HORSE LINTO CREEK
Summary of Inventories and Project Work 1979-1989

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Stream Report:

Horse Linto Creek
Summary of Inventories and Project Work 1979-1989

prepared by: D. Fuller
April 1990

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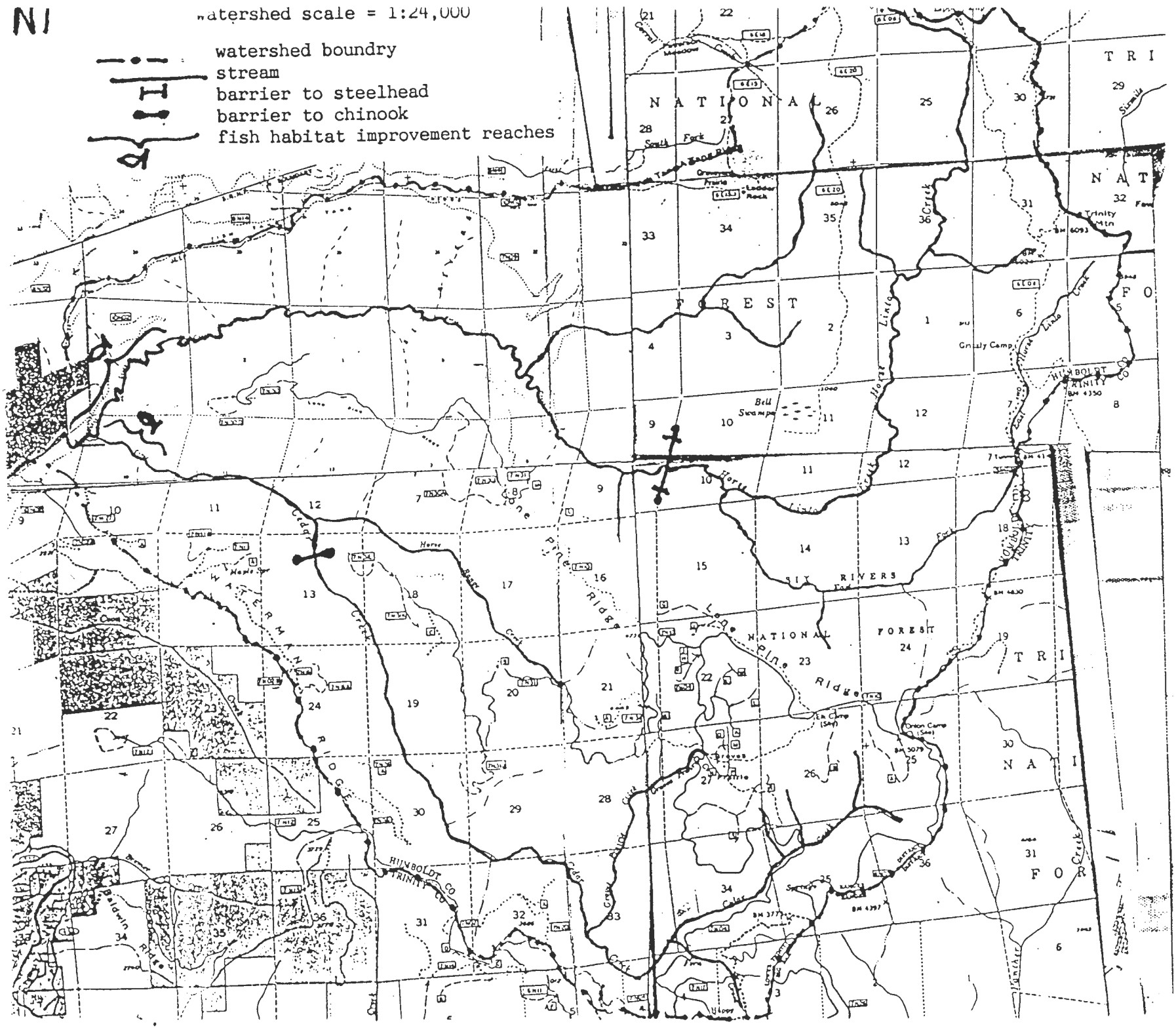

watershed scale = 1:24,000
watershed boundry
stream
barrier to steelhead
barrier to chinook
fish habitat improvement reaches
NATIONAL FOREST
SIX RIVERS
NATIONAL FOREST
Pine Ridge
Bell Swamp
Grizzly Camp
Trinity Mtn
Smith Fork
Horse Linto Creek
Maple Creek
Baldwin Ridge
HUMBOLDT CO
TRINITY CO

Habitat Type	Number Code	Letter Code
Low Gradient Riffle	1	LGR
High Gradient Riffle	2	HGR
Cascade	3	CAS
Secondary Channel Pool	4	SCP
Backwater Pool /Boulder	5	BWP
Backwater Pool /Rootwad	6	BWP
Backwater Pool /Log	7	BWP
Trench Pool	8	TRP
Plunge Pool	9	PLP
Lateral Scour Pool /Log	10	LSP
Lateral Scour Pool/ Rootwad	11	LSP
Lateral Scour Pool/ Bedrock	12	LSP
Dammed Pool	13	DPL
Glides	14	GLD
Run	15	RUN
Step-Run	16	SRN
Main Channel Pool	17	MCP
Edgewater	18	EGW
Channel Confluence Pool	19	CCP
Lateral Scour Pool /Boulder	20	LSP
Pocket Water	21	POW
Corner Pool	22	CRP

HORSE LINTO CREEK LOWER TRINITY R.D. SIX RIVERS NATIONAL FOREST COUNTY: HUMBOLDT

TABLE 1A - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS (IN FEET) SURVEY DATES: 7/1/87 - 7/21/87

CONFLUENCE: T.7N., R.5E., SEC. 9 WATERSHED CODE: 018-001-002-011-? USGS QUADS: TISH TANG POINT

UNITS MEASURED	HABITAT TYPE	MEAN LENGTH FT.	TOTAL LENGTH FT.	% TOTAL LENGTH	MEAN WIDTH FT.	MEAN DEPTH FT.	MAXIMUM DEPTH FT.	MEAN AREA SQ.FT.	TOTAL AREA SQ.FT.	MEAN VOL. CU.FT.	TOTAL VOL. CU.FT.	MEAN RESID. POOL VOL. CU.FT
188	1	158.5	29798.0	52.32	25.2	0.9	1.5	4140.5	778406.5	3757.7	706438.8	0.0
64	2	76.0	4865.5	8.55	24.2	1.0	1.7	1911.3	122320.5	1885.0	120636.9	0.0
2	3	178.3	356.5	0.63	30.0	1.2	2.8	4732.5	9465.0	6848.9	13697.7	0.0
1	4	22.0	22.0	0.04	14.0	1.5	2.4	308.0	308.0	462.0	462.0	646.8
13	5	31.0	403.5	0.71	12.9	1.5	2.3	364.8	4743.0	583.3	7583.0	548.3
11	7	20.3	223.0	0.39	14.5	1.5	2.2	290.4	3194.0	446.0	4906.4	497.5
3	8	55.0	165.0	0.29	10.3	2.6	4.2	685.7	2057.0	2090.2	6270.6	3288.5
11	9	28.2	310.0	0.54	23.7	2.5	3.8	645.7	7103.0	1653.7	18190.2	2096.5
7	10	21.0	147.0	0.26	19.6	2.2	3.4	480.8	3365.5	1180.8	8265.8	1575.2
10	11	40.2	402.0	0.71	17.3	2.1	3.0	747.7	7477.0	1632.5	16225.4	1612.6
78	12	55.2	4084.5	7.19	16.9	2.7	4.4	937.1	71219.5	2505.4	190408.3	3359.6
1	13	15.0	15.0	0.03	12.0	2.4	3.5	180.0	180.0	432.0	432.0	540.0
19	14	77.3	1468.6	2.58	27.5	1.4	2.2	2201.1	41820.0	3088.1	58674.3	0.0
109	15	66.3	7232.0	12.70	20.8	1.4	2.2	1462.7	159431.0	1994.7	217423.2	0.0
27	16	124.1	3352.0	5.89	22.3	1.4	2.3	2740.5	73992.9	3824.9	103248.0	0.0
52	17	62.8	3263.0	5.73	21.9	2.8	4.5	1394.8	72528.0	4024.5	209273.7	5560.5
1	19	87.0	87.0	0.15	42.0	3.7	6.8	3654.0	3654.0	13519.8	13519.8	22654.8
9	20	37.0	333.0	0.58	19.2	2.0	3.2	775.1	6976.0	1552.1	13968.7	1802.0
4	21	102.3	409.0	0.72	28.3	1.6	2.6	2919.3	11677.0	4957.9	19831.4	0.0

TOTAL UNITS MEASURED= 608

TOTAL LENGTH 56938.6 FEET

TOTAL AREA 1379917.9 SQ.FEET 31.7 ACRES

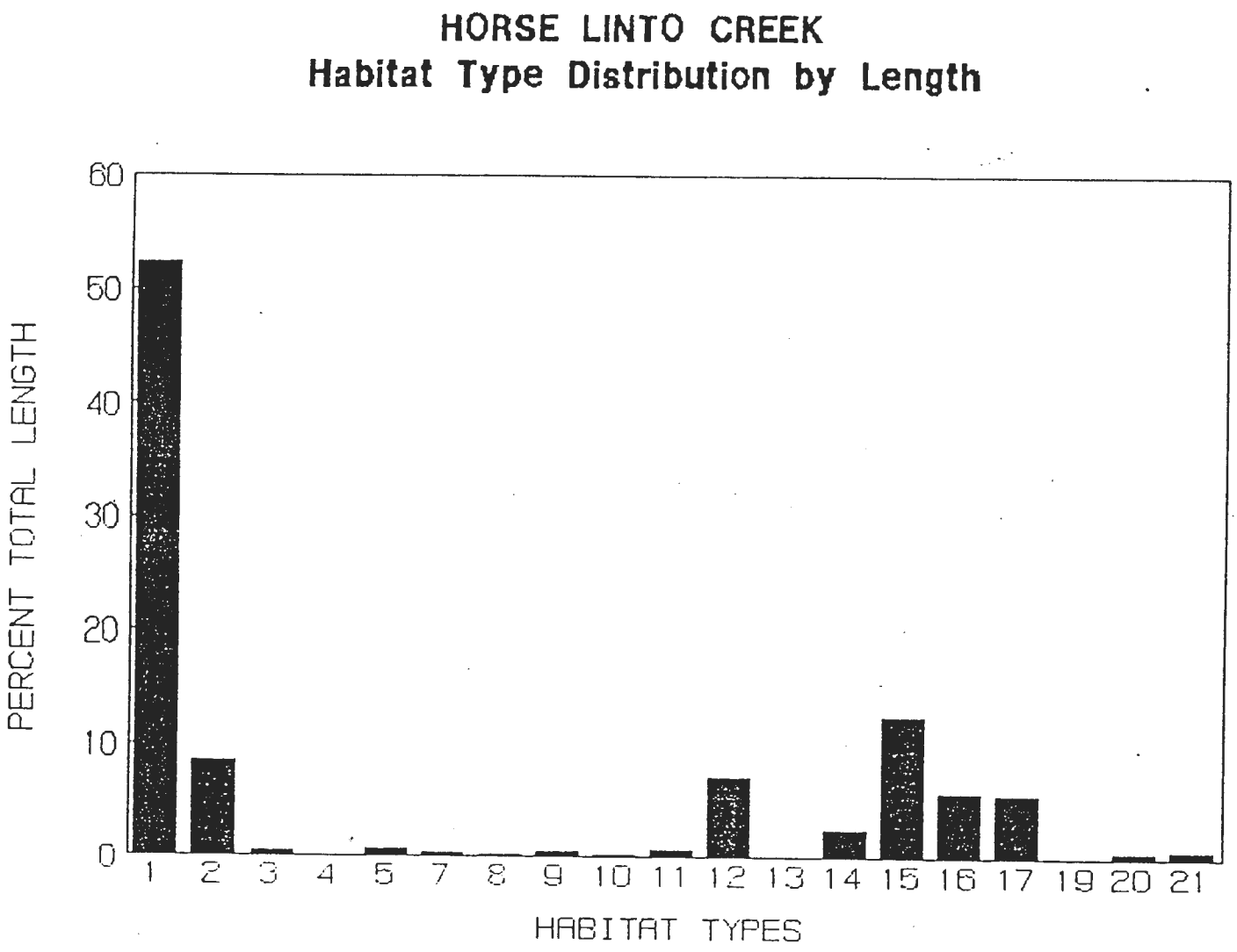
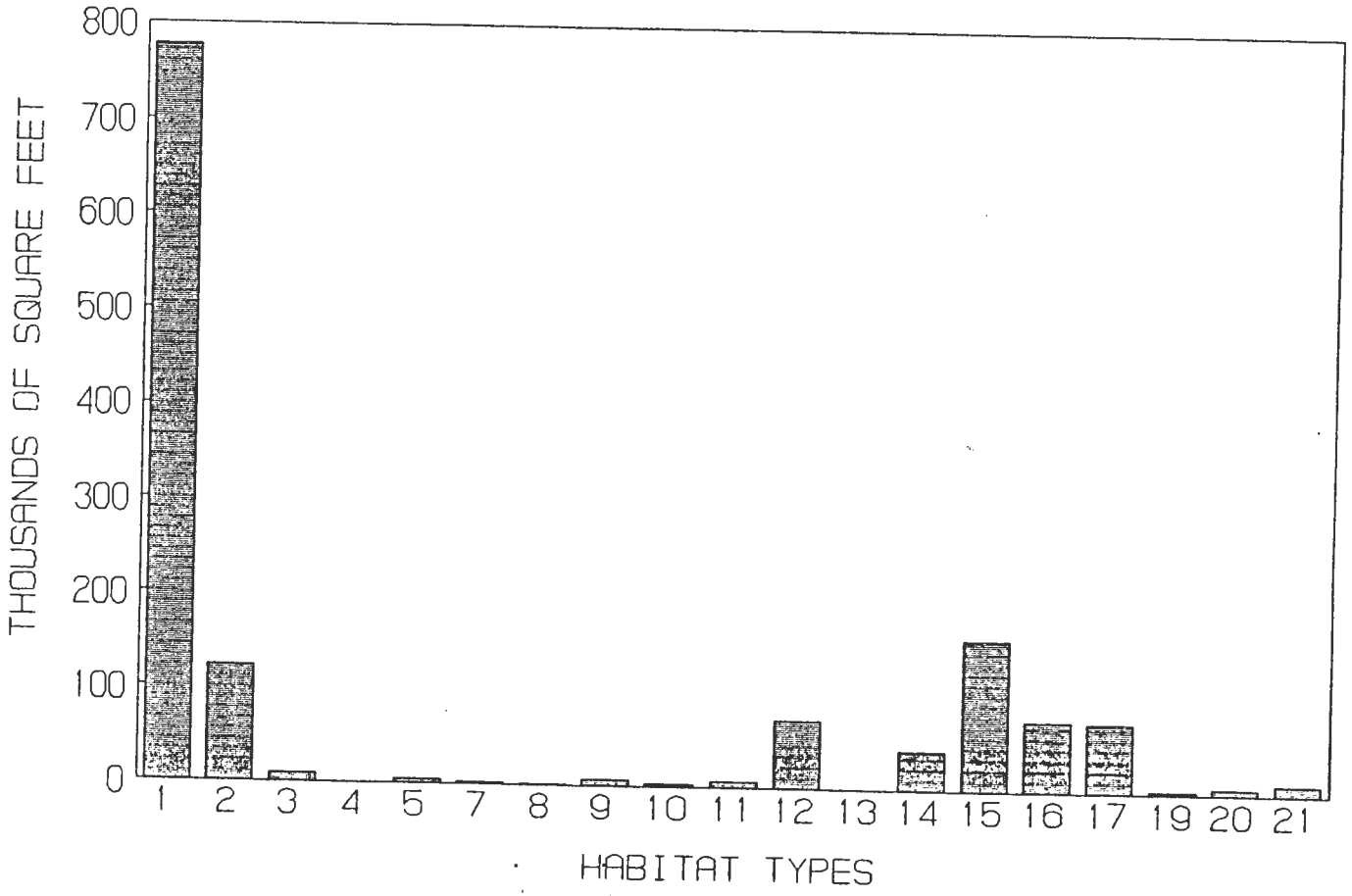


Figure 2. Distribution of habitat types in Horse Linto Creek by length.

HORSE LINTO CREEK
Habitat Type Distribution by Area



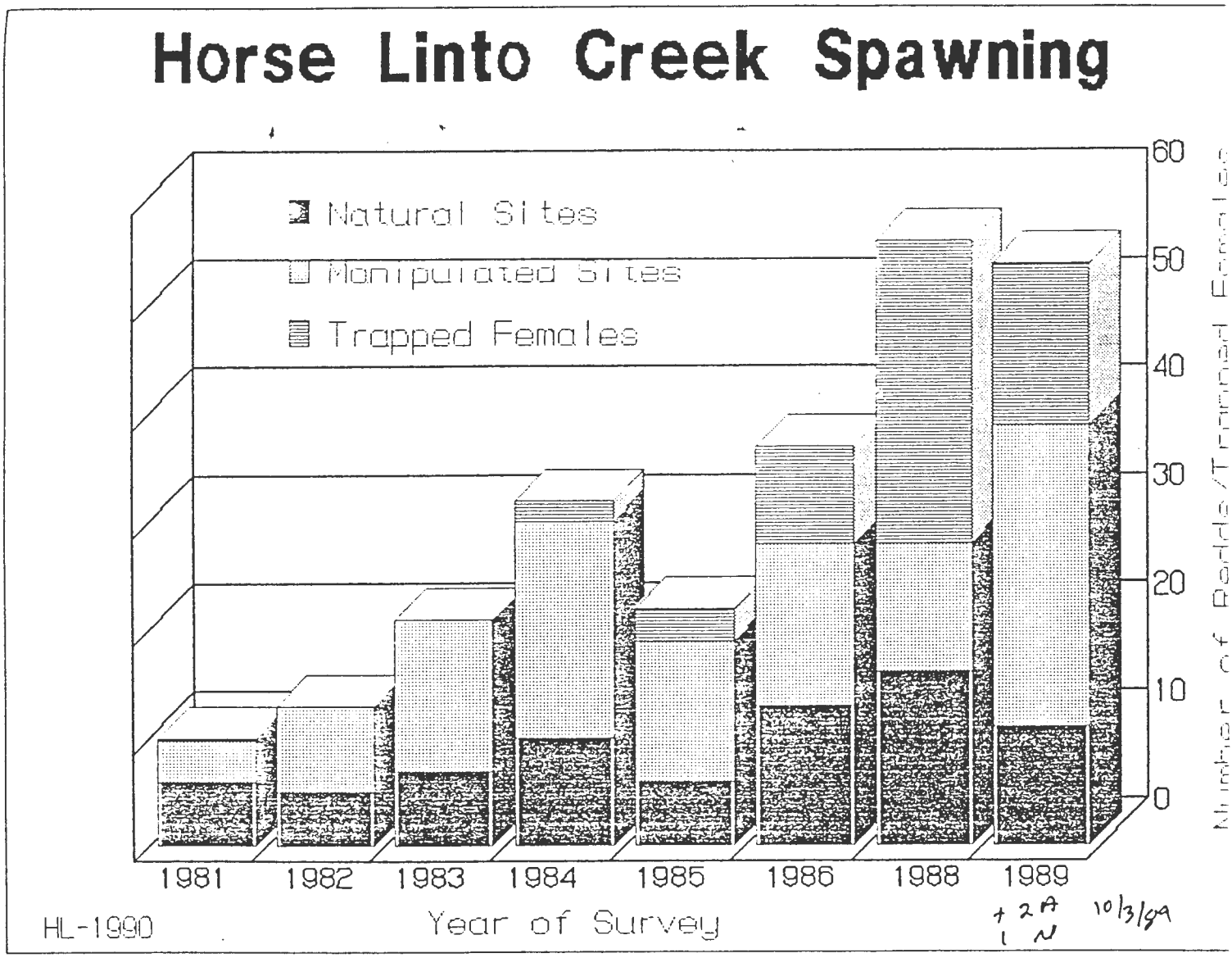


Figure 5. Number of chinook salmon redds and trapped females in Horse Linto Creek from 1981 through 1989.

The major habitat forming elements are bedrock outcrops and large woody debris. Large woody debris is uncommon in the stream channel but has a effect on channel stabilty and scour where it is present according to observations of the survey crew and others familiar with the stream channel.

III. Management Summary

Habitat Use vs Availability

Rearing Habitat

To this date, very limited samples of fish populations have been conducted in Horse Linto Creek. A total of 25 habitat units (4 LGR, 2 HGR, 4 GLD, 5 RUN, 3 SRN, 5 MCP, and 2 LSP) were sampled using direct observation techniques (two divers making repeated passes) during September 1988. Since the total number of units sampled is so small, this data is of limited use. However, this data was used to examine habitat use vs availiability (figure 4). Step-Runs (SRN), runs and low gradient riffles had the highest density of steelhead parr. No information on chinook or coho salmon was collected.

Spawning Habitat

Surveys of chinook salmon spawning areas have been conducted since Fall 1980. Surveys are conducted every ten days, weather permitting, beginning in October and running until the spawning run is complete (usually December). Redds are counted, measured, and flagged. Carcasses are counted, measured, and checked for coded wire tags (CWT). Any live adult salmonids observed are noted, lengths are estimated, and sex is recorded if known.

The chinook salmon population in Horse Linto Creek has been judged to be limited by low escapement thus major efforts have been undertaken to increase escapement. Increases in the amount of suitable spawning habitat have been accomplished through instream stuctures and stabilization of a large landslide. Increases in the number of smolts produced has been accomplished through a small hatchery, egg boxes, and rearing habitat improvement structures (see appropriate sections of this report for further discussion). Since 1981, there has been a 500% increase in the number of returning adult female chinook salmon (figure 5) which can be at least partially attributed to the above efforts to increase escapement.

Critical Habitat Needs

Rearing Habitat

Horse Linto Creek is dominated by low gradient riffle habitat. Much of this habitat is shallow and lacking in structure and major roughness elements. Results from researchers at the Pacific Northwest Experiment Station (Everest, Sedell, and Reeves) and well as studies conducted on Six Rivers National Forest (Fuller in preparation, McCain 1989) show that a complex assemblege of microhabitat conditions that result from abundant roughness elements (large woody debris, large boulders, etc) is a key factor in salmonid production. Monotypic reaches found in Horse Linto Creek are lacking in these characteristics and this lack of rearing habitat is thought to be the limiting factor to steelhead production. The fish habitat improvement program has sought to decrease this limitation.

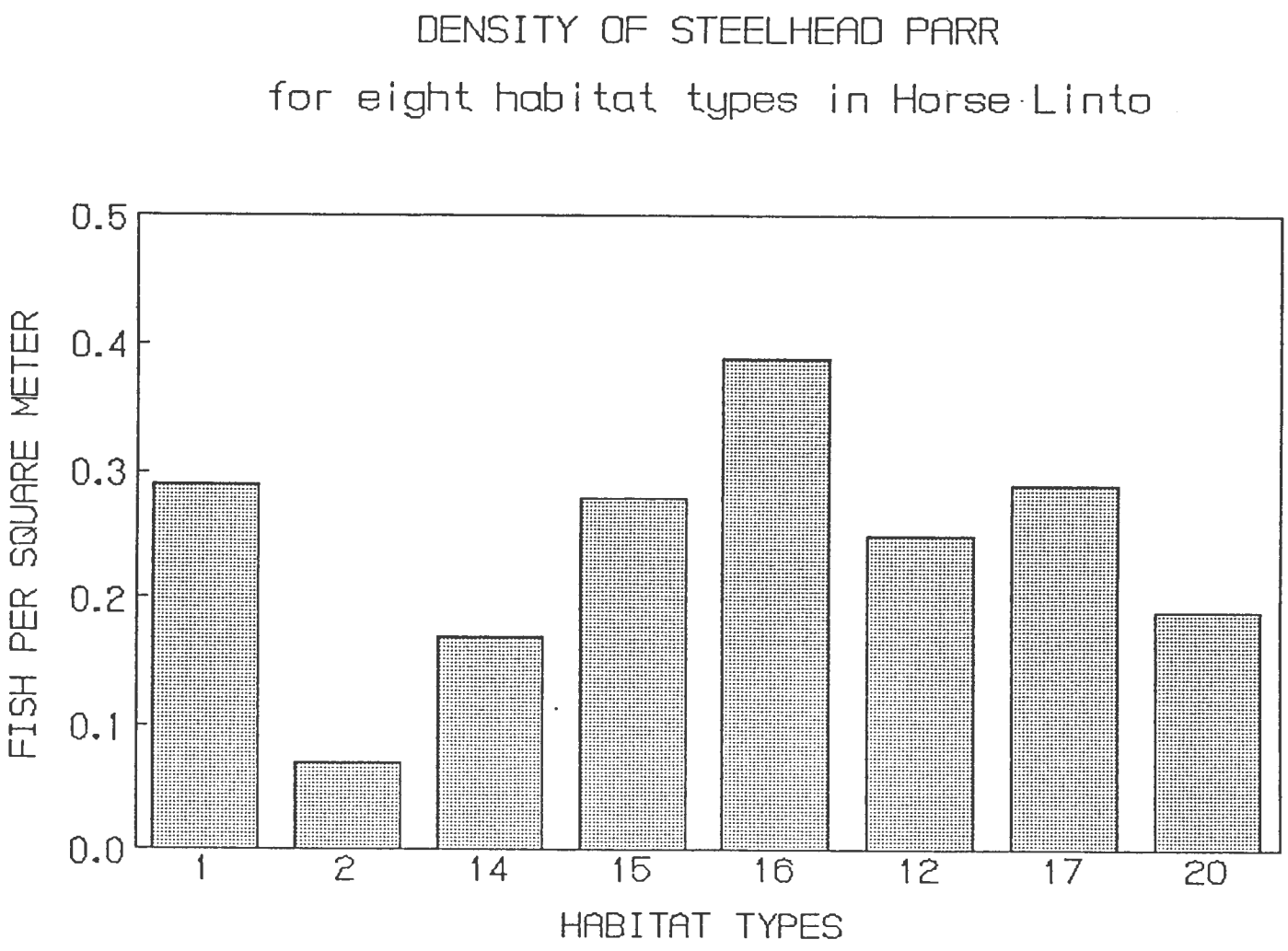


Figure 4. Densitiy of steelhead parr in eight habitat types in Horse Linto Creek, September 1988.

Spawning Habitat

A lack of suitable spawning habitat for chinook salmon is thought to exist compared to the estimated potential of Horse Linto Creek to produce chinook salmon. At this time, due to limited escapement, full utilization of available habitat has not occured during the time data has been collected. Spawning habitat for coho salmon and steelhead are not thought to be limiting production.

Fish Habitat Improvement Program

Since 1979, the lower portion of Horse Linto Creek has been modified through a large number of habitat improvement and restoration efforts. Initial surveys in 1978 revealed that the lower portion of the stream consisted primarily of shallow low gradient riffle habitat with a lack of pools and a lack of spawning gravels (Kerry Overton, pers. comm.). In addition, a large landslide (known as the Horse Linto Landslide) was introducing large amounts of fine sediment into the stream causing the reach downstream to be highly embedded and unsuitable for spawning. The overall objectives of the habitat improvement program were to: 1) create suitable spawning habitat through landslide stabilization and instream structures, and 2) improve rearing habitat conditions by converting some low gradient riffle habitat to lateral scour pools and introducing structural elements via instream structure projects to increase habitat diversity.

A total of 143 instream structures have been placed into Horse Linto Creek since 1979 in efforts to increase spawning and rearing habitat and a total of 7 projects have been undertaken for channel stabilization (table II).

Table II
Instream Fish Habitat Restoration Projects in Horse Linto Creek 1979-1989

Year	Number	Type	Cost
1979	4	Gabion Weirs	4370
1980	2	Gabion Weirs	11000
1981	3	Boulder Weirs	3800
1981	1	Log Jam Modification	600
1981	2	Bridge Removal	2000
1982	52	Boulder Structures	12600
1982	2	Boulder Weirs	200
1982	9	Gabion Weir/Deflector	13000
1982	3	Channel Stability	7500
1982	1	Bridge Removal	5000
1983	2	Bank Stabilization	100
1983	1	Gully Deflector	9000
1983	9	Gabion Weirs/Deflectors	28517
1983	1	Boulder Deflector	400
1983	1	Log Deflector	500
1984	4	Gabion/Log Structures	10600
1984	5	Boulder Structures	16465
1985	1	Gabion Deflector	2400
1986	1*	Boulder Weir (mod. gabion)	unavail.
1987	1*	Boulder Weir (mod. gabion)	"
1987	4*	Log/Gabion (mod. gabion)	"

1988	2*	Log Structure (mod. gabion)	"
1988	9*	Boulder Structures (mod gabion)	"
1989	30	Boulder Deflectors/Clusters	"

TOTALS: 150 * structures converted from gabion type to other types

Net Total = 126 (Net= Total - conversion of existing structures)

Weirs (gabion, boulder, and log) have been used extensively to trap suitable gravels and create proper hydraulic conditions for chinook salmon spawning. Deflectors (gabion, boulder, and log) have been used to modify riffle habitat to Lateral Scour Pools which increase the diversity of rearing habitat and increase the amount of pool-tail habitat which is preferred for spawning. Boulder clusters have been placed mid-channel to modify riffle habitat to Pocket Water habitat, increase depth, increase cover, and increase channel complexity.

Biorestoration Facility

Since the chinook salmon population in Horse Linto Creek is limited by escapement, Six Rivers National Forest in cooperation with other agencies and user groups has been involved in biorestoration efforts since 1981. The goal of these efforts, in conjuction with habitat improvement efforts, has been to increase escapement of fall-run chinook salmon to a level comensurate with available spawning habitat.

Biorestoration began in 1981 with Six Rivers National Forest started an egg box program with 20,000 chinook salmon eggs obtained from the Trinity River Hatchery in November 1981. Due to equipment failures only 3500 juveniles survived to be released. In addition, 20,000 coho salmon eggs were obtained resulting in 13,000 fry released. In 1982 20,111 chinook salmon eggs were obtained and 4000 juveniles were released while 20,250 coho salmon eggs were obtained with 8300 fry released.

In 1983-85 egg boxes were discontinued and the Horse Linto Biorestoration Facility was established allowing for spawning, egg incubation, and juvenile rearing. This facility was established as part of a proposal submitted and carried out by the PCFFA and the Klamath-Trinity River Fall-Chinook Salmon Natural Production Enhancement Committee. Operation and maitenence of this facility has bee performed by PCFFA and Six Rivers National Forest with California Department of Fish and Game overseeing the fish culture operations.

In Fall 1985 4 natal fall-run chinook males and 3 natal females were captured in the Horse Linto Weir yielding 8691 fertilized eggs and by October 1986 4971 chinook salmon smolts (with coded wire tags) were released directly into Horse Linto Creek. In Fall 1986 9 females and 10 males were trapped yielding 31,000 eggs. A rearing pond was established the Summer of 1986 and unfortunately 16,000 fry escaped during transfer to the pond. A total of 6780 tagged juveniles were released in July 1987 and another 7015 tagged juveniles were released in October 1987. Eleven males and eleven females were spawned (22 males and 13 females were trapped) Fall 1987 yielding 38,000 eggs. A total of 26,945 tagged smolts were released in October 1988. In Fall 1988 72,900 eggs were taken from 20 females spawned with 21 males (a total of 28 female and 21 males were trapped). In May 1989 32,128 fingerlings were released (25,584 were tagged) and approximately 25,498 tagged smolts were released in October.

In Fall 1989 20 females were spawned with 19 males yielding 53,720 eggs. A total of 28 females, 26 males, and 82 grilse were trapped.

The escapement of females in Horse Linto Creek has doubled since the biorestoration Facility started in 1985. Long term intense monitoring of biorestoration production and spawning ground information will hopefully lead to full utilization of habitat in Horse Linto Creek.

Watershed Restoration

The Horse Linto Landslide was approximately 10 acres in size located on a steep (mean slope 40°) north slope along the left bank. This landslide was introducing large amounts of fine sediment into the stream channel resulting in degradation of salmonid spawning habitat (Northcoast Rehabilitation Group 1982). Before slide stabilization work began, the embeddedness of the substrate was sampled upstream and downstream of the slide. The substrate in the area downstream of the slide was determined to be 70% embedded while the substrate upstream of the slide was determined to be 40% (Kerry Overton, pers. comm.). Spawning surveys show that no spawning occured downstream of the slide.

In the summer of 1982 the slide was stabilized and re-vegetated. The amount of fine sediment introduced into the stream channel from the landslide was reduced substantially. The results of this effort were almost immediate. High streamflows during the fall cleaned the substrate of fine sediments which reduced the embeddedness of the substrate downstream from the landslide to 40%. Chinook salmon spawning occured in the area downstream of the slide during Fall 1982.

A total of 17 other landslides were identified throughout the Horse Linto watershed and were prioritized for repair in 1983. Prioritization was based on the effects on fish habitat. At least five of those identified have been repaired to date.

Research/Study Needs

Currently the need exists for a basin-wide fish population survey. This information is critical to further understanding salmonid production in Horse Linto Creek. This survey is planned for Summer 1990.

In addition, futher research into the role of large woody debris in the channel would be beneficial in understanding habitat formation in this and other streams on the Six Rivers National Forest.

Ongoing Evaluations

Evaluations of the effectiveness of instream habitat improvement structures are underway. Since 1988 pre-project data have been collected on the physical characteristics of the project area and the abundance of salmonids utilizing the project area. Post-project data will be collected on a portion of projects beginning in Spring 1990. Physical characteristics will be mapped and fish utilization will be determined in the Spring (to look for chinook salmon) and in the late summer (to look for steelhead). The project sites will be compared to two control sites to monitor natural variation through time.

IV. Additional Studies

Horse Linto Creek has been the site of a research study conducted by Six Rivers National Forest. In summer 1989 ten habitat units were selected for a study of steelhead habitat needs during summer low-flow conditions. This study involved the preparation of detailed maps and direct observation of fish locations within the mapped habitat units.

Horse Linto Creek has been used as a comparison stream to Grouse Creek (a tribuary to the South Fork Trinity River) because it is similar in size and discharge. The mean width-to-depth ratio of main channel pools was calculated for comparison with Grouse Creek and the mean percentage of fine sediments (< 5mm diameter) was calculated for all pool types for comparison to Grouse Creek.

References

McCain, M.E., D.D. Fuller, C.K. Overton, and L.M. Decker. 1990. Stream habitat classification and inventory procedures for northern California. FHR Currents number 1 . US Forest Service Region 5, San Francisco, California. 22pp.

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Personal Communication:
Kerry Overton, Fisheries Habitat Program Manager, Six Rivers National Forest, Eureka, California.