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OREGON DEPARTEMNT OF FISH AND WILDLIFE

CENTRAL REGION ADMINISTRATIVE REPORT

No. 86-1

Fivemile Creek Stream and Riparian Restoration Project Progress Report

By
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INTRODUCTION

In 1975, Oregon Department of Fish and Wildlife personnel from Klamath District recognized the poor condition of Fivemile Creek in and upstream from Foster Field. The stream's poor condition was largely due to abuse from grazing cattle. Cattle had trampled the banks and eaten the streamside grasses, sedges and willows which resulted in a wide, shallow stream with little cover for trout or shade over the water. There was evidence that the water table had subsided, allowing sagebrush to replace the former vegetation.

To protect the stream and riparian areas, construction of fenced cattle exclosures was proposed to the landowners, the Fremont National Forest and Weyerhaeuser Co. (WEYCO). Initially, the Forest Service declined to cooperate on the project, but Weyco signed a project agreement in the spring of 1976. Subsequently, the Fremont National Forest agreed to a trial exclosure on their land; that exclosure was completed in June 1979. Through a land exchange, the Fremont National Forest acquired the Weyco land so all of the project is now on Forest Service property.

Fivemile Creek is a tributary to the lower North Fork of Sprague River, northwest of Bly, Oregon, Figure 1. The project is located mainly between rivermiles (RM) 10 and 11.

Goals for the project were to restore the stream and riparian habitats by excluding cattle. This would allow the vegetation to grow and remain there to trap sediments and shade the stream. This process should result in a narrower, deeper stream with more cover for fish from cutbanks and overhanging vegetation. The stream should be more shaded from solar radiation by the resulting willows, sedges, cutbanks and deeper water.

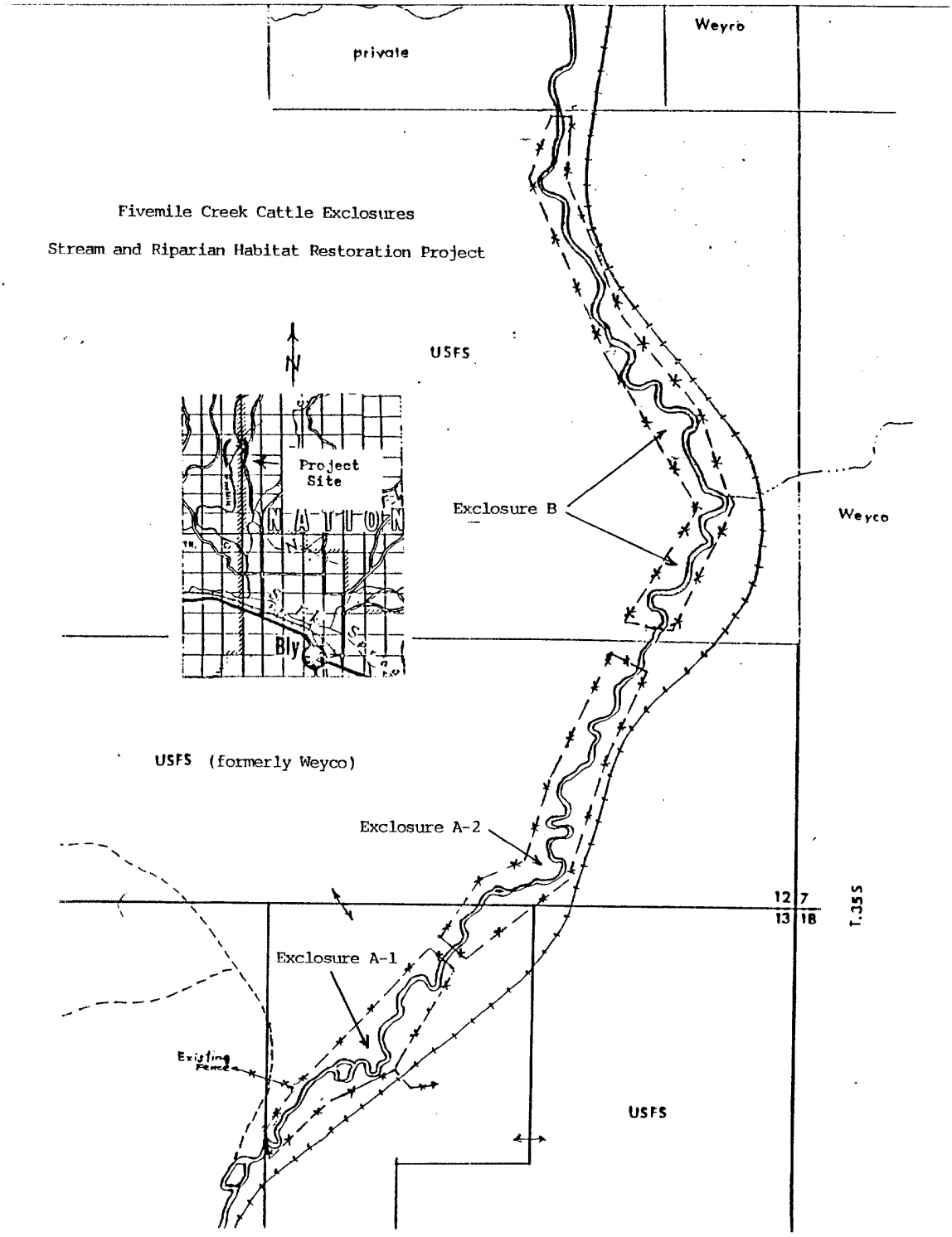


Figure 1. Fivemile Creek stream and riparian restoration project site location and exclosure layout.

The fences were financed and constructed by ODFW and the Klamath Country Fly Casters (KCFC). Weyco furnished railroad ties for corner posts for the first project. U.S.F.S. supplied and installed supplemental treated posts for corners on the second project. Maintenance on the projects has been done by ODFW, U.S.F.S. and KCFC.

Descriptions of Exclosures

The lay-out of the project exclosures is illustrated in Figure 1. The first (A) segment of the project was comprised of two separate exclosures encompassing 0.8 miles of stream with a water-gap near the mid-point to allow for cattle watering. These exclosures averaged about 150 feet in width and enclosed about 10 acres.

The second (B) segment was one continuous exclosure, covering 0.64 miles of stream within about 9 acres of land. This exclosure was also about 150 feet wide to encompass the stream meanders.

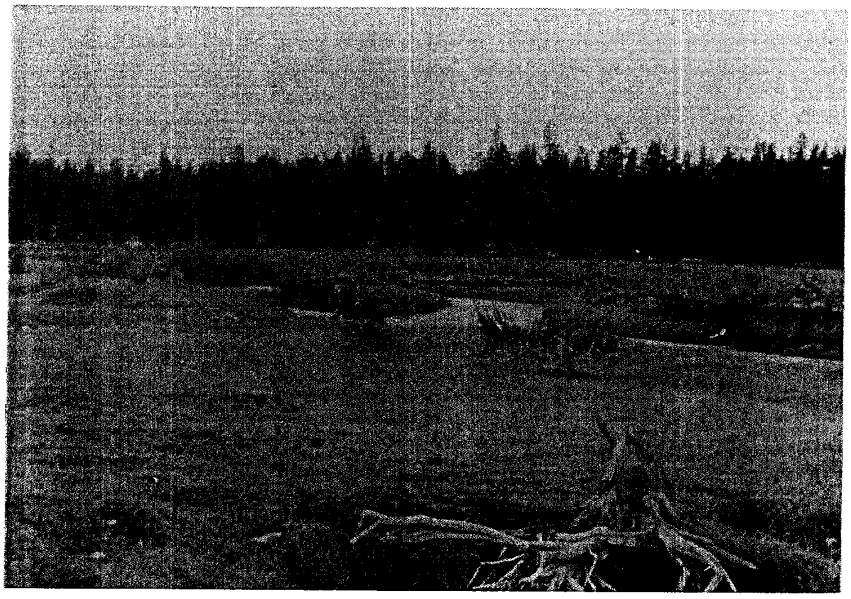
Detailed project descriptions and specifications are on file in the Oregon Department of Fish and Wildlife Klamath District office in Klamath Falls.

Project Evaluation

Several methods have been used to evaluate the project results. These include photo-points, cross-sections, fish populations, insect populations and water temperature.

Photo Points

Thirty-three photo-points were established at thirteen locations distributed along the project area. The first series of slides was taken in November 1975, before the exclosures were built. Additional slide series have been taken periodically since then with the most recent taken



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7-12-86

Figure 2. Photopoint 5 downstream overview from downstream portion of Exclosure A-2.

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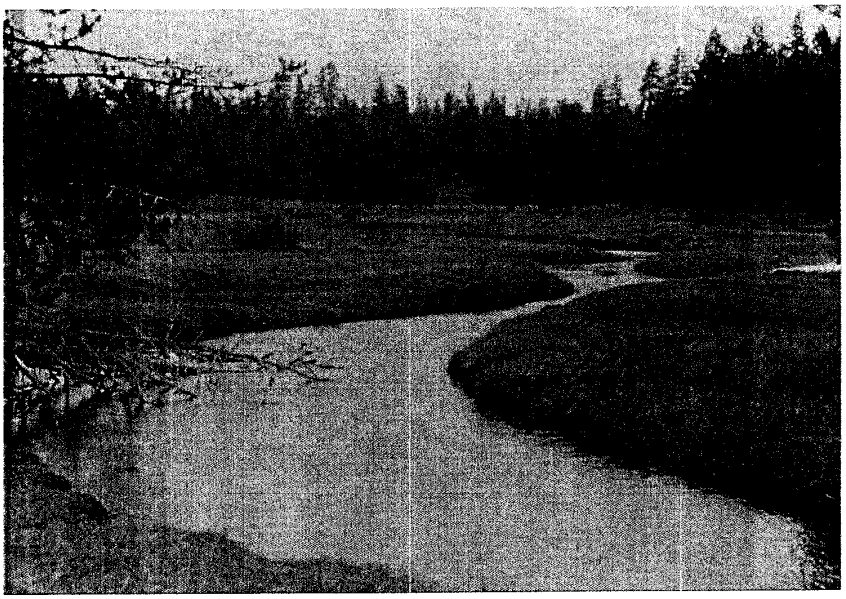
Figure 2. Photopoint 5 downstream overview from downstream portion of Exclosure A-2.



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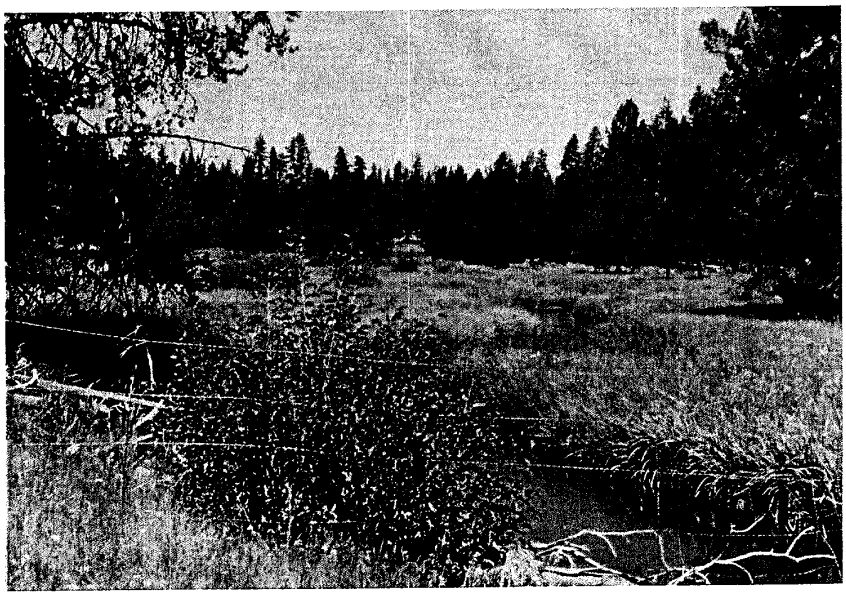

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Figure 3. Photopoint 7 looking upstream into the downstream end of Exclosure B.

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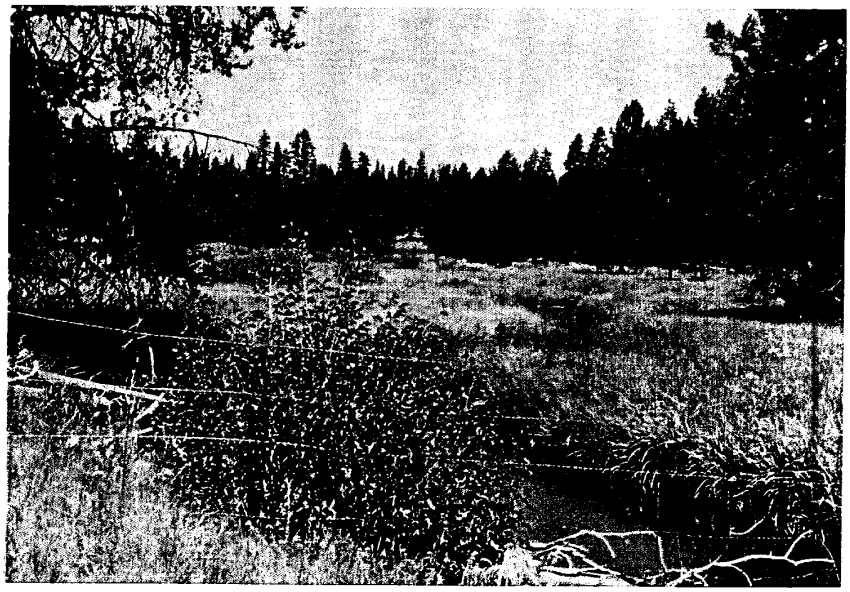

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Figure 3. Photopoint 7 looking upstream into the downstream end of Exclosure B.

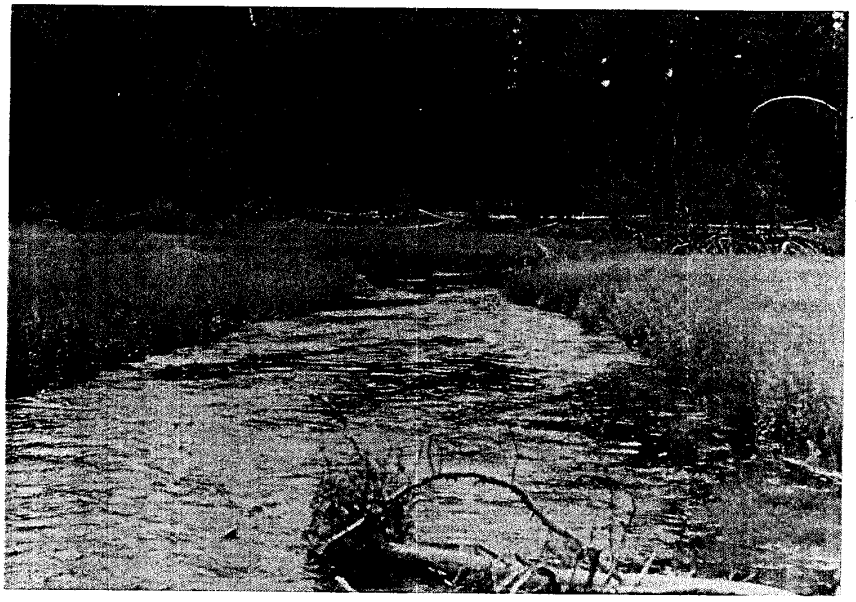

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Figure 4. Photopoint 13 looking downstream into the upstream end of Exclosure B.

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Figure 4. Photopoint 13 looking downstream into the upstream end of Exclosure B.

in July 1986. These slide series are on file at the Klamath office.

Figures 2, 3 and 4 are pictures from selected photo-points showing pre-project conditions compared to those in the summer of 1986. Figure 2 is an overview showing the overgrazed condition in 1975 with dead clumps of willow, exposed stream banks lacking vegetative cover. The 1986 photo is not totally comparable because it was taken during the growing season, but it does show much better conditions of the vegetation including the ground cover, stream-side cover and regrowth of willows.

Figure 3 is also a November - July comparison but does illustrate the dramatic change at that location. The most obvious development is the growth of stream-side alder that is beginning to provide shade to the water and cover for fish. The growth and maintenance of sedges and grasses on the stream banks have trapped sediment leading to narrowing of the channel and providing cover for fish and shade over the water. The overhanging shrubs and sedges also provide a source of terrestrial insects for added fish food.

Figure 4 shows comparable photos after six years of protection and illustrates how ungrazed vegetation can trap sediment and build up stream banks there by narrowing, deepening and stabilizing the channel. The later condition offers better habitat for fish and better water quality.

Cross-sections

Four stream cross-sections were established in and up-stream of Exclosure B in 1979. Figure 5 shows the approximate locations of those sites. These profiles show the location of the stream channel and banks. Comparisons of the cross-sections seen in 1979 and those measured in 1986 are depicted in Figures 6 - 9. In each case, the stream channel has become narrower. At the water surface, cross-sections 1, 2, 3, and 4 were 13, 13.5, 22 and 6 percent, respectively, narrower in 1986 than they were when

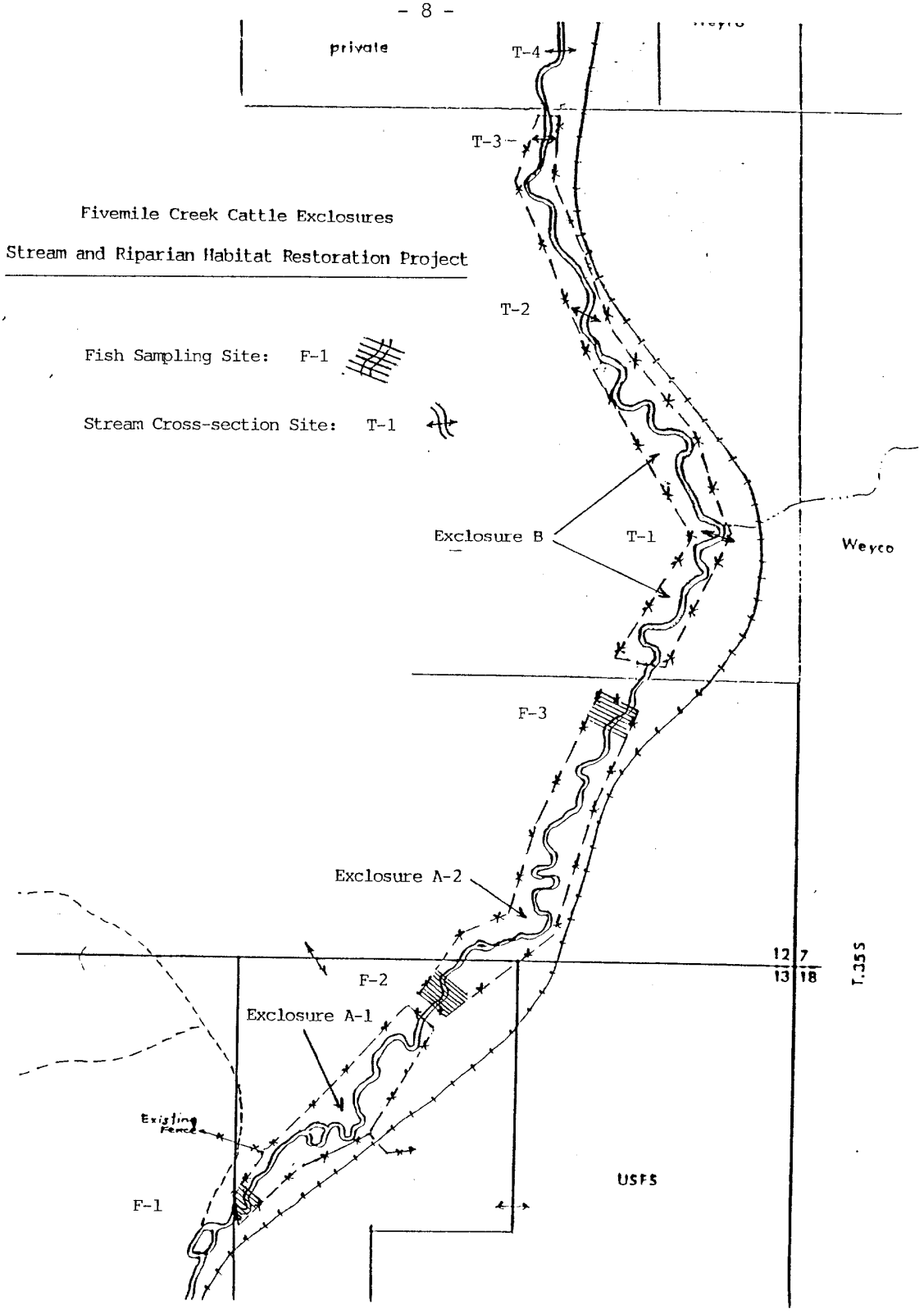

Figure 5. Location of fish sampling sites and stream cross-sections.

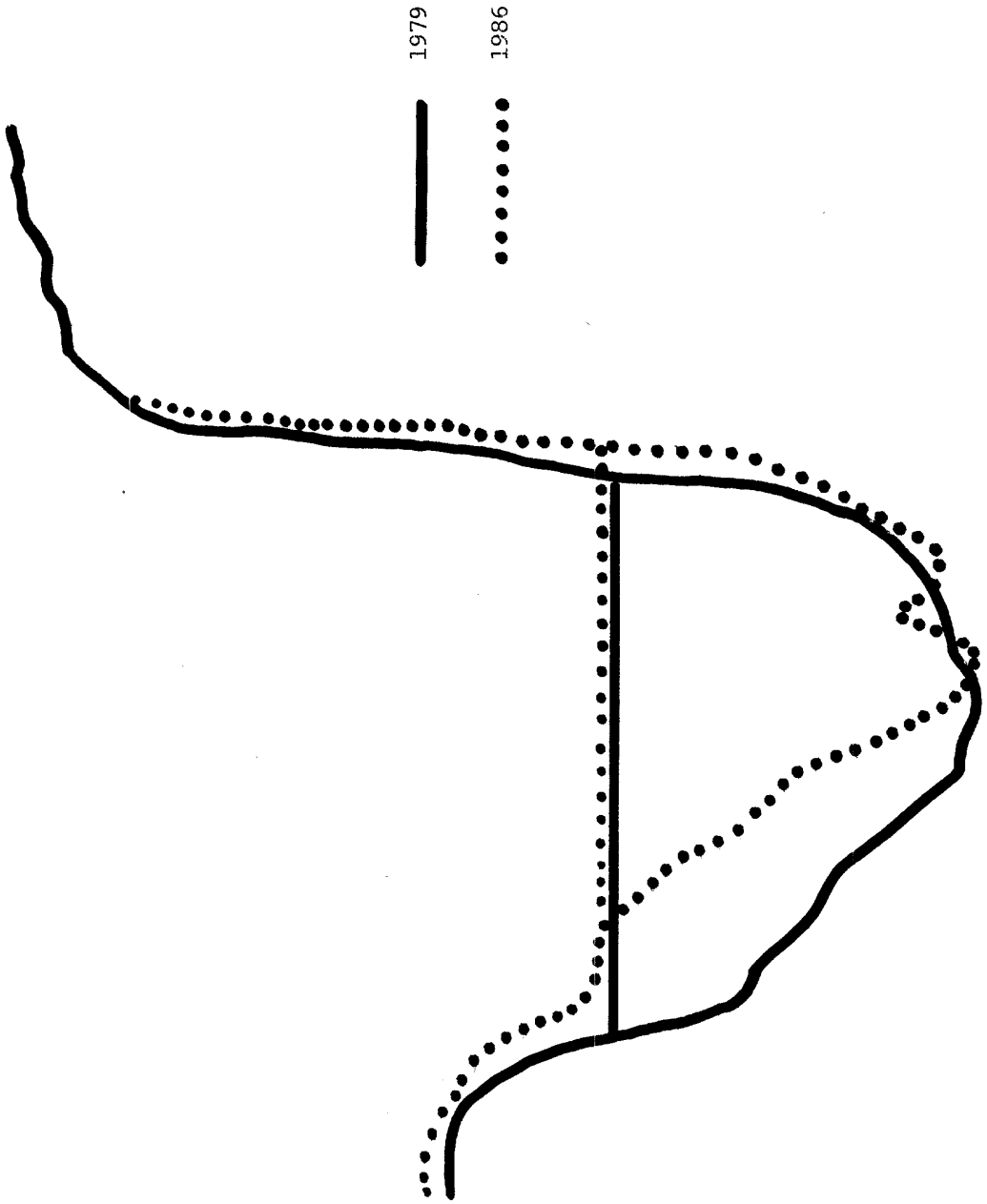

Figure 6. Cross-section #1 in Fivemile Cr. exclosure comparing contours in 1979 vs. 1986.

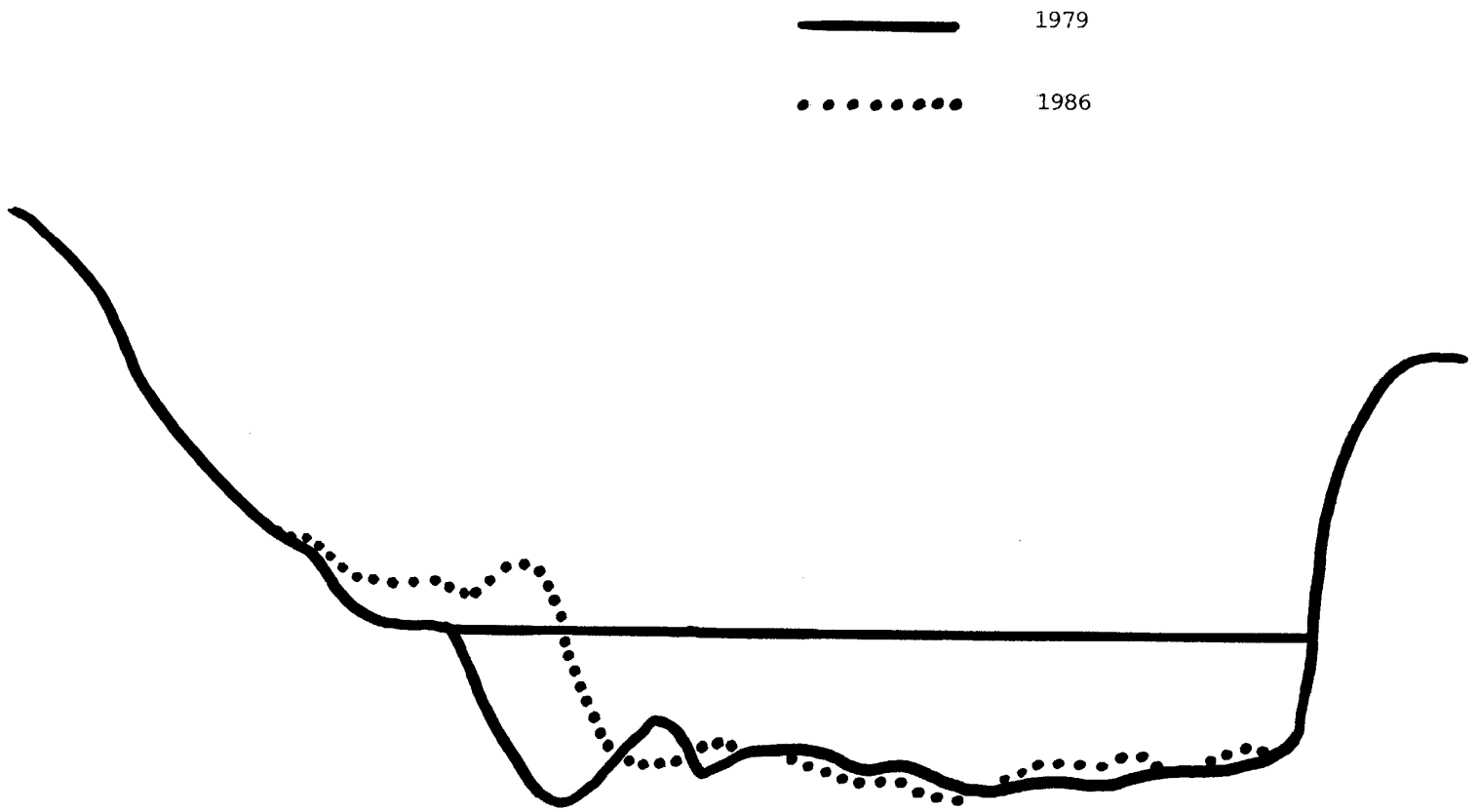

Figure 7. Cross-section #2 in Fivemile Cr. exclosure comparing contours in 1979 vs. 1986.

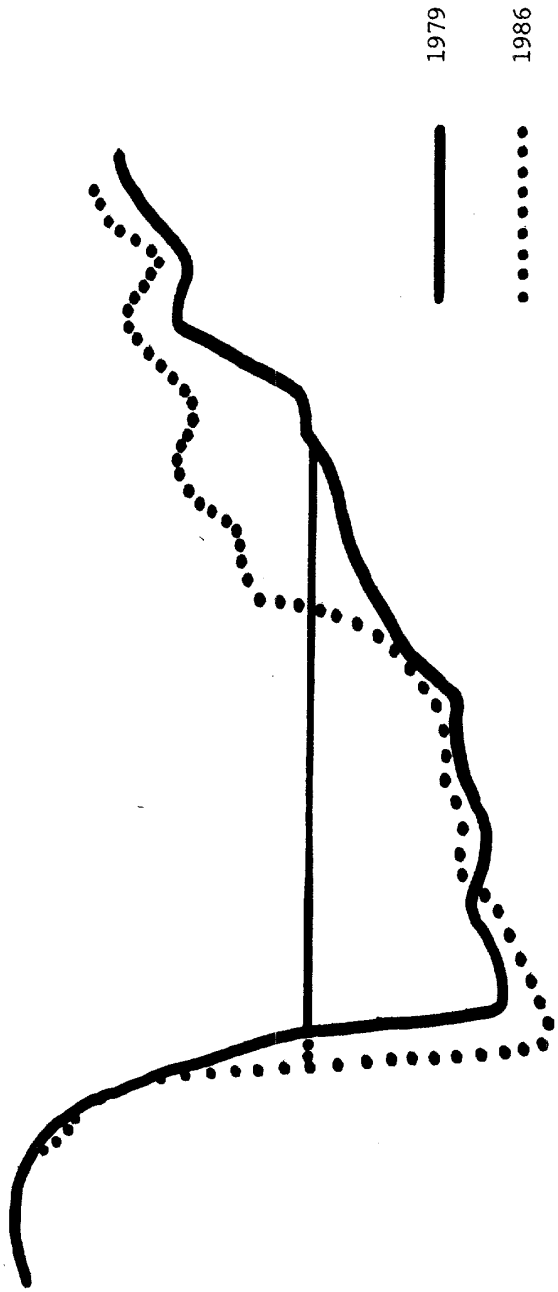

Figure 8. Cross-section #3 in Fivemile Cr. exclosure comparing contours in 1979 vs. 1986.

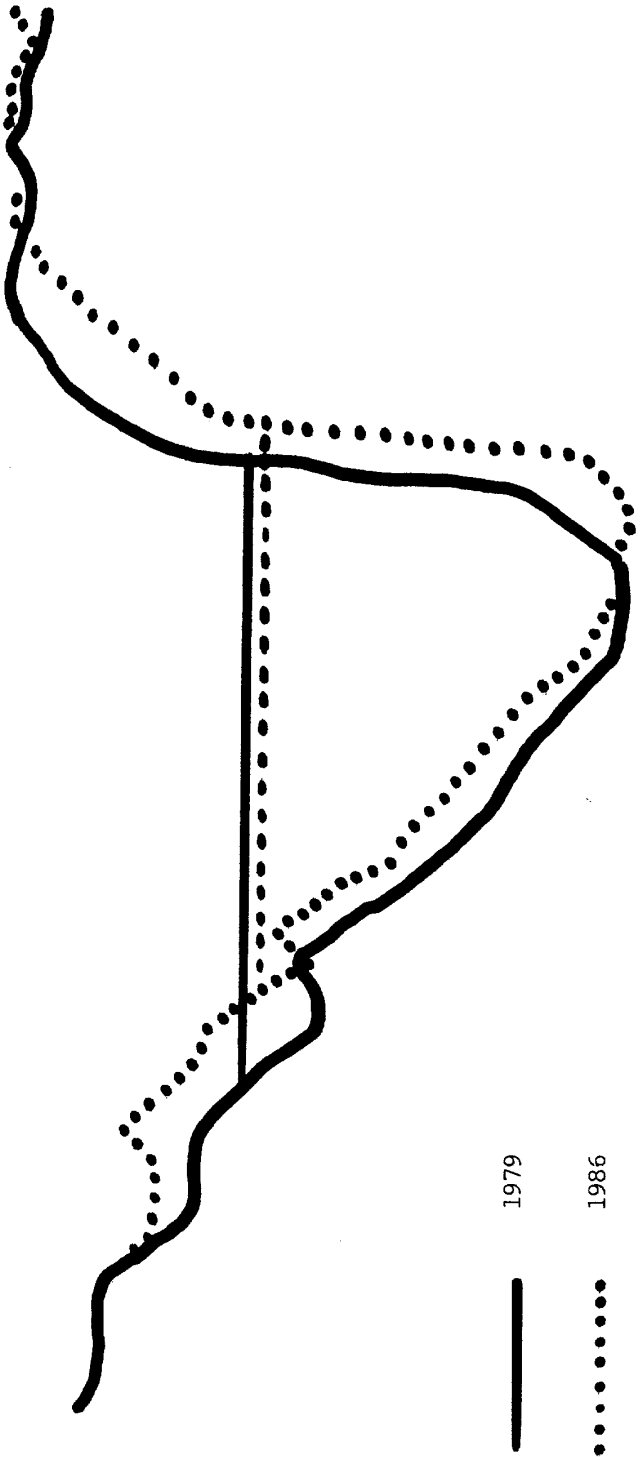

Figure 9. Cross-section #4 on Fivemile Cr. comparing contours in 1975 vs. 1986.

the exclosure was constructed. This process has resulted from sedges, grasses and forbs trapping sediments, thereby building up the point bars and restricting the channel.

Fish Population Samples

Sampling of the fish population was initiated as a method of evaluating the project. The three 100-foot sample sections are shown in Figures 2 and 10. The sampling attempted in 1976 was not successful because of problems with the electrofishing unit. The fish could not be captured effectively, but there were three species seen including five rainbow trout, up to about 9 inches, numerous speckled dace and sculpins.

The most complete sample was made in 1983 when a larger pram-mounted electrofishing unit was used. That unit employed two positive electrodes and a large crew of people to capture the fish. In 1986, another sample was taken, utilizing two back-pack shockers. These units were relatively successful in turning the fish, but there wasn't enough manpower to capture them before they escaped. The results of the 1983 and 1986 samples are presented in Tables 1, 2, and 3 for the three separate sampling sites. In both of these years, brown trout and lamprey ammocetes were captured in addition to the species seen in 1976. Table 4 is a summary of the samples taken in 1983 and 1986. Species, abundance and size composition appear to be similar but, reflecting the relative affectiveness of the sampling gear and manpower. The exception is the 12-inch brown trout taken in 1986 which is the largest fish that has been seen in the project area.

Aquatic Insects

Samples of aquatic insects were also taken with the intent of evaluating the project. Four sites, Figure 10, were sampled for insects with a square-foot sampler in 1976, 1979 and 1983. Those sample results are

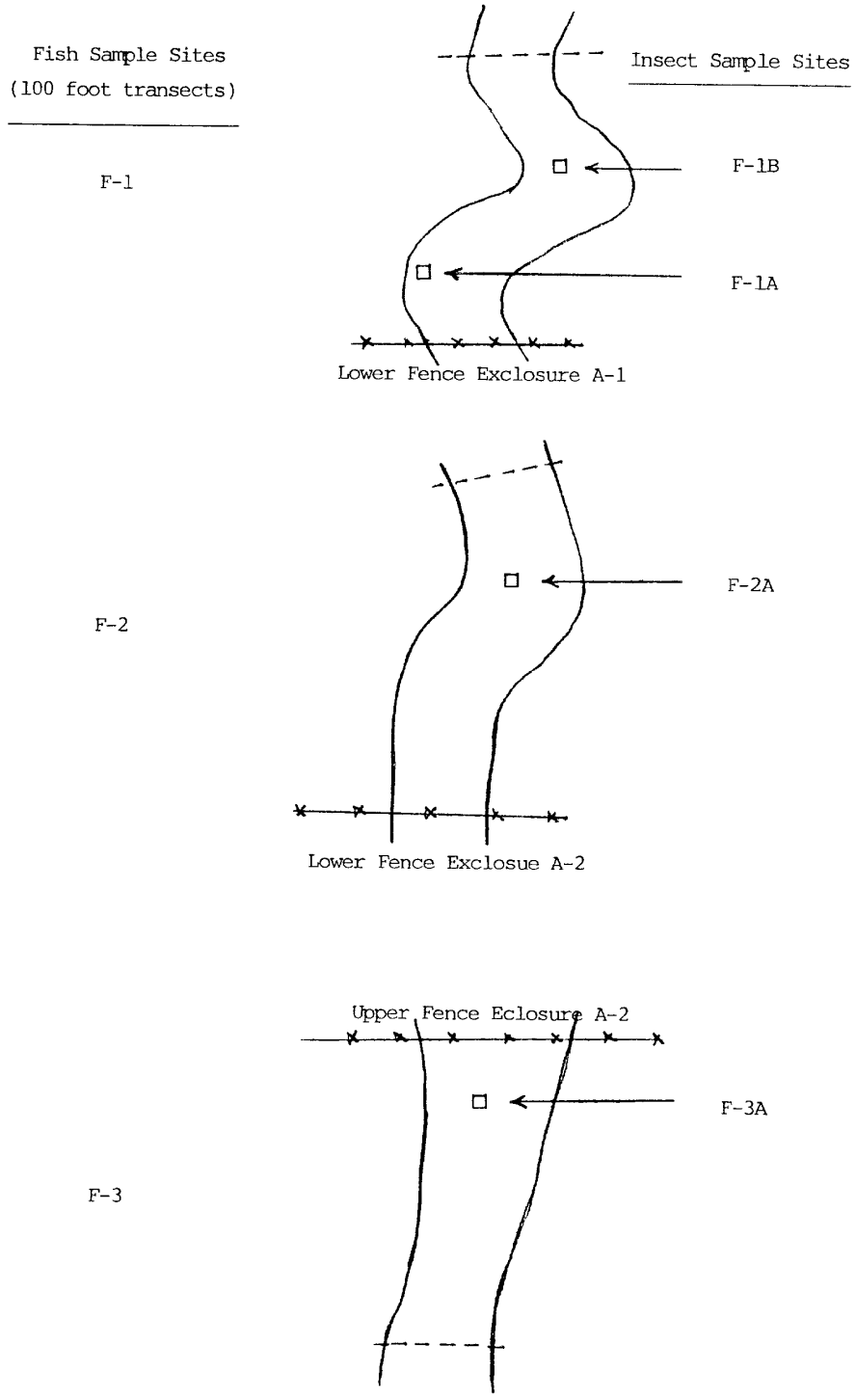

Figure 10. Locations of fish and insect sampling sites.

presented in Tables 5, 6 and 7. Each sample was counted and weighed (wet, blotted weight) by Order of insect. The sampling techniques were similar from year to year. Table 8 summarizes the sample totals by year and Order. The sample results do not show any particular trend in insect populations.

Water Temperature

Recording thermometers were used to document water temperatures in 1977 and 1978. These records are displayed in Tables 10-14. In August 1977, one thermograph was placed at RM 10.55, at the top of Exclosure A-2 and one at RM 9.95, near the bottom of Exclosure A-1. The mean temperatures for these sites for the month were nearly identical; however, the lower site had a mean maximum 2.6 F higher than the upper station. During the same period, the mean minimum was 1.8F lower at the lower site. There was 5F more daily range in temperature at the lower end of the exclosure than at the upper site.

In June 1978, thermographs were placed at the same locations as in August 1977, plus one more near the upper end of Exclosure B at RM 11.1. The resulting temperature pattern was similar to that seen in 1978. For some unknown reason the RM 10.55 site had cooler maximums and warmer minimums than at the RM 11.1 station.

No temperature records have been made since 1978.

DISCUSSION

The Fivemile Creek exclosures appear to be generally successful in restoring the stream and riparian habitats. The restoration is not complete after 10 years on the A-Exclosure and 7 years on the B-Exclosure. Response by grasses and sedges was quite quick, but shrubs took longer to show good growth. The relatively slow overall response was probably due to the initial poor condition of the area and lowered water table. Occassional trespass by

cattle has also delayed the process.

A beaver dam was built in the spring-summer of 1986 toward the upper end of A-1. The beaver has eaten and utilized willow and pine for the dam. The dam has raised the water table in a fairly large area which may result in an accelerated response by the vegetation. That remains to be seen, but it will be interesting to follow the impact the beaver has on the area.

Photo-points have been an excellent tool for showing the restoration process. They should be continued, at least at selected points and taken at times of the year that are comparable to the original photos November and August for A-Exclosure and July for B-Exclosure.

The stream cross-sections have documented the dynamics of the stream channel and have shown the expected narrowing of the stream. Measurement of these profiles should be continued.

Fish populations should be responding to the improved habitat. Unfortunately, the great discrepancy in equipment and manpower among the sampling efforts has prevented good comparisons of the fish populations. The equipment and techniques used in 1983 provided the best sample of fish. If possible, they should be utilized for future samples.

One further problem with the use of fish populations, particularly trout, to evaluate the project is that of fish being caught and removed from the population during the fishing season. These exclosures have provided attractive habitat for trout and, therefore, are attracting more angling effort. Reportedly, anglers have been harvesting "good numbers of big fish" in the past couple of years.

Aquatic insects can be a good indicator of stream health because insect species are adapted to certain conditions. However, the technique

used in the evaluation of this project does not provide such indications because the insects were identified only to Order. There is too much diversity among the species of insects within an Order for the broader category to provide meaningful information relative to the restoration of the stream. The insect sampling, as it has been done, should be abandoned. If aquatic insects are sampled in the future, they should be identified and analyzed by a professional entomologist for identification to species and their habitat requirements.

It is apparent from the water temperature records that:

1) High temperatures were reaching the marginal threshold for rainbow trout.

2) Lack of shade and cover within and upstream from the project allowed for excess heating and cooling of stream waters. It is natural for a stream to warm during the day as it is exposed to solar radiation and ambient temperature. But such heating can be minimized by a healthy stream and riparian condition. As the stream is restored, excessive temperature problems should be controlled within the project area.

Water temperature is reaching the low 70's F before it reaches the project area. This relatively high temperature is apparently due to the poor conditions upstream from the project area. In the summer, nearly all of the flow in Fivemile Creek comes from a group of springs in the vicinity of RM 13. Temperatures of these springs are between 45 and 55 degrees F but it has been up to 72 F in the creek when it reaches the project. That rate of heating is at least 8 F/mile. Improvement of stream and riparian conditions on these upstream, private lands is a desirable goal, but lacking such improvements, it is even more important to restore and keep the habitat in good condition within the project area.

Temperature monitoring at the established sites is in order in the near future to measure any influence the project has had.

According to the agreement with Fremont National Forest, the project must be evaluated in 1988 when the agreement expires. In order to make that evaluation, the following studies are recommended:

1. Take the series of photo-points to compare with those taken in 1975 and 1979.
2. Re-measure the stream cross-sections to compare with those done in 1979.
3. Sample fish populations in the established sites utilizing a raft mounted shocker with two electrodes and adequate manpower to capture fish.
4. Monitor summer water temperatures with recording thermographs at the established sites for comparison with records from 1977 and 1978.

Table 1. Length frequency (inches) in fish sampled from Site F1 in 1983 and 1986.

1983	Number/Species				
Inch groups	Rainbow tr.	Brown tr.	Sculpins	Dace	Lamprey
1				6	
2	3	1	10	22	
3	1		30	1	2
4			10		8
5					2
6					
7					
Total	6	1	50	29	12
Ave. Length	3.5	2.8	3.5	2.4	3.5
1986					
1				2	
2	3			15	
3	3		15	8	1
4			4		
5					
6	1				
7					
8					
9					
10					
11					
12		1			
Total	7	1	19	25	1
Ave. Length	3.4	12.0	3.5	2.7	3.7

Table 2. Length frequency (inches) in fish sampled from Site F2 in 1983 and 1986.

1983	Number/Species				
Inch groups	Rainbow tr.	Brown tr.	Sculpins	Dace	Lamprey
1				1	
2	5		4	20	
3	10		25	1	1
4	1		7		3
5	1				2
6	2				
7	1				
8	1				
Total	21	0	36	22	6
Ave. Length	3.9	--	3.6	2.5	4.6
1986					
1					
2	2			5	
3			10	5	3
4			1		2
5					
6	1				
Total	3	0	11	10	5
Ave. Length	4.0	--	3.6	3.0	3.8

Table 3. Length frequency (inches) in fish sampled from Site F3 in 1983 and 1986.

1983	Number/Species				
Inch groups	Rainbow tr.	Brown tr.	Sculpins	Dace	Lamprey
1	1			1	
2	12	1	3	2	
3	1		14	1	2
4			1		2
5	1				
6	1				
7	1				
Total	17	1	18	4	4
Ave. Length	3.2	2.9	3.3	2.3	4.0
1986					
1					
2	1				1
3	1		8	1	
4			2		3
5					
Total	2	0	10	1	4
Ave. Length	3.1	--	3.5	3.2	3.9

Table 4. Total numbers of fish by species and average length from sample Sites F1, F2, and F3 in 1983 and 1986.

Year	Number/Species				
1983	Rainbow tr.	Brown tr.	Sculpins	Dace	Lamprey
No.	44	2	104	55	20
Ave. Length	3.6	2.9	3.5	2.4	4.2
1986					
No.	12	1	40	36	10
Ave. Length	3.5	12.0	3.5	2.8	3.8

Table 5. Numbers and weights of aquatic insects sampled from Site F1-A, 1976-1983.

	Year		
Order	1976	1979	1983
Diptra			
No.	68	158	84
%	31	55	45
Wt.	0.1705	0.1297	0.138
%	6.99	13.76	19.30
Ephemeroptera			
No.	33	47	37
%	15	16	20
Wt. gr.	0.0551	0.0856	0.100
%	2.26	9.08	13.99
Plecoptra			
No.	13	1	2
%	6	<1	1
Wt.	0.0376	0.0017	0.014
%	1.54	0.18	7.53
Coleoptera			
No.	35	51	42
%	16	18	23
Wt.	0.0111	0.0287	0.186
%	0.45	3.05	26.01
Trichoptera			
No.	45	15	19
%	21	5	10
Wt.	1.1587	0.0298	0.246
%	47.48	3.16	34.4
Odonata			
No.	24	14	1
%	11	5	<1
Wt.	1.0076	0.6668	0.031
%	41.28	10.76	4.34
Totals			
No.	218	286	185
Wt.	2.4406	0.9423	0.715

Table 6. Numbers and weights of aquatic insects sampled from site F1-B, 1976-1983.

	Year		
Order	1976	1979	1983
Diptra			
No.	28	25	18
%	6	7	11
Wt.	0.0914	0.0734	0.456
%	2.5	6.8	9.1
Ephemeroptera			
No.	24	94	36
%	5	25	21
Wt.	0.0524	0.1380	0.407
%	1.5	12.7	8.1
Plecoptera			
No.	10	0	0
%	2	0	0
Wt.	0.0412	0	0
%	1.1	0	0
Coleopetra			
No.	303	228	90
%	62	61	53
Wt.	0.1087	0.1488	0.333
%	3.0	13.7	6.7
Trichoptera			
No.	104	18	16
%	21	5	9
Wt.	1.4114	0.1132	0.885
%	39.1	10.4	17.7
Odonata			
No.	22	6	10
%	4	2	6
Wt.	1.9060	0.6111	2.924
%	52.8	56.3	58.4
Totals			
No.	491	371	170
Wt.	3.6121	1.0845	5.005

Table 7. Numbers and weights of aquatic insects sampled from Site F2, 1976-1983.

	Year		
Order	1976	1979	1983
Diptra			
No.	81	127	41
%	21	36	24
Wt.	0.0745	0.1436	0.428
%	3.0	6.0	15.4
Ephemeroptera			
No.	32	60	32
%	8	17	19
Wt.	0.0942	0.1173	0.177
%	3.8	4.9	6.4
Plecoptera			
No.	12	3	7
%	3	1	4
Wt.	0.0562	0.0006	0.051
%	2.3	0.02	1.8
Coleoptera			
No.	85	75	50
%	22	21	29
Wt.	0.0340	0.0530	0.124
%	1.4	2.2	4.5
Trichoptera			
No.	170	60	35
%	45	17	20
Wt.	2.2319	0.3385	0.313
%	89.6	14.1	11.2
Odonata			
No.	0	28	7
%	0	8	4
Wt.	0	1.7488	1.687
%	0	72.8	60.6
Totals			
No.	380	353	171
Wt.	2.4908	2.4018	2.786

Table 9 . Total numbers and weights of aquatic insects sampled from Sites F1-A, F1-B, F2, and F3, 1976-1983.

	Year		
Order	6/23 1976	7/26 1979	7/16 1983
Diptra			
No.	224	325	157
%	16.9	23.4	27.1
Wt.	0.4008	0.4285	1.257
%	4.6	7.5	14.2
Ephemeroptera			
No.	98	210	109
%	7.4	15.1	18.8
Wt.	0.2290	0.3579	0.713
%	2.6	6.2	8.0
Plecoptera			
No.	48	11	9
%	3.6	0.8	1.6
Wt.	0.1633	0.0235	0.130
%	1.9	0.4	1.5
Coleoptera			
No.	533	585	214
%	40.3	42.1	36.9
Wt.	0.1982	0.3961	0.680
%	2.3	6.9	7.7
Trichoptera			
No.	383	213	73
%	28.9	15.3	12.6
Wt.	4.8843	1.1354	1.496
%	55.6	19.8	16.9
Odonta			
No.	47	49	19
%	3.6	3.5	3.3
Wt.	2.9163	3.4003	4.649
%	33.2	59.2	52.4
Total			
No.	1323	1390	580
Wt.	8.7929	5.7417	8.869

Table 10

Water Temperatures, Fivemile Cr. - Rm 9.95 Station

Date	Maximum °F	Minimum °F	Mean °F
August (1977) 1	68.0		
2	69.0	55.0	62.0
3	72.0	55.0	63.5
4	71.0	54.0	62.5
5	69.0	53.0	61.0
6	70.0	53.0	61.5
7	61.0	55.0	58.0
8	67.0	51.0	59.0
9	70.0	52.0	61.0
10	71.0	54.0	62.5
11	72.0	54.0	63.0
12	69.0	54.0	61.5
13	67.0	54.0	60.5
14	70.0	54.0	62.0
15	71.0	53.0	62.0
16	71.0	53.0	62.0
17	67.0	55.0	61.0
18	69.0	55.0	62.0
19	70.0	55.0	62.5
20	70.0	54.0	62.0
21	70.0	54.0	62.0
22	69.0	53.0	61.0
23	69.0	51.0	60.0
24	61.0	55.0	58.0
25	55.0	52.0	53.5
26	58.0	52.0	55.0
27	59.0	51.0	55.0
28	61.0	54.0	57.5
29	68.0	52.0	60.0
30	67.0	54.0	60.5
31	67.0	50.0	58.5
	Maximum 72.0	Minimum 50.0	Average 60.5

Mean Max. 67.4 Mean Min. 51.6

Downstream end of cattle exclosure.

Table II

Water Temperatures, Fivemile Creek - Rm 10.55 Station

Date	Maximum °F	Minimum °F	Mean °F
August 1977 1	68.0		
2	66.0	57.0	61.5
3	70.0	57.0	63.5
4	69.0	56.0	62.5
5	66.0	55.0	60.5
6	67.0	55.0	61.0
7	59.0	57.0	58.0
8	64.0	54.0	59.0
9	67.0	54.0	60.5
10	68.0	56.0	62.0
11	69.0	55.0	62.0
12	67.0	56.0	61.5
13	64.0	56.0	60.0
14	68.0	56.0	62.0
15	68.0	55.0	61.5
16	68.0	55.0	61.5
17	64.0	57.0	60.5
18	65.0	56.0	60.5
19	67.0	56.0	61.5
20	67.0	56.0	61.5
21	67.0	56.0	61.5
22	66.0	55.0	60.5
23	67.0	54.0	60.5
24	58.0	56.0	57.0
25	55.0	54.0	54.5
26	56.0	53.0	54.5
27	57.0	53.0	55.0
28	58.0	55.0	56.5
29	65.0	54.0	59.5
30	64.0	55.0	59.5
31	65.0	52.0	58.5
	Maximum 70.0	Minimum 52.0	Average 60.0

Mean Max. 64.8 Mean Min. 53.4

Upstream end of cattle exclosure.

Table 12

Water Temperatures, Fivemile Cr. - Rm 9.95 Station

Date	Maximum °F	Minimum °F	Mean °F
June 1978 1			
2			
3			
4	70.5	52.5	56.5
5	72.0	52.0	62.0
6	71.0	53.0	62.0
7	71.0	52.0	61.5
8	72.0	52.0	62.0
9	64.0	51.0	57.5
10	60.5	53.0	56.8
11	70.0	49.0	59.5
12	64.0	53.0	58.5
13	68.5	53.0	60.8
14	68.0	53.0	60.5
15	64.5	49.0	56.8
16	70.0	50.0	60.0
17	71.0	50.5	60.8
18	57.0	55.0	56.0
19	72.0	51.0	61.5
20	71.0	53.0	62.0
21	69.0	53.0	61.0
22	65.0	53.0	59.0
23	62.0	52.0	57.0
24	57.5	54.0	55.8
25	63.5	49.0	56.3
26	65.0	51.5	58.8
27	70.5	52.0	61.3
28	59.0	54.0	56.5
29	61.0	53.0	57.0
30	68.0	51.0	59.5
31			
	Maximum 72.0	Mimimum 49.0	Average 59.1

Mean Max. 66.6 Mean Min. 52.0

Table 13

Water Temperatures, Fivemile Cr. - Rm 10.55 Station

Date		Maximum °F	Minimum °F	Mean °F
1978	1			
	2			
June	3			
	4	67.5	52.5	60.0
	5	68.5	52.5	60.5
	6	68.5	53.0	60.7
	7	68.0	53.0	60.5
	8	69.0	53.0	61.0
	9	61.0	52.0	56.5
	10	57.0	53.5	55.2
	11	66.0	50.0	58.0
	12	61.0	53.0	57.0
	13	64.0	53.0	58.5
	14	63.5	53.0	58.2
	15	60.0	50.0	55.0
	16	65.0	50.5	57.7
	17	66.0	53.0	59.5
	18	55.0	54.5	54.7
	19	67.0	51.5	59.2
	20	66.0	53.5	59.7
	21	65.0	53.0	59.0
	22	61.0	53.5	57.2
	23	57.0	53.0	55.0
	24	55.0	54.0	54.5
	25	60.0	50.0	55.0
	26	61.0	52.0	56.5
	27	67.0	53.0	60.0
	28	55.5	54.0	54.7
	29	58.0	54.0	56.0
	30	65.0	53.0	59.0
	31			
		Maximum 69.0	Minimum 50.0	Average 57.7
		Mean Min. 62.9	Mean Min. 52.6	