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COLLECTION OF WILD FISH FOR HATCHERY BROOD PURE STRAIN WESTSLOPE CUTTHROAT TROUT

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The existing broodstock of westslope cutthroat trout was derived from eggs collected from Hungry Horse Reservoir adults spawning in Hungry Horse Creek and Emery Creek in 1965 and 1967. Emery Creek and Hungry Horse Creek enter Hungry Horse Reservoir from the east about 5 miles above the dam (see attached Forest Service map). George Holton's history of hatchery cutthroat will give more detail. About 20-25 pairs of fish were spawned each year, and the eggs were transported to the Arlee Hatchery. Only one pair of fish were taken from Emery Creek, and the remainder were from Hungry Horse Creek.

One point of interest was the large number of albino fish resulting from these wild eggs. I have never seen an albino juvenile or adult in the Hungry Horse Reservoir system.

In 1966 about 30 pair of cutthroat from Hungry Horse Creek adfluvial run was spawned, and the eggs were taken to Creston National Fish Hatchery. These fish were tested for IPN by Dick Begay; all tests were negative. In 1966 we held some fish immediately above the Hungry Horse Creek trap for 45 days without them becoming ripe enough to spawn. They were released, and there is no indication they did not spawn afterwards.

Various attempts have been made since 1967 to "juice-up" the gene pool in the Arlee westslope broodstock by adding wild eggs or half-wild eggs. These are detailed below; what we did, but not what the hatchery did.

1. In 1972, Art Whitney, Joe Huston, and Jim Steffes collected about 3,000 eggs from 25-30 males and a like number of females at the Hungry Horse

Creek trap-site. Mr. Whitney delivered these eggs to the Arlee Hatchery. Mr. Holton's hatchery cutthroat history details what happened to these eggs.

2. In 1979, Art Whitney, Emmett Colley, Warren Taylor, Joe Huston, Bob Domrose, et. al., electrofished in the Hungry Horse Creek drainage and collected about 2 dozen wild females and 3-4 males. These fish were taken to the hatchery by Warren Taylor.

3. In 1980, Joe Huston and Gary Anderson collected 40-45 adult cutthroat from Flathead River, and these fish were moved to Murray Springs. Collection was made in late April. Almost all fish were females.

4. In May, 1982, Joe Huston, Charlotte Schultz, and Ben White ran gill nets in Hungry Horse Reservoir for 3 days and nights and collected 40-45 cutthroat. Darryl Hodges moved these fish to the Murray Springs Hatchery.

5. In early 1983, a meeting between Helena office personnel, University of Montana genetics people, and U. S. Fish and Wildlife people decided the way to go was to collect wild males and cross them into domestic females. Region people did not care for this idea because of difficulties of collecting only males and timing of wild spawning versus hatchery spawning. Anyway, it was decided that a regional crew of Joe Huston and Ben White plus one man from Crestion National Fish Hatchery would try to collect males from the Flathead River near Kalispell in April, move them to Creston, and hope they ripened to match the hatchery brood. The sampling crew caught about 15 males in 4 nights' work, and these were transferred to Creston. As far as is known, none of these males were added to the Creston pool.

It was after this fiasco that it was decided to collect wild fish and use them as a start of a new broodstock. When this decision was made, the only populations tested for purity were adults in lower Flathead River, Hungry Horse and Emery Creeks. In the spring of 1983, fish were collected from Sullivan Creek

(which includes Battery, Ball, Branch, Connor, and Quintonkon Creeks) and Felix Creek. Samples were found to be pure westslope cutthroat. In addition, fish from Emery and Hungry Horse were collected for disease testing; testing was negative.

Fish collected in the summer of 1983 were from Emery Creek, Hungry Horse Creek drainage (Hungry Horse, Margaret, Tiger, and Lost Mare Creeks), Felix Creek, and Sullivan Creek drainage (Battery, Quintonkon, Ball, Branch, Connor, and Sullivan Creeks). The targeted goal of 3,000 fish was decided primarily by Mr. Huston based upon conversations with Emmett Colley, G. Holton, Darryl Hodges, and Mr. Huston's knowledge of the creeks' fish populations, collection methods, and manpower availability. The same number goal was also set for 1984 collections.

Additional electrophoretic testing was done in the summer of 1983, and early 1984 to broaden the streams for collection of cutthroat trout scheduled for the summer of 1984. We wanted to include streams that contained resident populations as well as migratory populations. Streams determined to contain purestrain populations included Tin Creek in the South Fork Flathead River drainage (migratory fish mostly), and Marten Creek and Vermilion River above Vermilion River Falls in the lower Clark Fork River drainage (resident fish only).

Disease testing was done on cutthroat trout from Tin and Marten Creeks and cutthroat and brook trout from Vermilion River. All disease tests were negative.

Attached are electrophoretic test results and results of disease tests. Region One files do not have the disease test results of fish collected from Marten Creek or Vermilion River. The Department fish health specialist should be able to provide these records. Attached are Forest Service maps showing the location of the streams from which cutthroat trout were collected.

Methods used to collect cutthroat were the same each year. Fish were collected using a back-pack shocker (Coffelt Model BP-2) from all the creeks. Some fish in Hungry Horse and Emery Creek were caught in a downstream trap. Fish

caught in downstream traps were classified as all adfluvial smolts. Fish caught by electrofishing in those streams known to be used as rearing areas for adfluvial smolts and also populated by resident cutthroat could not be classified as adfluvial or resident with any degree of accuracy. I have divided catch into adfluvial and resident fish based upon my experience.

In general, fish less than 3 inches total length were not collected and adults from Hungry Horse Reservoir (12 inches or longer) were not kept. All sizes of resident fish were captured and with one exception, all these fish were less than 10 inches total length. The one exception was fish taken from Marten Creek where a few of the adults exceeded 10 inches total length; maximum length in Marten Creek was about 13 inches.

At no time were individual fish examined for deformities. Handling of fish was kept to the minimum neeeded to get them from the creek into the fish truck. Fish taken from the fish traps were netted and immediately placed in a holding box in Hungry Horse Creek or into a bucket, fish truck, and then the holding tank in Hungry Horse Creek. Fish caught by electrofishing were dip netted, placed into buckets, and when the bucket held 20-40 fish, the fish were transported by foot to the fish truck. Fish were counted from the bucket into the tank truck and a running total kept. Dead fish were removed whenever or wherever they occurred, in the bucket, fish truck, or holding tank.

Captured fish were held in live boxes in various streams until a truckload was captured; then they were moved to Murray Springs Hatchery. Fish captured by trap or electrofishing in Emery and Hungry Horse Creek were held in live boxes in Hungry Horse Creek immediately above the downstream trap site. Some fish were held up to a week. Felix Creek fish were trucked directly to Murray Springs the same day of capture. Fish from the Sullivan Creek drainage and Tin Creek were held 4-5 days in Qunitonkon Creek about 100 feet above its junction with

Sullivan Creek before being trucked to Murray Springs. One small load of Marten Creek fish (150 fish) were trucked to Murray Springs the day of capture, June 28, while the remainder were mixed in with Vermilion River Fish, held overnight in Vermilion River, and then transported to Murray Springs.

SPAWNING CHARACTERISTICS

Age of maturity for adfluvial cutthroat will vary according to age at smolting. One-year old smolts often spawn the first time at 3 years of age and always by 4 years of age. Infrequently 1-year old smolts will spawn at 2 years of age, and invariably, these are males. Two-year old smolts generally spawn for the first time at 4 years total age except that some males will spawn a year earlier. The same holds true for 3-year old smolts; they spawn for the first time at 5 years except that some males and a few females will spawn as 4-year old fish.

Time of spawning of Hungry Horse Reservoir cutthroat seems to be controlled by creek temperatures. Fish will enter individual streams when water temperatures reach a minimum daily temperature of 40°F. Generally, actual spawning starts when daily minimum temperature is in the mid-40° range and high daily temperature in the low 50°F range. Spawning runs in the Hungry Horse Reservoir drainage will vary from creek to creek with most west-facing streams starting in late May or early June and east-facing streams starting in mid- to late June. New fish enter the streams for spawning over about a 35-45 day period, but time spent by individual fish from entering to leaving the creek averages about 25 days.

The number of eggs produced by wild adfluvial westslope cutthroat was determined by counting eggs from several females from the Hungry Horse Creek run. These are listed on the following page.

1969		1971 -1st time spawners		
Size of Female (inches)	Number Eggs		Size of Female (inches)	Number Eggs
13.7	902		12.8	1095
13.9	1001		12.9	797
14.1	1172		13.1	1028
14.2	1033		13.4	993
14.5	810		13.6	1007
14.5	1428		13.9	1126
14.5	1185		14.0	1111
14.6	858		14.3	1445
14.7	897		14.4	1196
14.8	1076		14.5	901
14.8	1440		14.8	1299
14.9	1484		15.2	1468
15.0	841	Average:	13.9	1122
15.2	1109			
15.4	1051			
15.6	971		1971 - repeat spawners	
Average: 14.6	1079			
			13.4	934
			13.9	891
			14.4	924
			14.9	1135
			14.9	969
			15.3	895
		Average:	14.5	958

Spawning time and characteristics of stream resident cutthroat have not been documented. I would assume that spawning times and creek conditions around the Hungry Horse drainage are very similar to conditions for the adfluvial fish. I have observed ripe males about 7 inches long trying to spawn with adfluvial females twice their size. As far as I know, none succeeded.

We did send Dr. Gerry Bouck cutthroat trout eggs for chormosome counts from resident female-male, resident male-adfluvial female, adfluvial male-resident female, and adfluvial male-female matings. None of the eggs were different from each other irregardless of mating type. Robb Leary has not been able to tell genetic differences between known adfluvial cutthroat populations and known resident cutthroat populations.

Sex ratios of adfluvial cutthroat are generally very skewed. We have good data on sex ratios from Hungry Horse Creek and Young Creek at different life stages. Adfluvial adult sex ratios vary from year to year from 1 male to 2 females to as high as 1 male to 6 females. The average would be about 1 male to 3.5 females. I suspect, but cannot prove at this time, that sex ratios of resident populations tend toward a few more males than females.

Sex ratios of the wild eggs hatched at Arlee in 1965 and 1967 were about 1:1 according to Vern Campbell. We determined sex ratios of smolts leaving Hungry Horse Creek, and this ratio was about 1 male to 1.5 females. Sex ratio of pre-spawning fish in Hungry Horse Reservoir (1 year from spawning) was about 1 male to 1.8 females. I have no idea why the ratio is so strong toward females in adult fish, but it does occur. This skewed ratio holds true in spawning runs, gill net catches, and angler harvest of adult fish.

INDIVIDUAL CREEK DESCRIPTIONS

Emery Creek--Emery Creek enters Hungry Horse Reservoir from the east, and the only fish species in the creek is westslope cutthroat trout. It supports a spawning run of cutthroat from the reservoir estimated to be about 3-400 fish. Flows in Emery Creek range from about 400 cfs during run-off to 5-10 cfs in the winter low period.

Ages of adfluvial smolts taken from Emery Creek would have been 1, 2, or 3 years old with most of the fish being 2 years old. Ages of the resident fish would have been from 1 year to 5 years old with the adults being either 4 or 5 years old. The vast majority of fish taken from Emery Creek ranged in size from 4-6 inches total length and 2 and 3-year old fish. Fish were collected from Emery Creek in both 1983 and 1984. Collection dates in 1983 were:

electrofishing--June 29, 30, July 5 through 10, July 13, and 14; downstream trap--July 6 through 10. Collection dates in 1984 were: electrofishing--July 16, 17, and 24; downstream trap--July 21 through 24.

The number of fish transferred to Murray Springs from Emry Creek is shown in Table 1 below.

Table 1

Emery Creek Cutthroat Moved to Murray Springs

Year and Method	Adfluvial	Resident	Total
1983 - Electrofishing	515	100	615
Trapping	185	0	185
Total	700	100	800
1984 - Electrofishing	245	100	345
Trapping	55	0	55
Total	300	100	400

Areas of electrofishing and the downstream trap site are shown on Figure 1. It was calculated that more resident fish were taken in 1984 than in 1983 because of time of electrofishing. Sampling was done later in the year in 1984 and after annual smolting of adfluvial fish was about complete.

Table 2 shows what age-growth information I have from Emery Creek fish. These data are from fish collected in 1967, but growth rates in the stream should be about the same now as then.

Table 2

Growth Rates and Ages of Cutthroat Collected from Emery Creek, 1967

Type Fish	Length in Inches at Annulus					
	I	II	III	IV	V	VI
Resident	2.7	5.1	7.0			
Adfluvial*						
X sub 1	3.5	8.3	11.9	13.7		
X sub 2	2.6	4.9	10.2	12.7	14.3	
X sub 3	2.4	4.1	5.9	11.3	13.1	14.5

*These were adults from Hungry Horse Reservoir spawning in Emery Creek X is total age while sub number is years spent in tributary; therefore, a 4_2 is 4 years old that smolted into reservoir during its third year of life (2 years in tributary).

Hungry Horse Creek--Hungry Horse Creek enters Hungry Horse Reservoir from the east. This is the drainage where an upstream and/or downstream trap was operated from 1963 through 1972 and from which most of the cutthroat data was first collected. The original broodstock was derived from eggs collected from fish caught in this trap in 1965 and 1967.

Flows in this creek vary from an average high of about 500 cfs to lows of 10 cfs. This stream supports a spawning run of cutthroat from the reservoir and has some resident fish. Cutthroat is the only fish found in the creek except that the lower stream below Margaret Creek is used for spawning by mountain whitefish. Most of the spawning by adfluvial cutthroat occurs in Margaret Creek, Tiger Creek, and Hungry Horse Creek above its junction with Tiger Creek. Lost Mare Creek serves a small number of adfluvial fish. Strength of the adfluvial spawning run was measured at about 600 fish in 1972 and about 400 fish in 1984.

Age of adfluvial smolts taken from Hungry Horse Creek would be similar to those from Emery Creek except differences between adfluvial spawning times and

annual smolting resulted in a slightly larger fish (5-7 inches) being caught. Spawning time and smolting time in Hungry Horse Creek is usually about 7-10 days later than Emery Creek.

Fish were collected from Hungry Horse Creek in both 1983 and 1984. Collection dates in 1983 were: June 22, 29, 30, July 5 though 11, July 13 and 14 for electrofishing and July 5 through 10 for downstream trapping. Collection dates in 1984 were: July 16, 17, and 24 for electrofishing and July 21 through 24 for downstream trapping.

The number of fish transferred to Murray Springs from Hungry Horse Creek is shown in Table 3 below.

Table 3

Hungry Horse Creek Cutthroat Moved to Murray Springs

Year	Method	Stream	Adfluvial	Resident	Total
1983	Trap	Hungry Horse Creek	360	0	360
1983	Electro	Hungry Horse Creek*	140	30	170
1983	Electro	Tiger Creek	250	50	300
1983	Electro	Lost Mare Creek	80	0	80
1983	Electro	Margaret Creek	200	40	240
		Total	1030	120	1150
1984	Trap	Hungry Horse Creek	120	0	120
1984	Electro	Hungry Horse Creek*	0	0	0
1984	Electro	Tiger Creek	180	20	200
1984	Electro	Lost Mare Creek	120	0	120
1984	Electro	Margaret Creek	180	30	210
		Total	600	50	650

*Hungry Horse Creek above mouth of Lost Mare Creek

Areas of electrofishing and the downstream trap site are shown on Figure 2. It is calculated that slightly fewer resident fish (percent of total catch) were taken in 1984 due to not sampling all the areas done in 1983.

Age and growth of adfluvial smolt cutthroat collected in 1972 is shown in Table 4 below. I have limited these data to only juvenile fish since these data are most applicable to what was taken in 1983 and 1984.

Table 4

Age and Growth of Juvenile Cutthroat Smolting from Hungry Horse Creek, 1972

Species	Length in Inches at Annulus		
	I	II	III
WCT adfluvial smolts	2.8(326)*	4.6(205)	6.1(32)

*Number in parenthesis is sample size

The age data in the above table is a good indication of the ages of fish moved to Murray Springs. Since we seldom kept fish less than 3-4 inches long, most of the fish were 2 and 3 years old. I would judge that 70 percent of what was moved were 2 years old with the other 30 percent about equally divided between 1 and 3-year old fish.

Resident cutthroat are scarce in the Hungry Horse Creek drainage except in the upper ends of the tributaries. Few adults were collected, and most of these were from upper Tiger Creek. Maximum size of these adults was about 8 inches total length and a guesstimate of age would be 4 years.

Felix Creek--Felix Creek enters Hungry Horse Reservoir from the east. Felix Creek flows range from about 300 cfs during highwater to a low of 5 cfs in the winter. Figure 3 shows Felix Creek and the area of sampling. This creek has effectively been blocked from the reservoir by a road culvert during all years except a low water year like 1984.

I have assumed that the fish population of Felix Creek is almost all resident fish. Fish were collected by electrofishing from Felix Creek August 29, 1983, and July 20, 1984. Cutthroat less than 3 inches total length were seldom kept

and maximum size of fish caught and kept was about 9 inches. I would assume that all the catch was of ages 1 year through 4-5 years. About one-fourth of the fish moved to Murray Springs would have been adult fish which should have spawned in spring 1984.

One point of interest is that in 1983 and 1984 the same length of section was shocked. Catch in 1983 was 200 fish and in 1984 catch was only 100 fish. The reduced catch may indicate over-exploitation of the population in 1983. We did note that considerably less adults were taken in 1984 compared to 1983. Table 5 shows the catch from Felix Creek in 1983 and 1984.

Table 5

Felix Creek Cutthroat Moved to Murray Springs

Year	Adfluvial	Resident	Total
August 29, 1983	0	200	200
July 20, 1984	0	100	100

Tin Creek--Tin Creek is the uppermost creek from which cutthroat were taken for the new broodstock. It does have a spawning run of cutthroat from Hungry Horse Reservoir, and I would guess this run may be about 50-100 fish. Flows in this stream may peak at about 150 cfs while low flow is less than 5 cfs. We have no age-growth information from Tin Creek, but I would guess that almost all the adfluvial smolts were 2 years old with a few being 1 and 3 years old. The few resident fish taken would have been from 2 to 4 years old. Catch from Tin Creek is listed in Table 6.

Table 6

Battery Creek Fish Moved to Murray Springs

Year	Method	Adfluvial	Resident	Total
1984	Electrofishing	220	20	240

Fish were collected from Tin Creek twice in 1984; 180 fish were moved to Murray Springs July 19, and 60 were caught August 7.

Figure 4 shows Tin Creek and the area from which cutthroat were captured.

Sullivan Creek Drainage--This description of Sullivan Creek drainage is divided into three parts: Battery Creek, Sullivan Creek, and Quintonkon Creek This division is made on adfluvial versus resident cutthroat populations.

Battery Creek--Battery Creek enters Hungry Horse reservoir (Figure 4) in Sullivan Creek Bay. This small creek does not serve as a spawning stream for reservoir fish since it is blocked by a falls at its mouth and two impassable road culverts. Fish taken from Battery Creek were all of the resident type. Battery Creek is a small stream having low flows of 2-3 cfs and high flows of 40-50 cfs. Number of fish moved to Murray Springs is listed in Table 7 below. In 1983, these fish were caught August 4; in 1984, on August 7. We have no idea what age and growth rates these fish have, but most of the fish caught were 6-9 inches long, probably adults and probably 3-4 years old.

Table 7

Battery Creek Fish Moved to Murray Springs

Year	Method	Adfluvial	Resident	Total
1983	Electrofishing	0	35	35
1984	Electrofishing	0	25	25

Sullivan Creek--Sullivan Creek drainage is the second largest stream flowing into Hungry Horse Reservoir (the main South Fork Flathead River being the largest). Average annual peak flow is about 2000 cfs and low flow is about 50-75 cfs. Flow from Quintonkon Creek would be about one-third of the total flow. Sullivan Creek drainage is used for spawning by good numbers of westslope cutthroat trout, bull trout, mountain whitefish, suckers, and squawfish from Hungry Horse Reservoir.

Mountain whitefish, suckers, and squawfish spawning generally occurs in Sullivan Creek below Quintonkon Creek. Bull trout generally spawn in the lower five miles of Quintonkon Creek and in Sullivan Creek above Connor Creek (Figure 4). Cutthroat trout spawn in Slide, Connor, Branch, and Ball Creeks; and, to a lesser extent, in Quintonkon Creek upstream of the bull trout spwaning area. The entire drainage contains a few too many resident cutthroat depending on location and strength of the adfluvial spawning population.

Number of adfluvial cutthroat spawning in Sullivan Creek drainage excluding Quintonkon Creek was estimated at about 3,000 fish in the mid-1960's. Quintonkon Creek has a fish barrier near its mouth which excluded adfluvial spawners from this creek; this barrier was removed about 1963. Number of cutthroat spwaning in the system now is not known, but it is probably about the same including the Quintonkon Creek run. Number of bull trout spwaning in the Sullivan system including Quintonkon is not know, but I would estimate the run at between 250-500 fish. Numbers of squawfish, suckers, and mountain whitefish entering Sullivan drainage for spawning probably numbers in the low thousands.

Branch, Conner, and Slide Creeks are the major areas used for spawning by the westslope cutthroat. We had road access into Branch and Connor, but not Slide Creek. Ball Creek supports a small run of adfluvial fish. Only cutthroat trout were caught in Ball and Branch Creeks while a few bull trout were caught in the lower end (2000 feet) of Connor Creek and only westslope cutthroat above this point.

Numbers of fish moved to Murray Springs from Sullivan Creek are listed in Table 8. Number of resident and adfluvial fish have been estimated based on experience and knowledge of the system. In 1983, fish were caught August 1 through 4, and in 1984, August 7 and 9.

Table 8

Sullivan Creek System Fish Moved to Murray Springs

Year	Creek	Method	Adfluvial	Resident	Total
1983	Ball	Electrofishing	45	100	145
1983	Branch	Electrofishing	155	20	175
1983	Connor	Electrofishing	270	30	300
1983	S. F. Connor	Electrofishing	40	10	50
		Total	510	160	670
1984	Ball	Electrofishing	0	0	0
1984	Branch	Electrofishing	115	15	130
1984	Connor	Electrofsihing	400	40	440
1984	S. F. Connor	Electrofishing	25	5	30
		Total	540	60	600

Figure 4 shows the location of capture sites in the Sullivan Creek system.

Resident fish taken from the Sullivan Creek system would likely have been mostly 2 to 4-year old fish with a few 1 and 5-year old individuals. Almost all the adfluvial fish would have been 2-year old fish with a few 3-year olds and 1-year olds. I would guess the percentages as 75 percent 2's, 5 percent 3's, and 20 percent 1's. The majority of fish were between 5 and 7 inches long.

Age and growth information on fish inhabiting Sullivan Creek is shown in Table 9. These data are from adfluvial smolts caught as they were leaving Sullivan Creek and resident cutthroat caught upstream from the junction of Sullivan and Quintonkon Creeks. These fish were caught in 1965, but I would not expect much change in creek growth rates between 1965 and 1983-84. I have excluded any adfluvial adults from the age and growth data because there have been changes in growth rates from 1965 to the present in the reservoir. I will state that adult cutthroat spawning in the Sullivan Creek drainage are generally 4 or 5 years old the first time they spawn. Characteristics of the Sullivan Creek adults should be about the same as those for Hungry Horse Creek. Sullivan Creek is an east-facing drainage and spawning runs usually do not start until mid-June and unspawned fish have been caught in late July.

Table 9

Age and Growth of Cutthroat in Sullivan Creek, 1965

Type Fish	I	II	III	IV
Stream Resident	2.8(36)	4.7(30)	6.1(6)	9.3(1)
Adfluvial Smolts	3.1(125)	5.1(106)	6.9(17)	

Note: Number in parenthesis is size of sample.

The data in Table 9 supports a prior statement that almost all the adfluvial fish taken from Sullivan Creek were 2 years old ranging from 5 to 7 inches long. It is also indicated that adfluvial smolts may grow better than resident cutthroat; a theory of mine that needs proving. The apparent disparity of growth may also be related to the "Rosa Lee" phenomina.

Quintonkon Creek--Quintonkon Creek is the major tributary of Sullivan Creek and does support spawning runs of cutthroat trout and bull trout from Hungry Horse Reservoir. Cutthroat caught for use as broodstock were taken from Quintonkon Creek above where bull trout spawn and in an area inhabited solely by cutthroat (Figure 5). The area sampled is also above the area most commonly used by adfluvial cutthroat from Hungry Horse Reservoir, so it was judged that most of the fish were stream residents. As such, there were a good mix of juvenile and adult fish with adults making up an estimated 20 percent of the number moved to Murray Springs (Table 10.) In 1983, fish were caught from Quintonkon Creek August 5, and in 1984, August 8.

Table 10

Quintonkon Fish Moved to Murray Springs--1983, 1984

Year	Method	Adfluvial	Resident	Total
1983	Electrofishing	20	130	150
1984	Electrofishing	40	325	365

Size of fish caught in Quintonkon Creek varied from about 4 inches to a maximum of 10 inches total length. Most of the fish were from 5 to 9 inches and ages varying from 2 to 4 years old. The available age and growth information from Quintonkon Creek is shown in Table 11 below. These data were from fish taken several miles downstream from the 1983-84 capture site.

Table 11

Age and Growth of Cutthroat from Quintonkon Creek, 1966

Length in Inches at Annulus			
I	II	III	IV
2.9(14)	5.0(14)	6.5(7)	7.5(2)

Marten Creek--Marten Creek is a tributary of Noxon Rapids Reservoir near the town of Trout Creek, Montana. This stream is small having high flows of 100-150 cfs and low flows of 2-3 cfs. The creek has intermittent flows during the summer, winter, and fall with a section downstream from Fir Creek to below Clinton Gulch being dry every year. The first two miles upstream from Noxon Rapids Reservoir has supported spawning runs of cutthroat and rainbow trout in past years. Apparently the dry section has acted as a barrier to prevent rainbow trout encroachment further upstream. The lower section of Marten Creek also contains brook trout, mountain whitefish, and suckers, dace, and sculpins.

Westslope cutthroat trout for Murray Springs were captured in the lower part of the North Branch, South Branch, and main Marten Creek below the junction of North and South Branches. The only species inhabiting this section is the westslope cutthroat trout. Location of the sampling section is shown on Figure 6. Number of fish transferred to Murray Springs from Marten Creek is shown in Table 12.

Table 12

Marten Creek Fish Moved to Murray Springs, 1984

Date	Method	Adfluvial	Resident	Total
June 28	Electrofishing	0	150	150
July 25, 26	Electrofishing	0	450	450
	Total	0	600	600

Estimated Number from North Branch = 100
Estimated Number from South Branch = 270
Estimated Number from Marten Creek = 230

We have no age and growth information from this area of Marten Creek. Age and growth of rainbow trout, cutthroat trout and brook trout in the lower area of Marten Creek would indicate that fairly good growth rates could be expected. Growth rates would indicate that cutthroat should grow about 3 inches per year. Cutthroat taken from Marten Creek ranged from 3 inches up to about 12-13 inches with most of the fish being in the 5-8 inch range. I would estimate that most of the fish taken were 2 to 3 years old.

Compared to other creeks from which westslope cutthroat were collected, Marten Creek had the most fish per linear foot and the greatest size range. I would estimate that the average size of cutthroat from Marten Creek averaged at least an inch larger than any other creek. An estimated 15 percent of the fish taken were mature fish and had probably spawned in spring, 1984. Further, I would estimate that 30-35 percent of the fish would be spawners in the spring, 1985, under natural conditions. Will these fish be spawners at Murray Springs in 1985?

Electrophoretic testing of fish taken from South Branch and main Marten Creek compared to fish taken from North Branch indicated statistical differences at a couple of loci. I suspect this occurrence would not be unusual in many cutthroat populations if testing of duplicate samples was done. This occurrence

of "genetically" different populations in two connecting streams 50 yards apart has appeared to cloud the broodstock development. I view the potential loss of a rare gene as a small issue compared to the total overall need for a better broodstock.

Vermilion River--Vermilion River is divided into two sections by a series of 4-10 foot falls called Vermilion Falls. Below the falls, Vermilion River is inhabited by bull trout, brown trout, rainbow trout, cutthroat trout, brook trout, suckers, whitefish, sculpins, dace, and maybe an occasional squawfish. Fish found above the falls includes sculpins, westslope cutthroat trout and brook trout.

Vermilion River above the falls in the vicinity of where the cutthroat for broodstock were captured is a medium-size mountain stream. Volumes range from about 500 cfs down to about 20-30 cfs. Location of sampling areas is shown in Figure 7. Number of fish moved to Murray Springs is shown in Table 13 below.

Table 13

Cutthroat from Vermilion River Transferred to Murray Springs, 1984

Date	Method	Adfluvial	Resident	Total
July 26,27	Electrofishing	0	450	450

Nothing is known about the age and growth of cutthroat from Vermilion River. I would expect that growth is slow averaging about 2 inches per year. Size of cutthroat taken from Vermilion River was the smallest of any stream sampled. Adult cutthroat were generally about 7-8 inches total length and maximum size only about 9 inches. It was estimated that most of the fish averaged between 4-6 inches total length and were 2 and 3-year old fish. Numbers of fish caught per linear foot of river was also the lowest of any stream sampled.

It must be remembered that other streams were populated by only cutthroat while Vermilion River had both brook trout and cutthroat trout.

General Notes

Recap of Numbers of Fish Caught for Broodstock Development

Year	Adfluvial	Resident	Total
1983	2260	745	3005
1984	1700	1730	3430
Total	3960	2475	6435

The above figures are for fish delivered to the Murray Springs Hatchery. Capture mortality, from electrofishing and holding in the field and transporting to the hatchery, averaged about 6 percent. Mortality during the first year in the hatchery was calculated to be about 27 percent. Of the 3,005 fish delivered to Murray Springs in 1983, 2,190 were delivered to the Anaconda Hatchery in summer 1984.

Effort required to capture fish was:

1983 - 20 field days with a five-man crew and 4 days trap tending
1984 - 13 field days with a five-man crew

Cost to capture fish in 1984 was calculated as:

$1.48 per fish delivered to hatchery truck (Region One budget)
.20 per fish delivered to hatchery (hatchery budget, Somers and Murray Springs)
$1.68 per fish total

JH/bj
1/14/85
Ref: JH7

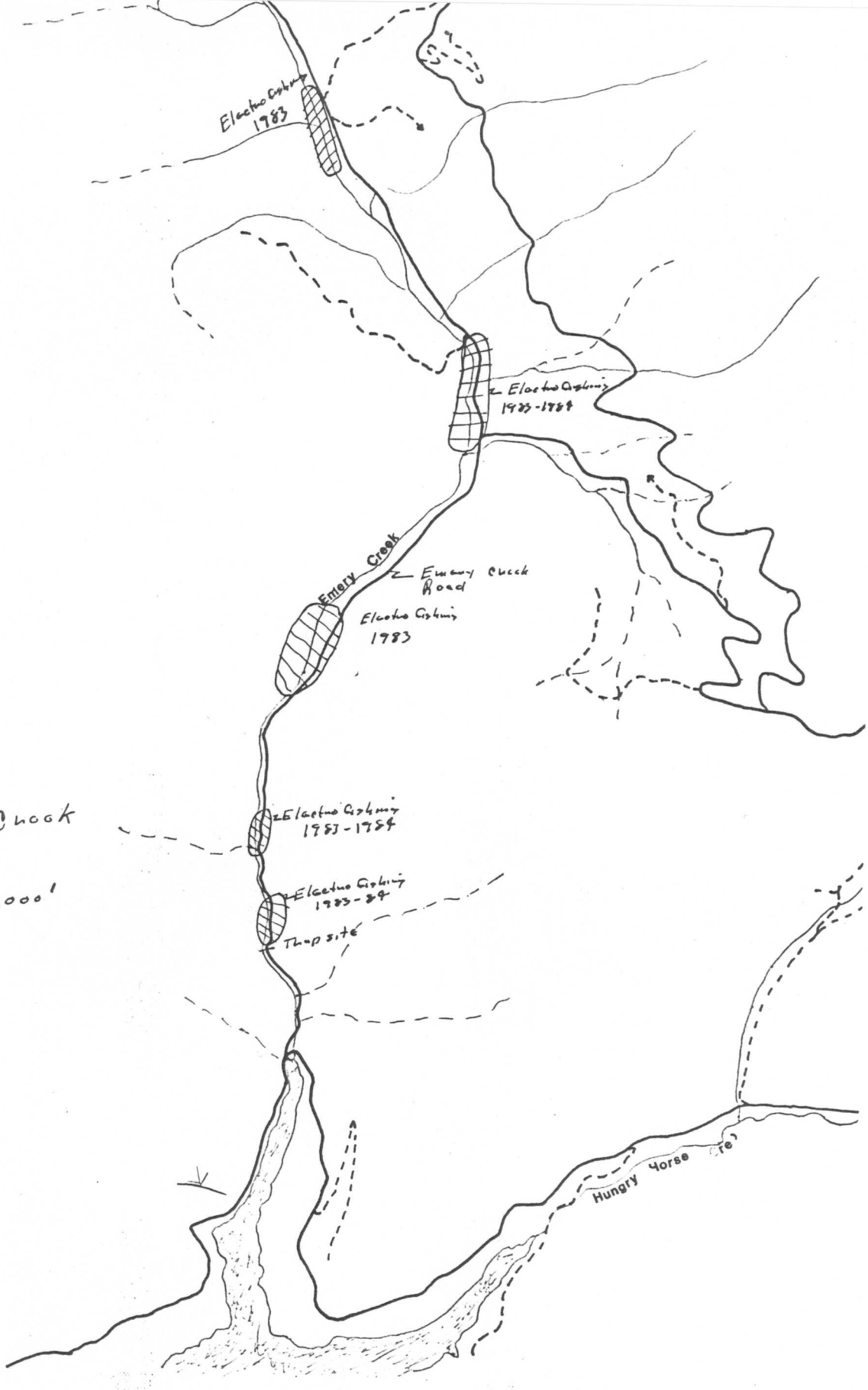


Figure 1.

Emery Creek

scale

1" = 2,000'

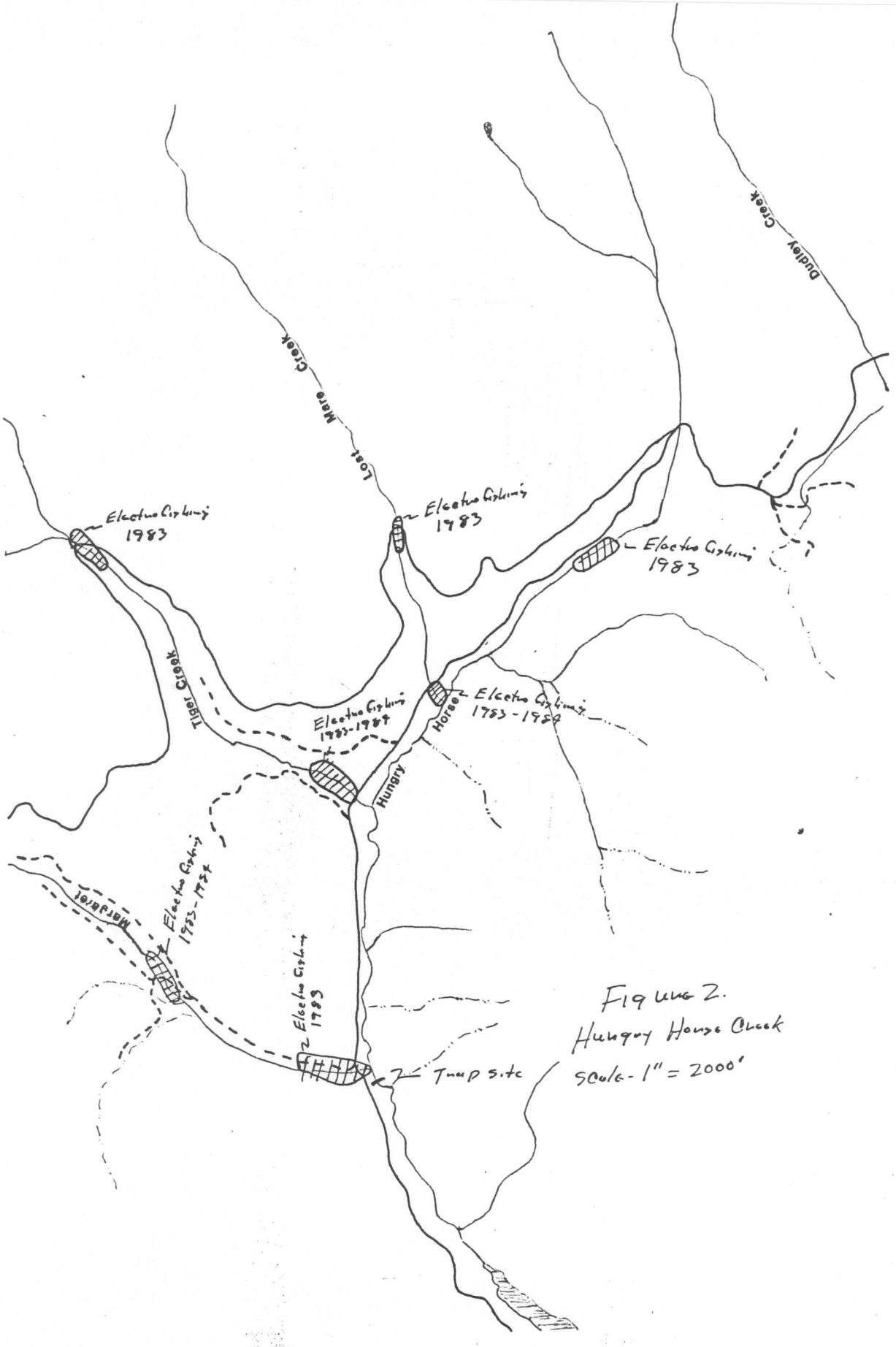


Figure 2.
Hungry House Creek
Scale- 1" = 2000'

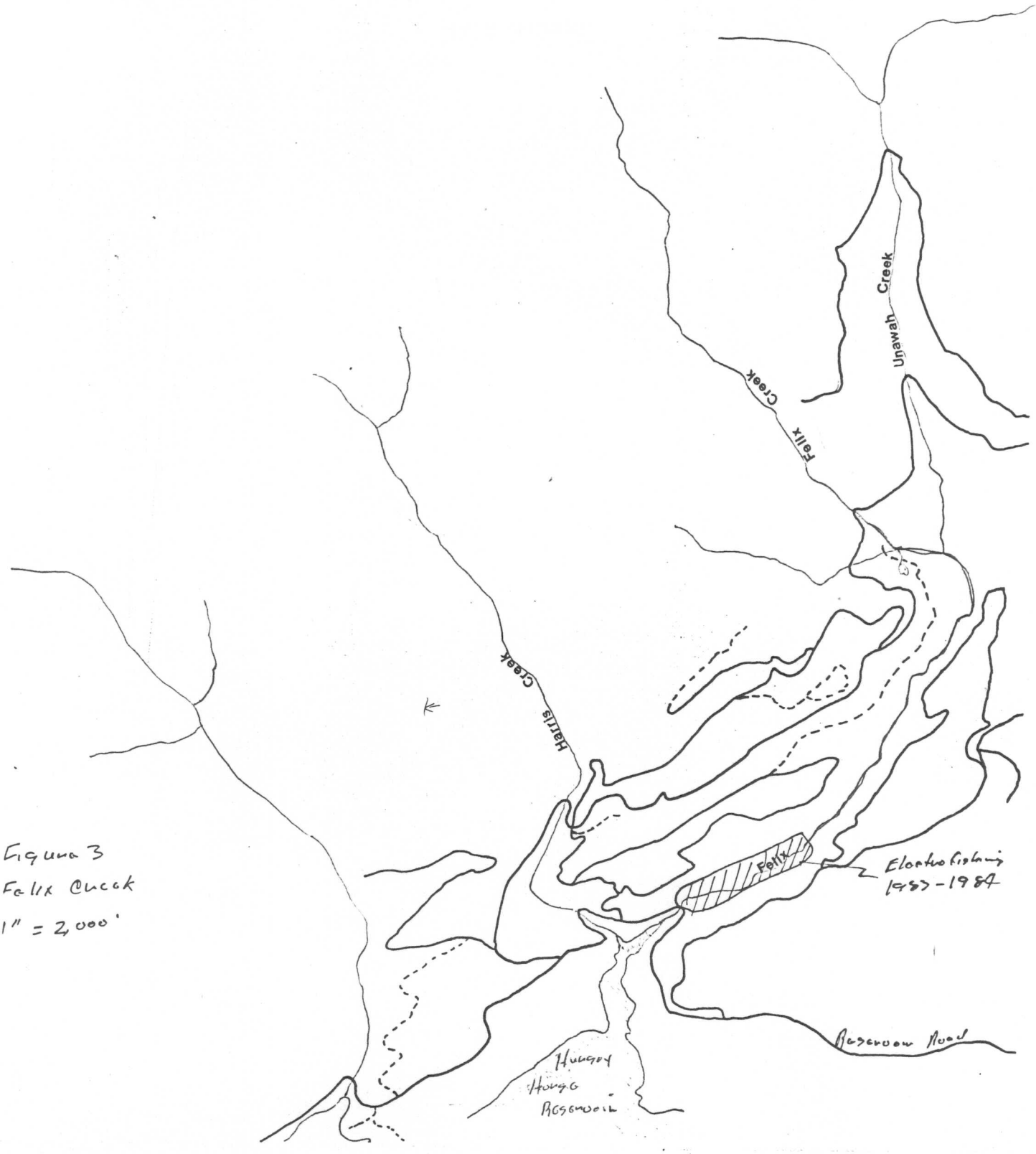


Figure 3
Felix Creek
1" = 2,000'

Figure 4
Tin Creek
Scale - 1" = 2000'
1

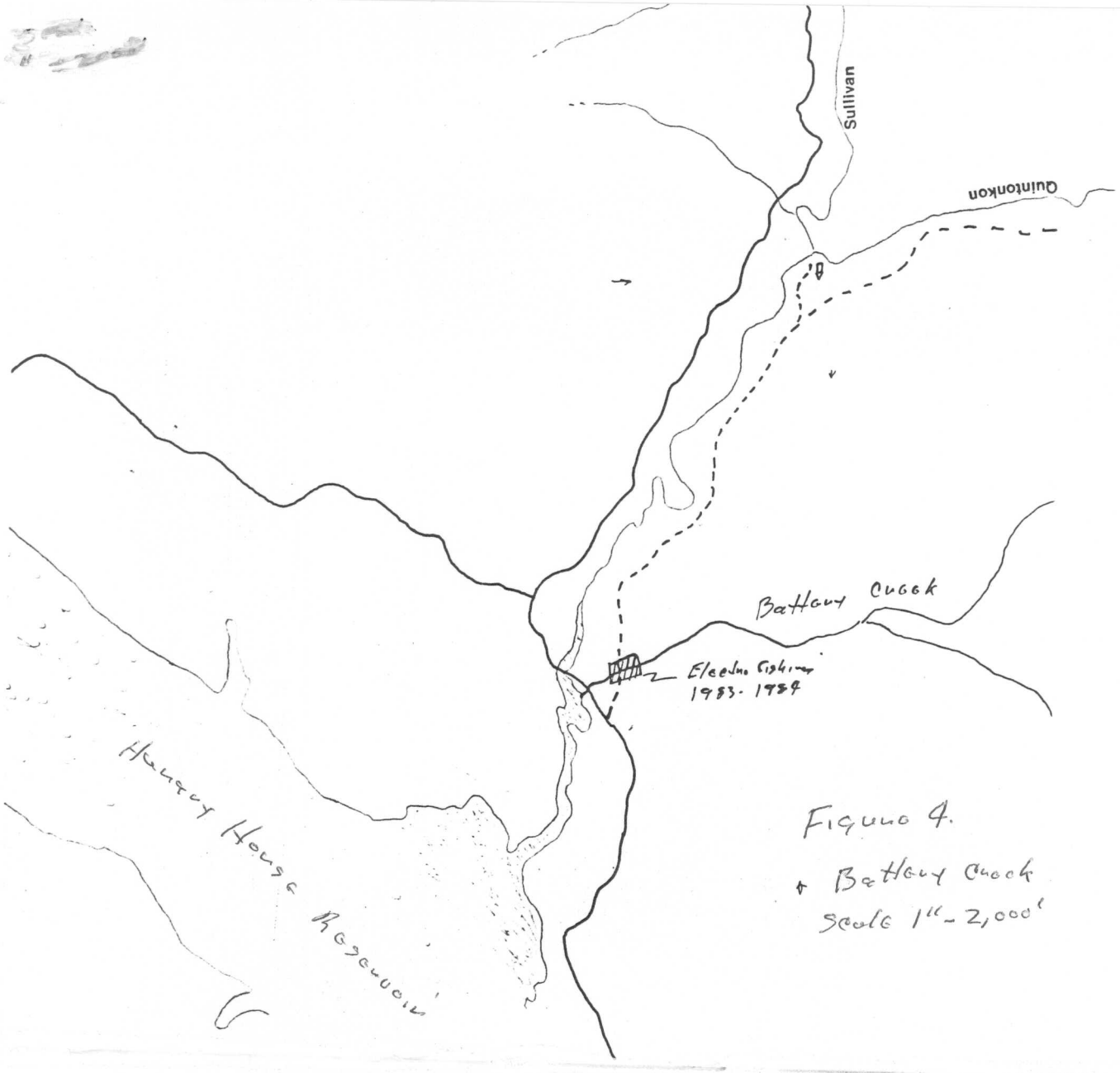


Figure 4.

+ Bethany Creek
Scale 1" - 2,000'

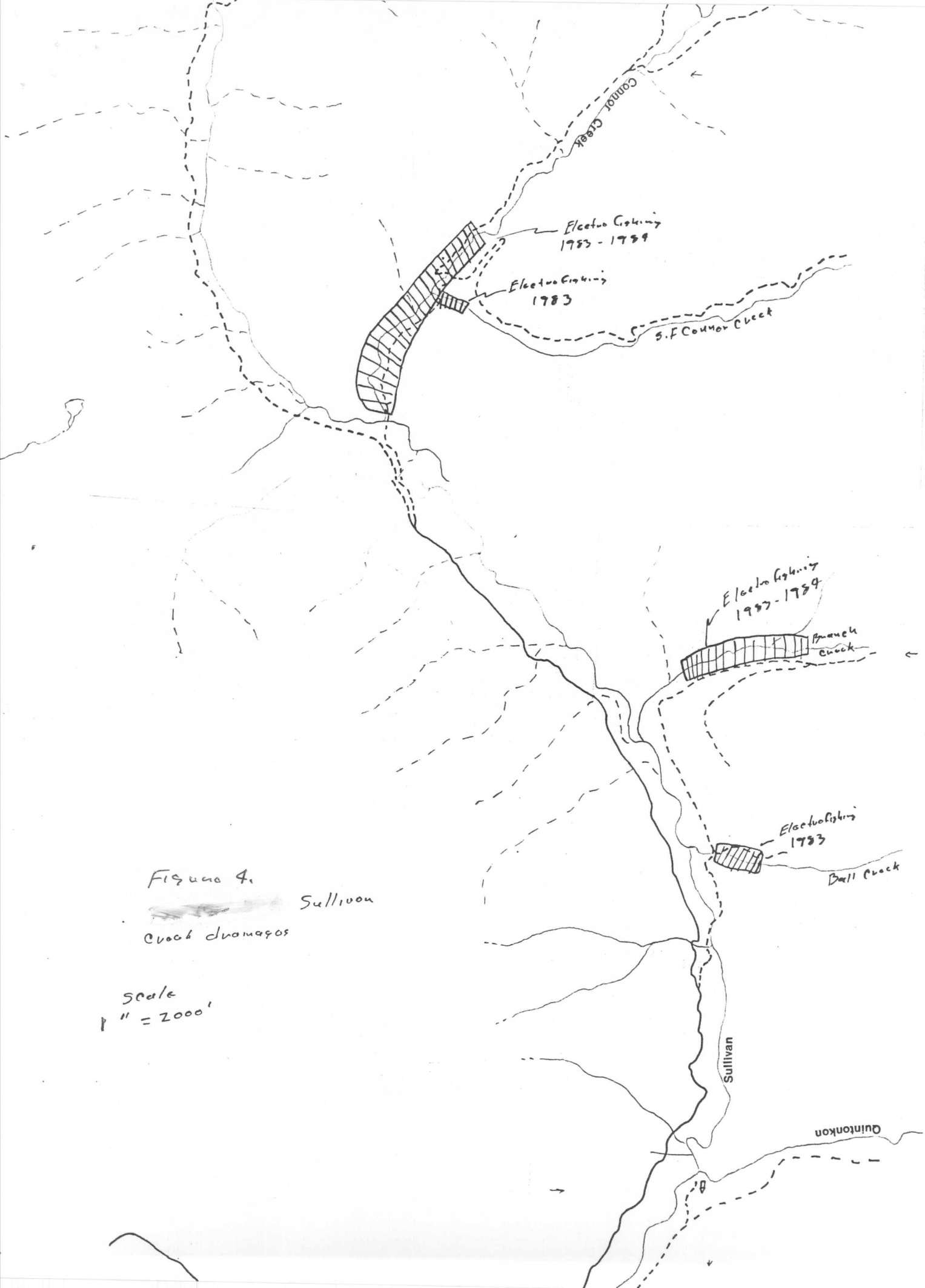


Figure 4.

Sullivan Creek drainage

scale
1" = 2000'

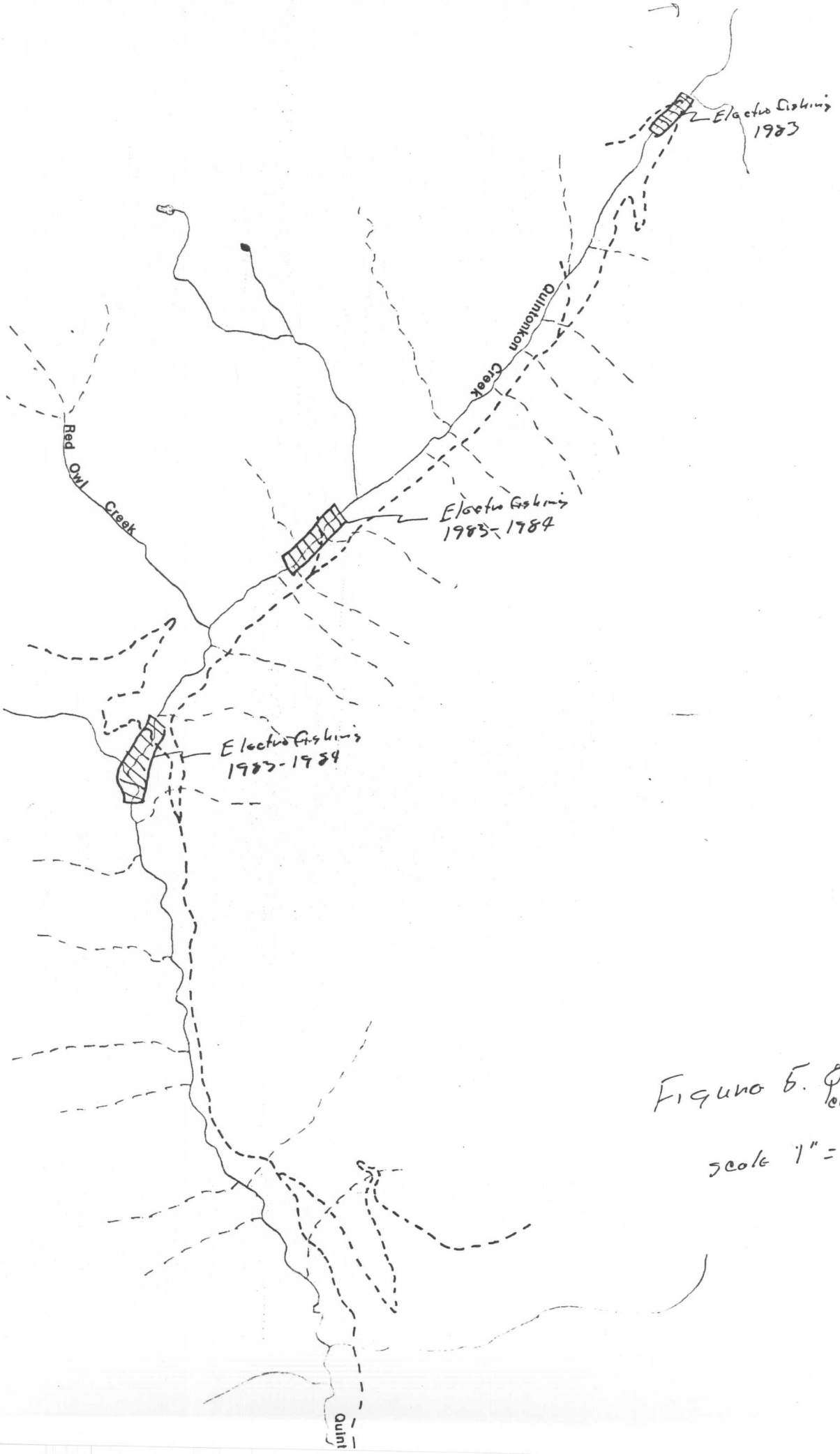


Figure 6. Quinlemkon Creek

scale 1" = 2,000'

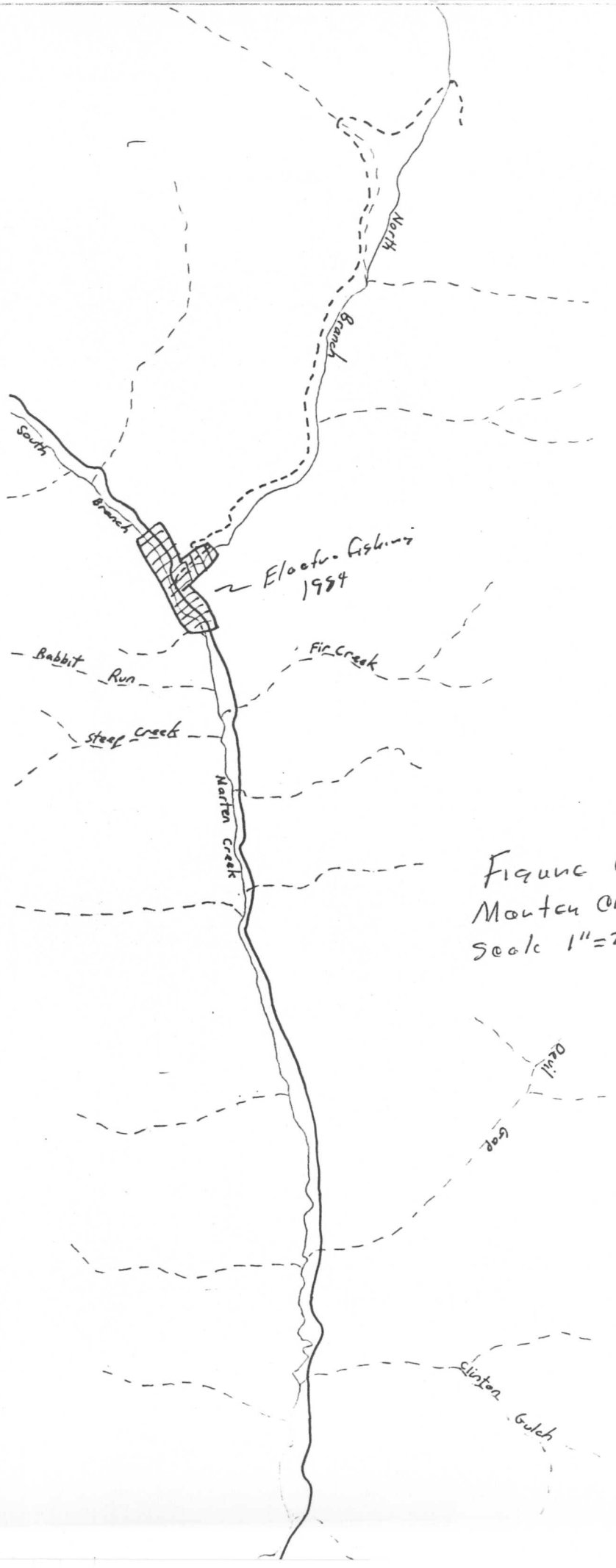


Figure 6.
Marten Creek
Scale 1" = 2,000'

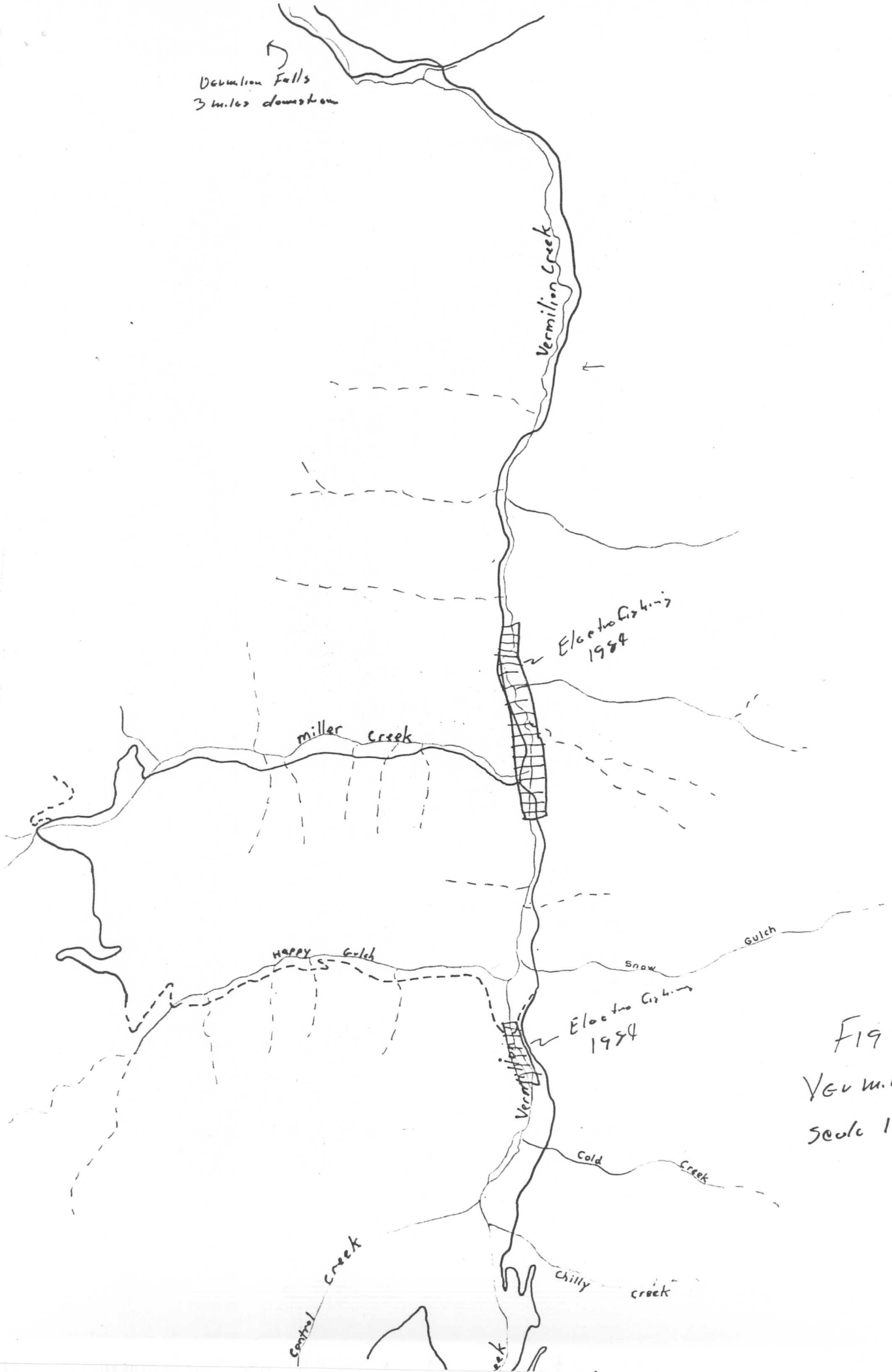
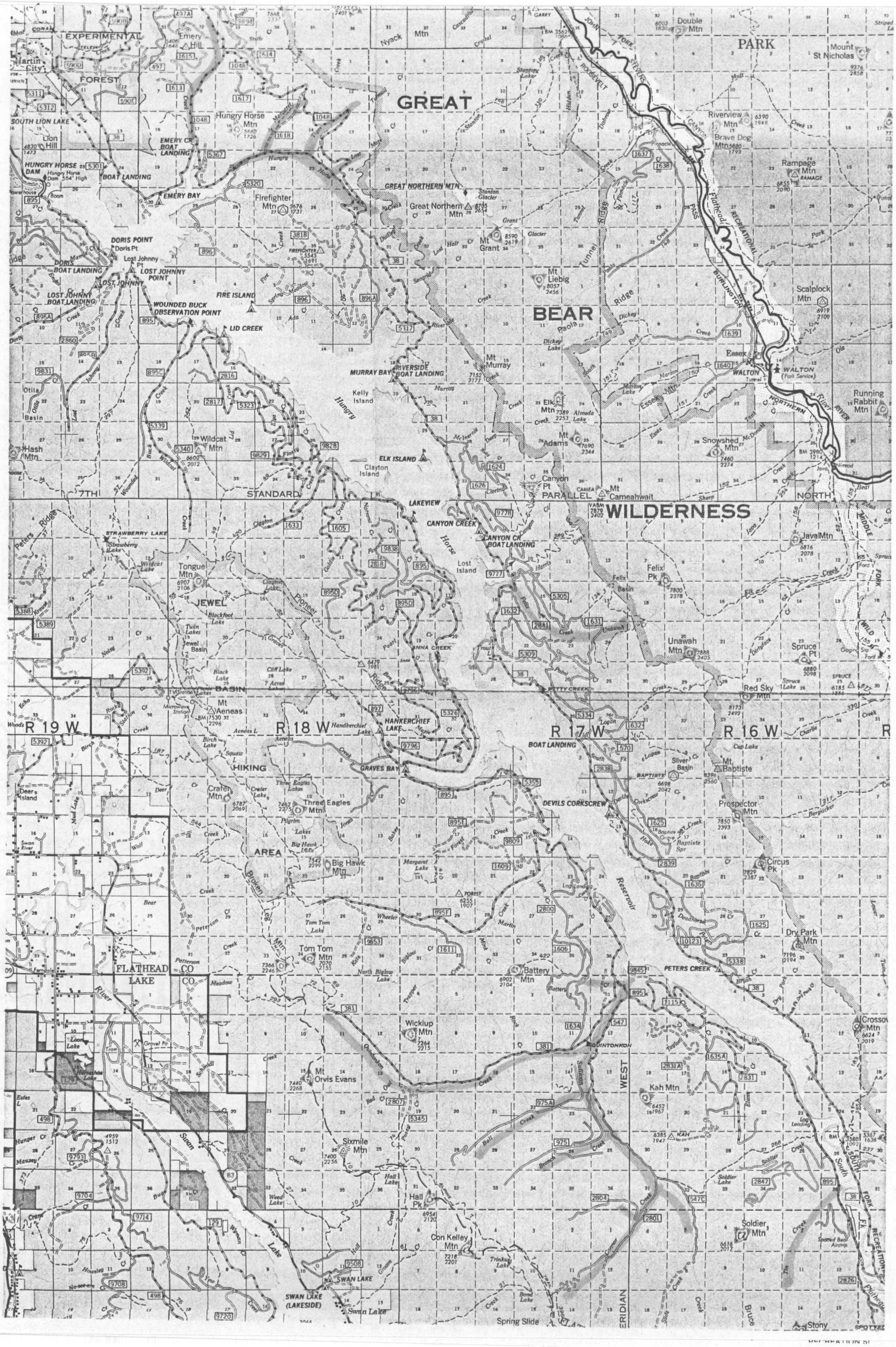
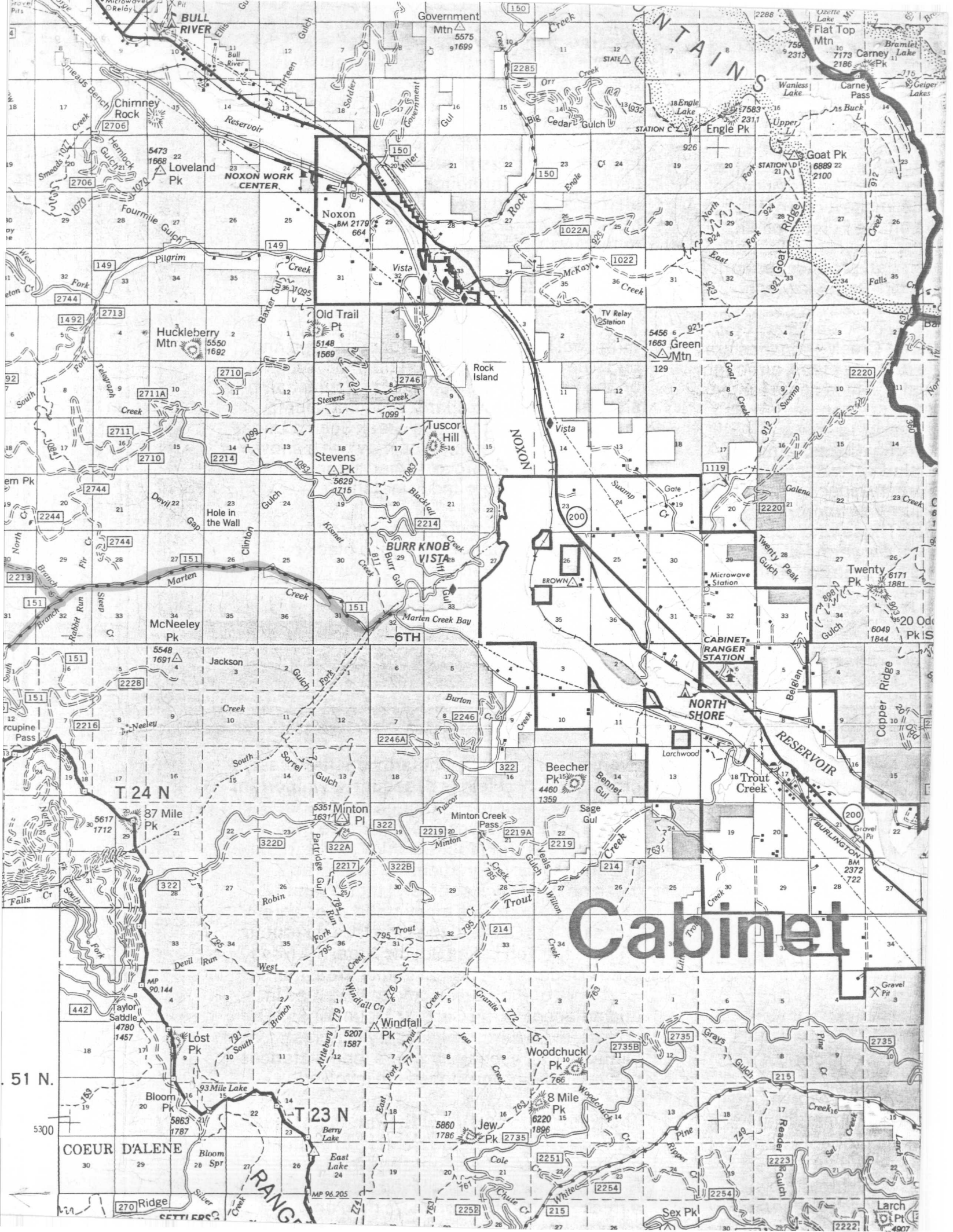


Figure 7
Vermilion R.D.
Scale 1" = 2,000'



GREAT
BEAR
WILDERNESS
PARK
EXPERIMENTAL
FOREST
Martin City
Emery Hill
Nyack Mtn
Double Mtn
Mount St Nicholas
SOUTH LION LAKE
Lion Hill
Hungry Horse Mtn
HUNGRY HORSE DAM
BOAT LANDING
EMERY BAY
EMERY CR BOAT LANDING
Riverview Mtn
Brave Dog Mtn
Rampage Mtn
GREAT NORTHERN MTN
Great Northern Mtn
Stanton Glacier
Firefighter Mtn
Mt Grant
DORIS POINT
Doris Pt
DORIS BOAT LANDING
Lost Johnny Pt
LOST JOHNNY POINT
LOST JOHNNY
LOST JOHNNY BOAT LANDING
WOUNDED BUCK OBSERVATION POINT
FIRE ISLAND
LID CREEK
Mt Liebig
Scalplock Mtn
Dickey Lake
Essex
WALTON
Mt Murray
MURRAY BAY
RIVERSIDE BOAT LANDING
Kelly Island
Elk Mtn
Almeda Lake
Marion Lake
Running Rabbit Mtn
Otila Basin
Hash Mtn
Wildcat Mtn
Mt Adams
Snowshed Mtn
ELK ISLAND
Clayton Island
Canyon Pt
Mt Cameahwait
7TH STANDARD PARALLEL NORTH
LAKEVIEW
CANYON CREEK
CANYON CR BOAT LANDING
STRAWBERRY LAKE
Strawberry Lake
Wildcat Lake
Tongue Mtn
JEWEL BASIN
Blackfoot Lake
Twin Lakes
Jewel Basin
Lost Island
Felix Pk
Java Mtn
Unawah Mtn
Spruce Pt
Black Lake
Cliff Lake
ANNA CREEK
BETTY CREEK
Red Sky Mtn
Mt Aeneas
Aeneas L
HANKERCHIEF LAKE
Handkerchief Lake
R 19 W
R 18 W
R 17 W
R 16 W
BOAT LANDING
Cup Lake
Birch Lake
HIKING AREA
GRAVES BAY
Silver Basin
Mt Baptiste
Deer Island
Crater Mtn
Three Eagles Mtn
Three Eagles Lakes
Pilgrim Lakes
Big Hawk Lake
Big Hawk Mtn
DEVILS CORKSCREW
Prospector Mtn
Baptiste Spr
Circus Pk
Margaret Lake
Reservoir
Tom Tom Lake
Tom Tom Mtn
Dry Park Mtn
North Biglow Lake
Battery Mtn
FLATHEAD LAKE CO
PETERS CREEK
Wicklup Mtn
QUINTONKON
Crossover Mtn
Loon Lake
Mt Orvis Evans
Kah Mtn
WEST MERIDIAN
Sixmile Mtn
Hall Lake
Hall Pk
Weed Lake
Con Kelley Mtn
Soldier Mtn
Trinkus Lake
Bond Lake
SWAN LAKE
SWAN LAKE (LAKESIDE)
Swan Lake
Spring Slide
Stony
Spotted Bear Airstrip


Cabinet
BULL RIVER
Government Mtn 5575 1699
Flat Top Mtn
Carney Pk 7173 2186
Chimney Rock
Loveland Pk 5473 1668
NOXON WORK CENTER
Noxon
Engle Pk 7583 2311
Goat Pk 6889 2100
Huckleberry Mtn 5550 1692
Old Trail Pt 5148 1569
Green Mtn 5456 1663
Rock Island
Vista
Tuscor Hill
Stevens Pk 5629 1715
Hole in the Wall
BURR KNOB VISTA
McNeeley Pk 5548 1691
Jackson
Marten Creek Bay
6TH
CABINET RANGER STATION
NORTH SHORE RESERVOIR
Twenty Pk 6171 1881
Beecher Pk 4460 1359
Trout Creek
Minton Pl 5351 1631
Minton Creek Pass
87 Mile Pk 5617 1712
Taylor Saddle 4780 1457
Lost Pk 5207 1587
Windfall Pk
Woodchuck Pk
8 Mile Pk 6220 1896
Jew Pk 5860 1786
Bloom Pk 5863 1787
93 Mile Lake
Berry Lake
East Lake
Bloom Spr
Sex Pk
Larch Pt
T 24 N
T 23 N
COEUR D'ALENE
Microwave Relay
TV Relay Station
Microwave Station
Gravel Pit
BURLINGTON
BM 2372 722
MP 90.144
MP 96.205