02	***11***	***Harvey Creek channel restoration***	***FWP***	***Complete***
013-02	12	Hauser Reservoir perch spawning habitat	FWP	Complete
014-02	13	Jefferson irrigation overflow fish migration barrier	Trout Unlimited	Complete
015-02	14	Madison Spring Creek channel restoration	Trout Unlimited	Complete
016-02	15	Mathew Bird Creek bank stabilization	Gallatin Land Trust	Complete
021-02	***16***	***Rattlesnake Creek fish ladder***	***Trout Unlimited***	***Complete***
022-02	***17***	***Rattlesnake Creek fish screens***	***FWP***	***Complete***
024-02	18	Sappington Spring Creek spawning channel	Trout Unlimited	Complete
027-02	***19***	***Stone Creek channel restoration***	***Cons. District***	***Complete***
028-02	20	Ninemile Creek riparian fencing	Landowner/ Trout Unlimited	Complete
		2002 SPECIAL DROUGHT FUNDING CYCLE		
030-02	21	Jefferson River ditch sealing	Trout Unlimited	Complete
		2002 SUMMER FUNDING CYCLE		
033-02	***22***	***Bitterroot River Republican Ditch fish screen***	***FWP***	***Complete/ ongoing maintenance (supplemented by 042-2000)***
034-02	23	Blackfoot River water salvage - stockwater well	Landowner	Complete
035-02	***24***	***Blanchard Creek riparian fence***	***DNRC***	***Complete***
036-02	***25***	***Cedar Creek water lease***	***Landowner/FWP***	***Complete***
039-02	26	East Gallatin River bank stabilization	FWP	Complete
040-02	***27***	***German Gulch channel restoration***	***TU/FWP***	***Complete (reduced scale)***
041-02	***28***	***Locke Creek fish passage***	***GYC***	***Complete***
042-02	29	Marias River habitat enhancement	Sportsmen group	Complete
043-02	***30***	***Marshall Creek woody debris recruitment***	***FWP***	***Complete***
045-02	31	Missouri River bank stabilization repair	FWP/Landowner	Complete

047-02	***32***	***Poorman Creek water salvage and diversion repair***	***TU***	***Complete (adds to 012-01)***
048-02	***33***	***Skalkaho Creek fish screens***	***FWP***	***Complete/ ongoing maintenance***
050-02	34	R-6 Ponds aeration	FWP	Complete
		2003 WINTER FUNDING CYCLE		
002-03	***1***	***Brackett Creek channel stabilization***	***Landowner/consultant***	***Complete***
003-03	2	Canyon Ferry perch spawning habitat	FWP	Complete
004-03	***3***	***Cottonwood Creek fish passage***	***FWP***	***Complete***
007-03	4	Dupuyer Creek channel stabilization	Landowner/FWP	Complete
008-03	***5***	***Elkhorn tributaries non-native fish removal***	***FWP***	***Complete***
009-03	6	Hauser Reservoir perch spawning habitat	FWP	Complete
010-03	***7***	***Laird Creek channel stabilization***	***Landowner***	***Complete***
012-03	***8***	***Lost Creek channel restoration***	***FWP***	***Complete***
013-03	***9***	***Marshall Creek fish passage***	***FWP***	***Complete***
016-03	***10***	***Middle Fork Rock Creek riparian fencing***	***USFS***	***Complete***
017-03	11	Mill Creek channel restoration	Watershed group/NRCS	Complete
018-03	12	McKee Spring Creek channel restoration	Consultant/Landowner	Complete
019-03	13	Nevada Spring Creek channel restoration	Consultant/Landowner	Complete
020-03	***14***	***Poorman Creek fish passage***	***Consultant/Landowner***	***Complete***
024-03	***15***	***Skalkaho Creek Hedge canal siphon***	***FWP***	***Complete/ ongoing maintenance***
025-03	***16***	***Skalkaho Creek Republican canal siphon***	***FWP***	***Complete/ ongoing maintenance***
026-03	***17***	***South Fork Bull River channel stabilization***	***Watershed group***	***Complete***
027-03	***18***	***South Fork Judith River fish passage barrier***	***FWP***	***Complete (supplemented by 016-06)***
028-03	***19***	***Thompson River riparian restoration***	***Plum Creek Timber***	***Complete***
029-03	***20***	***Upper Willow Creek channel restoration***	***FWP***	***Complete***
		2003 SPECIAL DROUGHT FUNDING CYCLE		
030-03	21	Jefferson River ditch sealing	Trout Unlimited	Complete
032-03	22	Sun River ditch sealing	FWP	Complete
		2003 SUMMER FUNDING CYCLE		
036-03	23	Clark Fork River riparian fencing	Landowner	Complete
037-03	24	Deep Creek riparian fencing and off site water	FWP/Landowner	Complete
039-03	25	East Fork Yaak River / Solo Joe Creek fish passage and road stabilization	Watershed group	Complete
042-03	26	Lost Creek channel restoration	FWP	Complete
043-03	***27***	***Marshall Creek riparian fencing***	***FWP/Landowner***	***Complete***
045-03	28	Mill Creek riparian fencing	Land trust	Complete
047-03	***29***	***North Fork Fridley Creek fish passage and water salvage***	***Landowner***	***Complete***
048-03	***30***	***North Fork Horse Creek riparian fencing and off site water***	***Landowner***	***Complete***
051-03	31	Shields River channel stabilization	Conservation district	Complete
053-03	32	Tenmile Creek channel stabilization	County water quality district	Complete
		2004 WINTER FUNDING CYCLE		
003-04	1	Canyon Ferry Reservoir perch spawning habitat	FWP	Complete

004-04	2	Chicken Creek riparian fencing and offsite water	Landowner/FWP	Complete
005-04	3	Clear Creek culvert fish passage	FWP	Complete (supplemented by 005-05)
006-04	4	Deep Creek bank stabilization repair	Cons. District	Complete
007-04	5	Deep Creek off channel livestock water	FWP	Complete
008-04	6	Duck Creek culvert fish passage	FWP	Complete
009-04	***7***	***Emigrant Spring Creek channel restoration***	***FWP/Landowner***	***Complete***
010-04	8	Fishtrap Creek pool habitat enhancement	FWP	Complete
013-04	9	Little Prickly Pear Creek (Sentinel Rock) instream flow enhancement	FWP/Landowner	Complete
014-04	10	Little Prickly Pear Creek (Rocking Z) riparian fencing	FWP/Landowner	Complete
019-04	***11***	***Meadow Creek riparian fence***	***USFWS***	***Complete***
020-04	***12***	***Mill Creek culvert fish passage supplement***	***FWP***	***Complete (adds to 09-01)***
021-04	13	Missouri River riparian plantings	FWP	Complete
022-04	***14***	***North Fork Horse Creek fish passage and flow enhancement***	***Landowner***	***Complete***
023-04	***15***	***Otie Reservoir riparian fencing and offsite water***	***FWP***	***Complete***
024-04	16	Pattee Creek channel re-naturalization	Montana Trout	Complete
026-04	17	Steel Creek riparian fencing	FWP	Complete
028-04	18	Tiber Reservoir perch spawning habitat	Local angler	Complete
029-04	19	Tiber Reservoir perch spawning habitat	Great Falls Walleye Unlimited	Complete
030-04	20	Tongue River T&Y diversion fish passage	FWP	Complete
031-04	21	Uncle George Creek riparian fencing and offsite water	USFS	Complete
033-04	22	Willow Creek riparian restoration	Bitterroot Land Trust	Complete
034-04	23	Willow Springs Creek spawning habitat enhancement	Trout Unlimited	Complete
		2004 SPECIAL DROUGHT FUNDING CYCLE		
035-04	24	Boulder River stock water well	Trout Unlimited	Complete
		2004 SUMMER FUNDING CYCLE		
037-04	***25***	***Blackfoot River drainage fish screen maintenance***	***FWP***	***Complete***
038-04	***26***	***Blackfoot/Clearwater rivers irrigation efficiency***	***FWP***	***Complete***
041-04	***27***	***Dry Creek diversion replacement for fish passage***	***FWP***	***Complete***
044-04	28	Missouri River riparian restoration and fencing	Trout Unlimited/FWP	Complete
045-04	***29***	***North Fork Horse Creek irrigation efficiency and water salvage***	***Landowner***	***Complete***
046-04	***30***	***Therriault Creek channel restoration***	***Watershed group***	***Complete***
047-04	***31***	***Tyler Creek riparian fencing***	***Land trust***	***Complete***
048-04	***32***	***Soda Butte Creek brook trout removal***	***FWP***	***Complete***
		2005 WINTER FUNDING CYCLE		
001-05	1	Antelope Creek channel restoration	Consultant/Landowner	Complete
002-05	***2***	***Ashby Creek channel restoration***	***Land trust/Landowner***	***Complete***
003-05	***3***	***Bad Canyon Creek barrier repair***	***FWP***	***Complete***
004-05	4	Big Hole River fish ladders	FWP	Complete
005-05	5	Clear Creek fish passage supplemental funding	FWP	Complete (Supplemented by 005-04)
006-05	6	Hamilton Slough spawning habitat enhancement	TU/Landowner	Complete

008-05	7	LaMarche Creek pool enhancement	FWP	Complete
009-05	***8***	***LaValle Creek riparian fencing***	***Landowner***	***Complete***
010-05	9	Little Blackfoot River bank stabilization	Landowner	Complete
012-05	10	Nelson/Dana spring creek channel restoration	Landowners	Complete
013-05	11	Parson's slough spawning habitat enhancement	TU	Complete
014-05	***12***	***Pilgrim Creek channel restoration***	***Watershed group***	***Complete***
016-05	13	Region 1 Lakes bass habitat structures	Bass club	Complete
017-05	14	Region 6 ponds aerator maintenance	FWP	Complete
018-05	15	Telegraph Creek riparian and channel restoration	Landowner/Consultant	Complete
019-05	16	Thompson River riparian enhancement	Plum Creek Timber	Complete
020-05	***17***	***Threemile Creek channel stabilization***	***Landowner/Consultant***	***Complete***
021-05	18	Tiber Reservoir perch spawning habitat	WU	Complete
022-05	19	Willow Creek channel restoration	Landowner	Complete
023-05	***20***	***Yellowstone tributaries fish screens***	***FWP***	***Complete***
		2005 SPECIAL DROUGHT FUNDING CYCLE	**No applications submitted**	
		2005 SUMMER FUNDING CYCLE		
024-05	***21***	***Arrastra Creek culvert replacement***	***TU***	***Complete***
025-05	22	Chicken Creek corral removal	Landowner	Complete
026-05	23	Darnutzer Slough channel restoration	Landowner	Complete
030-05	***24***	***Jacobsen Spring Creek channel restoration***	***TU***	***Complete***
031-05	***25***	***Kleinschmidt Creek channel and riparian restoration***	***TU***	***Complete***
032-05	26	Magpie Creek fish passage	FWP	Complete
033-05	***27***	***Piney Creek pool enhancement***	***FWP***	***Complete***
		2006 WINTER FUNDING CYCLE		
002-06	***1***	***Cottonwood Creek culvert replacement***	***TU***	***Complete***
003-06	***2***	***Eustache Creek channel restoration***	***TU***	***Complete***
005-06	3	Little Belt Creek riparian fencing	FWP/Landowner	2010
006-06	4	Little Prickly Pear Creek irrigation efficiency	Landowner	Complete
010-06	5	Missouri River riparian enhancement	FWP	Complete
013-06	6	Rock Creek channel restoration	FWP	Complete
015-06	***7***	***Salmon/Rock creeks riparian restoration***	***Land Trust***	***Complete***
016-06	***8***	***South Fork Judith River fish passage barrier supplement***	***FWP***	***Complete (supplement to 027-03)***
017-06	9	Teton River bank stablilization	FWP	Complete
019-06	***10***	***Upper Willow Creek riparian fencing***	***Land Trust***	***Complete***
020-06	***11***	***Yellowstone tributaries fish screens supplement***	***FWP***	***2011***
		2006 SUMMER FUNDING CYCLE		
021-06	12	Beavertail and Frenchtown ponds woody debris	FWP	Complete
025-06	13	Box Elder Creek channel restoration	Landowner/consultant	Complete
027-06	***14***	***Crooked Creek fish barrier***	***FWP***	***Complete***
029-06	***15***	***Elk Creek bank stabilization and riparian enhancement***	***Landowner/FWP***	***Complete***
030-06	16	Fish Creek channel restoration	TU	Complete
031-06	17	Fishtail Creek corral relocation	Stock association	Complete
032-06	***18***	***Meadow Creek culvert to bridge conversion***	***USFS***	***Complete***
033-06	***19***	***Midas Creek culvert replacement***	***Montana Trout***	***Complete***
034-06	20	Ninemile Creek fish screen	Landowner/NRCS	Complete
036-06	***21***	***Poorman Creek culvert to bridge conversion***	***TU***	***Complete***

037-06	22	Ruby River/Lazyman Creek bank stabilization and riparian enhancement	Watershed group	Complete
039-06	***23***	***Skalkaho Creek Hedge siphon supplement***	***FWP***	***Ongoing maintenance***
040-06	***24***	***Skalkaho Creek Republican siphon supplement***	***FWP***	***Ongoing maintenance***
042-06	***25***	***Trail Creek channel restoration***	***Consultant***	***Complete***
044-06	26	Tiber Reservoir xmas tree perch habitat	FWP	Complete
045-06	27	Wheelbarrow Creek bank stabilization and riparian restoration	Watershed group	Complete
046-06	28	Volney Creek corral relocation	Landowner/Stock Assoc.	Complete
		2007 WINTER FUNDING CYCLE		
001-07	1	Big Hole River riparian restoration	USFWS	Complete
002-07	2	Big Hole River riparian fencing	FWP	Complete
003-07	3	Big Hole River stockwater wells	USFWS	Complete
004-07	4	Blacktail Creek flood mitigation	Beaverhead County	Complete
005-07	***5***	***Collar Gulch channel stabilization***	***FWP***	***Complete***
006-07	6	Dick Creek fish screen	TU	Complete
007-07	***7***	***Goose Creek brook trout removal***	***FWP***	***Complete***
008-07	8	Governor Creek culvert to bridge conversion	USFWS	Compete
009-07	***9***	***Graves Creek habitat & riparian enhancement***	***Watershed group***	***Complete***
010-07	10	Jacobsen Spring Creek channel restoration	TU	Complete
011-07	***11***	***Lake Creek fish barrier***	***FWP***	***2011***
012-07	12	Lincoln Spring Creek channel restoration	TU	Complete
013-07	13	Little Blackfoot River enhancement	Conservation district	Complete supplemented by 013-09
014-07	***14***	***Lolo Creek tributaries culvert replacements***	***Montana Trout***	***Complete***
016-07	15	Poorman Creek culvert to bridge conversion	TU	Complete
017-07	16	Praine Creek riparian fencing and culvert replace	DNRC	Complete
018-07	17	South Fork Ross Creek habitat enhancement	Landowner	Complete
019-07	18	Spring Creek culvert replacement	Conservation district	Complete
021-07	***19***	***Theil Creek fish barrier***	***FWP***	***Complete***
022-07	20	Thompson Creek riparian fencing	MSU	Complete
023-07	***21***	***Yellowstone tribs. screens & ladder supplement***	***FWP***	***2011***
		2007 SUMMER FUNDING CYCLE		
026-07	22	Big Hole River Harrington riparian fencing	FWP	Complete
027-07	23	Big Hole River Huntley diversion restoration	FWP	Complete
028-07	24	Big Hole River Christiansen riparian fencing	FWP	Complete
029-07	***25***	***Cottonwood Creek riparian fencing***	***TU***	***2011***
030-07	26	Fish Creek Klos channel restoration	TU	Complete
032-07	27	Murphy Spring Creek fish screen	TU	Complete
033-07	***28***	***Rock Creek pool enhancement***	***Landowner***	***Complete***
034-07	***29***	***Rock Creek ford to culvert conversion***	***TU***	***Complete***
035-07	30	Rock/Big Lake creeks fish ladders	FWP	Complete
036-07	31	SF Big Swamp Creek channel restoration	USFWS	Complete
037-07	32	Swamp Creek riparian fencing	FWP	Complete
038-07	33	Threemile Creek channel stabilization	Watershed group	Complete
039-07	34	Tiber Reservoir perch habitat	FWP	Complete

042-07	***35***	***Whites Gulch fish barrier***	***FWP***	***Complete***
		2008 WINTER FUNDING CYCLE		
001-08	***1***	***Blackfoot River cross fencing***	***TU***	***2011***
003-08	***2***	***Cedar Creek instream water right purchase***	***FWP***	***Complete***
004-08	***3***	***Cottonwood Creek diversion improvement***	***FWP***	***Complete***
005-08	***4***	***Dunham Creek riparian enhancement***	***TU***	***Complete***
006-08	***5***	***East Fk Bull River channel stabilization***	***Watershed group***	***Complete***
007-08	***6***	***East Fk Rock Creek riparian fencing***	***Land Trust***	***Complete***
008-08	***7***	***Elk creek riparian fence and off-site water***	***TU***	***2011***
009-08	***8***	***Enders Spring Creek channel restoration***	***TU***	***Complete***
010-08	9	Gold Creek irrigation efficiency	Watershed group	2010
012-08	***10***	***Locke Creek fish passage***	***FWP***	***2011***
013-08	***11***	***Meadow Creek culvert to bridge conversion***	***USFS***	***Complete***
014-08	12	Moose/Swamp creeks off-stream water	USFWS	Complete
015-08	***13***	***Morrell Creek fish passage and screens***	***TU***	***Complete***
016-08	***14***	***North FK Highwood Creek fish barrier***	***FWP***	***2010***
017-08	15	Prickly Pear Creek instream flow enhancement	Water Trust	Complete
018-08	***16***	***Thompson River riparian enhancement***	***Consultant***	***Complete***
019-08	***17***	***York Gulch riparian fence & irrigation efficiency***	***USFWS***	***Complete***
		2008 SUMMER FUNDING CYCLE		
020-08	18	Beaver Creek culvert to bridge conversion	FWP	2011
022-08	19	Fish Creek (Hanson) channel restoration	TU	Complete
023-08	***20***	***Deer Creek culvert replacement***	***FWP***	***2011***
025-08	***21***	***Snowbank Creek diversion modification***	***TU***	***Complete***
029-08	***22***	***Whites Gulch fish barrier supplement***	***FWP***	***Complete supplement to 042-2007***
		2009 WINTER FUNDING CYCLE		
001-09	***1***	***Big Creek water lease extension***	***FWP***	***Ongoing***
003-09	***2***	***Cameron Creek channel restoration***	***Landowner***	***Complete***
004-09	***3***	***Dick Creek fencing and off-site water***	***TU***	***2011***
006-09	4	Fleshman Creek channel restoration	Landowner/FWP	Complete
008-09	5	Jack Creek channel restoration	Landowner/consultant	2010
009-09	6	Kalsta Spring Creek spawning habitat	Watershed group	Complete
010-09	***7***	***Kickabuck Spring Creek spawning habitat***	***FWP***	***Complete***
011-09	8	Lake Creek fish passage	Foundation	Complete
012-09	***9***	***Leverich Creek fish barrier***	***FWP***	***2011***
013-09	10	Little Blackfoot River stabilization supplement	CD	Complete supplement to 013-07
014-09	***11***	***Little McCormick Creek mine reclamation***	***TU***	***2011***
015-09	***12***	***Marten Creek bank stabilization***	***Landowner/USFS***	***Complete***
016-09	***13***	***Murphy Spring Cr instream flow enahncement***	***TU***	***Complete***
017-09	***14***	***St. Louis Creek mine reclamation***	***TU***	***2011***
019-09	***15***	***Sauerkraut Creek mine reclamation***	***TU***	***Complete***
020-09	16	Skalkaho Creek bank stabilization	Landowner	Complete
021-09	***17***	***Thompson River riparian enhancement***	***Consultant***	***Complete***
022-09	***18***	***Wigwam Creek riparian fencing***	***Foundation***	***Complete***
		2009 SUMMER FUNDING CYCLE		

023-09	***19***	***Bitterroot River Hedge ditch fish screen***	***Ditch Company***	***2011***
026-09	***20***	***Chamberlain Creek road decommissioning***	***TU***	***2011***
027-09	***21***	***Elkhorn Creek fish barrier***	***FWP***	***2011***
030-09	22	Fortine Creek riparian fence	FWP	Complete
032-09	***23***	***N. Fk. Fridley Creek instream flow lease***	***TU***	***2011***
033-09	24	N. Fk. Smith River riparian fence	FWP	Complete
034-09	***25***	***Piney Creek diversion modification***	***FWP***	***2010***
035-09	26	Prickly Pear Creek fish ladder	FWP	2010
036-09	27	Racetrack Creek riparian fencing	Watershed group	2011
039-09	28	Tributary Creek corral removal	Watershed group	Complete
040-09	29	Warm Springs Creek culvert to bridge	USFS	2011
		2010 WINTER FUNDING CYCLE		
001-10	1	Big Hole River off-channel stock water	USFWS	2011
002-10	***2***	***Braziel Creek channel restoration***	***TU***	***2011***
003-10	***3***	***Cottonwood Creek fish barrier***	***FWP***	***2010***
004-10	***4***	***Dry Cottonwood Creek riparian fencing***	***Watershed group***	***2011***
005-10	5	Fleshman Creek flood control	Park County	2011
007-10	6	Hellroaring Creek channel stabilization	Nature Conservancy	2011
009-10	7	Lincoln Spring Creek culvert fish passage	TU	2011
011-10	***8***	***Lower Deer Creek fish barrier***	***FWP***	***2011***
012-10	9	Mandeville Creek channel restoration	High School	2011
013-10	***10***	***Mattie V Creek mine reclamation***	***TU***	***2011***
014-10	***11***	***NF Highwood & Smith Cr fish barrier supplement***	***FWP***	***2011 supplement to 016-08***
015-10	12	N. Fk. Smith River riparian fence	FWP	Complete
017-10	13	Madison & O'Dell Creek riparian fencing	Foundation	Complete
018-10	***14***	***Oregon Gulch mine reclamation***	***TU***	***2011***
019-10	***15***	***Peterson Creek riparian fencing***	***Watershed group***	***2011***
021-10	16	Rocky Reef Spring Cr channel restoration	Consultant	2011
022-10	***17***	***Sauerkraut Cr culverts to bridges conversion***	***TU***	***2011***
023-10	18	Skalkaho Creek channel stabilization	Landowner/consultant	2011
024-10	19	S. Fk. Smith River riparian fence	FWP	Complete
025-10	***20***	***Tin Cup Creek in-stream flow enhancement***	***Landowner/Water Trust***	***2011***
026-10	***21***	***Vermillion River channel stabilization***	***Watershed group***	***2011***
		2010 SUMMER FUNDING CYCLE		
027-10	22	Bear Creek culvert fish passage	TU	2011
028-10	23	Big Spring Creek channel restoration	FWP	2011
031-10	24	Cow Creek dam enhancement & instream flow	FWP	2011
033-10	***25***	***Harvey Creek riparian fence***	***Landowner/consultant***	***2011***
034-10	26	Magpie culvert fish passage	FWP	2011
037-10	27	Nevada Creek fish screen	TU	2011
038-10	28	Nevada Creek channel restoration	TU	2010
039-10	***29***	***N. Fk. Frazier Creek culvert fish passage***	***TU***	***2011***
040-10	30	Poindexter Slough channel restoration & flow	Watershed group	2011
041-10	***31***	***Trout Cr woody debris & riparian enhance***	***TU***	***2011***
043-10	***32***	***Wyman Gulch culvert fish passage***	***Clark Fork Coalition***	***2011***

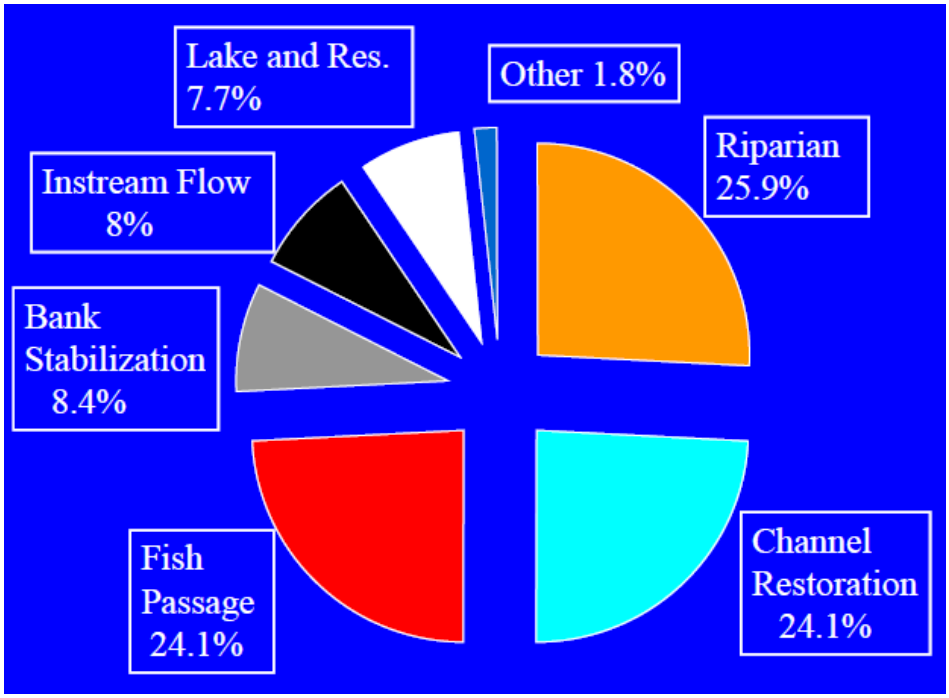

Figure 1. Generalized categories of project types that have been funded by the Future Fisheries Improvement Program since inception beginning in 1996.

NARRATIVE DESCRIPTION OF PROJECTS FUNDED SINCE LAST REPORT PERIOD (2009 THROUGH 2010)

Project Descriptions – 2009

(Italicized projects receive funding from HB647 because they restore habitat for bull trout and/or cutthroat trout)

1. ***Big Creek In-stream Flow Water Lease.*** Big Creek (Park County) is a vital tributary to the upper Yellowstone River that provides substantial recruitment of Yellowstone cutthroat trout to the river. However, lower Big Creek was commonly dewatered during the irrigation season prior to a significant water conservation project and a couple of associated water leases that were completed in 1999/2000 (substantially funded by the Future Fisheries Improvement Program). The current 10 cfs lease on this very successful project is set to expire in the Spring 2009. This project involves renewal of the 10 cfs lease for an additional 10 years. **Ongoing.**

2. ***Cameron Creek Channel Restoration.*** Cameron Creek (Ravalli County), a tributary to the East Fork Bitterroot River, supports a mixed salmonid fishery, including documentation of fluvial bull trout. A 450-foot reach of the stream historically was channelized and flowed in a ditch paralleling the highway. This project involved moving the ditched channel away from the highway and reconstructing an appropriate dimension, pattern and profile. **Completed.**

3. ***Dick Creek Riparian Fencing and Off-site Stock Water.*** Dick Creek (Powell County), a tributary in the Blackfoot drainage, supports a mixed salmonid fishery including a genetically

pure fluvial westslope cutthroat trout population. Lower Dick Creek has been the focus of numerous successful habitat restoration efforts in the past. A habitat restoration effort currently is being planned for upper Dick Creek, but improvements in grazing management need to be implemented prior to the planned work. This project involves the installation of cross fencing and several off-site stock water tanks to create a 4-pasture rest rotation grazing system. **Pending.**

4. Fleshman Creek Channel Restoration. Fleshman Creek (Park County), a tributary to the Yellowstone River near Livingston, supports a mixed salmonid assemblage. Portions of the stream have been substantially degraded as a result of channelization and historic overgrazing by livestock. This project involved restoring a 2,400-foot stream reach, as it flows through the Voyich Ranch, by reconstructing a relatively narrow, deep and sinuous channel and by re-vegetating the riparian corridor. The restored stream channel and streamside areas were protected with riparian fencing and the installation of off-site water for livestock. **Completed.**

5. Jack Creek Channel Restoration. Jack Creek (Madison County), a tributary to the Madison River near Ennis, supports a brown trout and rainbow trout fishery. Portions of the stream, as it flows through the Jack Creek Ranch, were channelized in the past. The original project, approved for $20,000 in program funding in January 2005, called for returning the stream to its historic channel located to the south of the existing ranch road, which acts as a floodplain berm. Due to design issues, the applicant now has changed the location of the new channel to the north of both the road and existing channel and re-submitted a revised application**.** **Pending.**

6. Kalsta Spring Creek Spawning Habitat Enhancement. Kalsta Spring Creek (Madison County), a tributary to the Big Hole River near Melrose, had the potential to provide spawning and rearing habitat for rainbow trout and brown trout. However, the spring creek complex had been degraded from past overgrazing by livestock and high water events in the Big Hole River. This project called for constructing a new 1,650-foot spawning channel that bypasses existing pond areas and flows directly into the river. The project also involved reconfiguring existing slough areas into a series of interconnected ponds. The landowner recently fenced the riparian areas. **Completed.**

7. *Kickabuck Spring Creek Spawning Habitat Enhancement.* Kickabuck Spring Creek (Sweet Grass County), a tributary to the Yellowstone River near Big Timber, had the potential to provide spawning and rearing habitat for Yellowstone cutthroat trout. Past livestock grazing practices contributed to the degradation of the existing channel. This project involved narrowing and deepening the existing channel, increasing sinuosity, and placing appropriately sized gravel to create approximately 1,400 feet of spawning and rearing habitat. The lessees are in the process of developing a grazing management strategy to protect the stream. **Completed.**

8. Lake Creek Fish Passage Enhancement. Lake Creek (Madison County), a tributary to the West Fork Madison River, supports a brown trout fishery. A small earthen dam, constructed in 1979 to provide hydraulic head for a stock water system, created a partial fish passage barrier for upstream migrating fish. This project called for removal of make-shift materials at the dam to provide for fish passage and the installation of a well and pipeline to provide an alternative water source for a nearby grazing allotment. **Completed.**

9. ***Leverich Creek Non-Native Fish Barrier.*** Leverich Creek (Gallatin County), a tributary to Bozeman Creek near Bozeman, supports a nearly genetically pure westslope cutthroat trout population. This population currently is threatened by the presence of non-native trout in downstream waters. This project involves construction of an upstream fish passage barrier located at an existing road crossing to prevent further invasion by non-native fish. **Pending.**

10. Little Blackfoot River Channel Stabilization Supplement. The Little Blackfoot River (Powell County) supports a mixed salmonid fishery. The river, as it flows through the RV Ranch, was degraded during the past from man-caused channel manipulations and overgrazing by livestock. This project, previously approved for program funding in January 2007, called for additional funding to increase habitat diversity and enhancing riparian integrity along a 2.6-mile reach of the river. **Completed.**

11. ***Little McCormick Creek Mine Reclamation.*** Little McCormick Creek (Missoula county), a tributary in the Ninemile Creek drainage, supports a westslope cutthroat trout population that is suspected to be genetically pure. **Past placer mining** has degraded a portion of the stream by confining the channel with dredge piles, simplifying channel structure, and causing the loss of riparian vegetation within disturbed areas. This project calls for the removal of dredge tailings from the floodplain, reconstruction of disturbed reaches of the stream channel and re-vegetation of the riparian corridor. **Ongoing.**

12. ***Marten Creek Channel Stabilization.*** Marten Creek (Sanders County), a tributary to Noxon Reservoir, supports a mixed salmonid assemblage, including westslope cutthroat trout and bull trout. High spring runoff during 2008 resulted in channel degradation in the form of accelerated bank erosion, subsequent downstream channel braiding and the loss of fish habitat complexity on several reaches of the stream. This project called for restoration of about 1,500 feet of stream channel by reconstructing the floodplain and installing grade control/energy reducing structures. **Completed.**

13. ***Murphy Spring Creek In-stream Flow Enhancement.*** Murphy Spring Creek (Powell County), a tributary to the North Fork Blackfoot River, supports westslope cutthroat trout and juvenile bull trout have been found rearing near its mouth. Presently, a diversion severely dewaters the lower 1.7 miles of the spring creek during the irrigation season. This project involved purchasing 2.2 cfs of water to maintain a minimum in-stream flow during the 2009 irrigation season, with plans to enter into a 10-year lease beginning in 2010. **Completed.**

14. ***St. Louis Creek Mine Reclamation.*** St. Louis Creek (Missoula County), a tributary to Ninemile Creek, supports a westslope cutthroat trout population. **Past strip mining** activities have degraded a portion of the stream by creating heavy-metal laden water, accelerated run-off and subsequent erosion and a simplified channel confined by piles of waste rock. This project involves the removal of waste rock from the floodplain and the reconstruction of portions of both the main-stem and east fork. **Pending.**

15. ***Sauerkraut Creek Mine Reclamation.*** Sauerkraut Creek (Lewis and Clark County), a tributary to the Blackfoot River, supports a mixed salmonid fishery including genetically pure westslope cutthroat trout and bull trout. Portions of Sauerkraut Creek historically were degraded

as a result of **placer mining**. This project involved reconstructing about one mile of channel to a proper form, reconnecting it to the floodplain and re-vegetating the riparian corridor. **Completed.**

16. Skalkaho Creek Bank Stabilization. Skalkaho Creek (Ravalli County), a tributary to the Bitterroot River, supports a mixed salmonid fishery. The 2008 spring runoff event created some accelerated bank erosion on the Gregory Chester and Robert Sheahan properties. This project called for stabilizing approximately 150 feet of actively eroding stream bank by constructing a bank-full bench using 4 logjams. **Completed.**

17. *Thompson River Riparian Enhancement.* The Thompson River (Sanders County) supports a mixed salmonid fishery, including westslope cutthroat trout and bull trout. Historic land clearing, livestock overgrazing and the invasion by non-native reed canary grass have resulted in the loss of woody riparian vegetation along portions of the river. Previously completed projects successfully have begun to re-established native shrubs along the river. This project called for installing additional browse protectors around native shrubs to enhance their chance for survival. **Completed.**

18. *Wigwam Creek Riparian Fencing.* Wigwam Creek (Madison County) supports a slightly hybridized westslope cutthroat trout population. Historic grazing practices have degraded portions of both the main stem and south fork of the stream. This project involved installing riparian fencing to create grazing exclosures on approximately 1.2 miles of channel, and developing alternative livestock watering facilities outside of the riparian corridor. **Completed.**

19. *Bitterroot River Hedge Ditch Fish Screen.* The Bitterroot River (Ravalli County) supports a very popular recreational fishery in western Montana, providing fishing opportunities for rainbow trout, brown trout, westslope cutthroat trout and mountain whitefish. The river also supports a remnant population of bull trout. The Hedge diversion, located about 9 miles upstream from the town of Hamilton diverts approximately 140 cubic feet per second of water for irrigation purposes and entrains an unknown number of fish. This project calls for designing and constructing a fish screen down-canal from the head of the diversion to eliminate the loss of fish into the ditch. Installation of a fish screen would be done in concert with re-building the existing diversion structure, which is failing, with the use of a separate source of funds. **Pending.**

20. *Chamberlain and Bear Creeks Road De-Commissioning.* Chamberlain and Bear creeks (Powell County), tributaries in the Blackfoot drainage located near Clearwater Junction, support nearly genetically pure fluvial westslope cutthroat trout populations. These drainages and several others will soon enter into public ownership with the aid of the USFWS Native Fish Habitat Conservation Plan, where Montana DNRC will become the ultimate owner with FWP holding a conservation easement. An existing road system encroaches on about 5.5 miles of the two streams, contributing to over-simplified aquatic habitat, sediment delivery and a corresponding reduction in spawning and rearing habitat quality. This project involves the deconstruction of about 5.5 miles of existing road located within the riparian corridor, re-construction of 2.3 miles of existing sub-standard upland road and construction of 2.8 miles of new upland road. **Pending.**

21. ***Elkhorn Creek Non-Native Fish Barrier.*** Elkhorn Creek (Lewis and Clark County County), located on FWP's Beartooth Game Range, is a tributary to Willow Creek and ultimately Holter Reservoir. A fish barrier was installed on the lower reach of this stream in 1972 to restore a genetically pure population of westslope cutthroat trout. This barrier appeared to be successful in preventing non-native rainbow trout and brook trout from entering the system through about 2002. Since 2002, however, sampling has indicated that rainbow trout have moved over the barrier and have hybridized with the westslope cutthroat trout population. Due to existing site conditions and to the difficulty of removing hybridized fish over 5 miles of complex habitat, a new barrier site further upstream will be constructed. **Pending.**

22. Fortine Creek Riparian Fencing. Fortine Creek (Lincoln County), a tributary to the Tobacco River, supports a mixed salmonid fishery. The stream, as it flows through the Peters Ranch, displayed a loss of woody riparian vegetation and associated accelerated bank erosion due to past overgrazing by livestock. This project called for re-establishing an old failed riparian fence, constructing a hardened livestock water gap, and placing browse protectors on existing shrubs. **Completed.**

23. ***North Fork Fridley Creek In-stream Flow Lease.*** North Fork Fridley Creek (Park County), a tributary to the Yellowstone River near Emigrant, was the site of a former successful Future Fisheries project that involved restoring stream connectivity to the Yellowstone River and enhancing in-stream flow by creating salvaged irrigation water and protecting it with an in-stream lease. Yellowstone cutthroat trout are now using the stream for spawning and rearing. To further protect in-stream flow in North Fork Fridley Creek, this project proposes to lease a series of water rights owned by the Church Universal and Triumphant and dedicate the entire amount of 95.4 acre-feet to in-stream flow. Although these water right claims have not been used for irrigation purposes in recent years, this proposed lease would prevent resumption of a consumptive use and further protect the investment in restoration that has been made on the stream. **Pending.**

24. North Fork Smith River Riparian Fencing. The North Fork Smith River (Meagher County), a tributary to the Smith River located near White Sulphur Springs, supports rainbow trout, brown trout and brook trout. Past livestock grazing practices on the Zehntner Ranch have contributed to the degradation of the existing channel. This project involved installation of approximately 1 mile of riparian fencing on both sides of the channel to restore bank integrity and enhance riparian vegetation. Livestock will be excluded from the riparian area for five years. **Completed.**

25. ***Piney Creek Diversion Modification.*** Piney Creek (Carbon County), a tributary to Sage Creek located in the Pryor Mountains, supports a remnant, genetically pure Yellowstone cutthroat trout population. This Yellowstone cutthroat trout population is one of the eastern most cutthroat trout populations found in Montana. Past overgrazing by livestock within the riparian corridor and dewatering from irrigation diversions have severely degraded the aquatic habitat in the stream. This project will enhance Yellowstone cutthroat trout habitat by installing rock and log features to increase the number of pools, installing riparian fencing to exclude livestock within the riparian corridor, and constructing a pond and an associated series of three screened standpipes to reduce entrainment into the irrigation system and create additional holding water for these rare fish. **Pending.**

26. Prickly Pear Creek Fish Ladder. Prickly Pear Creek (Lewis and Clark County), a tributary to Lake Helena near the city of Helena, supports brown trout, rainbow trout and brook trout. The stream has been severely degraded in the past from mining activities, dewatering from irrigation, fish migration barriers, channelization and livestock over-grazing. Several past restoration efforts to enhance habitat and in-stream flows have proven to be successful. With improving habitat conditions, an existing irrigation diversion located on the Burnham Ranch has been identified as a partial fish migration barrier to brown trout and rainbow trout. This project involves the installation of a Denil-style fish ladder on the diversion. **Pending.**

27. Racetrack Creek Riparian Fencing. Racetrack Creek (Powell County), a tributary to the Clark Fork River located near Deer Lodge, supports a mixed salmonid fishery. The stream, as it flows through the Five Rockin Angus Ranch, has been degraded during the past from dewatering and livestock use. This project involves the installation of about 3.1 miles of riparian fencing, creating a 300-acre riparian pasture. Two hardened livestock crossings also would be constructed. The proposal calls for 2 years of excluding livestock followed by a grazing plan involving 1 month of late summer grazing by 50 cow-calf pairs. **Ongoing.**

28. Tributary Creek Corral Relocation. Tributary Creek (Madison County), a tributary to the East Fork Ruby River, supports hybrids of westslope cutthroat trout and rainbow trout, as well as brown trout and brook trout. The stream also has been proposed for arctic grayling re-introductions. A livestock handling facility located on USFS lands resulted in water quality degradation and the loss of fish habitat, primarily due to associated streamside patterns of cattle movement. This project involved relocating the 5 acre sorting corral facility from its current location on the north side of the stream to a new upland site located about one mile south. The project also called for the construction of two hardened water gaps on the stream. **Completed.**

29. *Warm Springs Creek Culver to Bridge Conversion.* Warm Springs Creek (Ravalli County), a tributary to the East Fork Bitterroot River near Sula, supports westslope cutthroat trout and bull trout populations. The cutthroat trout are hybridized with rainbow trout in the lower reaches of the stream and are genetically pure in the upper reaches. A USFS culvert located about one mile upstream from the mouth currently acts, at the least, as a partial migration barrier to the upstream movement of juvenile trout and adult bull trout. This project involves replacing the existing undersized and perched culvert with a 50-foot long bridge. **Pending.**

<u>Project Descriptions – 2010</u>
(Italicized projects receive funding from HB647 because they restore habitat for bull trout and/or cutthroat trout)

1. Big Hole River Off-channel Stock Water. The Big Hole River (Beaverhead County) supports Montana's last remaining fluvial Arctic grayling population. This project calls for a new stock water well that would be used to replace the need to leave an irrigation diversion from the Big Hole River open after the irrigation season. The landowner associated with this project, Martin Jackson, has voluntarily enrolled in a Candidate Conservation Agreement with Assurances for fluvial Arctic grayling in the upper Big Hole River. The project is expected to result in a water savings for in-stream flow purposes during the late summer and fall totaling an

additional 2 to 8 cubic feet per second in the Big Hole River. The project is part of a much larger effort (50 stockwater wells developed in the past) intended to improve in-stream flows in the upper Big Hole River. **Pending.**

2. *Braziel Creek Channel Restoration.* Braziel Creek (Powell County), a tributary to Nevada Creek located downstream of Nevada Creek Reservoir, supports a westslope cutthroat trout population that is slightly hybridized with rainbow trout. A portion of the stream on the Wade Stitt and Skip Johnson ranches has been degraded in the past through channelization and over-grazing by livestock. This project calls for reconstructing about 1,500 feet of the stream with a step-pool design, replacing an undersized culvert, installing a fish screen on an irrigation diversion, installing riparian fencing and implementing a riparian grazing management plan. **Pending.**

3. *Cottonwood Creek Non-native Fish Barrier.* Cottonwood Creek (Lewis and Clark County); a tributary to Holter Reservoir located on Montana Fish, Wildlife and Parks Beartooth Wildlife Management Area; was recently restored to a genetically pure westslope cutthroat trout population. Associated with this restoration effort, a concrete fish barrier was constructed in 2000 using, in part, Future Fisheries dollars. The original barrier remains functional but is at risk for passing brook trout and rainbow trout during high spring runoff events. This project called for replacing the existing at risk barrier with a new fish migration barrier. **Completed.**

4. *Dry Cottonwood Creek Riparian Fencing.* Dry Cottonwood Creek (Deer Lodge County), a tributary to the Clark Fork River located near Deer Lodge, supports a westslope cutthroat trout population that is slightly hybridized with rainbow trout. The stream, as it flows through a series of five different landowners (including the U.S. Forest Service and Montana school trust), has been degraded from overgrazing by livestock, dewatering and fine sediment input from roads. This project calls for installing riparian fencing along six miles of the stream, creating a series of new riparian pastures. The project also calls for implementing changes in riparian grazing management. **Pending.**

5. Fleshman Creek Flood Control. Fleshman Creek (Park County), a tributary to the Yellowstone River near Livingston, supports a mixed salmonid assemblage. The lower 2.7 miles of the stream have been severely degraded due to urbanization within the city of Livingston. This proposed project would be a part of a much larger FEMA-funded flood control project, and involves restoring this reach of Fleshman Creek to a more natural and flood resistant state by replacing undersized culverts, removing point and non-point sources of pollution, narrowing over-widened portions of the channel and incorporating bank stabilization and re-vegetation. The project specifically calls for stabilizing a 3,050-foot reach of stream using encapsulated soil lifts, followed by the placement of spawning gravel. **Pending.**

6. Hellroaring Creek Channel Stabilization. Hellroaring Creek (Beaverhead County), a tributary to Red Rock Creek and ultimately Upper Red Rock Lake, supports an adfluvial population of Arctic grayling. The stream flows out of the Centennial Mountains and onto a classic active alluvial fan. The stream has been degraded in the past from alterations of flow paths on the fan and from blockages created by a road passing perpendicularly across the fan. Additional degradation activities have included over-grazing by livestock and the active removal of riparian willow; and the elimination of the beaver population. This project calls for

implementing Phase 2 of a three-phase project involving the stabilization of 2,984 feet of eroding stream bank and partially restoring flow path distributions at the apex of the fan. Treatments include re-sloping eroding banks and then stabilizing with sod mats and intensive willow plantings. Additional extensive plantings would occur on other reaches of the stream. **Ongoing.**

7. Lincoln Spring Creek Culvert Fish Passage Enhancement. Lincoln Spring Creek (Lewis and Clark County), a tributary to Keep Cool Creek and ultimately the Blackfoot River located near Lincoln, supports a mixed salmonid fishery. Currently, an existing county road crossing located about 1 mile upstream from the mouth acts as a partial fish migration barrier. This project calls for replacing an undersized and perched concrete culvert with a much larger structural plate bottomless arch culvert. **Pending.**

8. *Lower Deer Creek Non-native Fish Barrier.* Lower Deer Creek (Sweet Grass County), a tributary to the Yellowstone River located near Big Timber, supports a genetically pure population of Yellowstone cutthroat trout in the headwaters. Sampling for genetic integrity over the past several years has shown the population to be under threat of hybridization. This project calls for the construction of a fish migration barrier on a section of state land that would secure approximately 7 miles of cutthroat trout habitat. **Pending.**

9. Mandeville Creek Channel Restoration. Mandeville Creek (Gallatin County) is a small urban tributary to the East Gallatin River flowing through the city of Bozeman that supports a mixed salmonid fishery. This urban stream has been severely degraded in the past by channelization, culvert placements, the removal of riparian vegetation and urban runoff. This project calls for restoring about 1,200 feet of the channel by constructing an inset floodplain, creating meanders and associated pool and riffle habitat, day lighting 150 feet of the stream currently in a culvert, and replacing non-native riparian vegetation (Kentucky bluegrass) with native grasses, shrubs and trees. **Pending.**

10. *Mattie V Creek Mine Reclamation.* Mattie V Creek (Missoula County), a headwater tributary to Ninemile Creek, supports brook trout and westslope cutthroat trout populations. **Historic mining activities** have degraded the stream through channelization, tailings piles, and diversions into settling ponds. The settling ponds, in combination with ongoing beaver activity, have disconnected the stream from Ninemile Creek and have created habitat favorable to non-native brook trout. This project involves returning the stream to its historic alignment, creating a step pool channel; and will remove approximately 20,000 cubic yards of historic mining overburden. **Ongoing.**

11. *North Fork Highwood and Smith creeks Non-Native Fish Barrier Supplement.* North Fork Highwood and Smith creeks (Chouteau County), headwater tributaries to Highwood Creek located near Great Falls, support hybridized westslope cutthroat trout and brook trout populations. This project is a request for supplemental funding for a previously funded project that called for the installation of fish migration barriers on the two streams. These barriers will be precursors to removal of all non-native fishes and the re-introduction of pure strain westslope cutthroat trout. The project will result in restoring westslope cutthroat trout to about 2.5 miles of the North Fork Highwood Creek and 1.5 miles of Smith Creek. **Pending.**

12. North Fork Smith River Riparian Fencing. North Fork Smith River (Meagher County), located near the town of White Sulphur Springs, supports a mixed assemblage of salmonids. The stream, as it flows through the Lind Ranch, has been degraded from past livestock overgrazing; resulting in bank instability and low willow recruitment. This project involved the installation of electric fencing to exclude livestock on a series of three segments of the channel. These three exclosures provide a demonstration for future riparian management by allowing for the recruitment of willow and the elimination of hoof shear on the protected stream banks. **Completed.**

13. Madison River and O'Dell Creek Riparian Fencing. The Madison River (Madison County) supports a blue ribbon fishery and is one of the most heavily fished bodies of water in Montana. The river, as it flows through property owned by the Granger Ranches, has been degraded in the past by livestock overgrazing and bank trampling. This project called for the installation of temporary electric fencing to exclude livestock from the riparian area along the river and creek for a single year. Riverside fencing then would be replaced with pasture cross fencing in the second year to allow for the implementation of a rotational grazing system. Pasture fencing and a rotational grazing system is expected to enhance the riparian corridor along lower O'Dell Creek as well as the river. Fences needed to be temporary in this area because severe ice gorging that commonly occurs on the river prevent the use of permanent fencing. **Completed.**

14. *Oregon Gulch Mine Reclamation.* Oregon Gulch (Mineral County), a headwater tributary to Cedar Creek and ultimately the Clark Fork River located near the town of Superior, supports fluvial bull trout in its lower reaches, as well as a genetically pure westslope cutthroat trout population. However, **past mining activities** have significantly degraded the stream channel in the vicinity of the confluence with Lost Creek (about two miles upstream from the confluence with Cedar Creek). This channel degradation appears to prevent bull trout from migrating further upstream to quality spawning habitat located on national forest lands. This project calls for restoring approximately 2,000 feet of degraded channel and 10 acres of adjacent floodplain and wetland. The project will include channel reconstruction, removal of mine tailings, floodplain reconstruction and the planting of native riparian vegetation. **Pending.**

15. *Peterson Creek Riparian Fencing.* Peterson Creek (Deer Lodge County), a tributary to the Clark Fork River located near the town of Deer Lodge, supports a genetically pure strain of westslope cutthroat trout. The stream, as it flows through the property owned by Joie Kramer and through several sections of state land, has been degraded in the past as a result of overgrazing by livestock. Livestock grazing has resulted in the widening of the stream channel, stream bank instability and the loss of riparian vegetation. This project calls for the installation of approximately seven miles of riparian fencing along three miles of the stream channel. **Pending.**

16. Rocky Reef Spring Creek Channel Restoration. Rocky Reef Spring Creek (Cascade County), a tributary to the Sun River located near the community of Fort Shaw, has the potential to provide a source of recruitment for rainbow trout and brown trout to the river. However, past agricultural practices through channelization, livestock operations, irrigation return flows and road crossings have severely degraded the stream. A number of actions to restore this spring creek have already been undertaken, including the cessation of all livestock operations and

alteration of the irrigation delivery system. This project calls for the replacement of five perched culverts and one bridge and the restoration of approximately 3.7 miles of stream channel for trout spawning and rearing habitat. **Pending.**

17. *Sauerkraut Creek Culverts to Bridges Conversion.* Sauerkraut Creek (Lewis and Clark County), a tributary to the Blackfoot River located near the town of Lincoln, supports populations of westslope cutthroat trout, bull trout and brown trout. The westslope cutthroat trout are known to be genetically pure. Sauerkraut Creek is the site of a recently approved Future Fisheries project involving the restoration of about one mile of channel that had been historically degraded by **placer mining**. Currently, three undersized and perched culverts located on the stream act as partial fish migration barriers. This project involves replacing these undersized culverts with three pre-cast concrete bridges. **Ongoing.**

18. Skalkaho Creek Channel Stabilization. Skalkaho Creek (Ravalli County) is a tributary to the Bitterroot River located near Hamilton that supports a mixed salmonid fishery, including bull trout and westslope cutthroat trout. Historic channel modifications on the Soehren property have caused some channel incision and associated bank erosion. This project calls for installing a series of three log weirs located approximately 20 feet apart and then planting willows on the lower stream banks to help stabilize the structures once installed. **Pending.**

19. South Fork Smith River Riparian Fencing. South Fork Smith River (Meagher County), located near the town of White Sulphur Springs, supports a brown trout, rainbow trout and brook trout fishery. The stream, as it flows through the Rostad Ranch, has been degraded from past livestock overgrazing; resulting in bank instability and low willow recruitment. This project calls for the installation of electric fencing to exclude livestock on a series of four segments of the river. The project will act as a demonstration for future riparian management by allowing for the recruitment of willow and the elimination of hoof shear on the protected stream banks. **Ongoing.**

20. *Tin Cup Creek In-stream Flow Enhancement.* Tin Cup Creek (Ravalli County) is a tributary to the Bitterroot River located near the town of Darby that supports a mixed salmonid fishery, including bull trout. The stream currently suffers from dewatering due to irrigation withdrawals. Tin Cup Lake, a small storage reservoir located in the headwaters, has the potential for providing additional in-stream flow to the creek. However, the dam on the lake was breached in 1998 and, as a result; the reservoir is currently operating only at half capacity. This project calls for funding to help repair the dam on Tin Cup Lake. As part of this proposed repair, the Montana Water Trust (MWT) has entered into an agreement with the water users to purchase 400 acre-feet of stored water per year for 99 years that would be used to enhance in-stream flow in Tin Cup Creek between August 1 and September 30. This water purchase, along with an existing water lease, will provide sufficient water to meet the minimum in-stream flow requirements in the stream (7.3 cubic feet per second). **Pending.**

21. *Vermilion River Channel Stabilization.* The Vermillion River (Sanders County), a tributary to the Clark Fork River located near the town of Trout Creek, supports a mixed salmonid fishery including westslope cutthroat trout and bull trout. A watershed assessment conducted in 2007 identified the Chapel slide, a large eroding mass waste located just downstream of Vermilion Falls, as the highest priority site for restoration in the drainage for improving westslope cutthroat

trout and bull trout populations. This project calls for moving the existing channel away from the toe of the slide and into a historic channel, installing grade control and fish habitat features and re-shaping about 700 feet of the existing channel into a floodplain. **Pending.**

22. Bear Creek Culvert Fish Passage Enhancement. Bear Creek (Missoula County) is a tributary to the Blackfoot River located in the Potomac Valley on property currently owned by The Nature Conservancy. Bear Creek supports populations of rainbow trout, brown trout, brook trout, cutthroat trout and very low densities of juvenile bull trout. The stream has been identified as an increasingly important spawning and rearing tributary to the lower Blackfoot River sport fishery. This project calls for improving migratory connectivity by replacing one road culvert with a free-span bridge and removing two additional road culverts. The project also calls for abandoning and rehabilitating 5,300 feet of adjoining road segments located within the riparian corridor. **Pending.**

23. Big Spring Creek Channel Restoration. Big Spring Creek (Fergus County), located near Lewistown, supports a very popular blue-ribbon brown trout and rainbow trout fishery. A reach of Big Spring Creek, located on property owned by Mark Machler immediately downstream of Lewistown, was channelized in the 1960's, resulting in a straight and entrenched channel with degraded habitat characteristics. In part, this channelization project created the impetus to the ultimate passage of the Montana Streambed and Land Preservation Act (310 law). The project will be located on a new FWP fishing access site that has a permanent walk-in public easement. The project calls for returning meanders to the straightened channel and creating a functional floodplain for 4,000 feet of the stream, resulting in the addition of about 1,400 feet of new channel. **Pending.**

24. Cow Creek Reservoir Restoration and In-stream Flow Enhancement. Cow Creek (Blaine County) originates in the Bears Paw Mountains and flows through the Sand Creek Ranch to the Missouri River. The headwaters of Cow Creek support a brook trout fishery, while Cow Creek Reservoir supports a popular mixed fishery including walleye, tiger muskellunge, yellow perch, channel catfish, black crappie and brook trout. Currently, the dam on Cow Creek Reservoir is highly susceptible to washing out. Pool levels have been kept low to reduce the possibility of a breach which, in turn, has adversely impacted the fishery by limiting the quantity of highly productive shallow water, near shore habitat. This project calls for rehabilitating the face of the dam to allow for the reservoir to return to full pool and to reduce the potential for a breach. In turn, the Sand Creek Ranch will enter into a water management and fishing access agreement with FWP, whereby they will agree to not divert water from Cow Creek for a period of 20 years. The agreement also will provide for public fishing on both Cow Creek and Cow Creek Reservoir for a period of 20 years. **Pending.**

25. *Harvey Creek Riparian Fencing.* Harvey Creek (Granite County), a tributary to the Clark Fork River located near Drummond, supports a genetically pure population of westslope cutthroat trout and bull trout. The stream, as it flows through the Harvey Creek Ranch, has been degraded in the past from livestock overgrazing, timber harvest and **mining activities**. This project calls for the installation of approximately 11,000 feet of riparian exclosure fencing along the east side of the stream with 3 water gaps. **Pending.**

26. Magpie Creek Culvert Fish Passage Enhancement. Magpie Creek (Lewis and Clark County), a tributary to Canyon Ferry Reservoir, supports a spawning run of rainbow trout. The lower 1.5 miles of the stream provide habitat for spawning rainbow trout, with the best habitat located in the upper 0.25 miles of the stream reach - just upstream of a Denil style fish ladder (partially funded in the past by Future Fisheries dollars) that provides passage around an in-stream pond. A couple of undersized culverts, located on property owned by Rene Requa, now are inhibiting upstream passage to this prime spawning habitat. This project calls for replacing these two culverts with bridges using precast concrete abutments and recycled timber stringers. **Pending.**

27. Nevada Creek Fish Screen. Nevada Creek (Powell County) is a tributary to the middle Blackfoot River that supports a mixed salmonid fishery. An unscreened diversion located on property owned by Tom Hatch currently consists of a dilapidated rock weir and tarps. The diversion creates a backwater effect that results in large amounts of fine sediment being deposited in the channel upstream of the dam. This project will upgrade the diversion with a rock cross vane fitted with a coanda style fish screen. The project will act to eliminate the backwater effect and associated sediment deposition and will improve fish passage and eliminate entrainment of fish in the ditch. **Pending.**

28. Nevada Creek Channel Restoration. Nevada Creek (Powell County) is described in the previous project summary. The stream, located immediately downstream of Nevada Creek Reservoir on property owned by the Montana Department of Natural Resources and Conservation and by Wade Stitt, is over-widened, suffers from bank erosion, and is deficient of suitable woody riparian vegetation. This project involves restoring the dimension, pattern and profile on approximately 4,400 feet of stream channel. The work will involve constructing a meandering channel with well defined pools and a low width to depth ratio. Stream bank stability would be enhanced with the placement of toe wood and log vanes and with the transplanting of woody riparian shrubs. An existing diversion also will be reconstructed and a fish screen will be installed. Grazing management would be improved with the installation of riparian fencing. **Pending.**

29. *North Fork Frazier Creek Culvert Fish Passage Enhancement.* North Fork Frazier Creek (Powell County), a tributary to Frazier Creek and ultimately the Blackfoot River near Helmville, supports a non-hybridized population of westslope cutthroat trout. A perched and undersized road culvert currently exists on the Mannix Ranch that creates a partial upstream migration barrier for fish and other aquatic organisms. This project calls for replacing the existing culvert with a properly sized culvert that will allow for fish passage at all flow levels. Additionally, the project calls for the installation of a rock cross vane near the outlet to provide for grade control and channel stability. **Pending.**

30. Poindexter Slough Channel Restoration and Flow Enhancement. Poindexter Slough (Beaverhead County) is a tributary to the Beaverhead River located near Dillon that supports a very popular fishery for rainbow trout and brown trout. FWP surveys on this stream have documented a steady decline in trout numbers over the last 20 years. This decline has been attributed to impaired riparian conditions and the loss of in-stream habitat, primarily as a result of management of stream flow that has restricted high spring flushing flows. These flushing flows were very important for maintaining a healthy stream channel. This project involves

enhancing about 4.5 miles of channel by increasing the quantity and depth of pool habitat, reducing width to depth ratios, removing or isolating existing deposits of fine sediment from the stream bed and encouraging the recruitment of woody riparian vegetation. The project also will involve the installation of a new head gate at the head of the channel to enable the release of a flushing flow, as well as the replacement of the control structure on the Dillon Canal with a wider and lower elevation structure to help eliminate backwater effects. **Pending.**

31. ***Trout Creek Woody Debris Enhancement.*** Trout Creek (Mineral County) is a tributary to the Clark Fork River located near Superior that supports populations of westslope cutthroat trout, bull trout and brown trout. As a result of past mining and riparian logging, the channel lacks large woody debris and the associated habitat that it creates. Additionally, sections of the stream have been armored with rock rip-rap to protect a road system, resulting in the loss of riparian vegetation and reduced fish habitat. This project, located on the Lolo National Forest, calls for constructing approximately 25 log-jam structures over a 6-mile reach of lower Trout Creek and re-vegetating approximately 1,000 feet of rock rip-rap with 2,000 willow cuttings using a stinger mounted on an excavator. **Pending.**

32. ***Wyman Gulch Culvert Fish Passage Enhancement.*** Wyman Gulch is a tributary to South Boulder Creek and ultimately Flint Creek located near Maxville that supports non-hybridized westslope cutthroat trout and bull trout. Nine existing undersized culverts located on South Boulder Creek and on Wyman Gulch currently are creating partial fish migration barriers. Seven of the culverts, all located on the Beaverhead Deerlodge National Forest, are scheduled and fully funded for replacement using federal funds. However, two remaining culverts on Wyman Gulch are located on private in-holdings. These two in-holding culverts are significantly undersized and are on the verge of failure. This project involves replacing these two private culverts with appropriately sized culverts that will provide for fish passage. **Pending.**

PHOTO ILLUSTRATIONS OF TYPICAL COMPLETED PROJECTS

Photo Illustration 1. The upper two photographs display a fish passage enhancement project located on Governor Creek, a tributary to the Big Hole River near the community of Jackson. The project replaced double 6-foot in diameter culverts (upper left photo) with a 64-foot concrete bridge (upper right photo) to the benefit of fluvial arctic grayling, rainbow trout, brown trout, burbot and mountain whitefish. The lower two photographs show a fish passage enhancement project on Poorman Creek, a tributary to the Blackfoot River located near the town of Lincoln. The project replaced a double culvert (lower left photo) with a free span bridge (lower right photo) to enhance fish passage for bull trout, westslope cutthroat trout and brown trout. Upper two photos are courtesy of Jeff Everett, USFWS. Lower two photos are courtesy of Ryen Aasheim, Big Blackfoot Chapter Trout Unlimited.

Photo Illustration 2. Fish passage barrier projects constructed on Cottonwood Creek and White Gulch for the purpose of protecting genetically pure westslope cutthroat trout from invasion by non-native fish, including rainbow trout, brown trout and brook trout. The upper photo shows the new fish passage barrier constructed on Cottonwood Creek, a tributary to Holter Reservoir located on FWP's Beartooth Game Range. The lower photo shows a new fish passage barrier constructed on White Gulch, a tributary to Canyon Ferry Reservoir. The upper photo is courtesy of Allied Engineering. The lower photo is courtesy of Ron Spoon, FWP.

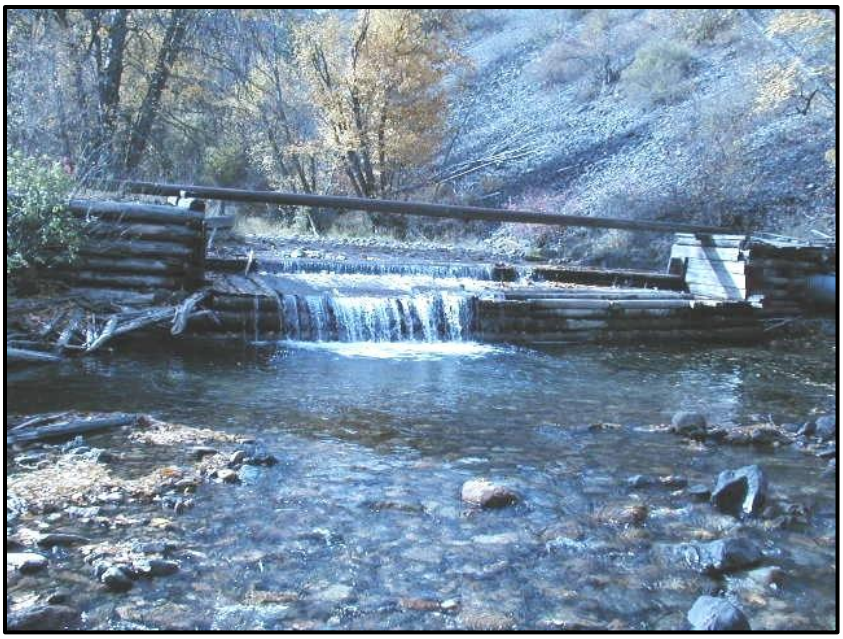

Photo Illustration 3. Upstream fish passage for bull trout, westslope cutthroat trout and sculpins was enhanced on Dry Creek, a tributary to the Clark Fork River located near the town of Superior, to improve access to important spawning and rearing habitat. The upper photograph shows the old wood crib diversion dam creating a hindrance to upstream fish passage. The lower photograph shows the new diversion consisting of three vortex rock weirs that create a series of rock steps, providing ample upstream passage opportunity for fish while continuing to provide the water user their irrigation diversion needs. Photos courtesy of Ladd Knotek, FWP.

Photo Illustration 4. Fish screens installed on irrigation diversions located on Morrell Creek and Ninemile creeks. Morrell Creek, a tributary to the Clearwater River located near the town of Seeley Lake, supports an important fluvial bull trout population. The Morrell Creek project (upper photograph) involved reducing entrainment into two irrigation canals by installing fish screens, improving upstream fish passage, reducing periodic channel disturbance and enhancing instream flow while continuing to meet the needs of the water user. Ninemile Creek is a tributary to the Clark Fork River located near the community of Ninemile that supports westslope cutthroat trout, rainbow trout, brown trout and mountain whitefish. The Ninemile Creek project involved installation of a coanda style fish screen to prevent entrainment into the irrigation canal and installation of a vortex rock weir to enhance upstream fish passage while meeting the needs of the water user. The lower left photograph shows the Ninemile Creek diversion before project completion. The lower right photograph shows the installed coanda fish screen and vortex rock weir. All photos courtesy of Ladd Knotek, FWP.

Photo Illustration 5. Channel restoration on Fleshman Creek, a tributary to the Yellowstone River near the town of Livingston. This reach of Fleshman Creek had historically been subjected to channelization and heavy livestock use. This project restored the morphology of 2,400 feet of stream channel and greatly enhanced the floodplain and riparian vegetation while continuing to maintain the agricultural viability of the ranch. The project has benefitted a mixed assemblage of fish including rainbow trout, brown trout, brook trout and Yellowstone cutthroat trout. The upper left photo shows the stream channel prior to restoration. The upper right photo shows the stream channel during construction, including the coir fabric used to form the newly created stream banks. The lower photo shows the restored channel following one growing season with the exclusion of all livestock.

Photo Illustration 6. Channel restoration on Sauerkraut Creek, a tributary to the Blackfoot River located near the town of Lincoln. The stream supports fluvial westslope cutthroat trout and bull trout. This reach of stream has a long history of placer mining and has been channelized and disconnected from the floodplain with placement of an earthen berm. Population densities of fish have been documented to be substantially lower within this channelized reach than in less altered portions of the stream. This project involved restoring the dimensions, pattern and profile of a one mile reach of straightened channel and reactivating the floodplain by removing the berm. The upper left photo shows the old straightened channel with poor fish habitat, confined by the earthen berm on right hand side. The upper right photo shows workers removing the berm. The lower photo shows the very recently restored stream channel that now has connection with its floodplain. The upper two photos are courtesy of Ryen Aasheim, Big Blackfoot Chapter Trout Unlimited.

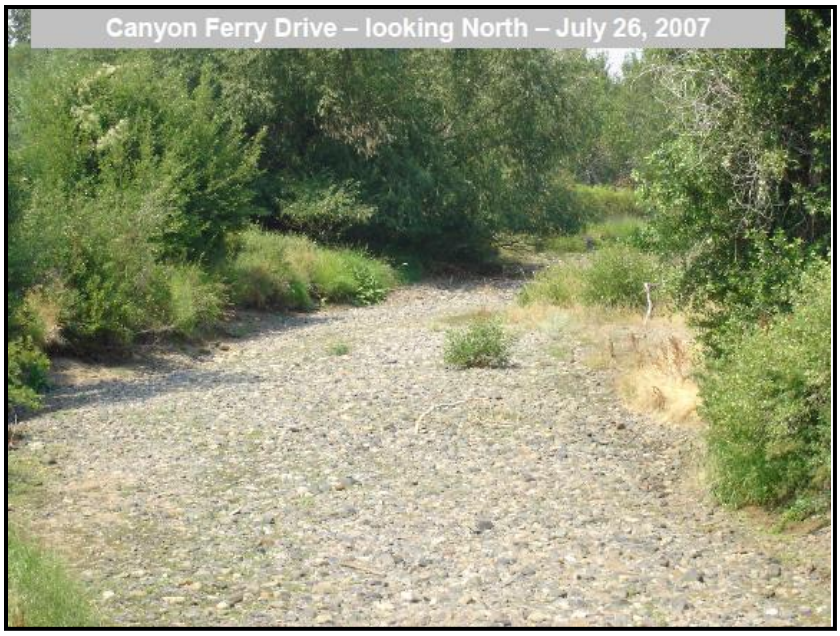

Photo Illustration 7. Re-watering a chronically dewatered reach of Prickly Pear Creek, a tributary to Lake Helena located near the town of East Helena. This project involved a series of water trades between the Helena Valley Irrigation District and the Prickly Pear Water Users which resulted in the reduction of water being diverted from two senior irrigation diversions, thus ensuring in-stream flow remained in Prickly Pear Creek. Historically, this reach of Prickly Pear Creek was totally dewatered during the peak of irrigation almost every year. This project has kept water in the stream year-round and has benefitted rainbow trout and brown trout. The upper photo shows the stream reach entirely dewatered. The lower photo shows the results of the water trades. Photos are courtesy of Rankin Holmes, Clark Fork Coalition.

TABLE 5. Future Fisheries Improvement Program expenditures and balances by Project and Funding source for the Report Period November 1, 2008 through October 31, 2010. Projects highlighted in bold are projects eligible for HB647 (RIT) funding because they restore habitat for bull trout and/or cutthroat trout.

Proj Id	Status	Project Name	2003 RIT 02022 EI131	2005 RIT 02022 EI150	2007 RIT 02022 EI170	2009 RIT 2022 EI109	2001 RR 02149 EI115	2003 RR 02149 EI131	2005 RR 02149 EI150	2007 RR 2149 EI170	1999 Gen Lic 02409 EI90	2001 Gen Lic 02409 EI115	EXPENDITURES FOR REPORT PERIOD	BALANCE OF COMMITTED FUNDS
027-1998	Ongoing	Big Creek Flow Enhancement						15,500.00					15,500.00	8,563.00
033-2002	**Ongoing**	**Bitterroot River**	24.52										24.52	12,249.48
048-2002	**Ongoing**	**Skalkaho Creek Fish Screens**		1,228.17									1,228.17	43,094.18
024-2003	**Ongoing**	**Skalkaho Cr. Hedge Canal Siphon**	28,237.34										28,237.34	10,414.96
025-2003	**Complete**	**Skalkaho Cr. Republican Canal Siphon**	28,553.96										28,553.96	
007-2004*	Complete	Deep Creek off stream livestock water					3,250.00	-3,250.00						
014-2004	Ongoing	Little Prickly Pear riparian fencing											0.00	4,175.41
019-2004	**Complete**	**Meadow Creek riparian fencing**			1,972.50								1,972.50	
037-2004	**Complete**	**Blackfoot River drainage fish screen**		8,209.41									8,209.41	
020-2006	**Ongoing**	**Several Yellowstone tributaries fish screens**											0.00	982.00
031-2006	Complete	Fishtail Creek corral relocation						2,000.00					2,000.00	
034-2006	Complete	Ninemile Creek fish screen						7,908.00					7,908.00	
039-2006	**Pending**	**Skalkaho Creek/Hedge siphon**											0.00	68,646.00
040-2006	**Pending**	**Skalkaho Creek/Republican siphon**											0.00	74,022.00
042-2006	**Complete**	**Trail Creek/Yellowstone channel restoration**		7,396.00									7,396.00	
046-2006	Complete	Volney Creek corral relocation						1,984.00					1,984.00	
004-2007	Complete	Blacktail Crk Flood mitigation							32,599.87			17,400.13	50,000.00	
008-2007	Complete	Governor Creek bridge										150,000.00	150,000.00	
009-2007	**Complete**	**Graves Creek habitat enhancement**		20,000.00									20,000.00	
011-2007	**Pending**	**Lake Creek fish barrier**											0.00	23,746.00
013-2007	Complete	Little Blackfoot habitat enhancement										24,450.00	24,450.00	
014-2007	Complete	Lolo Creek trib. culvert replacements										45,000.00	45,000.00	
016-2007	Complete	Poorman Creek Bridge										11,668.78	11,668.78	
018-2007	Complete	S. Fork Ross Cr. habitat enhancement									1,164.60	-1,164.60	0.00	
023-2007	Pending	Yellowstne Trib fish screen											0.00	28,277.00
026-2007	Complete	Big Hole Harrington riparian fencing									34,160.00		34,160.00	
027-2007	Complete	Big Hole Huntley diversion restoration									8,000.00		8,000.00	
029-2007	**Ongoing**	**Cottonwood Creek riparian fencing**	8,339.63										8,339.63	4,460.37
033-2007	**Complete**	**Rock Creek pool enhancement**		30,000.00									30,000.00	
037-2007	Complete	Swamp Creek riparian fence										44,161.17	44,161.17	
038-2007	Complete	Threemile Crk bank stabilization										8,505.00	8,505.00	
042-2007	**Complete**	**Whites Gulch fish barrier**			21,752.30								21,752.30	
001-2008	**Pending**	**Blackfoot River fencing**											0.00	6,350.00
004-2008	**Complete**	**Cottonwood Crk diversion modification**		5,000.00									5,000.00	
005-2008	**Complete**	**Dunham Crk riparian enhancement**		15,000.00									15,000.00	
006-2008	**Complete**	**E. Fk Bull River channel stabilization**		6,200.00									6,200.00	
007-2008	**Complete**	**E. Fk Rock Crk riparian fence**		14,980.00									14,980.00	
008-2008	**Pending**	**Elk Crk riparian fence**											0.00	14,435.00
009-2008	**Complete**	**Enders Spring Crk channel restoration**		40,290.00									40,290.00	
010-2008	Ongoing	Gold Crk irrigation efficiency					125,957.00						125,957.00	4,050.00
012-2008	**Pending**	**Locke Crk fish passage**											0.00	21,306.00
013-2008	**Complete**	**Meadow Crk culvert to bridge**			20,000.00								20,000.00	
014-2008	Complete	Moose/Swamp Crks off stream water					5,625.00						5,625.00	
015-2008	**Complete**	**Morrell Crk fish passage and screens**	4,311.00										4,311.00	
016-2008	**Ongoing**	**N Frk Highwood Cr fish barrier**		5,833.96	524.10								6,358.06	61,641.94
017-2008*	Complete	Prickly Pear Crk flow enhancement									1,490.00	-1,490.00	0.00	
019-2008	**Complete**	**York Gulch riparian fence**		32,739.50									32,739.50	
020-2008	Ongoing	Beaver Creek culvert to bridge										13,498.34	13,498.34	8,548.66
022-2008	Complete	Fish Creek Hanson channel restoration										60,832.03	60,832.03	
023-2008	**Pending**	**Deer Creek culvert replacement**												24,885.00
025-2008	**Complete**	**Snowbank Creek fish passage**			28,045.00								28,045.00	
029-2008	**Complete**	**Whites Gulch fish barrier supplement**			3,744.50								3,744.50	

Proj Id	Status	Project Name	2003 RIT 02022 EI131	2005 RIT 02022 EI150	2007 RIT 02022 EI170	2009 RIT 2022 EI109	2001 RR 02149 EI115	2003 RR 02149 EI131	2005 RR 02149 EI150	2007 RR 2149 EI170	1999 Gen Lic 02409 EI90	2001 Gen Lic 02409 EI115	EXPENDITURES FOR REPORT PERIOD	BALANCE OF COMMITTED FUNDS
001-2009	**Ongoing**	**Big Creek water lease extension**			15,500.00								15,500.00	115,500.00
003-2009	**Pending**	**Cameron Creek channel restoration**												19,090.00
004-2009	**Pending**	**Dick Creek riparian fencing**												7,500.00
006-2009	Complete	Fleshman Creek channel restoration										54,326.05	54,326.05	
008-2009	Pending	Jack Creek channel restoration												20,000.00
009-2009	Complete	Kalsta Spring Creek spawning habitat										83,030.00	83,030.00	
010-2009	**Complete**	**Kickabuck Spring Creek spawning habitat**		33,239.73									33,239.73	
011-2009	Complete	Lake Creek fish passage										5,250.00	5,250.00	
012-2009	**Pending**	**Leverich Creek fish barrier**			232.00								232.00	30,007.00
013-2009	Complete	Little Blackfoot enhancement supplement										29,089.00	29,089.00	
014-2009	**Ongoing**	**Little McCormick Creek mine reclamation**			9,406.37								9,406.37	8,256.63
015-2009	**Complete**	**Martin Creek channel stabilization**			20,000.00								20,000.00	
016-2009	**Complete**	**Murphy Spring Creek flow enhancement**		4,000.00									4,000.00	
017-2009	**Pending**	**St Louis Creek mine reclamation**												65,450.00
019-2009	**Complete**	**Sauerkraut Creek mine reclamation**		54,135.59	61,049.41								115,185.00	
020-2009	Complete	Skalkaho Creek bank stabilization										3,500.00	3,500.00	
021-2009	**Complete**	**Thompson River riparian enhancement**		4,765.00									4,765.00	
022-2009	**Ongoing**	**Wigwam Creek riparian fencing**		18,550.72									18,550.72	
023-2009	**Ongoing**	**Bitterroot River Hedge Ditch fish screen**			2,923.96								2,923.96	95,076.04
026-2009	**Pending**	**Chamberlain Creek road decommissioning**												100,000.00
027-2009	**Pending**	**Elkhorn Creek fish barrier**												54,598.00
030-2009	Complete	Fortine Creek riparian fencing										5,719.85	5,719.85	
032-2009	**Pending**	**NF Fridley Creek in-stream water lease**												38,160.00
033-2009	Complete	NF Smith River riparian fencing										13,928.70	13,928.70	
034-2009	**Ongoing**	**Piney Creek diversion modification**			561.00								561.00	53,939.00
035-2009	Pending	Prickly Pear Creek fish ladder												4,500.00
036-2009	Ongoing	Racetrack Creek riparian fencing							7,820.29				7,820.29	3,675.71
039-2009	Complete	Tributary Creek corral removal										19,959.89	19,959.89	
040-2009	**Pending**	**Warm Springs Creek culvert to bridge**												20,000.00
001-2010	Pending	Big Hole River off stream stock water												15,000.00
002-2010	**Pending**	**Braziel Creek channel restoration**												17,300.00
003-2010	**Complete**	**Cottonwood Creek fish barrier**		34,852.00		345.00							35,197.00	
004-2010	**Pending**	**Dry Cottonwood Creek riparian fencing**												23,182.00
005-2010	Pending	Fleshman Creek flood control												98,100.00
007-2010	Ongoing	Hellroaring Creek channel stabilization					6,741.84	18,544.76				7,959.60	33,246.20	26,526.80
009-2010	Pending	Lincoln Spring Creek culvert fish passage												7,925.00
011-2010	**Ongoing**	**Lower Deer Creek fish barrier**				261.00							261.00	141,697.00
012-2010	Pending	Mandeville Creek channel restoration												25,000.00
013-2010	**Ongoing**	**Mattie V Creek mine reclamation**		11,390.00									11,390.00	29,510.00
014-2010	**Pending**	**NF Highwood & Smith creeks fish barriers**												74,553.00
015-2010	Complete	NF Smith River riparian fencing						1,831.70					1,831.70	
017-2010	Complete	Madison & O'Dell Creek riparian fencing								3,807.20			3,807.20	
018-2010	**Pending**	**Oregon Gulch mine reclamation**												65,000.00
019-2010	**Pending**	**Peterson Creek riparian fencing**												20,000.00
021-2010	Pending	Rocky Reef Spring Creek restoration												70,530.00
022-2010	**Ongoing**	**Sauerkraut Creek culverts to bridges**		40,000.00									40,000.00	27,250.00
023-2010	Pending	Skalkaho Creek channel stabilization												11,226.00
024-2010	Complete	SF Smith River riparian fencing								2,169.14			2,169.14	
025-2010	**Pending**	**Tin Cup Creek in-stream flow enhancement**												100,000.00
026-2010	**Pending**	**Vermilion River channel stabilizarion**												25,000.00
027-2010	Pending	Bear Creek culvert fish passage												23,460.00
028-2010	Pending	Big Spring Creek channel restoration												50,000.00
031-2010	Pending	Cow Creek Lake and in-stream flow enhancement												73,705.00
033-2010	**Pending**	**Harvey Creek riparian fencing**												10,025.00
034-2010	Pending	Magpie Creek culvert fish passage												5,000.00

Proj Id	Status	Project Name	2003 RIT 02022 EI131	2005 RIT 02022 EI150	2007 RIT 02022 EI170	2009 RIT 2022 EI109	2001 RR 02149 EI115	2003 RR 02149 EI131	2005 RR 02149 EI150	2007 RR 2149 EI170	1999 Gen Lic 02409 EI90	2001 Gen Lic 02409 EI115	EXPENDITURES FOR REPORT PERIOD	BALANCE OF COMMITTED FUNDS
037-2010	Pending	Nevada Creek fish screen												10,000.00
038-2010	Pending	Nevada Creek channel restoration												35,800.00
039-2010	**Pending**	**NF Frazier Creek culvert fish passage**												4,420.00
040-2010	Pending	Poindexter Slough channel restore & flow												25,000.00
041-2010	**Pending**	**Trout Creek woody debris enhancement**												10,550.00
043-2010	**Pending**	**Wyman Gulch culvert fish passage**												38,070.00
TOTAL			69,466.45	387,810.08	185,711.14	606.00	141,573.84	44,518.46	40,420.16	5,976.34	44,814.60	595,623.94	1,516,521.01	2,119,429.18
73642		Endicott	6,254.75	2,000.35									8,255.10	
73643		Lere, Schroeer	4,216.87		187.14								4,404.01	
73644		Moser	6,672.56										6,672.56	
73645		Nelson	14,015.19	6,559.28									20,574.47	
73651		Moser	9,516.61										9,516.61	
Total Operations			40,675.98	8,559.63	187.14								49,422.75	
GRAND TOTAL			110,142.43	396,369.71	185,898.28	606.00	141,573.84	44,518.46	40,420.16	5,976.34	44,814.60	595,623.94	1,565,943.76	

	Nov - FYE 09	69,763.93	172,088.05	18,057.30		134,832.00	(3,250.00)	17,831.66		44,814.60	159,002.42	613,139.96
	FY10	35,385.06	58,257.92	155,456.93	345.00		43,226.92	21,800.57	5,976.34		398,298.85	718,747.59
	FY11 through Oct	4,993.44	166,023.74	12,384.05	261.00	6,741.84	4,541.54	787.93			38,322.67	234,056.21
		110,142.43	396,369.71	185,898.28	606.00	141,573.84	44,518.46	40,420.16		44,814.60	595,623.94	1,565,943.76

*Charges in these orgs were moved to expend the oldest orgs first

Appendix A

Future Fisheries Improvement Program Fisheries Monitoring Report 2010

Genetically pure westslope cutthroat trout. Photo by Dave Moser.

Prepared by
Linnaea Schroeer

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1420 E. Sixth Ave
Helena, Montana 59620-0701

December 2010

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Introduction

This report summarizes the results of monitoring conducted from 1996-2010 on selected projects to evaluate the effectiveness of selected habitat restoration projects funded through the Future Fisheries Improvement Program (FFIP).

The success of fish habitat restoration projects is dependant on a wide range of variables, many of which are beyond the control of the project applicant and attending biologist. Much of the State experienced extreme drought conditions with record-high temperatures from 2000-2007, while 2008-2010 saw a return to more typical rainfall and temperatures. Such fluctuations exert a tremendous influence on fish populations.

Still, monitoring is an essential tool to help biologists, engineers, and landowners understand what types of projects provide the most benefits to fish populations, even in the midst of widely-ranging climatic conditions. Biologists are seeing that in many instances, fish abundance indices remained stable or increased despite extremely low base flows in sampled reaches of FFIP projects. These data suggest that for many streams, low flows caused by drought can be partially mitigated through the types of habitat improvement projects detailed in this report.

This report presents data collected for 52 projects on 45 different streams and one reservoir. 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.

Big Hole River Drainage

Big Hole River Ralston Riparian Fence Project

WATER NAME: Bryant Creek and Big Hole River (Big Hole River)
DATA PROVIDED BY: Austin McCullough, FWP
FFI NUMBER: 002-07
STATUS: Completed in November 2007.

Restoration Objectives: To enhance riparian vegetative community that will stabilize banks, reduce sedimentation, provide cover, decrease temperatures and develop habitats that benefit Arctic grayling and numerous other native and sportfish species. This project will enhance riparian vegetation and stream banks by fencing the stream corridor and creating multiple pastures, and by providing an alternate water source for livestock. This project will include a grazing management plan developed through the CCAA Program.

Project Description: In 2007, approximately three miles of fence was constructed along the Big Hole River and Bryant Creek, a tributary to the Big Hole River, to protect and enhance riparian vegetation. The newly constructed fence excluded nearly 2.7 miles of Big Hole River and 0.5 miles of Bryant creek from impacts of livestock grazing. A stockwater well (see photo at right) was developed to provide a water source outside of the stream channel and two measuring devices were installed in irrigation diversions to allow the landowner to better manage diverted water. The new pasture configuration will be incorporated into a grazing management plan as a component of a Big Hole CCAA conservation plan for the property. A wildlife exclusion fence has also been built to protect haystacks.

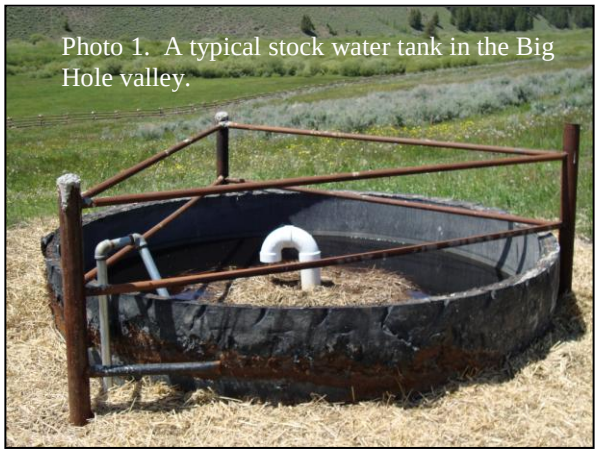


Photo 1. A typical stock water tank in the Big Hole valley.

Monitoring: Riparian assessments were conducted on both the Big Hole and Bryant Creek reaches prior to fence construction. These assessments determined that the Big Hole reach was “At Risk” for long-term sustainability because of lateral erosion, encroachment of hay forage species into the riparian area, absence of all age-classes of willows and the presence of spotted knapweed. The Bryant Creek reach was classified as “sustainable”. Both reaches are already benefitting from the change in livestock management and continue to be monitored.

Steel Creek Riparian Fence and Restoration Projects

WATER NAME: Steel Creek (Big Hole River)
DATA PROVIDED BY: Austin McCollough, FWP
FFI NUMBER: 006-96, 026-04
STATUS: Completed in December of 1996 and 2004

Restoration Objectives: Bank stabilization and riparian restoration

Project Summary: In December 1996, a bank-stabilization project was implemented on Steel Creek to address 430 feet of excessively eroding stream bank using a combination of rock, willow footers and mature willow transplants. A jackleg fence acting as a dam during elevated stream flows was also removed to improve floodplain access and overall stream function.

In 2004, three miles of riparian fence was constructed on a 1.5-mile reach of Steel Creek to promote and protect riparian vegetation growth. Within the fenced area mature and sapling willows were transplanted to stabilize eroding stream banks and promote functional stream morphology. At selected sites stream bank sloping was utilized to reduce sheer stress of vertical eroding banks. An abandoned bridge was also removed as part of this project. The private landowner agreed to rest the riparian pasture from livestock grazing for a five-year period to protect restoration efforts and allow riparian vegetation to establish.

Monitoring: Both project reaches have been monitored regularly since their completion.

Steel Creek Fish Monitoring Data: A 3.5-mile reach of Steel Creek between State Highway 43 and its confluence with the Big Hole River has been monitored annually since 1990 to document Arctic grayling and sympatric species population dynamics (Figure 1). The reach surveyed encompasses both FFIP projects listed above.

Three PIT fixed antenna stations have operated on Steel Creek since 2007, and are located at the upper and lower boundaries of the 2004 riparian fence/stream restoration project and at the mouth. Objectives for operating PIT tag antennae stations in Steel Creek are to further understand utilization of Steel Creek and the restoration reach in relation to spawning, summer and winter habitats, as well as response to instream temperature and flow regimes. PIT tag data collected from Steel Creek are currently being processed.

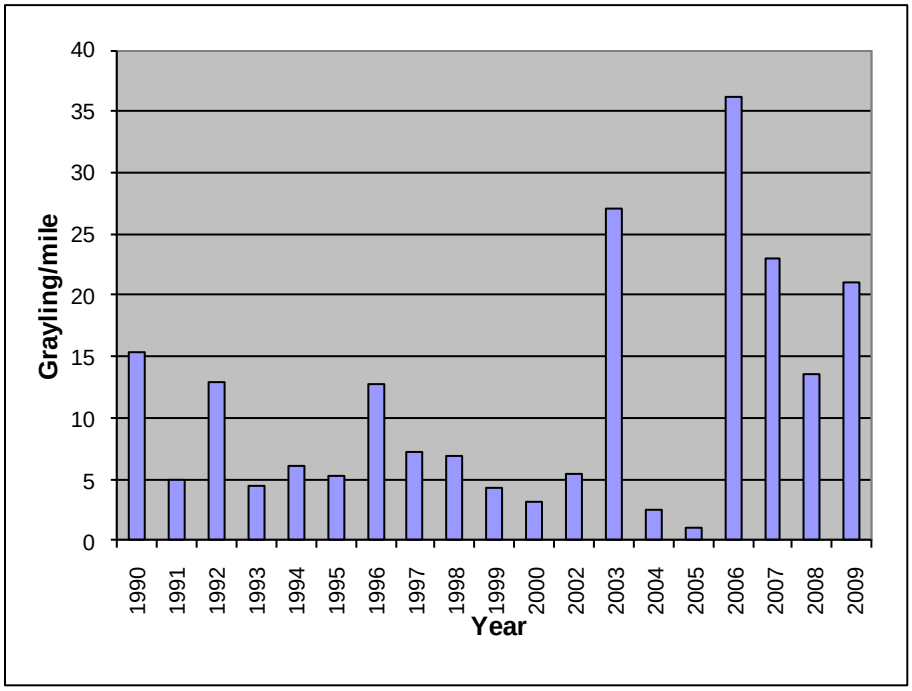


Figure 1. The number of grayling per mile captured during electrofishing surveys of Steel Creek from 1990 - 2009.

<u>Steel Creek Water Temperature Data:</u> Steel Creek water temperature regimes have been monitored annually since 1999 at a site located within the 2004 riparian fence/stream restoration project reach (Figure 2).

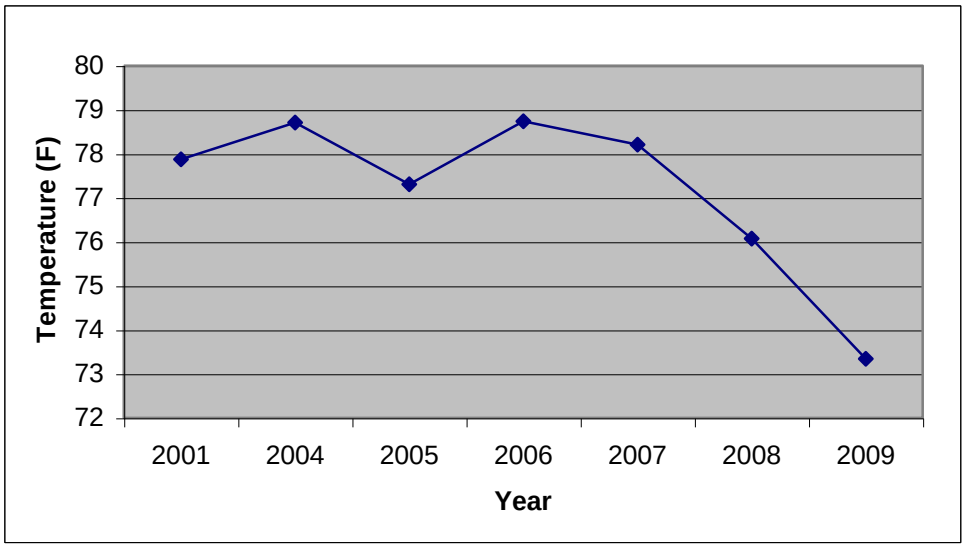


Figure 2. Maximum temperatures in Steel Creek from 2001 - 2009.

Steel Creek Steam Morphology Data: Cross section and pebble count survey sites were established within the 2004 restoration reach at one "riffle" and one "pool" channel bed feature. Pool cross section and pebble count data collected in 2005 compared to 2008 data implies a positive response from the stream as width/depth ratio and percent fines decreased and maximum pool depth increased (Table 1).

Steel Creek – Pool Cross Section and Pebble Count Data 2005 & 2008		
	2005	**2008**
% Fines	**14**	**7**
Width/Depth ratio	**21.19**	**19.08**
Max Depth (ft)	**3.46**	**3.73**

Table 1. Cross section and pebble count data collected from Steel Creek from 2005 & 2008.

Steel Creek Riparian Assessment Data: A riparian assessment was conducted on a reach of Steel Creek that included both FFIP projects in July 2007. The assessment characterized the reach as "At-Risk" for long-term sustainability. The reach exhibited minimal lateral erosion, excessive undesirable exotic species on the flood plain and the presence of Canada thistle. The reach also showed willow and sedge species regeneration that appeared to be thriving in the rested riparian pasture, as well as evidence of a narrowing channel at some locations. Overall, the reach appeared to be in an upward trend.

A greenline transect was established within the 2004 riparian fence/stream restoration project reach in 2008. The initial transect reported the stream banks as heavily dominated by Carex species. Riparian shrubs and bare soil were also present (Figure 3). The greenline transect was repeated in 2009, but data has not yet been analyzed.

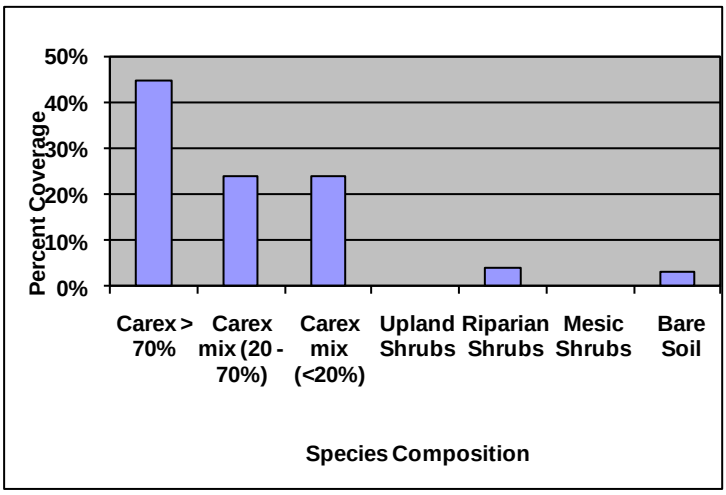


Figure 3. Greenline transect data collected by MFWP from Steel Creek in 2008.

Steel Creek Before and After Photos:

Photo 2. Stream bank and riparian vegetation conditions typical to Steel Creek prior to restoration.

Photo 3. Steel Creek during habitat restoration in 2003.

Photos 4. Steel Creek in 2009 documenting stream conditions post-project.

Photo 5. Steel Creek in 2009 documenting stream conditions post-project.

Fishtrap Creek Pool Enhancement Project

WATER NAME: Fishtrap Creek (Big Hole River)
DATA PROVIDED BY: Austin McCollough, FWP
FFI NUMBER: 010-04
STATUS: Completed in 2004

Restoration Objectives: Stream channel enhancement.

Project Summary: Fishtrap Creek, a tributary to the Big Hole River, consistently holds relatively high numbers of Arctic grayling and is considered an important stream for all grayling life-history stages. Years ago, a portion of Fishtrap Creek was straightened to accommodate the construction of State Highway 43, resulting in limited habitat complexity. In 2004, a pool enhancement project was implemented on an 800-foot reach of Fishtrap Creek immediately upstream of the highway. Eight pools were developed or enhanced by increasing pool depth and volume to provide complexity within the reach and enhance Arctic grayling habitat.

Monitoring: A 1.04-mile reach of Fishtrap Creek was initially sampled in 2000 and has been repeated annually from 2003 - 2009. The Fishtrap Creek Pool Enhancement project reach is included within the monitoring section. The reach is monitored to document Arctic grayling and sympatric species population dynamics in the creek, as well as document fish response to the pool enhancement project (Figure 4). A cross-section and pebble count survey site was established on a "pool" channel bed feature that was enhanced as part project in 2006. Cross-section and pebble count data from this site has not yet been analyzed.

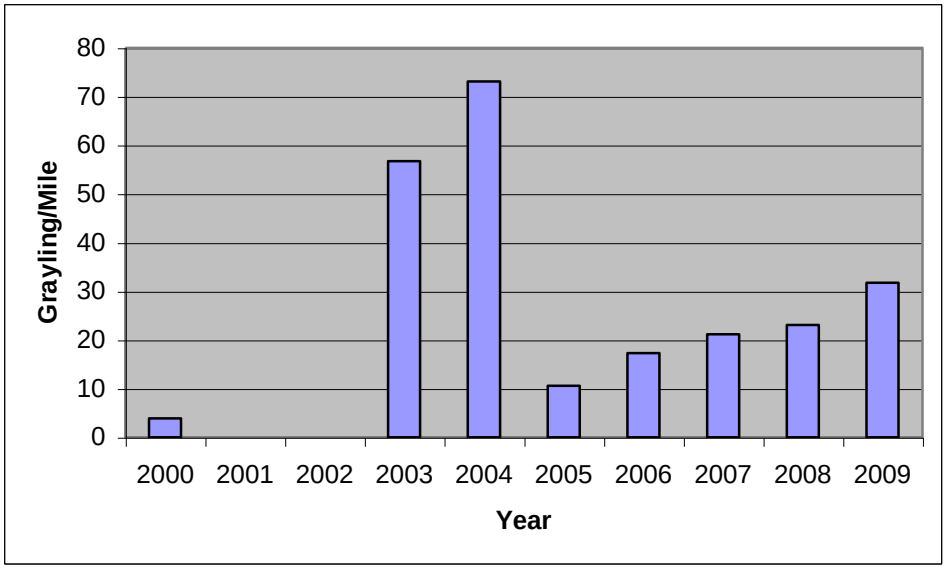


Figure 4. Grayling per mile captured during electrofishing surveys of Fishtrap Creek from 2000 - 2008.

Fishtrap Creek Before and After Photos:

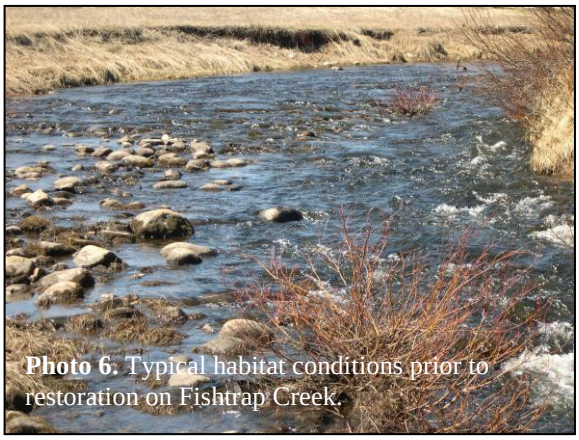


Photo 6. Typical habitat conditions prior to restoration on Fishtrap Creek.

Figure 7, Fishtrap Creek after completion of the pool enhancement project in 2005.

LaMarche Creek Pool Enhancement and Riparian Fence Project

WATER NAME: LaMarche Creek (Big Hole River)
DATA PROVIDED BY: Austin McCollough, FWP
FFI NUMBER: 008-05
STATUS: Completed in 2004

Restoration Objectives: Stream channel and riparian corridor enhancement, bank stabilization.

Project Summary: LaMarche Creek holds relatively high numbers of Arctic grayling of all life-history stages. Following the perceived success of the 2004 Fishtrap Creek Pool Enhancement project, a similar project was initiated on LaMarche Creek in 2005. A portion of LaMarche Creek had also been straightened during highway construction and pool quality and quantity were diminished. Sixteen pools were constructed or enhanced within a 2,500-foot reach of LaMarche Creek immediately upstream from its confluence with the Big Hole River to expand existing grayling habitat. When possible, constructed pools incorporated existing mature willows to encourage scouring and increase habitat complexity. Two excessively eroding banks within the project reach were re-sloped to resemble stable banks in the reach and received sod mat, mature willow and willow sprig transplants.

A 1.25-mile reach of LaMarche Creek immediately upstream from the Pool Enhancement project was protected by 2.5-miles of riparian fence in 2005. The construction of the fence divided an existing pasture, improving livestock management capabilities. The new pasture configuration will be incorporated into a Big Hole CCAA grazing management plan, which allows for the riparian pasture to be grazed every third year. Reducing grazing pressure in the riparian corridor promotes and protects bank stabilizing riparian vegetation, as well as reducing the effects of hoof shearing. The fence incorporated six angler access gates and a livestock crossing and water gap.

Monitoring:

LaMarche Creek Fish Population Data: A one-mile reach of LaMarche Creek immediately upstream from its confluence with the Big Hole Rive was initially sampled in 1993 and has been sampled annually from 2002 – 2009. The reach encompasses the LaMarche Creek Pool Enhancement project and includes the lower portion of the riparian fence project reach. This reach is sampled annually to monitor grayling population dynamics in the stream and utilization of the project reach (Figure 11).

As part of the PIT tag fish movement study in the upper Big Hole watershed, a fixed PIT antenna has been installed at the mouth of LaMarche Creek from 2007 –2009. The project reach is immediately upstream from the antenna site. Data from this antenna site are currently under analysis.

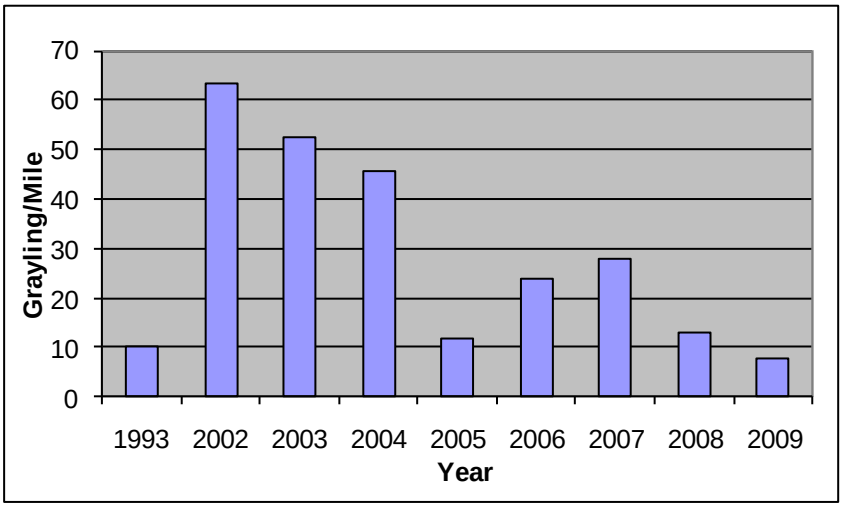


Figure 5. Grayling per mile captured during electrofishing surveys in LaMarche Creek from 1993 - 2009.

LaMarche Creek Water Temperature Data: LaMarche Creek instream temperature regimes have been monitored within the Pool Enhancement project reach since 2004 (Figure 6).

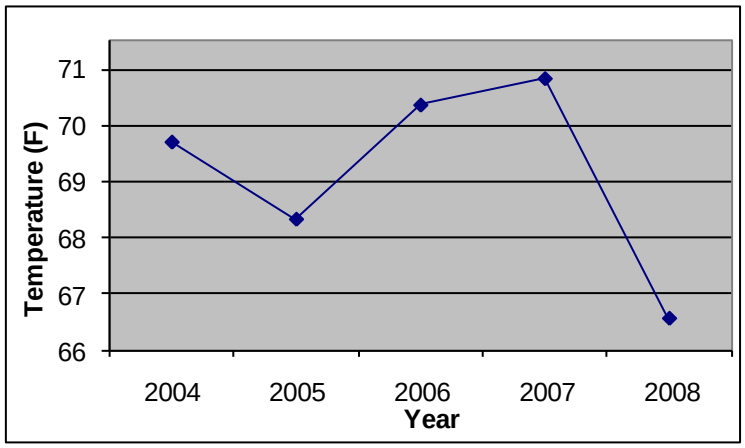


Figure 6. Maximum temperatures recorded in LaMarche Creek from 2004 - 2008.

LaMarche Creek Stream Morphology Data: One "pool" channel bed feature enhanced during the LaMarche Creek Pool Enhancement project has been monitored annually to determine changes in the channel dimension since the project's completion. A permanent benchmark has been established at the site to ensure repeatability. Data collected from this site has not yet been analyzed.

LaMarche Creek Riparian Assessment Data: The initial riparian assessment on the study reach protected by the new riparian fence was completed in August 2006. The reach was determined to be "At-Risk" for long-term sustainability. Moderate lateral bank erosion, excessive sediment deposition, lack of woody species regeneration and the presence of Canada thistle characterized the reach.

In 2008, a wildlife exclosure was constructed within the riparian pasture created by the new riparian fence as part of a study in the upper Big Hole valley to determine the extent of willow browse impacts by wildlife and livestock. Only two years of data has been collected from this site and the study is premature to determine any long-term trend at this point.

LaMarche Creek Before and After Photos:

Photo 8. Typical habitat conditions to LaMarche Creek prior to restoration.

Photo 9. LaMarche Creek immediately after the habitat enhancement project in 2005.

Photo 10. Typical pool in LaMarche Creek in 2005.

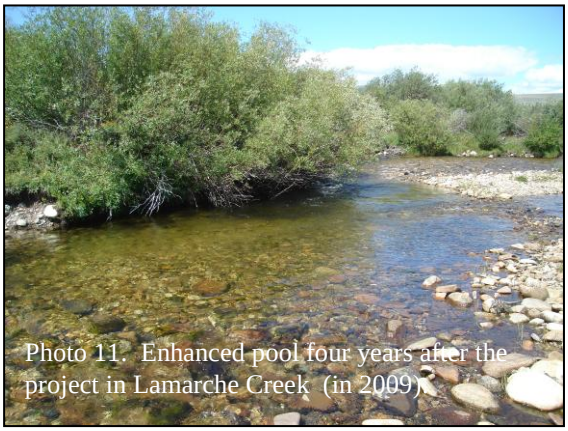


Photo 11. Enhanced pool four years after the project in Lamarche Creek (in 2009).

Rock Creek Reconnection and Restoration Project:

WATER NAME: Rock Creek (Big Hole River)
DATA PROVIDED BY: Austin McCullough, FWP
FFI NUMBER: 013-06
STATUS: Completed in Fall 2008

Restoration Objectives: To reconnect Rock Creek to the Big Hole River, stabilize streambanks, restore the riparian corridor, and enact a sustainable grazing plan.

Project Summary: Rock Creek is an important tributary to the Big Hole River that historically held relatively high numbers of Arctic grayling. Alterations to facilitate irrigation practices adjusted Rock Creek's connectivity from Swamp Creek, a tributary to the Big Hole River, to the Spokane Ditch. The Spokane Ditch is a major point of diversion from the Big Hole River with associated water rights in excess of 170 cubic feet per second (cfs). The loss of direct connectivity to the Big Hole system, habitat degradation and chronic drought and dewatering issues has resulted in the continued decrease in grayling abundance within Rock Creek. In 2005, a two-mile electrofishing survey of Rock Creek resulted in no grayling captured.

In 2006, the Rock Creek Reconnection and Restoration project was implemented on a 2.3-mile reach that would reconnect the stream to the Big Hole River, stabilize excessively eroding stream banks, enhance pool habitat and establish and protect a healthy riparian corridor. The project included constructing and reactivating over 4,800 feet of channel and floodplain through a historic swale to reconnect Rock Creek to the Big Hole River (Figure 7). Construction design for the new channel included creating stream morphology and floodplain characteristics to mimic that of a nearby reference reach. Sod mat and mature and sapling willow transplants were imported to establish healthy riparian vegetation along the newly constructed channel.

Approximately 7,500 feet of Rock Creek immediately upstream of the newly constructed channel received bank stabilization and pool enhancement treatments to further improve habitat conditions (Figure 7). Nearly 2,200 feet of excessively eroding stream banks were sloped and received sod mat and mature and sapling willow transplants. Thirty-three pools were created or enhanced using all or a combination of the following treatments; increase pool volume by excavating substrate to deepen and/or lengthen the pool, construct undercut banks and transplant mature willows adjacent to the pool to provide bank stability, overhead cover and shading.

New headgate and diversion irrigation structures were installed on the upstream end of the new channel to facilitate irrigation water to an active diversion point in the abandoned channel. The new diversion structure incorporated a fish ladder to allow year-round fish passage. Nearly five miles of riparian fence was constructed to protect the entire project reach. The private landowner agreed to rest the riparian pasture from livestock grazing for a five-year period to protect restoration efforts and allow riparian vegetation to establish. Following the rest period, the riparian pasture will be incorporated into a Big Hole CCAA developed grazing management plan for the property.

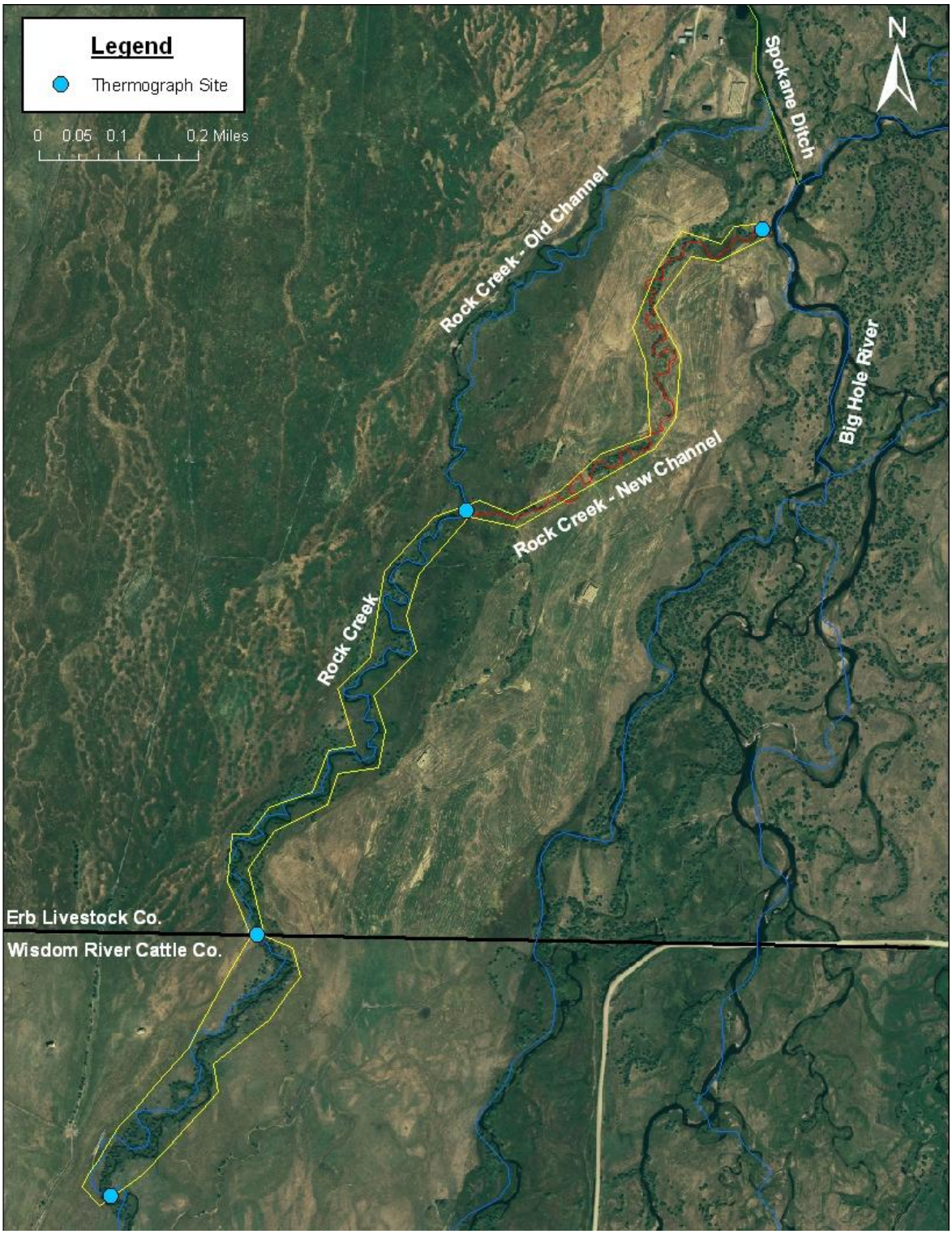


Figure 7. The Rock Creek Relocation and Restoration project reach, including the location of the new and old Rock Creek channels in relation to the Big Hole River and the Spokane Ditch, the riparian fence and the thermograph sites.

Monitoring:

Rock Creek Fish Population Data: Electrofishing surveys have been completed on several reaches of Rock Creek since 1978. Although recolonization of Rock Creek has not occurred since the projects completion, Figure 8 shows historic sampling efforts and the potential for Rock Creek to support grayling. A habitat restoration project on a six-mile reach of the Big Hole River adjacent to Rock Creek was completed in 2008 and has exhibited a slight increase in grayling abundance (N=0 in 2008; N=9 in 2009). As grayling abundance in the region increase, it is expected that recolonization of Rock Creek will follow.

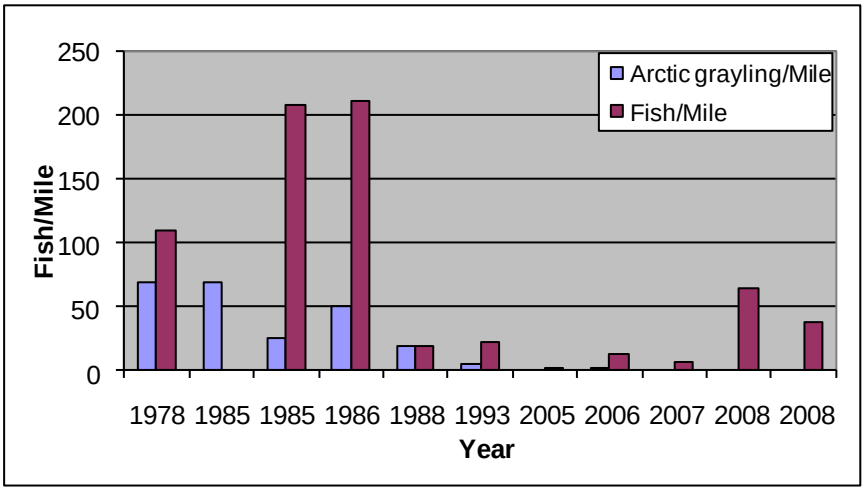


Figure 8. Arctic grayling per mile and total fish per mile captured during MFWP electrofishing surveys of Rock Creek from 1978 – 2008. Note: Total fish includes eastern brook trout, brown trout, rainbow trout and burbot. Only grayling were captured during the spring 1985 survey.

Rock Creek Water Temperature Data: Water temperature regimes in the Rock Creek Restoration project reach have been monitored at four locations since 2006 (Figure 9). The locations include the top of the project reach, at a landowner property boundary, the upstream end and mouth of the new channel.

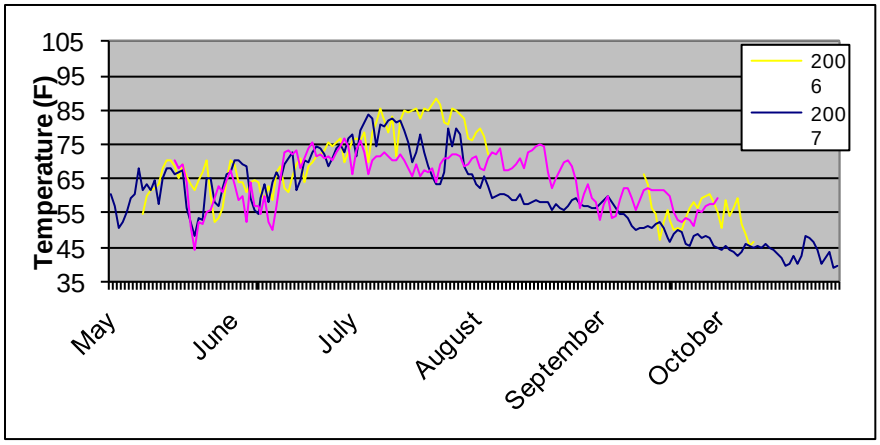


Figure 9. Maximum daily temperature recorded at the mouth of Rock Creek from 2006 - 2008. Note: Atmospheric temperature was recorded during parts of August and September in 2006.

Rock Creek Stream Morphology Data: Rock Creek channel cross-section and pebble count surveys have been conducted at one "pool" and one "riffle" channel bed feature since 2006. Cross-section and pebble count survey sites coincide and are located near the mouth of the new channel. The sites are benchmarked with permanent stakes to ensure repeatability. Data from these surveys have not yet been analyzed.

Rock Creek Before & After Photos:

Photo 12. Rock Creek before project, illustrating severe over-grazing and over-wide channel.

Photo 13. Rock Creek one year post-project.

Big Hole River Riparian Fencing Project Harrington Reach

WATER NAME: Big Hole River
DATA PROVIDED BY: Austin McCullogh, FWP
FFI NUMBER: 026-007
STATUS: Completed in fall 2007.

Restoration Objectives: To enhance riparian vegetative community that will stabilize banks, reduce sedimentation, provide cover, decrease temperatures and develop habitats that benefit Arctic grayling and numerous other native and sportfish species.

Brief Project Description: In 2008, nearly five miles of riparian pasture fence was constructed along a 2.25-mile reach of the Big Hole River two miles north of Wisdom, MT. This reach of the Big Hole River is considered critical Arctic grayling spawning and juvenile rearing habitat. Two large pastures were divided into five pastures, including two riparian pastures. The new pasture configuration will be incorporated into a grazing management plan as a component of a Big Hole CCAA conservation plan for the property.

Photo 14. Big Hole River Harrington reach riparian fence.

Monitoring: The Wisdom West reach of the Big Hole River contains the project reach and has been sampled regularly since 1983 (Figure 10). Total grayling captured during periods of the 1980's and 1990's show the potential for grayling recovery in this reach under improved habitat conditions.

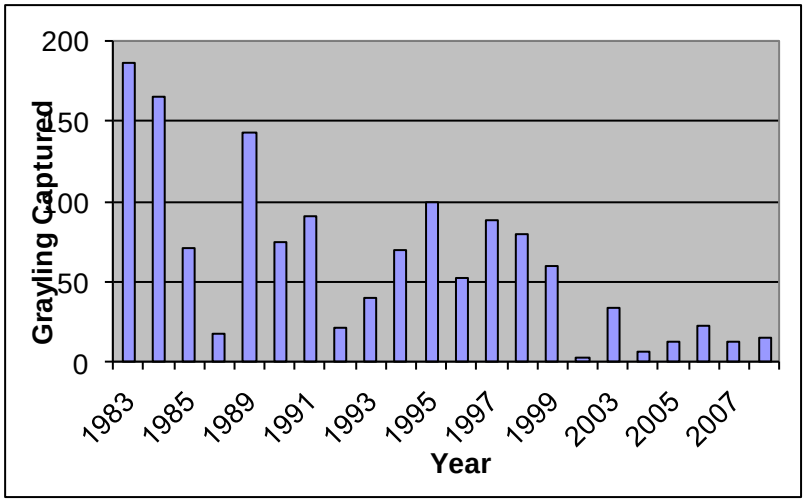


Figure 10. Total grayling captured during electrofishing surveys of the Wisdom West reach of the Big Hole River from 1983 - 2008.

Big Hole River Riparian Fencing Christiansen Reach Project

WATER NAME: Big Hole River
DATA PROVIDED BY: Austin McCullough, FWP
FFI NUMBER: 028-007
STATUS: Completed in fall 2007.

Restoration Objectives: To enhance riparian vegetative community that will stabilize banks, reduce sedimentation, provide cover, decrease temperatures and develop habitats that benefit Arctic grayling and numerous other native and sportfish species.

Project Description: Nearly three miles of riparian and pasture fence was constructed along the Big Hole River in 2007. One large pasture was divided into three smaller pastures, and 1.25 miles of the Big Hole River was protected from impacts of livestock. The new pasture configuration will be incorporated into a grazing management as a component of a Big Hole CCAA conservation plan for the property.

Monitoring: The new riparian fence provides landowner flexibility in grazing management that include pasture rotations and livestock management that has benefited riparian and stream channel function since its construction.

Big Hole River Huntley Diversion Restoration Project

WATER NAME: Big Hole River
DATA PROVIDED BY: Peter Lamothe, FWP
FFI NUMBER: 027-007
STATUS: Completed fall 2008.

Restoration Objectives: To allow more efficient use of irrigation diversion water. The resulting conservation of water will improve stream flows in the upper Big Hole.

Project summary: In 2007, FFIP collaborated with the NRCS, DNRC, and Ralph Huntley to fund a project to replace three non-functioning diversion structures and four headgate structures on Ralph Huntley and Son, Inc. property. The project also installed two irrigation water-measuring devices in the associated irrigation systems. The project will improve the landowners' ability to control and quantify the amount of water diverted from the Big Hole River. A flow agreement is being developed as a component of the Big Hole CCAA conservation plan for the property.

Photo 15. A typical outdated irrigation structure on the Huntley Diversion.

Photo 16. A new headgate structure installed on the Huntley Diversion.

Monitoring: Monitoring for this project will occur through the implementation of the site-specific plan (i.e., conservation plan) as part of the Big Hole Grayling CCAA Program. As part of this program the landowner will have to maintain diversions of irrigation water within the constraints of existing water rights for the property. The program also requires reductions in diversions of irrigation water as streamflow levels drop in this part of the watershed.

Big Hole River Riparian Restoration Project

WATER NAME: Big Hole River
DATA PROVIDED BY: Austin McCullough
FFI NUMBER: 001-07
STATUS: Completed

Restoration Objectives: Restoration of Riparian Corridor

Project Summary: The Big Hole River Riparian Restoration project focused on riparian habitat restoration and stream bank stabilization on six river miles of the Big Hole River near Wisdom, MT. This reach of river is considered critical to all Arctic grayling life-history stages in the upper Big Hole watershed. Habitat degradation and dewatering from a combination of irrigation practices and on-going drought conditions have resulted in severe reduction in grayling abundance documented during population surveys. The restoration reach is protected by a combination of 5-strand barbed wire and high-tensile electric fence. The private landowner has agreed to rest the riparian pasture from livestock grazing for a five-year period to protect restoration efforts and allow riparian vegetation to establish. Following the rest period, the riparian pasture will be incorporated into a Big Hole CCAA developed grazing management plan for the property.

Monitoring: This project is located within the McDowell electrofishing survey reach that has been sampled regularly since 1985 (Figure 11). The six-mile reach provides a relatively long-term population abundance trend, as well as insight to the potential for grayling recovery in the region.

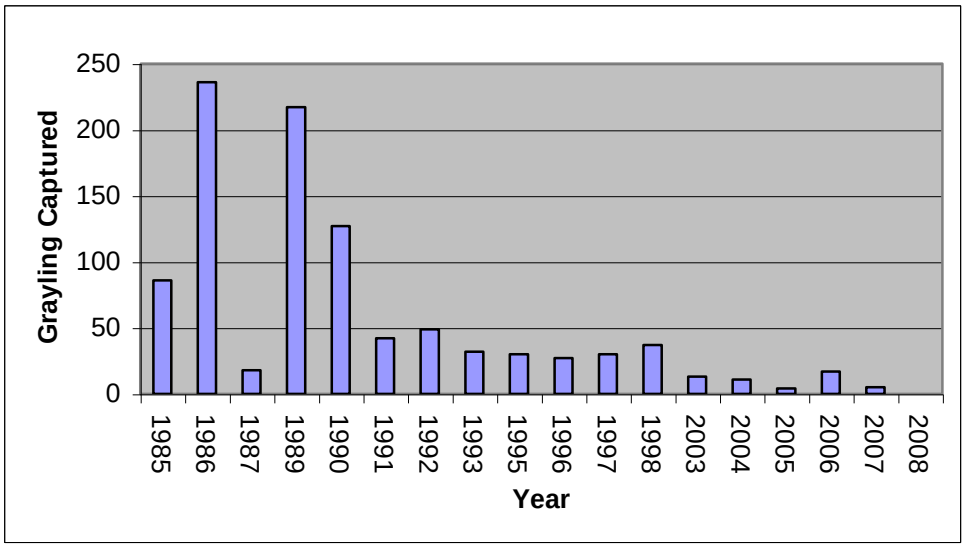


Figure 11. The total number of grayling captured within the McDowell reach during MFWP electrofishing surveys from 1985 - 2008.

A temperature logger has been maintained near the lower boundary of the Big Hole River Riparian Restoration project reach from 2005 – 2008 (Figure 12).

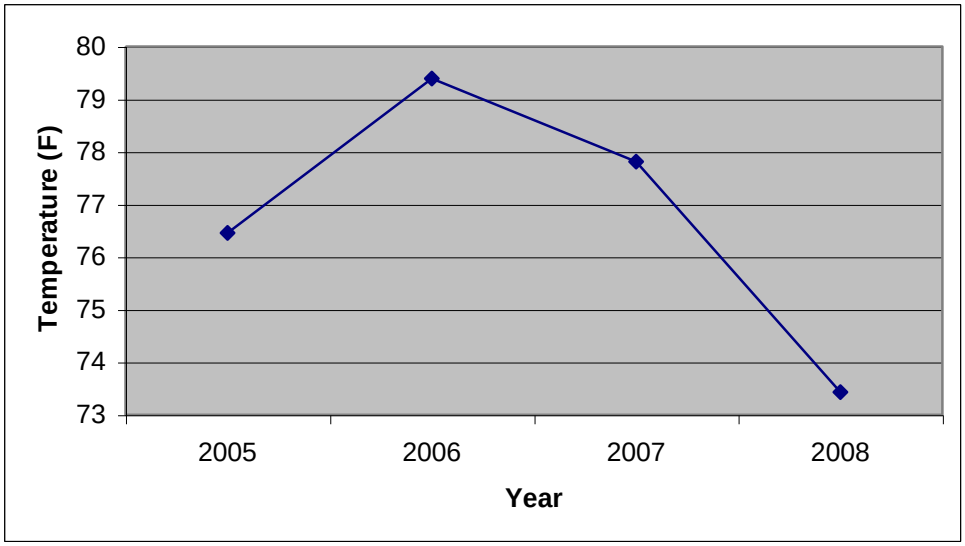


Figure 12. Maximum stream temperature recorded in the Big Hole River at the lower boundary project reach from 2005 - 2008.

Big Hole River Riparian Restoration Before & After Pictures:

Photo17. Typical stream bank and riparian conditions of the McDowell reach prior to restoration in 2005.

Photo 18. Typical stream bank and riparian conditions of the McDowell reach after restoration in 2009.

Blackfoot River Drainage

This section of the monitoring report summarizes restoration activities along with the 2009 and 2010 fish population monitoring results for 21 streams associated with Montana Fish, Wildlife and Parks (FWP) Future Fisheries Program (Figure 13). Ten previous FWP reports spanning the 1989-2007 fisheries investigations provide additional information to these and other restoration endeavors (Peters 1990; Pierce and Peters 1991; Pierce et al. 1997, 2001, 2002, 2004, 2008; Pierce and Schmetterling 1999; Pierce and Podner 2000, 2006).

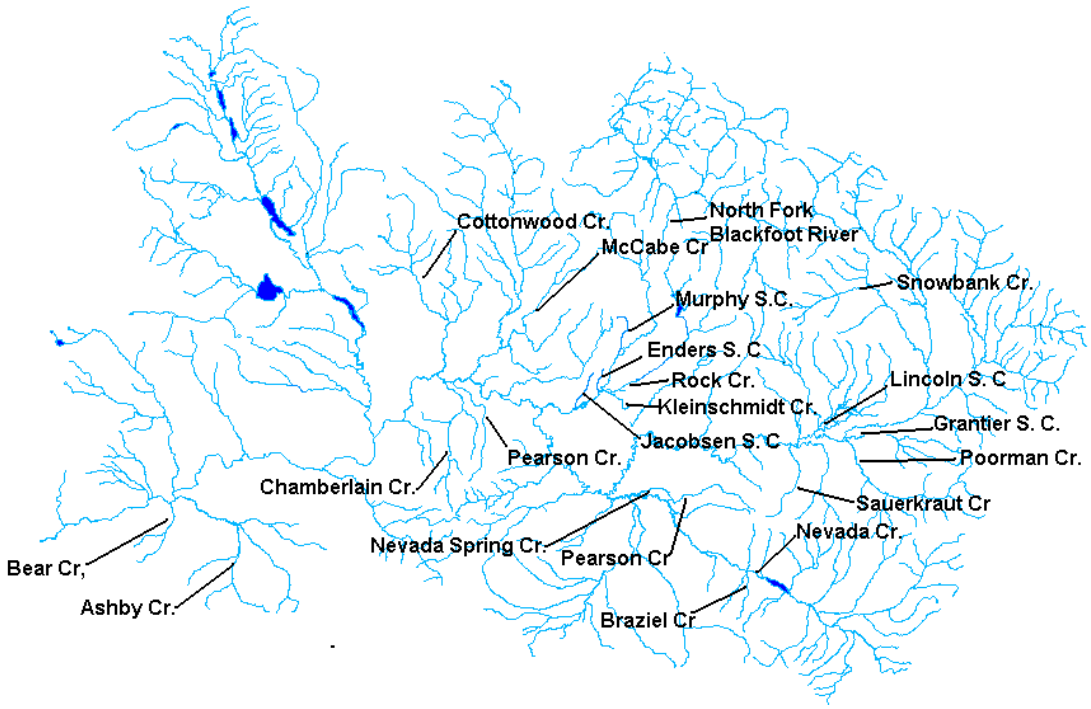


Figure 13. Map of the Blackfoot River drainage showing streams covered in this report.

<u>Ashby Creek Channel Restoration Project</u>

WATER NAME: Ashby Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 002-05
STATUS: Completed in 2007

Restoration objectives: Protect the genetic purity of westslope cutthroat trout (WCT) in the upper Ashby Creek watershed by using an existing wetland complex as a migration barrier, and improve WCT habitat by creating a natural channel that provides complexity, increases riffle-pool habitat features and available spawning substrate, and increase shade

and small diameter wood recruitment to the stream channel. Improve and re-establish wetland functionality.

Project summary: Ashby Creek is a 2nd order tributary to Camas Creek in the Union Creek basin that supports a genetically pure WCT population. The upper reaches of Ashby Creek originate in forested areas on DNRC and BLM properties before entering private ranch lands near mile 3.0. Past agricultural practices have significantly altered Ashby Creek. Alterations include diversion for irrigation and channel ditching to increase farmable acreage, livestock degraded stream banks, loss of woody plant communities, irrigation-related dewatering and the draining of downstream wetlands.

A comprehensive restoration project plan was completed on the Hayes Ranch in 2007. The project included 1) reconstruction of three miles of stream that had been historically ditched, 2) enhanced instream flows, 3) improved upstream fish passage and the installation of a fish screen at a diversion point, 4) riparian grazing changes, and 5) shrub plantings. This project also connected Ashby Creek to an 80-acre wetland in a manner that is designed to inhibit the upstream movement of fish. Last, a conservation easement was placed on the Hayes ranch in order to preserve the rural character and natural resources of the property.

Monitoring: In 2007 we established two fish population survey sites in the new channel at mile 2.7 and a downstream survey site at mile 2.0 as well as an upstream reference. During the first two years of population monitoring, fisheries surveys found no fish within either of the two new (treatment area) monitoring sites. However, WCT have begun to occupy the upper segment of the new channel during the more recent (2009 and 2010) monitoring efforts (Figure 14).

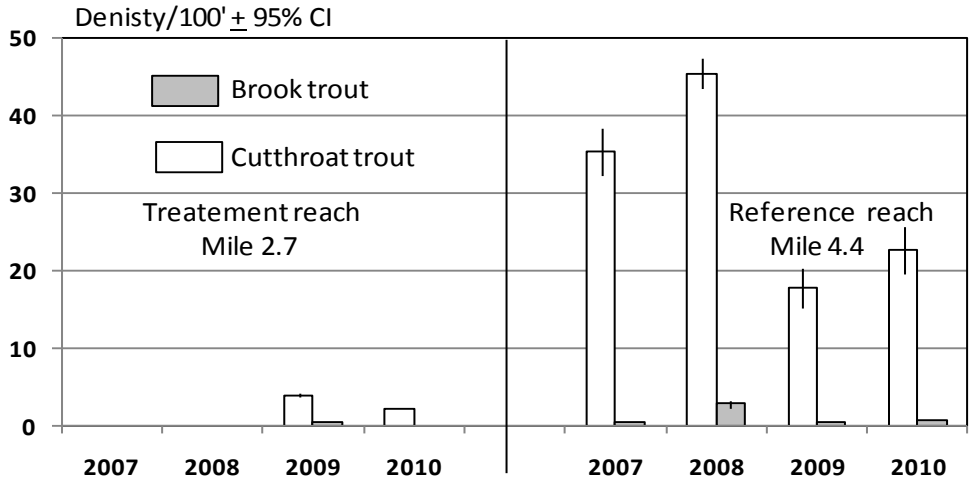


Figure 14. Estimated densities of age 1+ trout for two reaches of Ashby Creek.

Bear Creek Channel Restoration Project

WATER NAME: Bear Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 028-98
STATUS: Completed in 1999.

Restoration Objectives: Restore habitat degraded by historical activities in the channel, restore fish passage and thermal refugia, and improve recruitment of trout to the Blackfoot River.

Project Summary: Bear Creek, a small 2nd-order tributary to the lower Blackfoot River, flows six miles north to its mouth where it enters the Blackfoot River at river mile 12.2 with a base-flow of 3-5 cfs. Bear Creek is one of the colder tributaries to the lower Blackfoot River.

Located on industrial forest and agricultural lands, Bear Creek has a long history of adverse habitat changes, which include placement of undersized culverts, road drainage and siltation, irrigation, channelization of the stream, excessive riparian grazing, and streamside timber harvest. Prior to restoration activities, these fisheries impairments contributed to the loss of migration corridors and the simplification and degradation of salmonid habitat. Many of these impairments were corrected in the late 1990s, and these included: 1) upgrading culverts and addressing road-drainage problems; 2) improving water control structures at irrigation diversions; 3) reconstructing 2,000' of channel; 4) enhancing habitat complexity on an additional 2,000' of stream; 5) shrub plantings; and 6) the development of compatible riparian grazing systems for one mile of stream.

Monitoring: Bear Creek supports predominately rainbow trout and lower numbers of brown trout and brook trout in the lower stream, along with WCT in the upper basin and very low densities of juvenile bull trout. In 2009 and 2010, we continued to monitor fish populations in a reconstructed section (mile 1.1) of Bear Creek. The monitoring shows an increasing trend in trout abundance 7-9 years post-treatment followed by stable densities at approximately double the pre-treatment densities (Figure 15).

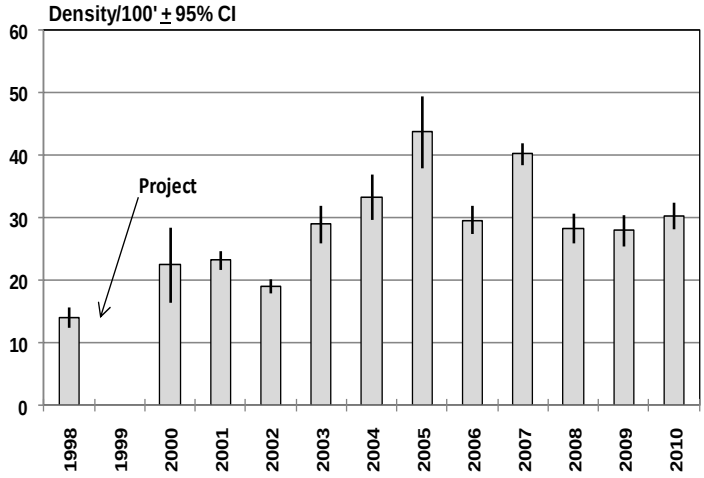


Figure 15. Estimated total trout densities of age 1+ fish in the reconstructed section of Bear Creek at mile 1.1.

Braziel Creek Channel Restoration Project

WATER NAME: Braziel Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 024-09, 002-10
STATUS: Completed in 2010.

Restoration objectives: Restore a functional stream and riparian area capable of supporting WCT.

Project Summary: Braziel Creek drains a small watershed located along the southeastern foothills of Hoodoo Mountain, just south-southeast of Helmville. This small stream is ~4 miles in length, generates an estimated base-flow of 0.5-1.0 cfs before entering Nevada Creek at mile 24.5 about 2.0 miles downstream of the Nevada Creek reservoir.

Braziel Creek has historically been degraded from channelization, dewatering and heavy riparian grazing. In addition, undersized culverts limited fish passage and cutthroat trout entrainment has been indentified in one irrigation ditch. To improve conditions for cutthroat trout, a 1500' segment of lower Braziel Creek was reconstructed to a step-pool channel, an undersized culvert was replaced at the county road, a new screened diversion was constructed, and livestock were fenced from the project to allow vegetative recovery. These restoration activities were all enacted in the fall of 2010.

Monitoring: Braziel Creek currently supports a simple fish community of WCT and sculpin. Fish population survey sites were established in 2010 at two sites, (one 0.4 mile) upstream of the project and one (mile 0.2) immediately downstream of the project area (Figure 16). In addition, we also surveyed an unscreened irrigation ditch. This survey generated a catch of 11 age 1+ cutthroat trout/100' in the upper portion of the ditch. This pre-treatment survey will help test the efficacy of a Coanda fish screen installed as part of the larger project.

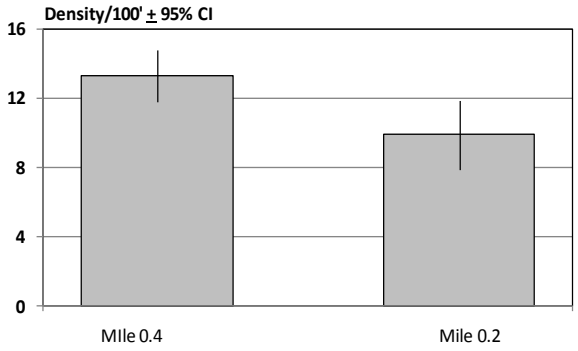


Figure 16. Density estimates for age 1+ cutthroat trout upstream of and within restoration treatment reach of Braziel Creek.

Chamberlain Creek Restoration Project

WATER NAME: Chamberlain Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 009-97
STATUS: Completed in early 1990's and 1998.

Restoration Objectives: Improve access to spawning areas; improve rearing conditions for westslope cutthroat trout; improve recruitment of WCT to the Blackfoot River.

Project Summary: Chamberlain Creek is a small Garnet Mountain tributary to the middle Blackfoot River, entering near rm 43.9 with a base-flow of 2-3 cfs. Prior to 1990, sections of lower Chamberlain Creek were dewatered and severely altered (grazing and channelization), which led to sharp declines in WCT densities (Peters 1990). During the early 1990s, Chamberlain Creek was also one of the first comprehensive restoration projects within the Blackfoot Basin. Restoration emphasized road drainage repairs, riparian livestock management changes, instream habitat restoration, irrigation upgrades (consolidation of ditches, water conservation, elimination of fish entrainment and fish ladder installation on a diversion), conservation easements and improved stream flows through water leasing. Restoration occurred throughout the drainage with emphasis in the lower mile of stream. At this time, riparian restoration activities in the form of road decommissioning are continuing in the Chamberlain Creek basin.

Monitoring: Chamberlain Creek is a WCT- dominated stream over its entire length although lower reaches also support rainbow and brown trout in low abundance. Following restoration and WCT recovery in lower Chamberlain Creek, radio telemetry identified Chamberlain Creek as a primary spawning stream for fluvial WCT from the Blackfoot River (Schmetterling 2001). In 2009 and 2010, we continued to monitor fish population densities in the restoration area near the mouth. This reach is also influenced by an FWP-held water lease donated by a private landowner. This long-term dataset shows stable densities at elevated levels compared to the pre-treatment population densities (Figure 17).

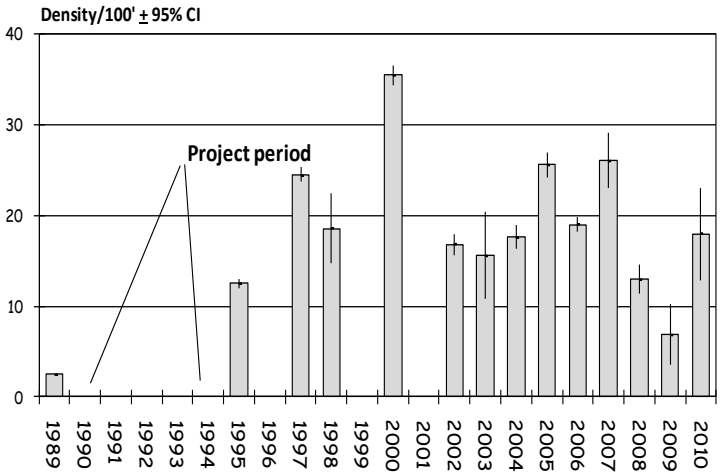


Figure 17. Densities of age 1+ westslope cutthroat trout in Chamberlain Creek at mile 0.1. 1989-2010.

Cottonwood Creek Restoration (various projects)

WATER NAME: Cottonwood Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 007-96, 044-96, 037-97, 030-98, 008-99, 037-99, 038-99, 009-00, 010-00, 004-03, 002-06
STATUS: All completed.

Restoration objectives: improve degraded habitat; eliminate fish losses to irrigation ditches; and restore instream flows and migration corridors for native fish.

Project Summary: Cottonwood Creek, a 3rd order stream, flows ~16-miles south from the Cottonwood Lakes and enters the middle Blackfoot River at rm 43 with a base-flow of ~15 cfs. Genetically pure WCT and bull trout dominate the headwaters of Cottonwood Creek, and rainbow, brook, and brown trout dominate middle to lower stream reaches. Cottonwood Creek is considered a "core area" and was designated as "critical habitat" under the ESA for the recovery of bull trout in 2010. Since 1996, Cottonwood Creek has been the focus of several restoration actions.

Monitoring: In 2009 and 2010, we continued to monitor fish populations in upper Cottonwood Creek (mile 12.0) where enhanced flow, irrigation ditch screening and diversion upgrades were made (Figure 18). Prior to 1997 this section was completely dewatered during late summer and fall by irrigation. Following an initial increase in the late 1990s age 1 and older westslope cutthroat trout have remained stable at the mile 12.0 monitoring site. However, this dataset also shows an interesting decline in densities between 2000 and 2002. This adjustment appears to be the result of the habitat changes involving the loss of instream wood and pools within the monitoring section. Bull trout densities have remained static at low densities throughout the post-treatment monitoring period.

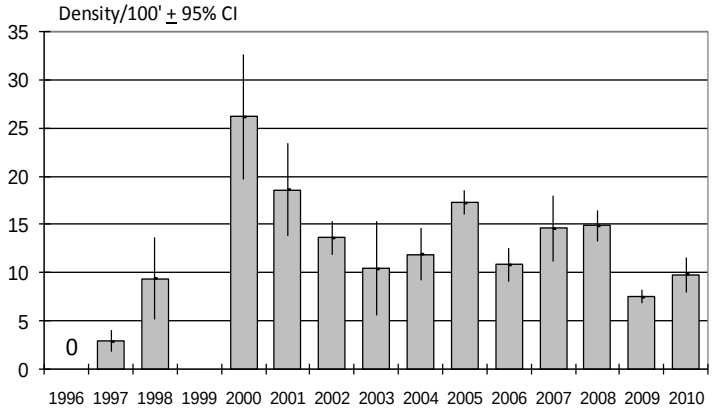


Figure 18. Estimated densities of westslope cutthroat trout in Cottonwood Creek at stream mile 12.7 following diversion upgrades and instream flow enhancement.

Enders Spring Creek Channel Reconstruction Project

WATER NAME: Grantier Spring Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 009-08
STATUS: Completed in fall 2008.

Restoration objectives: Restore the spring creek to natural conditions, reduce water temperatures to level suitable for bull trout, reduce instream sediment levels, enhance habitat quality utilizing in-stream structures, vegetation and provide suitable substrate for spawning.

Project Summary: Enders Spring Creek was a heavily degraded 1st-order spring creek tributary to the North Fork of the Blackfoot River entering at mile 6.3. Past degradation stem from past agricultural activities and include the loss of sinuosity, channel widening and heavy sediment loading in pools and glides. Enders Spring Creek was the last major spring creek to the North Fork that requires active restoration when reconstructed in 2008.

Monitoring: Enders Spring Creek supports a mixed community of salmonids with brook trout as the most abundant species followed by bull trout and brown trout in low abundance. Fish population monitoring began in 2009 at mile 0.5 (Figure 19) and water temperatures in Enders Spring Creek near the confluence with the North Fork. At this early stage of monitoring total trout densities appear to be increasing. Water temperature monitoring has shown cooling effect with mean daily highs declining from 55.6 pre-treatment to 50.8°F post-treatment as shown in Figure 20. These temperatures are considered favorable to bull trout.

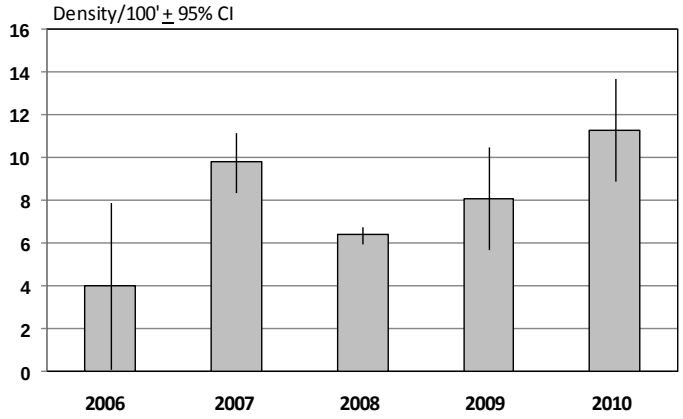


Figure 19. Estimates of total trout density for Enders Spring Creek at mile 0.5, 2006-2010.

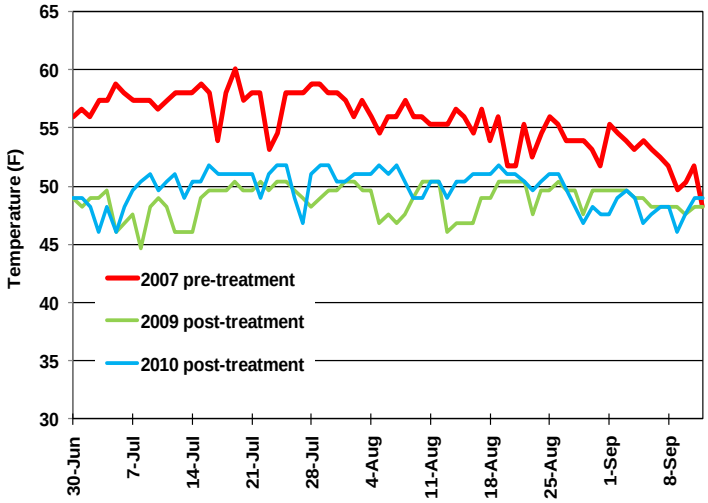


Figure 20. Summer maximum daily water temperatures for Enders Spring Creek pre-and post-treatment, 2007-2010.

Grantier Spring Creek Restoration Project

WATER NAME: Cottonwood Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 006-1997
STATUS: Completed.

Restoration objective: restore natural channel features of a degraded spring creek.

Project Summary: Grantier Spring Creek is a large spring creek tributary to lower Poorman Creek, which enters to the upper Blackfoot River at river mile 108. Grantier Spring Creek was the first major spring creek restoration project undertaken in the Blackfoot River Basin. Grantier Spring Creek was reconstructed in 1990 and allowed to recover thereafter

Fish populations and other monitoring: Fish population surveys in the early 1990s found brook and brown trout as only the salmonids present; however, fifteen years after channel reconstruction, WCT were the most abundant trout at the sampling location, and nonnative trout were reduced to very low densities (Figure 21). Despite an overall decline in total trout abundance, this shift in species composition included the presence of large (>400mm) adult WCT. These large fish have helped elevate total trout biomass above pre-treatment levels (FWP unpublished data). Subsequent spawning surveys identified westslope cutthroat trout redds within the upper spring creek, and subsequent fish population surveys found age-0 westslope cutthroat trout throughout the spring creek in low abundance.

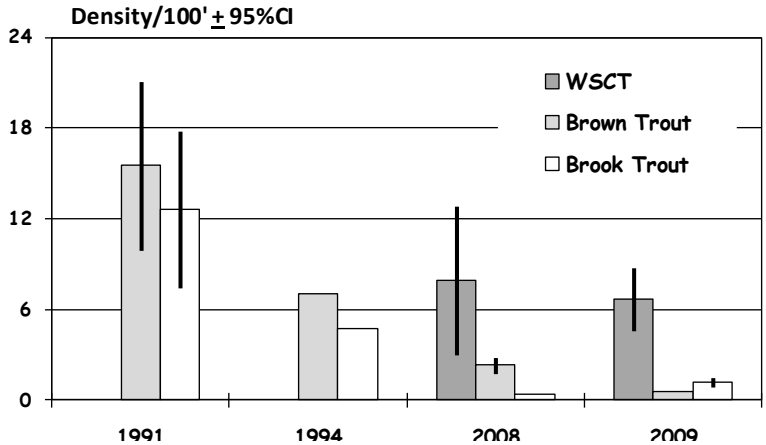
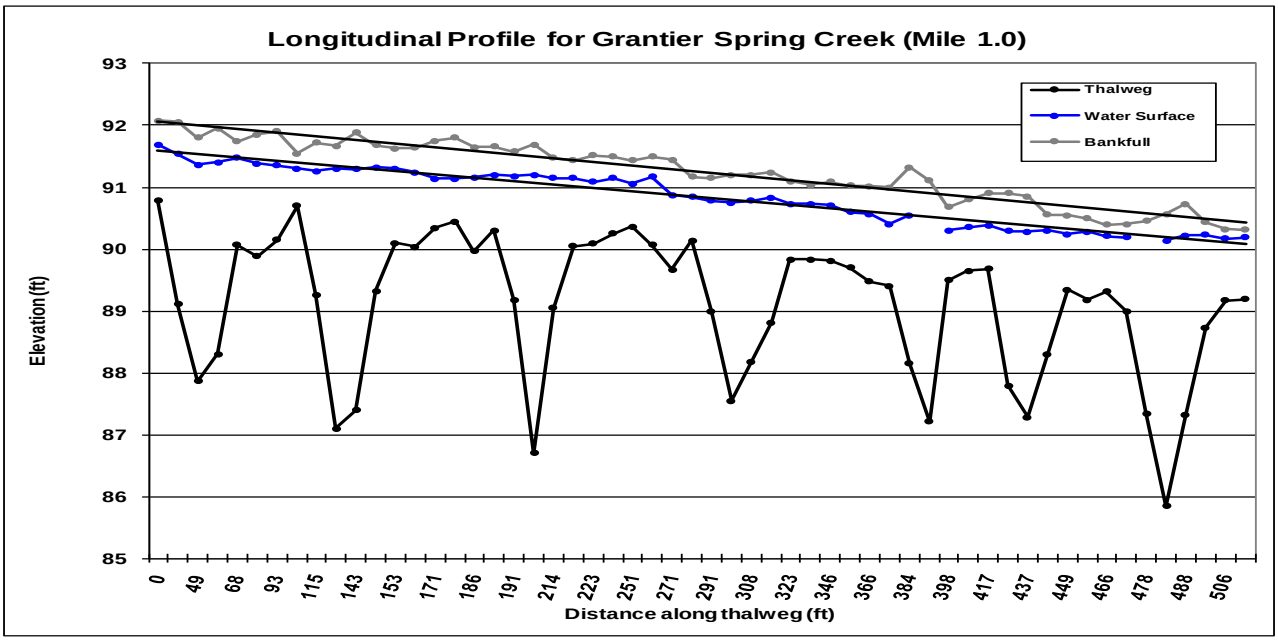
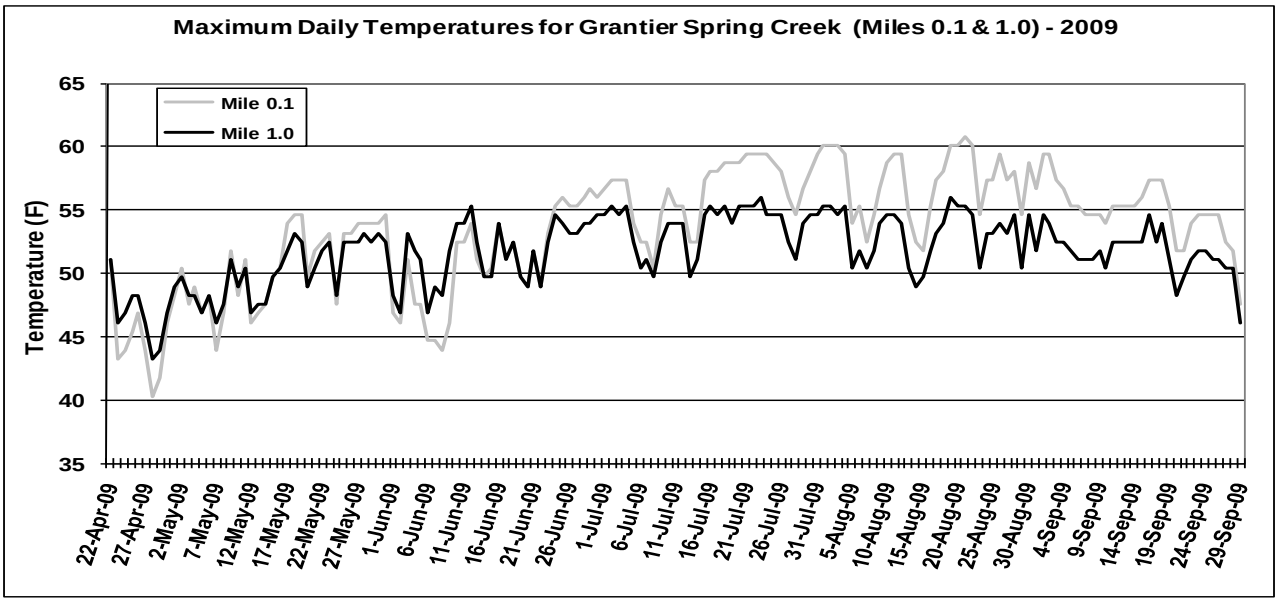


Figure 21. Trout densities in Grantier Spring Creek.

These findings of WCT recolonization are especially interesting given widespread reports of WCT displacement by brook trout and brown trout. Because this shift in species composition is poorly understood, FWP performed a series of aquatic assessments to describe the environmental conditions associated with this change. These included geomorphic and instream habitat surveys, water temperature and instream sediment surveys (Figures 22, 23, and 24). Genetic work is currently ongoing to help identify the population source(s) associated with this recolonizaiton of WCT.





				Larger particle sizes (mm)			% Fines		
Stream Name	Site/Core	Sorting Coeff.	Fredle Index	Geo Mean	D25	D75	(< 0.84mm)	(0.84 - 4.6mm)	(< 6.35mm)
Grantier Spr Cr	1	3.30	1.40	4.50	1.50	15.80	19.60	28.70	55.30
	2	3.90	2.60	10.40	3.40	52.60	12.80	17.20	33.90
	3	2.70	2.60	7.20	3.10	23.60	12.50	18.80	36.50
	4	4.20	0.90	3.70	0.80	14.30	26.30	25.00	57.00
	5	2.40	4.60	11.10	6.60	39.00	10.20	10.80	24.40
	6	3.70	1.10	4.00	1.10	14.90	22.30	26.90	54.80
Mean	Mean	3.4	2.2	6.8	2.8	26.7	17.3	21.2	43.7
Range	Range	1.80	3.70	7.40	5.80	38.30	16.10	17.90	32.60

Figures 22-24. Longitudinal survey (top), maximum water temperatures recordings (middle) and McNeil core sample (lower) graphs undertaken on Grantier Spring Creek.

Jacobsen Spring Creek Channel Restoration Project

WATER NAME: Jacobsen Spring Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 030-05.
STATUS: Completed in 2007.

Restoration objectives: Maximize secondary instream productivity; maximize quality of shoreline rearing areas; restore spawning site potential by reducing levels of fine sediment in riffles to a level suitable for spawning; reduce summer water temperatures suitable for bull trout (<60^{0}F); provide high quality pools with high level of complex cover; maximize use of existing channel belt-width and existing shoreline areas.

Project Summary: Jacobsen Spring Creek forms from two spring creeks that merge at mile 0.7 and generate a base-flow of 4-7cfs near the mouth. This small spring creek system enters the North Fork of the Blackfoot River at mile 4.7. According to landowner accounts, Jacobsen Spring Creek historically supported both bull trout and WCT.

Jacobsen Spring Creek was severely degraded due to historic grazing and timber harvest practices, the consequences of which included a wide and shallow channel, low sinuosity, elevated water temperatures and excessive sediment loading (Pierce et al 2006). However, early habitat investigations identified the spring creek as possessing the basic habitat components necessary for improved fisheries such as stable groundwater inflows, gravel substrate and a relatively dense riparian spruce forest that has potential to provide shade, complexity, and wood to the stream channel.

Starting in 2005, the entire 17,220' of Jacobsen Spring Creek (both channels) was reconstructed. The project emphasized a deep and narrow channel with higher sinuosity, the inclusion of backwater and shoreline rearing areas, gravel in pool tail-outs, and the placement of instream wood and sod mats on the stream banks to facilitate recovery. The project also included shrub plantings and the adoption of livestock management changes consistent with project objectives.

Monitoring: Jacobsen Spring Creek supports a mixed community of salmonids. In order of relative abundance species present include brook trout as the most abundant species followed by brown trout, rainbow trout and bull trout. In 2009 and 2010, we continued to monitor fish populations at mile 0.6, which was a site established prior to restoration activities. At this stage of monitoring, fisheries response shows a slight upward trend in total trout densities (Figure 25). We also continued to monitor post-treatment water temperatures near the mouth. This monitoring has shown a cooling effect with mean daily highs declining from 60.3^{o}F pre-treatment to 54.7^{o}F post-treatment (Figure 26).

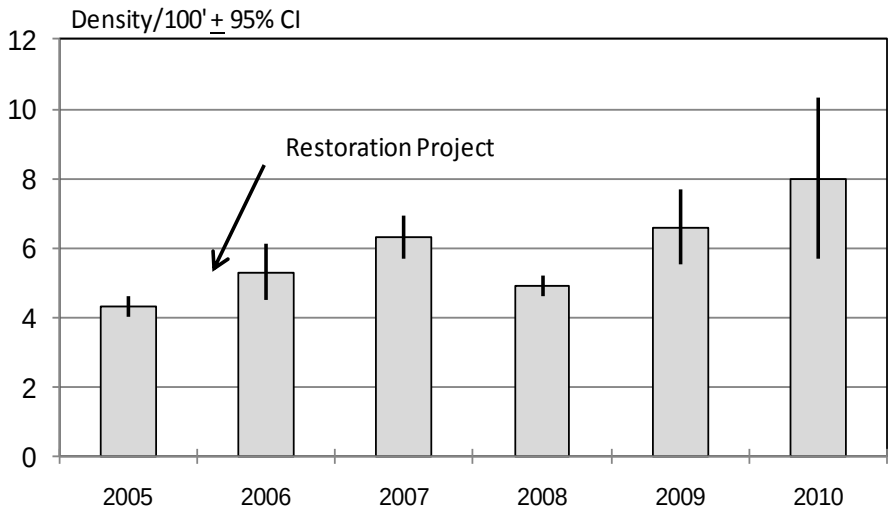


Figure 25. Estimated total trout densities in Jacobsen Spring Creek at mile 0.6, 2005-2010.

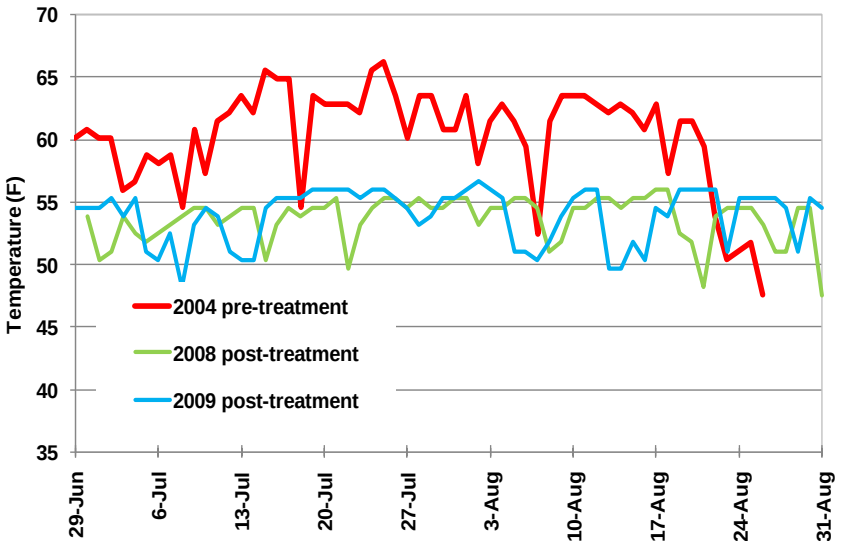


Figure 26. Maximum summer daily water temperatures for Jacobsen Spring Creek pre-treatment (2004) and post-treatment (2008-09).

Kleinschmidt Creek Channel and Riparian Restoration Project

WATER NAME: Kleinschmidt Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 044-99, 031-05.
STATUS: Restoration projects completed in 1991, 2001, and 2006..

Restoration objectives: Restore stream channel morphology for all life stages of trout; increase recruitment of trout to the Blackfoot River; and restore thermal refugia and rearing areas for North Fork Blackfoot River bull trout.

Project Summary: Kleinschmidt, a spring creek tributary with a base flow of ~9 cfs, joins with Rock Creek at mile 0.1 before entering the North Fork of the Blackfoot River at mile 6.2. Kleinschmidt Creek has a long history of stream degradation involving livestock over-use and channel alterations related to instream rock dams, undersized culverts and highway channelization (Pierce et al 2008). Summaries of pre-and post-project fisheries and related assessments (water temperatures, discharge, substrates, channel morphometrics) are described in Pierce et al. 1997, 2002, 2004, 2006, and 2008). The majority of Kleinschmidt Creek reconstruction was completed in 2001.

Monitoring: During 2009 and 2010, we resurveyed at two locations (mile 0.5 and 0.8) on lower Kleinschmidt Creek which were established in 1998 prior to restoration. These two sites were established to compare restoration techniques involving the placement of large instream wood into E4-type channels. For this study, there was no instream wood in the reconstructed channel at mile 0.5, whereas the rest of the channel, including the mile 0.8 survey site, included instream wood placements.

Both sites show higher densities of age 1 and older brown trout compared to the pre-project periods; however brown trout in the section with wood seemed to respond more

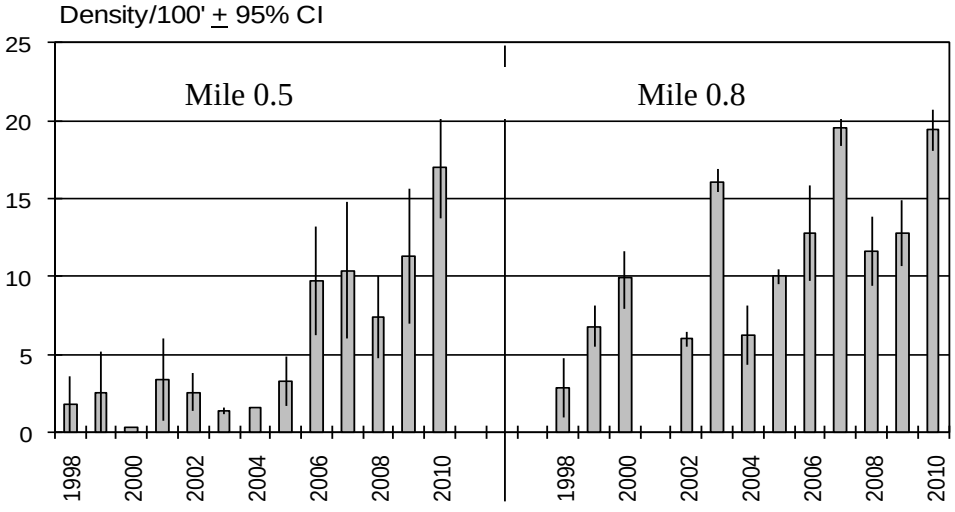


Figure 27. Estimated densities of age 1+ brown trout in two sections of Kleinschmidt Creek. The section at mile 0.5 lacks instream wood whereas the section at mile 0.8 includes instream wood.

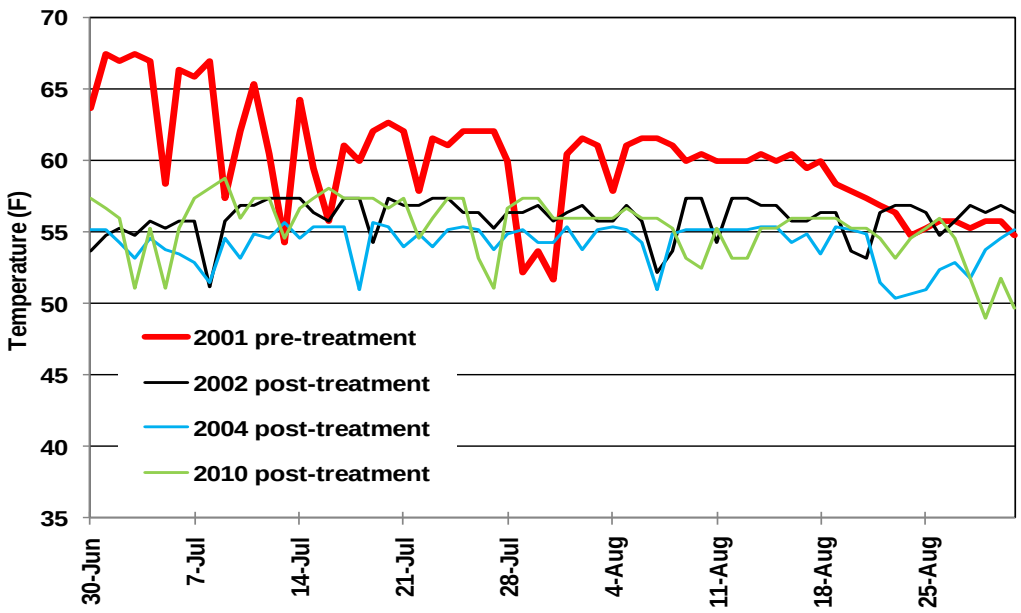


Figure 28. Summer maximum daily water temperatures for Kleinschmidt Creek pre-and post-treatment.

quickly and continuously expressed higher densities (Figure 27). A comparison of pre- and post-treatment summer water temperature show a mean temperature reduction from daily high of 60.0 pre-treatment to 55.2^{o}F averaged over four years post-treatment (Figure 28).

Lincoln Spring Creek Channel Reconstruction Project

WATER NAME: Lincoln Spring Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 012-07.
STATUS: Completed in summer 2008.

Restoration objectives: Improve overall habitat conditions, improve spawning and rearing habitat for salmonids, eliminate fish passage barriers, and improve water quality conditions.

Project Summary: Lincoln Spring Creek is a large spring creek tributary to Keep Cool Creek, which enters the Blackfoot River at mile 105.2. This 1st-order, low-gradient spring creek is ~6.3 miles in length and originates from an alluvial aquifer under the Lincoln Valley and generates variable base-flow that seasonally rises and falls with the aquifer. The stream flows west through private ranchland and the town of Lincoln before entering Keep Cool Creek at mile 0.6. It is primarily a gravel based stream with a surrounding spruce riparian over-story.
Fisheries-related impairments include irrigation practices, heavy livestock grazing and residential impacts and undersized culverts. The activities have suppressed riparian

vegetation and contribute to an over-widened and shallow stream channel, fine sediment loading and generally simplified fish habitat.

About 9,000' of Lincoln Spring Creek (mile 2.9 and 4.6) was reconstructed in 2008 to a more narrow and deepened channel with increased stream sinuosity. The project included the placement of instream wood, re-vegetation of stream banks, removal of three undersized culverts and an upgrade to an irrigation diversion. The project hopes to benefit salmonids by improving physical habitat conditions associated with the channel and by reducing temperature and sediment levels and restoring movement corridors.

Monitoring: Lincoln Spring Creek supports a community of brown and brook trout. Native trout have not been detected in fish population surveys undertaken between 1995 and 2010. In 2007, we established a pre-treatment fish population survey within the project area at mile 3.8. Following channel reconstruction, we returned to resample fisheries in 2009 and 2010 and found declining densities of both brook and brook trout 1-2 years post-treatment compared to the pre-treatment survey (Figure 29). In a related survey of age-0 trout, we also found a higher numbers of fry within an unscreened irrigation ditch (CPUE = 6.3/100') within the project area verses the reconstructed stream (CPUE = 1.8). Additional monitoring will be necessary to track fisheries response of this project. The ditch survey indicates a screen to prevent movement of fish into the ditch may be necessary.

Figure 29. Estimated densities of age 1+ brown and brook trout in Lincoln Spring Creek on the Grosfield Ranch, 2007-2010.

Murphy Spring Creek Fish Screen Project

WATER NAME: Murphy Spring Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 011-06.
STATUS: Completed in 2006.

Restoration objectives: Restore habitat conditions suitable to westslope cutthroat trout and juvenile bull trout; prevent irrigation ditch losses; maintain minimum instream flows and provide rearing and recruitment for fluvial bull trout and cutthroat trout to the North Fork.

Project Summary: Murphy Spring Creek, a small WCT dominated tributary, originates on the north side of Ovando Mountain and flow six miles south and enters the North Fork at mile 9.9. Murphy Spring Creek has a history of irrigation impacts and fish passage problems (Pierce et al. 2006). Irrigation problems involve chronic dewatering and entrainment of WCT to the Murphy ditch at mile 1.8. Fish passage problems involved an undersized culvert at mile 0.5 and the defunct condition of the Murphy diversion. The culvert reduced the upstream movement of juvenile bull trout from the North Fork, while the diversion reduced downstream movement of WCT from the headwaters to the North Fork through dewatering and entrainment.

The Murphy Spring Creek restoration project began in 1998 with a new diversion fitted with a Denil fish ladder. In 2000, we replaced the culvert with a larger baffled culvert designed to allow the upstream movement of YOY bull trout from the North Fork. In 2004-05, the Blackfoot Cooperators expanded restoration actions by developing an instream flow agreement that granted habitat maintenance flows as well as a 2.2 cfs minimal instream flow in Murphy Spring Creek. In 2006, a Coanda fish screen was placed in a diversion as a measure to eliminated losses of WCT.

Monitoring: Fish population surveys between 1997 and 2010 show increasing densities in native trout following stream treatments (Figure 30). Cutthroat trout is the prevalent native species. Bull trout were not detected at this survey site pre-treatment, but have been sampled consistently following restoration activities
Clark Fork River Drainage.

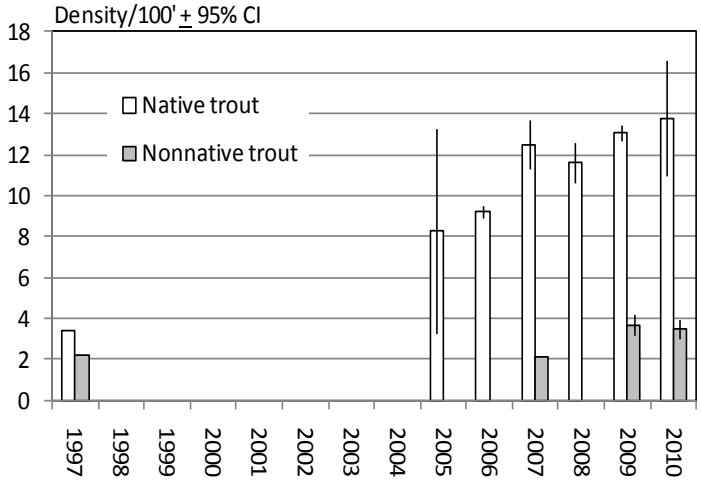


Figure 30. Estimated densities for native and nonnative trout in Murphy Spring Creek 1997-2010.

Nevada Creek Restoraiton Project

WATER NAME: Nevada Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 037-10, 038-10.
STATUS: Completed in 2010.

Restoration objectives: Restore a potentially functioning stream and riparian area capable of demonstrating and maintaining complex habitat and providing environmental conditions supportive of cold water trout.

Project Summary: Nevada Creek is a large and heavily degraded tributary to the middle Blackfoot River, entering at river mile 67.8. Nevada Creek is listed on the total maximum daily load (TMDL) 303(d) list for nutrients, siltation, suspended solids and thermal modifications (DEQ 2008). Flow alterations and water quality impairments greatly reduce the ability of Nevada Creek to sustain coldwater salmonids over large reaches of the lower stream. In the middle portion of Nevada Creek, immediately downstream of Nevada Reservoir a stream restoration project was completed in 2010 to restore a heavily degraded ~4,400 foot section of Nevada Creek. Here, Nevada Creek was incised, over-widened with eroding banks, and lacked woody riparian vegetation. Sediment analysis indicated that currently 0.21 tons of sediment per foot was being lost each year. Pre-treatment bankfull widths were measured up to 56 feet, verses a bankfull width of the new channel of 24 feet.

In addition to active channel work, a grazing management plan was also developed consistent with the protection of riparian resources. Finally, a diversion was replaced with cross-vane retrofitted with a Coanda fish screen to exclude fish from the ditch.

Monitoring: The stream variously supports westslope cutthroat trout, rainbow trout, and brown trout. Bull trout have also been reported in the upper section and the incidental presence of bull trout has been identified in the lower Nevada Creek basin (Pierce et al 2006). In 2010, we established a fish population survey section within the project reach. For this survey, density estimates for westslope cutthroat trout and rainbow trout >4.0' were 4.6 $\pm$ 2.0 and 27 $\pm$ 12.8 per 1000', respectively.

Nevada Spring Creek Restoration Project

WATER NAME: Nevada Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 033-98, 034-98, 035-98, 036-98.
STATUS: Ongoing.

Restoration objectives: Restore habitat suitable for cold-water trout; improve downstream water quality, and reduce thermal stress in Nevada Creek and the Blackfoot River.

Project Summary: Nevada Spring Creek, a tributary of lower Nevada Creek, originates from an artesian spring and flows through agricultural lands to its junction with Nevada Creek at mile 6.2. The spring source produces between six and nine cfs. Nevada Spring Creek is joined near the source by Wasson Creek, a small, basin-fed tributary that brings and additional base flow of approximately two cfs during the non-irrigation season. Water temperatures at the artesian source are a constant year-around 44°F.

Restoration of Nevada Spring Creek has been ongoing for several years. A habitat restoration project for the entire 4.2 miles of Nevada Spring Creek was completed between 2001 and 2009. The project entailed the complete reconstruction of Nevada Spring Creek, riparian grazing changes, instream flow enhancement, wetland restoration and shrub plantings. Prior to restoration, summer water temperatures in the lower portion of Nevada Spring Creek exceeded >75°F due in part an over-widened channel (Pierce et al. 2002). This warming and agricultural runoff from adjacent lands contributed to water quality degradation, and created unsuitable habitat conditions for coldwater salmonids in the lower portion of Nevada Spring Creek (Pierce et al. 2002). A complete before and after summary of channel measurements is located in a previous monitoring report (Pierce et al. 2006).

Monitoring: Prior to channel restoration, Nevada Spring Creek supported low densities of brown trout in upper reaches and non-game species (redside shiners, northern pikeminnow, and largescale sucker) in lower reaches (Pierce et al 2002). Westslope cutthroat trout were present in very low abundance; however they were historically abundant based accounts by a long-term landowner (Frank Potts, personal communication)

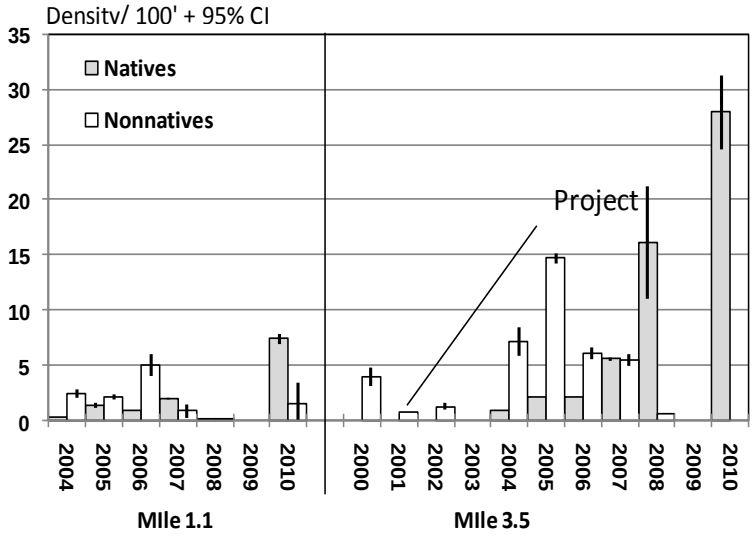


Figure 31. Densities for age 1+ native and nonnative trout salmonids at two locations on Nevada Spring Creek, 2000-2010.

In 2009-10, we continued post-project fish population monitoring at two sites, at mile 3.5 (upper site near the source) and 1.1 (lower site). Near the spring source, densities of age 1 and older nonnative brown trout have recently declined; however, native westslope cutthroat trout have expressed a significant increase (Figure 31). The brown trout decline appears to relate to a reduction in juvenile recruitment within Nevada Spring Creek, whereas, the sharp increase in westslope cutthroat trout densities coincides with upstream restoration of Wasson Creek section and increased recruitment of native fish from that source area.

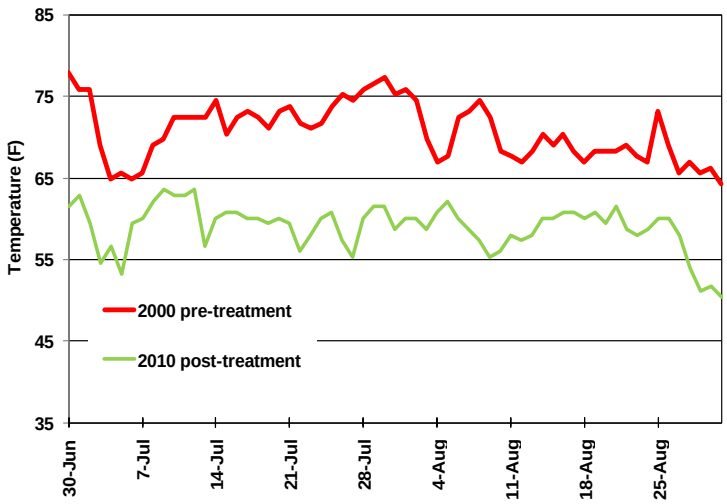


Figure 32. A pre-and post-treatment comparison of maximum summary daily water temperatures in Nevada Spring Creek at mile 0.1.

We also monitored water temperatures in 2010 near the mouth of Nevada Spring Creek following the completion of additional channel reconstruction. A comparison of maximum daily water temperatures from the original 2000 pre-treatment condition to 2010 is shown on Figure 32.

North Fork Blackfoot River Restoration Project

WATER NAME: North Fork Blackfoot River (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 011-97.
STATUS: Completed.

Restoration objectives: Eliminate the loss of bull trout and WCT to irrigation canals; manage riparian areas to protect habitat for native fish; improve recruitment of native fish to the Blackfoot River.

Project Summary: The North Fork of the Blackfoot is the largest tributary to the Blackfoot River, with headwaters draining the Scapegoat Wilderness. Upon exiting the mountains near mile 12, the North Fork enters Kleinschmidt Flat, a large glacial outwash plain before entering the middle Blackfoot River at river mile 54. Five irrigation canals, located on the Flat between stream mile 8.8 and 15.3, divert an estimated 40-60 cfs from the North Fork. In addition, this reach of the North Fork naturally loses water to alluvium with flows returning as down-valley spring creeks. The North Fork is one of three primary fluvial bull trout-spawning streams for the Blackfoot River. Bull trout recovery and related "core area" fisheries conservation projects (MBTRT 2000) involve developing compatible riparian grazing systems and eliminating entrainment of migratory bull trout, from five canals. In 2010 the North Fork was designated critical bull trout habitat under the Endangered Species Act.

Monitoring: The North Fork of the Blackfoot River supports one of the largest stocks of fluvial bull trout in the Blackfoot Basin. Fluvial bull trout of the North Fork are wide-ranging and migratory with a documented range extending from the upper Blackfoot River to the Clark Fork River (Swanberg 1997, Pierce 2003, Schmetterling 2003). To monitor the population status (and recovery) of fluvial bull trout, FWP relies primarily on spawning (redd count) surveys as an index of population abundance. These redd counts show a population increase during the decade of the 1990 when protective angling regulations the screening of all the North Fork ditches were enacted (Figure 33). This increase was followed by a decline during a seven-year period of protracted drought. With the return of more normal flows, bull trout spawning has increased between 2008 and 2010.

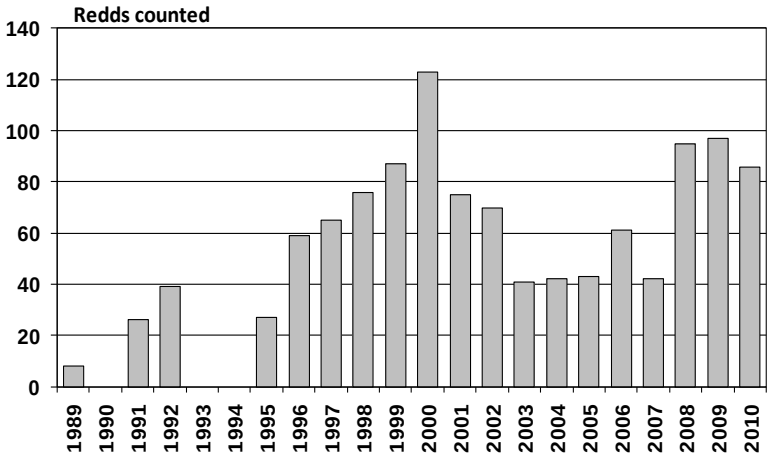


Figure 33. Bull trout red counts in the North Fork of the Blackfoot River, 1989-2010.

Pearson Creek Habitat Restoration Project

WATER NAME: Pearson Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 052-99, 052-00.
STATUS: Completed.

Restoration objectives: Improve status of westslope cutthroat trout population and increase recruitment of fluvial WCT to the Blackfoot River.

Project Summary: Pearson Creek is a small 2nd order tributary to Chamberlain Creek with a base-flow of one cfs. Pearson Creek has a history of channel alterations and adverse irrigation and riparian land management (grazing and timber harvest) practices in its lower two-miles of channel. Beginning in 1994, Pearson Creek has been the focus of a holistic restoration project involving channel reconstruction and instream habitat work, instream flow enhancement (water leasing), conservation easements and riparian grazing changes. Additional riparian grazing improvements completed in 2006 included riparian corridor fencing for the lower two miles of stream, off-stream water developments and armoring a road crossing.

Monitoring: Pearson Creek is a fluvial WCT spawning stream connected to the Chamberlain Creek WCT population. In 2009 and 2010, we continued fish population monitoring at two sites in lower Pearson Creek. The upstream site (mile 1.1) was established in 1999 prior to instream restoration activities. Following an initial increase between 1999 and 2000, age 1 and older WCT have remained elevated; however densities have incrementally declined in recent years (Figure 34). This decline corresponds with repeated unplanned cattle incursions (and related streambank damage) into the project area. In 2005, we established the downstream site (mile 0.5) following the degradation of stream banks by cattle. The population decrease between the upper and lower site may be further related to an inadequate road-crossing. Additional restoration work is being considered to address current problems.

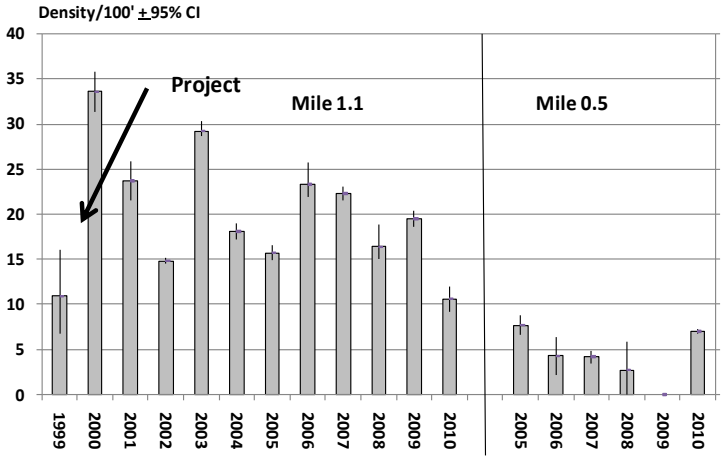


Figure 34. Densities of age 1 and older WCT in Pearson Creek at miles 0.5 and 1.1, 1999-2010.

Poorman Creek Channel Restoration Project

WATER NAME: Poorman Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 052-00,012-01, 046-02, 020-03, 036-06, 016-07.
STATUS: Completed.

Restoration objectives: Improve riparian habitat conditions and enhance instream flows; restore migration corridors; improve recruitment of native fish to the Blackfoot River.

Project Summary: Poorman Creek, one of the larger tributaries from the Garnet Mountains, enters the Blackfoot River a t river mile 108. Poorman Creek has been identified with hardrock and placer mining, irrigation dewatering, fish losses to ditches, channel instability, excessive riparian grazing pressure, subdivision impacts and multiple undersized culverts. Beginning in 2002 and continuing through the present, a comprehensive restoration projects was implemented on lower Poorman Creek. Restoration projects involved instream flow enhancement and ditch screening through the flood-to-sprinkler irrigation conversion, culvert to bridge replacements and riparian grazing changes (corridor fencing, off-stream water) and shrub plantings. Lower Poorman Creek is now entering the passive recovery phase. The recovery of riparian plant communities and improved channel stability now hinges on the continuation of compatible grazing practices, a process expected to take several years.

Monitoring: Poorman Creek supports genetically pure WCT, brown trout and brook trout, and is one of only two known Garnet Mountain stream that still supports bull trout reproduction. Native fish densities increase in the upstream direction while non-native fish occupy lower Poorman Creek.

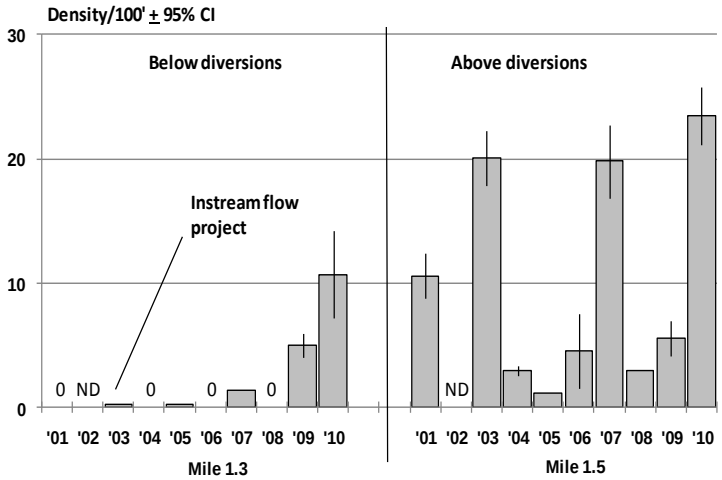


Figure 35. Density estimates of age 1+ trout in Poorman Creek at mile 1.3 and 1.5, 2001-2010.

In 2009 and 2010, we continued to monitor fish population at two sites (mile 1.3 and 1.5) in lower Poorman Creek (Figure 35). These sites were established in 2001 up-and downstream of active irrigation diversion and prior to flow enhancement, ditch screening and passive restoration actions associated with a reduction in livestock grazing. Recent survey results suggest an initial favorable population response for brown trout and WCT downstream of the irrigation conversion project area.

Rock Creek Ford to Culvert Conversion Project

WATER NAME: Rock Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 034-07.
STATUS: Completed.

Restoration objectives: Restore migration corridors for native fish; restore natural stream morphology to improve spawning and rearing conditions for all fish using the system.

Project Summary: Rock Creek is the largest tributary to the lower North Fork of the Blackfoot River, but has been degraded over most of its 8.2-mile length due to a wide range of past channel alterations and riparian management activities (Pierce 1990; Pierce et al. 1997, 2006). Rock Creek has also been the focus of continued restoration since 1990. Restoration actions involved working with 13 separate landowners on grazing improvements, instream flow enhancement, channel reconstruction and revegetation.

Active restoration is now completed over the entire length of Rock Creek and its primary tributaries, the South Fork of Rock Creek, Salmon Creek and Dry Creek. From this time forward, project success hinges on the ability of all cooperators to managing instream flows and livestock in riparian area, while allowing the passive re-colonization of woody riparian plants. Recovery of riparian areas, including plant communities, will take many years.

Monitoring: Rock Creek supports a mixed salmonid community. Rock creek provides spawning of brown trout and rainbow trout in lower reaches, a resident brook trout population, limited bull trout rearing and a migration corridor for fluvial WCT to headwater areas.

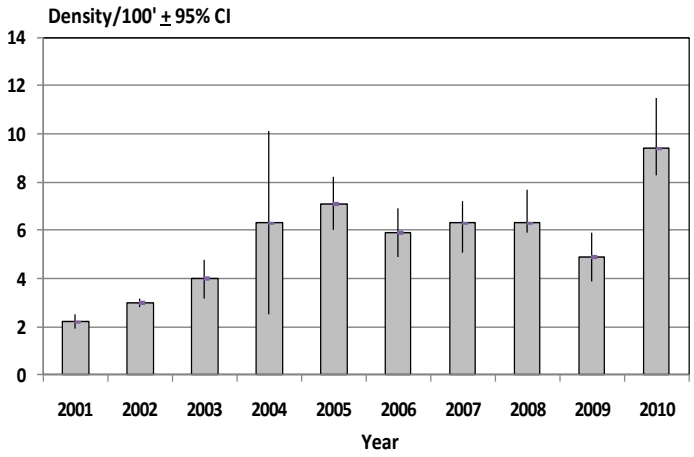


Figure 36. Density estimates of age 1+ trout in Rock Creek at stream mile 1.6, 2001-2010.

In 2009 and 2010, we continued to monitor fish populations in lower Rock Creek (mile 1.6) where the stream was reconstructed in 1999. At this location, brown trout and brook trout are predominant along with low numbers of bull trout. Total trout density estimates for age 1+ fish are located in Figure 36.

Sauerkraut Creek Road Crossing Improvement and Placer Mine Reclamation Project

WATER NAME: Sauerkraut Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 019-09, 022-10.
STATUS: Completed.

Restoration objectives: Restore natural stream morphology to improve spawning and rearing conditions for native cutthroat trout and bull trout.

Project Summary: Sauerkraut Creek is a small tributary to the upper Blackfoot River, entering at river mile 102.1 with a base flow of 3-4 cfs. Sauerkraut Creek has a long history of placer mining, which has resulted in severe channel alterations; including channelization, the loss of floodplain function, and is a contributing factor to intermittent flows in one section of stream. In addition, inadequate stream crossings and overgrazing by livestock also has contributed to the degraded channel conditions.

Restoration of Sauerkraut Creek began in 2008 after the U.S. Fish and Wildlife Service Native Fish Habitat Conservation Program granted FWP funds to purchase a conservation easement on the Sunny Slope Ranch. This easement is intended to promote the conservation of both WCT and bull trout. As part of this arrangement, a stream restoration project was developed in upper Sauerkraut Creek in the area of past mining impacts. The project reconstructed about 5,000' of Sauerkraut Creek that historically had been altered by placer mining, fenced livestock from the riparian area, planted native shrubs and upgraded two road crossings. Future restoration work for lower Sauerkraut Creek is currently in project development phases.

Monitoring: The stream supports primarily WCT along with low numbers of brook and bull trout in the headwaters and a mixed community of salmonids in the lower stream. Sauerkraut Creek supports a small run of migratory cutthroat trout as identified in past telemetry study (Pierce et al 2007). The WCT have been tested as genetically pure. Monitoring sites have been established for both reference and treatment sites (Figure 37).

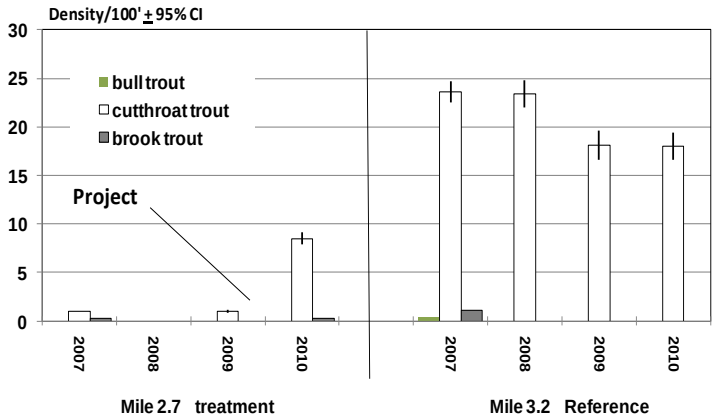


Figure 37. Density estimates of age 1+ trout in Sauerkraut Creek at treatment and reference reaches, 2007-2010.

Snowbank Creek Diversion Modification Project

WATER NAME: Snowbank Creek (Blackfoot River)
DATA PROVIDED BY: Ron Pierce and Craig Podner, FWP
FFI NUMBER: 025-08.
STATUS: Completed.

Restoration objectives: Restore migration corridor for native fish; enhance instream flows; eliminate loss of bull trout and westslope cutthroat trout to an irrigation ditch; improve recruitment of native fish to Blackfoot River.

Project Summary: Snowbank Creek is a 1st order tributary Copper Creek, entering at stream mile 5.9. Snowbank Creek was identified as being fisheries impaired in 2003 during an assessment of a defunct diversion at stream mile 0.4. The Snowbank diversion was constructed in 1962 to divert water in order to create a recreational fishery at Snowbank Lake (FWP historical files). The U.S. Forest Service and FWP identified fisheries impairments in lower Snowbank Creek to include: 1) native fish entrainment from a diversion to Snowbank Lake; 2) fish passage problems at the diversion and a culvert near the mouth; 3) dewatering below the diversion; and 4) the lack of a legitimate water right that would allow the legal use of Snowbank Creek water for Snowbank Lake (Pierce et al 2004, 2006). Because of the water right problem, the diversion to Snowbank Lake was closed in 2005. This allowed the stream to function naturally and gave FWP an opportunity to measure fisheries under both dewatered and natural flow regimes. In 2007, the USFS obtained a water right that allows the filling of Snowbank Lake with the condition of maintaining minimal of 4 cfs in lower Snowbank Creek during base-flow periods. The old diversion was replaced with a new diversion and Coanda fish screen in 2009. Renewed filling of Snowbank Lake began 2010 with the new screened diversion and instream flow arrangement.

Monitoring: Fish population monitoring began in 2003 and continued through 2010 up-and downstream of the diversion at stream mile 0.4. These surveys identified increases in cutthroat trout abundance and the incremental expansion of bull trout from Copper Creek into Snowbank Creek (Figure 38). Following this expansion, bull trout spawning was then documented in 2008 through 2010 both within and dewatered section and throughout the upper Snowbank Creek upstream of the diversion (USFS unpublished data).

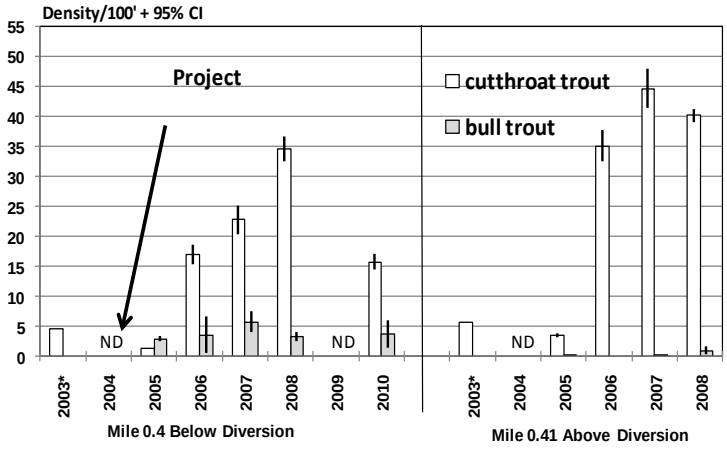


Figure 38. Density estimates of age 1+ cutthroat trout and bull trout up- and downstream of the Snowbank diversion, 2003-

Clark Fork Drainage

Frenchtown and Beavertail Ponds Habitat Structures Project

WATER NAME: Frenchtown and Beavertail Ponds (Upper Clark Fork River)
DATA PROVIDED BY: Ladd Knotek, FWP
FFI NUMBER: 021-06
STATUS: Completed

Restoration Objectives: To increase habitat complexity for perch, sunfish, and bass.

Project Summary: Beavertail Pond and Frenchtown Pond (Missoula County) support naturally reproducing populations of yellow perch and pumpkinseed sunfish. Largemouth bass are also transported to the ponds from the Lee Metcalf Wildlife Refuge on an annual basis. Both ponds are located within state parks and are extremely popular with local anglers. Habitat and cover was historically scarce in both ponds, which limited spawning and rearing. This project involved adding woody structures along the shorelines of the two ponds to increase habitat complexity and provide cover.

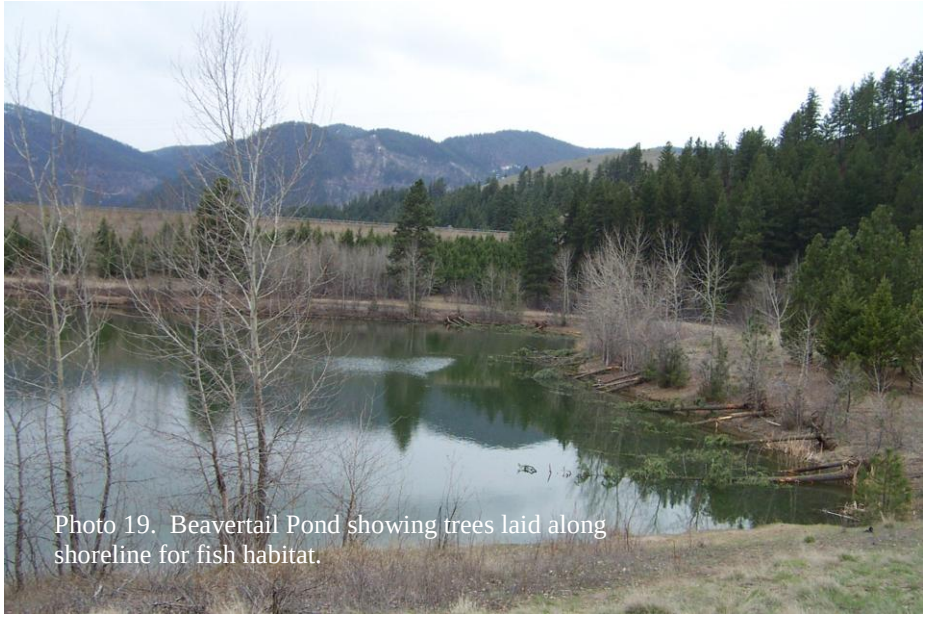


Photo 19. Beavertail Pond showing trees laid along shoreline for fish habitat.

Monitoring: The woody habitat structures that were put in place for this project are basically the only cover in the two ponds. No quantitative data has been collected for this project, but fishery personnel have snorkeled around the structures and creeled anglers since installation. They appear to hold high densities of fish of all age classes. The ponds are great fisheries and probably receive the highest pressure in the region on a per acre basis.

East Fork Bull River Channel Restoration Project

WATER NAME: East Fork Bull River (Lower Clark Fork River)
DATA PROVIDED BY: Jon Hanson, FWP
FFI NUMBER: 013-00, 06-08
STATUS: Completed

Restoration Objectives: Improving channel function.

Project Summary: East Fork Bull River (Sanders County) supports native bull and westslope cutthroat trout, and has been the focus of significant stream restoration efforts. One project involved restoring approximately 1,200 ft of stream by returning a braided channel to a single thread channel that is capable of transporting sediment and conveying bankfull flows (Figure 39). Treatments included rootwad and log revetments, placement of large woody debris weirs, and revegetation of stream banks and the floodplain with native shrubs and tree seedlings. A high flow event that occurred in November 2006 caused extensive stream bank failure and triggered a slide that routed the channel into a steep eroding slope. A subsequent project involved routing the stream away from the slope again re-working the channel. Approximately 800 ft of stream was treated.

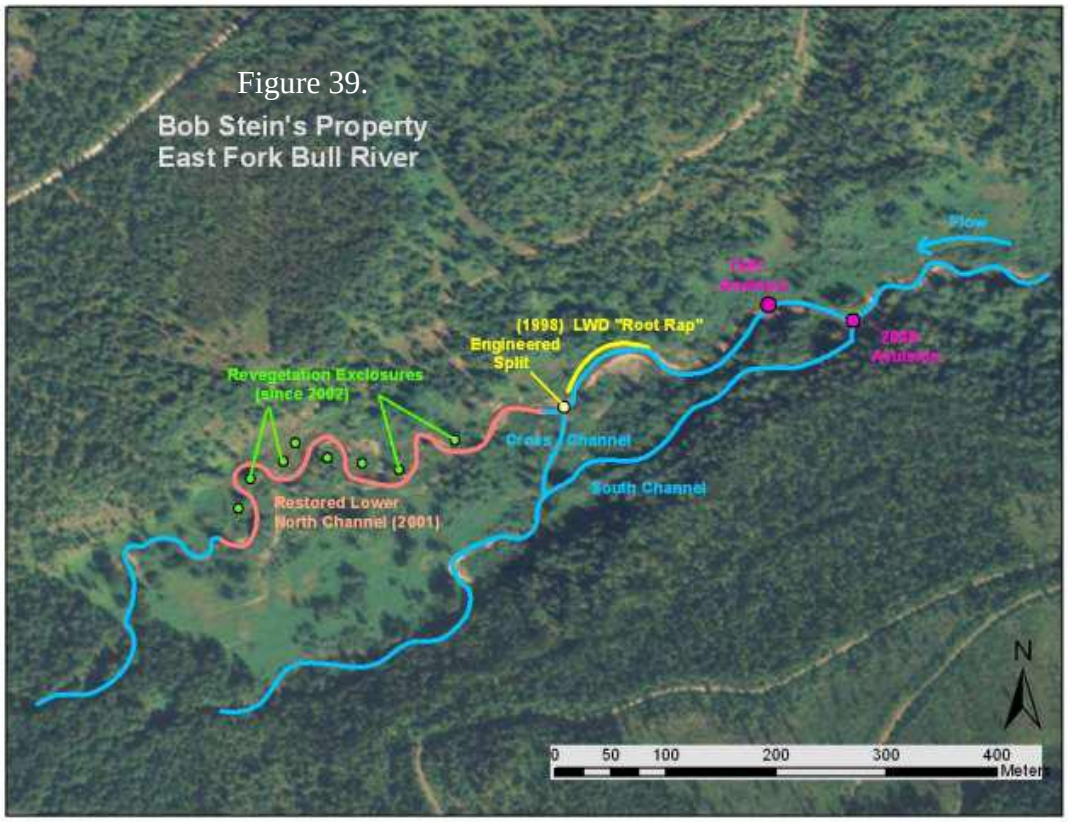


Figure 39.

Monitoring: To date, the reconstructed channel completed in 2008 has maintained itself through two high water events (slightly less than bankfull flow). No event larger than

bankfull has been experienced yet, but changes will be monitored. Several cross sections have been designated as permanent monitoring sites.

Revegetation work consisted of installing a series of wildlife exclosures (fenced areas) in riparian areas near the rechanneled section. Twenty-one exclosures were constructed in 2002. First stage successional species (alder, willow, serviceberry, etc.) were planted inside of the exclosures at the outset. Conifers were planted once first stage trees/shrubs were large enough to provide shade. Additionally, weed mats were installed to prevent reed canary grass from outcompeting the woody plants. Maintenance has occurred every year since 2002, including weeding, pruning, thinning, fence repair, addition of new plants, and other necessary tasks. Growth has been vigorous within the exclosures and a few are being removed in 2010. Once removed the trees that initially grew within the fenced areas should begin to spread out byproviding a seed source and appropriate micro-sites for germination of "wild" trees and shrubs. Ultimately, riparian forest will be restored within this reach, providing stability for the streambanks through the 2001 restoration stream reach.

One of the interesting components of the 1998 stabilization work was the engineered split that was supposed to keep water moving down both channels. It worked for a year or two, but nothing in stream restoration stays exactly as built – and eventually nearly all of the base flow was going through the north channel. This was until 2008, when a pair of cedar trees fell into the creek, caused an avulsion and sent the East Fork's entire baseflow back to the South channel, upstream of all the restoration work. It has remained there since, and all of the restored reaches are dry in summer, fall and winter. Fortunately, the south channel is lined by riparian forest and is quite stable. The irony is that a few trees and an avulsion kicked off this whole restoration process, and another tree-caused avulsion returned things to a condition very similar to pre 1997. It is entirely possible that water could return to the North Channel with either human intervention or another natural alteration, and revegetation efforts will continue with that in mind.

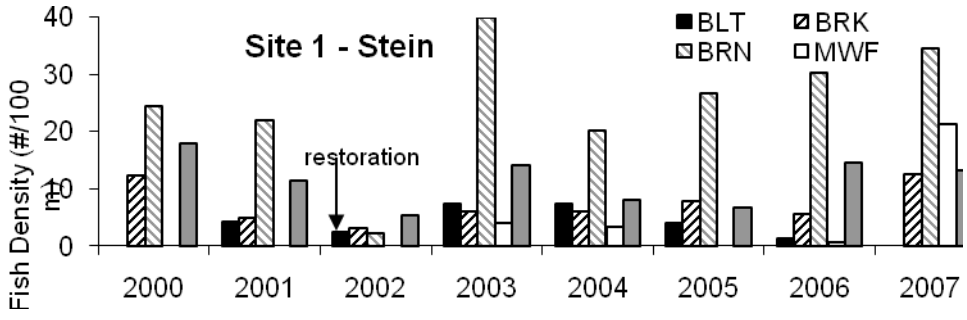


Figure 40. Fish densities pre-and post restoration on the East Fork Bull River.

Two general patterns in fish densities are evident for all species in the restored section (Figure 40). First, there was a general decrease in fish densities from 2000 – 2002. Densities increased substantially in 2003, then declined again in 2004. Brown trout

densities steadily increased from 2004 – 2007 while bull trout densities declined to zero fish in 2007. This is the first time since 2000 that no bull trout were captured at the Stein site. Brook and westslope cutthroat trout numbers have remained fairly consistent over the period 2004 – 2007, with no obvious pattern. Mountain whitefish appeared sporadically over the period of sampling, usually in low densities (<5 fish/100m), suggesting that they migrate in and out of this stream reach.

Sites two and three, both well upstream of the Stein property, showed similar changes in fish densities from 2000 – 2007 (Figure 39). The pattern is markedly different from site one, but the species composition and habitat are also quite different. Depletion estimates indicate an overall increase in abundance of bull trout from 2000 through 2005. Densities then declined from 2005 – 2007 at site three, and from 2006 – 2007 at site two. It is yet unclear if these short term declines will be sustained. However, the 2007 estimate at site three was the lowest recorded bull trout density to date. Yearly changes in westslope cutthroat trout densities were more dynamic, but showed a slight downward trend at both sites. Also, the proportion of bull to westslope cutthroat trout increased over the sampling period. In 2000 and 2001 westslope cutthroat trout far outnumbered bull trout at both upstream sites.

Elk Creek Stream Restoration Projects

WATER NAME: East Fork and Mainstem Elk Creek (Lower Clark Fork River)
DATA PROVIDED BY: Jon Hanson, FWP
FFI NUMBER: 049-96, 040-99, 005-09
STATUS: Completed

Restoration Objectives: Improving channel function

Project Summary: Elk Creek (Sanders County), a tributary to the lower Clark Fork River, supports a mixed salmonid fishery, including genetically pure westslope cutthroat trout. Elk Creek has been the focus of a series of habitat restoration efforts by a local watershed group since 1996, because numerous reaches have been damaged by flooding and adjacent land use practices. Future Fisheries provided the watershed group with professional help in order to conduct a watershed assessment, and has also provided some funding for subsequent projects.

A stream survey of East Fork and Mainstem Elk Creek was completed by the firm Watershed Consulting in 1997. A total of 16 stream reaches were surveyed (Rosgen methodology), and a few of them were identified as problem areas, lacking suitable stability and dimensions to transport bedload and provide aquatic habitat for fish. Problems were mostly caused by lack of riparian forest and the associated large woody debris in the stream channel. In 1996 an extremely large flood (size unknown, but estimated at >100 year event in the assessment) caused significant erosion and deposition in these problem areas. Upon completion of the survey, 37 individual sites were

recommended for stream restoration to improve channel and bank stability. The Elk Creek Watershed Council obtained funding from several sources to implement the majority of these recommended projects. Over the course of the next two years (1997 and 1998) 35 of the 37 recommended sites saw channel reconstruction.

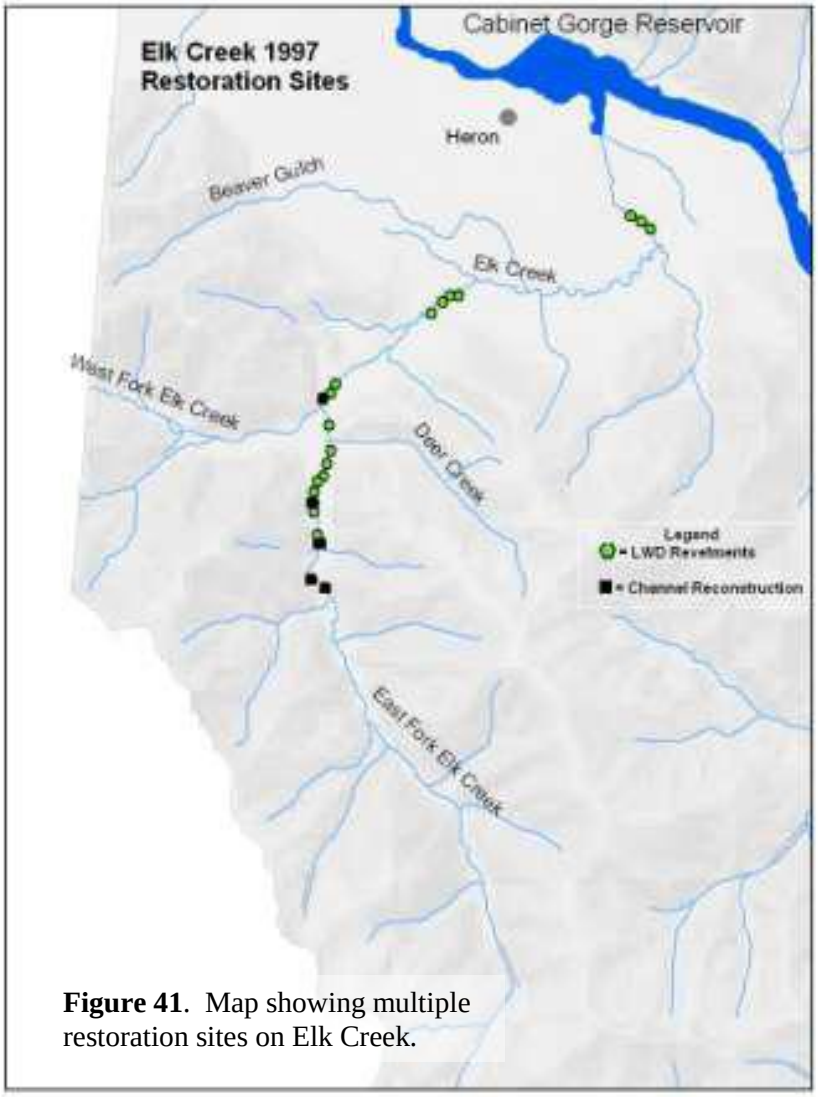


Figure 41. Map showing multiple restoration sites on Elk Creek.

<u>Monitoring:</u> Most of the structures built during this restoration project have been successful. An assessment of the project was completed by Watershed Consulting in 2000, and it noted that only one rootwad revetment failed completely. This was repaired in 1998. Four other structures partly failed, but most remained intact and functioning as of 2000.

Pilgrim Creek Channel Restoration Project

WATER NAME: Pilgrim Creek (Lower Clark Fork River)
DATA PROVIDED BY: Jon Hanson, FWP
FFI NUMBER: 014-05
STATUS: Completed

Restoration Objectives: Improve channel function and stability.

Project Summary: Pilgrim Creek (Sanders County) enters the Clark Fork River at Cabinet Gorge Reservoir. The stream supports bull and cutthroat trout as well as several non-native salmonids. The stream suffers from channel straightening, floodplain encroachment, clearing of riparian vegetation, and riparian logging. The drainage also has a history of catastrophic fires. This project involves reconstructing approximately 1600 ft of channel, rebuilding the floodplain, and revegetating stream banks.

Monitoring: The channel reconstruction work was completed in November 2006. It transformed the creek from a braided, shallow, unstable configuration into a single channel with more appropriate channel dimensions. Unfortunately, the new channel had very weak banks due to the unconsolidated nature of the soil within the reach. This would lead to significant failures during following high water events.

The first failure came in 2007 after a mild snowmelt runoff which was estimated at a <2 year event. The second meander within the project eroded significantly during high water. This was repaired in summer of 2007 at a cost of $12,000, funded by Avista. The repair work included installing a large wood structure and soil lift in the second meander and backfilling scoured large wood structures in the lower portion of the project area. The other portions of the project remained largely intact during this first year. Significant channel failures followed the larger runoff of spring 2008, estimated at about a 10-year event. River Design Group completed a site review of the project area on July 23, 2008. Generally, several of the LWD structures failed, several soil lifts were undermined, and much of the work in the upper half of the project was in need of repair.

Repairs to several meanders were made in October 2008 and in the spring of 2009. The rest of the project also fared well during 2009 and 2010. Also in 2009 some maintenance on the vegetation was needed, as trees and shrubs were outgrowing their browse protection. Overall, plant survival has been mixed. Some parts of the project area are sub-irrigated and plant growth is positive. Other portions are extremely dry and have experienced higher mortality of plants. Monitoring of this project will continue well into the future, with maintenance occurring as needed.

Salmonid populations in Pilgrim Creek have generally increased from 2005 – 2007. The dominant species at all three sites showed higher numbers in 2007 than in either of the two previous years. Within the restoration zone (site one) brook trout estimates have more than doubled from 49.7 fish/100m in 2005 to 117.5 fish/100m in 2007. A strong year class from 2005 appears to be doing well. Many young brook trout <75mm were captured in 2006 and were omitted from density estimate calculation that year. In 2007,

those fish met the >75mm total length criterion, boosting estimates. Rainbow trout densities were highest in 2006 at 18.6 fish/100m; slightly lower in 2007 at 13.3 fish/100m. Low numbers of brown, westslope cutthroat and cutthroat/rainbow hybrids have been captured with some regularity over the years, but are a small portion of the overall fish community.

Restoration on Pilgrim Creek was designed to improve channel and bank stability and reduce sediment inputs in a reach that had been denuded of vegetation. Creating habitat structures specifically for fish was a secondary concern, as few native fish remain in Pilgrim Creek, below the forks. With the dominance of the fish community by brook trout, it is unlikely that restoration efforts alone will benefit native fish. Regardless, early results indicate that restoration activities have positively influenced brook trout populations on the Reishus property. Density estimates rose over the sample period of 2005 – 2007. Restoration occurred in 2006, although brook trout densities increased more from 2005 to 2006 than 2006 to 2007. This increase was caused by a strong year class from 2005. This calls into question the importance of habitat restoration in allowing population expansion, as that strong year class was already present when the work took place. It may be that restoration has allowed strong survival of this year class, increasing population size.

Marshall Creek Riparian Fencing, Fish Passage, Fish Screen, and Woody Debris Projects

WATER NAME: Marshall Creek (Lower Clark Fork River)
DATA PROVIDED BY: Ladd Knotek, FWP
FFI NUMBER:
STATUS: Completed in November 2001

Restoration Objective: Riparian restoration, fish passage, fish habitat.

Project Summary: Marshall Creek (Missoula County) has been the focus of multiple restoration projects, including riparian fencing (photo 20), the addition of woody debris (photos 21, 22 and 23), fish screening, and fish passage. Fish passage projects included retrofitting an existing culvert with baffles (photo 24), and building a fish ladder so fish could reach a perched culvert (photos 25 and 26).

Photo 20. Marshall Creek riparian fence.

Monitoring: projects are functioning as intended.

Photo 21. Marshall Creek before addition of LWD.

Photo 22. Marshall Creek during LWD project.

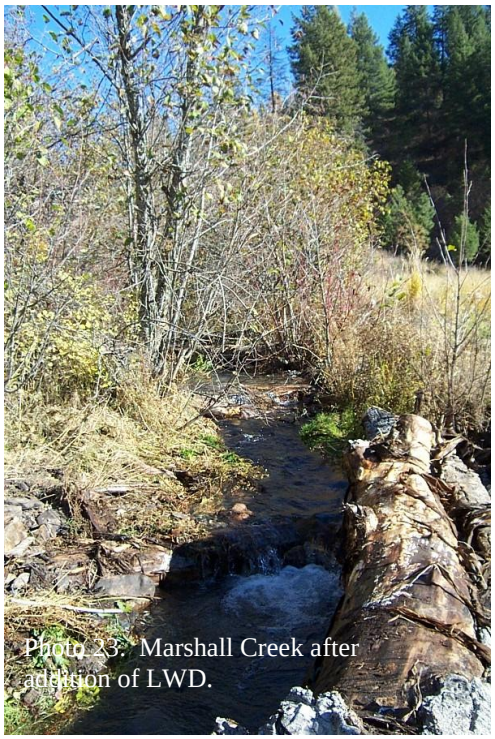


Photo 23. Marshall Creek after addition of LWD.

Photo 24. Marshall Creek culvert with new baffles.

Photo 25. A perched culvert on Marshall Creek that was impeding fish passage.

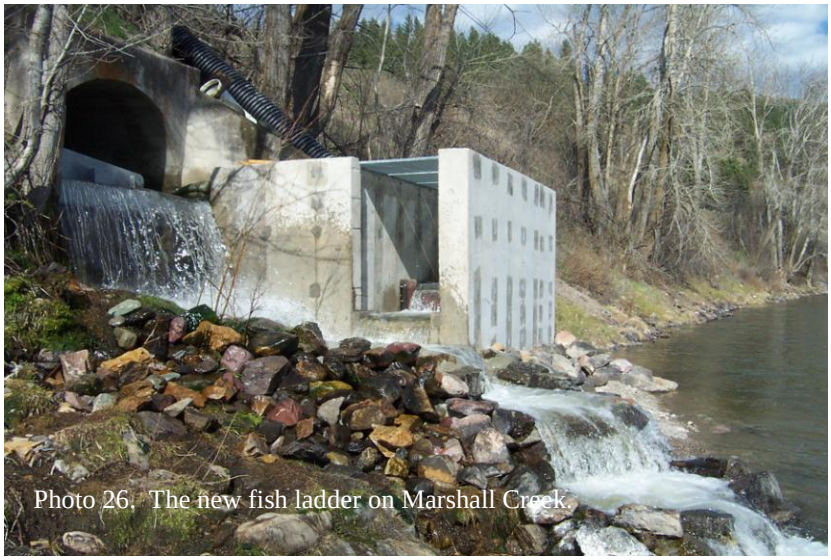


Photo 26. The new fish ladder on Marshall Creek.

Mill Creek Culvert Replacement Project

WATER NAME: Mill Creek Upper Clark Fork River)
DATA PROVIDED BY: Ladd Knotek, FWP
FFI NUMBER: 009-01, 020-04
STATUS: Completed

Restoration Objective: Improving fish passage.

Project Summary: Mill Creek (Missoula County), a tributary to the Clark Fork River near Frenchtown, supports a mixed trout population. This project involved replacing an undersized, perched culvert that was a barrier to fish migration with a culvert with two larger natural bottom arches.

Monitoring: Quantitative data for this project has not been collected but the new culvert appears to be functioning well.

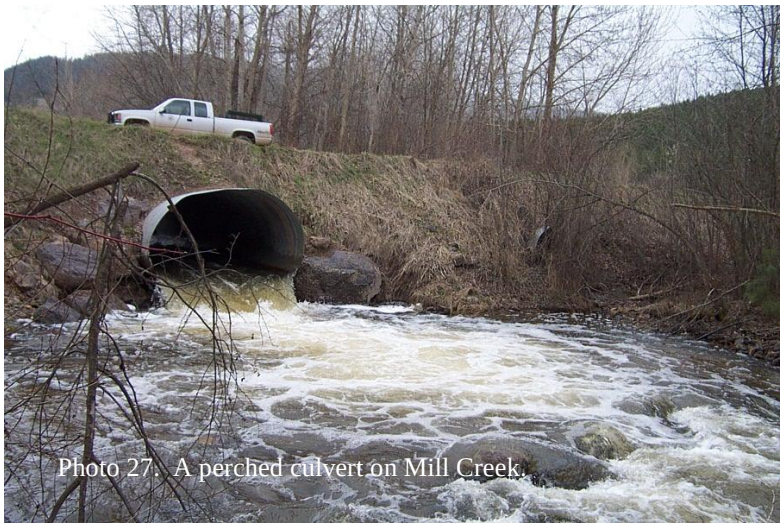


Photo 27. A perched culvert on Mill Creek.

Photo 28. The new culvert on Mill Creek with open-bottom arches.

Ninemile Creek Riparian Fencing Project

WATER NAME: Ninemile Creek (Lower Clark Fork River)
DATA PROVIDED BY: Ladd Knotek, FWP
FFI NUMBER: 028-2002
STATUS: Completed
Restoration Objective: Restoration and enhancement of riparian corridor

Project Summary: Nine Mile Creek (Missoula County) supports a mixed trout assemblage and receives a spawning run of native westslope cutthroat trout from the Clark Fork River. Portions of the stream have been degraded due to grazing. This project involved installation of 1,150 ft of riparian fencing (see photo 29). The riparian area will be managed as a grazing exclosure.

Photo 29. Riparian fence on Ninemile Creek.

Monitoring: There is no fisheries data for this specific reach of Ninemile Creek but the fence is functioning and the riparian corridor is slowly recovering

White Pine Creek Restoration Project

WATER NAME: White Pine Creek (Lower Clark Fork River)
DATA PROVIDED BY: Jon Hanson, FWP
FFI NUMBER: 022-01
STATUS: Completed in November 2001

Restoration Objectives: Eliminate a headcut and reduce severe erosion throughout the project reach.

Project Summary: Whitepine Creek (Sanders County) is a tributary to Beaver Creek that subsequently flows into Noxon Reservoir. The stream supports a mixed salmonid fishery that includes brook, brown, and cutthroat trout. Brook trout are the predominant species in most reaches. The stream suffered from a variety of impacts including logging, grazing, and roading.

This project involved a variety of treatments to improve the stream including channel reconstruction, bank stabilization, revegetation, and improvements to facilitate fish passage. Restoration work was completed in 2001, but unfortunately the first high-water event in 2002 washed out all of the channel reconstruction work and most of the revegetation efforts.

Monitoring: This project is not being monitored.

Rattlesnake Creek Side Channel Enhancement Project

WATER NAME: Rattlesnake Creek (Clark Fork River)
DATA PROVIDED BY: Ladd Knotek, FWP
FFI NUMBER: 013-01
STATUS: Completed in 2002

Restoration Objectives: Restoration of side channels for spawning habitat.

Project Summary:
Rattlesnake Creek side channel stabilization. Rattlesnake Creek (Missoula County) is a tributary to the Clark Fork near Missoula. Over the years the lower reaches were channelized to accommodate urban development. Although heavily impacted, portions of the urban channel continue to be used for spawning by Clark Fork River fishes – particularly one side channel. This project used a variety of techniques to maintain spawning habitat in side channels, improve fish passage, and reduce urban flooding.

Photo 30. Rattlesnake creek after habitat enhancement project.

Monitoring: No quantitative monitoring has been conducted post-project, but brown and rainbow trout redds are commonly observed during seasonal walk-throughs. Some of the added spawning gravels were transported out of the project reach during high flow events in 2008 and 2009.

Rattlesnake Creek Fish Ladder Project

WATER NAME: Rattlesnake Creek (Clark Fork River)
DATA PROVIDED BY: Ladd Knotek, FWP
FFI NUMBER: 021-02
STATUS: Completed

Restoration Objectives: Improve fish passage for WCT and bull trout.

Project Summary: Rattlesnake Creek (Missoula County) supports important spawning runs of both bull and WCT from the Clark Fork River. A ten ft high diversion dam, that supplies water for the city of Missoula, prevents migrant fish from gaining access to the upper 15 miles of Rattlesnake Creek. This project involves construction of a fish ladder that will allow migrant spawners to move upstream.

Monitoring: Bull trout redd counts in Rattlesnake Creek pre-and post project are shown in Figure 42. Redd counts rose post-project but then appeared to crash in 2009 and 2010, for unknown reasons.

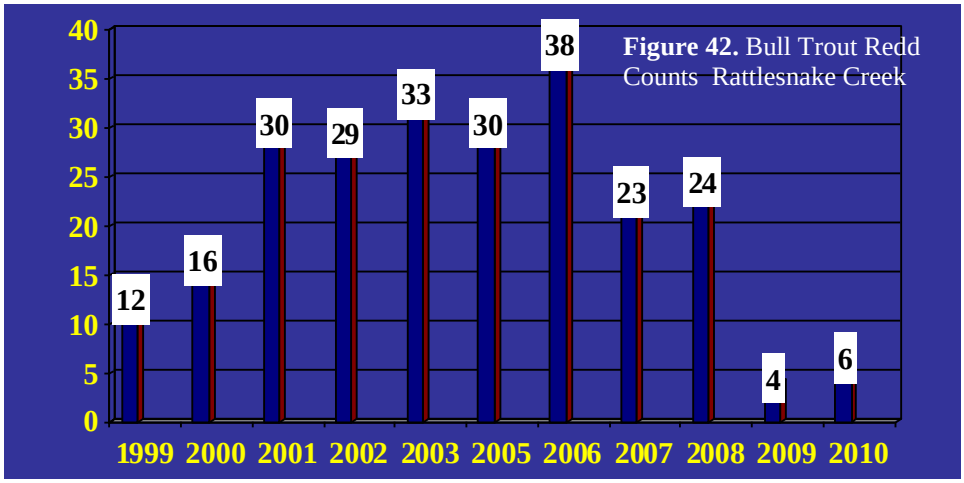


Figure 42. Bull Trout Redd Counts Rattlesnake Creek

Rattlesnake Creek Fish Screen Project

WATER NAME: Rattlesnake Creek (Upper Clark Fork River)
DATA PROVIDED BY: Ladd Knotek, FWP
FFI NUMBER: 022-02
STATUS: Complete

Restoration Objectives: Reduce fish entrainment.

Project Summary: Rattlesnake Creek (Missoula County) supports important spawning runs of both bull and westslope cutthroat trout from the Clark Fork River. Loss of migrating fish into diversions has been identified as a limiting factor for bull and cutthroat trout. There are presently 4 unscreened irrigation diversions on Rattlesnake Creek. This project involved construction of screens on two of the four unscreened diversions and improvements to an existing screened diversion.

Entrainment in irrigation diversions is a typical source of juvenile and adult salmonid losses in western Montana streams. In Rattlesnake Creek and other tributaries of the Clark Fork River, irrigation diversions typically entrain age-0 and juvenile salmonids as they move downstream out of spawning and rearing areas. Although fish species composition in diversion ditches is usually similar to that of the source stream, the magnitude of fish losses varies considerably with the size, location and orientation of the canal entrance.

Six small (2-7 cfs) irrigation diversions are currently operated on the lower 5 miles of Rattlesnake Creek (Figure 43, Table 2). These diversions were originally constructed to

irrigate agricultural lands and provide stock water, but are now used primarily for watering residential lawns.

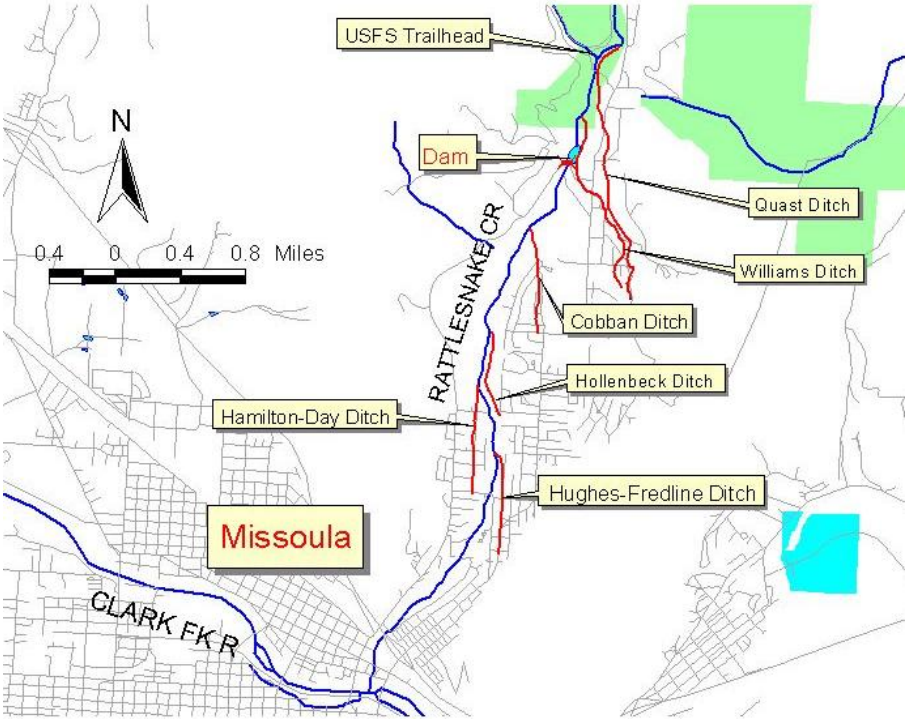


Figure 43. Irrigation diversions in lower Rattlesnake Creek.

Table 2. Active irrigation ditches on lower Rattlesnake Creek in 2003.

Diversion Name	~ cfs	Screened? (yr)	Screen Type
Cobban	4-6	Yes (2002)	Brencail
Hamilton-Day	2-4	Yes (2002)	Brencail
Hughes-Fredline	2-4	No	-
Hallenbeck	5-7	No	-
Quast	5-7	Yes (1998)	Brencail
Williams	3-5	Yes (1999)	McKay Self-Cleaning

Monitoring: Although there was some variation in species composition and fish density, trout were abundant in all unscreened diversion canals (Table 3). Overall fish species composition was similar to lower Rattlesnake Creek, but the relative abundance of bull trout was much higher in the Coban and Hamilton-Day diversions relative to the stream. Juvenile salmonids, especially bull trout, normally use side channels and stream margins as rearing habitat. Small irrigation ditches with abundant vegetation and cover likely mimic these habitats and attract juvenile fish. We suspect that entrainment in small diversions is particularly prevalent in lower Rattlesnake Creek as this reach (through Missoula) has been channelized and confined where it was historically braided, with abundant side channels and rearing habitat.

We found that relative fish abundance and species composition may change over a single irrigation season and between years. Fish appeared to accumulate in canals over the course of the summer in Rattlesnake Creek diversions and species composition changed as different species emerged from gravels or emigrated downstream. Although not shown in Table 3, the abundance of fish in unscreened diversions was much lower in June relative to September/October in 2001. Fish likely accumulate in the canals throughout the irrigation season. However, fish collected by electrofishing in canals are only a small proportion of the total number entrained and lost over an entire irrigation season. Sampling near head gates does not afford a reliable estimate of fish losses, but does provide a snapshot of fish species composition and relative abundance. We used relative fish abundance in our sampling sections as an indication of fish losses and justification for fish screens.

Table 3. Fish sampling in irrigation diversion canals on Rattlesnake Creek in 2001-2003.

DIVERSION – DATE SAMPLED	SECTION LENGTH	FISH SPECIES	NUMBER	SIZE RANGE
COBAN				
		Bull Trout	53	53 – 243 mm
Aug 22, 2001	~ 500 ft	Oncorhynchus Spp	25	48 – 210 mm
Before Screened		Brown Trout	3	183 – 212 mm
		Brook Trout	16	50 – 300 mm
Sept 27, 2002	~ 250 ft	Oncorhynchus Spp	2	50-70 mm
After Screened		Brown Trout	2	61-80 mm
Aug 19, 2003	~ 500 ft	Oncorhynchus Spp	27	50-112 mm
After Screened				
HAMILTON-DAY				
June 25, 2001		Bull Trout	3	107 – 218 mm
Before Screened	~ 250 ft	Oncorhynchus Spp	11	40 – 121 mm
		Mountain Whitefish	2	116 – 202 mm
		Brook Trout	5	69 –145 mm
After Screened	~ 350 ft	Oncorhynchus Spp	22	45-92 mm
		Brown Trout	33	58-82 mm
		Brook Trout	6	45-86 mm
Aug 15, 2003		Oncorhynchus Spp	22	49-113 mm
After Screened	~ 500 ft	Brown Trout	13	51-171 mm
		Brook Trout	2	45-138 mm
QUAST				
June 23, 2001	~ 250 ft	No Fish		
After Screened				
Oct 10, 2002	~ 250 ft	Oncorhynchus spp.	1	58 mm
After Screened		Brook Trout	20	62-172 mm
Aug 19, 2003	~ 500 ft	No Fish		
After Screened				
WILLIAMS				

June 23, 2001 **After Screened**	~ 250 ft	No Fish		
Oct 10, 2002 **After Screened**	~ 300 ft	No Fish		
Aug 19, 2003 **After Screened**	~ 500 ft	Oncorhynchus spp. Brook Trout	1 2	52 mm 79-84
HUGHES-FREDLINE				
Sept 27, 2002 **Not Screened**	~ 250 ft	Oncorhynchus spp. Brown Trout Brook Trout Mtn Whitefish	12 45 1 5	38-122 mm 41-172 mm 58 mm 61-85 mm
HOLLENBECK				
Aug 12, 2002 **Not Screened**	~ 300 ft	Oncorhynchus spp. Brown Trout Brook Trout	8 15 16	73-117 mm 55-242 mm 48-242 mm

Note: Oncorhynchus spp. refers to rainbow trout, westslope cutthroat trout & hybrids of these species

Rock Creek Instream Flow and Habitat Improvement Project

WATER NAME: Rock Creek (Upper Clark Fork River)
DATA PROVIDED BY: Jason Lindstrom, FWP
FFI NUMBER: 020-99, 015-01
STATUS: Complete

Restoration Objectives: Instream flow.

Project Summary:. Rock Creek (Powell County) is a tributary to the Clark Fork River near Garrison. The stream has a history of being completely dewatered during most years. We recently completed installing a more efficient irrigation system combined with a water lease that left 5-10 cfs in the stream -- even during the low water year of 2000.

Monitoring: Fisheries investigations for the Rock Creek (Garrison) Instream Flow and Habitat Improvement Project have historically included fall redd counts and electrofishing directed at measuring trout density in the project area. Fish sampling was reinitiated in Rock Creek in 2009 after several years when no monitoring was conducted.

Electrofishing was carried out on October 8, 2009 in both the lower and upper portions of the project area. Multiple electrofishing passes (2-3) were made through two 100-meter sections. Brown trout heavily dominated the trout community at both sites. For this species, population estimates were generated for fish greater than or equal to 150 mm (~ 6”) in total length. Given the relatively poor capture efficiency of smaller size classes, fish in these groups were reported as the total number captured in the section. This was also true for non-target species (non-trout), and trout species with very low densities.

At the lower section, 13 brown trout (Mean Length: 253 mm, Range: 70-441 mm), 144 mountain whitefish (Mean Length: 122 mm, Range: 96-333 mm), 51 slimy sculpin, and one longnose sucker (156 mm) were captured in two electrofishing passes. At the upper section, 42 brown trout (Mean Length: 176 mm, Range: 67-374 mm), one westslope cutthroat trout – rainbow trout hybrid (222 mm), 28 mountain whitefish (Mean Length: 131 mm, Range: 104-365 mm), eight longnose dace, and 59 slimy sculpin were captured in three electrofishing passes. Population estimates for brown trout greater than or equal to 150 mm in total length were 9 at the lower section and 21 at the upper section. The estimate for the upper section was similar to 2001 and 2002, while brown trout numbers appeared to be slightly down from past years at the lower section (Figure 44). One note of interest was the relatively high-observed density of juvenile mountain whitefish at the lower sample site in 2009. Past sampling in 2001 did not detect any whitefish in this section, and only a few were observed in 2002. Future monitoring will help to determine if the pattern of increasing whitefish abundance is real, or a product of annual variation.

A single redd count was made through the project area on November 18, 2009. The timing of the survey was selected to target fall-spawning brown trout. The length of the reach surveyed was approximately 1.8 miles and extended from the stream mouth to the upper pivot diversion point. A total of 10 redds were counted. Past redd counts were somewhat variable, and ranged between approximately 9 and 36 (including probable redds in the total count; Figure 45). The average number of redds counted between 2000 and 2004 was 18.2 (including probable redds). However, the section length surveyed during these years was approximately 2.5 miles, about 0.7 miles longer than the section surveyed in 2009. Nevertheless, 2009 redd counts indicate that brown trout are continuing to utilize the restored reaches of Rock Creek for spawning.

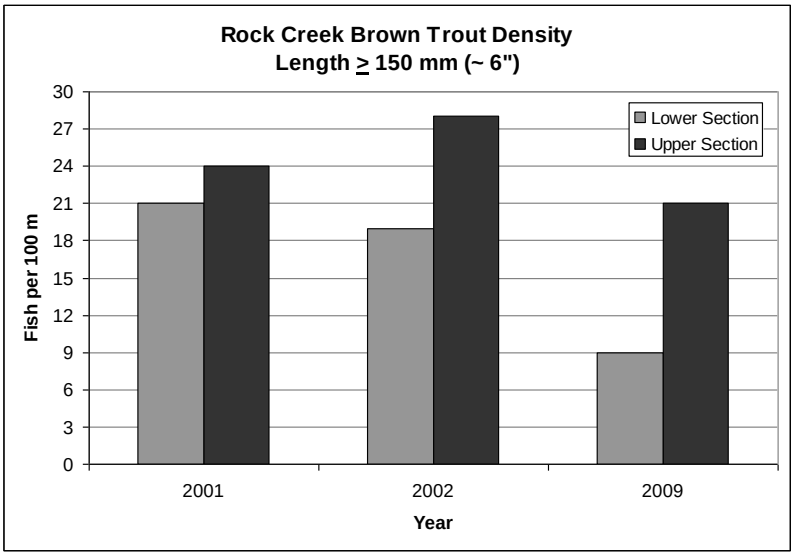


Figure 44. Brown trout density in two sections of the Rock Creek project area.

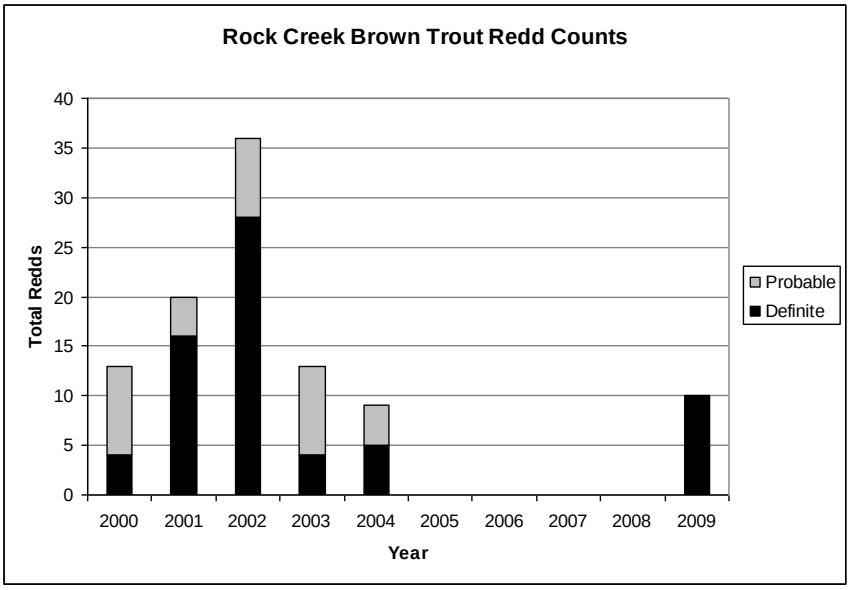


Figure 45. Brown trout redd counts throughout the Rock Creek project area.

Upper Willow Creek Channel Restoration Project

WATER NAME: Upper Willow Creek (Clark Fork River)
DATA PROVIDED BY: Mark Lere, FWP
FFI NUMBER: 022-05, 019-06
STATUS: Completed in 2007

Restoration Objectives: The goal of the Upper Willow Creek Restoration Project was to restore a nearly 2-mile reach of degraded stream channel and to protect the restoration effort from future adverse land use activities for a minimum of 20 years.

Project Summary: Upper Willow Creek (Granite County) is reportedly the most important cutthroat spawning stream in the upper Rock Creek drainage. The stream is severely degraded and incised due to previous agricultural practices. This project aimed to restore about 6500 ft of stream, including reconstruction of the channel, installation of natural habitat features, rebuilding of stream crossings and irrigation structures to a more fish friendly design, and comprehensive revegetation of riparian areas.

This completed project restored the dimension, pattern and profile of 9,500 feet of the altered reach by constructing a narrower and deeper channel that meandered through the floodplain. The project increased channel length by approximately 34% and reconnected the channel to the flood plain.

In addition to restoration of the channel form, the project restored the riparian vegetative community by transplanting approximately 400 live willow clumps along the newly constructed channel, installing approximately 12,000 willow sprigs obtained from nearby sources within the drainage along the stream margin, and entering into a project agreement with the landowners stipulating that the riparian corridor will be excluded

from grazing for a minimum of 15 years, followed by careful riparian management for a minimum of 5 years thereafter.

Monitoring: Fish population estimates for brown trout (*Salmo trutta)* and rainbow trout X westslope cutthroat hybrids (*Oncorynchus mykiss X Oncorhyncus clarki lewisi*) are shown in Figure 46. Capture efficiencies typically were lower during 2007 than 2006, resulting in mostly wider confidence intervals around the point estimates. Non-overlapping confidence intervals were considered statistically significant for this report. Comparisons of trout abundance between sections, standardized to 1,000 feet, indicate that, at least in the short term, habitat quality may not have been significantly improved as a result of the restoration work. However, salmonid populations have been shown to be dynamic and natural fluctuations in abundance can be large (Platts, Nelson 1988).

A metric for abundance not influenced by natural population variation is the measure of the quantity of habitat. For this restoration project, the quantity of habitat was increased by 34% in terms of stream length. Assuming habitat quality was not degraded as a result of this habitat restoration effort, fish abundance likely has increased in proportion to stream length.

Other fish species collected while sampling included two longnose suckers (*Catostomus catostomus*) during 2006 and a single brook trout (*Salvelinus fontinalus*) during 2007.

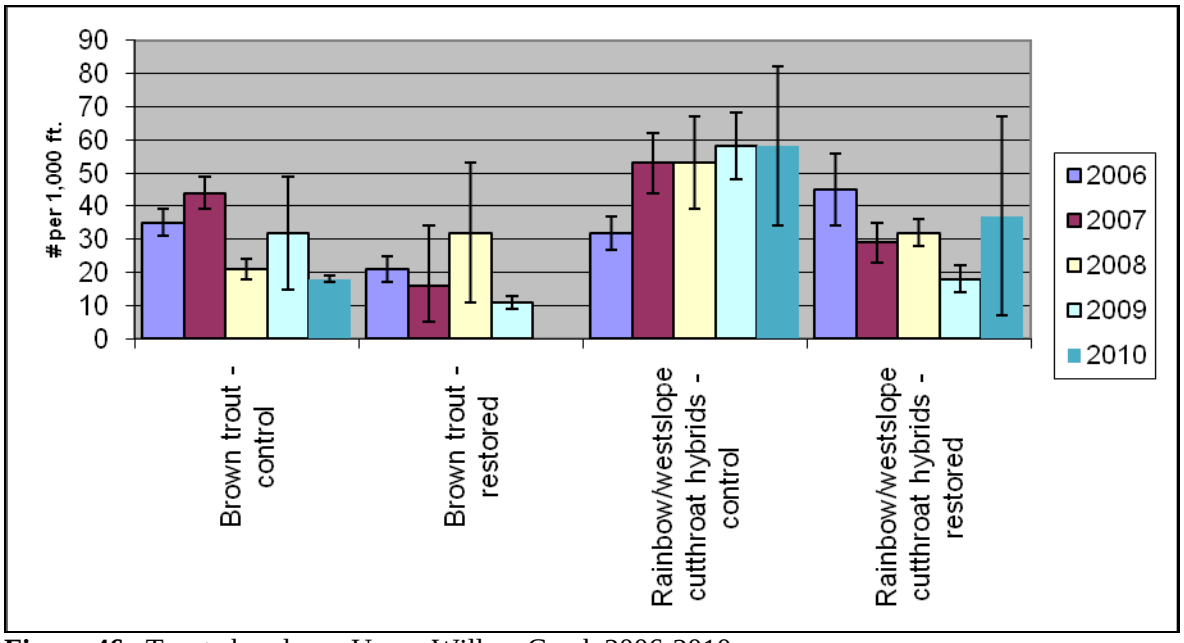


Figure 46. Trout abundance Upper Willow Creek 2006-2010.

Flathead River Drainage

Region 1 Bass Habitat Structures Project:

WATER NAME: Echo, Loon, Horseshoe and Middle Thompson Lakes (Flathead River)
DATA PROVIDED BY: Leo Rosenthal, FWP
FFI NUMBER: 016-05
STATUS: Completed

Restoration Objectives: to provide spawning and rearing habitat for bass.

Project Summary: Echo, Loon, Horseshoe, and Middle Thompson Lakes (Flathead, Lake and Lincoln Counties) support largemouth bass populations that are believed to be limited by the availability of hiding and rearing cover for fry and juveniles. This project involves installation of artificial habitat structures that will serve this purpose.

Monitoring: Bass nests on Loon and Horseshoe Lakes are surveyed annually, see figures 47 and 48.

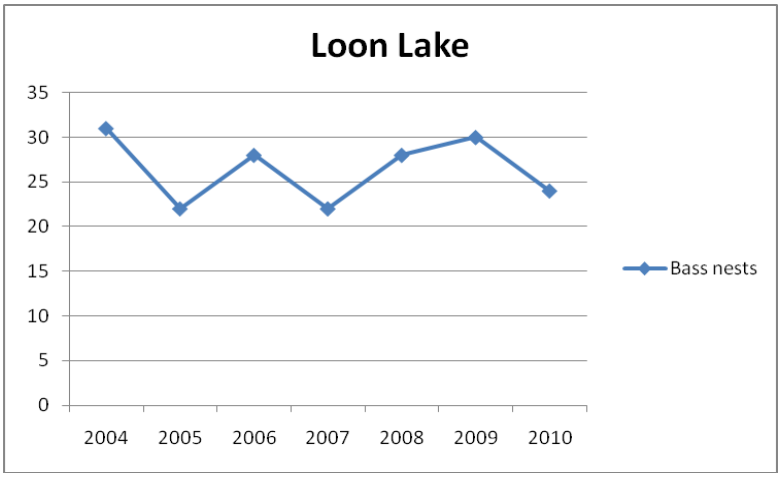


Figure 47. Bass nest abundance on Loon Lake 2004-2010.

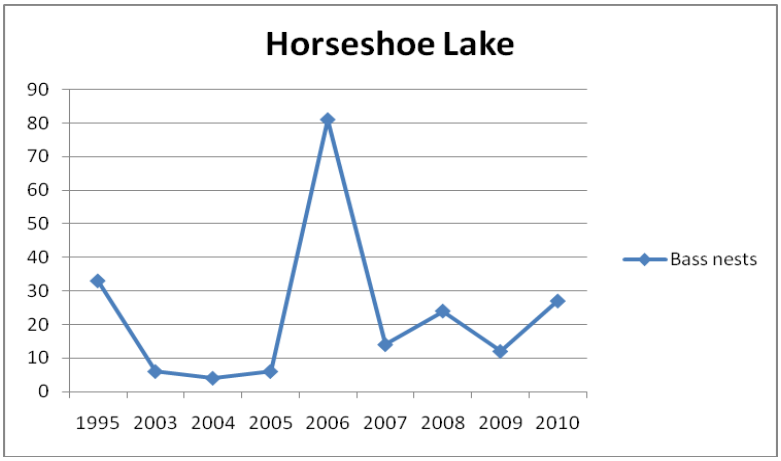


Figure 48. Bass nest abundance on Horseshoe Lake 1995-2010.

Jefferson River Drainage

Antelope Creek Channel Reconstruction Project

WATER NAME: Antelope Creek (Jefferson River)
DATA PROVIDED BY: Ron Spoon, FWP
FFI NUMBER: 001-05
STATUS: Completed in winter 2005.

Restoration Objectives: To increase recruitment of brown and rainbow trout in the Jefferson River.

Project Summary: Antelope Creek (Madison/Jefferson Counties) enters the Jefferson River about 2 miles upstream from Sappington Bridge. The Jefferson supports populations of brown and rainbow trout and is judged by fishery biologists to be recruitment limited. This project involved restoration of approximately 5,400 ft. of Antelope Creek and occurred immediately upstream from its confluence with the Jefferson River. The project included building approximately 1,000 ft of new meandering channel where the stream had previously been channelized; narrowing and deepening portions of the channel to improve sediment transport and create better habitat; redesign of channel geometry including construction of additional pools and installation of bed control structures to beneficially influence scour; water conservation resulting from replacement of an existing diversion structure with a more efficient center pivot system; and riparian fencing that created a 70-acre riparian pasture. Grazing will be managed to protect the investment in restoration.

Monitoring: Channel reconstruction and the elimination of an irrigation canal occurred in fall/winter of 2005. Brown trout redds have been observed, but surveys have not documented a significant change in fry abundance at this time (Figure 49). That may be due to the fact that rearing habitat is still somewhat limited due to lack of structure and relatively high velocity.

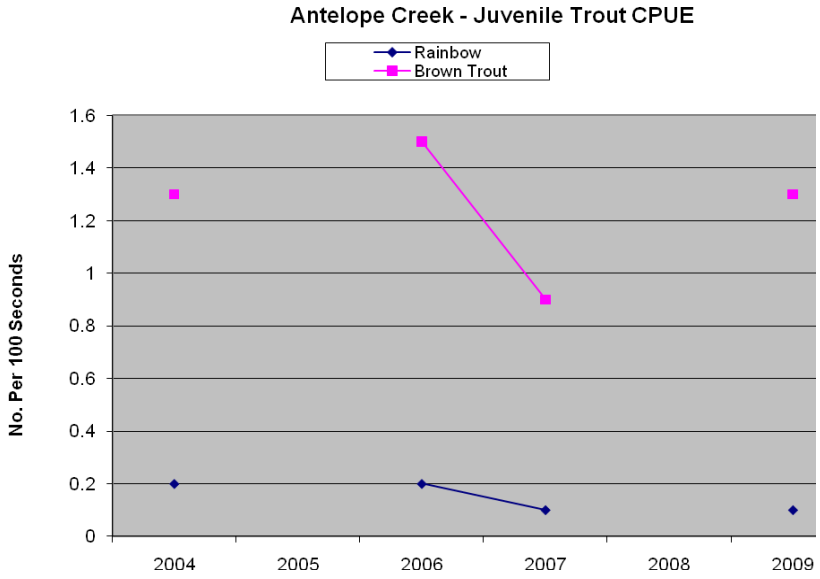


Figure 49. Antelope Creek juvenile trout CPUE 2004-2009.

Judith River Drainage

Big Springs Creek Brewery Flats Channel Restoration Project

WATER NAME: Big Spring Creek (Judith River)
DATA PROVIDED BY: Anne Tews, FWP
FFI NUMBER: 024-97
STATUS: Completed September 2000.

Restoration Objectives: Reconstruction of a channelized reach.

Project Summary: Big Spring Creek in the Brewery Flats area consisted of a straight, rock-lined channel with high velocities due to channelization that occurred around 1910. Future Fisheries Improvement Program funds were used to restore this section to a more natural meandering stream type by lengthening the stream from 2500 to 3900 feet in this section. Work began in 1998 and water was directed into the new channel in September of 2000.

Monitoring: Mark-recapture data for trout populations are collected in August or September from three sections of Big Spring Creek. Rainbow and brown trout numbers for fish 10 inches and longer in the Brewery Flats section are substantially higher than pre-project levels, and remain higher than the other sampling sections.

A new habitat assessment has recently been completed on the restored reach of Brewery Flats and is shown in Table 4. The channel has progressively become deeper and narrower over the 10 years since project completion. Maximum pool depths by be underestimated due to the challenge of measuring such deep pools with a scanoe and measuring rod.

	Pre	Post 4-years	Post 10-years
Date	9/1999	1/2005	11/2010
Flow (cfs)	127	107	150
Area (ft^2)	88,698	130,431	127,773.6
Volume(ft^3)	125,400	181,200	196,383
Area Percentages			
Glide (GLD)	0.0	27.1	5.8
Low Gradient Riffle (LGR)	16.8	11.7	7.0
Run (RUN)	74.5	23.2	37.7
% Fast	**91.3**	**62.0**	**50.5**
Scour Lateral Bedrock Pool (SLR)	8.1	0.0	0.0
Scour Plunge Culvert Pool (SPC)	0.6	0.0	0.0
Scour Lateral Meander Pool (SLM)	0.0	36.6	47.5
Scour Mid Boulder Pool (SMB)	0.0	1.5	2.0
% Slow	**8.7**	**38.0**	**49.5**
Pocket Pools	46	3	4
Pocket Pool Depth (ft)	1.80	1.27	3.34
Overall			
Mean Max depth pools	3.83	4.65	5.14
Mean pool crest depth	2.20	2.00	2.23
Mean residual pool depth	1.63 (N=3)	2.66 (N=15)	2.91 (22)
Stream Length (ft from aerial)	2500 (1989)	3880 (2004)	3840 (2009)
Mean Depth (ft)	1.41	1.49	1.54
Mean Width (ft)	35.3	36.6	33.3
% Stable	15.6	83.1	84.1
% Undercut	63.2	28.9	33.7

Table 4. Habitat assessment on restored section of Big Spring Creek.

Collar Gulch Channl Relocation Project

WATER NAME: Collar Gulch (Judith River)
DATA PROVIDED BY: Anne Tews, FWP
FFI NUMBER: 005-07
STATUS: Complete

Restoration Objectives: Native fish conservation.

Project Summary: In 2007, Future Fisheries partially funded a new channel in Collar Gulch Creek, a pure WCT stream in the Judith Mountains. WCT are the only fish species. The new channel bypassed a historic log crib structure that partially dammed the creek. The stream also had very few deep pools. The old and new channels are the same length. In 2007, the BLM placed woody debris in the stream and did some selective logging. This stream only has 1.5 – 2.5 miles of fish habitat, depending on moisture.

Monitoring: Table 5 shows recent population estimates in Collar Gulch. More fish with a larger average size were located in the section after the project in 2010 than immediately prior to channel construction in 2007. In 2008 and 2010, WCT numbers were also high in the downstream survey section. Before and after pictures (photos 31-34) of the new channel show some washout occurred soon after the project, but three of the largest pools remain. The project appears to have created large deep pools and may have made passage upstream of the crib easier, both of which likely benefitted the WCT population. High precipitation after extended drought is likely an additional reason for the high population numbers.

Location	Date	Section (ft)	#/1000 ft	Mean total length (≥ 4 inch)	Mean total length (all)	Size range
Up from crossing	9/7/2004	623	54 (54 – 56)	5.1	3.9	1.8 – 7.7
Old channel by Crib/Dam	9/17/2007	275	83 (83 – 96)	5.1	3.6	1.6 – 7.4
Up from crossing	8/4/2008	300	210 (195 – 225)	7.6	7.6	5.3 – 10.8
Up from crossing	7/8/2010	200	265 (256 – 274)	5.3	4.8	2.1 – 8.9
New channel by Crib/Dam	7/8/2010	275	146 (133 – 168)	5.8	4.7	2.0 – 8.9

Table 5. Population estimates of WCT in Collar Gulch from 2004-2010.

Photo 31. Collar Gulch before project.

Photo 32. Collar Gulch after project July 2010.

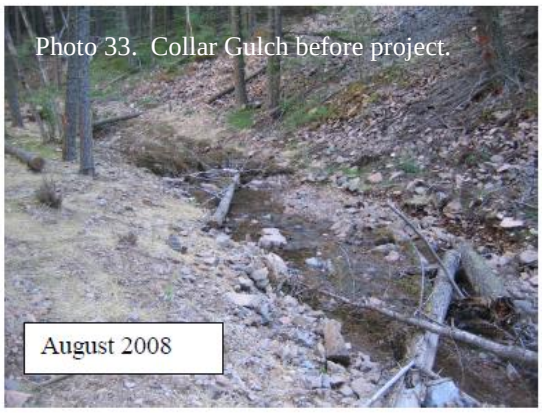


Photo 33. Collar Gulch before project.

Photo 34. Collar Gulch after project July 2010.

Pictures on left taken in 2008, pictures on right take July 2010. Some smaller pools washed out within 1 year of construction. There are 3 nice pools remaining.

Missouri River Drainage

Prickly Pear Creek Channel Restoration and Instream Flow Project

WATER NAME: Prickly Pear Creek (Missouri River)
DATA PROVIDED BY: Eric Roberts, FWP
FFI NUMBER: 023-00 and 017-08
STATUS: Completed in 2010

Restoration Objectives: to bring back sufficient flows to support rainbow and brown trout in a section of creek that often becomes completely dewatered.

Project Summary: Prickly Pear Creek (Lewis and Clark County) supports a mixed salmonid fishery but chronic dewatering during July and August limits fish populations throughout much of the Helena Valley. This project involves shutting down an irrigation system that uses approximately 30 cfs of Prickly Pear Creek water and replacing the diverted water with Canyon Ferry Reservoir water purchased from the Bureau of Reclamation. The term of the project is one

year. Three miles of dry stream will be re-watered and flows will be enhanced in additional downstream reaches.

Monitoring: The 0.66 mile reach of Prickly Pear Creek on the Burnham Ranch was electrofished in 2003 and again in spring 2010. This section includes 0.29 miles of restored channel (FFI-023-00) and improved instream flow through a water exchange with the landowner and the Bureau of Reclamation (FFI-017-08). This section was not sampled prior to construction of the restored channel in 2001 because drought conditions led to complete dewatering of the stream. Dewatering of the stream has been identified as the primary limiting factor for fish populations in this section.

Brown trout abundance increased 43% from 137 brown trout per mile in 2003 to 196 per mile in 2010. Rainbow trout abundance was estimated at 255 rainbow trout per mile in 2003; however enough rainbow trout were not captured for a viable population estimate in 2010. Increased numbers of brown trout is attributable to increased water flows in the summer and fall which improve accessibility to quality spawning and rearing habitats. Rainbow trout abundance in this reach is heavily influenced by migratory fish from Hauser Reservoir. Low rainbow trout abundance may be a function of blocked fish passage below the section or from continued effects of poor recruitment due to several years of extreme dewatering.

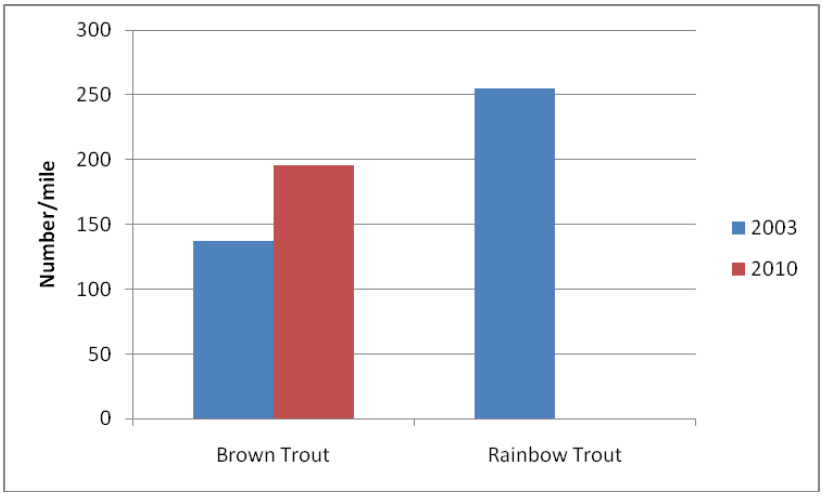


Figure 50: Population estimates (fish per mile) for brown and rainbow trout at the Burnham Ranch section on Prickly Pear Creek.

Cottonwood Creek Fish Barrier Reconstruction Project

WATER NAME: Cottonwood Creek (Missouri River)
DATA PROVIDED BY: Dave Moser, FWP
FFI NUMBER: 003-10
STATUS: Completed in 2010

Restoration Objectives: To prevent hybrid fish from mixing with the genetically pure westslope cutthroat trout population that has been recently established in upper Cottonwood Creek.

Project Summary: Cottonwood Creek (Lewis and Clark County); a tributary to Holter Reservoir located on Montana Fish, Wildlife and Parks' Beartooth Wildlife Management

Area; was recently restored to a genetically pure westslope cutthroat trout population. Associated with this restoration effort, a concrete fish barrier was constructed in 2000 using, in part, Future Fisheries dollars. The original barrier functioned well but was at risk for passing brook trout and rainbow trout during high spring runoff events. This project called for replacing the existing at risk barrier with a new fish migration barrier.

The new barrier was constructed in the summer of 2010 and approximately 5,000 WCT were outplanted from Threemile Creek and Whites Gulch. These fish had been reared using remote site incubators in 2009.

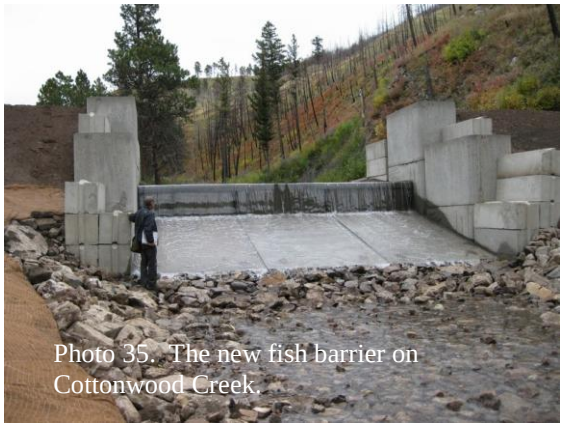


Photo 35. The new fish barrier on Cottonwood Creek.

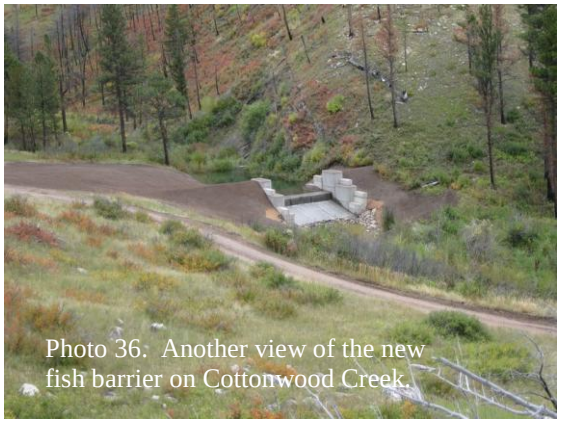


Photo 36. Another view of the new fish barrier on Cottonwood Creek.

Monitoring: Will begin in the fall of 2010.

Ruby River Watershed

Willow Creek Channel Restoration Project

WATER NAME: Willow Creek (Ruby River)
DATA PROVIDED BY: Austin McCullough, FWP
FFI NUMBER: 022-05
STATUS: Completed in 2005

Restoration Objectives: To decrease sediment input into the Ruby River and improve spawning and rearing habitat for Arctic grayling.

Project Summary: Willow Creek, a tributary to the Ruby River, was straightened and channelized in the 1960's to accommodate livestock watering and irrigation practices. A study by the University of Montana (1999 – 2000) on the extent of livestock impacts on Willow Creek reported the total suspended solids input into the Ruby River as 2.7 tons per day. As a result of the study, a livestock corral adjacent to Willow Creek was removed in 2004. In 2005, FFIP partially funded a project that relocated the Willow Creek channel into a historic floodplain. Natural stream function was restored by increasing sinuosity, thus decreasing slope and establishing native riparian vegetation in the floodplain. The restoration reach was protected by a high-tensile electric fence. Project goals were to restore the stream channel to a natural state and provide spawning and rearing habitat for Arctic grayling and other native and sport fish species. RSI's were used to introduce Arctic grayling fry to Willow Creek from 2004 - 2008.

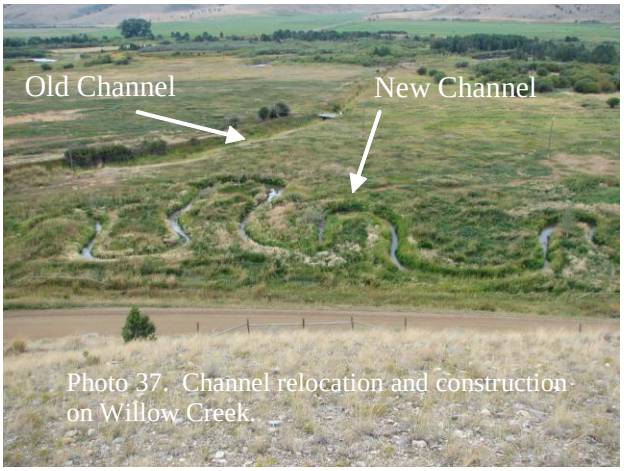


Photo 37. Channel relocation and construction on Willow Creek.

M**onitoring:** Electrofishing surveys of Willow Creek were conducted in 2004 to collect baseline data for fish species composition and abundance. Post-project surveys of Willow Creek have been conducted from 2006 – 2008 to document colonization of the new channel (Figure 51). Although no grayling have been captured during fall electrofishing surveys, Willow Creek RSIs have successfully introduced grayling fry into the system from 2006 – 2008.

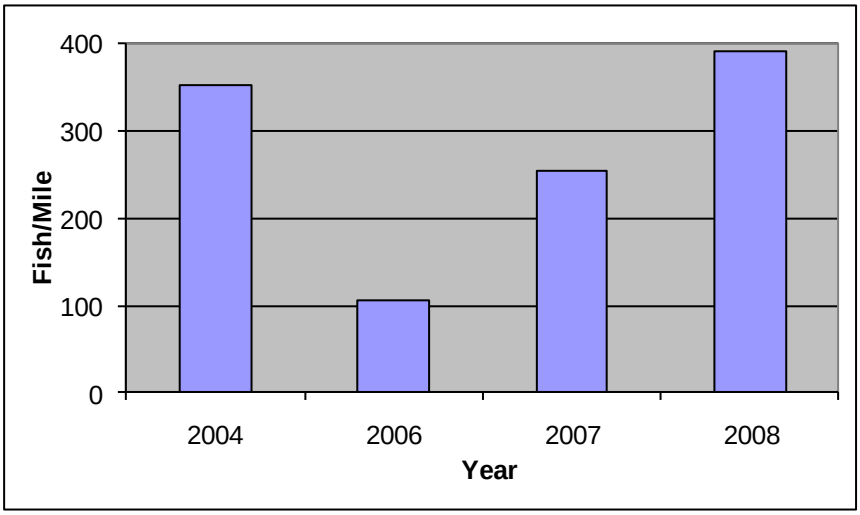


Figure 51. Total fish per mile captured during MFWP electrofishing surveys in Willow Creek from 2004 - 2008. Note: Total fish include brook trout, brown trout rainbow/cutthroat trout hybrids and mountain whitefish.

Ruby River Pool Enhancement and Lazyman Creek Restoration Project

WATER NAME: Ruby River and Lazyman Creek (Ruby River)
DATA PROVIDED BY: Austin McCullough, FWP
FFI NUMBER: 037-06
STATUS: Completed in 2007

Restoration Objectives: Increase spawning and rearing habitat for Arctic grayling in the upper Ruby River and Lazyman Creek.

Project Summary: Limiting factors for Arctic grayling reintroduction success in the upper Ruby drainage are a lack of spawning and rearing habitat and a limited number of high quality pools for adult habitat. The Ruby River Pool Enhancement and Lazyman Restoration project is a two-part project with goals of addressing each limiting factor.

Lazyman Creek is a tributary to the Ruby River that had become incised and lost habitat complexity, in part from livestock grazing impacts, and was regularly dewatered during the irrigation season. The Lazyman Creek Restoration project goals were to restore a stable, functioning stream capable of maintaining a year-round fishery, improve Arctic grayling spawning and rearing habitat, improve irrigation system efficiency, and maintain perennial in-stream flows.

Treatments to stabilize eroding Lazyman Creek stream banks included transplanting mature and sapling willows and horizontally pinning mature juniper trees. Incised stream banks were sloped to allow floodplain access, and a new irrigation system was designed to facilitate irrigation water more efficiently. A water lease is currently being pursued to ensure year-round in-stream flows in Lazyman Creek.

The Ruby River Pool Enhancement project reach is located immediately downstream from the Ruby River's confluence with Lazyman Creek. The goals associated with this project were to provide multiple high quality pools to support adult Arctic grayling and to reduce sediment inputs by stabilizing two excessively eroding stream banks. Eight pools were constructed or enhanced using a combination of treatments to increase pool volume and improve in-stream habitat complexity and overhead cover. Two eroding stream banks totaling 800 linear feet were stabilized using mature willow transplants, deep-rooted shrub transplants and bank sloping.

Monitoring: The Lazyman Creek restoration project reach was sampled in 2006 prior to restoration to establish a baseline for fish species composition and abundance. The same reach has been sampled annually from 2007 – 2009 to document fish community response post-project (Figure 52). A reach of the Ruby River including the project reach is sampled annually as part of the monitoring plan for grayling reintroduction efforts. Fish species composition and abundance within the project reach was documented in 2007 prior to restoration activity, and have been sampled annually since then (Figure 53). A temperature logger has also been deployed at the mouth of Lazyman Creek from 2006 – 2009 (Figure 54).

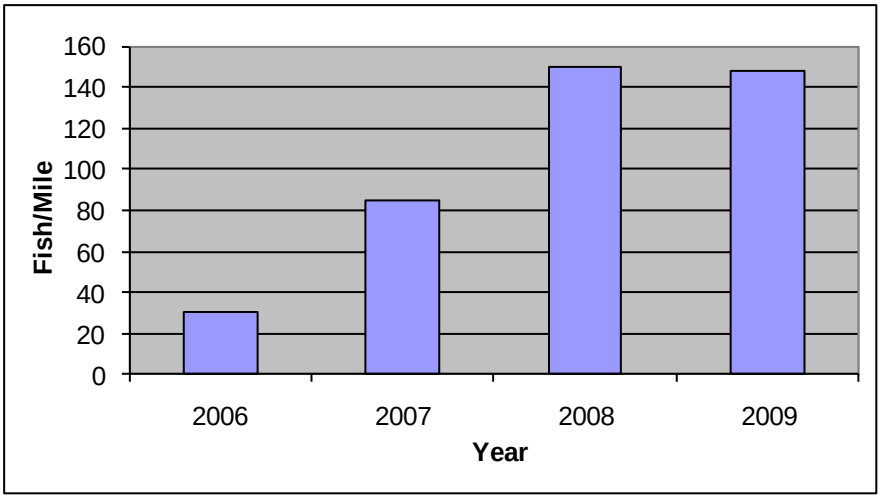


Figure 52. The number of Rainbow/Cutthroat trout hybrids captured per mile during MFWP electrofishing surveys of Lazyman Creek.

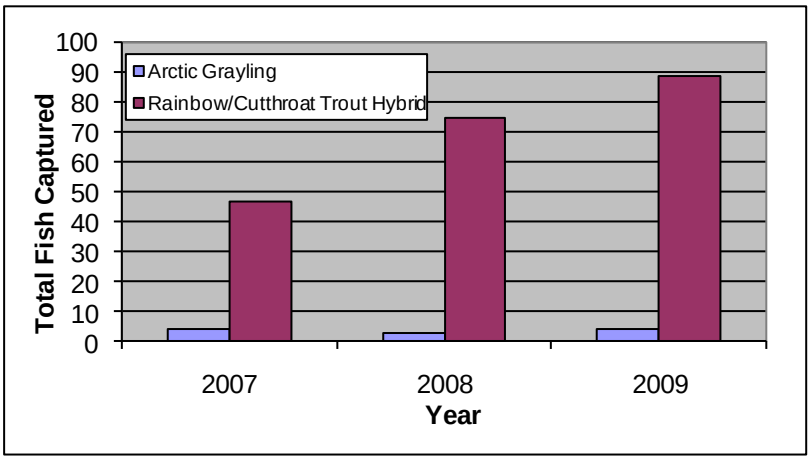


Figure 53. Total grayling and Rainbow/Cutthroat trout hybrids captured in the Ruby River Pool Enhancement project reach by MFWP during electrofishing surveys from 2007 - 2009.

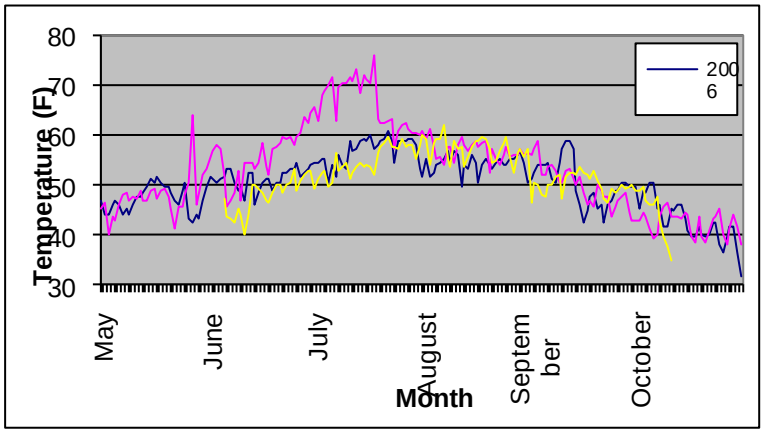


Figure 54. Maximum daily temperature recorded by MFWP at the mouth of Lazyman Creek from 2006 - 2009.

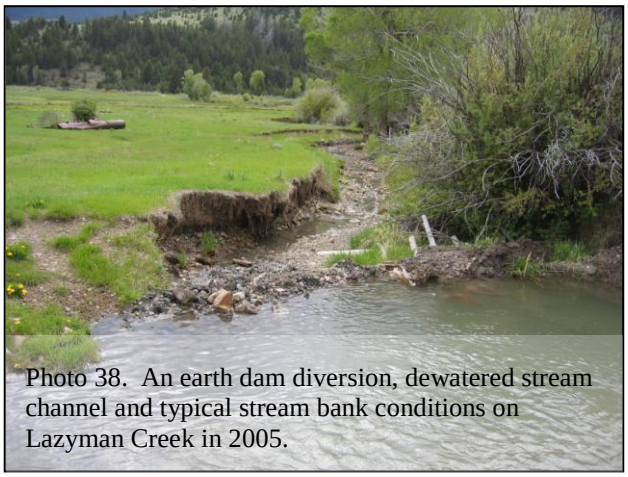


Photo 38. An earth dam diversion, dewatered stream channel and typical stream bank conditions on Lazyman Creek in 2005.

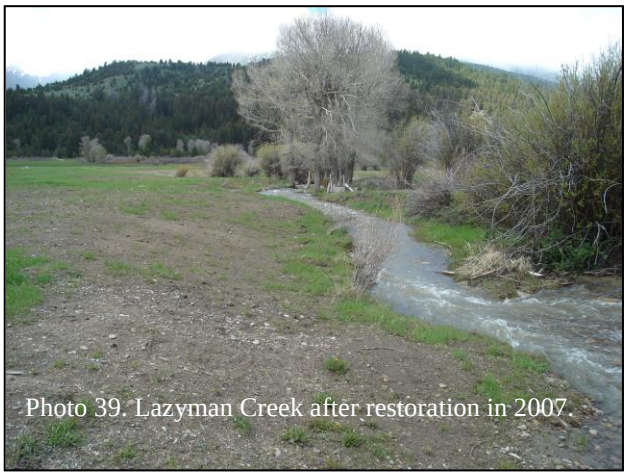


Photo 39. Lazyman Creek after restoration in 2007.

Photo 39. A non-functioning headgate structure on Lazyman Creek in 2006.

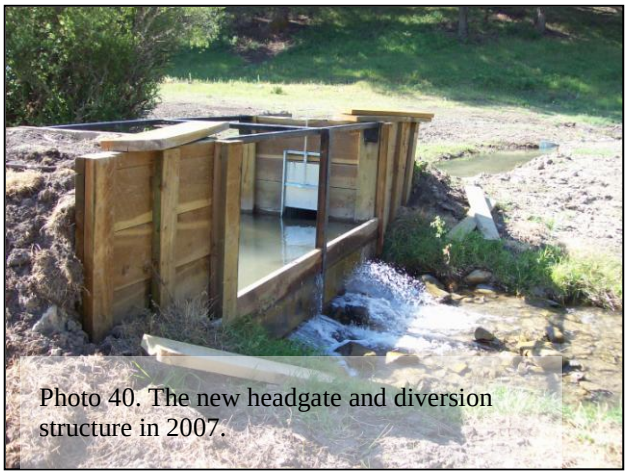


Photo 40. The new headgate and diversion structure in 2007.

Yellowstone River Drainage

Piney Creek Habitat Enhancement Project:

WATER NAME: Piney Creek (Yellowstone River)
DATA PROVIDED BY: Ken Frazer, FWP
FFI NUMBER: 033-05, 034-09
STATUS: Under construction

Restoration Objectives: conservation of native species.

Project Summary: Piney Creek (Carbon County), a tributary to Sage Creek located in the Pryor Mountains, supports a remnant, genetically pure Yellowstone cutthroat trout population. This Yellowstone cutthroat trout population is one of the eastern-most cutthroat trout populations found in Montana. Past overgrazing by livestock within the riparian corridor and dewatering from irrigation diversions have severely degraded the aquatic habitat in the stream. This project proposes to enhance Yellowstone cutthroat trout habitat by installing rock and log features to increase the number of pools, installing riparian fencing to exclude livestock within the riparian corridor, and constructing a pond and an associated series of three screened standpipes to reduce entrainment into the irrigation system and create additional holding water for these rare fish.

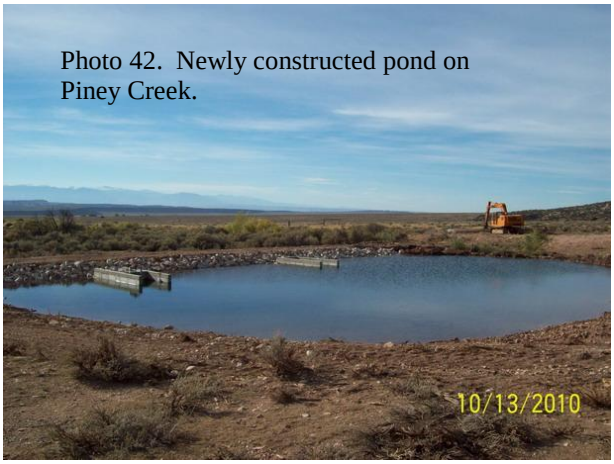


Photo 42. Newly constructed pond on Piney Creek.

Monitoring: Piney Creek pool enhancement was under construction in October 2010. Construction and earthwork should be completed soon. Evaluation of the fishery will occur in 2011. Additional riparian work is being discussed with the BLM taking the lead.

Crooked Creek Fish Barrier Project:

WATER NAME: Crooked Creek (Yellowstone River)
DATA PROVIDED BY: Mike Ruggles, FWP
FFI NUMBER: 027-06
STATUS: Completed in 2008

Restoration Objective: Native Species Protection.

Project Summary: Crooked Creek (Carbon County) supports one of the easternmost populations of Yellowstone cutthroat trout. A natural barrier that protected the genetic integrity of the population recently washed out during a 100-year rainstorm. This project involves reconstruction of a barrier near a natural bedrock constriction to protect this unique population.

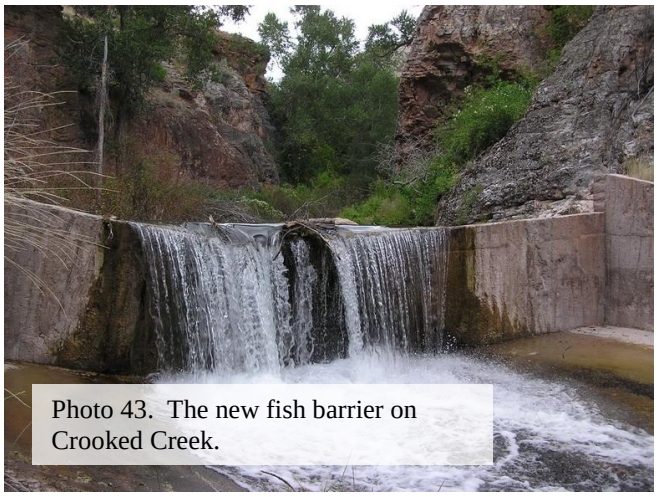


Photo 43. The new fish barrier on Crooked Creek.

Monitoring: The barrier, completed in 2008, has now been in place for 2 field seasons. The section above the barrier was treated with rotenone in 2008 to remove brown and brook trout. The barrier on visual inspection appears to be in good shape, and vegetation around the barrier has become re-established. Montana Fish Wildlife and Parks, United States Bureau of Land Management, and United States Forest Service crews combined efforts to evaluate the fishery above and below the constructed barrier on August 17, 18th, and 19th, 2009 and July 26th and 27th, 2010. The fish were sampled using back pack electrofishing equipment. Yellowstone cutthroat trout from upstream have started to inhabit the protected area. In both 2009 and 2010 three cutthroats and no other species of trout were found in the section above the barrier. Crooked Creek below the barrier was sampled for nearly a mile with 24 and 16 brown trout captured in 2009 and 2010 respectively and no Yellowstone cutthroat trout. In 2009 and 2010 invertebrate populations on visual inspection were recovering from the rotenone treatment with mayfly, stonefly, caddis fly, as well as midge and other fly taxa noted.

The project appears to be successful at this time. It's anticipated as additional Yellowstone cutthroat migrate down from the upper reach of Crooked Creek and as resident fish begin spawning the population will increase over the next few years. If natural recruitment continues to be limited in the protected area further evaluations will be made to determine the reason and steps taken to improve them.

Kickabuck Spring Creek Project:

WATER NAME: Kickabuck Spring Creek (Yellowstone River)
DATA PROVIDED BY: Carol Endicott, FWP
FFI NUMBER: 010-09
STATUS: Completed in 2008

Restoration Objective: Increase spawning habitat for Yellowstone cutthroat trout.

Project Summary: Kickabuck Spring Creek (Sweet Grass County), a tributary to the Yellowstone River near Big Timber, has the potential to provide spawning and rearing habitat for Yellowstone cutthroat trout. Riparian vegetation is fairly good along much of the stream, but the channel is unnaturally straight (see photo 44). This project involved narrowing and deepening the existing channel, increasing sinuosity, and importing gravel to enhance approximately 1,400 feet of spawning and rearing habitat. The lessees are in the process of developing a grazing management strategy to protect the stream.

Monitoring: The Kickabuck Spring Creek spawning channel was constructed in spring of 2009. As the intent of the project was to create a spawning stream for fluvial Yellowstone cutthroat trout, Kickabuck Spring Creek was surveyed in 2009 and 2010 during the Yellowstone cutthroat trout spawning period to determine use by fluvial fish. No cutthroat trout redds were observed in either year, but it was likely too soon for trout to fully utilize this "new" stream. In addition, the low numbers of Yellowstone cutthroat trout present in this reach of river in recent years means fewer fish available to find the high quality spawning habitat in Kickabuck Spring Creek.

Photo 44. Kickabuck Spring Creek before reconstruction.

Interestingly, juvenile mountain whitefish were found to be making substantial use of the stream. The lower third of the newly constructed channel teemed with hundreds of apparent age-1 mountain whitefish. This was surprising as mountain whitefish typically move downstream into larger streams to overwinter Mountain whitefish are native to the YellowstoneRiver watershed, and are currently the subject of increased study given concerns for potential declines in abundance and range.

Photo 45. Kickabuck Spring Creek post-project showing increased sinuosity.

Photo 46. Kickabuck Spring Creek post-project showing imported spawning gravel.

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