MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: Montana PROJECT NO.: F-78-R-2
PROJECT TITLE: Statewide Fisheries Investigations
JOB TITLE: Northcentral Montana Coldwater Streams
PERIOD COVERED: July 1, 1995 through June 30, 1996

ABSTRACT

Electrophoretic analysis identified three pure westslope cutthroat trout populations in streams along the Rocky Mountain Front. A natural barrier was improved to further secure a pure westslope cutthroat trout population upstream. The westslope cutthroat trout population of the North Fork of Badger Creek was estimated at 183 fish per mile. The trout population of the North Fork Sun River was estimated at 596 fish per mile while the South Fork was assessed at 485 fish per mile. Exploitation rates remain low for trout harvested in both forks of the Sun River as well as for fish tagged at the head of Gibson Reservoir. In Big Spring Creek rainbow trout numbers continued to decline in the Burleigh Section but population levels were similar to estimates in 1994 for the Tresch section. Brown trout numbers continued to increase on Big Spring Creek. Aging data indicates that the decline of rainbow trout in the Burleigh section was due to lack of recruitment. Population estimates from the channelized Brewery Flat section of Big Spring Creek were higher for rainbow and brown trout than the Burleigh section. On the Smith River, population estimates of rainbow trout ≥8 inches remained at historic low levels in 1995. In the Deep Creek section, the number of rainbow trout ≥8 inches was the fourth highest on record. Brown trout population levels remained very high in the Eagle Creek section when compared to historic levels. In the Deep Creek section, numbers were the second highest level on record. Biomass estimates of brown trout remained steady in the Eagle Creek section and substantially increased in the Deep Creek section. Fall 1995 rainbow trout population estimates on the Missouri River were higher than the mean historical range and were similar to estimates from the Craig and Cascade sections in 1994. Spring brown trout population estimates on the Craig and Cascade sections showed a decrease in the resident population from 1995, but were similar to levels in 1994. Whirling disease monitoring was continued in Region 4 waters. In spring 1996, rainbow trout from Little Prickley Pear Creek and the Craig Section of the Missouri River were collected that contained the parasite that causes whirling disease. Approximately 164 projects were reviewed under the Natural Streambed and Land Preservation Act while another 63 projects were reviewed under the Stream Preservation Act.

OBJECTIVES

1. To identify and monitor the characteristics and trends of fish populations, angler harvest and preferences, and habitat conditions in northcentral Montana coldwater stream ecosystems.

2. Use survey and inventory information to identify management problems and opportunities, then develop and implement management actions to maintain fish populations at levels consistent with habitat conditions or other limiting factors.

3. Review projects proposed by state, federal, and local agencies and private parties which have the potential to affect fisheries resources and aquatic habitats. Provide technical advice or decisions to reduce or mitigate resource damage.

4. Provide landowners and other private parties with technical advice and information to sustain and enhance fisheries resources and aquatic habitat.

5. Enhance public understanding and awareness of fishery and aquatic habitat resources and issues in northcentral Montana through oral and written communication.

6. Maintain and enhance public access to fishery resources in northcentral Montana.

7. To enhance trout populations and trout fishing opportunity in Marias River immediately downstream from Tiber Dam.

PROCEDURES

Fish populations in the Choteau area were sampled using an aluminum jet boat with fixed booms, a backpack shocker, hook and line, and snorkeling. A two-pass method was used to estimate cutthroat trout numbers in North Fork Badger Creek. Trout populations in the forks of the Sun River were estimated using the Petersen mark-recapture method (Ricker 1975). All rainbow and cutthroat trout over eight inches in total length were measured and tagged. Floy tags were used to mark the trout and snorkelers visually observed fish to obtain recapture data. Cutthroat trout were collected for electrophoretic analysis at the University of Montana by Dr. Robb Leary. Much of the work done within the Lewis & Clark National Forest was done in cooperation with Forest Service personnel.

Trout populations on Big Spring Creek and the Smith River were surveyed using a fiberglass drift boat equipped with a mobile electrode and Coeffelt VVP-15 or Mark XXII-M to rectify AC to straight DC. Power was obtained from a 240 volt generator. The Missouri River was electrofished at night using two aluminum jet

boats. Both boats were equipped with headlights and fixed booms with stainless steel droppers suspended in front of the bow. Electricity from 240 volt portable generators was converted to pulsed or straight DC using Coffelt rectifying units. The only pulsed setting used was the Complex Pulse System (CPS). Other stream population surveys were performed using a backpack electrofishing unit equipped with a Mark V generator and a Coeffelt rectifying unit which converted AC current to 30Hz pulsed DC. Rainbow and brown trout populations from Big Spring Creek, the Smith River and the Missouri River were estimated using the log-likelihood method which generates recapture efficiency curves for estimate production (MDFWP 1994). We analyzed mark-recapture and age data with a MFWP computer program on an IBM-PC compatible microcomputer. Whole heads of trout were collected, frozen, and sent to the Washington Animal Disease Diagnostic Laboratory at Washington State University for examination to determine the presence of the protozoan that produces whirling disease.

Recommendations and alternatives for projects involving stream banks and channels were made through participation in the Stream Protection Act (SPA) and Natural Streambed and Land Preservation Act (SB310).

FINDINGS

Westslope Cutthroat Trout

Electrophoretic analysis of samples collected in 1994 determined that East Fork Woods Creek, Whiterock Creek and Lime Gulch all contain pure westslope cutthroat trout populations. Due to a small sample size, the analysis of Green Gulch fish remained uncertain. In 1995, we collected genetic samples from the South Fork of Birch Creek; results were not available to be included in this report.

The North Fork of Badger Creek was sampled on August 1, 1995; the total population was estimated at 183 westslope cutthroat trout per mile. The westslope cutthroat trout ranged from 3.1-12.1 inches in total length and averaged 6.2 inches.

A natural barrier on Whiterock Creek was improved to protect westslope cutthroat trout and to prevent the invasion of exotic species. During electrofishing surveys, westslope cutthroat trout up to 7.5 inches were captured; however, brook trout were also captured. Approximately one-quarter mile of stream above the barrier was electrofished. All brook trout taken were removed.

Sun River

In an effort to assess harvest and movement in the upper Sun River drainage, we electrofished both forks near the confluence area at the upper end of Gibson Reservoir on May 30, 1995. A total of 211 rainbow and cutthroat trout were tagged and released; the fish averaged 11.4 inches in length (range=8.3-16.7) and weighed an average of 0.53 pounds (range=0.23-1.40), which is nearly identical to means obtained in 1994 (Tews et al. 1995). Anglers harvested three, or 1.4%, of the fish tagged in 1995. Nine additional tagged fish were reported caught and released. Six fish tagged in 1995 moved up the South Fork, four moved up the North Fork, and two were caught at the confluence (Figure 1). Since tagging was initiated in 1994, a cumulative total of 11 fish tagged at the confluence have been captured upstream on the South Fork, six on the North Fork, six at the confluence, and one below the reservoir (Figure 1). Six fish tagged at the confluence in 1994 were kept by anglers in 1995, resulting in a cumulative harvest of 4.4%. Fish tagged in 1994 have been reported from the confluence area, Gibson Reservoir, below the reservoir, and in both forks of the Sun River (Figure 1). Fish tagged in 1995 have only been reported recaptured in the confluence and both forks (Figure 1).

Trout populations in both forks of the Sun River were estimated on July 24-26, 1995. In the North Fork section, 109 fish were tagged and released. The mean length of the fish was 11.2 inches (range=8.0-16.2). A total of 122 fish, which had a mean length of 11.9 inches (range 9.0-15.4), were tagged and released in the South Fork. In 1995, trout populations were estimated at 596 and 485 fish per mile for the North and South Fork, respectively (Figure 2). The North Fork population estimates have increased in 1994 and 1995; however, the South Fork estimate increased in 1994 but then decreased in 1995 (Figure 2). Mean lengths of fish have decreased since 1992 and 1993 in the South Fork and the North Fork, respectively (Figure 2).

Cumulative angler harvest of trout in the North Fork Sun River ranges from approximately 1% for 1994 tagged fish to over 5% for 1990 tagged fish (Table 1). Similarly, for the South Fork Sun River, no fish were reported as harvested in 1995; the cumulative rate was 6.1% for fish tagged in 1990. In 1995, a total of 5 other tagged fish were caught and released by anglers or re-tagged by fisheries crews (Table 1).

Angler catch rates for the North Fork are generally two times greater than on the South Fork (Tews et al. 1995). During 1995, mean catch rates for the FWP survey was 4.9 fish/hour on the North Fork and 2.6 on the South Fork.

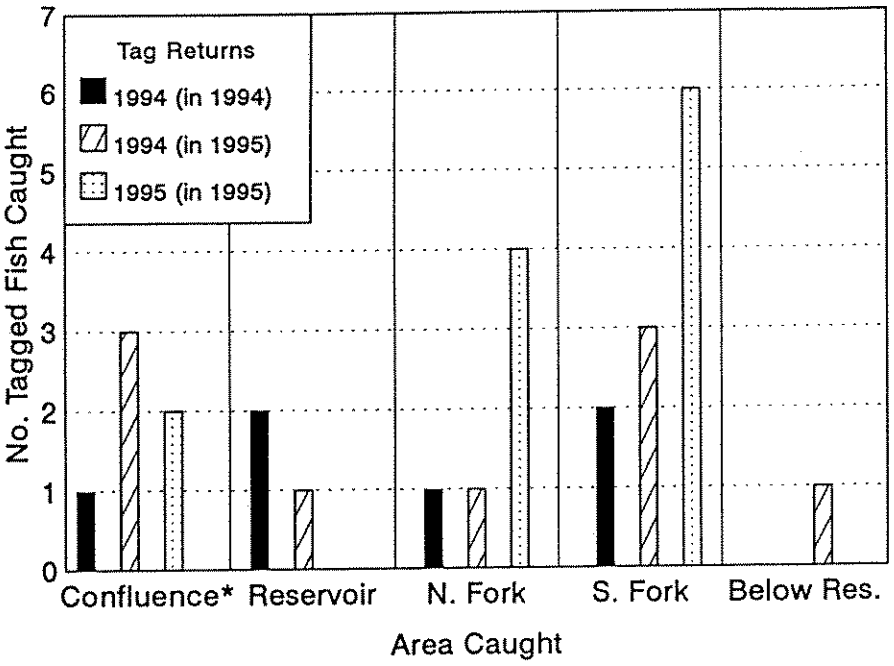

Figure 1. Movement of tagged trout from the confluence of the North and South Fork Sun River (*confluence = tagging area).

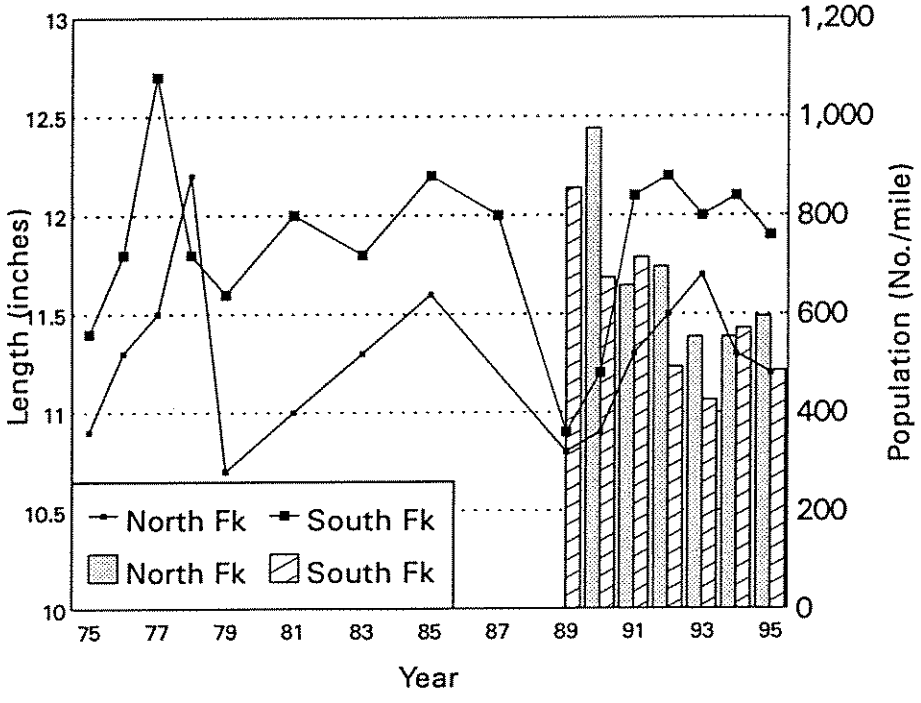

Figure 2. Population estimates and average lengths of trout in the forks of the Sun River (Line = lengths; bars = population estimate).

Table 1. Exploitation of rainbow and cutthroat trout from the North and South Forks of the Sun River based on voluntary angler tag returns, 1990-1995.

Stream	Year tagged	Number tagged*	Number harvested	Cumulative harvest(%)	No. fish released	Others** released
North Fk.	1990	113	6	5.3	6	3
	1991	124	6	4.8	6	1
	1992	97	2	2.1	0	2
	1993	102	4	3.9	10	4
	1994	109	1	0.9	1	2
	1995	107	2	1.9	2	2
	Totals	652	21	3.2	25	14
South Fk.	1989	92	2	2.2	0	3
	1990	82	5	6.1	0	6
	1991	102	4	3.9	1	8
	1992	96	5	5.2	8	2
	1993	65	1	1.5	5	3
	1994	90	2	2.2	0	5
	1995	119	0	0.0	2	3
	Totals	646	19	2.9	16	30

* - Numbers adjusted to compensate for fish released after tags pulled by anglers or fish re-tagged by FWP.
** - Includes fish with tags pulled or re-tagged.

The majority of the fish tagged in the study sections appear to be resident, based on locality of recaptures. Since 1990, 85% of the fish tagged in the North Fork Sun River and later recaptured have been recaptured in the North Fork (Table 2). The same trend has been observed in the South Fork; 83% of tag returns for fish tagged in the South Fork came from that fork (Table 3). However, some fish tagged in both forks moved downstream to the confluence and to Gibson Reservoir.

Scale samples were collected from a representative number of trout taken at the confluence and in both forks. As in previous collections, the majority of the samples and the population were 2-4 years old (Tables 4-6). The maximum age determined was six years.

Lewistown Area

Big Spring Creek

Mark recapture electrofishing estimates were obtained on three sections of Big Spring Creek in August-September, 1995 (Table 7 and Appendix Table 1). On the Burleigh section, rainbow trout were estimated at 398 per mile and brown trout at 196 per mile. The estimates indicated a continued drop in rainbow numbers but brown

Table 2. Movement of trout tagged in the North Fork of the Sun River*, 1990-1995.

Year tagged	Return year	Number recaptured by area			
		Confluence	Gibson Res.	Below Gibson	No.Fk. So.Fk.
1990	1990				5
	1991				6
	1992		1		2
	1993				1
1991	1991		1		2
	1992	2			3
	1993				1
	1994		1		3
1992	1992				
	1993				2
	1994			1	
	1995				1
1993	1993		1		9
	1994				7
	1995				1
1994	1994		1		
	1995				3
1995	1995		1		5
	Totals	2	6	1	51

* - The North Fork Sun River study section includes an area from the vicinity of Freezeout Creek upstream to slightly above Glenn Creek.

Table 3. Movement of trout tagged in the South Fork of the Sun River*, 1989-1995.

Year tagged	Return year	Number recaptured by area			
		Confluence	Gibson Res.	N. Fork	S. Fork
1989	1989				
	1990				1
	1991				2
	1992				
	1993				1
	1994				1
1990	1990				1
	1991	3		1	5
	1992				1
1991	1991				4
	1992	2	1		2
	1993				3
	1994				1
1992	1992				10
	1993	1			3
	1994				1
1993	1993				2
	1994	1			5
	1995				1
1994	1994				
	1995	1	1		5
1995	1995				5
	Totals	8	2	1	54

* - The South Fork study section begins near Bear Creek and extends upstream to slightly below Windfall Creek.

Table 4. Age composition of rainbow and cutthroat trout at the confluence of North and South Forks of Sun River, 1995.

Length group (inches)	Number of fish per length group	Number of fish/age group					
		1	2	3	4	5	6
4	1	1					
5	0						
6	1		1				
7	4		4				
8	10		8	2			
9	10		3	7			
10	10		2	7	1		
11	9			3	6		
12	10			6	4		
13	8			1	1	5	1
14	5					4	1
15	1						1
16	2						2
Totals	71	1	18	26	12	9	5

Table 5. Age composition of rainbow and cutthroat trout, North Fork Sun River, 1995.

Length group (inches)	Number of fish per length group	Number of fish/age group				
		2	3	4	5	6
8	3	2	1			
9	13	7	5	1		
10	14		13	1		
11	29		21	8		
12	10		3	5	2	
13	9			3	2	4
Totals	78	9	43	18	4	4

Table 6. Age composition of rainbow and cutthroat trout, South Fork Sun River, 1995.

Length group (inches)	Number of fish per length group	Number of fish/age group 2	3	4	5	6
9	5	4	1			
10	16		12	4		
11	29		19	10		
12	29		10	14	5	
13	11		1	7	3	
14	2			1		1
15	2					2
Totals	94	4	43	36	8	3

Table 7. Rainbow and brown trout population estimates for the Burleigh, Tresch and Brewery Flats sections of Big Spring Creek, August, 1995.

Section	Date marked	Number per mile <10 in	>10 in	All	Biomass (lbs)	Size range (inches)
			Rainbow trout			
Burleigh	8/21/95	124	274	398	265	6.0 - 21.9
Tresch	8/23/95	875	923	1797	900	6.0 - 18.9
Brewery Flats	8/22/95	721	411	1131	436	6.0 - 21.9
			Brown trout			
Burleigh	8/21/95	0	196	196	245	11.0 - 19.9
Tresch	8/23/95	131	325	456	352	8.0 - 17.9
Brewery Flats	8/22/95	15	312	327	356	9.0 - 17.9

trout increased. Populations on the Burleigh section in 1995 were 85% of rainbow trout and 131% of brown trout levels observed in 1994 (Tews et al. 1995). The low number of recaptured fish in the Burleigh section required two recapture runs, compared with only one in previous years. Population estimates were run twice to compare results using data based on 1 or 2 recapture runs. P-values indicated that the MR4 log-likelihood model (MDFWP 1994) was

valid for either estimate (Appendix Table 1). Brown trout estimates were nearly identical. However, the estimates for numbers of rainbow less than 10 inches per mile varied from 124 (2 recapture runs) to 481 (1 recapture run) (Appendix Table 1). This unacceptable difference was probably due to the large size of the smallest recaptured fish (11 inches) during the first recapture run. Problems of this type need to be further evaluated when using the MR4 model.

As we would anticipate, the Tresch section had several times more trout than the Burleigh section. A total of 1,797 rainbow trout and 456 brown trout per mile were estimated in the Tresch Section (Table 7). These 1995 estimates were similar to 1994; they represented 96% of the total rainbow trout and 103% of the total brown trout estimated in 1994 (Tews et al. 1995).

The Brewery Flats section yielded an estimate of 1,131 rainbow and 312 brown trout per mile. Surprisingly, the channelized Brewery Flats section was estimated to contain nearly 2.5 times more trout and 1.5 times the trout biomass per mile than the Burleigh section (Table 7). The Brewery Flats section contained almost the same biomass of brown trout as was found in the Tresch section (Table 7). Estimates were also obtained on the Brewery Flats section in 1967, 1968 and 1982. In the past, the Burleigh section typically had slightly more rainbow trout greater than 10 inches in total length than we estimated in the Brewery Flats Section (Figure 3). In 1995, populations of both rainbow and brown trout greater than 10 inches were the highest ever seen in the Brewery Flats section (Table 8), while they are at near record lows for rainbow trout in the Burleigh section (Tews et al. 1995).

Thirty-two Age 1 rainbow trout, collected during population estimates on the Brewery Flats section tested negative for whirling disease. A total of 87 rainbow trout from Big Spring Creek have tested negative for whirling disease since February 1995.

Population estimates for each age class were computed for rainbow and brown trout from the Tresch and Burleigh sections of Big Spring Creek for 1967-1994 (Figures 4-7 and Appendix Tables 2-5). The ages have not been validated and aging has not been completed for the 1995 data and is not included here. The average total length at age varied between years (Appendix Tables 2-5) and was probably due in part to difficulty in reading scales. The population decline of rainbow trout in the Burleigh section is due to reduced numbers of young fish; Age III and older fish have maintained fairly constant numbers (Figure 4). Based on size class data this trend has continued into 1995. Prior to 1992, Age I and II rainbow trout were typically more numerous than Age III and older fish. More recently, however, this has not been the case. Brown trout size classes do not show similar changes (Figure 5). On the Tresch section, Age I and II rainbow trout continue to be more common than older fish, however young fish numbers are lower than

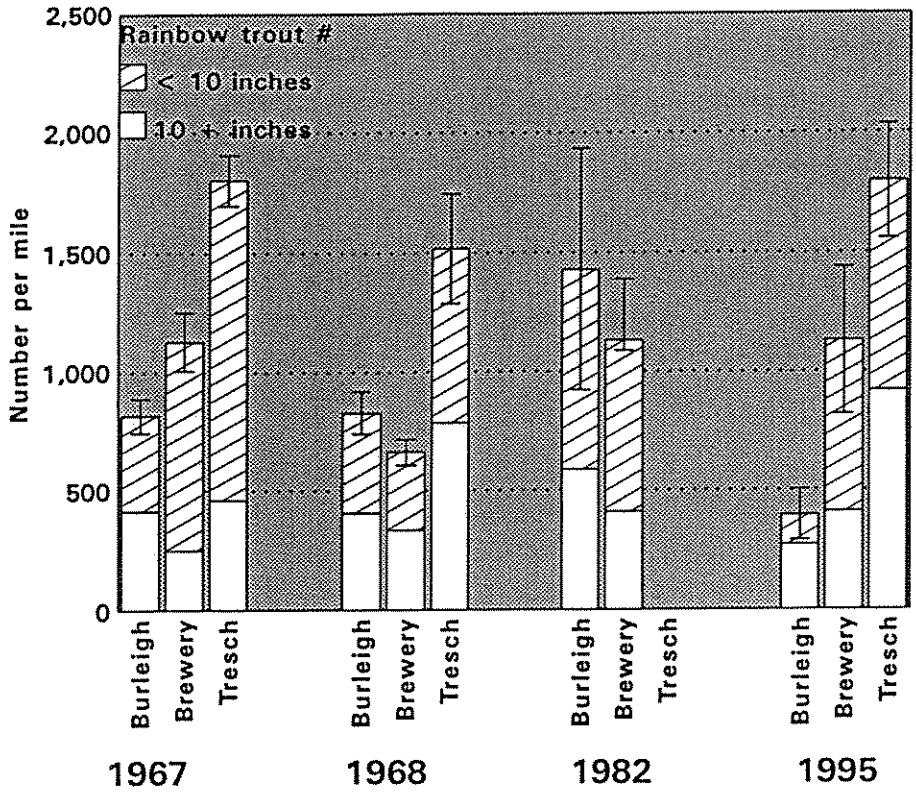

Figure 3. Comparison of rainbow trout numbers between the Burleigh, Brewery Flats and Tresch sections of Big Spring Creek.

Table 8. Rainbow and brown trout population estimates for 1967, 1968, 1982, and 1995 on the Brewery Flats section, Big Spring Creek.

Date marked	Number per mile <10 in	>10 in	All	Biomass (lbs)	Size range (inches)
			Rainbow trout		
7/21/67	445	250	695	257	6.0 - 15.9
7/29/68	326	334	661	308	6.0 - 15.9
8/25/82	888	316	1205	372	6.0 - 14.9
8/22/95	721	411	1131	439	6.0 - 21.9
			Brown trout[1]		
7/21/67	63	163	223	189	6.0 - 19.9
8/22/95	15	312	327	356	9.0 - 17.9

[1] Brown trout estimates were not valid based on the log likelihood model for 1968 and 1982 estimates.

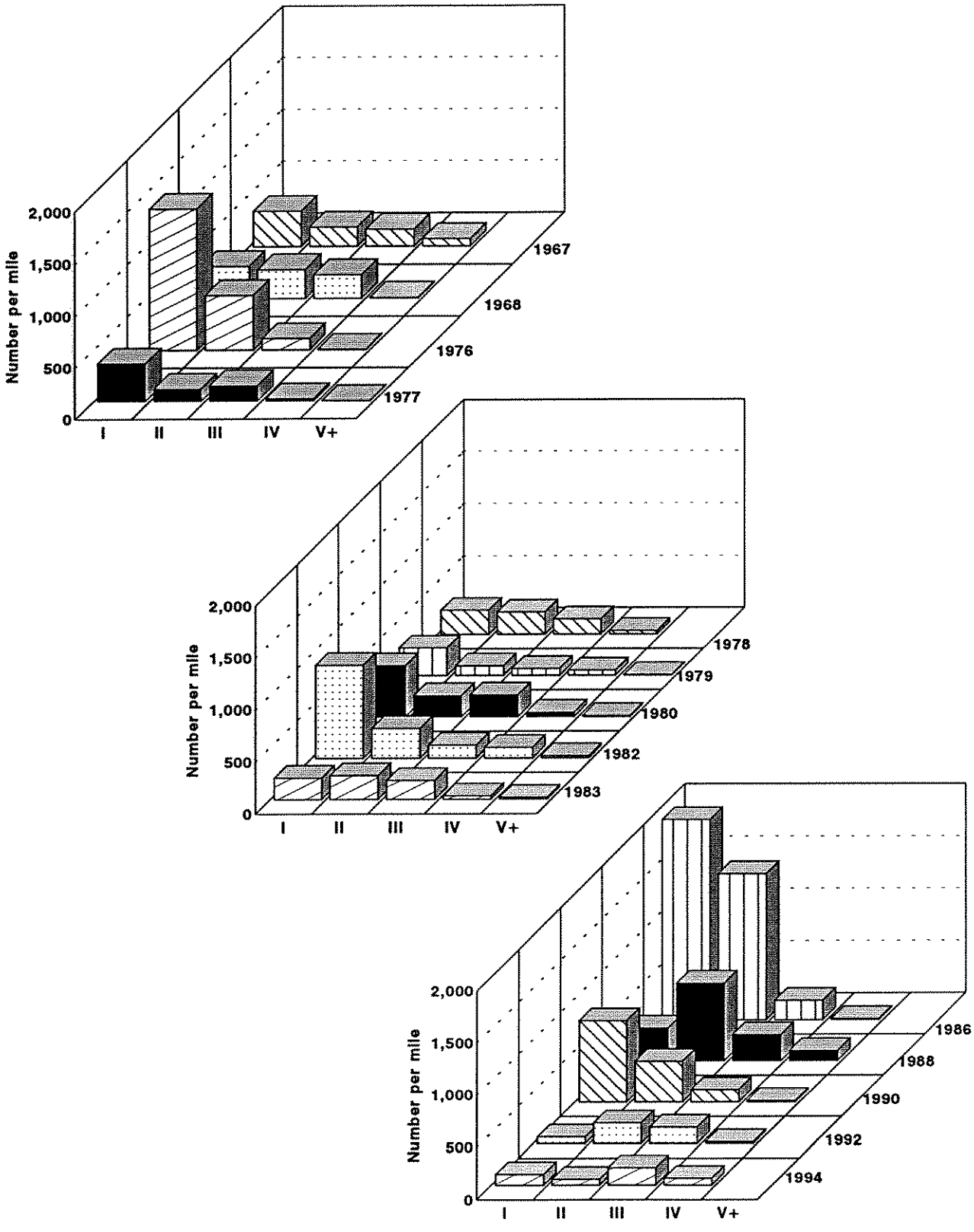

Figure 4. Age structure estimates for rainbow trout captured in the Burleigh section of Big Spring Creek 1967-1994.

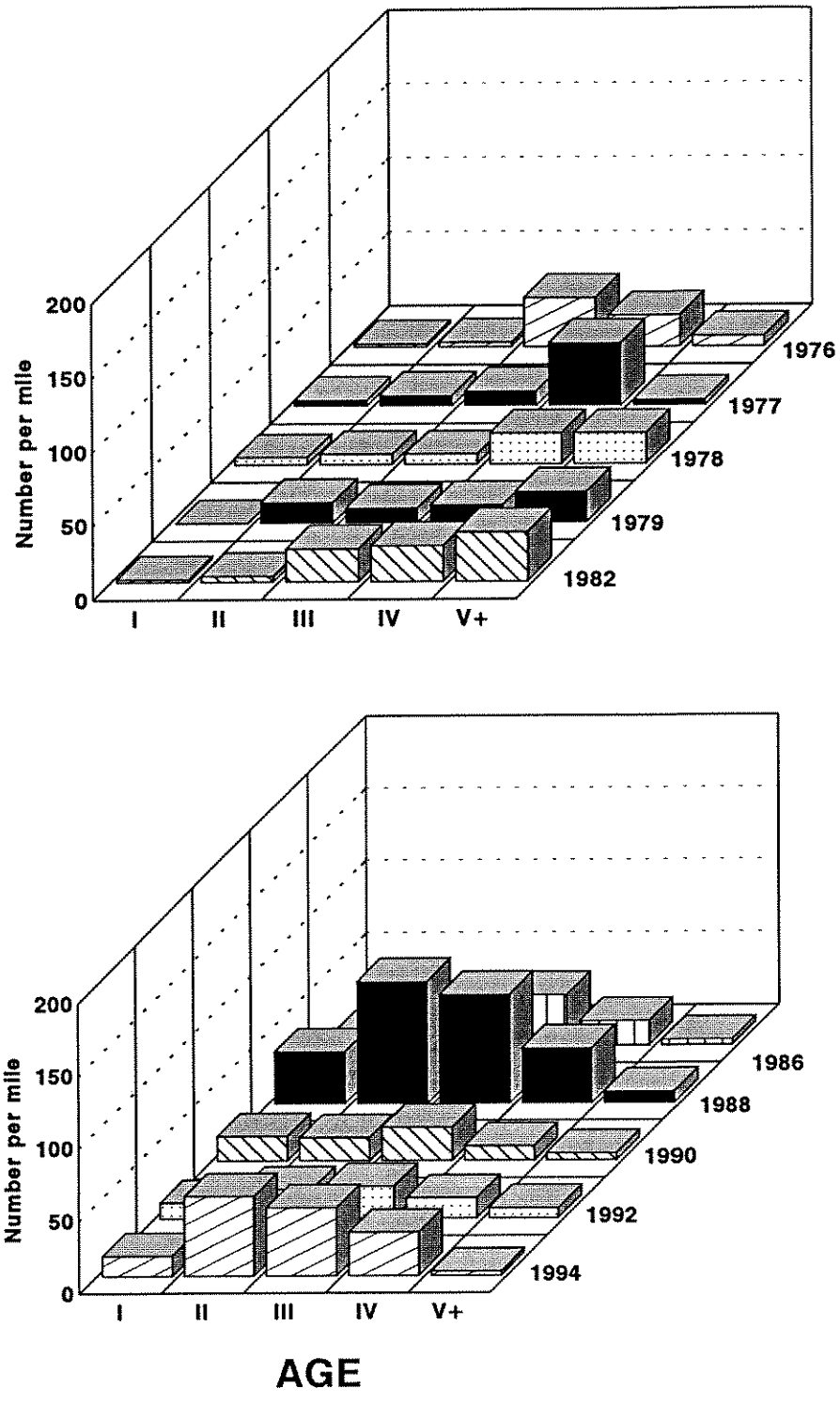

Figure 5. Age structure estimates for brown trout captured in the Burleigh section of Big Spring Creek 1967-1994.

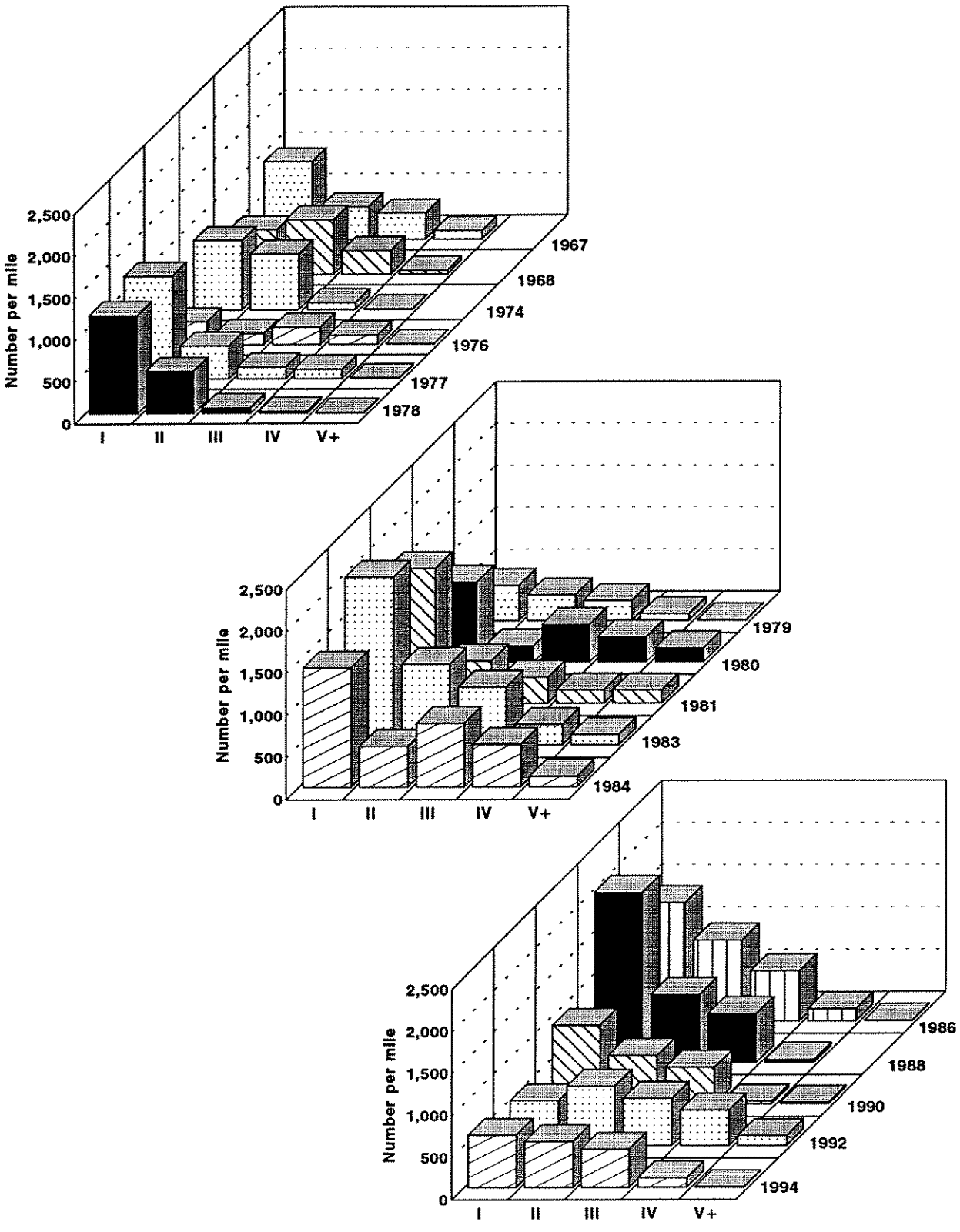

Figure 6. Age structure estimates for rainbow trout captured in the Tresch section of Big Spring Creek 1967-1994.

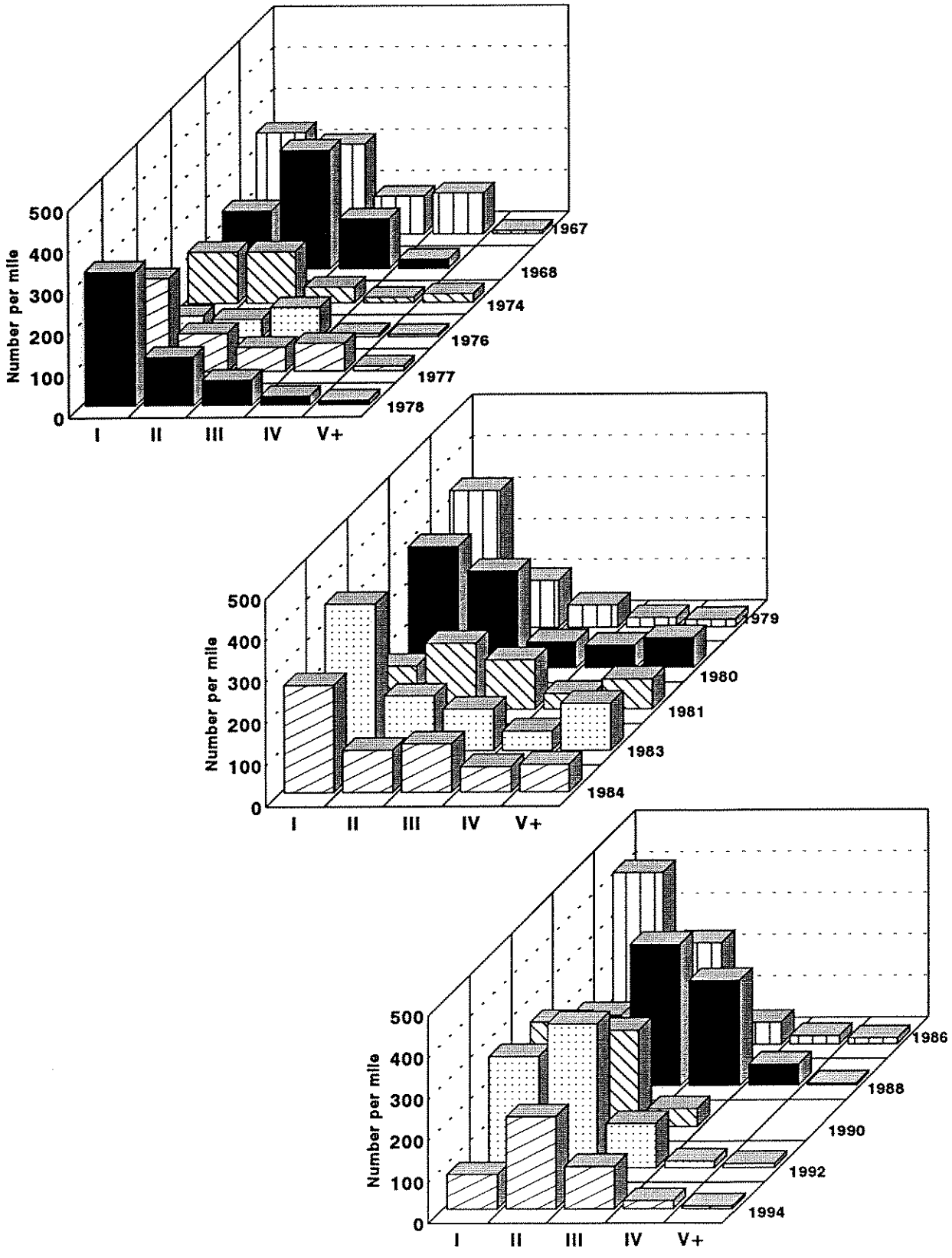

Figure 7. Age structure estimates for brown trout captured in the Tresch section of Big Spring Creek 1967-1994.

was seen in the 1980's (Figure 6). In recent years there have been declines of both young and old brown trout in the Tresch section (Figure 7).

A creel census on upper Big Spring Creek was initiated in May 1996. the purpose of the census was to determine if fishing pressure has had a major impact on salmonids and if any regulation change in this reach would provide an improved fishery.

Two consulting firms were contacted for input to assess the feasibility of remeandering Big Spring Creek in the channelized Brewery Flats area. Jim Lovell of Inter-fluve visited the site in September, 1994 and Dave Rosgen of Wildland Hydrology looked at the site in October 1995. Both firms proposed channel and fishery improvements at Brewery Flats that would cost about $260,000. Inter-fluve proposed a plan which would have a similar meander pattern to the rest of upper Big Spring Creek and would result in an increase in channel length of 36%. Dave Rosgen suggested constructing two channels. A channel with a meander pattern not typical of Big Spring Creek that would take the majority of the flow. In addition, a narrow deep channel with spawning gravel and a box control structure would be created. These two channels would result in about a 3 fold increase in stream length. MFWP prefers the Wildland Hydrology plan and also hopes to create a trout pond at Brewery Flats in conjunction with this project. Tentative plans and drawings from both consultants are on file in the Lewistown office. If Environmental Assessments and public comment periods are completed without negative results and permits and funding obtained, construction on the new channel could be done as early as 1997.

Other waters

Three streams in the Lewistown vicinity were surveyed in 1995 by making one pass with a backpack electrofisher (Table 9). Brook trout, white suckers, and longnose dace were captured from Louse Creek and Little Rock Creek. Both streams had high conductivities which prevented efficient electrofishing with a backpack unit. Four brook trout and a brown trout were captured on Louse Creek. The number of brook trout captured during earlier surveys, which were conducted from 1979-1985 (Lewistown office file notes), was higher than the number we captured; however, brown trout were not previously reported. The decline in the number of brook trout captured was probably due in part to use of a smaller power source. White sucker, northern redbelly dace and fathead minnows were captured in Horsethief canyon, a tributary to McDonald Creek (Table 9).

Table 9. Population and physical data from steams in the Lewistown area surveyed with one pass electrofishing in 1995.

Stream (location)	Date	Section length (ft)[1]	Temp (°F)(	Cond ohms/cm)[2]	Species[3]	#	Length (inches) mean	range
Little Rock Creek (T15N,R16E,S11)	6/15/95	about 400	68	800	EB	5		(8.0-9.5)
					WSU	30[4]		-
					LnD	Common		-
Louse Creek	5/19/95	500	46	860	EB	4	8.0	(6.8-11.4)
					LL	1	7.0	-
					LnSu	7	5.2	(4.5- 6.2)
					LnD	16	3.3	(2.1- 4.1)
					MSc	1	4.1	-
Horsethief Canyon (T15N,R20E,S36)	7/6/95	200	13.5C	250	WSu[3]	4	-	-
					NRD	7	-	-
					FHM	6	-	-

1 - Estimated length; 2-corrected to 77°F;3- EB = brook trout, LL=brown trout, WSu = white sucker, LnD= longnose dace, LnSu = longnose sucker, MSc= mottled sculpin, NRD= northern redbelly dace, FHM= fathead minnow; 4-not measured estimated number.

Great Falls Area

Smith River

The total population estimates in 1995 for both rainbow and brown trout from the Eagle Creek section (Table 10) were similar to estimates obtained in 1993 and 1994 (Tews et al. 1995). However, both the number of brown and rainbow trout ≥8 inches were slightly lower in the Eagle Creek section than in 1993 and 1994 (Figure 8); the point estimate of fish ≥8 inches decreased from 534-488 per mile from 1994 to 1995 for brown trout and from 264-233 per mile for rainbow trout between 1994 and 1995. Total rainbow trout numbers decreased only 22 per mile from 1994-1995 the Eagle Creek section; however, rainbow trout ≥8 inches long are at record low levels. Rainbow trout estimates have remained at the historic low level since 1993 and have been decreasing since peaking in 1987 (Figure 8). Larger rainbow trout, ≥13 inches, were estimated at 12 per mile compared to a historic mean of 59 per mile. Brown trout population levels remained very high when compared to the historic range (Figure 8). Also, the brown trout population was dominated by larger sized fish; 80% and 67% of the population was ≥10 and ≥13 inches, respectively, while only 35% and 3.5% of the rainbow trout population exceeded the 10 and 13 inch length, respectively.

Table 10. Rainbow and brown trout population estimates by total size range in the Eagle Creek and Deep Creek sections of the Smith River, Montana during September 1995.

Section	Date marked	Size range (inches)	Number per mile	Pounds per mile	Mean condition factor	Pooled Chi Square P Value
			Rainbow trout			
Eagle Creek	9/13/95	7.0-15.9	337±43	123±16	41.8	0.06
Deep Creek	9/15/95	6.0-16.9	252±36	106±22	43.7	0.04
			Brown trout			
Eagle Creek	9/13/95	7.0-21.9	502±105	551±211	41.2	0.23
Deep Creek	9/15/95	7.0-22.9	415±159	418±273	41.2	0.09

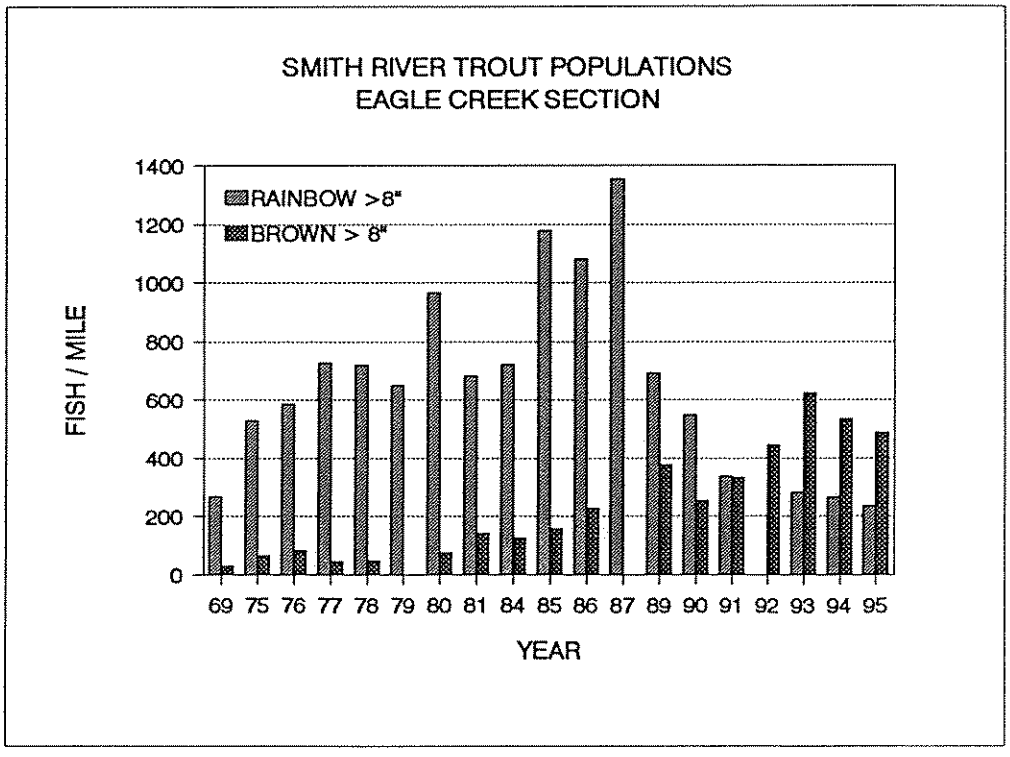

Figure 8. Population estimates of rainbow and brown trout ≥8 inches on the Eagle Creek section of the Smith River, Montana, 1969-1995.

All estimates in the Eagle Creek section produced valid results using the log-likelihood model.

The total number of rainbow trout estimated in the Deep Creek section was about 25% less than in the upper section. However, point estimates of population levels for both rainbow and brown trout increased from 1994-1995 in the Deep Creek section. The total estimated number of rainbow trout increased by 47 to 252±36 per mile; however, confidence intervals of the estimates overlapped. Although the total brown trout estimate increased 100 to 415±159 fish per mile, overlapping confidence intervals suggested no significant difference between the 1994 and 1995 estimates. The estimated number of rainbow trout ≥8 inches in the Deep Creek section was the highest since 1987 and the fourth highest on record (Figure 9). Brown trout ≥8 inches also showed a rebound from 1994 to a similar level as we observed in 1993 (Figure 9), which represents the second highest level on record. Although the Deep Creek rainbow trout population estimate did not produce an acceptable P value, after the 11.0-11.9 inch fish were removed from the data set, a very good fit to the model was achieved (Pooled P = 0.22).

As in 1994, the biomass estimate for brown trout in the Eagle Creek section was higher than any other estimate (Table 10) and remained similar to 1994 levels (Tews et al. 1995). The largest increase of a biomass estimate was brown trout in the Deep Creek Section (Table 10). Rainbow trout biomass estimates were substantially lower than brown trout in both sections in 1995 and similar to 1994 levels (Tews et al. 1995). Average condition factors for rainbow trout were higher in the Deep Creek section than in the Eagle Creek section (Table 10); mean condition factors for brown trout were identical in the two sections. The Mid-Canyon section was not electrofished.

Missouri River

The estimated total number of rainbow trout by length was 4,368±262 and 2,486±256 per mile in the Craig and Cascade sections, respectively, during fall 1995 (Table 11). This represents increases in the total point estimates from both sections compared to 1994 population estimates (Tews et al. 1995). However, numbers of rainbow trout ≥10 inches were essentially the same in both sections as in 1994 (Figures 10 and 11) and near the upper end of the normal historical range. The rainbow trout population estimates for catchable fish ≥10 inches for the Craig section were higher than fall 1995 levels (2,849 per mile) in 1984, 1987, 1988, and 1994 (Figure 10). In the Cascade section, the estimated number of catchable fish were greater in 1987, 1992, and 1994 (Figure 11). P-values for both estimates were very low and resulted from high efficiencies in small and large fish.

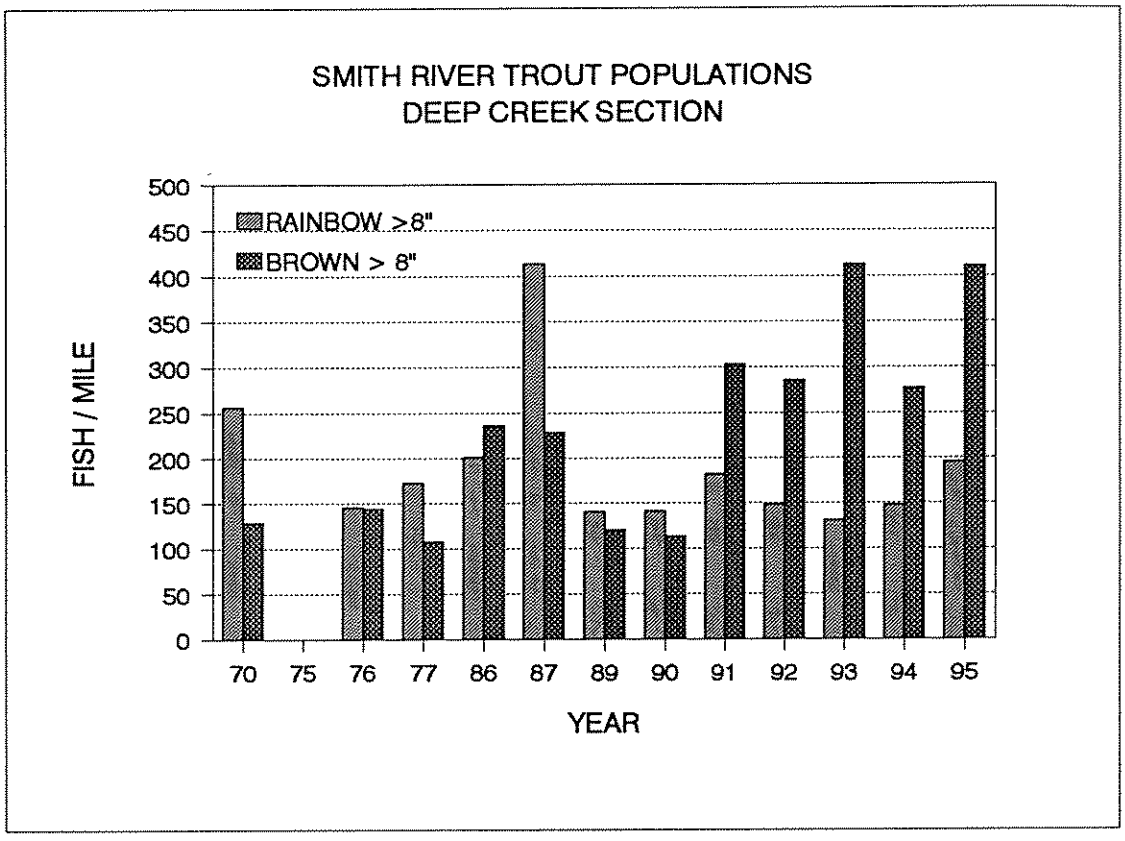

Figure 9. Population estimates of rainbow and brown trout ≥8 inches on the Deep Creek section of the Smith River, Montana, 1970-1995.

Table 11. Rainbow and brown trout population estimates by total size range in the Craig and Cascade sections of the Missouri River, Montana during fall 1995 and spring 1996.

Section	Date marked	size range (inches)	Number per mile	Pounds per mile	Mean condition factor	Pooled Chi Square P Value
			Fall 1995 - rainbow trout			
Craig	10/04/95	5.0-23.9	4368±262	4052±500	41.0	0.02
Cascade	10/06/95	6.0-20.9	2486±256	2020±517	40.6	0.0008
			Spring 1996 - brown trout			
Craig	5/01/96	6.0-30.9	701±40	785±108	35.7	0.03
Cascade	5/02/96	7.0-26.9	269±34	434±190	34.9	0.31

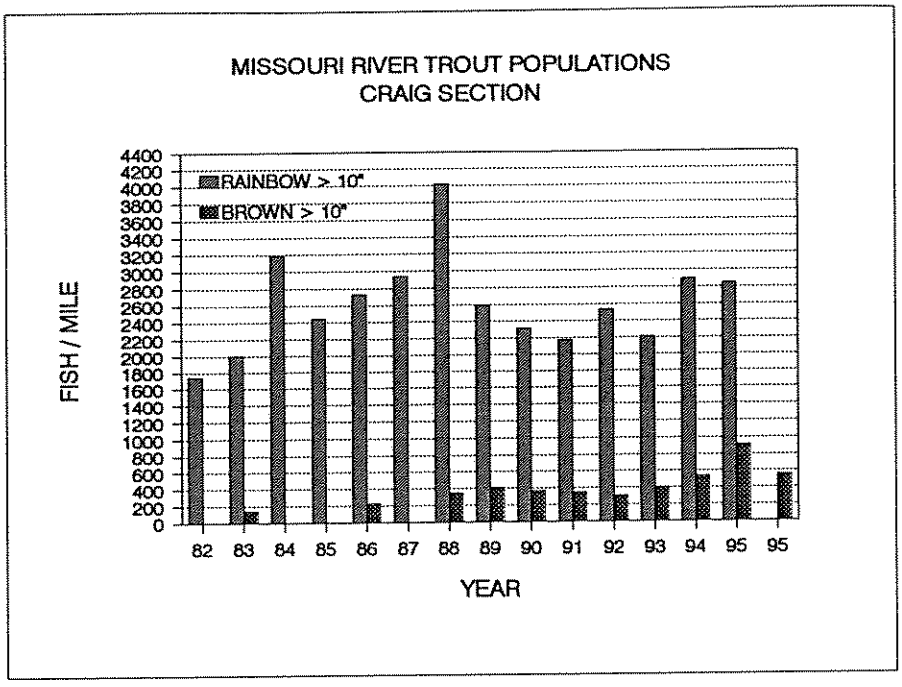

Figure 10. Population estimates of rainbow and brown trout ≥10 inches on the Craig section of the Missouri River, Montana, 1982-1996.

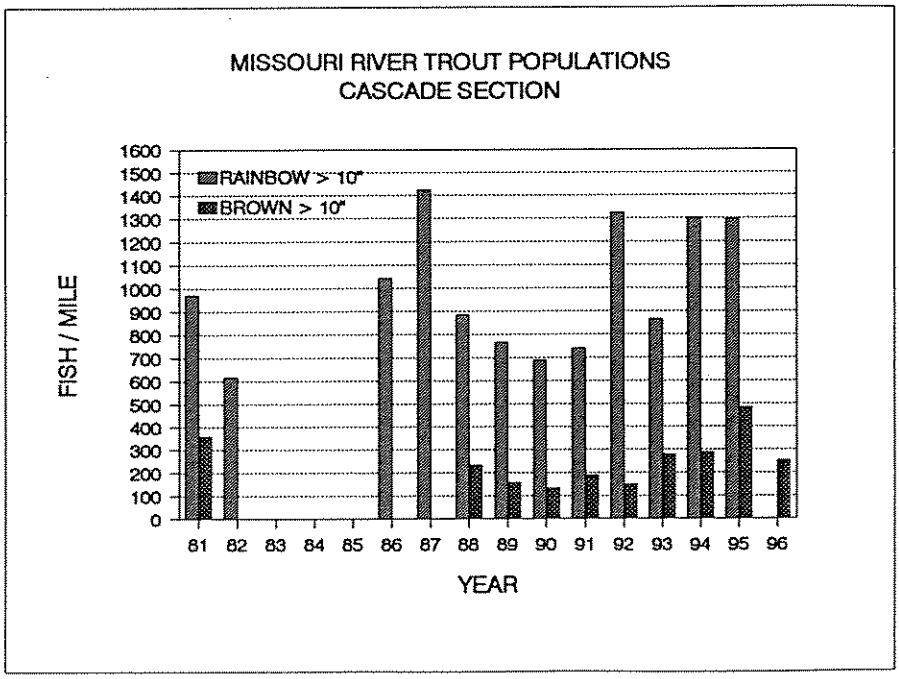

Figure 11. Population estimates of rainbow and brown trout ≥10 inches on the Cascade section of the Missouri River, Montana, 1982-1996.

Spring 1996 brown trout estimates returned to more normal levels in both the Craig and Cascade sections. In the Craig section, spring brown trout estimates dropped from 1,016±53 fish per mile in spring 1995 (Tews et al. 1995) to 701±40 in 1996 (Table 11) and was similar to 1994 levels. The estimated brown trout population level in the Cascade section also declined and was 269±34 per mile (Table 11), which is close to the historical mean of 281 per mile. The number of brown trout ≥10 inches in both sections also showed a downward trend towards average historic levels (Figures 10 and 11). The P-value was high enough in the Cascade section to provide a good fit of the model to the data; however, in the Craig section, high efficiencies of small and large fish provided for a poor fit of the model and low P-values.

Whirling Disease Monitoring - Missouri and Smith Rivers

We continued to collect samples of fish from the Missouri and Smith rivers during fall 1995 and spring 1996 (Tables 12 and 13) to determine if the parasite responsible for whirling disease, *Myxobolus cerebralis*, was present in the cartilage of salmonids in these waters. All samples of rainbow trout and brown trout from the Missouri River below Holter Dam were negative during fall 1995. However, rainbow trout collected in the Craig Section during April and May 1996 tested positive. Rainbow trout from Little Prickley Pear Creek also tested positive. The Smith River was sampled in the Eagle Creek and Deep Creek sections; smaller sample sizes were obtained during fall 1995 than what we previously had collected (Table 13). As of August 1996, results have not been provided by WADDL for the Smith River samples.

Table 12. Sampling data from the Missouri River, Montana, below Holter Dam to determine presence of Myxobolus cerebralis, 1995-1996.

DATE COLLECTED	WATER	SECTION	LEGAL DESCRIPTION	SPECIES	SAMPLE SIZE	AGE GROUP	LENGTH (INCHES) MEAN	LENGTH (INCHES) RANGE	WEIGHT (LBS) MEAN	WEIGHT (LBS) RANGE	TEST RESULTS
2/24/95	MISSOURI RIVER	CRAIG	S32,29,28,T15N,R3W	RAINBOW TROUT	60	1-2	4.9	2.7-10.1	-	-	NEGATIVE
"		CRAIG	"	BROWN TROUT	30	1-2	7.0	4.3-10.8	-	-	NEGATIVE
4/25-5/11/95	MISSOURI RIVER	CRAIG	S32,29,28,21,16	RAINBOW TROUT	60	1-2?	5.0	2.7-8.3	0.07	0.01-0.25	NEGATIVE
"		CRAIG	15,10,T15N,R3W	BROWN TROUT	67	1	5.4	3.6-7.4	0.07	0.02-0.20	NEGATIVE
"		CRAIG	"	MOUNTAIN WHITEFISH	58	1	6.6	5.0-7.7	0.11	0.05-0.21	NEGATIVE
"		CRAIG	"	MOTTLED SCULPIN	5	?	-	-	-	-	NEGATIVE
4/27-5/9/95	MISSOURI RIVER	CASCADE	S36,25,T15N,R2W&	RAINBOW TROUT	84	1	4.7	2.5-7.6	0.05	0.01-0.20	NEGATIVE
"		CASCADE	S30,29,20,17,	BROWN TROUT	77	1	5.9	3.8-7.6	0.09	0.02-0.21	NEGATIVE
"		CASCADE	T15N,R1W	MOUNTAIN WHITEFISH	73	1	6.1	4.4-7.1	0.08	0.03-0.14	NEGATIVE
"		CASCADE	"	MOTTLED SCULPIN	6	?	3.3	-	0.03	-	NEGATIVE
10/2-12/95	MISSOURI RIVER	CRAIG	S32,29,28,T15N,R3W	RAINBOW TROUT	68	0-3	8.9	6.0-16.0	0.34	0.10-1.42	NEGATIVE
"		CRAIG	"	BROWN TROUT	61	0-4	9.6	5.2-19.6	0.50	0.07-2.70	NEGATIVE
10/5-13/95	MISSOURI RIVER	CASCADE	S36,25,T17N,R2W	RAINBOW TROUT	62	0-1	8.8	6.3-10.2	0.29	0.14-0.51	NEGATIVE
"		CASCADE	S30,29,20,17,T17N, R1W	BROWN TROUT	30	0-5	9.5	6.3-19.6	0.39	0.09-2.74	NEGATIVE
4/30&5/1/96	MISSOURI RIVER	CRAIG	S32,29,28,21,16,15 T15N,R3W	RAINBOW TROUT	60	1-2	6.4	3.1-9.7	0.12	0.01-0.35	POSITIVE
5/2/96	MISSOURI RIVER	CASCADE	S36,25,T17N,R2W S30,29,20,17,T17N, R1W	RAINBOW TROUT	32	1-2	6.9	4.0-9.2	0.14	0.02-0.33	NEGATIVE

Table 13. Sampling data to determine presence of Myxobolus cerebralis from the Smith River, Montana, 1995-1996.

DATE COLLECTED	WATER	SECTION	LEGAL DESCRIPTION	SPECIES	SAMPLE SIZE	AGE GROUP	LENGTH (INCHES) MEAN	LENGTH (INCHES) RANGE	WEIGHT (LBS) MEAN	WEIGHT (LBS) RANGE	TEST RESULTS
2/9/95	SMITH RIVER	CAMP BAKER /ELK CANYON	S2,13,T12N,R4E	RAINBOW TROUT	2	1-2	7.3	4.5-10.1	0.21	0.03-0.39	NEGATIVE
5/4/95	SMITH RIVER	EAGLE CREEK	S14,11,2,T12N,R4E	RAINBOW TROUT	31	1-2	7.0	2.7-11.4	0.18	0.01-0.54	NEGATIVE
"		EAGLE CREEK	"	BROWN TROUT	22	1-2	5.2	3.7-9.4	0.07	0.02-0.33	NEGATIVE
"		EAGLE CREEK	"	MOUNTAIN WHITEFISH	27	1-2	5.2	4.2-9.5	0.07	0.02-0.19	NEGATIVE
"		EAGLE CREEK	"	MOTTLED SCULPIN	37	?	?	?	?	?	NEGATIVE
9/27/95	SMITH RIVER	EAGLE CREEK	S2,3,T12N,R4E&	RAINBOW TROUT	16	0-1	7.2	5.9-8.3	0.19	0.07-0.31	?
"		EAGLE CREEK	S34,T13N,R4E	BROWN TROUT	10	0-1	8.3	7.3-9.2	0.28	0.13-0.35	?
9/29/95	SMITH RIVER	DEEP CREEK	S30,19,18,T16N,R4E	RAINBOW TROUT	10	0-1	8.8	6.6-9.1	0.27	0.11-0.41	?
	SMITH RIVER	DEEP CREEK	&S24,T16N,R3E	BROWN TROUT	15	0-1	7.8	5.1-8.9	0.18	0.04-0.28	?

Habitat Protection

Providing input and recommendations about alterations of streambeds or banks by private individuals or government entities are handled through a permit process. The 1975 Natural Streambed and Land Preservation Act (310) involves the private sector while the Stream Protection Act of 1963 (SPA) covers government agencies. In the Choteau area, 17 projects were reviewed and processed under the 1975 Natural Streambed and Land Preservation Act (310) while an additional 11 projects were handled under the 1963 Stream Preservation Act (SPA). In the Lewistown management area 66 Natural Streambed and Land Preservation Act "310" permits and 12 Stream Preservation Act (124) permits were processed. Also, an additional 81 "310's" and 40 "124" permits were processed through the Great Falls office. This resulted in a total of 164 "310's" and 63 "124" permits. Site inspections were made on most of the projects. Site inspections were made on most of these projects. No significant water discharge permit applications or renewals were received and no significant pollution complaints were received during the report period.

DISCUSSION AND RECOMMENDATIONS

Westslope cutthroat trout populations remain a high priority in the project area. As time and funding permits, additional collections should be obtained to identify additional genetically pure populations. Also, habitat improvement projects, such as what was implemented on Whiterock Creek, should be undertaken. Cooperative projects with the Forest Service involving both westslope cutthroat and habitat improvement will continue.

Trout populations at the head of Gibson Reservoir, and at the forks of the Sun River were harvested at relatively low rates; cumulative rates range from 4-6%. Based on location caught, voluntary angler tag returns suggest little movement occurs for any of the three populations. In 1995 however, slightly more movement appeared to occur up the forks from Gibson Reservoir; this was thought to be related to higher than normal flows. Population numbers in the forks ranged from 500-600 per mile, which was comparable to 1993 and 1994. Trout populations in the forks of the Sun River and at the head of Gibson Reservoir should continue to be monitored.

Rainbow trout numbers on the Burleigh section continued to decline, but brown trout numbers were near all time highs (Table 7 and Tews et al. 1995). Factors contributing to the decline in the recruitment of rainbow trout in the Burleigh section need to be identified and mitigated if possible. The creel census initiated in May 1996 on upper Big Spring Creek will help determine if fishing pressure has had a major impact on salmonids and if regulations should be changed on this reach. However, the decline in small fish suggests problems associated with recruitment (Figure 4), not fishing pressure. Possible reasons for the

lack of recruitment include accumulation of fine sediment in spawning areas and/or an increase in brown trout predation associated with higher brown trout population levels. Sedimentation in Big Spring Creek may have increased after dam construction on tributaries of the creek in the 1970's since the frequency of flushing flows was likely reduced. Field surveys to assess spawning substrate condition and overall sedimentation in the upper reaches of Big Spring Creek along with crude estimates of flushing flow requirements could help identify potential problems.

Annual monitoring of the Brewery Flats, Burleigh and Tresch sections of Big Spring Creek should continue. Work on the Environmental Assessments, public meetings and attempting to obtain funding should be continued for the project to re-meander the channel at Brewery Flats. Flatwillow Creek and the Judith River still need to be evaluated to see if stocking should be terminated. We also hope to survey several streams in the Lewistown area during the next reporting period.

Monitoring of the Eagle and Deep Creek sections on the Smith River will continue. We will also continue to electrofish two sections on the Missouri River to obtain population estimates. Additional monitoring on the Missouri River and it tributaries, especially Little Prickley Pear Creek, will be initiated to document any impacts from the presence of *Myxobolus cerebralis*.

Stream protection/preservation activities will continue to be processed as projects occur.

ACKNOWLEDGEMENTS

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Prepared by: George A. Liknes, Anne E. Tews and William J. Hill

Date: September, 1996

Principal Fish Species Involved: Rainbow trout, cutthroat trout, westslope cutthroat trout, brown trout, brook trout, mountain whitefish.

Code Numbers of Waters Referred to in Report:

14-2240	Green Gulch
14-3760	No. Fk. Badger Creek
14-5400	So. Fk. Birch Creek
14-6600	Whiterock Creek
14-6760	E. Fk. Woods Creek
16-0310	Big Spring Creek, Section 2
16-2160	Louse Creek
16-00AI	Little Rock Creek
17-4896	Missouri River Section 09
17-6832	Smith River Section 02
20-3450	Lime Gulch
20-4400	No. Fk. Sun River
20-5600	So. Fk. Sun River

Appendix Table 1. Mark recapture statistics from population estimates done on Big Spring Creek during 1995.

Rainbow trout									
Section	Date marked	Number of fish M	C	R	Pooled(P)	Number per mile <10 in	>10 in	All	Biomass (lbs)
Burleigh (2 recapture runs)	8/21/95	96	71	16	0.184	124	274	398	265
Burleigh (1 recapture run)	8/21/95	96	40	9	0.348	481	290	770	315
Tresch	8/23/95	353	188	55	0.066	875	923	1797	900
Brewery Flats	8/22/95	124	69	15	0.133	721	411	1131	439

Brown trout									
Section	Date marked	Number of fish M	C	R	Pooled(P)	Number per mile <10 in	>10 in	All	Biomass (lbs)
Burleigh (2 recap runs)	8/21/95	63	48	18	0.296	0	196	196	245
Burleigh 1 recapture run	8/21/95	63	30	11	0.596	0	199	199	246
Tresch	8/23/95	103	64	18	0.074	131	325	456	352
Brewery Flats	8/22/95	60	57	15	0.77	15	312	327	356

Appendix Table 2. Age statistics for rainbow captured on the Burleigh section of Big Spring Creek from 1967-1994.

Year		AGE					
		0	I	II	III	IV	V+
1994	Number/mile	49	105	58	166	66	0
	Average TL[1]	5.40	7.56	11.24	13.87	14.49	-
1992	Number/mile	22	63	195	156	17	0
	Average TL	6.05	6.72	12.58	13.57	14.51	-
1990	Number/mile	559	784	393	118	14	0
	Average TL	6.70	8.38	12.12	13.14	14.05	-
1988	Number/mile	-	318	749	255	99	0
	Average TL	-	7.82	12.07	13.42	14.08	-
1986	Number/mile	-	1913	1397	187	12	0
	Average TL	-	7.7	11.7	13.3	14.7	-
1983	Number/mile	-	208	231	181	35	20
	Average TL	-	7.4	11.1	12.9	14.0	14.0
1982	Number/mile	-	894	286	123	103	21
	Average TL	-	7.7	12.0	13.1	13.1	13.1
1981	Number/mile	-	593	183	148	29	11
	Average TL	-	8.8	11.4	13.4	14.0	14.0
1980	Number/mile	-	493	205	210	44	9
	Average TL	-	8.4	12.0	12.8	14.0	14.9
1979	Number/mile	-	268	94	68	50	5
	Average TL	-	6.7	10.5	12.2	13.6	13.9
1978	Number/mile	-	235	215	149	36	0
	Average TL	-	7.3	12.6	13.0	13.0	-
1977	Number/mile	16	367	120	149	24	4
	Average TL	6.5	7.8	11.3	13.3	13.7	13.7
1976	Number/mile	-	1357	526	109	6	0
	Average TL	-	7.0	10.6	13.1	14.6	-
1968	Number/mile	-	310	277	225	9	0
	Average TL	-	7.0	10.5	13.1	15.7	-
1967	Number/mile	-	340	186	163	72	0
	Average TL	-	6.8	11.3	13.7	14.7	-

1-Average TL = Average total length.

Appendix Table 3. Age statistics for brown trout captured on the Burleigh section of Big Spring Creek from 1967 -1994.

Year		AGE					
		0	I	II	III	IV	V+
1994	Number/mile	14	55	47	30	3	0
	Average TL[1]	8.8	13.9	15.7	17.9	18.1	-
1992	Number/mile	11	20	22	14	7	0
	Average TL	9.4	13.1	16.6	17.2	17.2	-
1990	Number/mile	17	16	23	10	5	0
	Average TL	9.7	13.7	16.3	17.7	17.7	-
1988	Number/mile	36	84	75	38	8	0
	Average TL	9.1	12.3	14.9	17.3	19.8	-
1986	Number/mile	9	22	35	17	4	0
	Average TL	9.4	14.7	16.7	18.9	20.1	-
1982	Number/mile	2	4	22	24	33	0
	Average TL	7.8	11.4	16.8	18.6	18.8	-
1979	Number/mile	-	14	10	12	21	0
	Average TL	-	13.5	15.6	17.3	17.8	-
1978	Number/mile	5	7	7	21	21	0
	Average TL	9.0	13.9	14.5	16.4	17.1	-
1977	Number/mile	4	7	10	42	4	0
	Average TL	10.2	11.4	14.5	16.1	17.0	-
1976	Number/mile	2	3	33	21	7	0
	Average TL	12.5	12.5	14.2	16.8	16.8	-
1974	Number/mile	21	37	50	5	0	0
	Average TL	8.8	15.3	16.3	16.3	-	-

1-Average TL = Average total length.

Appendix Table 4. Age statistics for rainbow trout captured on the Tresch section of Big Spring Creek from 1967-1994.

Year		AGE					
		0	I	II	III	IV	V+
1994	Number/mile	130	622	541	454	113	9
	Average TL_1	5.5	8.07	11.7	13.9	15.1	16.3
1992	Number/mile	340	534	705	560	424	119
	Average TL	5.9	8.7	12.0	13.5	14.6	
1990	Number/mile	439	939	581	437	34	21
	Average TL	7.0	8.4	11.6	13.5	14.0	13.8
1988	Number/mile	246	2013	810	586	40	0
	Average TL	5.6	7.6	11.1	12.6	13.6	-
1986	Number/mile	62	1396	953	593	145	6
	Average TL	5.7	7.7	11.5	12.8	14.5	14.8
1984	Number/mile	-	1421	484	755	504	124
	Average TL	-	8.9	11.9	13.1	14.5	16.0
1983	Number/mile	-	2007	966	691	246	125
	Average TL	-	7.6	11.4	13.0	14.4	15.8
1981	Number/mile	-	1614	511	313	163	159
	Average TL	-	7.2	11.0	13.9	15.0	16.2
1980	Number/mile	-	958	195	448	301	169
	Average TL	-	6.5	11.3	13.2	14.5	-
1979	Number/mile	-	418	304	237	82	8
	Average TL	-	8.3	11.1	12.8	14.4	14.7
1978	Number/mile	-	1180	512	71	28	10
	Average TL	-	7.7	11.5	14.1	15.6	15.8
1977	Number/mile	306	1227	400	146	114	13
	Average TL	5.4	8.0	11.4	13.8	15.2	16.5
1976	Number/mile	-	276	135	207	111	8
	Average TL	-	7.6	11.4	13.0	14.7	14.8
1974	Number/mile	-	822	658	81	8	0
	Average TL	-	7.9	11.8	14.4	16.0	-
1968	Number/mile	-	536	651	282	48	0
	Average TL	-	8.2	10.3	12.4	14.1	-
1967	Number/mile	16	933	393	317	106	0
	Average TL	5.6	6.6	8.4	12.8	15.0	-

1-Average TL = Average total length.

Appendix Table 5. Age statistics for brown trout captured on the Tresch section of Big Spring Creek from 1967 -1994.

Year		AGE					
		0	I	II	III	IV	V+
1994	Number/mile	29	84	223	103	20	7
	Average TL	5.1	9.8	12.0	14.3	15.8	15.8
1992	Number/mile	63	269	348	107	17	10
	Average TL	5.6	10.0	13.2	14.6	16.6	17.1
1990	Number/mile	-	253	233	44	-	0
	Average TL	-	10.7	13.0	14.6	-	-
1988	Number/mile	-	172	340	253	51	5
	Average TL	-	8.5	11.2	12.9	14.9	16.2
1986	Number/mile	-	414	244	53	20	14
	Average TL	-	8.9	11.6	15.2	16.9	18.0
1984	Number/mile	-	257	101	116	61	66
	Average TL	-	9.2	11.3	14.0	16.1	18.2
1983	Number/mile	-	355	132	100	47	113
	Average TL	-	5.4	10.0	12.4	14.3	16.5
1981	Number/mile	-	105	160	119	38	72
	Average TL	-	8.8	10.9	13.5	15.1	16.9
1980	Number/mile	-	296	236	64	55	73
	Average TL	-	7.2	12.3	14.6	16.1	17.8
1979	Number/mile	-	332	114	54	23	18
	Average TL	-	8.6	11.4	13.2	15.5	16.9
1978	Number/mile	-	325	118	62	22	12
	Average TL	-	8.2	12.0	14.4	16.4	17.2
1977	Number/mile	33	226	93	59	68	12
	Average TL	5.3	8.9	12.0	14.7	16.6	18.9
1976	Number/mile	-	53	44	72	8	6
	Average TL	-	8.4	11.3	14.0	19.2	19.2
1974	Number/mile	-	124	124	38	13	21
	Average TL	-	8.8	12.3	15.1	18.4	18.8
1968	Number/mile	-	141	287	120	22	0
	Average TL	-	7.6	10.6	13.8	15.0	-
1967	Number/mile	-	247	218	92	99	8
	Average TL	-	8.3	10.4	12.4	15.4	16.8

1-Average TL = Average total length.

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