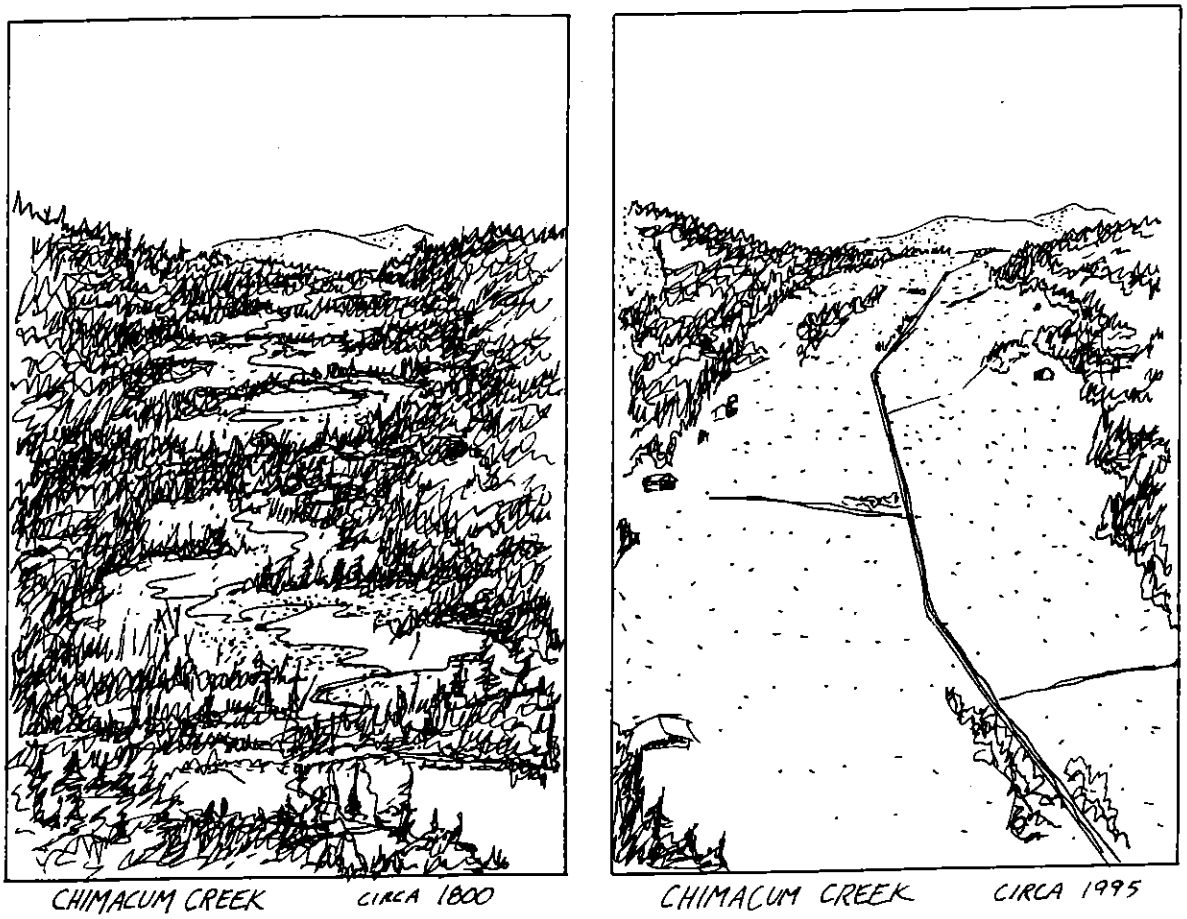
Chimacum Watershed
Coho Salmon Restoration Assessment



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EXECUTIVE SUMMARY

Habitat Loss

Coho salmon (*Oncorhyncus kitsutch*) habitat in Chimacum Watershed has decreased dramatically both in quantity and quality over the past 145 years. Removal of swamps, beaver ponds and channel meanders by extensive ditching of the East Fork, West Fork, and mainstem has inadvertently eliminated over 90% of the coho juvenile rearing habitat from the watershed. In comparison to pre-european settlement (1850s), an estimated 6% of summer rearing habitat, 3% of winter rearing habitat and 88% of spawning habitat remains.

Of this fraction of remaining habitat, most has been degraded by a combination of land use impacts that severely limit coho survival. Major problems include low oxygen and elevated temperatures associated with the lack of forested riparian zones along most of the channelized East and West Forks, heavy siltation of spawning and rearing gravels in the mainstem and tributaries, and loss of channel complexity and structure, particulary the loss of large woody debris that forms pool habitat and cover needed by juvenile coho.

Restoration Recommendations in order of descending priority

- Protect existing high quality habitat. These few remaining areas are the strongholds of the wild coho population.

- Replace seven impassable culverts to provide access to historic spawning and rearing habitat.

- Restore stream side buffers by fencing out livestock, planting native trees along East and West Fork channels, and dredging out reed canary grass mats where necessary to create shade, lower water temperature, discourage reed canary grass invasion, reduce nutrient and fine sediment loading, and possibly increase oxygen levels

- Increase shaded rearing ponds and channels in the East and West Fork valleys to compensate for historic loss of rearing habitat.

- Create plunge pool habitat by installing submerged full-spanning large logs in the main channel of the East Fork to expand adult holding and juvenile rearing habitat.

- Enhance existing spawning and rearing in ditched headwater tributaries by the addition of meanders and large woody debris.

INTRODUCTION

Scope

This report provides a watershed-wide assessment of the habitat limitations to the wild coho salmon population in the Chimacum Watershed. The assessment gives natural resource managers a guide to restoration of coho salmon habitat in the Chimacum and the baseline data necessary to monitor the effectiveness of future restoration activities.

The report consists of a three stage analysis of the Chimacum Watershed's coho population and habitat conditions: existing conditions, historical conditions and assessment of habitat loss and limiting factors. Section 1 evaluates the existing distribution and abundance of coho in the watershed for each phase in their life-cycle: spawning, and summer and winter rearing. The summer rearing life phase is evaluated based on field work conducted during 1995. Winter rearing and spawning life phases are evaluated based on existing general knowledge of habitat needs and preferences of coho and a limited amount of prior spawning data gathered previously in Chimacum Watershed.

In section 2, the environmental history of the Chimacum Watershed is reconstructed to estimate coho salmon population and habitat conditions that occurred prior to Euro-american settlement of the watershed. Based on oral histories from long-time residents of the watershed, General Land Office (GLO) surveys conducted between 1858-1874, a 1919 watershed map showing stream locations as they occurred prior to a major drainage district project, other reports, and knowledge of existing conditions, a summary (text and table) of land use history in the Chimacum Watershed was assembled. From these sources, the habitat conditions and historical distribution and abundance of the coho population was reconstructed.

In section 3, historical (circa 1850) and existing (1995) coho populations and habitats were compared to identify factors that may be limiting coho survival at each stage in their life cycle. The historical loss of habitats -- in terms of quantity, quality and location in the watershed -- is provided.

Finally, we present recommendations for voluntary habitat restoration projects, future research, and monitoring.

Objectives

1) To evaluate habitat limiting factors to coho survival by comparing historic and existing conditions for summer rearing, winter rearing and spawning life-stages.

2) To provide recommendations for voluntary projects that will address these habitat constraints to the coho salmon population of the Chimacum Watershed.

3) To provide comprehensive baseline data on current and historic coho salmon habitat of Chimacum Watershed for use in monitoring and evaluating future habitat conditions and the effect of restoration projects.

4) To establish communication and cooperative affiliation between the Port Gamble S'Klallam Tribe, Jefferson County Conservation District, private property owners and farmers of the Chimacum Watershed, volunteer conservation groups, and the academic community in preparation for future restoration activities.

Overview of Chimacum Watershed

Located on the far north eastern side of the Olympic Peninsula in western Washington, Chimacum Creek forms the largest drainage basin on the Quimper Peninsula. The watershed slopes north in the shape of a "Y," with the mainstem draining north to Admiralty Inlet, Puget Sound (Fig. 1). Combined stream length of the East and West Forks is approximately 29.5 miles. These low gradient creeks drain approximately 37 square miles of land. The uplands are composed of glacial deposits overlying shale, sandstone and lava bedrock. The lowland valleys contain extensive and deep muck and peat soils. Five small lakes are located within the basin: Anderson, Beausite, Gibbs, Peterson and Delanty. Of these, only Anderson is currently connected to Chimacum Creek by a year-round tributary. Rainfall is relatively low for the region. In the rain shadow of the Olympic Mountains, Chimacum Watershed receives approximately 22 inches per year. Summer is normally dry: July and August generally have less than an inch of rain.

All land adjacent to Chimacum Creek is privately owned. Land uses include several large dairy farms, rural residential homes, logging of second growth timber, and a few hobby farms. Although the valleys historically supported cedar and spruce swamps, wet prairies and beaver swamps, most of the lowlands were drained and converted to pasture at or before the turn of the century. Virtually all lowlands have been cleared, dredged and channelized.

Anadromous (migratory) fish runs historically included native coho (*Oncorhyncus kitsutch*), summer and fall chum (*O. keta*) (in the lower 2 miles), and steelhead (*O. mykiss*). Resident fish runs included abundant cutthroat trout (*O. clarki*). Coho, chum, and steelhead now exist as small populations of mixed native and planted stocks.

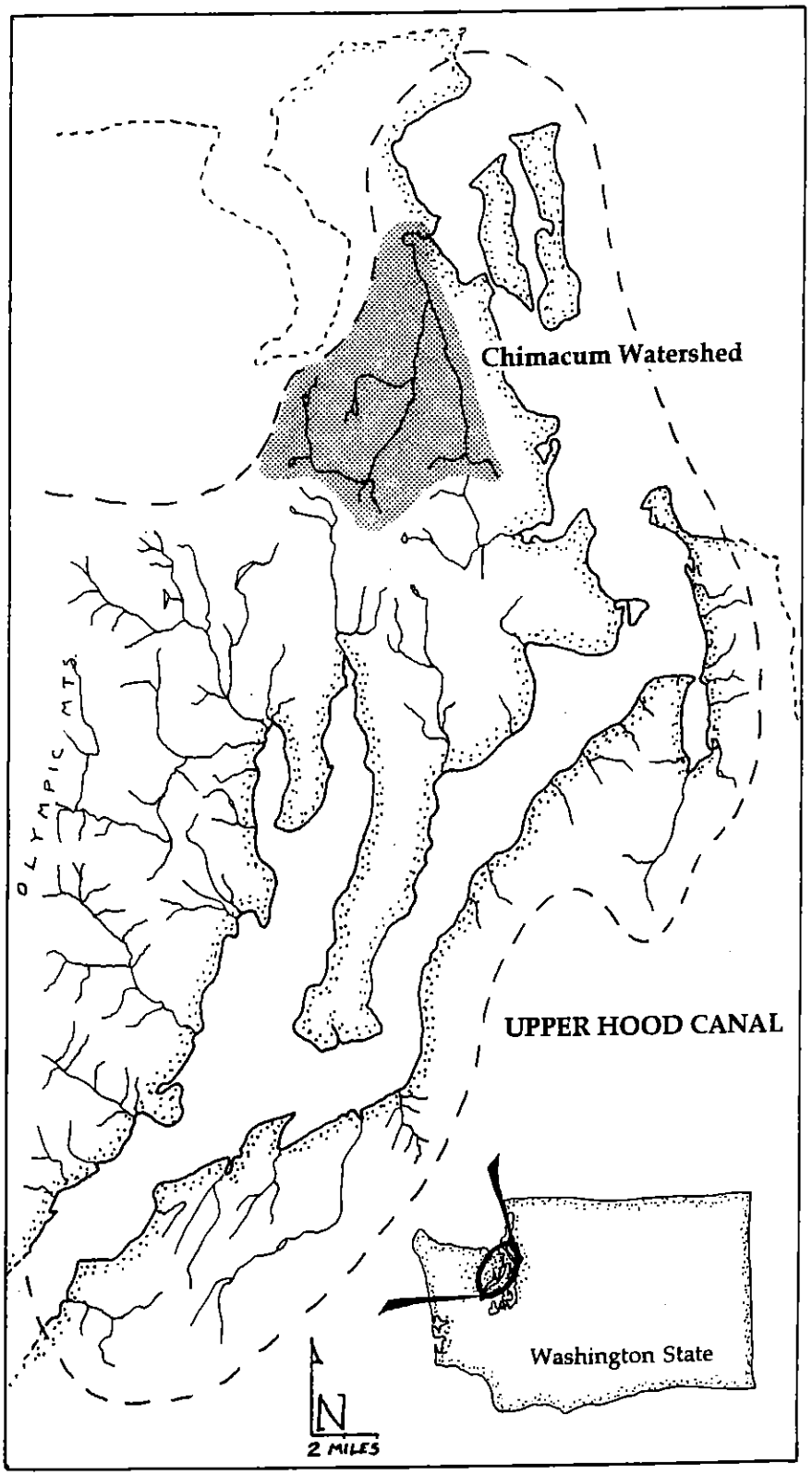


Figure 1. **Location of Chimacum Watershed on the northeast Olympic Peninsula, Washington State.**

Justification for Study

Native coho and chum runs in the Chimacum Watershed are greatly diminished from historic levels (Lichatowich, 1994). According to the Salmon and Steelhead Stock Assessment (SASSI), Chimacum coho are a unique stock due to their geographic isolation and late run timing (WDFW and Western Treaty Tribes, 1994). SASSI lists Chimacum coho as "healthy." However, the SASSI definition does not consider past habitat degradation, but instead measures stock health by utilization of current available habitat. In a more detailed stock assessment, Lichatowich (1994) states that the Chimacum coho population is depressed compared to historic levels. Long-time residents of the Chimacum Watershed agree that abundance of coho spawners in the watershed has declined dramatically (Yarr, Matheson, Broderson, Bishop, pers. comm.) Recent spawning surveys and weir counts indicate a small population. During the winter of 1994-5, 105 adult coho were counted at a weir trap on the West Fork one-eighth mile upstream from the confluence of the East and West Forks. An additional 100 fish were estimated to have passed the weir without being counted (W. Michael, pers. comm.).

Summer chum salmon historically spawned in the lower one mile of stream between the mouth and Irondale Road crossing. Chum spawner surveys conducted between 1971 and 1976 show a total annual count ranging between 15 and 190 fish. An estimated 1500 chum spawned in the stream in 1983 (Lowrie, 1976 and pers. comm.). However, no chum were observed during spawning surveys conducted during the past three years (1993-95) indicating that the summer chum population is extinct (Bahls, 1995).

Historically abundant salmon stocks throughout the Pacific Northwest are declining rapidly, and many stocks are threatened with extinction throughout large portions of their historic range (Nehlson, et al. 1991; Pacific Rivers Council, 1993; Lichatowich et al., 1995). Pacific coho were petitioned for listing under the Federal Endangered Species Act (ESA). In 1995, the coho populations of Oregon and California were listed.

Salmon declines have negatively impacted local and state economies, the biotic integrity of watersheds, and the culture of native people who have relied on salmon as a dietary mainstay for more than 8,000 years (Croes and Hackenderger, 1988). Chimacum Watershed is the largest and potentially most productive coho watershed in the northeast Olympic Peninsula.

The health of the salmon runs is of great concern to the Port Gamble , Lower Elwha and Jamestown S'Klallam Tribe and the Skokomish Tribe; four Tribes which share Chimacum Creek as part of their Usual and Accustomed fishing grounds reserved by the Point No Point Treaty of 1855. The chum and coho runs are also of concern to many other local residents, to the Jefferson County Conservation District, which seeks to balance ecological and agricultural interests, and to Wild Olympic Salmon, a community group which supports salmon restoration efforts. Determining the most effective methods for coho habitat restoration is the focus of our study.

A diverse group of stakeholders including Jefferson County, Tribes, environmental groups and agricultural and development interests recently completed the Dungeness-Quilcene Pilot Project, a two-year planning process designed to resolve water resource issues in eastern Jefferson and Clallam Counties, including the Chimacum Valley. The plan recommends that "Salmon habitat which has been destroyed or degraded in eastern Jefferson County should be enhanced and restored, and areas not yet impacted should be maintained and protected." (Dungeness-Quilcene Water Resources Management Plan, 1994).

Native salmon stock declines are attributed to habitat loss, over-fishing, and negative interactions with hatchery stocks (Nehlson et al., 1991) as well as changes in marine primary production and predation by animals. We recognize that myriad factors are probably impacting the coho runs on the Chimacum. However, preliminary testing between 1991 and 1994 indicated that high summer temperatures and a lack of summer rearing habitat may limit coho population size (Bahls, 1993). Since 1919, mainstem and tributary streams in the valley have been channelized to drain agricultural land; reducing side channel and wetland rearing areas (Williams et al. 1975, Lichatowich, 1994). Summer rearing habitat is currently further reduced by water diversion for irrigation (Lichatowich, 1994).

Approach

Historic habitat conditions and fish distribution were compared to existing conditions and to known biological requirements of the species to identify constraints to coho survival. The assessment focused on three major freshwater life stages: summer rearing, winter rearing and spawning. Based on this evaluation, site-specific recommendations for future habitat restoration projects in the watershed were provided.

Existing and historic coho habitats were evaluated based on several information sources. Field data collected during the summer of 1995 on the distribution and abundance of juvenile coho and habitat conditions, spawning surveys conducted in previous years by WDFW and the Tribes, and oral history accounts were used. However, no field data exists for the juvenile coho over-wintering stage.

Research information on the freshwater requirements and preferred habitats of Pacific coho salmon at each stage in their life history formed the basis for many of the inferences drawn regarding coho use of various habitats, particularly for winter rearing. General habitat preferences and requirements are summarized below.

Summer rearing habitat

Pools of all types and beaver ponds are the preferred coho rearing habitats during summer. Glides and boulder-cobble riffles are also used, but are much less preferred. Early rearing habitat utilized by recently emerged fry in late spring includes shallow (<30 cm), quiet areas (<10 cm/s) usually associated with slow-moving backwater pools, dam pools and beaver ponds, but also found in side-channels and along shallow, slow-moving stream margins. Generally, as juveniles grow, they move to deeper (>20 cm), larger pools with an abundance of cover (Reeves, et al, 1989; T. Nichelson, 1995 unpubl. data).

Winter rearing habitat

Deep (>80 cm), quiet (<10 cm/s) areas usually associated with an abundance of cover (large and fine woody debris) are used for winter rearing. Beaver ponds, alcoves, and backwater pools are preferred habitats. Less preferred habitats include lateral scour pools and plunge pools (Reeves, et al, 1989; T. Nichelson, 1995 unpubl. data).

Spawning habitat

Preferred spawning areas are on gravel patches, usually located at the tail-out areas of pools. Gravel of one to 20 cm in size (about the size of peas to oranges, with most in the range of golf balls) is most frequently used. Egg survival is higher in gravels which are low in fine sediment (<17% fines) and relatively stable; i.e. those areas less susceptible to scour by high flows or burial by gravel aggradation (Reeves, et al, 1989).

Water quality

Dissolved oxygen and temperature can be important determinants of habitat quantity and quality, especially during summer. For example, high water temperatures impede fish metabolism and growth; thus large bodies of warm water may function as a total loss of potential fish habitat. Optimal temperature range for juvenile coho is between 13-18° C (55.4-64.4°F) (Reiser and Bjornn, 1979). Salmon also require high oxygen concentrations. Salmonid production impairment can occur below 8 mg/L, with acute mortality below 3 mg/L (EPA, 1986).

Study Limits

Salmon are anadromous and spend about half of their lives at sea. This report did not address the myriad effects of the marine environment on salmon. Marine contributions to salmon decline can be substantial, most notable are fluctuations in primary production and predation (including harvest by humans), but they are not addressed here. Instead the focus is on the freshwater phases of the life cycle: spawning, winter rearing and summer rearing.

The possible effects on coho salmon of withdrawal of surface and groundwater for irrigation and domestic purposes are not discussed. Water withdrawal can be especially detrimental for streams located in the rain shadow of the Olympic Mountains, since naturally low summer flows are considered to be a primary factor constraining salmon production, as well as increasing vulnerability of the habitat to other impacts (Lichatowich, 1995). However, we did not have the resources to investigate this potentially important limiting factor.

Evaluation of winter rearing and spawning habitats is based only on spawning salmon surveys conducted by the state, Tribes, and volunteers in previous years, inferences drawn from summer field data on habitat and coho distribution and general knowledge of winter habitat requirements of coho derived from studies in other areas. Field data is needed to verify assumptions regarding juvenile coho distribution and habitat conditions during winter.

The salmon of the Chimacum Watershed migrate through privately owned property, much of which is farmland. Each landowner in the watershed has a unique level of willingness to participate in a restoration program; many have participated in projects sponsored by the Jefferson County Conservation District (JCCD) and Wild Olympic Salmon (WOS). The restoration suggestions offered here are based primarily on ecological information; landowner willingness and economic cost-benefits -- though both important considerations -- are not analyzed here.
The authors' assumption is that public and private funds will be sought by those groups currently active in watershed restoration in the Chimacum, such as the JCCD and WOS, and that volunteers will continue their restoration efforts, thus reducing costs to landowners of recommended projects.

METHODS

1. Existing Conditions

Site selection

In May, 1995, Chimacum Watershed was classified into discrete stream segments based on the following habitat parameters:

gradient: low (0-1%) vs. moderate (1.1-6%)
stream type: mainstem vs. tributary
vegetation: tree vs. shrub vs. grass
ditch status: ditched vs. unditched

Where possible, two sampling sites were selected in each stream segment class to fully represent the existing range of habitat conditions (Fig. 2). Although sites were also selected to be distributed widely throughout the watershed, three areas included multiple study sites grouped together to obtain a better understanding of the immediate downstream effects of changes in riparian vegetation on water quality and fish abundance. In total, 22 "standard" sites, were selected for use in assessing physical habitat and fish distribution in the watershed (Figure 3 and Table 1).

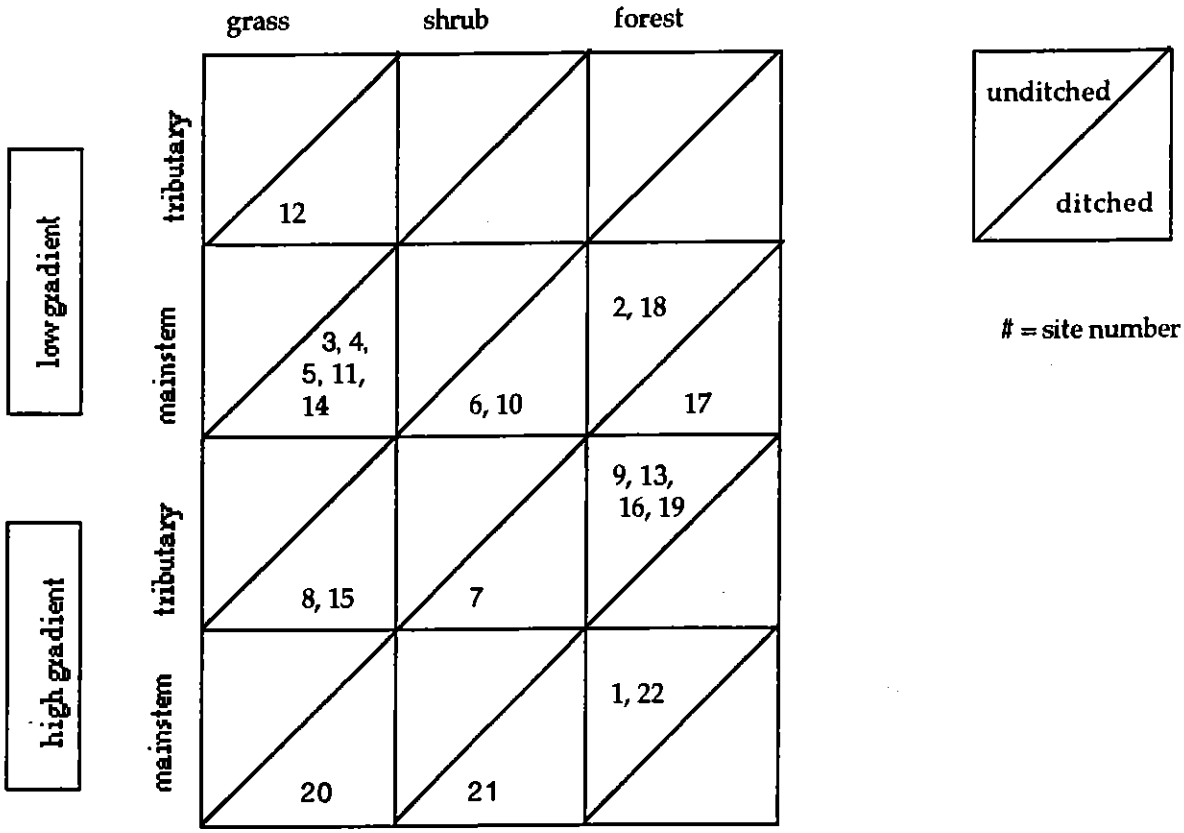


Figure 2. Standard sampling sites identified within existing stream reach classes, summer 1995, Chimacum Watershed.

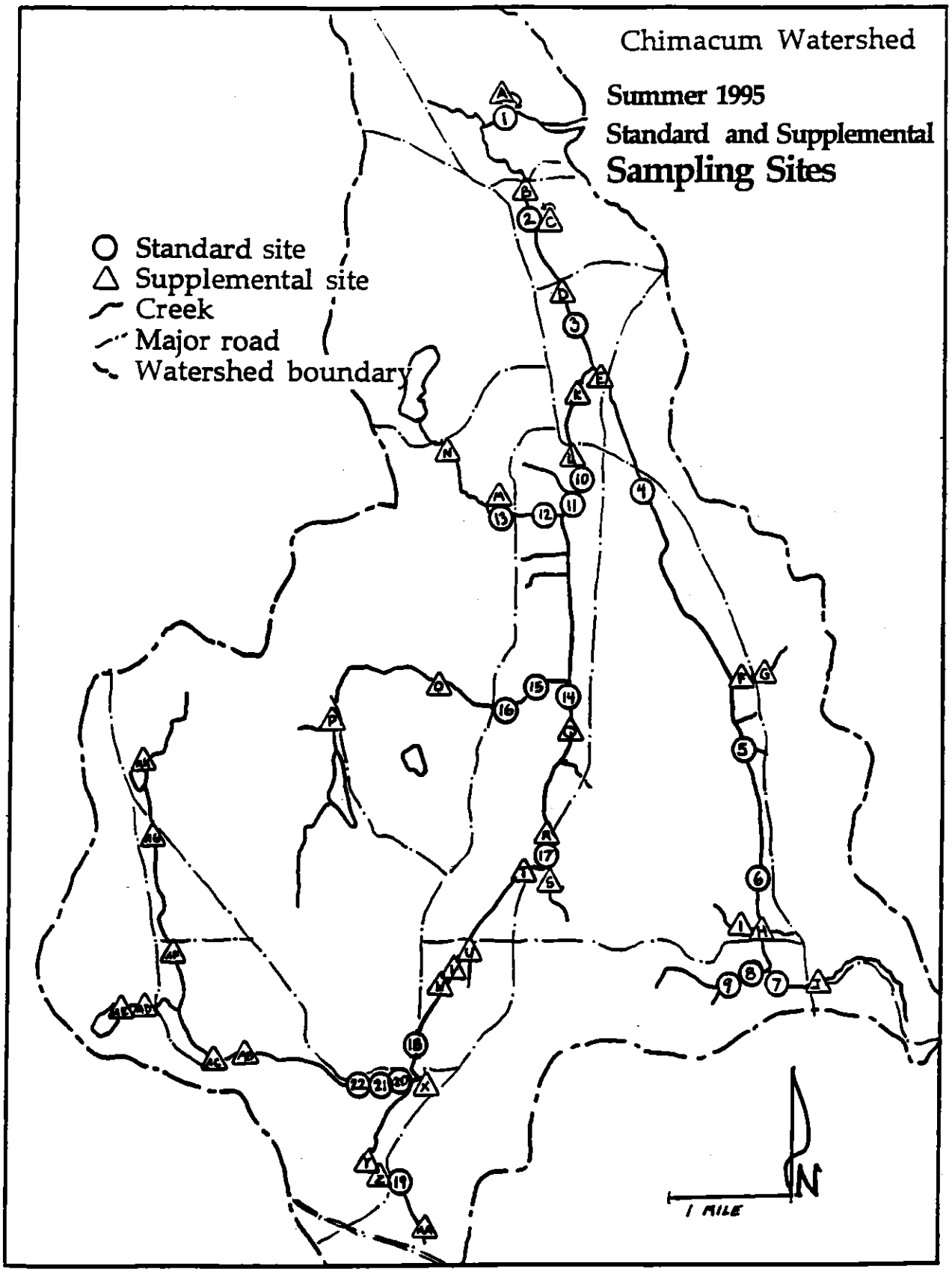


Figure 3. **Map of standard and supplemental sampling sites in Chimacum Watershed, summer 1995.**

Table 1. Standard sampling sites and locations in Chimacum Watershed, summer 1995.

Site#	Name	Location
1	Mouth	~100 m upstream of estuary/forest interface
2	Proud	near Proud's place near Conservation District Office
3	Lopeman	~100 m upstream of end of Lopeman rd.
4	Scholz	~100 m upstream of Beaver Valley rd. X-ing
5	Plank road	~5 m upstream of Plank rd. X-ing
6	Lee	~5 m upstream of pvt. rd. X-ing
7	Olsen	west of Olsen's , 300 m downstream of pvt. rd. X-ing
8	Bishop pasture	bottom end of pasture below site 9
9	Bishop forest	~100 m upstream of pasture/forest interface
10	Mustin shrub	downstream end of shrub/tree area on Mustin's
11	Mustin grass	~50 m upstream of bridge crossing
12	Shaw	~5 m upstream of Mustin's prop. line
13	Mills	~100 m downstream of old cement dam
14	Short Main	~25 m upstream of cement bridge X-ing
15	Short Trib	~2 m upstream of outlet pipe (PVC) from pond
16	Linderoth	1 m upstream of lower gate and ford across Ck.
17	Yarr	~30 m upstream of Center rd. X-ing
18	Nisbet	~100 m upstream of W. Valley rd. X-ing
19	Schmidt	~5 m upstream of Center rd. X-ing
20	Holt Pasture	~25 m upstream of jct. with Barnhouse Ck.
21	Holt Shrub	downstream end of shrub section of Ck.
22	Holt Forest	100 m above ditched forest section of Ck.

Table 2. Supplemental sampling sites and locations in Chimacum Watershed, summer 1995.

Site#	Name	Location
A	Mouth	same as site 1. Mouth
B	Irondale Rd.	~10 m upstream of Irondale rd. X-ing
C	Proud	same as site 2. Proud
D	Ness Road	5 m upstream of Ness rd. X-ing
E	Joyce East	~50 m downstream of Chimacum rd. X-ing
F	Doolittle Below	downstream of pond outlet culvert
G	Doolittle Above	~150 m upstream of Beaver V. rd. X-ing
H	Bishop Below	~50 m downstream of Egg&I rd. X-ing
I	Bishop Spring	N. of Egg&I rd, 10 m upstream of jct. w/ E.Fk.
J	Swansonville	~20 m upstream of Beaver V. rd. X-ing
K	West Fork	above Joyce prop., adjacent to County gravel pit
L	High School	~10 m upstream of Rhody Dr. X-ing
M	Putansu Pond	from boat in pond W. of W. Valley rd.
N	Anderson Outlet	~200 m downstream of Anderson Lake rd. X-ing
O	Naylor's Upstream	~1/2 mile upstream of W. Valley rd. X-ing
P	Gibbs Outlet	~50 m upstream of Gibbs Lake rd. X-ing
Q	Short Above	~20 m downstream of bridge X-ing, cottonwoods
R	Sahli	~200 m downstream of Center rd. X-ing
S	East-of-Yarr Trib	~50 m upstream of pvt. rd. X-ing
T	Yarr Above	~10 m upstream of Center rd. bridge X-ing
U	HuntingfordTrib	ditch W. of houses , 10 m upstream of Egg&I rd.
V	Huntingford Main	~10 m upstream of Egg&I rd.
W	Huntingford Above	~100 m upstream of Egg&I rd. (above site V.)
X	Holt East Trib	~30 m upstream of jct. with main Ck.
Y	Barnhouse Beaver	large beaver pond downstream of site Z.
Z	Barnhouse	upper end of beaver ponds to Center rd X-ing
AA	Barnhouse Spring	access from HWY 104, 100m down from Dragonfoot
AB	First Flow NDC	north of unpaved road off Old Eaglemount rd
AC	Above First Flow	100 m upstream of site AB, isolated pools, no flow
AD	Peterson outlet	upstream of Old Eaglemount rd. X-ing
AE	Peterson Lake	outlet end of Peterson Lake
AF	Delanty Below	10 m downstream of Eaglemount cut-off rd. X-ing
AG	Delanty Outlet	~100 m downstream of Eaglemount rd. X-ing
AH	Delanty Inlet	~100 m upstream of Delanty Lake

Each standard site had a minimum of 300 meters of representative habitat conditions upstream from the thermometer monitoring point. This point, referred to in this report as Point A, was used as the starting place for all physical habitat and fish abundance data collection. Points B and C were located 100 and 200 meters upstream, respectively.

In addition to selection of standard sites, 20 additional "supplemental sites" were chosen for spot checks. (Table 2, above). At supplemental sites, all data except water velocity and discharge were taken once during the summer. Standard and supplemental sites are denoted with numbers and letters, respectively, on the site map (Fig. 3). Permission to access the sampling sites was sought and granted from private land owners.

Fish, habitat, and water quality data were collected at standard and supplemental sites from July 15 to September 11, 1995.

Channel Characteristics

Stream channel characteristics were measured using standard methods of Washington's Timber-Fish-and-Wildlife Ambient Monitoring Program (Schuett-Hames et al., 1993). Channel profile, including bankful width, water edge width, and channel depths were measured. Water velocity was measured once during the summer at Point A at each standard site using a propeller driven velocity meter. A minimum of 10 velocity readings was averaged at each site to determine summer low flow discharge. Stream gradient was measured using a clinometer. Substrate types were estimated visually over a 200 meter distance between Points A and C while walking upstream in the channel. Substrate types were categorized by size and percent composition over the same 200 meter distance.

Riparian Vegetation

Shade was measured using a hand-held densiometer positioned level at the water surface of creek in accordance with standard methods for ambient monitoring (Schuett-Hames et al., 1993). An average value for percent shade was obtained by taking four measurements at 90° intervals pivoting on a point in the center of the channel at each of Points A, B and C. Where the creek was too wide or deep to measure from the center of the channel and there was a corresponding lack of canopy, shade was estimated as zero (sites 11 and 14, West Fork mainstem).

Percent cover by dominant plant species was visually estimated, averaging streamside vegetation composition in the buffer zone over three 100 meter long increments starting at point A and extending upstream to the next point. Buffers were defined as those riparian areas with woody or perennial vegetation with a maximum width of 30 meters. In grazed areas with fences, buffers were measured to the inside of the fence. A buffer width of 0 indicates that the riparian corridor was grazed or cleared to the water's edge.

At supplemental sites, riparian characteristics were estimated visually and averaged over a minimum 100 meter stream length distance.

Large Woody Debris (LWD)

Large woody debris pieces were counted and measured in the 100 meter distance between points A and B. Pieces were recorded in 4 size categories: 10-20 cm; 21-50cm; 51-100 cm; > 1m. At supplemental sites, relative abundance of LWD was estimated visually over a minimum 100 meter stream length distance.

Pools

Distinct pools >10 cm deep were also measured between points A and B at standard sites. Width, length and residual depth of each pool was recorded. Total number of pools and a pool : riffle ratio were calculated for each 100 meter stream length surveyed. At supplemental sites, pool size and pool: riffle ratio were visually estimated over a minimum 100 meter stream length distance.

Stream temperature

In a previous study conducted from 1992-1995, weekly max-min thermometers were monitored at 4 Chimacum sites: The High School, Irondale Road, Eaglemont Road, and Lower Beaver Valley Road. This report incorporates data from that monitoring project (Bahls, 1995 unpubl. data).

In 1995, the 22 standard sites were monitored using computerized continuous monitoring thermometers. These were calibrated to within +/- .3°C of an accurate mercury thermometer prior to installation. Thermometers were housed in rigid white plastic casings, wired and tied to a wooden stake, and hammered into the side or bottom of the channel at point A of each standard site. Where possible, thermometers in casings were tied directly onto underwater tree roots. An attempt was made to place the thermometer in an area likely to be used by juvenile salmonids and accordingly were always placed out of direct sunlight in the deepest pools available. Thermometers were installed away from livestock watering holes and bridge crossings. Thermometers were programmed to record continuous hourly temperatures from July 21 - September 11, 1995. During weekly visits, researchers inspected the sites for thermometer security. Only once did a thermometer slip off its post, at site 6. It was retrieved and replaced within one day. At 20 supplemental sites, temperatures were recorded once, using the thermometer on the oxygen meter.

Dissolved oxygen

Using a Hach portable dissolved oxygen meter (model 16046), the 22 standard sites were monitored weekly from July 21-September 11, 1995, for a total of eight readings at each site over the summer. The oxygen meter was calibrated with atmospheric

pressure (obtained daily from the Bremerton Airport Weather Service) and ambient air temperature at each measurement site. Initially, oxygen readings were recorded once at points A, B and C at each standard site to determine variability within each site. Variability between points at the same site and sampling time was determined to be negligible (<1 mg/L difference). At supplemental sites, oxygen readings were taken once during the field season.

It was impossible to check all sites at the same time of day to avoid variation in readings due to daily fluctuations in oxygen concentration at a site. During August it was noted that site 14 fluctuated between 6 and 13 mg/liter in a diurnal pattern: low in the morning and high in the afternoon. Researchers decided to conduct a "24 hour oxygen vigil" to document the diurnal fluctuation and compare it to other sites. Beginning the morning of August 23, 1995, oxygen and temperature were measured at seven sites at four hour intervals during a continuous 24 hour period. Sites were selected to represent a variety of habitat conditions.

Coho distribution and abundance

Juvenile coho distribution and abundance during the summer were estimated by electro-shocking, minnow trapping and visual estimation at standard and supplemental sites located throughout the watershed. All attempts were made to balance sampling accuracy with the least invasive methods. Electro-shocking was limited to very short durations compared to conventional use of shockers. At 20 standard and 22 supplemental sites, researchers shock sampled for a minimum of 120 seconds and a maximum of 238 seconds over the 100 meter distance between Points A and B at each site. Fish were identified by species. However, it was difficult to distinguish cutthroat from steelhead juveniles and sculpin from bullhead, so these were grouped and counted respectively as cutthroat and sculpin.

Where water visibility was too poor to use electro-shocking techniques, usually in deep slough areas, wire minnow traps were used. Each trap was baited with approximately two tablespoons of borax-cured steelhead eggs tied in cheese cloth and suspended in the trap. At each site, a minimum of three traps were placed in the stream at least 10 meters apart and left overnight for a minimum of 7 and a maximum of 23 hours. Eleven hours was the average trapping time.

At supplemental site AB, the headwaters of the West Fork (Paulson Creek), abundance of coho juveniles was so high and water so clear and shallow that researchers were able to see the population without sampling. At other supplemental sites, no fish were present because streams were dry.

New field data on winter rearing juvenile coho and adult spawners was not collected as part of this study. The assessment of the existing winter coho population and habitat relied on assessing spawning surveys conducted by Washington Department of Fish and Wildlife and Point No Point Treaty Council (Lichatowich, 1994), and inferences drawn from knowledge of the general

habitat types occurring in Chimacum Creek and habitat requirements of coho during winter spawning and rearing stages (Reeves, et al, 1989; T. Nichelson, 1995 unpubl. data).

2. Historic Conditions

The assessment of historic coho habitat conditions was conducted by investigating a variety of sources as described below.

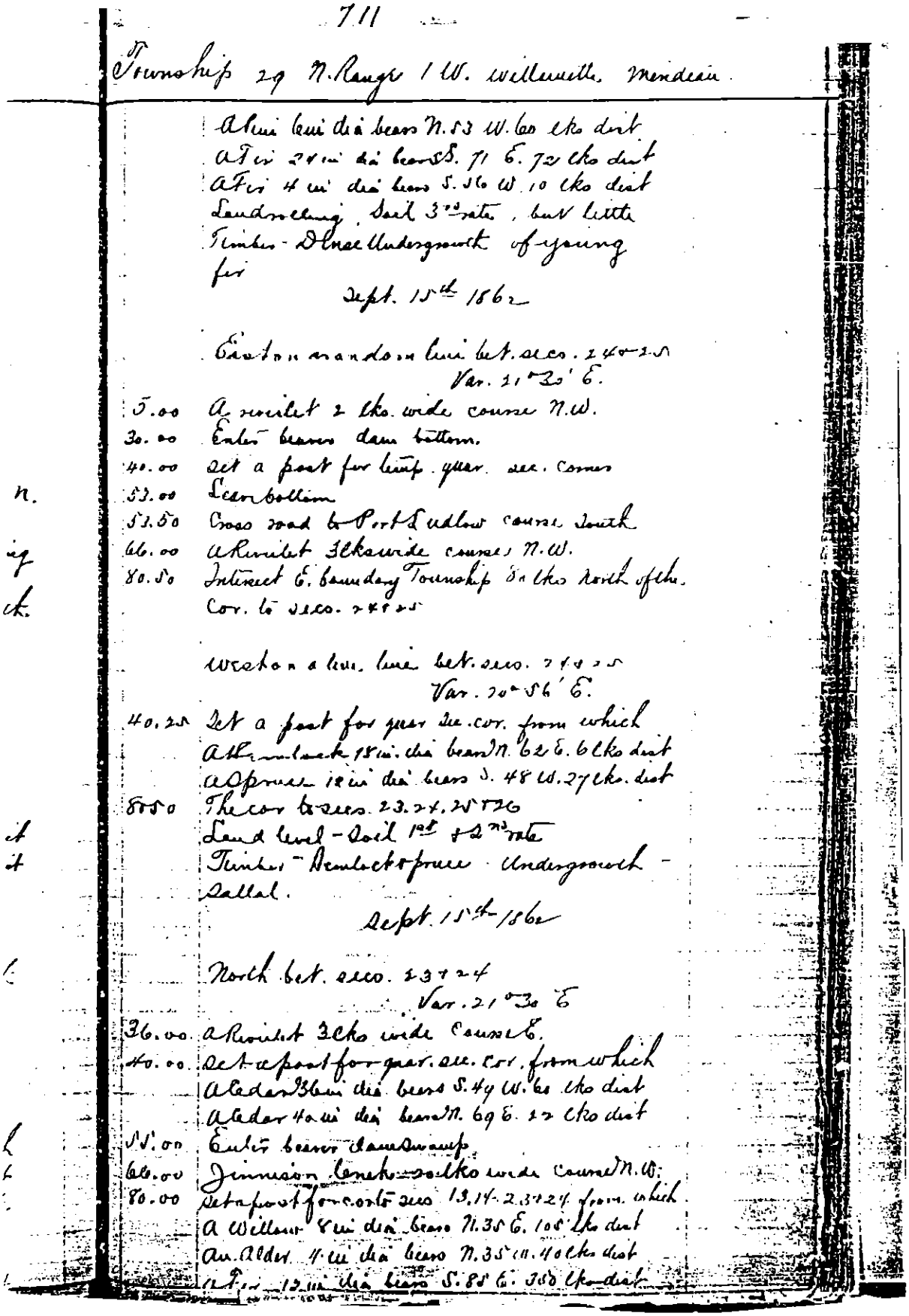
General Land Office survey maps

Department of Interior General Land Office (GLO) pre-agricultural settlement descriptions and accompanying cadastral maps dating from 1858-1874 for the Chimacum Watershed were obtained from Department of Natural Resources, Public Land Survey Office, Olympia. Original field survey notes describe soil type, land forms, creek and tributary widths, vegetation, and cultural structures (such as homesteads) encountered by surveyors walking along section lines within a given township (Fig. 4). Field survey notes for twelve section lines that crossed streams in the Chimacum were examined in detail (Figure 5), as were the sections in the surrounding uplands. Illustrated versions of the field notes for each section line were drawn to aid in interpretation. The GLO field surveys were a primary source of information on three aspects of the historic habitat conditions: 1) stream width, 2) location and extent of swamps and wetlands, and 3) vegetation types.

A 1919 survey map obtained from the Jefferson County Conservation District showed Chimacum Creek's meandering course prior to most ditching activities. A 1956 map showing ditched stream channel locations was superimposed onto the older map (Fig. 6). Based on an inspection of 1995 aerial photos and researchers' field knowledge of the watershed, the 1956 map was considered to provide an accurate representation of existing 1995 channel locations.

Oral History

Between August 29 and December 22, 1995, 11 oral history interviews with long-time residents of Chimacum Watershed were conducted. Residents from the upper mainstem, East and West Fork valleys, Peterson Lake and Delanty Lake were asked a series of questions about their perceived changes in salmon returns, changes in the habitat and landscape, and their opinions about the cause of salmon decline. Interviews were conducted in the homes of interviewees (with the exception of Ray Lowrie, who was interviewed at the JCCD office) by Judith Rubin. Each interview lasted from 45 to 75 minutes. Vickie Eldridge interviewed Bill Matheson in 1994 using the same questions; this interview is included. Six of the interviews were transcribed professionally. Five were summarized by the interviewer. The interviews were used with other sources of information to reconstruct the history of coho salmon distribution and abundance, and freshwater habitats since 1905.



711

Township 29 N. Range 1 W. Willamette Meridian.

A Iron bears N. 53 W. 60 lks dist
A Tree 24 in dia bears S. 71 E. 72 lks dist
A Tree 4 in dia bears S. 36 W. 10 lks dist
Land rolling, Soil 3rd rate, but little
Timber - Some Undergrowth of young
fir

Sept. 15th 1862

Eastern random line bet. secs. 24 & 25
Var. 21° 30' E.

5.00 A rivulet 2 lks. wide course N.W.
30.00 Enter bears down bottom.
40.00 Set a post for temp. quar. sec. Corner
53.00 Leave bottom
53.50 Cross road to Portland course South
66.00 A Rivulet 3 lks wide course N.W.
80.80 Intersect E. boundary Township 3 lks North of the
Cor. to secs. 24 & 25

Western a true line bet. secs. 24 & 25
Var. 20° 56' E.

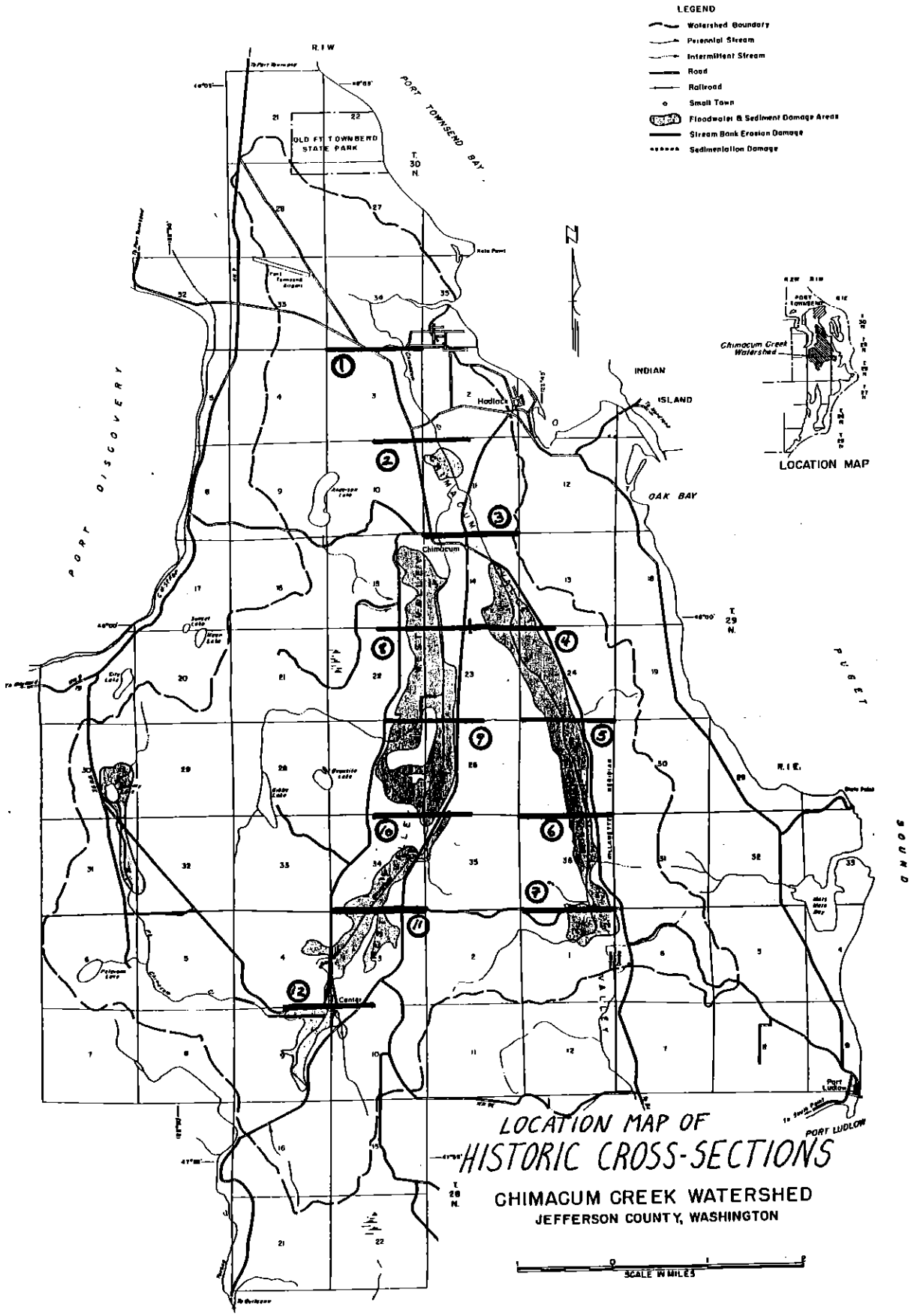
40.25 Set a post for quar sec. cor. from which
A Hemlock 18 in. dia bears N. 62 E. 6 lks dist
A Spruce 12 in dia bears S. 48 W. 27 lks. dist
80.50 The cor to secs. 23. 24. 25 & 26
Land level - Soil 1st & 2nd rate
Timber - Hemlock & pine Undergrowth -
Sallal.

Sept. 15th 1862

North bet. secs. 23 & 24
Var. 21° 30' E

36.00 A Rivulet 3 lks wide Course E.
40.00 Set a post for quar. sec. Cor. from which
A Cedar 36 in dia bears S. 49 W. 60 lks dist
A Cedar 40 in dia bears N. 69 E. 12 lks dist
N.W. 00 Enter bears down swamp
60.00 Immersion Creek 3 lks wide course N.W.
80.00 Set a post for cor to secs 13, 14, 23 & 24 from which
A Willow 8 in dia bears N. 35 E. 105 lks dist
An Alder 4 in dia bears N. 35 W. 40 lks dist
A Fir 12 in dia bears S. 85 E. 350 lks dist

Figure 4. **Example of General Land Office Survey field notes recorded in 1862 near current location of standard sampling site 4 on Chimacum Creek.**



CHIMACUM CREEK WATERSHED,WASH. 7-E-15212-N

Figure 5. **Location of twelve GLO surveys conducted from 1858-1874 and used to evaluate historic habitat conditions in the Chimacum Watershed.**

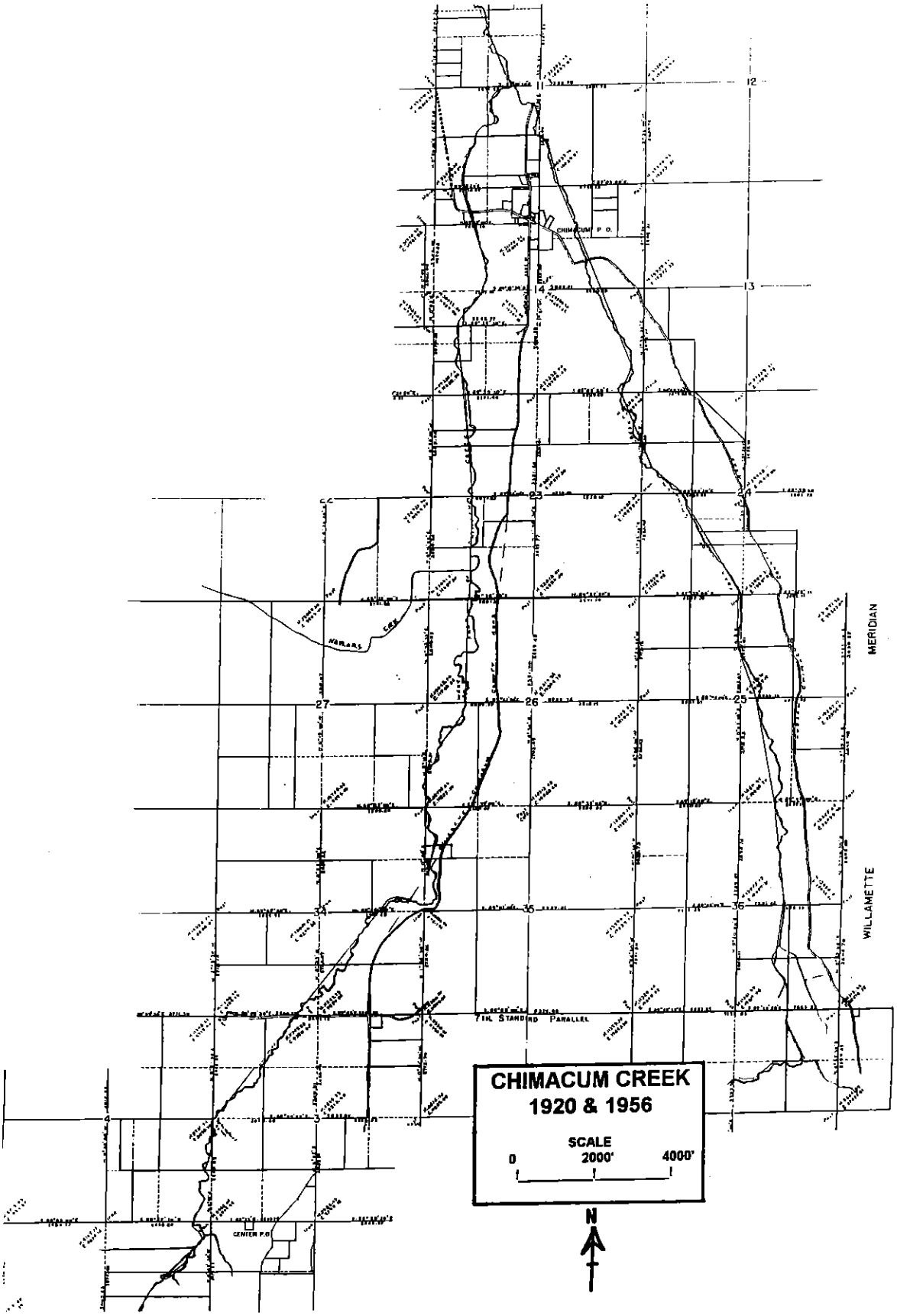


Figure 6. **Historic 1920 map of Chimacum Creek showing meanders and 1956 overlay showing present location of straightened channels.**

In addition, the draft report was presented at two community meetings and at a Jefferson Conservation District Board of Directors meeting in early 1996 to obtain feedback from 45 residents of Chimacum Watershed and the immediate surrounding area. Their written and oral comments were incorporated into this report.

Additional Resources

The 1956 Watershed Work Plan for Chimacum Watershed was obtained from the Jefferson County Conservation District (SCS, 1956). Department Of Ecology irrigation permit records, Hydraulic Permit Approvals (HPAs) issued between 1978-1995 by WDFW for in-stream work, S'Klallam spawning surveys, weir counts from a Wild Olympic Salmon project, and hatchery release records from both WDFW and Chimacum High School were examined to inform the historic picture.

3. Habitat Loss and Limiting Factors

Historic and existing stream lengths of Chimacum Creek were measured with a map wheel from the 1919 and 1956 maps, respectively. These distances were then compared to obtain an estimate of the loss in stream length due to ditching activity and fish passage blocks.

The location, size and frequency of inundation of historically flooded areas was derived from the GLO field notes, oral history interviews and the authors' familiarity with existing site conditions. Flooded areas (or "swamps" or "beaver swamps" as they were usually referred to in the GLO surveys), were classified as inundated "year round" or "only in winter". These areas were superimposed onto the 1919 map and surface area was quantified using a palinimeter. Wetlands classified as "flooded year-round" were interpreted as available summer and winter habitat, while those reaches that flooded "only in winter" were considered winter rearing habitat. It was assumed that these flooded areas were used for winter and summer rearing based on research by Nichelson (1995 unpubl. data, 1992) and Reeves et al. (1989) that show that dam-pools (such as beaver ponds) are preferred habitat for juvenile coho. Since most of the valleys floors were historically forested, water quality (temperature and oxygen) conditions were presumed not to have been a constraint on summer rearing.

Stream surface area is a more accurate measure of available habitat than stream length alone (Bilby and Ward, 1989). To determine habitat loss by surface area, it was first necessary to assess potential changes in channel width by comparing historic widths from GLO surveys to existing widths measured at nearby sampling sites in summer, 1995. The quantity of historic and existing habitat, by surface area, was then

estimated for each stage in the life history of the coho salmon and compared. Estimates were made both for stream channels alone, and again with the addition of historic "swamps".

Habitat losses were mapped corresponding to each freshwater life stage of the coho; with habitat loss defined primarily in terms of the percent loss of a stream reach's historic habitat quantity, measured in surface area. "Complete loss" was defined as 100 percent loss of historic use by coho due to culvert blockage or lethal water quality. "High loss" was defined as a 90 percent or more loss of the historic habitat quantity due to channelization (loss of meanders and wetlands) or in a few cases, an exceptionally severe loss in habitat quality, such as loss of pool habitat due to sedimentation. "Low loss" was defined as a loss of less than 90 percent of the historic habitat quantity (surface area) and a relatively low loss in habitat quality. This latter category included most of the accessible, un-ditched and forested streams, comprising most of the tributaries and some areas of mainstem.

RESULTS AND DISCUSSION

1. Existing Conditions

The following assessment of the existing coho population and habitat conditions in the Chimacum Watershed was based largely on a qualitative interpretation of habitat data collected during the 1995 field season. Due to time constraints, a statistical correlation analysis between habitat variables, such as coho abundance and percent shade, was not conducted. Fish and habitat data is presented in summary form on maps of the watershed. Detailed presentations of data are included as appendices.

Channel Characteristics and Geomorphology

Channel characteristics reflect the underlying land forms and history of extensive channelization. The East and West Fork stream channels flow through ancient, low gradient (0-1 %) peat valleys. Channel substrates are mostly fine sediment: peat, silt and sand. Channels are now mostly straight and ditched, with near vertical banks and narrowly fenced buffers of grass or shrubs. Few side channels or meanders remain. The East Fork consists largely of a shallow riffle with a sand substrate, whereas much of the West Fork is a lower gradient (0-.5 %) slow-moving slough. The headwaters originate in the surrounding forested hills of glacial outwash material. Although stream gradients are slightly higher, large loads of fine sediment apparently reduce the potential pool size. The mainstem below the junction of the forks is of moderate gradient (1-4 %) and flows through a forested glacial outwash plain and a confined ravine, with numerous large pools and riffles throughout. Substrates are intermixed sands and gravels. Data on channel characteristics for each sampling site are included in Appendices A to D.

Most of the tributaries dry up completely in their upper reaches during the summer. The upper end of Naylor's Creek (upstream of site O) and the western-most tributary of the West Fork (upstream of site AB) usually dry up during the summer. However, Barnhouse Creek, the southern-most tributary on the West Fork, originates as a groundwater spring about one-half mile upstream of site 19, and appears to maintain a stable year-round flow.

Riparian Vegetation

Riparian zones in headwater areas are mostly forested with a mixture of mature coniferous and deciduous trees, while riparian areas of lowland valleys are dominated by grass, willow, bulrush and occasionally alder trees. In the lower West Fork valley, between Short Farm (site 14) and Chimacum High School (site 10), reed canary grass has invaded aggressively, choking channels with its extensive root system.

Shade levels in the watershed range from 0% (no shade) in some open pastures to 90.5% in a conifer forest on Putansu Creek. In general, sites with dense canopies had colder water in the stream channel. However, since forested riparian zones generally occur in the spring-fed headwater areas, it is difficult to isolate and evaluate the effect of riparian shade on stream temperature. It appears that short sections of brush or forested zones in the lowland valleys do little to lower water temperatures. In addition, a dense forest in and of itself does not create coho salmon habitat; site 13 on Putansu Creek is the shadiest of all sites studied, but it supports relatively few coho due to its sandy substrate and a subsequent lack of large pools (Riparian characteristics - Appendices E and F). A summary of existing channel and riparian characteristics of the Chimacum Watershed is presented in Figure 7.

Large Woody Debris

LWD levels at the sites seem to be directly related to the character of the riparian zones, except at a few sites where wood was placed in the channel for previous restoration projects (sites 12 and 13). The forested tributaries and lower mainstem contain much more wood than the West and East Fork valleys, which have little or no wood (Fig. 8). Several forested sites have some recruitment of large wood (> 50 cm diameter), but most are young mixed forests with smaller LWD. Our observations indicate that larger size classes of in-channel wood create plunge and scour pools preferred by coho juveniles. There appears to be a strong relationship between LWD and fish abundance (Large woody debris data -Appendix G and I).

Pool habitat

Suitable pool habitat is rare in the Chimacum Watershed, especially in the East and West Fork ditched channels (Fig. 9). Our observations indicate that optimal pool size

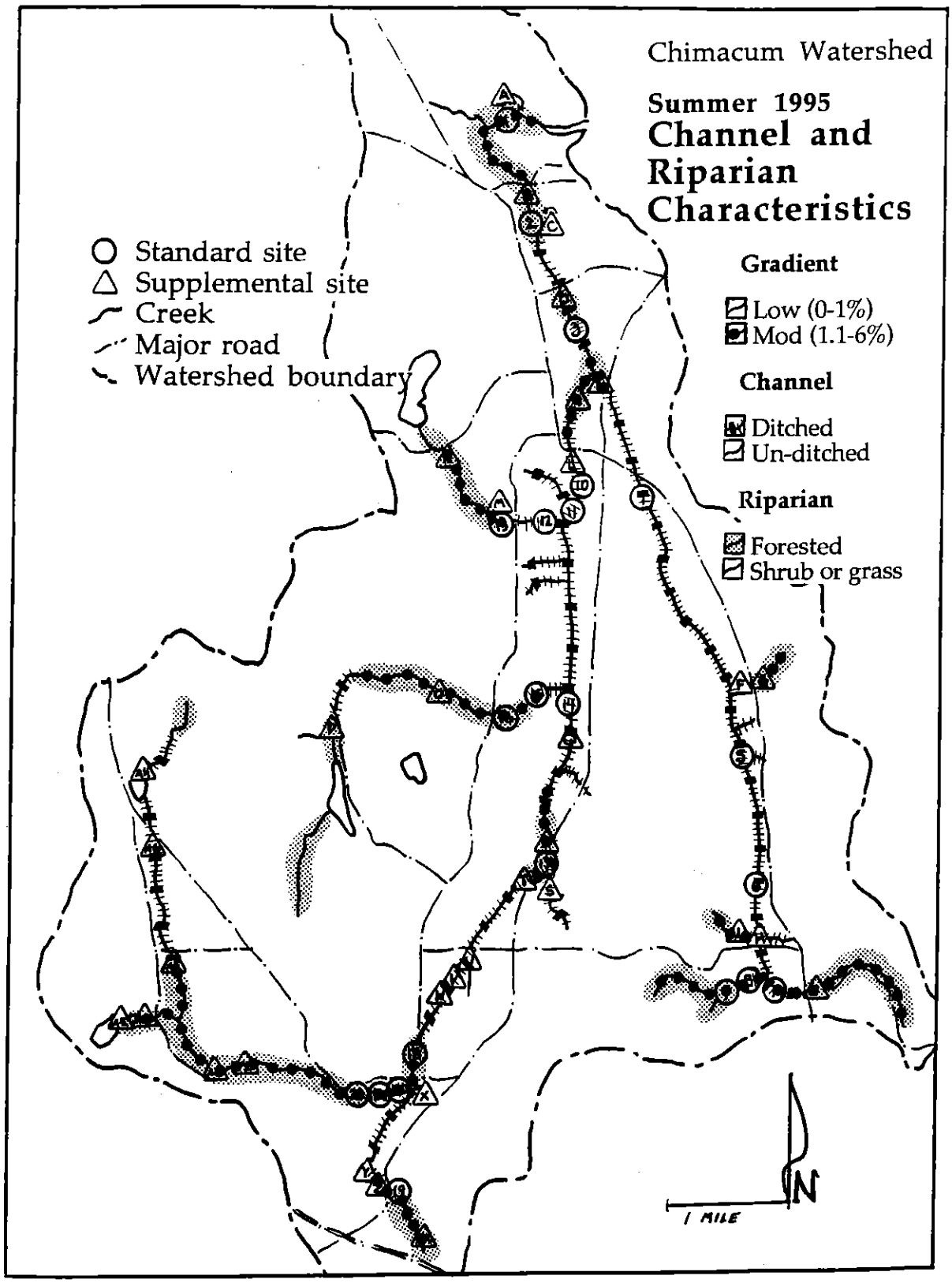


Figure 7. **Map of existing channel and riparian characteristics of Chimacum Watershed.**

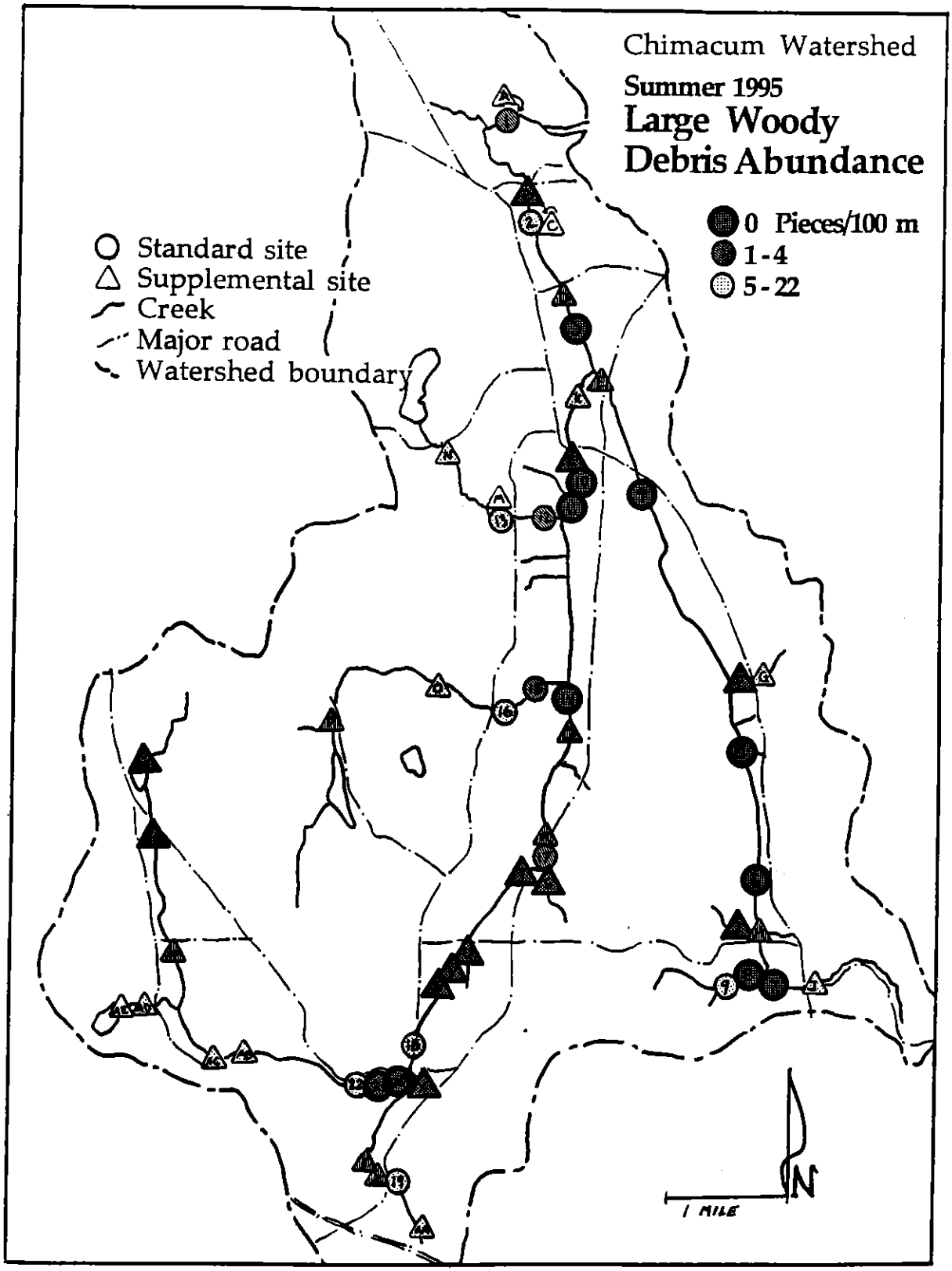


Figure 8. **Map of large woody debris (LWD) abundance in Chimacum Watershed, summer 1995.**

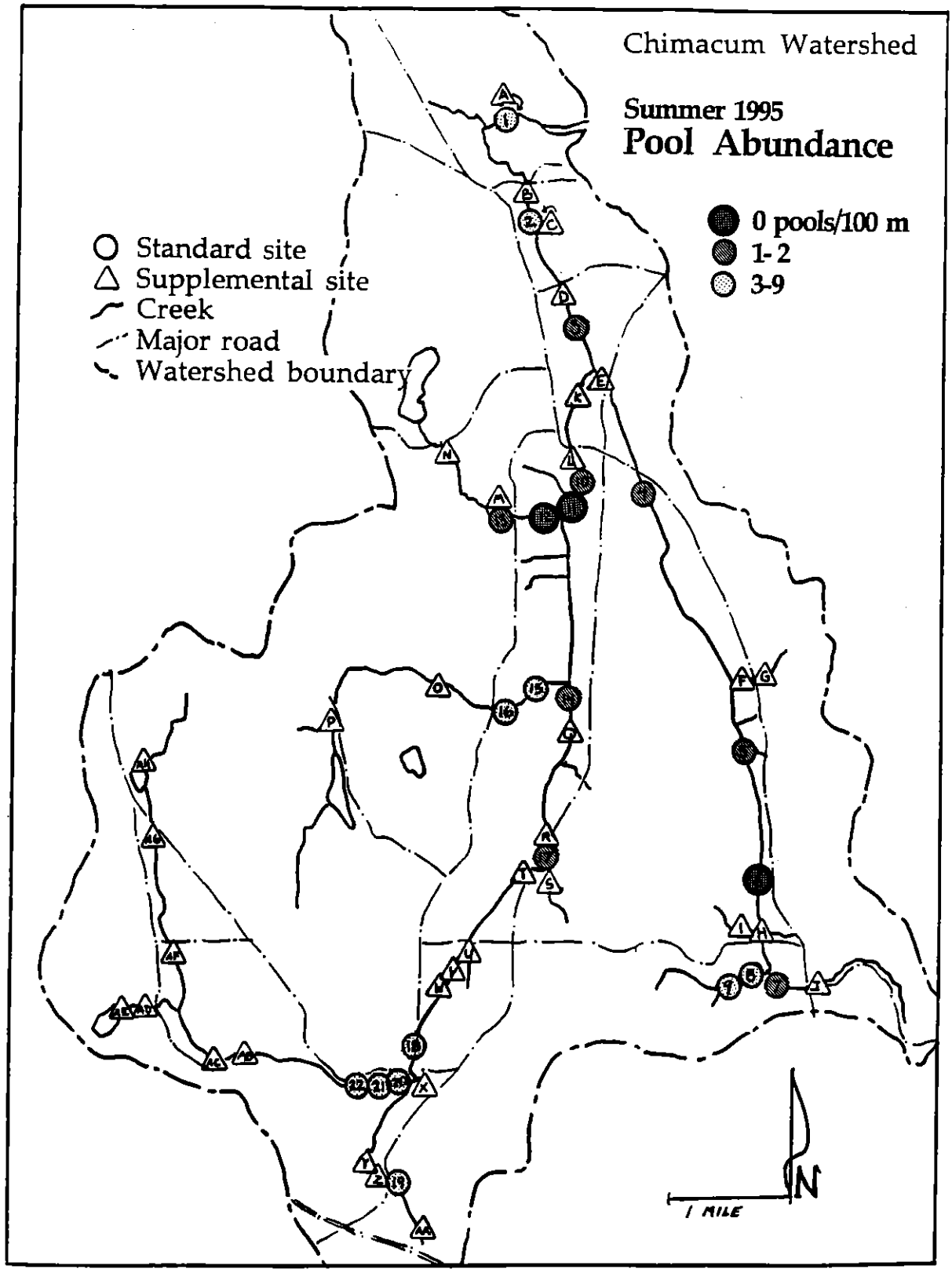


Figure 9. **Map of pool abundance in Chimacum Watershed, summer 1995.**

for summer rearing coho ranges from 1.5-2 meters wide by 2-7 meters long, with a maximum depth of .5 -1 meter. The lower West Fork is mainly a long slough, while the East Fork is mostly shallow riffle. The highest frequency of pools was found in headwater tributaries and lower mainstem sites characterized by forested un-ditched channels of moderate gradient.

There appears to be a direct relationship between number of pools, LWD and fish abundance. However, quantity of pools alone does not necessarily determine juvenile rearing habitat; location, size and water quality also seem to be important. The long slough, or dam pool, along the lower two miles of the West Fork may not be used by coho due to poor water quality as discussed below. However, on the East Fork, coho were found in isolated plunge pools, sometimes below a culvert outfall, in otherwise shallow riffles with marginal water quality. In the otherwise optimal habitat of site 13 (dense shade, cold water, high LWD), few coho were found, perhaps due to the small size of pools there (Pool data - Appendix H and I).

Stream Temperature

Coho juvenile abundance and stream temperature appear to be inversely related, with few or no coho found in areas with elevated temperatures. However, temperature is merely one of a number of variables that may be influencing coho distribution and abundance.

Optimal temperature range for juvenile coho is 13-18°C (55-64.4°F). High water temperatures impede fish metabolism and survival, and large bodies of warm water may function as a block to fish habitat (Reiser and Bjornn, 1979). 16° C and 18° C are the Washington State minimum water temperature standard for class AA "excellent" and Class A "good" water quality streams, respectively (U.S. EPA, 1986). Between 1992 and 1994, weekly max-min water temperatures measured at four sites in the watershed frequently exceeded the recommended 20°C (68° F) threshold tolerable by salmonids (Bahls, 1994).

Because the summer of 1995 was rainy and cold, summer stream temperatures were much lower than those recorded during the previous three years of monitoring. Stream temperatures cooled in early August, unlike previous years where relatively hightemperatures were recorded into early September (Fig. 10). When water is cold, salmon metabolism is efficient and other life functions, such as swimming speed, are probably not impaired (Reiser and Bjornn, 1979). Also, farm irrigation requirements in 1995 were low relative to previous years; little water was diverted from the creek. (Short, pers. comm.). Thus, 1995 summer rearing data probably represents a "best case scenario" for juvenile salmon in Chimacum Creek.

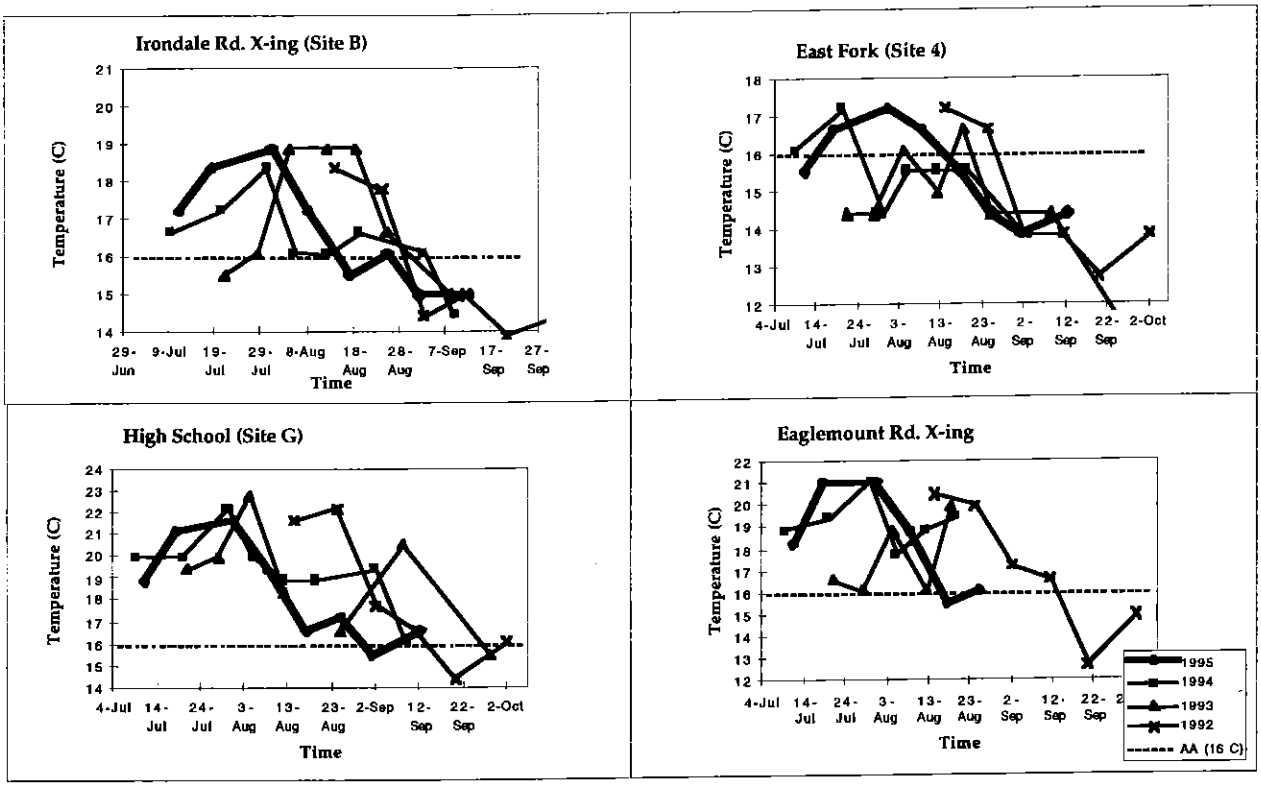


Figure 10. Maximum weekly summer stream temperatures at four sampling sites in Chimacum Creek, 1992-1995.

Thermographs provide a summary of hourly temperatures recorded at each of the 22 standard sites (Figs. 11-13). Maximum summer stream temperature reached at each standard site shows a pattern of increasing temperatures from headwater sites to valley sites (Fig. 14). Temperature appears to be directly related to the type of riparian cover and percent coverage. Maximum temperature exceeded 20° C at site 14, a wide, open slough section along the West Fork; and also at site 12, an unfenced, ditched section of Putansu Creek below Putansu Pond. However, effects of riparian cover on stream temperature can be confounded by the influence of groundwater inputs of colder water, as well as shading provided by stream banks in deeply ditched sections. For example, the East Fork has little riparian shade in the agricultural valley, but it is a fairly narrow stream ditched as deep as 2 meters through peat. Groundwater movement and shade from entrenched stream banks appears to dampen the effects of limited shade from riparian zones.

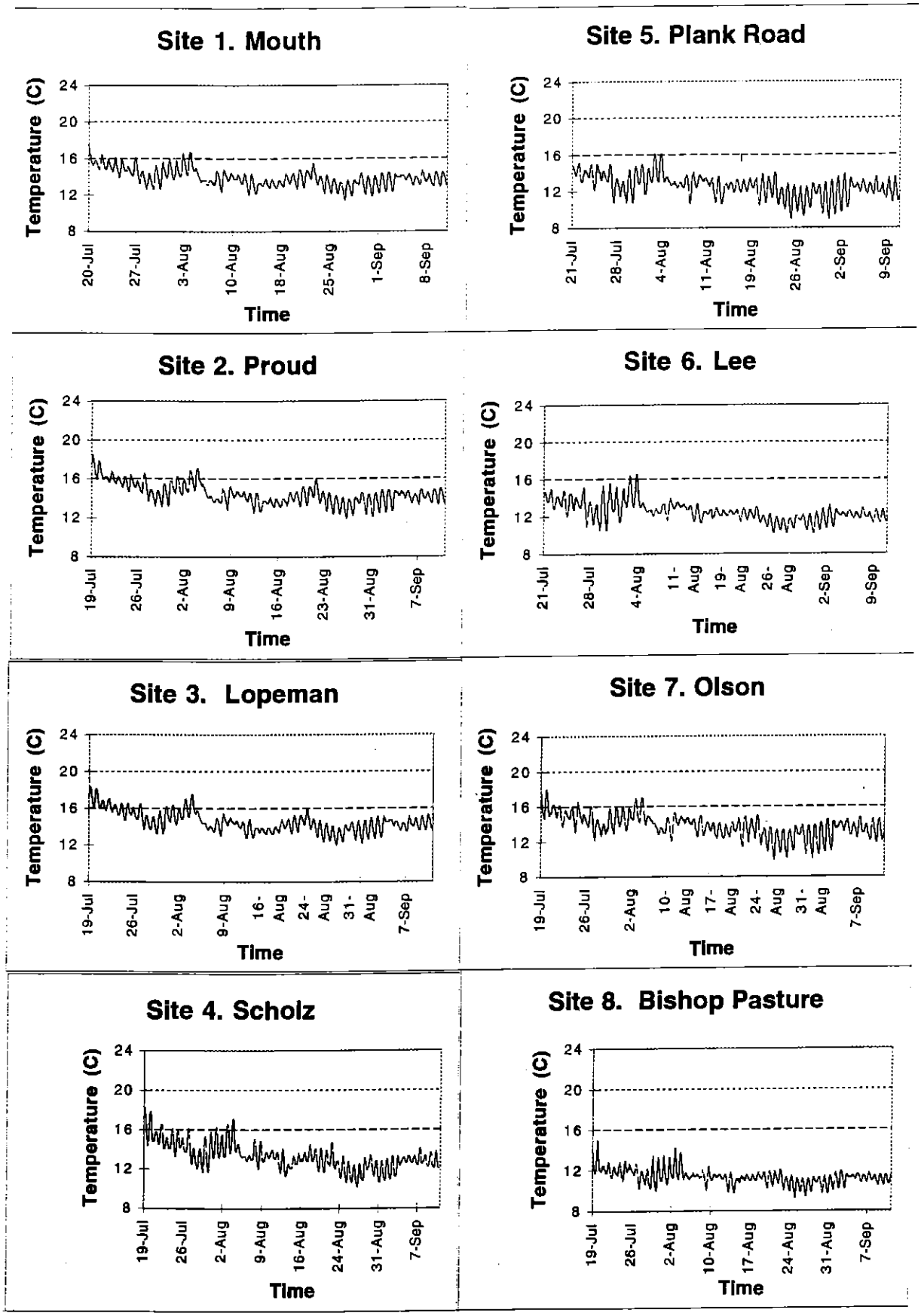


Figure 11. Thermographs for standard sampling sites 1-8, summer 1995, Chimacum Watershed

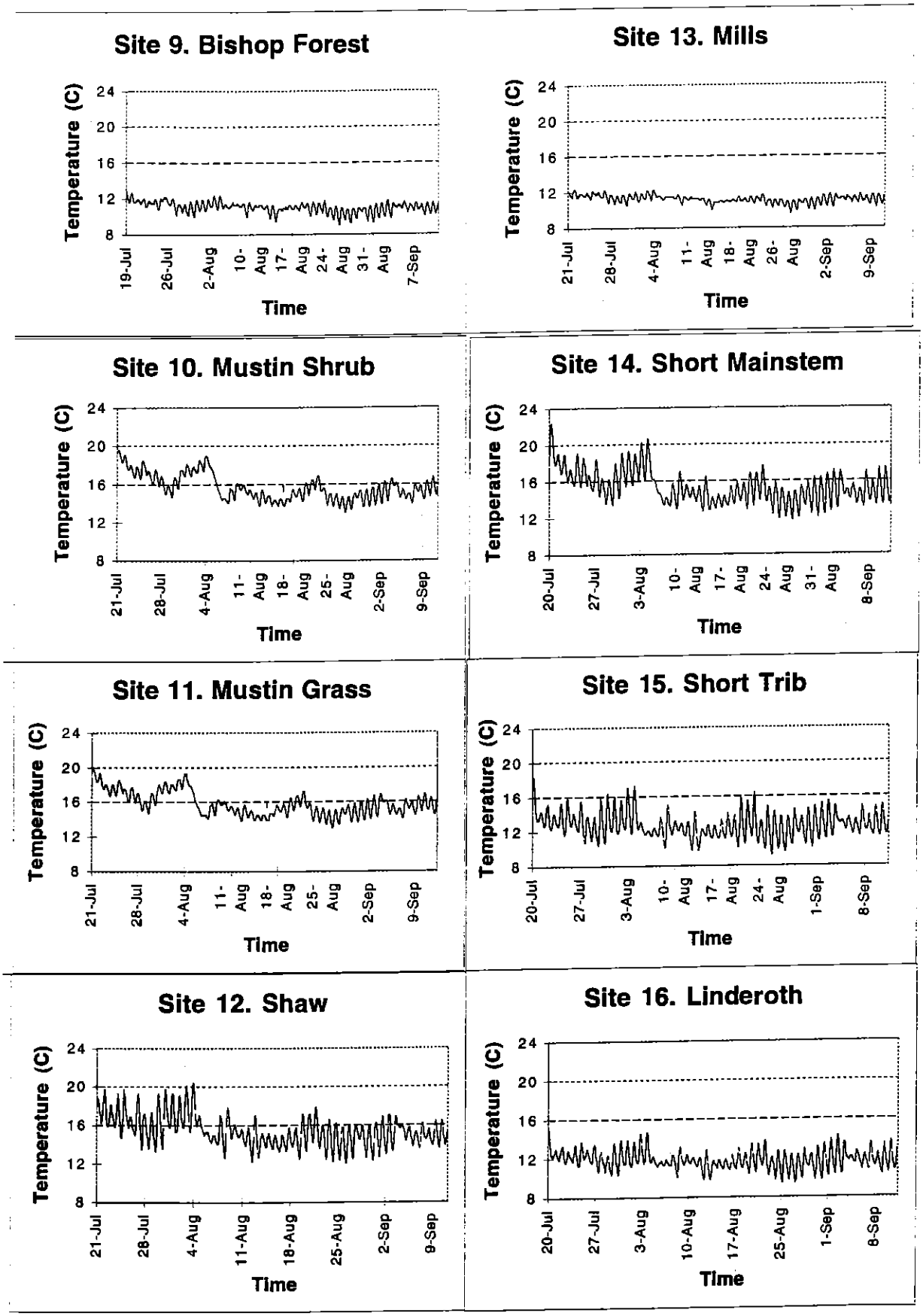


Figure 12. Thermographs for standard sampling sites 9-16, summer 1995, Chimacum Watershed.

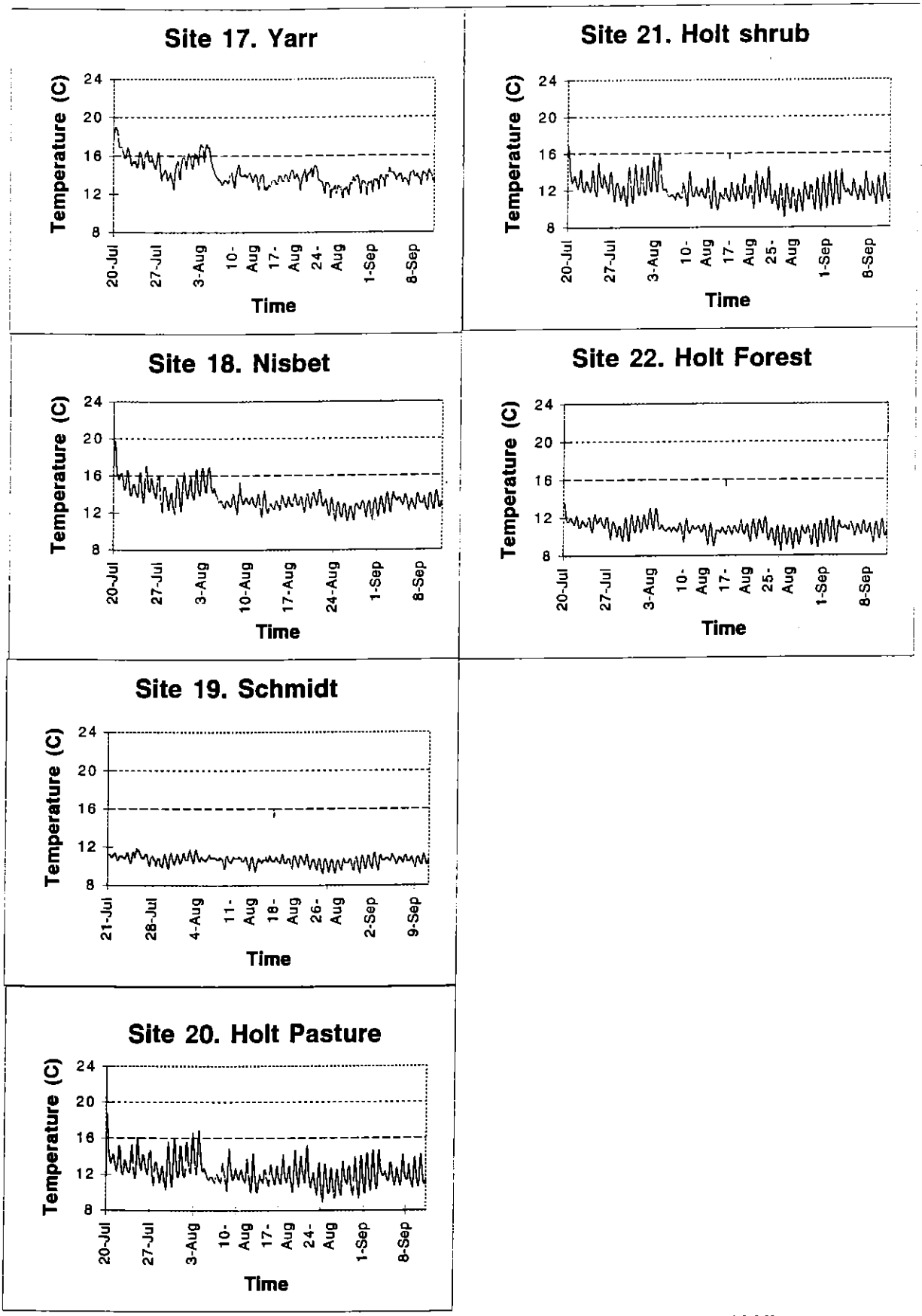


Figure 13. Thermographs for standard sampling sites 17-22, summer 1995, Chimacum Watershed.

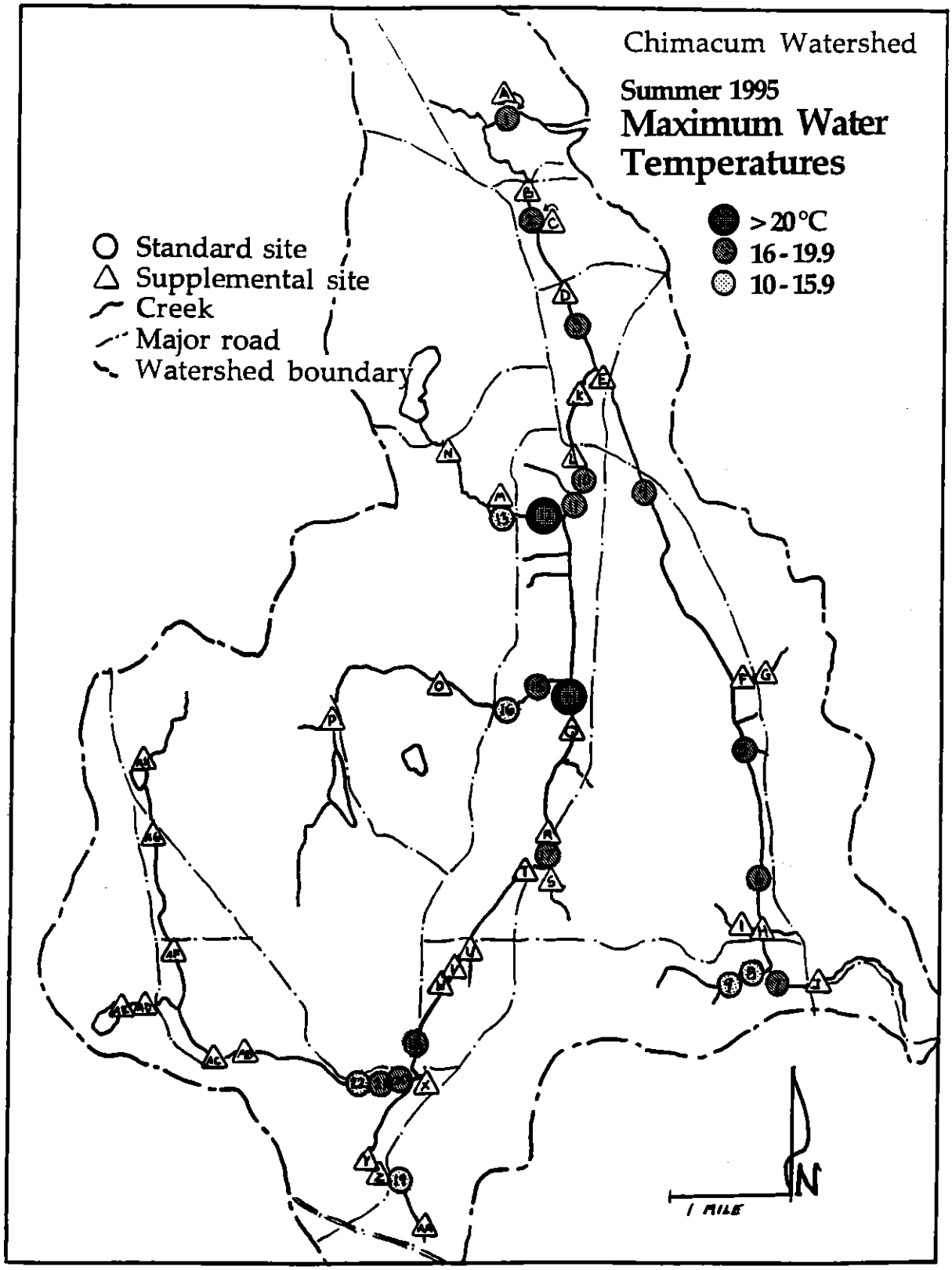


Figure 14. **Maximum stream temperatures recorded at standard sites, summer 1995, Chimacum Watershed.**

In an effort to determine the effects of riparian vegetation density on water temperature, we examined several adjacent standard sites with different riparian conditions positioned consecutively on the same stream segment. Site 9, located immediately downstream of a forested headwater tributary of the East Fork maintained a fairly constant temperature fluctuating between 10° and 13° C . However, after flowing through about 300 meters of pasture to site 8, maximum daily water temperatures were commonly reaching 15° C. Similarly, cold water temperatures ranging between 9° and 14° C were recorded downstream of a forested headwater tributary on the West Fork, but after flowing 300 meters through a ditched shrub section, maximum daily temperatures were consistently higher than site 21, immediately upstream. After flowing through another 300 meters of pasture, maximum daily temperature twice exceeded 16° C. Stream temperatures continued to increase downstream. By site 14, daily temperatures regularly exceeded 18° C and mean temperatures were in the range of 14° to 16° C. This result is, of course, to be expected. But the reverse case did not hold: temperatures at site 10 located immediately downstream of a ditched shrub and forest zone of about 200 meters in length was not noticeably cooler than site 11, located immediately upstream.

Dissolved oxygen

The summer's minimum dissolved oxygen levels recorded at each standard and supplemental site show a pattern of decline, from headwaters to valley floors (Fig. 15). Oxygen levels in Chimacum Creek ranged from a high of 10.8 mg/L at site 22 to a low of 0.8 mg/L at sites 10 and 11. Fish were most abundant in water containing at least 8.1 mg/liter dissolved oxygen. Coho were usually rare at sites with low oxygen levels and were completely absent at three out of four sites with oxygen below 5 mg/L. This is consistent with previous research which found that salmon require high oxygen concentrations; the optimal summer rearing range for coho is 8.1-13 mg per liter. The EPA (1986) reported production impairment below 8 mg/L, with acute mortality at 3 mg/L.

The low oxygen levels observed are probably a direct result of increased stream temperatures and decreased stream gradient as streams flow from headwaters to valleys. Cold water holds oxygen at a higher saturation than warm water. In addition, oxygen from the air is added to water when it is mixed at the surface. The steeper the stream gradient, and the more complex the channel surface, the greater the oxygenation of water. The reed canary grass and irrigation dam on the lower West Fork near the High School may have reduced oxygen levels even further by blocking water flow.

Surprisingly, coho juveniles seem to be able to exploit relatively small "oases" of habitat within low oxygen, high temperature "deserts." While sampling stressful sites O2<5; T>18° C) no fish were found. Yet adjacent to these sites, where a culvert

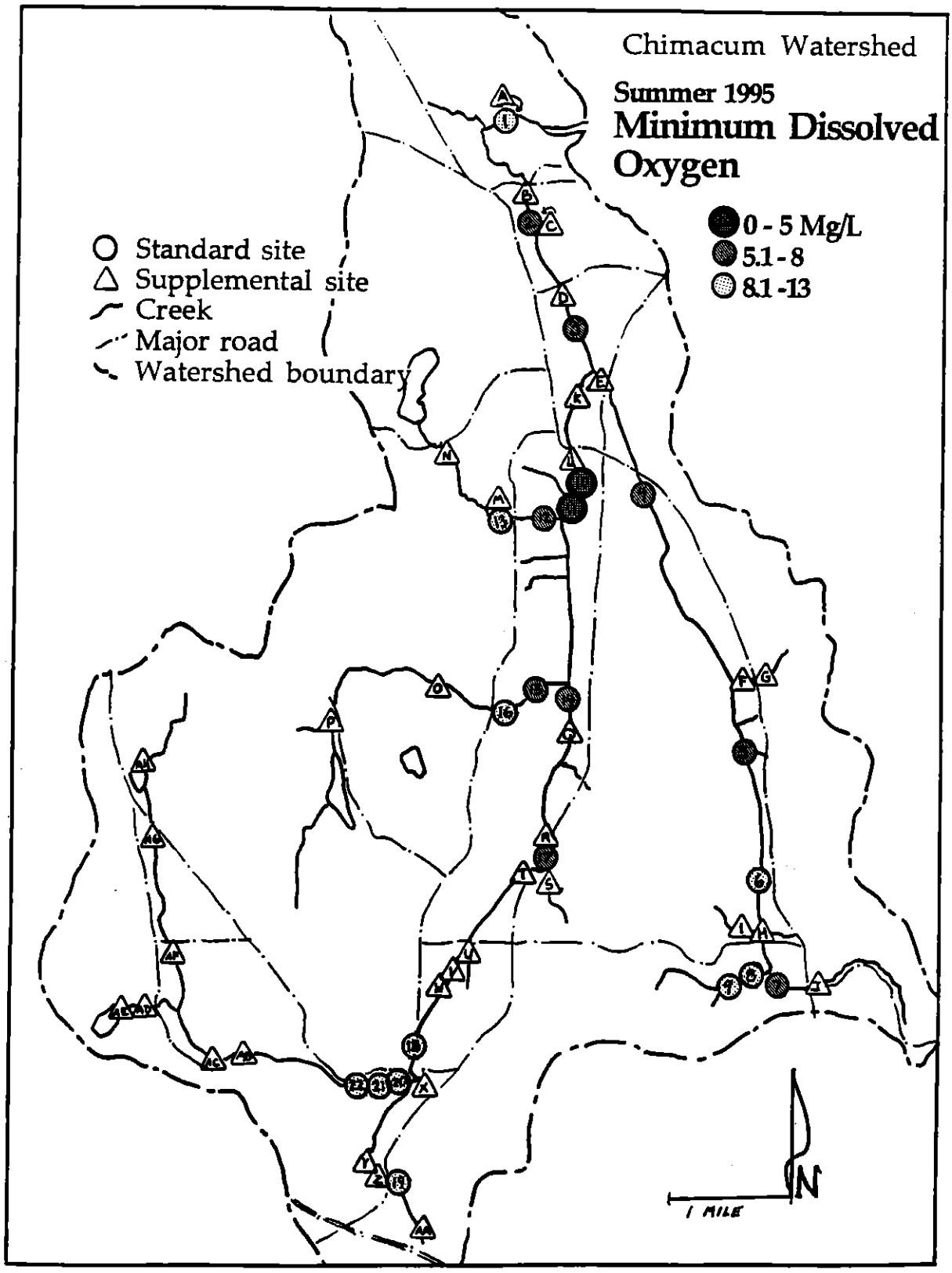


Figure 15. **Minimum dissolved oxygen levels recorded at standard sites in the Chimacum Watershed, summer 1995.**

or large log formed a cool, deep, oxygen-rich pool, coho juveniles were found (Dissolved Oxygen data- Appendix J).

On August 23, 1995, researchers measured 7 sites at 4 hour intervals during a continuous 24 hour period to establish a cause for the diurnal fluctuation pattern at site 14. Sites were chosen to represent a range of habitat conditions and oxygen levels. Results show that oxygen levels at all sites remained fairly constant, with the exception of site 14, which fluctuated 6 mg/l during a 24 hour period (Fig. 16). The relatively large fluctuation in daily oxygen level corresponds very closely to the fluctuation pattern in daily temperature at this site and both appear to be closely tracking the solar cycle (Fig. 17). These findings indicate that site 14, a large open slough with very slow-moving water and an abundance of aquatic plants, may be acting like a eutrophic lake. As the sun warms the water, aquatic plants, such as blue-green algae, begin photosynthesizing and pumping oxygen into the stream. After the sun sets, plants continue to respire and the oxygen levels decline.

Coho distribution and abundance

Field surveys indicated that coho juveniles inhabit most of the mainstem and tributaries of the watershed during the summer (Fig. 18). No coho were found above impassable culverts on Swansonville Tributary on the East Fork nor Barnhouse Tributary of the West Fork. No coho were found in the upper ends of West Fork tributaries due to a variety of reasons. Putansu Creek appears to provide minimal spawning and rearing habitat for coho due to lack of spawning gravels and rearing pools, probably caused by high loading with fine sediment. The upper ends of several West Fork tributaries were dry (see Channel Conditions, above). No coho were found in the slough section of the lower West Fork (sites 11 and 14). Lethal dissolved oxygen and temperature conditions may cause mortality in these reaches.

Although field data was gathered on coho distribution only during the summer, we assumed the same distribution during winter, with the additional winter use of the slough section of the West Fork. It was assumed that cool winter climate conditions would provide cold, well-oxygenated water conditions in this reach during the winter.

The coho spawning distribution in the watershed is severely limited by the naturally small amount of suitable gravel bed spawning areas, compounded by existing fish passage blocks. Data from spawning surveys confirms that spawning coho congregate in small reaches of the watershed. The upper West Fork (sites 18 to AB) is probably the most heavily used spawning area in Chimacum Creek.

Summer rearing coho were most abundant in higher gradient tributaries and were least abundant on the valley floor mainstem forks (Fig. 18). The highest abundance of fish were found in the headwaters of the West Valley fork, near Center at sites 18, 22, and AB. Other relatively abundant locations were the headwaters forest of the East Fork, at site 9, and at the confluence of the main channels, at site E. Fish appears to be positively correlated with pool frequency, amount of large woody debris, and high water quality (Fish data - Appendix K, L and M)

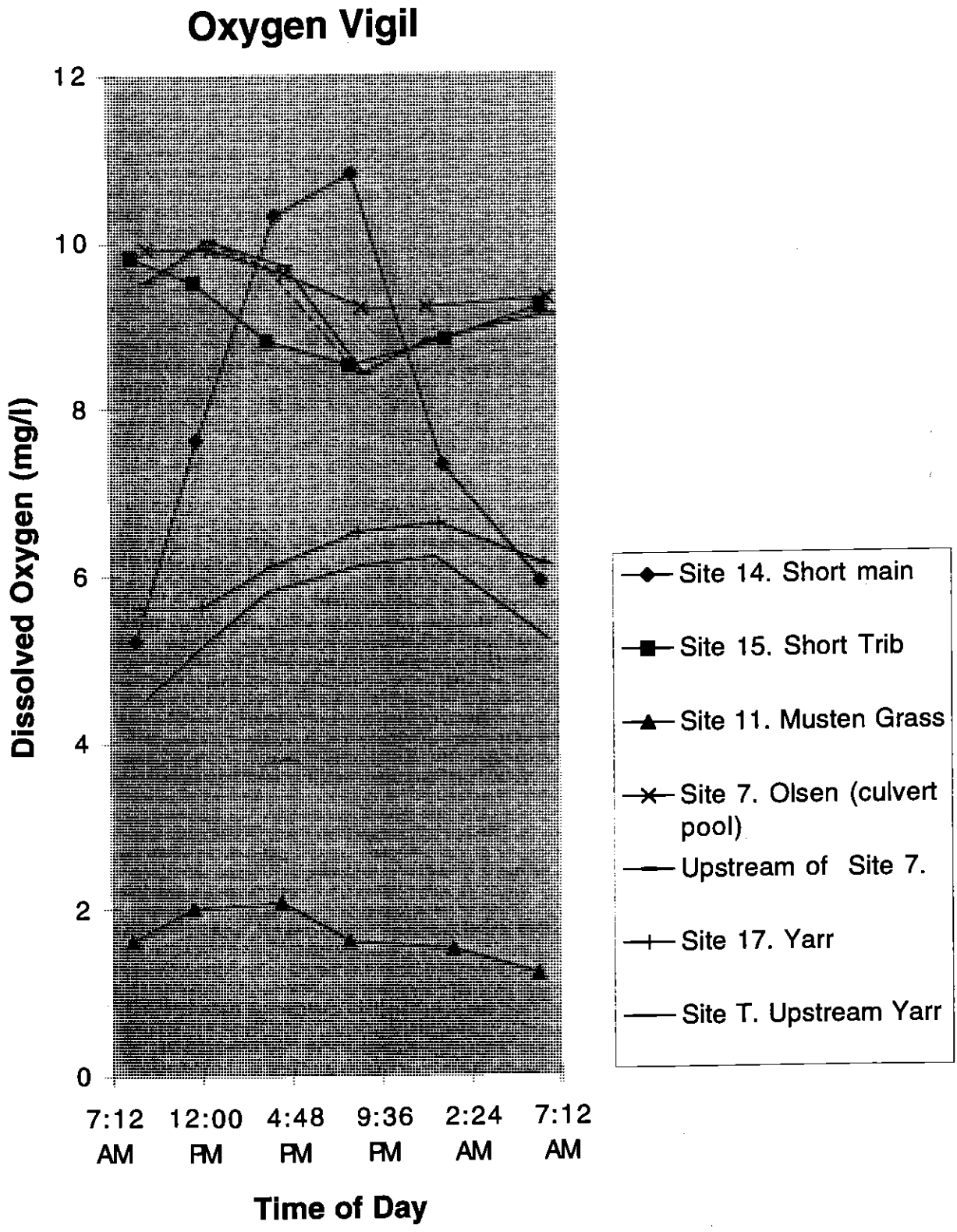


Figure 16. **"Oxygen Vigil" graph of dissolved oxygen levels recorded over a 24 hour period at seven locations, Chimacum Watershed.**

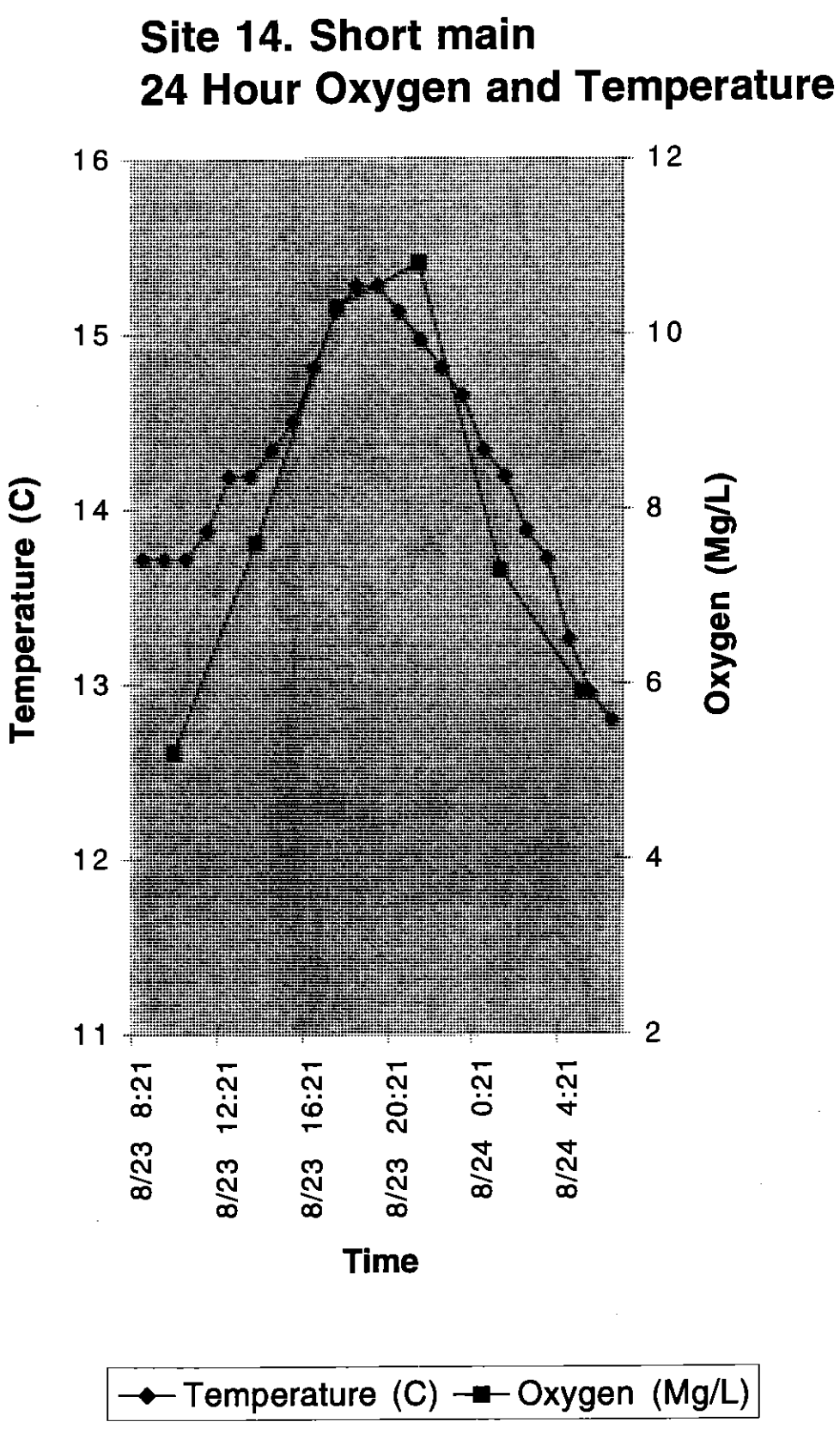


Figure 17. **Dissolved oxygen and stream temperature recorded over a 24 hour period at standard site 14, Chimacum Watershed.**

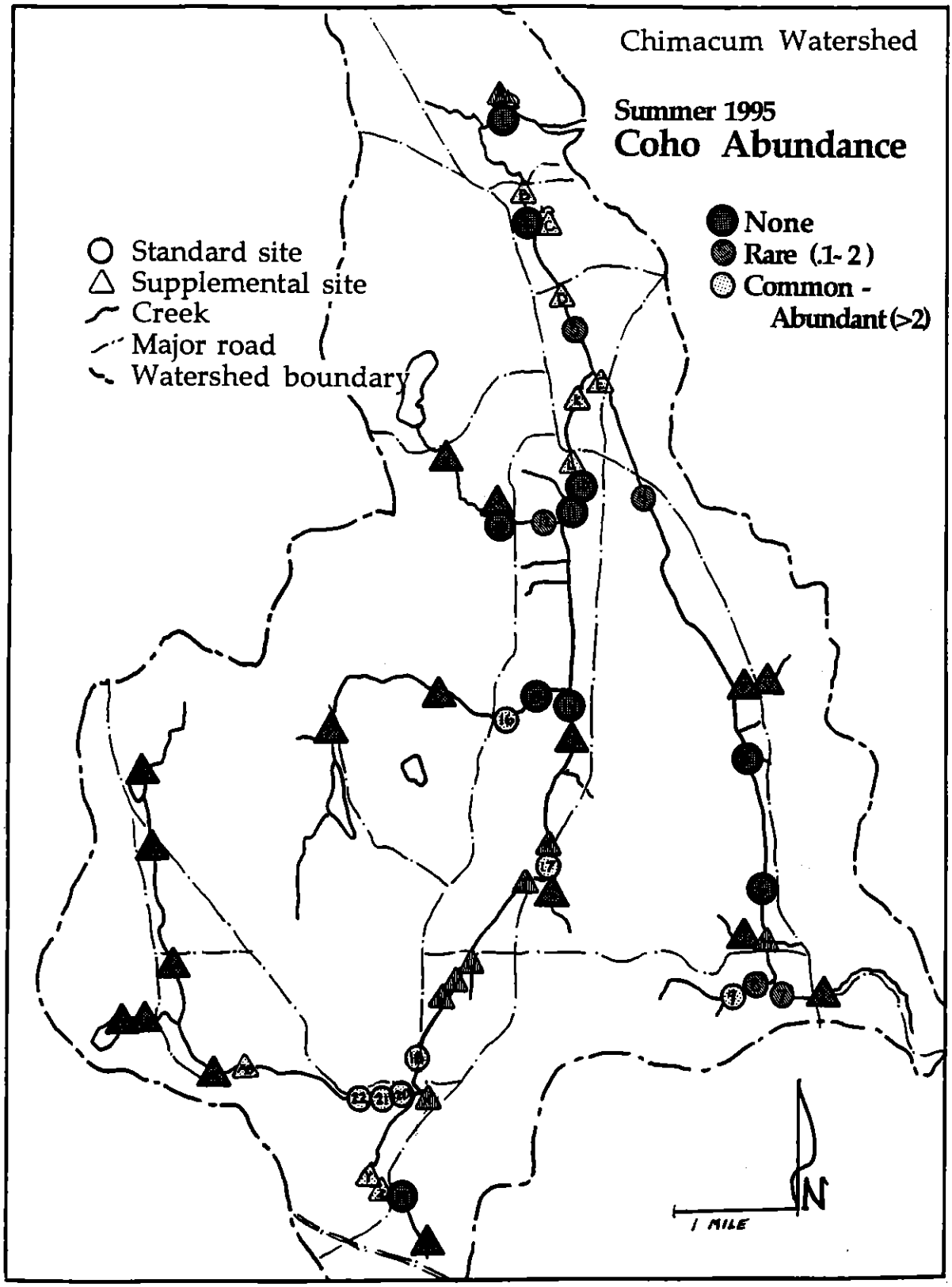


Figure 18. **Relative abundance of juvenile coho sampled at standard and supplemental sites in Chimacum Watershed, summer 1995.**

2. Historic Conditions

"There is but little land in this township suited to agriculture. There are, however several settlers... The larger portion of the township has been run over by fire many years ago and nearly all timber destroyed... The surface of the ground is nearly covered by fallen trees, and grown up by dense thickets of young firs, hemlocks, cedars, etc. The water in all the streams in this township is cold and of the purest kind."

-- 1873 General Land Survey of Township 28, North Range 1 West, Willamette Meridian, Washington Territory

Environmental history of the Chimacum Watershed

Key events in the history of the Chimacum Watershed, as derived from General Land Office (GLO) surveys, published and unpublished historical manuscripts, and oral histories are listed in Table 3 and summarized below.

Prior to the initiation of Euro-american settlement of the watershed in the 1850s, most riparian areas along Chimacum Creek were thickly forested with conifers such as spruce, cedar, hemlock and fir. Illustrated cross-sections of Chimacum Creek watershed, derived directly from the GLO survey notes, are presented in Figures 19-22. Enormous tree roots and trunks once submerged in saturated peat soil floated to the surface as settlers cleared fields of the Chimacum valleys at the turn of the century (Bishop, pers comm.; Short, pers comm.). The extensive swamp forests that once grew in the valley were laced with meandering channels and pocketed with beaver ponds, wet prairies, and thickets of crabapple and hardhack.

Although the valley had previously been inhabited by the Chimacum Tribe, few of them survived after disease and massacres killed most of them (Matheson, 1995). First hand accounts of large cedar, hemlock, fir and spruce forests, abundant large wood in the mainstem and tributaries, as well as abundant coho salmon and cutthroat trout are reported by old time Chimacum residents whose parents homesteaded here (Yarr, pers. comm.; Broderson, pers. comm.).

By the turn of the century, the Chimacum was rapidly being colonized by pioneers, most of European descent. Much of the uplands were logged and the lowland riparian forests were cleared for conversion to agriculture. In 1919, a drainage program was initiated to channelize most of the streams in the West and East Fork valleys and upper mainstem to abate flooding of agricultural lands. The program was partially subsidized by the federal government. In addition, most valley farmers installed drainage tiles under fields to provide rapid drainage of wetland areas.

Table 3. Land use history: major changes in Chimacum Watershed 1780-1995.

Year	Event	Source
1780	400 Chimacum Indians, linguistically related to Quileutes on western shore of Olympic Peninsula, live in the Chimacum Valley. Main settlements are at the mouth of Chimacum Creek and Kala Point.	Brewer, 1988
1780 and prior	Native's village at the mouth, and the whole Chimacum prairie are called, "Gsqai." "Chimacum" may be a native name for "prairie."	Matheson-Eldridge interview, 7/19/94
1780-1850	Disease and warfare reduces tribe to 150 people.	Brewer, 1988
1850s	An epidemic disease or war exterminates most Chimacum Indians. Precise date unknown. Chimacum are regarded by some as an extinct culture in the time of white settlement, but are included in 1855 Point No Point Treaty.	Matheson Papers, 1988 Brewer, 1988
1858-1873	General Land Surveys are conducted and Cadastral Maps are drawn along Section, Township and Range lines of Chimacum Creek. Surveyors report stream width, soil quality, vegetation, and cultural centers such as homesteads. An Indian ranch is reported at Kala Point. The valleys of both forks support beaver marshes, cedar and spruce swamps, and shallow lakes. Uplands consist of large timber and fire-scarred land.	General Land Office, Department of Interior Original Surveys: 1858-1873
1878	Indian Department of Census lists only 13 Chimacum people. Surviving Chimacum are assimilated into the Suquamish and S'Klallam tribes by marriage.	Brewer, 1988
1901	Beaver common in Chimacum Creek Elk extinct in valley, but many horns & bones found.	Matheson Papers, 1988 Yarr, pers comm 8/29/95
1904	Accounts of abundant salmon runs in the headwaters of both forks of Chimacum Creek.	Broderson, pers comm 8/31/95 Yarr, pers comm 8/29/95

Table 3. Land use history, continued

Year	Event	Source
1916	Large cedar shingle mill (Mastick & Co.) in operation on the west side of Port Discovery Bay.	General Land Office, Department of Interior Original Surveys: 1858-1873
Early 1900s	Big timber logging is common near streams and other water bodies.	Peterson, pers comm 12/18/95 Broderson, pers comm 8/31/95
Early 1900s and prior	No salmon migrate to Peterson Lake. The channel dries up 6 months/year.	Peterson, pers comm 12/18/95 Germeau, pers comm 12/18/95
1919	First ditches excavated on mainstem as part of a government-subsidized flood control program. Large tax burdens leave several farmers bankrupt. Many mortgage their farms.	A. Bishop, pers comm 12/20/95 Yarr, pers comm 8/29/95
1920	Since at least 1920 no salmon have ever come up to Delanty Lake. Not enough water to sustain rearing.	Germeau, pers comm 12/18/95
1922	97 day drought.	Yarr, pers comm 8/29/95
1923-1926	Floating cannery operated by native women remains at the Irondale smelter docks for approximately 6 weeks in the fall and early winter.	Schold, pers comm 1/3/96
1929-1941	Government pays bounty on seal, bobcat, cougar, coyote, and crows.	Lopeman, pers comm 9/12/95
1930s	Lower Chimacum Creek at Irondale is called "Irondale Creek." Popular recreation areas at the mouth. Confluence of main forks (at Doug Joyce property) abundant fishing.	Matheson-Eldridge interview, 7/19/94
1934-1935	Peat land burns near confluence of Beaver valley and West Fork.	Lopeman, pers comm 9/12/95
1930s	Log boom at mouth of Chimacum Creek.	Matheson-Eldridge interview, 7/19/94

Table 3. Land use history, continued

Year	Event	Source
year?	Construction of Beaver Valley Road and subsequent ditching creates a high culvert fish block at Swansonville Road. Salmon previously migrated up Swansonville Creek to spawn.	A. Bishop, pers comm 12/20/95
	Construction of West Valley Road creates a high culvert fish block at "Barnhouse Creek," south of Center. Salmon previously migrated up "Barnhouse Creek" to spawn.	Broderson, pers comm 8/31/95
Early 1940's	Drainage ditches are dug throughout the Chimacum Watershed. Commonly blown open with black gun powder, sometimes during salmon migrations. Meanders and side channels are reduced.	Lopeman, pers comm 9/12/95
1948	Beavers reintroduced to Peterson Lake.	Peterson, pers comm 12/18/95
Early 1950s	Reed canary grass planted by farmers. Promoted as a wet soil tolerant grass by WSU Cooperative Extension.	Short, pers comm 8/29/95
1953	Salmon and steelhead reported along the full length of Chimacum Creek: from the mouth up to B. G. Brown's farm, at Center.	Shaw, pers comm 12/20/95
1954	Beaver mostly trapped out of Jefferson County, with the exception of Peterson Lake, where they were protected.	Lopeman, pers comm 9/12/95 Peterson, pers comm 12/18/95
1956	Watershed Work Plan Agreement signed between the Jefferson County Soil Conservation District and Drainage District #1 of Jefferson County to abate floodwater damages to farmland. Work Plan lists fish runs present: Resident fish include cutthroat and rainbow trout; Anadromous fish listed are coho, steelhead and chum. Human population approximately 700. 16 small [10 acre] irrigation projects exist. Surface water supplies are "completely vested." Study notes long duration time of winter floods, late spring floods in late April.	Watershed Work Plan Agreement, 1956

Table 3. Land use history, continued

Year	Event	Source
1956	Existing channels have insufficient depth to drain channels. 1,961 acres of "poor drainage" land; 900 acres subject to "frequent inundation;" 756 acres are on a perched water table. Thick vegetation lines the banks of the mainstem	Watershed Work Plan Ageement, 1956
1958 (?)	"Bishop's Dam" installed beneath Rhody Drive on the West Fork. Boards are placed in dam during summer and removed by September 15th annually.	Shaw, pers comm 12/20/95
1960s	Beaver re-introduced to East Jefferson County by Fish and Game Department.	Lopeman, pers comm 9/12/95
1970	Native Steelhead and Chum return annually.	Lowrie, pers comm 9/12/95
1970s	Dredging period ends	Eldridge, pers comm 7/95
1971	Gravel pit dug by George Cotton adjacent to mainstem of creek just below confluence of two forks.	Lopeman, pers comm 9/12/95
1970-1995	Chimacum High School runs a salmon hatchery program. Fish weir installed at the mouth of the creek 1974-75. Weir washed out in a storm.	Lowrie, pers comm 9/12/95
1979	Approximately 100,000 gallons of highly chlorinated water released from reservoir into Chimacum Creek at Summerville Road hydrant location. Spill occurred in June, just after WDF and Chimacum High School released an estimated 42,350 hatchery coho juveniles from Dungeness and Quilcene stock into creek. Water Department and consulting engineer fined. Using electro-shocker, only 100 juvenile fish found downstream of spill. Hydrant subsequently removed.	Shaw, pers comm 12/20/95 Engel, Port Townsend Water Department, pers comm 1/2/96
1980-1983	Several stream-side residents note high returns of coho salmon.	Shaw, pers comm 12/20/95 Short, pers comm 8/29/95 Vodder, pers comm 12/18/95

Table 3. Land use history, continued

Year	Event	Source
Winter 1982/3	Irondale fill failure. Three day storm washes approximately 20,000 yards of fill into the mainstem, causing cementation of spawning gravels downstream.	Lowrie, pers comm 9/12/95 Latham, pers comm 7/18/95 Department of Public Works, pers comm 1/7/96
1983/4	Storm- induced landslide on West Fork (logging landing failure approx. 1/2 mile upstream of BG Brown's farm) releases large sediment loads onto spawning gravels. Sediment basin is installed and cleaned out every several years.	Latham, pers comm 7/18/95 Lowrie, pers comm 9/12/95 Michel, pers comm 2/11/96
1983	Estimated return of 1500 chum, 3-5,000 coho. Many redds buried by landslide sediments.	Lowrie, pers comm 9/12/95
1994-5	Wild Olympic Salmon installs and monitors fish weir at the mouth. Fewer than 200 fish -- the minimum required for genetic health of a run -- return.	Wild Olympic Salmon Weir Log, 1995 Michel, pers comm 1995

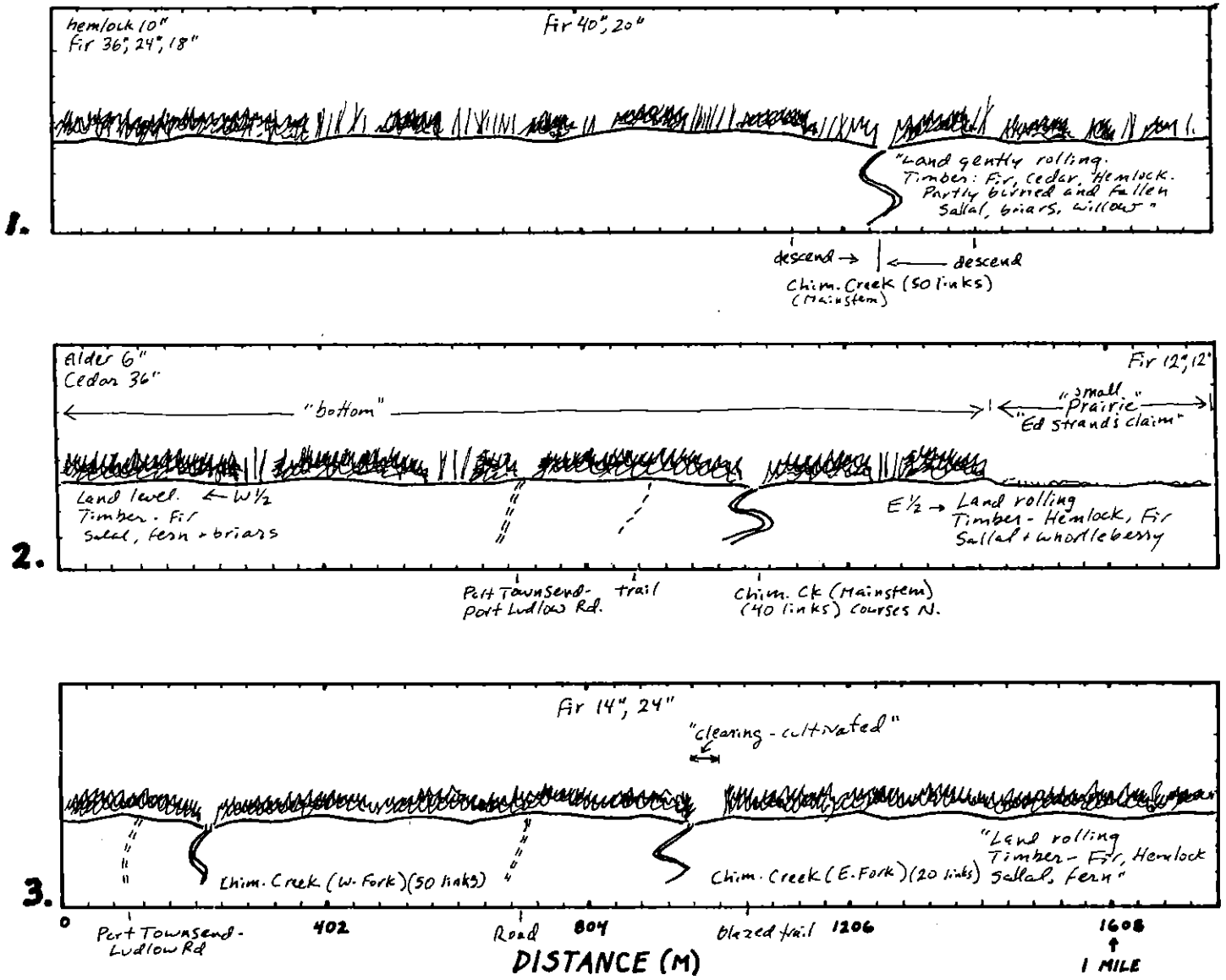


Figure 19. **Illustrated cross-sections (no. 1-3) of Chimacum Creek Watershed derived from GLO field surveys conducted from 1858 to 1874.**

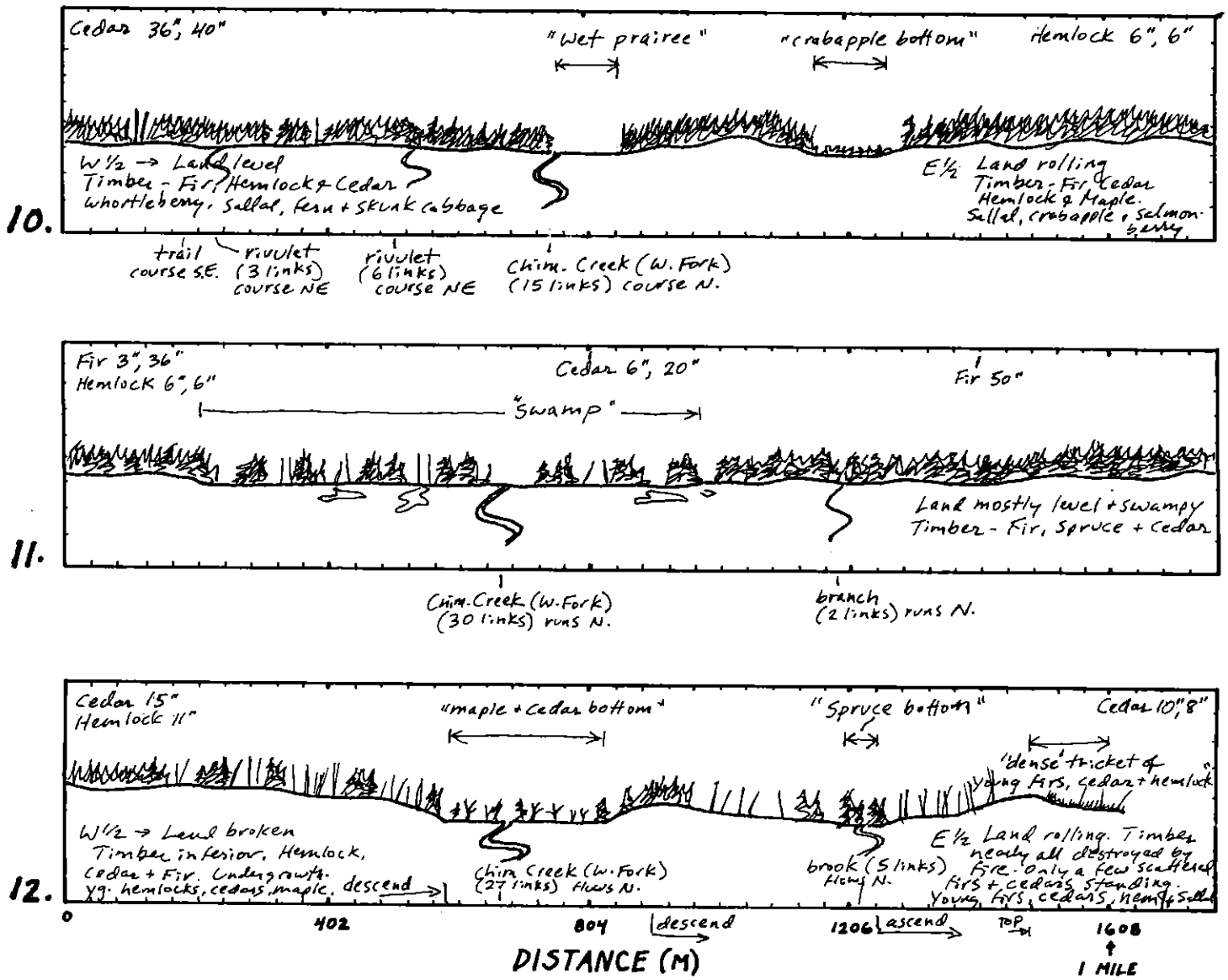


Figure 22. **Illustrated cross-sections (no. 10-12) of Chimacum Creek Watershed derived from GLO field surveys conducted from 1858-1874).**

During the mid-1920s, coho and chum populations were abundant enough in the region to support a temporary fish cannery operated by several native women and located on a barge at the mouth of Chimacum Creek. A second major drainage maintenance program was initiated in 1956 by the local drainage district and Soil Conservation District (Jefferson Co. SCS, 1956), but farmers say that only the lower few miles of the creek were dredged.

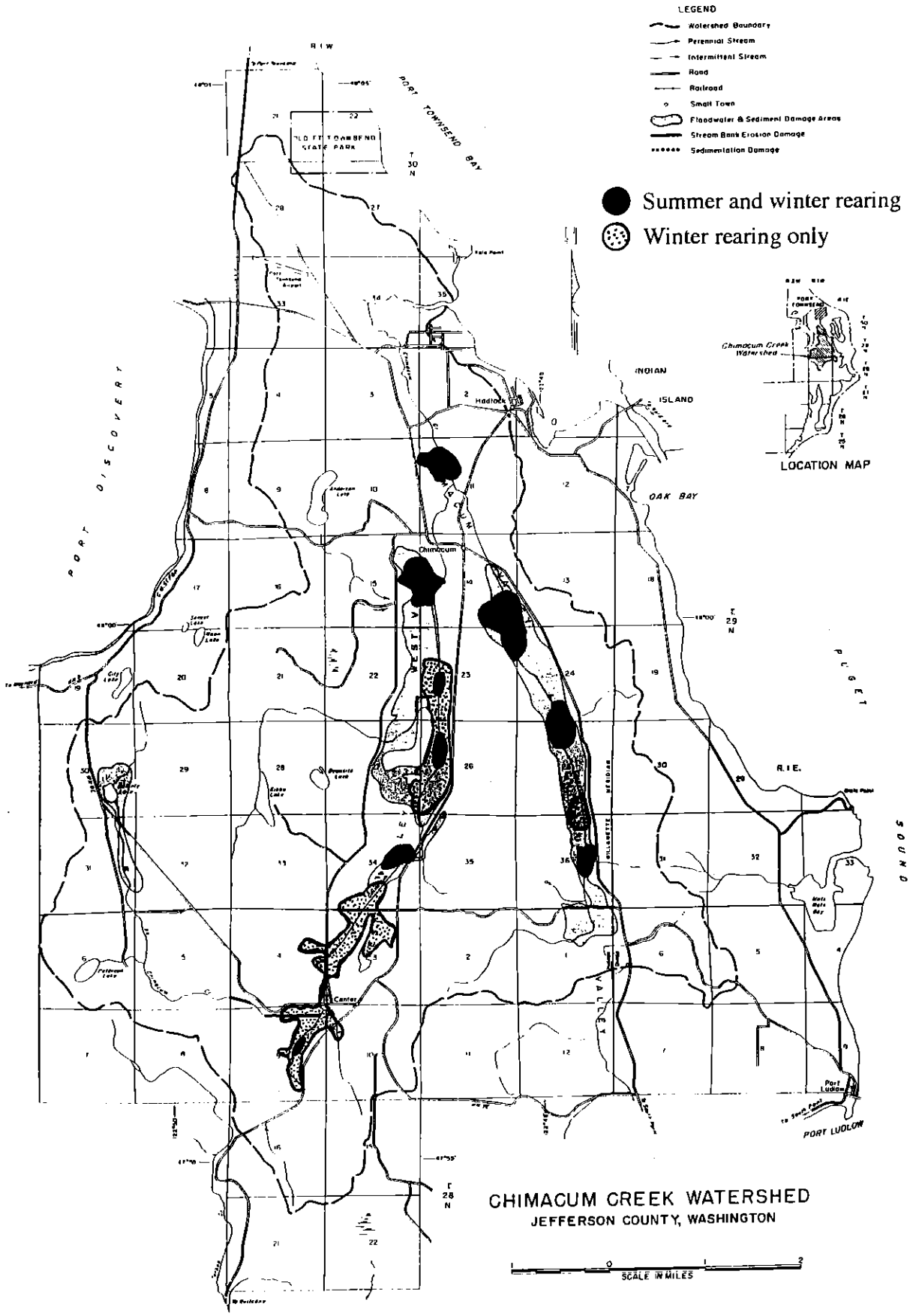
The lowland valleys were converted from forested swamps, beaver ponds and wet prairies to drained agricultural pastures and fields, mostly supporting small dairy farms (Fig. 23 and 24). In the surrounding hills, the main conversion was from large coniferous forests (burned and unburned) to smaller second growth and mixed coniferous-deciduous forests. Road building required construction of culverts, several of which blocked fish passage. Since the 1920's, the small dairy farms in Chimacum have all but disappeared. Many small farmers went broke after first mortgaging their farms to pay their share of the 1919 Drainage District project and then were faced with the Great Depression (J. Yarr, G. Bishop, pers. comm.). Only a few large-scale farms still operate. Farmers continue to dredge, straighten and clear vegetation from ditches on a small scale. Reed canary grass is periodically removed from the West Fork channel south of Rhody Drive and Chimacum High School (R. Johnson, WDFW Hydraulic Permit Approval records, 1980-1995).

Several landslides and road failures occurred in the early 1980s, burying prime spawning areas with excessive sediment. From the 1950s to 1995, Chimacum Creek was planted with various non-native stocks of hatchery coho by the Chimacum High School hatchery operation and Washington Department of Fisheries (WDFW, unpubl. data).

Many Chimacum residents agree that the decline in salmon population has been dramatic. However, it was not possible to draw a clear link between coho abundance and habitat changes over time due to the limited historical information on coho abundance and potential influence of other factors influencing coho. Sporadic spawning surveys began in the 1950s, after most of the major habitat changes had taken place and only sketchy information on coho abundance is available from the few people who remember the coho runs of the early 1900s. Also, relatively large numbers of spawners observed by residents in the 1970s and early 1980s may be related more to favorable ocean conditions and large-scale hatchery out-planting that occurred during that time than to substantial habitat improvements.

In the mid-1980's, habitat restoration projects were begun by Wild Olympic Salmon, a non-profit volunteer group.

Information gleaned from 11 interviews with long time residents of Chimacum Creek provided a wealth of information. Interviews are included in their entirety in Appendix N.



CHIMACUM CREEK WATERSHED,WASH. 7-E-15212-R

Figure 23. Location of historic (pre-1850) wetlands considered to have provided summer and/or winter rearing habitat, Chimacum Watershed.

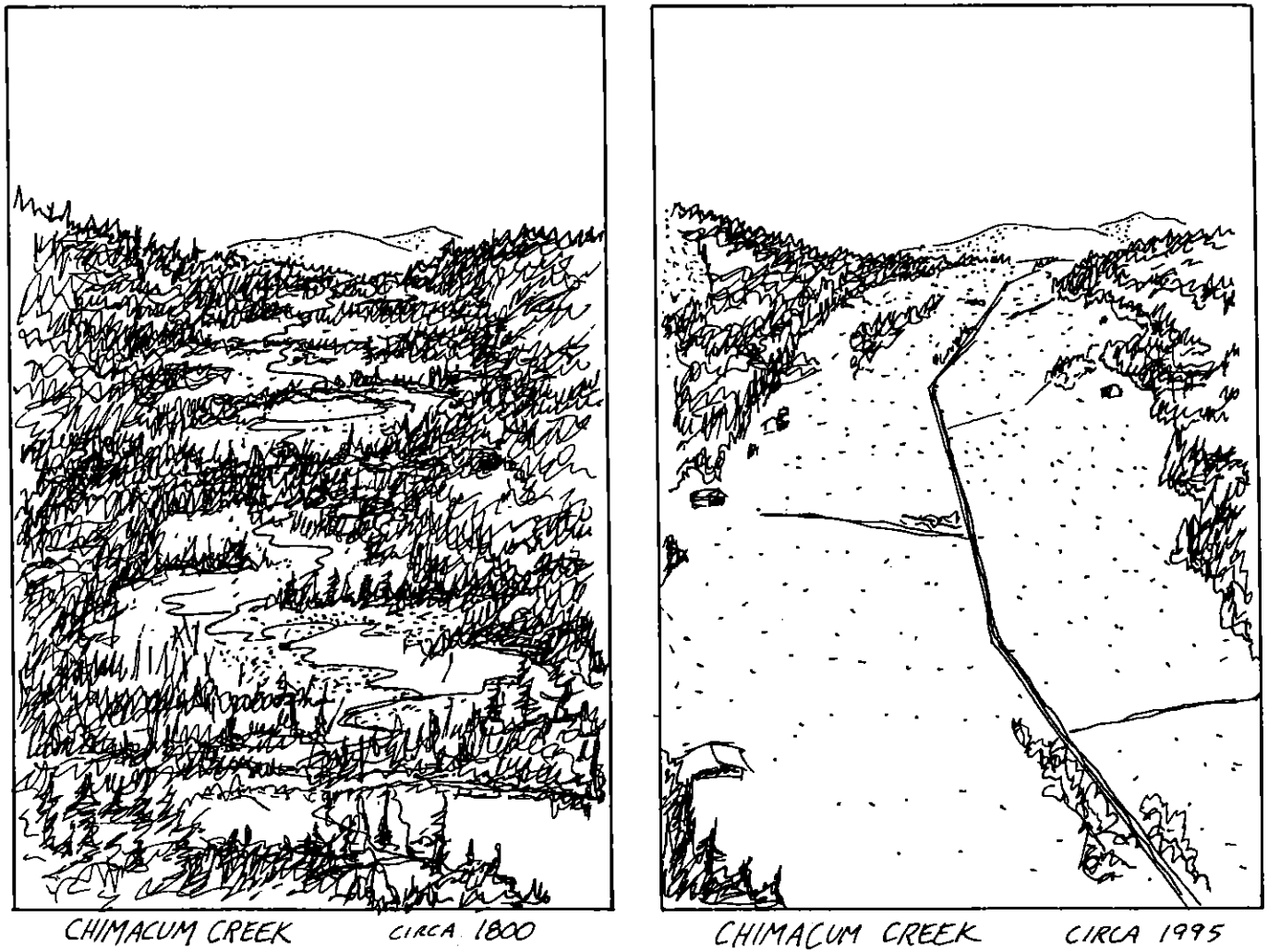


Figure 24. **An illustrated overview of the Chimacum Watershed looking upstream along the West Fork valley showing historic beaver ponds, stream meanders and forested wetlands (circa 1850) and channelized streams and pasture land (circa 1995) and).**

Historic channel characteristics

According to GLO surveys, the 1919 channel map and oral histories, the East and West Forks were meandering channels interlaced with beaver ponds and large seasonally flooded wetlands. Large woody debris was abundant in even the low gradient valley streams (Yarr, pers. comm.). The lower mainstem, as well as upper tributaries in the hills were probably similar to existing conditions, except that they contained larger and more abundant woody debris, larger pools and probably less silt (Broderson, pers. comm.). In addition, inspection of aerial photos and existing site conditions indicate that large wetlands occurred in headwaters; at the upper ends of Naylor's Creek (site P) and the West Fork (site MG). These wetlands may have augmented summer flows and prevented the upper ends of the tributaries from drying up as they do now.

The most unusual historic change in channels is found on the upper East Fork. According to Gerald Bishop (pers. comm.), the Swansonville tributary (site 7 and site J) flowed into a large wetland in the valley near site 7 and located on the divide between Ludlow Watershed to the south and Chimacum Watershed to the north. The wetland was connected to the upper end of both Ludlow and Chimacum Creeks. Most maps show Swansonville Creek connected to Ludlow Creek. When Swansonville Creek and the wetland were channelized and drained for farming, the creek was connected to Chimacum and isolated from Ludlow Creek, as it remains to the present (Bishop, pers. comm.).

Historic riparian characteristics

Prior to Euro-american settlement of the watershed in the 1850s, most riparian areas along Chimacum Creek were thickly forested with conifers such as spruce, cedar, hemlock and fir. The extensive swamp forests that once grew in the valley were laced with meandering channels and pocketed with beaver ponds, wet prairies, and thickets of crabapple and hardhack. Riparian zones probably provided high quality rearing habitats, in terms of cover, food supply, habitat diversity, shade and water quality.

Historic pool habitat

Pool habitat was undoubtedly abundant throughout the Chimacum due to the extensive meandering channels with abundant large woody debris, as well as beaver ponds and seasonally flooded wetlands. The only historical information on high gradient tributaries suggests that they probably had much more pool habitat due to abundant large woody debris and less siltation from land disturbing activities (Broderson, pers. comm.).

Historic water quality (temperature, oxygen, acidity)

In general, riparian zones and wetlands were well forested and water quality for coho is presumed to have been excellent. Although some wetlands were not well-shaded, spring inflows and subsurface flows through peat soils and under beaver ponds may have been sufficient to maintain suitable water temperatures and oxygen levels for summer rearing by coho (Lichatowich, pers. comm.); although excessive acidity from peat wetlands was a possible constraint (Frissel, pers. comm.).

Historic coho distribution and abundance

According to local elders, coho did not utilize three of four lakes in the watershed. Delanty Lake actually flowed north into Discovery Bay until a landslide blocked the outlet stream and a ditch was dug that connected Chimacum Creek to the south side of the lake (Germeau, pers. comm.). Even with the ditch providing potential passage during winter, Mr. Germeau had not seen sign of a salmon in Delanty Lake in his 75 year of residence at the lake. An impassable falls and steep stream gradient prevent salmon from accessing Anderson Lake. Peterson Lake has a small seasonal outlet stream with a steep gradient that appears to block fish passage. According to Bernard Peterson, who has lived at the lake for 79 years (pers. comm.), the upper extent of the coho spawners and juveniles is about one-half mile downstream of the lake on the upper West Fork. This location corresponds to the upper extent of surface flow and coho juveniles found during the summer survey (site AB).

Gibbs Lake may be the only lake that coho utilized historically. Although the lake outlet stream, Naylor's Creek, dries up during the summer about one-half mile upstream of West Valley Road crossing (site O), coho spawners have been observed farther upstream (site P) and coho have been caught in Gibbs Lake by anglers (Ammeter, pers. comm.). Presumably, the coho caught were wild coho prevented from out-migrating as smolts in the spring due to low flow in the outlet stream. Additionally, several residents informed us that they believe that Naylor's Creek had perennial flow prior to human impacts and may have provided more extensive year round access to coho for rearing in Gibbs Lake (Jay and Ammeter, pers. comm.). They suggested that increased sediment loads and/or the removal of large beaver pond wetlands below Gibbs Lake may have caused the change. However, there is no historical account to confirm the perennial flow theory and for this report it is assumed that Naylor's Creek was always a seasonal stream in the upper reaches with little or no successful rearing in Gibbs Lake due to access restrictions.

Although oral histories were quite varied, all except for one of the 11 long-time residents interviewed agreed emphatically that there has been a significant decline in salmon runs over time. Elders 75 to 95 years old describe habitat and salmon runs that only remotely resemble present conditions. Quantitative information is inconclusive, since salmon spawning surveys by Washington State Fisheries were begun in the 1950s and have only been conducted systematically since about 1980 (C. Baranski, February 2, 1987 note to Grant Fiscus); too short a period to analyze trends.

3. Historic Loss and Limiting Factors

Loss of channel length

Most of the West and East Fork streams were channelized and straightened. Meandering bends in the river were cut-off, substantially reducing the length of some stream segments (Fig. 25). Road crossings through streams resulted in seven culvert blocks to fish passage on several tributaries, further reducing available habitat. During the summer, about two miles of the lower West Fork are not used by coho, probably due to low dissolved oxygen and elevated temperatures. Prior to stream straightening and human impacts, the main channels and tributaries provided 43.7 km (about 20 miles) of habitat. The conversion of sinuous channel meanders to straight channels, with fish passage blocks and unsuitable water quality areas, reduced the overall channel length by approximately 25%. In total, approximately 20 to 30 percent of the stream length used for summer and winter rearing and spawning has been lost (Table 4). However, this is probably an under-estimate since land clearing and limited ditching activities for agricultural conversion had started in the 1850s and many historic channels were probably not shown on the 1919 channel map used in this analysis.

Table 4. Historic loss of channel length by habitat type in Chimacum Watershed.

	Stream channel length (km)		
Habitat type	Historic 1919	Existing 1995	%loss
Summer rearing	43.7	31.1	28.8
Winter rearing	43.7	35.0	19.9
Spawning	17.4	13.6	22.0

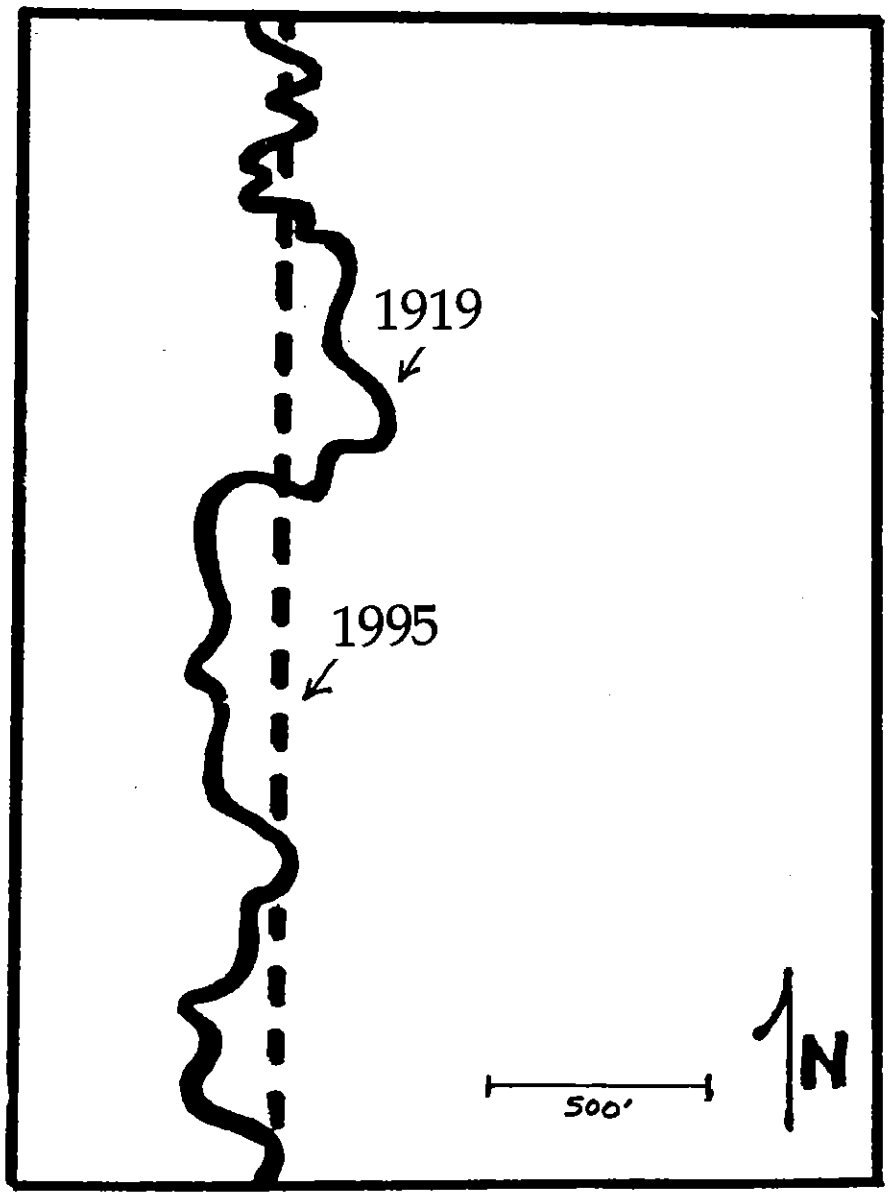


Figure 25. **A section of the West Fork of Chimacum Creek before and after channelization in 1919.**

Loss of surface area

A comparison of historic and existing channel widths indicates no clear trend of increasing or decreasing width (Table 5). However, the comparisons are approximate at best, since historic widths were measured in fall and spring, not just during summer low flow. Also, it is unknown whether GLO surveyors were measuring bankful width or stream width, so both measurements are presented here. Thus, for the purposes of the assessment, stream width was assumed to have remained constant, with the exception of historic wetlands.

Table 5. Comparison of historic (1858-1874 surveys) and existing (1995) stream widths of Chimacum Creek.

Historic (1858-1874)			Existing (1995)			
		Channel	Closest	Bankful width (m)		Wetted width
X-section#	Location	width (m)	sites	Supp. site	Stand. site	standard site
1	Mainstem	10.1	B	6.0		
2	Mainstem	8.0	D,3	6.0	2.5	2.3
3	West Fork	10.1	L	2.5		
3	East Fork	4.0	4		2.4	1.7
4	East Fork	4.0	4		2.4	1.7
5	East Fork	swamp	5		1.4	0.7
6	East Fork	2.4	6		1.9	0.8
7	East Fork	0.8	H	3.0		
8	West Fork	10.1	11		10.3	9.2
9	West Fork	6.0	Q,14	7.0	14.4	13.6
9	Naylor's Trib.	2.0	16		1.3	1.2
10	West Fork	3.0	R,17	6.0	4.6	3.6
11	West Fork	6.0	V	7.0		
11	Hunting. Trib.	0.4	U	1.0		
12	West Fork	5.4	18		7.2	2.2

The surface area of historically flooded areas -- comprising summer and winter rearing habitat -- is 539.6 hectares (1333 acres). Currently, the only summer rearing "swamp" is a small beaver pond less than 2 acres on the upper West Fork (Barnhouse Creek). Winter rearing has also been drastically reduced. Although some areas still flood in winter, stream channelization, drainage ditches and tiles under fields have reduced the duration of flooding. Inundated areas previously

available to coho juveniles and smolts for several months during winter flooding may now drain in a week. Thus, for the purposes of this analysis, existing wetlands used as rearing habitat was assumed to be negligible.

Loss of habitat in terms of channel surface area, not including swamps, represents a 33% loss of summer rearing surface area, 15.6 % loss of the winter rearing and 7.6 % loss of spawning area (Table 6). Loss of summer rearing is higher than winter rearing because a wide slough section of the lower West Fork has poor enough water quality to effectively eliminate it as summer habitat. Spawning losses are mainly in the small tributaries due to culverts blocking fish passage.

Draining ponds, wet prairies and beaver marshes created an even more dramatic loss in summer and winter rearing habitat. In terms of surface area of habitat, 98% of winter rearing and 95% of summer rearing habitats have been lost since the 1850s (Table 6). Channel length and surface area losses for mainstem and each fork are presented in Table 7.

Table 6. Historic loss of stream area (including swamps) in the Chimacum Watershed.

	Surface area (hectares)				
	Historic		Existing	%loss	
Habitat type	1919	Swamps	1995	channel	w/swamps
Summer rearing	15.4	179.6	10.3	33.0	94.7
Winter rearing	15.4	539.6	13.0	15.6	97.7
Spawning	6.6	0.0	6.1	7.6	7.6

Table 7. Historic loss of stream channel length and surface area (including swamps) in mainstem and forks of the Chimacum Watershed.

		Channel length (km)			Surface area (hectares)			%loss	
		Historic	Existing		Historic		Existing		
Habitat Type	Stream	1919	1995	%loss	1919	Swamp	1995	channel	w/swamp
Summer rearing	mainstem	4.5	4.3	3.6	4.3	0.0	4.3	0.9	0.9
	east fork	13.9	10.9	22.1	1.6	88.9	1.3	18.7	98.5
	west fork	25.3	15.9	37.0	9.4	90.7	4.7	50.3	95.3
Winter rearing	mainstem	4.5	4.3	3.6	4.3	31.0	4.3	0.9	87.8
	east fork	13.9	10.9	22.1	1.6	111.3	1.3	18.7	98.8
	west fork	25.3	19.8	21.6	9.4	397.3	7.3	21.9	98.2
Spawning	mainstem	3.6	3.6	0.0	4.1	0.0	4.1	0.0	0.0
	east fork	4.2	2.1	50.8	0.4	0.0	0.2	48.7	48.7
	west fork	9.7	8.0	17.6	2.0	0.0	1.7	15.0	15.0

Loss of habitat quality

While comparisons of habitat quantities give an idea of the magnitude of the historic habitat losses, it is important to note that the quality of the remaining habitat was also severely degraded. The descriptions of historic and existing habitats, presented in previous sections, indicates substantial impacts to historic high quality coho habitats. Conversion of valley lands to agricultural use, wetland drainage and forest clearing caused a major change in habitat quality by eliminating large woody debris, smoothing and reducing channel structure, reducing pool habitat, water quality, food chain support and other riparian functions that helped maintain productive habitat. Forested tributaries have also declined in quality, although not as dramatically. Logging, road building and development resulted in stream habitat being altered by landslides, removal of large woody debris, loss of pools and increased sedimentation of spawning gravels.

Habitat loss mapping

The location of coho summer rearing, winter rearing and spawning habitats in the Chimacum Watershed and extent of habitat loss is mapped for each life history stage in Figures 26, 27, and 28. The maps show that most of Chimacum Creek, with the exception of seasonal tributaries and lakes, was judged to have provided suitable summer and winter rearing habitat prior to the 1850s and that most of the losses occurred in the valleys converted to agriculture. The only obvious difference between summer and winter habitats is the complete loss of summer rearing in the lower West Fork due to poor water quality under existing conditions. Spawning habitat appeared to have been relatively limited in the watershed historically due to the natural rarity of suitable gravel spawning areas in the extensive peat valleys. Spawning habitats have been further reduced by impassable culverts and channelization, mostly in tributaries.

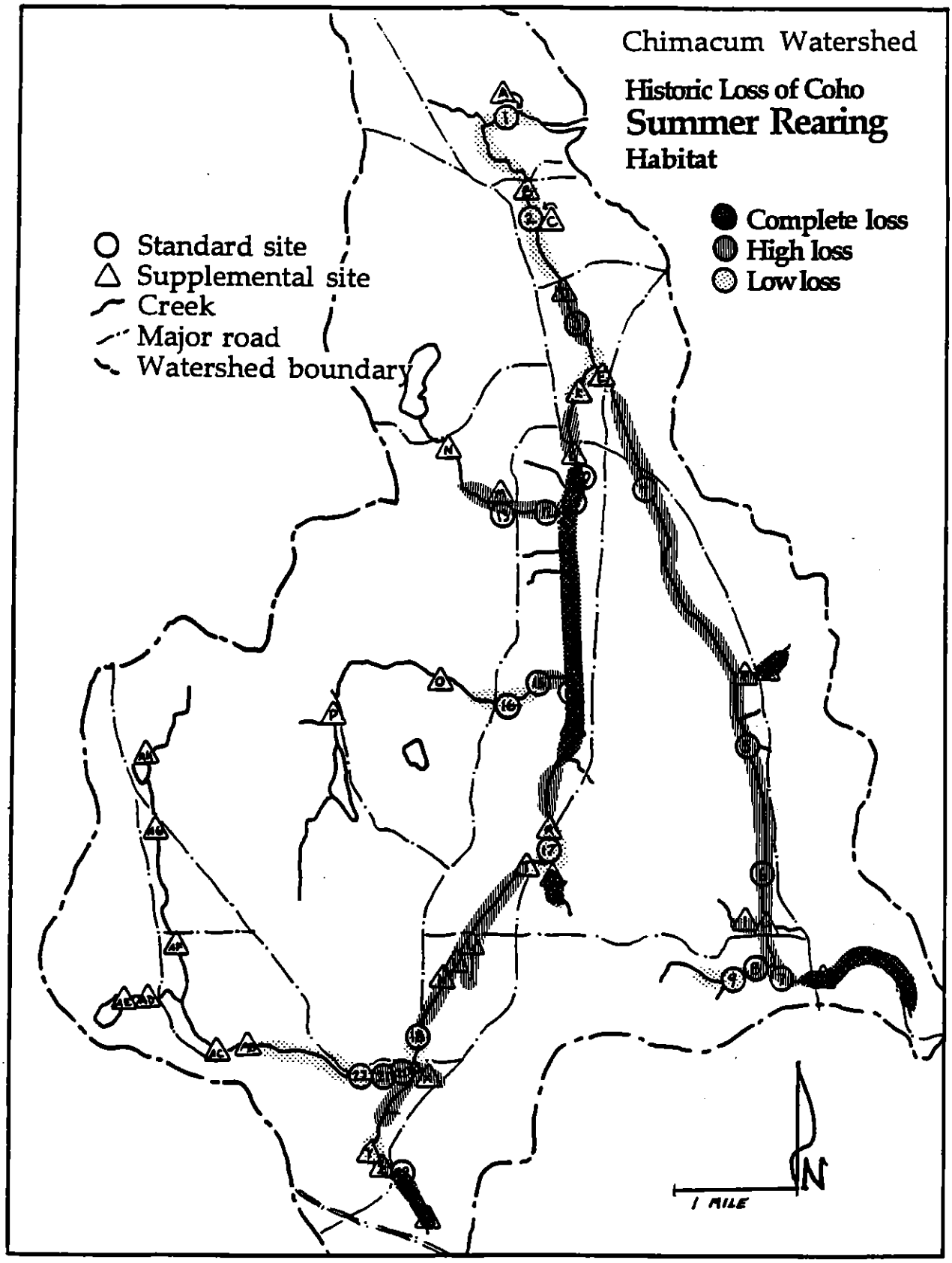


Figure 26. Map of historic loss of coho summer rearing habitat in Chimacum Watershed.

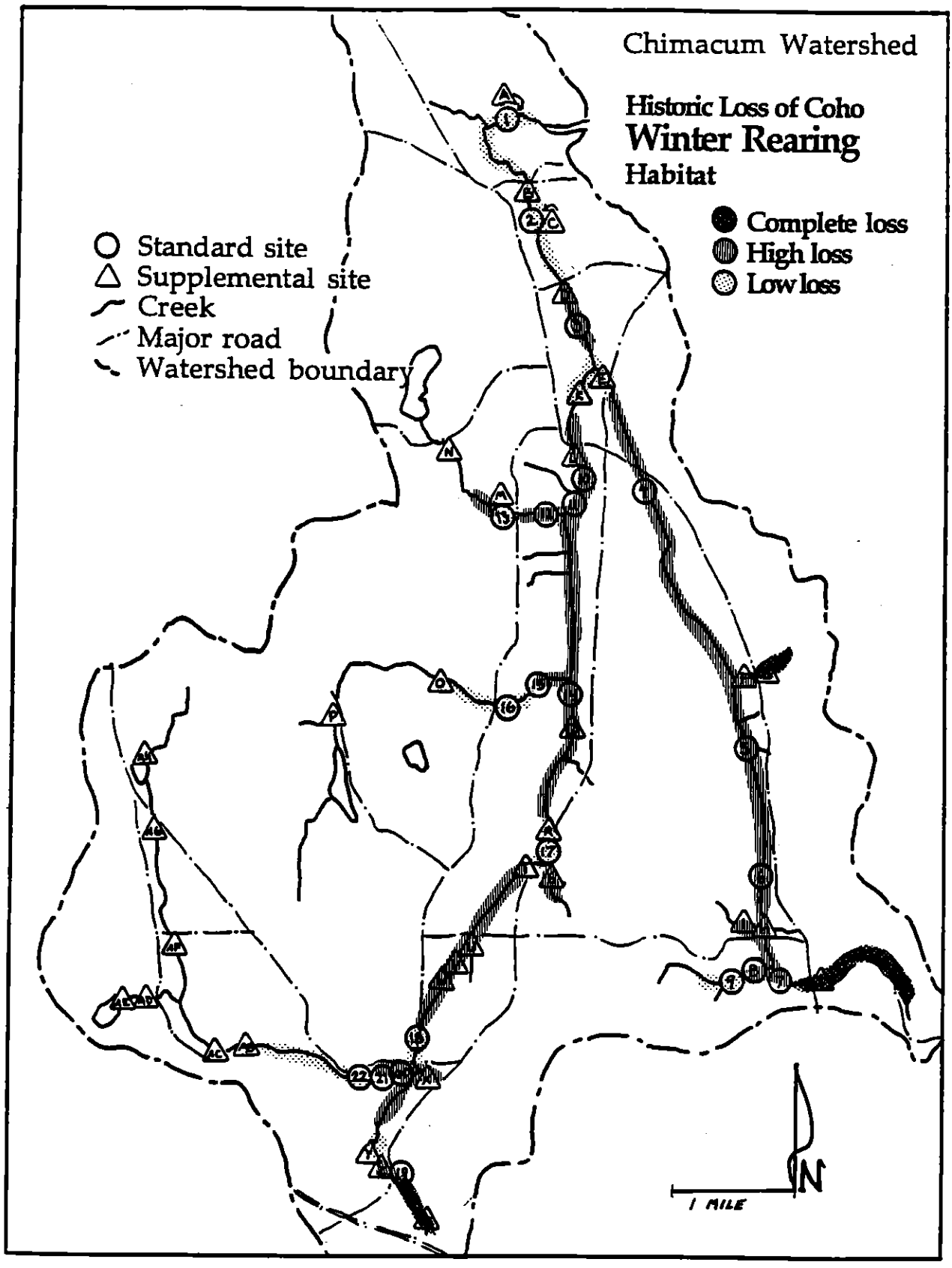


Figure 27. Map of historic loss of coho winter rearing habitat in Chimacum Watershed.

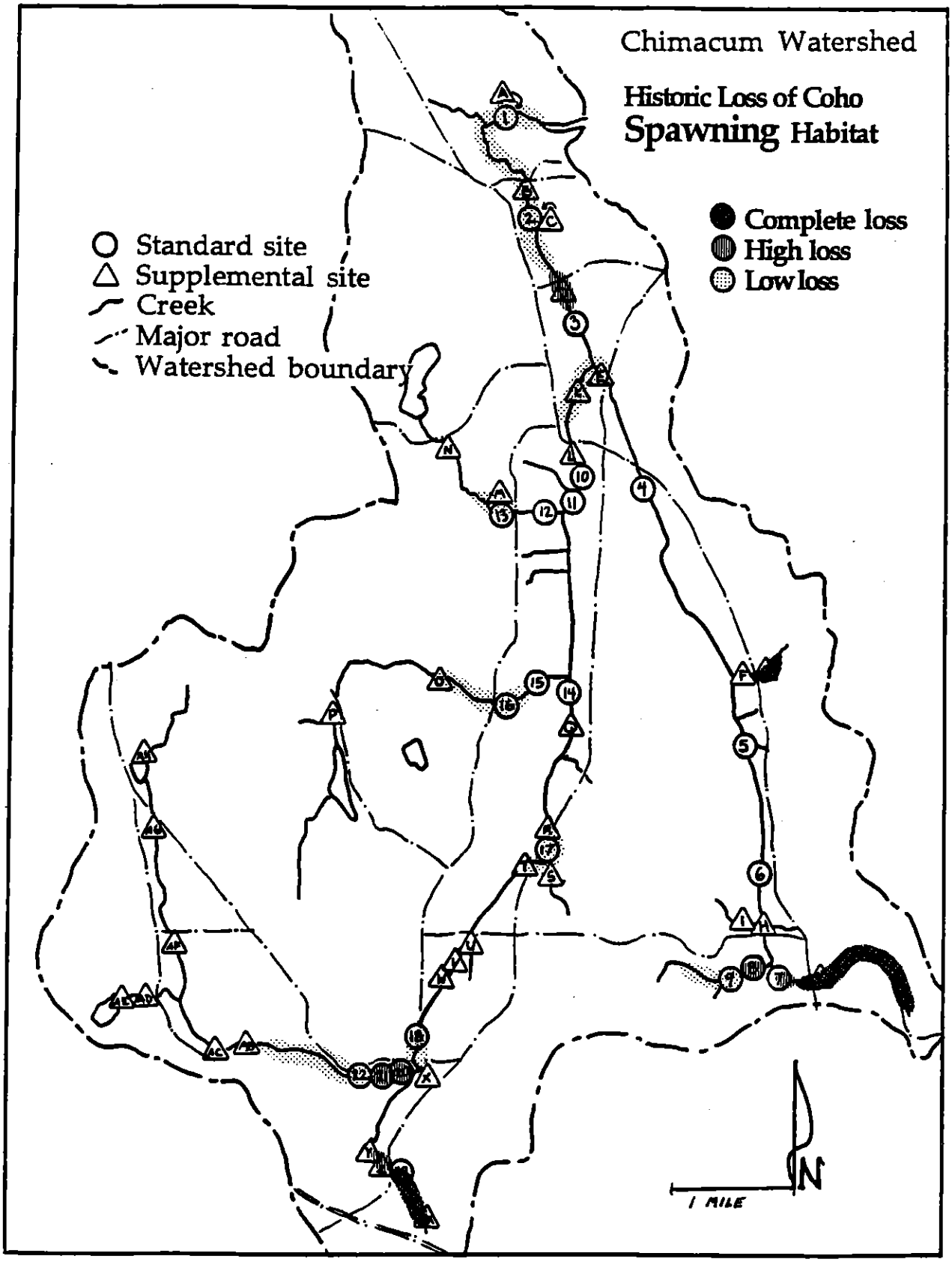


Figure 28. Map of historic loss of coho spawning habitat in Chimacum Watershed.

RECOMMENDATIONS

Implications for Restoration

The results of this assessment indicate that the wild coho population of Chimacum Creek is primarily being constrained during their freshwater life history by the historic loss of over 90 percent of historic summer and winter rearing habitat. The limited amount of existing suitable rearing habitat is probably being utilized to the fullest extent possible by juvenile coho. Thus, fish stocking projects aimed at increasing egg to fry survival, such as a captive brood stock program to supplement the wild population with hatchery reared fry, would probably be counter-productive, disrupting wild populations and lowering overall survival of the population as it faced the habitat "bottlenecks" of summer and winter rearing. We recommend that restoration of Chimacum coho focus on increasing suitable habitats, especially summer and winter rearing habitats.

Restoring riparian zones by stream-side fencing and planting of native trees and shrubs to improve water temperature and oxygen conditions is probably one of the most promising ways to improve habitat. However, our results indicate that elevated water temperatures were not reduced after the stream flowed through 300 meters of shaded riparian zone. Thus, riparian restoration projects should be undertaken as major projects, spanning as long a continuous distance as possible. Small scale plantings in isolation, while not harmful, would not be expected to ameliorate high water temperatures. Any stream side plantings should be as extensive and as dense as possible. Research on riparian shading suggests that buffers of trees should be a minimum of 50 feet on each side of the creek to provide 90 percent of their shading potential (Brazier and Brown, 1973).

In contrast, it may be possible to create small areas of plunge pool rearing habitat in places where there is little existing habitat. The assessment indicates that small plunge pools used by coho existed as oases within the long reach of the East Fork of Chimacum Creek, a shallow riffle habitat with sand substrate, little used by coho. The implications for restoration are hopeful: while watershed-wide restoration is preferable to small scattered projects, these findings imply that juvenile coho will exploit even small scale improvements in summer rearing habitat.

Restoration Recommendations

Projects to restore the wild coho population of the Chimacum Watershed will be most effective if they address existing habitat limitations. Constraints on habitat can be categorized into four major types:

- Physical fish blocks due to impassable culverts at road crossings.

- Low water quality blocks -- areas where high temperature and low oxygen may severely limit fish survival due to loss of forested riparian zones and invasion of reed canary grass and possibly nutrient loading.

- Lack of summer and winter rearing channels and wetlands due to stream channelization and associated loss of beaver ponds, wetlands and meandering channels.

- Lack of large woody debris and associated pools, especially in the East Fork, due to stream channelization and wood removal.

General types of restoration projects are recommended to address these habitat constraints in ecologically suitable areas (Fig. 29). For example, any attempts to create side channels for summer or winter rearing should be limited to those places that already subject to the flooding and which support the natural creation and maintenance of wetlands. Specific project proposals that may arise from these general recommendations must be evaluated based on land owner cooperation, cost/benefit, and potential adverse impacts to the environment or property in the vicinity.

The following six general projects are recommended in decreasing order of priority.

1. Protect Refuge Areas

Description: Protect existing high quality salmon refuge areas by acquisition or easement from willing landowners. Refuge areas are defined as stream reaches with relatively high quality riparian and in-stream habitat (forested riparian zones and infrequent or no past channelization) that currently support high numbers of coho juveniles and spawners.

Justification: Protection of rare remaining high quality habitat that is heavily utilized by coho is essential to maintaining the wild coho population of Chimacum Creek.

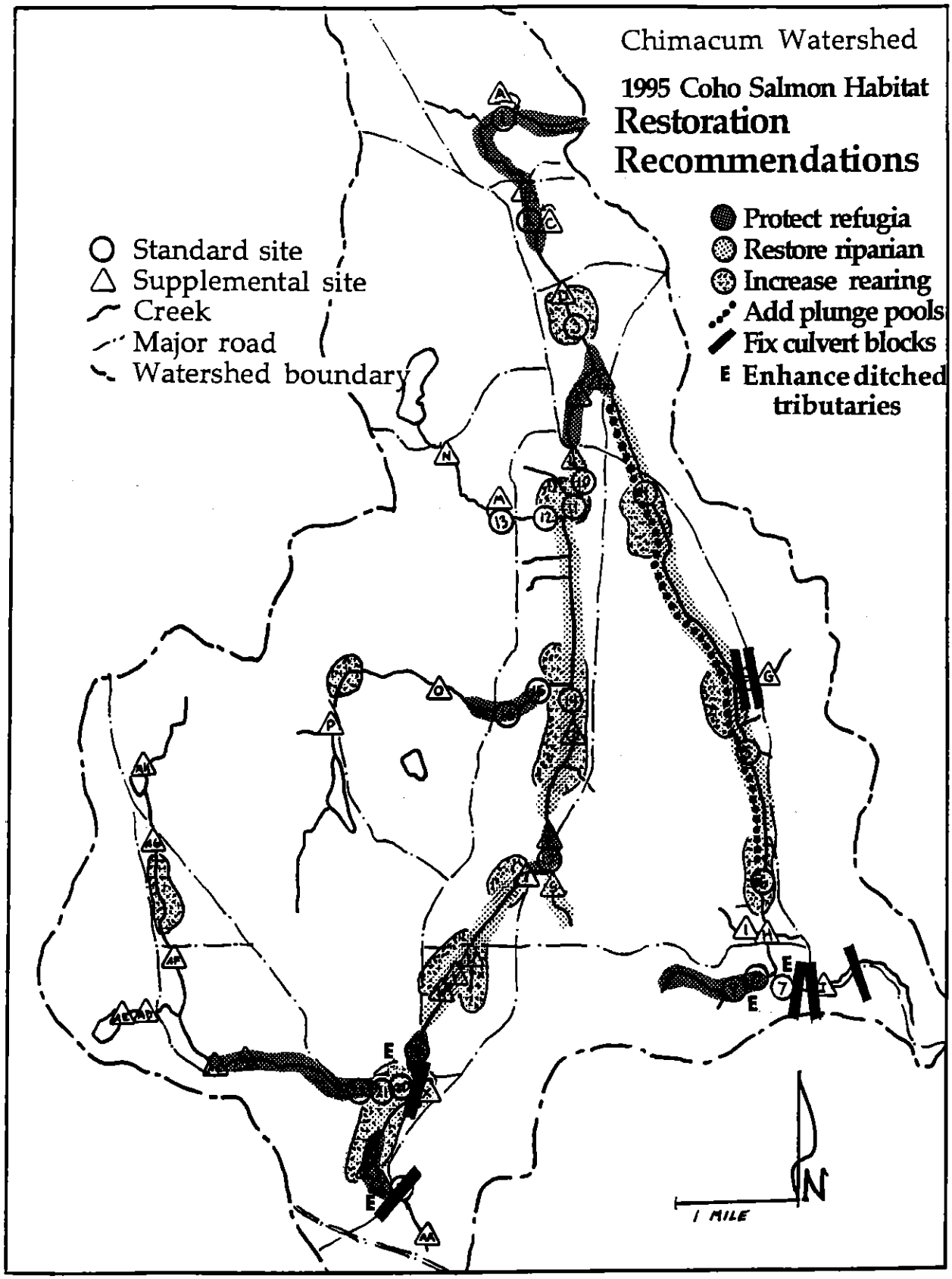


Figure 29. **Map of recommended coho salmon restoration projects in Chimacum Watershed.**

Areas of application:

Lower Mainstem (near sites 1 and 2) - Mostly unditched and forested spawning and rearing habitat in ravine. Multiple ownership.

Upper Mainstem (near site K) - Mostly unditched and forested mainstem spawning and rearing habitat. Multiple ownership.

Lower East Fork (site E) - ditched spawning and rearing habitat with riparian zone of mature alder and conifer. Owned by Doug Joyce.

Lower Naylor's Creek (site 16) - unditched, partly forested spawning and rearing habitat. Few coho found above the West Fork road. Owned by Cliff Linderoth.

Yarr Forest (site 17) - ditched (but recovering) and forested spawning and rearing habitat on the West Fork. Owned by Patty Yarr.

Nisbet (site 18) - unditched forested spawning and rearing mainstem . Owned by Nisbet.

Barnhouse (site Y and Z) - ditched spawning tributary and beaver pond. Owned by Howard Barnhouse.

West Fork Brown Forest - unditched forested major tributary and primary spawning area in the West Fork. Owned by B. G. Brown.

East Fork Bishop Forest - Unditched, forested tributary forming the primary spawning area in the upper East Fork. Owned by Gerald Bishop.

2. Repair Impassable Road Culverts

Description: Seven culverts are impassable to migrating coho salmon. Problems include steep drops, excessive gradient, and in one case, complete surface water flow blockage. Two impassable culverts are under county roads, one is under a State Highway (Beaver Valley Road) and three are under small private roads. In several cases, culverts were constructed prior to agricultural ditching. When water levels were lowered by ditching, culverts were left hanging above the water surface.

Justification: Impassable culverts block migrating adult and juvenile salmon from potential spawning and rearing habitat. Removing passage problems is the most fail-safe method of restoring habitat.

Areas of application:

Stream: Barnhouse Creek, West Fork
Location: Center Valley Rd (site 19).
Owner: County culvert
Habitat loss: Blocks .5 miles of prime spawning and rearing habitat (see Broderson interview, Appendix M) .

Stream: Unnamed tributary (site X)
Location: farm road on Holt farm, just south of Center x Eaglemont Rd.
Owner: Holt
Habitat loss: Partially blocks .1 miles of very small tributary rearing habitat.

Stream: Swansonville Creek (sites 7 and J)
Location: three locations near Swansonville and Beaver Valley roads
Owner: one county road and two private roads
Habitat loss: Blocks .5 miles of small tributary spawning and rearing habitat.

Stream: Unnamed tributary at Mrs. Doolittle Farm (site F)
Location: two locations - below farm pond and Beaver Valley
Owner: Doolittle
Habitat loss: Blocks .25 miles of very small tributary spawning and rearing habitat.

3. Plant and Fence Stream Side Buffers.

Description: Plant native trees such as spruce, fir and cedar in riparian areas devoid of trees. Reduce livestock access to the creek by installing fencing with limited access or by installing self-pumping troughs. A minimum buffer width of 50 feet on each side of the creek is recommended to restore about 90 percent of shade potential and provide other critical riparian functions: bank stability, food chain support, large woody debris input, and sediment and nutrient filtration.

Justification: Re-forestation of riparian zones along much of the East and West would reduce elevated water temperatures, and possibly relieve depressed oxygen levels that currently limit coho habitat. Re-forestation could eventually control invasion by reed canary grass, which encroaches on slow moving stream channels, stagnating flow and possibly reducing oxygen levels. Control of reed canary grass is important for successful restoration of salmon habitat. Fencing stream-side areas of livestock use will allow native plantings to become established and reduce fine sediment and fecal organic matter from reaching the stream.

Areas of application: Along East and West Fork channels and small tributaries without forested riparian zones.

4. Create Shaded Summer and Winter Rearing Habitat

Description: Build and encourage the formation of summer and winter rearing ponds and meandering channels where they existed historically. Beaver ponds should be encouraged in areas where flooding impacts are acceptable to adjacent landowners. Human-made ponds or channels should be densely planted with native trees and shrubs to provide shade and prevent encroachment of reed canary grass. Ponds must also have good water circulation, with cool water inflow from a spring, tributary or mainstem. Historical maps and aerial photos should be used to locate and re-connect historic meanders and side channels to the mainstem. Removal of reed canary grass mats from channels by dredging is also recommended as a stop-gap method of restoring rearing habitat if the grass is choking the channel and restricting flows. Unless stream banks are planted and/or the water table is

raised, reed canary grass will probably return. Thus, dredging activity should be done in consort with longer-term management.

Justification: An estimated loss of 95% of historic summer rearing and 98% winter rearing habitat has occurred due to loss of stream meanders, swamps, ponds and beaver ponds. Approximately 539 hectares (1330 acres) of rearing habitat, of which 179 hectares (445 acres) was summer rearing habitat, was channelized and drained. Although formation of beaver ponds would not be tolerated by landowners in some areas due to flooding impacts, they should be promoted at suitable sites since they represent the only proven method of regaining high quality rearing habitat and haveother potential benefits, such as augmenting summer low flow and water quality by raising the water table, and storing peak flows to reduce flooding and should be promoted at suitable sites. Artificial rebuilding of rearing habitats is more expensive and presents greater risks of impacting existing habitat, but carefully designed and closely monitored projects should be encouraged.

Areas of application: Creation or enhancement of rearing habitat should occur only where natural hydrology processes exist to support them, as indicated by historic conditions, and shown in Fig. 29. Potential sites for beaver ponds include probable beaver pond wetlands near sites 3, P, and MG.

5. Install Submerged Logs to Create Plunge Pools

Description: Create plunge pool habitat for summer rearing by embedding full spanning cedar logs across the channel and into the banks. Ideally, the top of the log weir would be slightly above the elevation of the summer water level.

Justification: In 1995 field sampling, coho juveniles consistently preferred pools greater than .3 meters deep and 3 meters in surface area. Coho were mostly absent from East Fork sampling sites; when found, they were always in (rare) plunge pools. Log weirs would probably work well in this stream to form plunge pools and remain stable over time due to the 1-2 percent gradient and relatively low flow.

Areas of application: East Fork, south of Chimacum Road.

6. Enhance Ditched Tributaries

Description: Restore meanders and add large woody debris to enhance ditched headwater tributaries currently used by coho.

Justification: Higher gradient ditched tributaries near forested headwaters are already being utilized by salmon. Temperature and oxygen levels are suitable due to flows from upstream forested areas. Thus, increasing channel length and complexity should result in higher use by salmon. However, there is a risk of impacting existing and downstream habitat; great care must be taken in selecting and designing projects on a site specific basis.

Areas of application: Channelized tributaries below forested headwaters.

Holt (B.G. Brown) farm (sites 20-22)
Bishop farm (sites 8- 9)
Barnhouse farm (site Z)
Olson farm (sites 7-J)

Research and Monitoring Recommendations

1. A high priority for future research is to learn more about coho use of winter rearing habitat. In particular, it would be useful to know whether coho migrate to the lower West Fork (between sites 10 and 14) after high temperatures and low oxygen conditions of summer subside. Also, little is known about whether juvenile coho use flooded pastures for winter rearing along the East and West Forks; and if they do use these areas, whether they are stranded as waters recede.

2. Evaluate historic and existing hydrology of the watershed. An assessment of existing summer stream flows should be conducted in the context of water losses due to surface and groundwater withdrawals and loss of beaver dams and wetlands. Historic changes in the magnitude and duration of winter peak flows should also be assessed.

3. Continue monitoring water temperatures annually at the four sites that have been sampled every summer between 1992 and 1995 using max-min thermometers. This data will provide an invaluable baseline for long term monitoring.

4. Water temperature monitoring should be conducted along the West Fork at site 10, 11, 14 and 17 during the summer of 1996 using continuous reading thermographs. Dissolved oxygen should also be measured on a weekly basis if possible. This monitoring will allow a comparison with 1995 data to evaluate the effects of reed canary grass removal that was conducted in September of 1995 (near site 11) on water quality. The monitoring will also provide additional information about the stream reach of Chimacum Creek that appears to have the lowest water quality.

5. Restoration projects should be carefully documented and monitored on a regular basis. Monitoring should include pre-and post-project photographs and quantitative fish and habitat surveys.

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Transcribed Interviews

Art and Gerald Bishop	December 20, 1995
Bill Broderson	August 31,1995
Joe Germeau	December 18, 1995
Leon Lopeman	September 12, 1995
Ray Lowrie	September 12, 1995
Bill Matheson	July 19, 1995
Bernard Peterson	December 18, 1995
Jim Shaw	December 20, 1995
Roger Short	August 29, 1995
Barbara Vodder	December 18, 1995
Josephine Yarr	August 29, 1995

Other personal communications

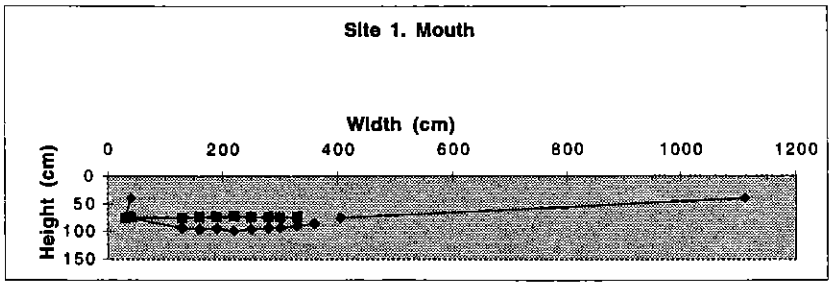
Tom Ammeter
Vickie Eldridge
Chris Frissel
Tom Jay
Jim Lichatowich
William Michel
John Schold

APPENDICES

Appendix A. Channel width and discharge at standard sites.

				Channel width(m)		Discharge	
Site #	Site name	Month	Day	Bankful	Wetted	(m3/sec)	(ft3/sec)
1	mouth	7	24	10.72	3.76	0.10	3.45
2	proud	7	25	4.7	4	0.07	2.51
3	lopeman	7	31	2.5	2.33	0.03	1.01
4	scholz	8	3	2.4	1.7	0.02	0.54
5	plank road	8	3	1.35	0.65	0.01	0.21
6	lee	8	3	1.9	0.8	0.01	0.47
7	olson	8	4	2.22	1.5	0.00	0.03
8	bishop pasture	8	4	0.98	1.05	0.00	0.10
9	bishop forest	8	4	2.68	0.9	0.02	0.63
10	mustin shrub	8	8	7.8	7.15	0.03	0.94
11	mustin grass	8	8	10.25	9.2	0.07	2.60
12	shaw	8	8	2.4	0.75	0.00	0.06
13	mills	8	8	1.51	0.83	0.00	0.12
14	short main	8	2	14.4	13.6	0.00	0.00
15	short trib	8	2	1.05	1	0.01	0.24
16	linderoth	8	8	1.3	1.2	0.01	0.26
17	yarr	8	2	4.6	3.6	0.03	1.12
18	nisbet	8	8	7.2	2.15	0.05	1.83
19	schmidt	8	2	0.9	0.9	0.01	0.46
20	holt pasture	8	9	3.15	1.95	0.02	0.58
21	holt shrub	8	9	1.85	1.8	0.02	0.60
22	holt forest	8	9	6.75	2.55	0.01	0.29
1A	Mouth add'l	8	12		3.7	0.16	5.65
1B	Mouth add'l	9	1	9.9	3.85	0.15	5.37

Appendix B. Channel cross-sections at standard sites.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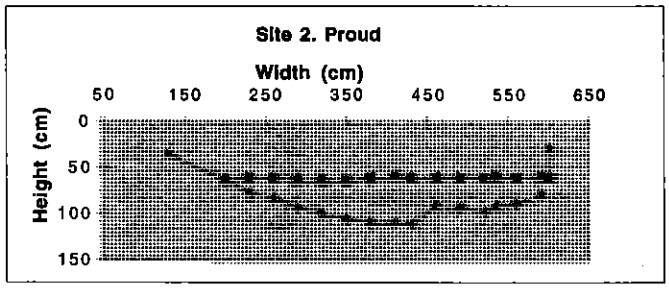
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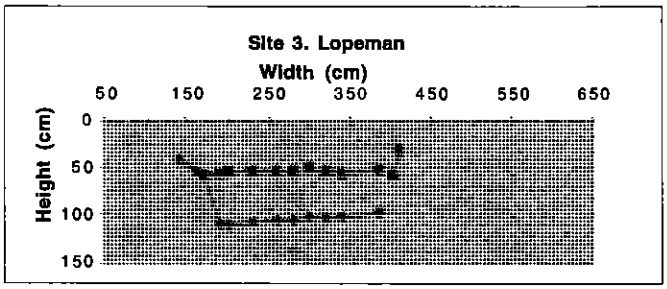
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Height (cm)
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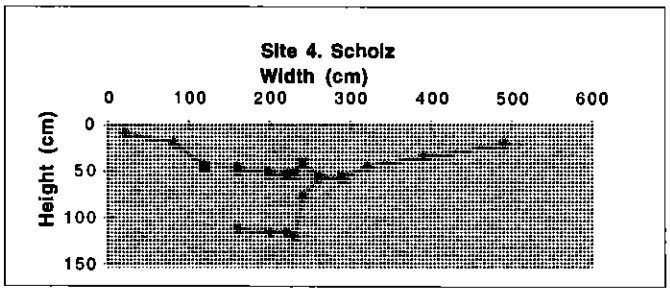
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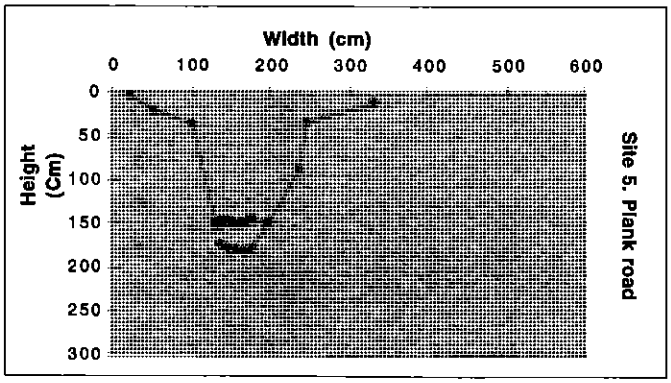
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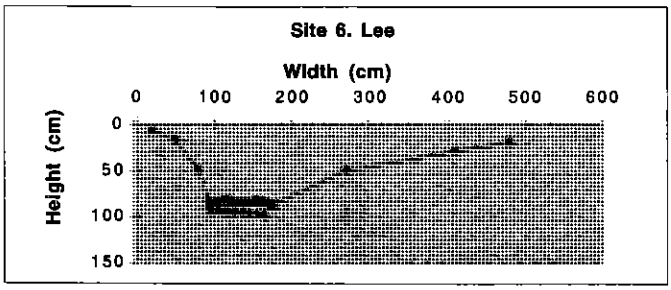
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Height (cm)
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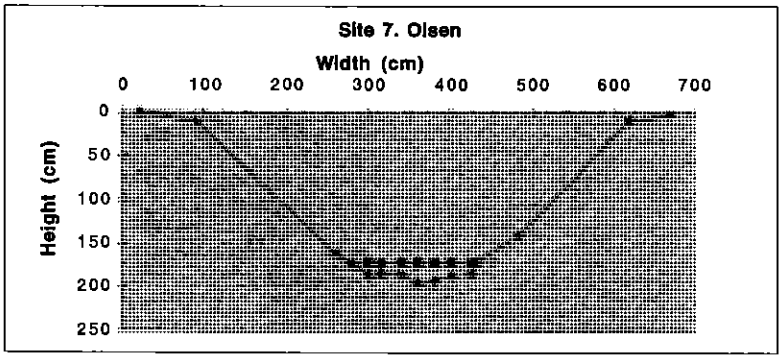
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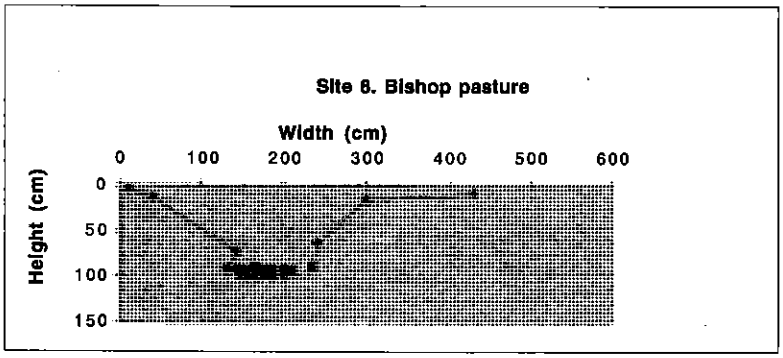
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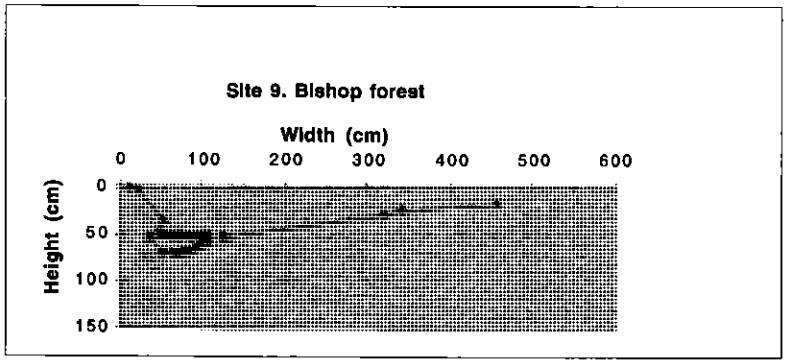
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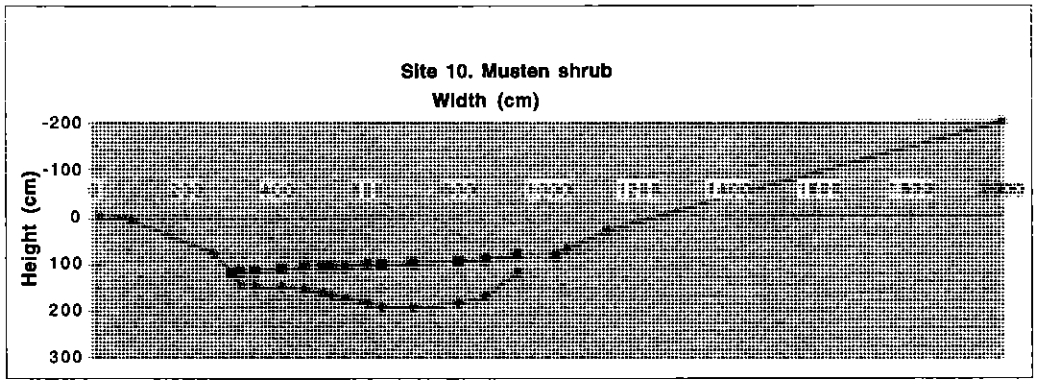
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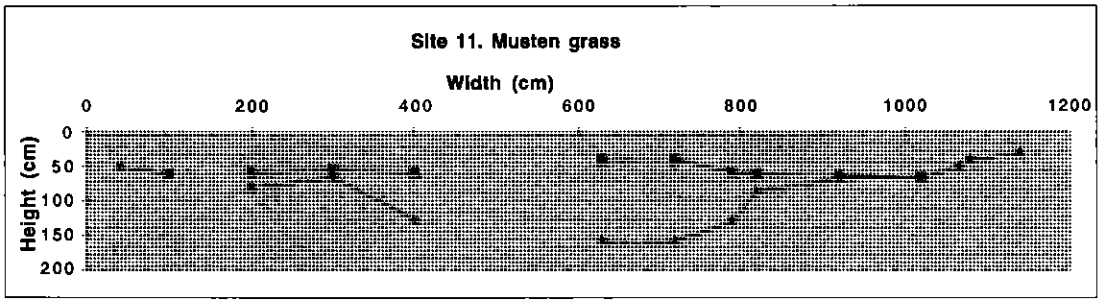
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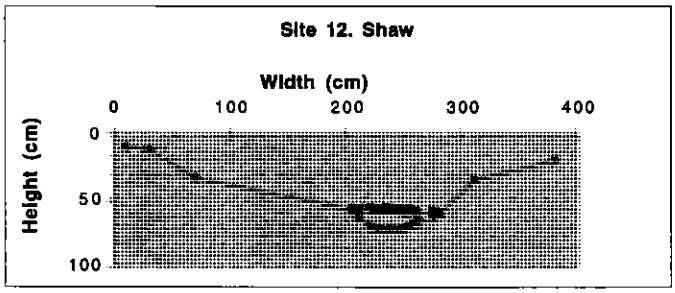
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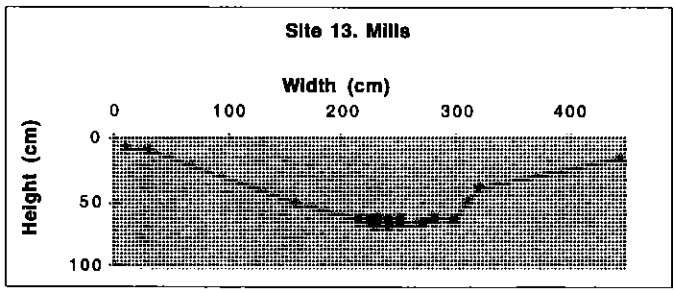
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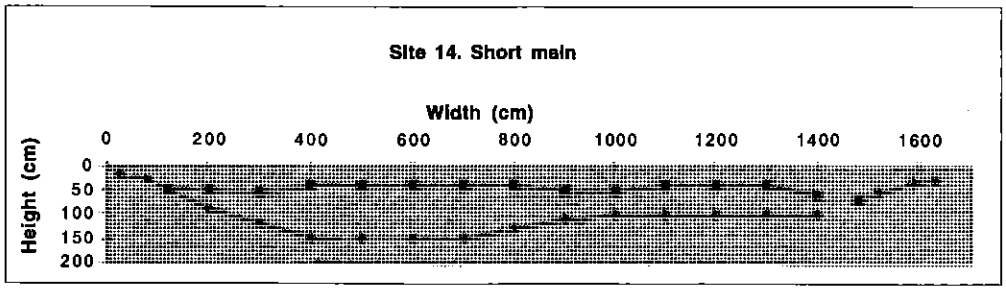
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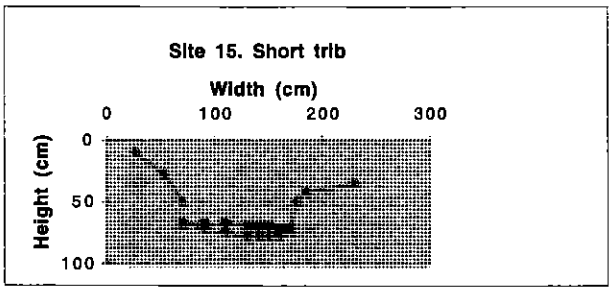
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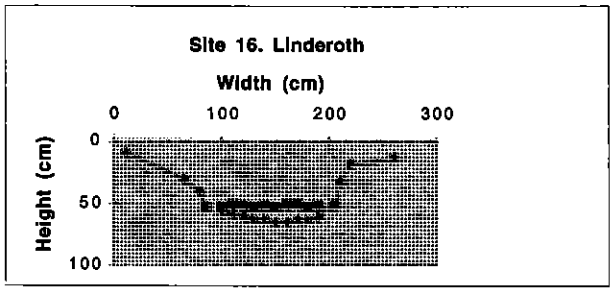
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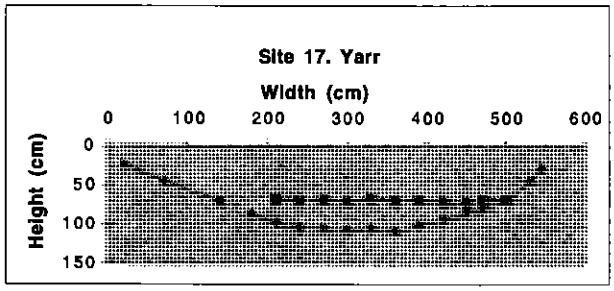
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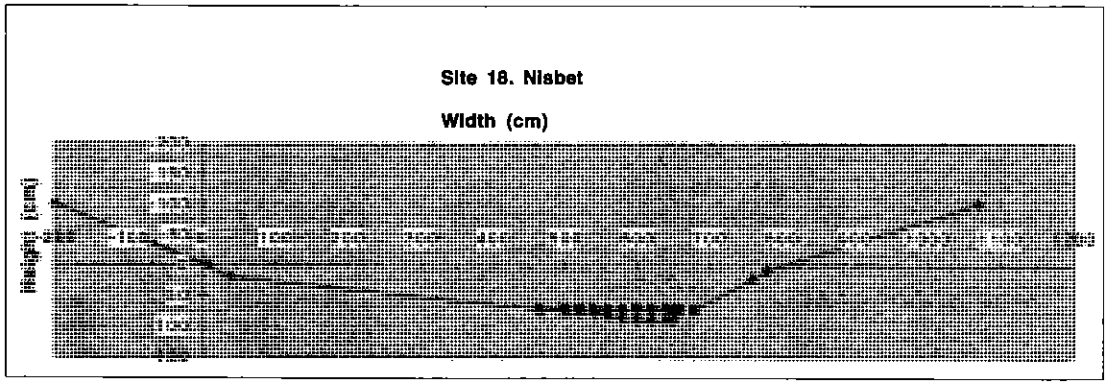
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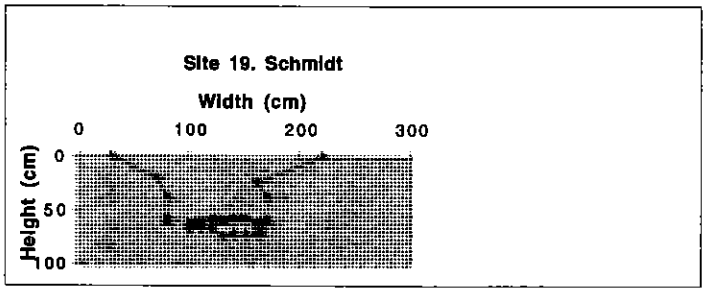
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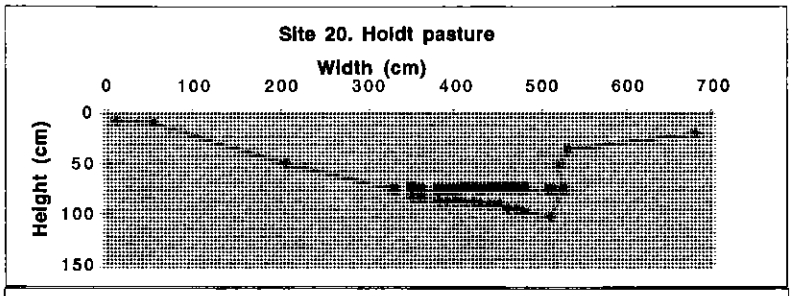
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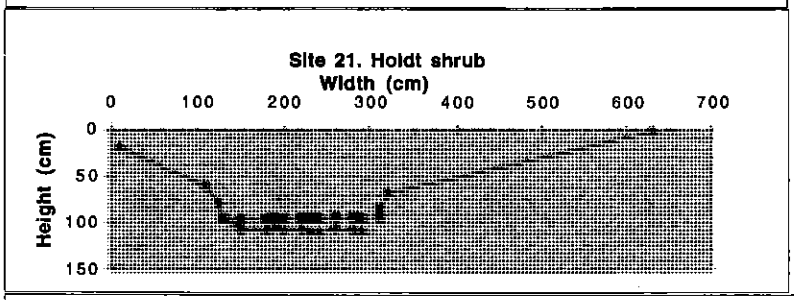
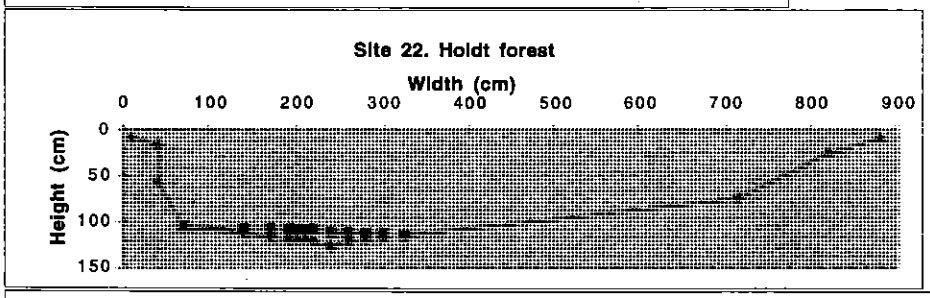
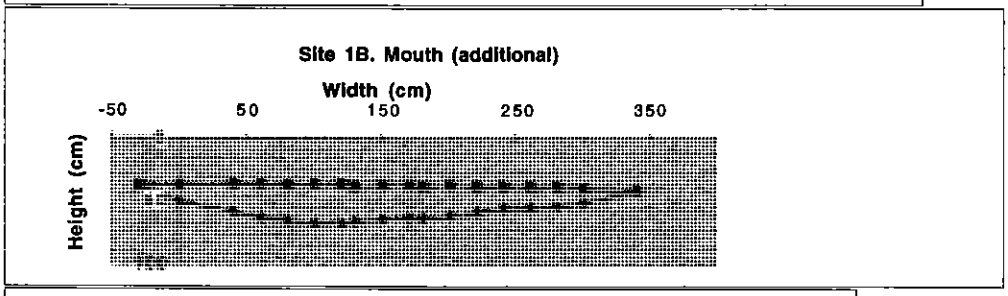
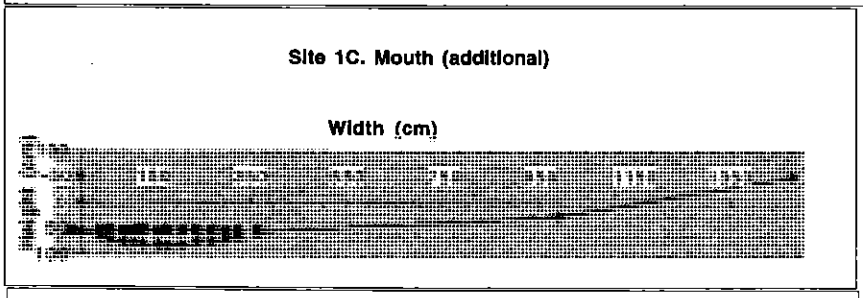
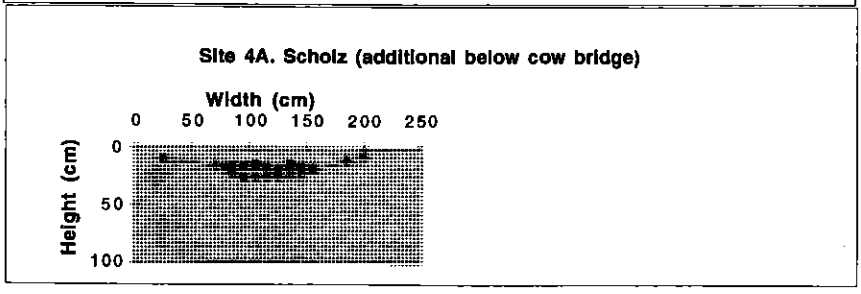
Height (cm)
0 50 100 150


Site 21. Holdt shrub
Width (cm)
0 100 200 300 400 500 600 700
Height (cm)
0 50 100 150


Site 22. Holdt forest
Width (cm)
0 100 200 300 400 500 600 700 800 900
Height (cm)
0 50 100 150


Site 1B. Mouth (additional)
Width (cm)
-50 50 150 250 350
Height (cm)


Site 1C. Mouth (additional)
Width (cm)


Site 4A. Scholz (additional below cow bridge)
Width (cm)
0 50 100 150 200 250
Height (cm)
0 50 100

Appendix C. Stream gradient and percent substrate composition at standard sites.

Site #	Site name	Gradient (average)	Pe	Or	Si	Sa	Gr	Ru	Bo	Be	Ot
1	mouth	1.7	0	0	10	40	30	20	0	0	0
2	proud	0.5	0	0	10	60	30	0	0	0	0
3	lopeman	0.5	50	0	0	0	50	0	0	0	0
4	scholz	0.5	0	0	70	30	0	0	0	0	0
5	plank road	0.5	0	0	20	80	0	0	0	0	0
6	lee	0.5	0	0	0	100	0	0	0	0	0
7	olson	1.2	0	0	70	30	0	0	0	0	0
8	bishop pasture	1.5	0	0	0	80	20	0	0	0	0
9	bishop forest	3.0	0	0	0	80	20	0	0	0	0
10	mustin shrub	0.0	0	0	100	0	0	0	0	0	0
11	mustin grass	0.0	0	100	0	0	0	0	0	0	0
12	shaw	0.5	0	0	0	70	30	0	0	0	0
13	mills	1.5	0	0	0	100	0	0	0	0	0
14	short main	0.0	0	0	100	0	0	0	0	0	0
15	short trib	1.5	0	0	0	40	60	0	0	0	0
16	linderoth	1.5	0	0	10	40	30	20	0	0	0
17	yarr	1.0	0	0	30	40	30	0	0	0	0
18	nisbet	1.2	0	0	0	60	30	10	0	0	0
19	schmidt	3.0	0	0	0	90	10	0	0	0	0
20	holt pasture	1.5	0	0	0	10	30	60	0	0	0
21	holt shrub	1.5	0	0	10	0	30	60	0	0	0
22	holt forest	2.0	0	0	0	50	20	30	0	0	0

Substrate types: Pe=peat, Or=organic, Si=silt, Sa=sand, Gr=gravel, Ru=rubble, Bo=boulder, Be=bedrock, Ot=other

Appendix D. Channel characteristics at supplemental sites.

Site	Site name	Bankful Width (m)	Gradient	Aquatic veg. (y/n)	% Substrate composition Pe	Or	Si	Sa	Gr	Ru	Bo
A	mouth	10	1-2	n	0	0	30	50	20	0	0
B	irondale rd	6	1-2	n	0	0	30	30	40	0	0
C	proud	see standard site									
D	ness rd	6	1-2	n	0	0	40	40	20	0	0
E	joyce east	5	1-2	n	0	0	20	20	60	0	0
F	doolittle below	0.5	0-1	n	0	0	50	50	0	0	0
G	doolittle above	1	2-4	n	0	0	0	50	50	0	0
H	bishop below	3	0-1	n	0	0	80	20	0	0	0
I	bishop spring	0.4	1-2	n	0	100	0	0	0	0	0
J	swansonville	1	2	n	0	0	20	80	0	0	0
K	west fork	8	1-2	n	0	0	20	0	80	0	0
L	high school	2.5	0-1	y	0	0	20	0	80	0	0
M	putansu pond	no data									
N	anderson outlet	1	4-6	n	0	0	20	70	10	0	0
O	naylors upstream	1.5	2-4	n	0	0	0	80	20	0	0
P	gibbs outlet	1	0-1	n	0	0	100	0	0	0	0
Q	short above	7	0-1	y	0	50	50	0	0	0	0
R	sahli	6	1-2	y	0	0	20	30	50	0	0
S	east of yarr trib	0.7	0-1	y	0	0	0	100	0	0	0
T	yarr above	3	0-1	y	0	0	90	10	0	0	0
U	huntingford trib	1	0-1	y	0	0	100	0	0	0	0
V	huntingford main	7	0-1	y	0	0	50	50	0	0	0
W	huntingford above	6	0-1	y	0	0	50	50	0	0	0
X	holt east trib	1	0-1	n	0	0	100	0	0	0	0
Y	barnhouse beaver	10	0-1	n	80	20	0	0	0	0	0
Z	barnhouse	1	2	n	0	0	0	30	70	0	0
AA	barnhouse spring	3	4-6	n	0	0	0	80	20	0	0
AB	first flow ndc	4	2-4	n	0	0	0	50	50	0	0
AC	above first flow	3	2-4	n	0	0	33	33	33	0	0
AD	peterson outlet	2	2-4	n	0	0	0	0	100	0	0
AE	peterson lake	no data									
AF	delanty below	2	0-1	n	0	0	100	0	0	0	0
AG	delanty outlet	2	0-1	n	0	0	100	0	0	0	0
AH	delanty inlet	2	0-1	n	0	0	100	0	0	0	0

Pe=peat, Or=organic, Si=silt, Sa=sand, Gr=gravel, Ru=rubble, Bo=boulder

Appendix E. Riparian vegetation and upland characterization at standard sites.

Site #	Site name	Riparian veg. types	Densiometer A	B	C	Ave.	Land use types Right bank	Left bank	Buffer width (m) R. bank	L. bank
1	mouth	mixed mature forest	44.0	88.3	68.8	67.0	residential	residential	30.0	30.0
2	proud	mixed mature forest	65.0	89.3	65.0	73.1	residential	residential	30.0	21.7
3	lopeman	reed canary grass	2.8	2.0	6.8	3.8	residential	residential	30.0	21.7
4	scholz	reed canary grass	33.3	27.0	22.0	27.4	grazed pasture	grazed pasture	3.0	3.0
5	plank road	grass	62.8	53.8	75.8	64.1	grazed pasture	grazed pasture	2.7	2.0
6	lee	willow shrub	81.3	87.5	88.5	85.8	pasture	none	11.3	30.0
7	olson	grass/shrub	51.8	95.0	51.8	66.2	pasture/hay	pasture/hay	2.2	2.5
8	bishop pasture	grass	63.8	73.3	71.0	69.3	grazed pasture	grazed pasture	1.5	1.8
9	bishop forest	mixed mature forest	89.8	84.0	90.5	88.1	timber	timber	30.0	30.0
10	mustin shrub	shrub	29.5	50.0	0.0	26.5	grazed pasture	resid/pasture	0.7	6.0
11	mustin grass	grass	0.0	0.0	0.0	0.0	grazed pasture	grazed pasture	0.7	1.0
12	shaw	grass	8.3	14.0	6.3	9.5	grazed pasture	grazed pasture	2.0	3.7
13	mills	conifer mature forest	89.0	89.0	93.5	90.5	timber/resid	forest	24.3	30.0
14	short main	grass	0.0	0.0	0.0	0.0	hay field	pasture	0.0	1.0
15	short trib	grass	45.0	26.8	36.8	36.2	pasture	road/pasture	1.0	1.0
16	linderoth	alder mature forest	92.5	85.8	87.3	88.5	resid/pasture	pasture	10.0	10.0
17	yarr	alder mature forest	80.0	82.0	75.3	79.1	pasture	road	30.0	30.0
18	nisbet	mixed mature forest	93.5	82.0	82.8	86.1	road	forest	26.7	30.0
19	schmidt	conifer mature forest	92.8	92.0	84.5	89.8	resid/forest	forest	30.0	30.0
20	holt pasture	bullrush	0.0	0.0	0.0	0.0	pasture/road	pasture	3.0	3.0
21	holt shrub	shrub	83.3	12.5	82.5	59.4	pasture/road	grazed pasture	4.3	3.0
22	holt forest	mixed mature forest	86.5	90.5	92.0	89.7	timber	timber/road	30.0	30.0

Appendix F. Riparian zone characterization at supplemental sites.

Site	Site name	Riparian veg. types	Shade %	Fence (y/n)	Buffer width (m) R. bank	L. bank
A	mouth	mixed mature forest	65	n	30+	30+
B	irondale rd	alder mature forest	60	n	30+	30+
C	proud	see standard site				
D	ness rd	alder mature forest	70	n	30+	30+
E	joyce east	willow/alder shrub	95	n	5	5
F	doolittle below	reed canary	70	y	1	1
G	doolittle above	mixed mature forest	95	n	30+	30+
H	bishop below	alder/willow/ grass	65	y	30+	1
I	bishop spring	blackberry shrub	90	y	1	1
J	swansonville	alder mature forest	70	n	20	30+
K	west fork	alder mature forest	80	n	30+	15
L	high school	rose/b.berry shrub	60	y	5	5
M	putansu pond	no data				
N	anderson outlet	mixed mature forest	95	n	30+	30+
O	naylors upstream	mixed mature forest	90	n	30+	30+
P	gibbs outlet	mixed mature forest	80	n	20	30+
Q	short above	reed canary grass	5	n	1	1
R	sahli	alder/grass	70	y	5	30+
S	east of yarr trib	rush/cress/grass	85	n	0	0
T	yarr above	reed canary grass	20	y	4	4
U	huntingford trib	grass/shrub	20	y	1	1
V	huntingford main	grass	10	y	2	2
W	huntingford above	grass	20	y	2	2
X	holt east trib	rush/grass	60	n	0	0
Y	barnhouse beaver	rushes/salmonberry	30	n	30+	5
Z	barnhouse	rushes/blackberry	40	y	2	2
AA	barnhouse spring	mixed mature forest	90	n	10	10
AB	first flow ndc	conifer mature forest	90	n	20	20
AC	above first flow	conifer mature forest	70	n	20	20
AD	peterson outlet	cedar mature forest	90	y	30+	30+
AE	peterson lake	no data				
AF	delanty below	alder/willow	65	n	10	30+
AG	delanty outlet	mixed mature forest	60	n	30+	30+
AH	delanty inlet	rush/grass	50	n	0	0

Appendix G. Number and frequency of large woody debris (LWD) at standard sites.

		No. of LWD pieces by size range (cm)					LWD	
Site #	Site name	10-20	21-50	51-100	>100	Total#>20	Total#	Frequency
1	mouth	1	1	1	0	2	3	0.3216
2	proud	5	3	0	2	5	10	0.47
3	lopeman	0	0	0	0	0	0	0
4	scholz	0	0	0	0	0	0	0
5	plank road	0	0	0	0	0	0	0
6	lee	0	0	0	0	0	0	0
7	olson	0	0	0	0	0	0	0
8	bishop pasture	0	0	0	0	0	0	0
9	bishop forest	6	2	0	0	2	8	0.2144
10	mustin shrub	0	0	0	0	0	0	0
11	mustin grass	0	0	0	0	0	0	0
12	shaw	3	1	0	0	1	4	0.096
13	mills	6	8	0	0	8	14	0.2114
14	short main	0	0	0	0	0	0	0
15	short trib	1	0	0	0	0	1	0.0105
16	linderoth	1	4	4	0	8	9	0.117
17	yarr	3	0	0	0	0	3	0.138
18	nisbet	7	3	0	1	4	11	0.792
19	schmidt	4	0	4	1	5	9	0.081
20	holt pasture	0	0	0	0	0	0	0
21	holt shrub	0	0	0	0	0	0	0
22	holt forest	12	7	0	3	10	22	1.485

LWD frequency=(#LWD pieces/channel length surveyed)*(bankful channel width)

Appendix H. Mean pool size and pool:riffle ratio at standard sites.

		Mean pool size (m)				pool:riffle	
Site #	Site name	Length	Width	Area	Depth	ratio	
1	mouth	16.8	5.3	96.0	0.3	67	33
2	proud	17.3	5.8	101.2	0.7	52	48
3	lopeman	35.0	4.0	90.0	1.2	70	30
4	scholz	100.0	1.5	150.0	0.8	100	0
5	plank road	50.0	1.0	50.0	0.5	50	50
6	lee	0.0	0.0	0.0	0.0	0	100
7	olson	100.0	1.5	150.0	0.2	100	0
8	bishop pasture	2.2	0.8	1.8	0.3	6.5	93.5
9	bishop forest	2.2	1.8	4.0	0.2	20	80
10	mustin shrub	100.0	5.0	500.0	1.5	100	0
11	mustin grass	100.0	5.0	500.0	1.0	100	0
12	shaw	0.0	0.0	0.0	0.0	0	100
13	mills	3.5	2.5	8.8	0.3	3.5	96.5
14	short main	100.0	6.0	600.0	0.8	100	0
15	short trib	2.5	1.0	2.4	0.3	10	90
16	linderoth	7.7	3.0	23.0	0.7	23	77
17	yarr	41.5	4.5	168.5	0.4	83	17
18	nisbet	9.6	5.0	52.8	0.3	48	52
19	schmidt	6.8	1.5	9.2	0.2	54.5	45.5
20	holt pasture	10.5	2.4	25.0	0.2	42	58
21	holt shrub	10.5	2.0	21.0	0.2	42	58
22	holt forest	3.7	2.3	9.7	0.3	11	89

Appendix I. Large woody debris (LWD) and pool data at supplemental sites.

Site	Site name	LWD (n,l,m,h)	Maximum pool size (m) Length	Width	Depth	Pool:riffle ratio Pool%	Riffle%
A	mouth	h	20	10	1	50	50
B	irondale rd	n	15	6	0.5	60	40
C	proud	see standard site					
D	ness rd	l	10	6	0.5	70	30
E	joyce east	l	20	5	0.5	50	50
F	doolittle below	n	5	0.9	0.3	10	90
G	doolittle above	m	1	1	0.2	50	50
H	bishop below	l	8	3	1	20	80
I	bishop spring	n	1	0.4	0.2	10	90
J	swansonville	m	5	0.8	0.2	30	70
K	west fork	m	12	6	1	50	50
L	high school	n	50	5	0.6	90	10
M	putansu pond	no data					
N	anderson outlet	m	dry	dry	dry	10	90
O	naylors upstream	m	2	2	0.2	20	80
P	gibbs outlet	l	2	1	0.2	20	80
Q	short above	l	100	7	0.5	100	0
R	sahli	l	15	6	1	50	50
S	east of yarr trib	n	20+	0.7	0.2	80	20
T	yarr above	n	100	3	0.9	100	0
U	huntingford trib	n	50	0.3	0.1	90	10
V	huntingford main	n	50	7	0.8	100	0
W	huntingford above	n	50	6	0.5	90	10
X	holt east trib	n	2	0.5	0.1	20	80
Y	barnhouse beaver	l	100	30	2	90	10
Z	barnhouse	l	15	15	0.5	10	90
AA	barnhouse spring	h	1.5	1.5	0.1	10	90
AB	first flow ndc	h	3	2	0.2	30	70
AC	above first flow	h	1	1	0.2	30	70
AD	peterson outlet	m	dry	dry	dry	dry	dry
AE	peterson lake	no data					
AF	delanty below	l	dry	dry	dry	dry	dry
AG	delanty outlet	n	dry	dry	dry	dry	dry
AH	delanty inlet	n	dry	dry	dry	dry	dry

For LWD, estimate of relative abundance where n=none, l=low, m=moderate, h=high

Appendix J. Dissolved oxygen measured weekly at standard sites.

		Dissolved oxygen (mg/l)						
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 8
Site#	Site name	7/24-24	7/31-8/4	8/8-8	8/14-14	8/23-23	8/29-9/1	9/10
1	mouth	8.5	9.8	9.3	10	9.7	10.1	9.7
2	proud	8	9.6	8.5	9.2	10.4	9.2	9.3
3	lopeman	6.5	6.6	8	8	7	6.8	7.6
4	scholz	5.2	5.2	5.3	6	6.4	6.4	6.3
5	plank road	8.5	8.5	8.8	8.9	9.6	9.7	7.6
6	lee	8.2	9.2	8.7	9.8	10.1	10.1	9.6
7	olson	7.2	5.7	6	6	7.5	7.8	8
8	bishop pasture	10.1	9.2	10.3	10.1	10.4	10.2	9.9
9	bishop forest	10.3	10.2	10.2	10.2	10.8	10.3	9.9
10	mustin shrub	2.4	0.8	1.1	2.4	1.6	3.3	3
11	mustin grass	2.4	0.8	2.2	2.7	1.6	3.2	2.5
12	shaw	8.4	8.2	8	9.5	9	8.4	8.2
13	mills	9.7	10	10.2	9.6	10.1	10.7	10
14	short main	8.5	13.6	8.3	7.8	5.2	6.3	10.8
15	short trib	7.3	8.9	10	9.6	9.8	8.4	12.1
16	linderoth	9.8	10.1	9.5	9.9	9.9	10.1	9.8
17	yarr	6	6	5.6	6.5	5.6	6.2	7.9
18	nisbet	8.8	9.2	9.2	9.2	8.8	10	9.1
19	schmidt	10.2	10	10.4	10.4	9.5	10	10.3
20	holt pasture	9.1	10.8	11.3	10.1	10.2	10.4	9.6
21	holt shrub	9.6	10.5	11.4	10.4	10.7	10.8	9.9
22	holt forest	9.8	10.1	10.4	10.4	10.4	10.8	10.8

Appendix K. Dissolved oxygen measured once at supplemental sites.

Site#	Site name	Dissolved oxygen (mg/l) 7/24-24
A	mouth	10
B	irondale	9.3
C	proud	9.2
D	ness rd	8.6
E	joyce east	9
F	doolittle below	10
G	doolittle above	9
H	bishop below	8.9
I	bishop spring	9.9
J	swansonville	no data
K	west fork	7.6
L	high school	4.1
M1	putansu pond	12.1
M2	putansu pond	12.9
M3	putansu pond	14
N	anderson outlet	dry
O	naylors upstream	dry
P	gibbs outlet	dry
Q	short above	8
R	sahli	8.4
S	east of yarr trib	4.9
T	yarr above	6
U	huntingford trib	5.6
V1	huntingford main	8.2
V2	huntingford main	8.8
W	huntingford above	no data
X1	holt east trib	7.2
X2	holt east trib	8.7
Y	barnhouse beaver	10.4
Z	barnhouse	10.6
AA	barnhouse spring	no data
AB	first flow ndc	6
AC	above first flow	dry
AD	peterson outlet	dry
AE	peterson lake	10
AF	delanty below	no data
AG	delanty outlet	no data
AH	delanty inlet	dry

Appendix L. Relative abundance of fish at standard sites.

					Fish abundance					Shock	Trap
Site#	Site name	Mo.	Day	M	Coho	Cut	Sculp	Stick	Unkn	time	time
1	mouth	7	31	E	0.0	1.9	1.6	0.0	0.6	189	
2	proud	7	31	E	0.0	2.1	2.1	0.0	0.4	169	
3	lopeman	7	31	E	0.0	0.0	1.0	0.5	0.3	229	
3	lopeman	8	9	T	0.0	0.7	0.0	0.7	0.0	10:15	17:30
3	lopeman	8	9,10	T	0.3	0.3	0.0	0.7	0.0	17:30	9:00
4	scholz	8	3	E	0.8	0.8	0.0	1.5	1.0	238	
5	plank road	8	3	E	0.0	6.4	0.0	3.2	0.7	168	
6	lee	8	3	E	0.0	13.3	0.0	1.4	0.0	126	
7	olson	8	4	E	0.7	1.1	0.0	2.1	0.0	168	
8	bishop pasture	8	4	E	1.0	6.5	0.0	0.0	0.0	120	
9	bishop forest	8	4	E	5.2	9.9	0.0	0.0	0.0	103	
10	mustin shrub	8	8	E	0.0	0.0	0.0	0.4	0.0	150	
10	mustin shrub	8	8	T	0.0	0.0	0.0	14.5	0.0	11:30	17:30
11	mustin grass	8	8	E	0.0	0.0	0.0	0.5	0.0	128	
11	mustin grass	8	8	T	0.0	1.0	0.0	8.5	0.0	12:15	17:30
12	shaw	8	8	E	0.5	0.5	0.0	1.0	0.0	119	
13	mills	8	8	E	0.0	9.0	0.0	0.0	1.4	126	
14	short main	8	2	E	0.0	0.4	0.0	6.7	0.0	144	
14	short main	8	9	T	0.0	0.0	0.0	29.0	0.0	10:30	16:30
14	short main	8	9,10	T	0.0	0.3	0.0	22.3	0.0	17:30	8:30
15	short trib	8	2	E	0.0	8.8	0.0	0.0	1.6	116	
16	linderoth	8	8	E	2.6	10.7	0.0	0.0	0.4	162	
17	yarr	8	2	E	5.2	6.0	0.0	0.0	5.2	139	
18	nisbet	8	8	E	10.3	8.9	0.0	0.0	2.0	122	
18	nisbet	8	9	T	1.7	1.3	0.0	0.0	0.0	11:00	14:30
18	nisbet	8	9,10	T	1.3	2.0	0.0	1.7	0.0		
19	schmidt	8	2	E	0.0	0.7	0.0	0.0	0.2	129	
20	holt pasture	8	9	E	8.2	12.9	0.0	0.8	1.6	153	
21	holt shrub	8	9	E	6.6	13.6	0.0	0.5	1.9	128	
22	holt forest	8	9	E	10.8	10.3	0.0	0.0	0.0	122	

Fish species: cut=cutthroat, sculp=sculpin or bullhead, stick=stickleback, unkn=unknown.
Fish sampled by electroshocking (E), minnow traps (M), and direct observation (O).
E=#fish/60 sec shock, M=#fish/trap,O=#fish observed.

Apendix M. Relative abundance of fish at supplemental sites.

					Fish abundance					Shock	Trap
Site#	Site name	Mo.	Day	M	Coho	Cut	Sculp	Stick	Unkn	time	time
A	mouth	8	14	E	1.2	4.4	7.5	0.0	0.4	151	
B	irondale	8	14	E	4.5	3.1	3.6	0.0	0.0	134	
C	proud	8	14	E	3.9	2.4	1.5	0.0	2.4	124	
D	ness rd	8	14	E	3.8	2.3	1.5	0.0	1.1	157	
E	joyce east	8	16	E	5.1	8.5	0.9	0.0	2.6	141	
F	doolittle below	8	25	O	0.0	0.0	0.0	5.0	0.0		
G	doolittle above	8	25	O	0.0	0.0	0.0	0.0	0.0		
H	bishop below	9	1	E	2.0	14.9	0.0	0.0	1.5	121	
I	bishop spring	9	1	O	0.0	0.0	0.0	0.0	0.0		
J	swansonville	8	25	O	0.0	2.0	0.0	0.0	0.0		
K	west fork	8	16	E	8.8	6.5	0.9	0.0	0.9	130	
L	high school	8	16	E	4.6	1.3	0.0	0.0	0.8	142	
M	putansu pond	9	1,2	T	0.0	0.5	0.0	2.3	0.0		
N	anderson outlet	8	31	O	0.0	0.0	0.0	0.0	0.0		
O	naylors upstream	8	31	O	0.0	0.0	0.0	0.0	0.0		
P	gibbs outlet	9	1	O	0.0	0.0	0.0	0.0	0.0		
Q	short above	8	17,18	T	0.0	1.3	0.0	0.3	0.0	16:00	10:20
Q	short above	8	17	E	0.0	0.0	0.0	9.4	0.0	140	
R	sahli	8	17	E	1.2	3.3	0.0	0.4	0.0	147	
S	east of yarr trib	9	1	E	0.0	2.9	0.0	0.0	0.0	41	
T	yarr above	8	17,18	T	0.7	2.0	0.0	1.7	0.0	11:30	10:30
T	yarr above	8	17	E	0.4	0.0	0.0	5.5	0.0	165	
U	huntingford trib	8	17	E	0.4	0.0	0.0	5.4	0.0	155	
V	huntingford main	8	16,17	T	4.0	13.0	0.0	8.0	0.0	17:00	10:30
V	huntingford main	8	17	E	1.6	3.6	0.0	3.2	0.8	152	
W	huntingford above	8	17	E	1.8	13.6	0.0	1.8	0.4	137	
X	holt east trib	9	1	E	0.4	0.0	0.0	4.3	0.0	152	
Y	barnhouse beaver	8	28	O	5.0	6.0	0.0	0.0	0.0		
Z	barnhouse	8	28	E	3.0	4.7	0.0	1.7	0.0	139	
AA	barnhouse spring	8	16	E	0.0	5.0	0.0	0.0	0.0	120	
AB	first flow ndc	8	28	0	15.0	4.0	0.0	0.0	0.0		
AC	above first flow	8	28	0	0.0	0.0	0.0	0.0	0.0		
AD	peterson outlet	8	28	O	0.0	0.0	0.0	0.0	0.0		
AE	peterson lake	8	28	O	0.0	0.0	0.0	0.0	0.0		
AF	delanty below	8	28	O	0.0	0.0	0.0	0.0	0.0		
AG	delanty outlet	8	28	E	0.0	1.6	0.0	0.0	0.0	37	
AH	delanty inlet	8	28	O	0.0	0.0	0.0	0.0	0.0		

Fish species: cut=cutthroat, sculp=sculpin or bullhead, stick=stickleback, unkn=unknown.
Fish sampled by electroshocking (E), minnow traps (M), and direct observation (O).
E=#fish/60 sec shock, M=#fish/trap,O=#fish observed.

Appendix N. Oral history interview transcripts.

Art and Gerald Bishop	December 20, 1995
Bill Broderson	August 31,1995
Joe Germeau	December 18, 1995
Leon Lopeman	September 12, 1995
Ray Lowrie	September 12, 1995
Bill Matheson	July 19, 1995
Bernard Peterson	December 18, 1995
Jim Shaw	December 20, 1995
Roger Short	August 29, 1995
Barbara Vodder	December 18, 1995
Josephine Yarr	August 29, 1995

INTERVIEW WITH GERALD AND ART BISHOP

Interview with Gerald and Art Bishop, both lifelong residents of the Chimacum West (Beaver Valley) Fork, regarding the history of salmon runs in Chimacum Creek. Art Bishop is Gerald's father. Interview conducted by Judith Rubin on December 20, 1995.

JR: Can you tell me what the Chimacum was like when you were younger?

AB: I've lived here all my life. It looks pretty much the same, except we've done a lot more clearing. We had fish then. We don't have fish now.

JR: What kind of fish did you see up here?

GB: Salmon.

AB: I've seen as many as 500 at a time up on the bank. They'd come up here to die. They'd attract the hawks.

JR: When was that?

GB: That was when he [Art] was just a kid, before they dug any of the ditches. They dug the first ditch in 1919. Before then [the creek] wandered all over the valley. Then they made it straight with a big shovel. Eighty acres down from here, they come into heavy woods at the Connicky's (?) they stopped, that was where I took over [ditching]. I can still remember when they [the Connickys] were farming there, going down and cleaning that [ditch] out. They kept the beaver dams out of there. They left in 1948. After that the creek plugged up. When the creek was pretty clean, there were good salmon runs. You'd see a big salmon. If you moved you'd scare a fish and he'd skit up 5 feet and bump into another one. The creek was just littered with salmon.

JR: Do you remember how big fish were?

GB: They were full size: two and a half, three feet across. They'd stick out of the water 6 inches going upstream. But then, in 1969 or '70, the [neighbors downstream] stopped farming and a beaver dam formed, spanning 300 feet across. There were four sets of dams. Water kept widening out into a lake, shore to shore. Backed up water onto our land. In 1975, I dug the ditch across my 40 acres down below Egg & I Road, but it didn't do much good, because of the beaver dams. And the beaver dams stopped the salmon. There might have been a few fish up above the dams. If you wanted to see them you'd have to go down there to the banks where they were stranded. Hundreds of them out in the field. I went to get a permit, but was only given a permit to use a grub hoe to dig the ditch. Well, that didn't make too much sense, did it? The dam was 300 feet wide and 4 feet deep. We're in modern times with

backhoes and shovels to use. So I fought the state. Finally I got a permit to use a shovel, but they said I had to leave a bunch of junk [shade trees, brush] in the channel. Well, either you dig or you don't do it at all. So we dug a ditch and we dug a good one. They came and said I dug it too deep and too wide. I've got pictures of the time we dug that dam. The old ditch was totally gone, but I remembered where the [neighbors] had dug. We practically lived down there when I was a kid, fishing and such.

JR: What kind of fish did you catch as a kid?

GB: The trout with the red marks on the side.

JR: Cutthroat?

GB: I suppose so, I don't know what kind they were. But that creek was loaded with fish.

JR: When did you notice the decline in the fish?

GB: Without a doubt, the beaver dams stopped the fish.

JR: Do you think there could have been any other causes?

GB: After I dug a nice ditch through there, they could come, but now we don't have any fish. If the creek isn't maintained, its going to go back to what it was.

JR: Well, just to play the devil's advocate: before there were any farmers in the valley, in 1880, say, there were probably both salmon and beavers in Chimacum Creek.

AB: We don't know that. They may not have come up to the spawning grounds when there were beaver. When the farmers maintained the creek, they took all the twists out of it.

JR: So, as far as you know, there are only those two types of fish that came up here: coho and cutthroat?

GB: I think so, yes.

AB: The cutthroat eat the eggs from the others [coho].

JR: Do you remember what the valley was like before they ditched it?

AB: There were bullrushes and thickets of wild rose, you wouldn't know there was a creek there before they dug it.

GB: Did you see any fish up there yesterday [on the spawning survey]?

JR: No. We saw one redd.

GB: Well, if you'd seen what I've seen up there in my day, you'd be bewildered. There'd be so many dead fish you wouldn't believe it.

JR: What do you suppose happened?

GB: Well, I can tell you what I think happened. When the big logging outfits came in they sprayed [herbicides] real early in the morning, before anyone was even out of bed, and I've seen oil slicks coming down and I can't see that the [herbicides] would be any good for the fish. They used to use some pretty spooky [toxic] stuff. Now they've changed the laws. But the state says its the cow manure that killed the fish. And that just isn't true. In the past, most people had cows in the creek and there were plenty of fish. Everybody was surprised when we opened back up the ditch that fish were coming through, and I 'm just guessing the dates, but I'd say it was the late '70s.

JR: Did they also go up Swansonville Creek to spawn?

GB: Yeah, they did. They'd spur off and go up there. I dug that too. It was kind of wild up there too.

AB: I don't think there's any fish in that creek.

JR: Well, there are a few bad culverts between the mainstem and the creek starting at Olsen's place and up Swansonville Creek.

GB: They used to go as far as the highway, but that culvert's in the air. And so they'd jump but they couldn't get up. See they put those culverts in when the creek was high and then the Connickys dug it then I dug it and the culverts stayed up.

JR: So the culverts are high because the water level dropped when you did the ditching. So, [Art], before they built the county road, do you remember whether the fish would go up Swansonville Creek?

AB: I think some of them did. It wasn't very popular for fish, but some of them did.

JR: Oh, they liked it better coming up through your land.

AB: Well, that road to Swansonville used to go straight on to Ludlow. Then they built the Beaver Valley Road and that culvert came in there.

GB: See when he was a kid there was no Beaver Valley Road. Then when they put in the new road, the culvert was set in too high. And then we ditched it. And the ditch [undercut] too after that. I told Peter [Bahls] we should take that out or half way down and lower it to where it should be or put in a run up to it.

JR: Would you like to see the salmon come back?

GB: Why, sure who wouldn't.

AB: Of course.

GB: But they're going to have to stop the Indians from netting. They shouldn't be out there at all with those nets, being as there's no salmon. Why should they be allowing them to do it?

JR: What would you do to bring back the salmon?

GB: Make sure the beaver dams are out. And maintain the creek.

AB: We used to clean the creek out. There were 7 or 8 people who'd clean the creek out with potato forks, clean out the vegetation. Beck and Olsen came and dug ditch for my parents every year. They had to wear big boards on their feet to keep from sinking in.

GB: They'd take the hang ups out. Like if they couldn't get the beaver dams out, they'd take the beaver out. The Game Department used to take them out. But the Game Department we've got now is totally worthless. They couldn't catch nothing but me out there digging my drainage ditch. That's all they could catch. They have their mind on nothing but trying to destroy somebody.

The fish was pretty good in them days because everybody's livelihood depended on it. Nobody wanted to see that creek flood. Everybody had cows. You let the creeks go, and beaver will come in there right away. A creek is not like a river that can clear itself away. They only get wider and spread all over the place. Like dad said, they shouldn't be so hard on people for keeping the creeks up. That way there's something both for the land owner and fish too.

AB: There used to be cows on every ranch from here on down to Chimacum. Pretty good herds. You couldn't keep cows on most of that now.

JR: Why not?

AB: Too wet. Cow gets near that now and you might as well say good-bye.

GB: Chimacum Creek should be kept clear the whole way down. But now there's no one to do it. They don't really give a damn.

JR: [To Art] You just pronounced it 'Jemacum Crick.' That's how they say it in the old land survey maps. Do you know what the word meant?

AB: No, that's just the name for the creek as I first learned in grade school.

JR: Do you know anything about the Chimacum Indians?

AB: They were a little before our time. Senator Bishop married one. He told all the farmers when they wanted to dig that ditch, 'you do that and you'll lose your farm.' And by golly, he lost one of his farms. They charged so much! And all they had was that darn old shovel. It ain't like the ones now that can pull it out. It took forever for it to get up...

GB: While they dug, the machine was sitting on great big mats. And they had to keep it sitting on the creek as they went. It worked, but it must have been quite a task.

JR: Was Senator Bishop related to you?

AB: He married my mother's sister. He owned that ranch in Chimacum. At Short's. They lost that farm. 200-300 acres.

GB: When I started in the mid-60s, they were still pushing that tax, but all the ditching was on the other creek, so I went independent and dug my own. I'm glad I did that. I've spent thousands of dollars on that creek.

JR: Are you happy with it the way it is?

GB: Yeah, its perfect. Just the way it should be. Just like I told the Fisheries Department: there's something for the fish and for the farmer. That's how it should be. Not 100% for the fish. I might have destroyed a few fish when I dug it but that's just the way its got to be.

JR: [To Art] Did your parents say what it was like here when they fists arrived?

AB: Well, there was lots of brush. We cleared alders out with a team. It was a poor way to clear land, but the only way we had.

JR: Were there many stumps?

GB: Oh, yes, you should look at the one I have by my barn. That came up over [a period of] ten years. I noticed the grass turning yellower and

yellower... It was a spruce root. It took me some maneuvering to get that out. If you go out in the fields, you'll see big logs coming up again. When I first cleared it, there was a big mess out there. I had people come by and ask me why I dragged all that stuff out onto the fields. I said, 'I didn't drag it out, it just came up!' It was all buried underground. The fields over toward Olsen I cleared, that was all brush. That area I just cleared [on Beaver Valley Rd, south of Bishops farm] took me 35 years to clear. When I was 21 dad asked me to clear that old orchard. I come up just the other day and told him I'd finished the job.

JR: You know when we were looking for fish in the creek near your land this summer, we couldn't find any fish except under a great big log that formed a pool. Did you put that in? Or is that an old bridge? I had heard that you had to do that for mitigation?

GB: No, no. So many years I've worked the land, I know all about trees coming up. There's just no end to them. I got in trouble when I was digging logs out of the creek, because I took out a big log blocking my way. I said, you watch, and there will be logs again. Where that log was taken out, there must have been a log below there, it just came right up.

JR: Oh, Peter thought they asked you to put logs back in for mitigation.

GB: Well, they asked me to but I never did do it. I knew more about it than they did, and I knew they'd come back up. And they did. There's more come back in than I took out.

JR: Those logs were huge. That was great for the salmon.

GB: Every piece of wood I've ever seen them put in the creek got washed out in high water. They're probably down there blocking up the stream. Just let it do its natural thing and it always works much better.

INTERVIEW WITH BILL BRODERSON

Interview with Bill Broderson regarding the history of Chimacum Creek -- and its salmon runs -- where he lived on a homestead just south of Center from 1900 to 1992. Interview conducted on August 31, 1995 by Judith Rubin. Mr. Broderson, 95 years old, used a hearing aid. He was sharp, alert and in good health at the interview. Although he moved to Sequim in 1992, he speaks of his homestead on Chimacum Creek in the present tense. Information in brackets [] was added by the interviewer for clarification.

B.B.: I've been interviewed many times.

J.R.: About the creek?

B.B.: Oh no, about different history. About the history of the whole county.

J.R.: Can you explain how the Chimacum Creek has changed over time?

B.B: Well, I can remember back from 1904, 1905 on up to now. Well, it changed it a lot. That old creek used to run from Irondale clean up to my place. The headwork service [the center fork headwaters of Chimacum Creek] was right up there. I'd get my water right where it bubbles out of the ground. I was born and raised there and we played in that creek every summer, all summer long, and fished and everything and the salmon used to come up there. Of course it was so much different at that time than it is today. [The fish] came all the way from Irondale clean up to my place, about a mile from where I'd get my water. The headworks comes right out of the ground, [makes] a big hole and you just stick a pole right down in it and [the water] just comes right out of the ground at the foot of the hill. That's one of the biggest inlets [to Chimacum Creek]. That's called the headworks. It was up there in the wild and nobody knew where it was, even for a long time.

J.R.: So, when you were very young, what did the forest look like there?

B.B.: Oh, just all big timber. In 1904, 1905, it was all timber where this water comes out up in the school section; we always called it the school section. Then there was another homestead next to us we called the Campedunk homestead, 160 acres that joined ours. See there's so many roads that go through that place now across that creek -- way up there next to Pope & Talbot's line - you know where that is?

J.R.: Yes.

B.B.: That was the old county road, see. It went right through that homestead of 160 acres and sliced it in two and left 45 acres more or less on the west side of it. Now

it's been sold to several people, 45 acres or less. So, we bought part of that, neighbor and us, to get the water. I was just a small kid two or three years old and we used to go up that old road - you wouldn't know it was a road now, but it was Pope & Talbot's line. We used to go up there with a horse and sled, I was just a little kid, just small, probably about three or four years old. I used to go up there and haul water. Used to go up that old bridge, see, and haul water in a barrel down to our house. It had a pole on the end hooked up to the sled that pulled this barrel of water. Well, we used to go up there and there was fish all over in there.

J.R.: What kind of fish?

B.B.: Silver salmon. It was silvers. There were no dogs, dog salmon don't go that far. They just go up a mile or so up from the beach and that's as far as they go, but the silvers and steelhead will keep on a-going and there's so many pot holes you know, wild land. It wasn't cleared through the Chimacum valley and there were great big holes, stumps and logs across that would dam it up in places and make a regular big pond where the log fell across and there was great big fishing holes in it and the salmon used to come up there when it got to Center there at Brown's place it forked. There was the Paulson (?) homestead and Browns. The rest of it, it was our homestead - we owned that clean across there. But that's where the Creek forks...

J.R.: So, when you talk about that place, is it the place with the big walnut tree in the back, the big giant tree in the back?

B.B.: Yeah, but that ain't a walnut, it's elm.

J.R.: Oh, an elm tree.

B.B.: Oh that's the biggest. It covers the most ground of any tree in the county. Then I got three big redwood trees right out going out the road. That's my place.

J.R.: I was just there yesterday.

B.B.: Yeah. Well, that's part that we bought off of this other one with the water right of way. That's still mine, but I'm selling it on a contract. But anyway to tell about the fish, the salmon would be dead up around there you know. We didn't like to use the [Creek] water much, but we used to go get good clear [drinking] water that comes right out of the ground, in the hills. We had it. When we homesteaded there, they had to build down close to the creek. Well, the water wasn't good down there - - high water would come through that creek, turned red by the time it got down there, they never like to drink it, see, they didn't know what was above it, so we used to go up [to the headwaters of Barnhouse Creek] to get our drinking water, our wells dried up you know. We had wells dry up. The fish would be dead by the time they got up on there. They don't get that far anymore, they don't get up that far. They come to the new road they gotta stop, they can't come across the new road.

J.R.: Exactly.

B.B.: I know it! But it was all dead fish and the bear would come after the fish, there quite a lot of bear at that time.

J.R.: Black bear?

B.B.: Yeah, one time there was a bear right close there that little old bridge. Bridge is there yet if you can find it. The bull got scared of the bear and took off with the sled full of water and took off right down that road, about a half mile to where it turned and went down to my place. It made a turn, hit the stump and busted the barrel -- busted it all to pieces, so then we didn't have any more barrel, so then we had some milk cans and we hauled water in milk cans. But the fish were really thick up there and the silvers go up and spawn and die there. Then the bear come up and pick them up. But they don't get across the new road anymore because there's a culvert there.

J.R.: I just looked at that culvert a few days ago.

B.B.: It's too high.

J.R.: It is too high.

B.B.: I watched them, I've sit there and watched them try to get up there, they couldn't. They jump at it and get knocked back into the creek. There wasn't enough water coming out of it, so they could hit even hit the water, there wasn't enough water for them.

J.R.: I know exactly the spot you mean.

B.B.: In the pipe, it dropped down about four feet.

J.R.: The cement culvert?

B.B.: Yeah the cement one, they'd hit that and bounce back. I haven't looked at it lately - just a few years ago. The salmon never got past that anymore.

J.R.: Now they go the other way, they go up through Holdt's pasture, through Jodie's pasture clear in the other direction.

B.B.: Well, they used to come up both of them, but that's the Paulson place, the Browns, it used to be ours from that road to the other road -- all through the field

over there. Between our field and Brown's field. Go over the top of the ground until they dug a ditch, see, and that was all gravel up there, on the Paulson place, way up as far as you can go to Brown's house. So, Bishop owned it at that time and we had sold it, see, Bishop got it later on. We got 160 that went clean across. But Bishop got that 50 acres next to Eagle Mount Road. So, that's the way that went. Bishop had quite a bit of money at that time and he hired a bunch of Swedes to dig a ditch -- to make it straight instead it was going all over the field over to our place.

J.R.: Tell me, when it meandered, how wide were the curves? I see people pointing like this with their hands [making snaking movement], but was it ten feet [across the valley], was a quarter mile...?

B.B.: Changed its whole channel. It's like way up next to the woods around that turn to the right and went right down towards where our house is now, way down here to there.

J.R.: So, it want all the way across the whole valley, meandering like that?

B.B.: Yeah, almost across the valley and swung and went back down the other way.

J.R.: Was it one channel mainly or were there lots of little channels through the valley?

B.B.: It was pretty much on top of the ground. The cattle used to wade across it until he dug that ditch. It was all gravel. And when he dug that ditch -- just pick and shovel, they didn't have no equipment those days, just pick and shovel -- they dug a little ditch from there right on down to Brown's barn... When that high water come from Eagle Mount lakes, the two lakes up there [Peterson and Delanty Lakes], the overflow from them come down there, and that was a big stream that just cut a hole right in the ground right down through: that big. It caved in and caved in 10 to 12 feet high where the bank is where that water just cut it and did go right over the top right over the field, all over the field, ponds and puddles, everything. That part up in there was all gravel.

J.R.: What year did they dig that ditch, do you remember when that was?

B.B.: Yes I can remember when it was, I can tell by how old I was. I was going to school, I was probably about 9 or 10 years old. [1909 or 1910].

J.R.: Let me get it straight, what year were you born?

B.B.: 1900. I can remember every year. All I have to do is remember how old I was and that's the year it was.

J.R.: Do you remember fishing for salmon up there?

B.B.: When we got bigger we used fish them. That Paulson's creek was just full of them especially after they dug that ditch. Then there was a [water]fall there. There was a [water]fall there way up next to the woods -- you know how high [the gradient] is up there -- well the creek was level with the ground until it cut that way down below where the dam is there now. There was a great big [water]fall there it was about, oh I'd say about four or five feet high and it dropped right off that gravel pit right down into the creek and made a big hole and then they'd have to jump over that little falls. We kids used to go down there, but we were pretty small. The bigger ones would catch [fish] there with a hook and grab them when they'd jump to go over [the falls], and just leave them laying on the ground. They just caught them for fun.

J.R.: What other kinds of gear did you use to go fishing, gear and bait?

B.B.: A regular salmon hook. Some of the... older [kids] made a slip hook. They made a slip hook, had it on a pole. They'd take a cow's horn and cut it off and slip the pole into the cow's horn. Then they would tie a leather cord onto that hook on the cow's horn with the hook on the point of the cow's horn. That's the way they made [it] so the pole would hook into the salmon and then the [cow's horn] would pull off and then they'd have that string to fight around on. It wouldn't shake off. But if you just had a straight pole, which most of them did, [the fish would] kick off they wouldn't stay on it, but after they'd got [the fish] on there and that the string...

J.R.: Oh, then they could play it with that.

B.B.: So, that's the way they used to catch them. We'd just watch the bigger teenagers. I used to go up there after I got bigger and do it, but it got so that there was less fish all the time.

J.R.: When did you start noticing that there were fewer fish?

B.B.: One of the things is: they couldn't ... when they put the road they didn't have the spawning ground. They gotta have gravel to spawn in. There were great big holes, see, more water. There was more water dammed up by big logs. There was one great big log, a great big cedar [that] went across [the creek] and they my older brothers, they're about 20 years older than I am, they made a dam out of it . They cut a chunk right out of the middle of that big log and then made a dam out of it, dammed up the water.

J.R.: Where was that at?

B.B.: Right at our place, where it is now, where Waters' are, that was part of our place too. Down in that little gravel spot down there. So, that's what we used to do.

J.R.: So that's when you started noticing the decline in salmon? When did you start noticing that there were fewer fish?

B.B.: Oh, well it came so gradually it's pretty hard to tell but what made the big stop was going past the [road above] Juile's place [now Howard Barnhouse's home] where they had to jump, they never went across that anymore. That used to be Haller's place, that's just up past where we live. That little spot right there, bunch of gravel there, they'd go right through our place where we live now, that's part of our place right now, in Juile's was all muck, all black muck.

J.R.: Now, is that were the beaver dams are now? Is that the part you're talking about, just above the beaver dams?

B.B.: They were in there then, my uncle used to trap.

J.R.: How long have those beaver dams been there?

B.B.: [Since] before my time. I didn't know they were there when I was a kid until my brother, he went way up the creek, way up to my uncle, he'd go up there and trap.

J.R.: Were beaver dams a good place to go fishing?

B.B.: No, we didn't fish in the beaver dams, we didn't see them, they were up in the woods too far. Juile's was all marsh up in there, used to be a lake up there in Juile's place. That used to be a lake.

J.R.: Where Barnhouse lives now, Howard Barnhouse?

B.B.: Where Barnhouse lives, that's Juile's place. That was a swamp. We used to go over there and pick cranberries. The wild tea [labrador tea?] that goes around lakes, it was all full of that. When we were kids we used to pick cranberries.

J.R.: Do you think that those places were good for when the salmon are just fry? Do you think that those are good rearing grounds for the salmon, the beaver dams?

B.B.: Oh yeah, it was better for the salmon because they had more water. They didn't stop to spawn until they hit gravel. They never spawned down there in the mud, they go right through that. There's a strip of mud from where Waters' is, there's a gravel spot a couple of hundred feet, they'd stop there and do a little spawning.

J.R.: Oh, Water's is Schmidt's.

B.B.: Right on up to Barnhouse's, there's another gravel spot up there. But all that from Water's up to Barnhouse's was muck, all black peat ground.

J.R.: They say that's where they still spawn now.

B.B.: Oh yeah, they go up there. A few, but not very many, there ain't very many to get up there. The steelheads can get up there yet sometimes because they probably have more water coming out of that pipe -- they're a little more active and they're a smaller fish and they can get up there. A few steelheads.

J.R.: You mean the cutthroat trout or the steelheads?

B.B.: The steelheads.

J.R.: What time of year did you used to see the salmon spawning.

B.B.: Whenever the high water come. Whenever we had a big storm when the high water come. Right around Christmas time. It depends upon when the water come up, the water went up high, the fish were down there.

J.R.: You said when you were little you used to go all the way up and down the creek. Can you tell me about other areas on Chimacum Creek.

B.B.: Oh, well it just [runs] right on down through the valley. When I was a kid that was pretty well settled up down in after you left Center down to Tommy Yarr's place, from there on down it was pretty well settled.

J.R.: So, where it was settled it wasn't good fishing?

B.B.: Yeah, it was, but what spoiled the water was the dredger. They done [that] around about 1920. Everybody joined the drainage system. Everybody joined it, and some of them bucked it. They didn't want to [dredge]. William Bishop was Senator then and he said that it wouldn't be no good and would cost the farmers so much money. They didn't believe him , but it turned out he was right. Cost an awful lot of money for the engineers. Their overhead was to survey the whole country, to find out how much [dredging] would improve your land. If you had bottom land, you had to pay so much an acre for that drainage, if you had high land it didn't cost you nothing. That Juile's place was nothing but all swamp, he had to pay everything, he had to pay big. He couldn't pay for at all, so that left a mortgage on the place and in 1929 in the big depression came along and then the farmers couldn't make it. They were all milking cows for a living, you know, all they had

was milk cows, that's the only way they could make any money. Some of them tried chickens, but you had to milk cows to make money to make a living.

J.R.: Did you notice a change in the salmon after they dredged in 1920?

B.B.: There wasn't as many of them.

J.R.: How many could you catch a day before 1920 when you were a kid versus how many after?

B.B.: Oh, we'd just catch them for fun. Stand there all day when they come to that little falls. They had a hard time getting them, but you could see them jump to get over, they went right over, though.

J.R.: So, how many would you catch in a day when you were a little kid like that just for fun?

B.B.: Oh, we might have about 20 salmon laying around out there in that one place.

J.R.: So, after the dredging how many would you say you could catch at that same spot?

B.B.: Oh, I really don't know how many. I wasn't paying no attention to that. The road busted out, it cut so much in there, way up the creek, it washed out where the falls it was about four or five feet high, or six feet I don't know. Another little kid I used to walk along up there when you started to school. That [wash out?] washed the gravel out from underneath the sod and the sides hung over, hung over the big pond and if you walked too close to the edge... The little kid got too close to the edge and down he went right into the big pond, oh he got soaking wet! A whole big chunk got broke off. I seen that and I never got caught in that anymore.

J.R.: So, after the 1920 dredging they dredged it again later, right, in the 50's?

B.B.: Oh, they dredged then, there was a big dredger. It cost the farmers. We had 18 acres of it [dredged land] on our little 40 [acres] that we had left and that cost us a $1,000, that was a lot of money. That was a $1,000 then they had '29 [the Great Depression] came along and my stepfather and mother had to mortgage for another $1,000 to remodel the house and they weren't making any money on the [farm]. It was costing them. They were selling their milk on a butterfat basis, so all we got paid for was the cream. Didn't get nothing for the skim milk, there was no market for the skim milk, nobody wanted it. So, pretty near all the farmers had to get a mortgage. The [price of] feed was pretty high. They were only getting 15 cents a pound [for] butter fat and it was costing them 25 cents a pound to produce it so they went in the hole and had to pay their feed bills just to feed their cows, and kept right on doing that...it didn't take very long you know. Hoover was President, had a Republican

President at that time. It really got tough for the farmers. He said it was on account of the war [World War I], paying the war debt. We were only in that war about six months, and I was in it. This other war -- we had good times when we had the other war.

J.R.: So, after the second world war they dredged it again, didn't they? Didn't they do a lot of work on the creek after the second world war in the 40's and 50's?

B.B.: Not much.

J.R.: I read about this big plan that was written in 1956 to put all the drainage tile down in the lowlands and put a lot of irrigation ditches in. They didn't end up doing a lot of that?

B.B.: They didn't do much of anything. Just a few of the farmers got up to dig it deeper, to clean it out. Some of the low places like Short's -- that was the lowest place and it flooded every year and filled up and then they'd get somebody to clean it out.

J.R.: Do you remember what Short's place looked like around 1910?

B.B.: Oh yeah, that was the big lake.

J.R.: How deep was the lake?

B.B.: Oh, when the water the water was high [the lake depth was] about four or five feet deep close to the creek.

J.R.: So, how much of the valley did the lake fill?

B.B.: That whole bottom down there that you see from the road. Pretty near the whole thing. Both ways it raised towards the west so I drove on another road. Beautiful lake.

J.R.: How long was it? Did it go down to B.G. Brown's place?

B.B.: No. [Referring to Jodie Holdt nee Brown's property:] That was a different deal up there.

J.R.: Oh, that was high ground up there.

B.B.: [Chimacum Creek] crossed the road right there on that Eagle Mountain road under a big culvert there.

J.R.: Oh, I'm thinking of the other Brown down there [in the town of Chimacum, behind the Chimacum Cafe].

B.B.: [Referring to his own homestead along the Creek, here:] We had quite a bit of bottom land because we're right next to Juiles, but Juiles used to be a lake and we had part of it see, we had part of that lake so my father, when they homesteaded, cleaned out the stumps and logs by hand so they could pass through ours, but [at] Juiles you couldn't for a long time. Heller had to come in, he had a lot of money, he ditched it, he hired ditchers to ditch and that didn't do him much good because they didn't have fall enough [gradient] for the ditch because the creek [water] would come up and back right up the ditches. There wasn't fall enough. They spent a lot of money digging them ditches, Heller did. He was a wealthy man.

J.R.: On Juile's place?

B.B.: Yeah. It's now Barnhouse.

J.R.: So, where else were there lakes in the valley? Were there other lakes other than at Roger Short's and at Juiles'?

B.B.: The biggest one was right down on Short's. That was the lowest spot, both of them places there, both the Shorts' places. The whole thing there. Right down you get the Blanchard's place then it cleans out because it's higher down there. That was a low place. From Gould's place right on down to both Shorts' places.

J.R.: I know exactly where you mean. So, at Gould's was there a lake there too... or that's quite a bit higher isn't it? Up at Goulds is where the lake started and then it goes down through Shorts' and that was a lake and below Shorts' it stopped being a lake?

B.B.: A little bit of water...It was Grady's place then.

J.R.: You're talking about Gould's place?

B.B.: Gould's place they called it, I don't know whose it is now.

J.R.: They kind of split it all up now.

B.B.: It was flooded back up there too. It would go down right away. It would go down to Shorts' and stay there for a long time.

J.R.: That's why they've got 60 feet of peat down there.

B.B.: Well, up there at our place we had a good grade when we ditched, we had a good grade, but Heller he didn't.

J.R.: Can you tell me about the area that's below where Beaver Valley fork comes in, down below there, down towards the mouth at Irondale? Can you tell me about the fishing down there.

B.B.: That's a different creek. That comes right down where the store is, Beaver Valley store. It runs two ways, it goes towards Port Ludlow from there and then there's all kinds of water where the fish pond used to be and then it goes the other way, it goes to Irondale. Part of it goes to Ludlow and part of it goes to Irondale.

J.R.: And did you ever used to fish there?

B.B.: Oh I never got over there. Didn't have to go that far to fish as a kid. Then I got big, and I quit fishing, had something else on my mind when I was a teenager. I like to hunt, I always did like to hunt.

J.R.: Oh, what did you hunt for?

B.B.: Deer mostly and grouse, cougars and cats.

J.R.: Cougars and cats. What about elk?

B.B.: Oh, in 1900 they were all gone, when I was born. All that was left was horns. We used to go hunting in the woods and elk horns were all over the woods. Great big white elk horns.

J.R.: How come they were gone by then?

B.B.: They were gone, they went back into the mountains. They didn't stay down there.

J.R.: Speaking of being gone, can you tell me anything about the Chimacum Indians?

B.B.: Well, only what I've read and what I've heard. Quite a lot about that. I kind of keep up on that on account of my wife, she's an Indian. I keep up on that pretty well. There ain't no more. There used to be a tribe of Indians, Chimacum Indians, but from what I've read: the Canadians used to come across, they'd come across in boats and had war with the Indians, killed all the men Indians, took the wives back over to Canada, that's what I've heard.

J.R.: I guess there's a lot of different stories. Do you know what the word Chimacum means?

B.B.: I don't know. It's an Indian name, I don't know what it means.

J.R.: I can't come across anybody who knows what it means.

B.B.: I don't think its got any meaning at all, only an Indian name, "Chinook," they call it.

J.R.: Do you think the climate changed since you were a kid, is the weather different there in the valley?

B.B.: Yeah, it's getting warmer here than it used to be. Over a period of years there's quite a bit of warmer climate than there used to be. Used to have some tough winters, I'll tell you.

J.R.: Snow?

B.B.: In 1916 we got four feet of snow.

J.R.: That's what Josie Yarr said too.

B.B.: Four feet of snow, yeah. Who told you, Josie Yarr?

J.R.: Yeah.

B.B.: We all went to school together.

J.R.: I just talked to her two days ago. She's great.

B.B.: We all went to school in Center. I remember the first day she started school, second or third grade when she started. She was a cute little, black little kid, real dark you know, but real cute. She was a cute kid. [Lauhing...] Bashful as she could be. I'd try to get a hold of her to hug her, and, oh, she'd fight and kick me, fight and kick me. [Lauhing...] She had long chicken legs, and she'd kick me. Her brother was a year older than I was then her sister was about a year younger than I was. I remember when Grace [Rudorfer] started school too. Ed, he always did have a bad heart, Ed did. We used to fight and wrestle and the big kids would get us fight. The big teenage kids would get us little kids to fight and match us the by size. He was a year old than I was. They'd get us to fight to watch something. [Laughing more]

J.R.: They had a good time. They didn't have TV, huh? They'd have to watch something. Is there anything else that you want to tell me about the creek or about the forests or the way that it changed through the years. Is there anything else that

you can think of to tell me that would be helpful. Did you live on the homestead your whole life?

B.B.: No, not my whole life. But I always came home. When we got married, we got married when we were 18.

J.R.: Do you mind if I ask how you met your wife? I know it's not about the creek, but how did you meet your wife?

B.B.: School. She was going to Chimacum high school. I didn't go to high school, but she did. When I passed the eighth grade, why, I was working. I had a good job, I was making a man's wages.

J.R.: What were you doing?

B.B.: Driving team. I was a good horseman when I was 13 or 14 years old. I could get a man's job driving a team. I was doing that. Started about 1916, I was 16 years when school started.

J.R.: What part of the valley did she grow up in?

B.B.: Oh, my wife?

J.R.: Yeah.

B.B.: She was born in Irondale. You know where Sparling's place was, there's a big barn there, you know Nancy's restaurant is? Nancy's down there four corners [at Ness Rd.]. That was her grandfather's homestead. She was born on her grandfather's homestead.

J.R.: So she probably fished too. Did she like to go fishing when she was a kid?

B.B.: No, she didn't live there when she was a kid, she was born there. Her father was a real smart man, was a real smart man. He died pretty young too. His wife was a full blooded Indian woman. Him and his brother, Charlie Twigs and her uncle Johnny Twigs were partners in logging and they made a lot of money. They logged with oxen first and then got horses. They had to log right close to the beach, they couldn't go in. I was going to tell you about that up around our place. It wasn't worth anything.

J.R.: The logs weren't worth anything?

B.B.: No, not anything.

J.R.: Why not?

B.B.: Because it was eight miles from the salt water. They had to be hauled down to Hadlock, Ludlow, Port Ludlow, was a full eight miles. Wasn't any good at all, they had to burn them up to get rid of them. Great big firs 10 to 12 thousand dollar stumpage now. Burned them all, everybody wanted to get rid of them so they get some cows to milk, plant some garden or something. They weren't worth anything, in 1914, when I was 14 years old. They had a lot of them burned up and got rid of. But they made a lot shingle mills out of the cedar. They had shingle mills there, they got rid a lot of the cedar with shingle mills.

J.R.: Where did they do that?

B.B.: Well there was one there at Center, right across from Brown's house is, right across on the lower side of that creek where it crosses road, that was a mill pond, where they dumped the logs and the mill pond was just over back that a ways.

J.R.: That was a pond then?

B.B.: Yeah, a big mill pond, they had a dam in it. People would haul their logs in there and dump them, using horses and wagons, they didn't have no trucks. So, some would haul in with a sled, some hauled it in with horses and wagons. Couple of cords on a wagon and dump in there. Where it goes across the bridge, the road across there just below Brown's house they'd get on the bridge and dump over into the pond. The pond backed right up there to that bridge. The mill was down probably a couple hundred feet from there you see. [At Nisbet]

J.R.: There's a lot of salmon fry in there now. There's a lot salmon in now, right in the creek right where you're talking about.

B.B.: There's gravel there, they stop there to spawn and there on up it's gravel. Up for a short distance, just up in there a little ways of the barn there's no more gravel, up as far as Water's place there's some gravel along in there, from that bridge right up to Water's place, then there's no more gravel. Till they get up to Juiles' place, then there is a little of strip of gravel.

J.R.: You can still see traces of it there you know. You can still make it out.

B.B.: For a while there they could get a load of fish right there when they couldn't go any further. After they get up there that far you' have to get them right there when they get up there. They're white, the skin is all worn off of them. They're pretty good smoked or something like that. We didn't eat them much.

J.R.: You didn't eat much salmon?

B.B.: Nobody ate them much after they got up the creek.

J.R.: Right. Did you ever go down to the salt water to catch them?

B.B.: Oh yeah, they used to go down to the mouth. I was too small to go that far down, that's nine miles down there from our place down to the mouth. I never got down that far unless somebody took me. I get them right close there, do pretty good there. The dog salmon used to come up there too. They didn't go up the creek only about a half a mile, that's as far as they'd go up the creek, they wouldn't go up any further than that, the dog salmon, chums they call 'em now.

J.R.: They counted only about a hundred of them last year.

B.B.: They were good smoked, we called them dogs. Them were the only ones that went a little ways up the creek.

J.R.: Were there any other kinds of salmon aside from the chums and the silvers?

B.B.: Silvers and the chums.

J.R.: Then the steelhead and the cutthroat trout.

B.B.: The steelheads they'd go right on up. They go up earlier. They're a trout, they're not a salmon, they're a trout. Steelhead belong in the trout family.

J.R.: When do they go up?

B.B.: Whenever it was spawning time in high water.

J.R.: Well that's all I have to ask you about unless you want to tell me anything else.

After the tape was turned off Mr. Broderson confirmed that the Paulson property is what we think of as the NDC timberlands below Peterson Lake and above the Holdt place which he was referring to as the Brown's homestead because Jodie Holdt's maiden name is Brown. Also, I asked him about flooding and he said that his place would flood in the winter time but if it flooded in the morning it would be dry by evening because they had a pretty high gradient. But above him at the property he refers to as Juile's place [which is owned by Howard Barnhouse now] would remain flooded because it was a small lake. He also confirmed that the spring he referred to right in the beginning of the interview is the spring where Wild Olympic Salmon set the "dragonfoot" plaque. It is the headwaters of what they call "Barnhouse

Creek." Broderson used to go all the way up there to get drinking water. It was logged in the 1930's and again just recently but he didn't know about that.

INTERVIEW WITH JOE GERMEAU

Summary of an interview conducted with Joe Germeau, 75 year resident of Delanty Lake, which feeds Chimacum Creek. Conducted on December 15, 1995 by Judith Rubin. Mr. Germeau, 84 years old, has Parkinson's disease, but is otherwise in good health.

JR: Does Delanty Lake connect to Chimacum Creek all year round? Has Delanty Lake ever had a salmon population?

JG: There never were any salmon up to Delanty Lake. There isn't even water up here most of the time, let alone salmon. The government sponsored workers came up here to check the culverts to see if fish could pass. But in 75 years, I've never seen a salmon come up here.

JR: Where have you seen them?

JG: Well, I'm not really a salmon fisherman, I was a timber man, but I've seen them come up as far as a half mile above the [sediment basin] down on Brownie's (BG Brown's) land out of Center... Almost a mile below Old Eaglemont Road is as far up as they go.

JR: Do you know whether they go up into Peterson Lake?

JG: Peterson Lake [tributary] is bone dry in the summertime. No, the creek is mostly spring fed up there.

JR: I realize you've always lived up here, not down in the valley, but do you remember what that was like in terms of the vegetation before agricultural settlement?

JG: Well, before I ever got here, all the timber companies had logged the big timber. My dad had stripped this place clean, but look at it: it has all grown back now. Far as I know, they logged everything that was within a mile of the water. The last old growth was up on skidder hill, but now that's been logged too.

JR: Do you remember what kind of vegetation was down in the valley?

JG: It was all swamp down there.

JR: Was there spruce?

JG: I believe there was. But that was used during the war to build airplanes because it was strong and light.

JR: So the spruce in the valley would have been logged?

JG: Well, that would have been knotty and bushy, that spruce. This much I do know: there's hundreds of roots under the peat. So wet down there they don't decompose. They just keep coming up all the time. I used to be able to drive 45 miles an hour across my field but now there's these roots that keep working their way up.

JR: Do you think there has been a salmon decline over the years?

JG: Well, I'm not a salmon fisherman, so I can't really say. If there is a decline in salmon runs out here its on account of the gill netters in Hood Canal scooping everything up.

INTERVIEW WITH LEON LOPEMAN

Interview with Leon Lopeman regarding the history of Chimacum Creek -- and its salmon runs. Mr. Lopeman has lived in Chimacum for 61 years. He lives on the mainstem, just below the Schold Gravel Company the confluence with the Beaver Valley Fork. Interview conducted on September 12, 1995 by Judith Rubin. Information in brackets [] was added by the interviewer for clarification.

J.R.: When did you move here?

L.L.: 1934. I was six years old.

J.R.: Did you live here in this house the whole time?

L.L.: No, not all the time. I was married in 1949 and we were out here until '56 and my father was killed in an accident and then we bought the estate.

J.R.: Do you remember fishing then. Did you do a lot of fishing?

L.L.: Sure did. Do a lot of hunting.

J.R.: For what?

L.L.: Oh, Chinese pheasants and pigeons, grouse, they were all here then...deer.

J.R.: Any elk?

L.L.: There was never an elk population here. We had to go down to the Duckabush or the Dosewallips, to the west end [of the Olympic Peninsula] for elk.

J.R.: What about for the fish?

L.L.: Dog salmon and jack salmon, steelhead trout and silvers. There were very few silvers ever in Chimacum Creek, throughout my lifetime.

J.R.: So the jack salmon, they're the..

L.L.: Jacks are just a small type.

J.R.: Where do you remember them spawning?

L.L.: Well, they spawned all up and down the creek and in the drainage ditches. Probably the biggest spawning ground was clear up to the old Charlie Eldridge place out of Center, that would be Brown's place now.

J.R.: Jodie Holdt live in there now?

L.L.: I don't know who lives there now.

J.R.: Brown's daughter?

L.L.: There was thousands of dog salmon and what we called the little jack salmon and I don't know the proper name for them. But once in a great while you would see a silver, as far as there were ever great number of silvers spawning in Chimacum Creek. The Chimacum High School built the biggest bunch of spawners of the silvers.

J.R.: With the hatchery?

L.L.: With the hatchery.

J.R.: Yeah, I just talked with Ray Lowrie this morning... So, when did they build the gravel pit right here -- did they used to run all right through here?

L.L.: No, this is the part of the Chimacum Creek over here. The gravel pit was put in in 1971 or '72. George Cotton bought the old farm from a man by the name of Henry Jenkins. His wife owned it and George Cotton bought the east half of the farm and turned it into a gravel pit, that's when he put cement pond in.

J.R.: Did that used to be a wetlands up there?

L.L.: No, that used to be all farm land, I bailed hay and put in hay on all that property -- plowed it and sowed it.

J.R.: Pretty high and dry then?

L.L.: It was well drained.

J.R.: Because of all that gravel I guess?

L.L.: No, the wetland back there is a peat bog like this is here, but in those days we had what they call the Soil Conservation Corps, and the government put in monies and hired people to dig ditches and drain it. Chimacum Creek was a lot different in those days than it is now.

J.R.: Can you tell me about how it was before they drained it?

L.L.: It was a meandering stream that went all over the fields just like it is now -- absolutely doing nothing. So, in the early 40's the Soil Conservation and drainage district was formed and they brought in all this money and there were several

contractors around the community [who] dug all these drainage ditches and the surveying was done by the government and the grades were put in by the government.

J.R.: What grades?

L.L.: The grades for the ditch so the water would flow down the ditch. There's a big map of that somewhere in some governmental agency. You probably got it.

J.R.: It says 1956 though, did they do it in the early '40's also?

L.L.: Early 40's is when it started and in 1948/49..yeah '49, I worked for a construction company and all we did was dig drainage ditch all over Leland valley, Chimacum Valley and Sequim, and Dog Fish Creek in Poulsbo, Kitsap County.

J.R.: What time of year would you dig the ditches?

L.L.: Year 'round.

J.R.: Year 'round. So, you'd see the salmon running in the winter time -- you said there's been a big decline in the salmon run. When did you start noticing that?

L.L.: Oh, I've got no idea. After I became a grown man and got a decent job and quit the little [ditching] contractors, I didn't pay much attention to the creek. My children grew up here and a lot of my nephews and nieces grew up here and they paid attention to the streams all the time and there were lots of salmon running when they were growing up and lots of fishing the creek for them -- lots of steelhead, lots of cutthroat trout and rainbow trout.

J.R.: Up until say what year? I mean do you think it's dropped off recently?

L.L.: I wouldn't have any idea how much it's dropped off or anything because I don't go down to the creek. It's so closed off that you can't go to the creek anymore and enjoy yourself like you used to.

J.R.: What was it like before?

L.L.: It was all farm land and it was all wide open. I didn't need a highway to go to Chimacum or to go to the garbage dump and the school.

J.R.: Oh, did you go in a little boat?

L.L.: No, I'd just walk through -- crawl underneath the fences and walk through. The farmers didn't care as long as you behaved yourself. There were no homes between here and there.

J.R.: Between here and where?

L.L.: Chimacum bridge. There was one home that was close to Chimacum Creek and that's the old Bills home right across from Chimacum school. It wasn't a whole bunch of property owners, it was all farmers fields as you went up through there. As far as decline in the salmon runs, I couldn't say when that started or why it started, but I know we got a lot of problems about the salmon. And the biggest problem we got is the 50 or 60 seal laying at the mouth of Chimacum Creek eating the salmon.

J.R.: I've seen them.

L.L.: Yeah, well do you know how many salmon a seal would eat a day?

J.R.: No, do you?

L.L.: 30 or 40 pounds of salmon and he eats. Multiply that by 30 seals laying on the logboom at the mouth of Chimacum Creek. Well, pretty soon when you figure out a 24 hour period with all the seals eating that much and you multiply it by a week and then you get up to a month...

J.R.: Remember, historically, when there used to be thousands [of salmon], though. Don't you think there used to be seal at the mouth of the creek then too?

L.L.: No.

J.R.: Why not?

L.L.: Because there was a bounty on seal when I was a child. There was an eight dollar and a sixteen dollar bounty on seal and the grown men killed every one of them they could find, and there was still fields of sea lions. They were still out there when we went fishing in the boats. There was always a seal following you along side. Those bounties were sixteen dollars and eight dollars in the '30's.

J.R.: Until the '30's?

L.L.: Oh, I don't know probably until 1941, the bounty was on. There was also a bounty on crows, there was a bounty on bobcat, coyote and cougar.

J.R.: And who paid the bounty?

L.L.: The state. State and the federal governments.

J.R.: So, that was pretty good money then?

L.L.: Oh yes, it was good money. In those days it was big money.

J.R.: So, you think that since there's more seals and sea lions, there's fewer salmon?

L.L.: Oh, I know there's fewer salmon. I was a salmon fisherman until three years ago. Had a boat and my motors and my son.

J.R.: And where did you go?

L.L.: Middle grounds. We fished right here and around Marrowstone Island and then over to Port Ludlow. Then the laws got so foolish and so many people got to going out there and there was such a big crowd. And every time you came in, there was a fishery man with his notebook he was doing a survey or he wanted to see your catch or he wanted to see if you were complying with the laws, like using barbless hooks... You know it got to be such a hassle, I sold my boat and motors and I quit.

J.R.: You're not as free anymore, huh?

L.L.: Well, it never was free. There was always a limit on salmon.

J.R.: I mean the feeling, you know.

L.L.: Why go out there if every time you turn around there's someone looking at you through a set of field glasses or somebody's waiting on the shore with your boat number waiting to check you out when you come to shore? You don't have a good feeling.

J.R.: So... you were here when they were doing the dredging. Was that effective in reducing the flooding in the fields?

L.L.: Oh, yeah.

J.R.: Do you remember beaver dams -- was there a bounty on beaver too?

L.L.: There was no beaver here when I was a child until the game department brought the beaver back in and planted them.

J.R.: What year was that?

L.L.: Oh probably in the early '60's. The [Fish and] Game Department and the Federal Government brought the beaver in and planted them in the streams and in the lakes and all of a sudden they became a big nuisance again and they trapped them all out. They're trying to kill them all out again.

J.R.: Why did they bring them back in in the first place?

L.L.: Who knows. I'm not a politician. I've got no idea why they brought them back, but the beaver did beautiful things if you can keep them away from the populated areas and off of the farmers' fields. You know like the lakes out in Pope & Talbot's, and up at Penny creek especially ... [where] the [beavers] created a big huge lake out there and flooded probably 30-40 acres of land -- they cleared it all out around; they dammed up Penny Creek and they created a fishery there that you wouldn't believe.

J.R.: What was in there?

L.L.: Cutthroat trout and Eastern brook trout. You could go out there and wade around in chest waders or take an old boat and pull yourself through the trees [the beavers] killed and get your limit of cutthroat trout or at least char or eastern brook trout, 14, 15, 16 inches long. The only thing is you couldn't play them like a sportsman because they'd run around those limbs and get snagged up and tear loose. It was a magnificent fishery and then all of a sudden where they built a dam on Penny creek by this old road the Game Department and the wardens of the state and Federal Government said, 'we gotta get rid of these beaver.'

J.R.: Because they would start messing [up] the transportation?

L.L.: So now they started messing with this lousy old dirt road with a four foot culvert underneath the road.

J.R.: So that's a on whole different watershed though, that's down by Quilcene.

L.L.: Yeah, that's down by Quilcene. Then they go in and they dynamite the beaver and bring in the trappers, the trappers start trapping.

J.R.: But you don't remember there being beaver down through here in this stretch where you live?

L.L.: There was no beaver in Jefferson county when I was 25 years old, let's put it that. Absolutely there wasn't a beaver anywhere.

J.R.: So, what year was that?

L.L.: When I was 25 years old, it must have been about 1954, '55.

J.R.: Okay. Now what else. Do you remember a lot of flooding in the whole creek when you were a kid?

L.L.: When I was a child, there was a lot of flooding up and down the valley. Some of those farms up there were so wet that the people who owned them could hardly farm them. They were in mud knee deep all the time. Then when this drainage system came in, they got the creek straightened out and got drainage ditches and in and the tile ditches in so the farm land could be farmed like an ordinary human being farmed. Today there are so many rules and regulations about cleaning out a drainage ditch that a lot of people just give up. As far as the drainage district goes I don't even know if it is still in operation. Most people used to pay taxes into that to build a fund to take care of the drainage.

J.R.: I'm not sure whether that still exists.

L.L.: I don't believe it does. Another thing about the creek here in this drainage back behind me, the stream is so plugged with bull rushes and trees and reed canary grass from Chimacum bridge to the mouth that the salmon hasn't got a chance to run. They can get through some obstacles but they can't get through everything. As for the stream bed back, the creek runs through it but it would be pretty hard to find.

J.R.: We found it down there.

L.L.: Does it still go straight across?

J.R.: Well, it meanders a bit.

L.L.: That stream when they dug it up and straightened it out and cleaned it out why it was as straight as an arrow across that place and right on down through there.

J.R.: Were you glad when they did that?

L.L.: Oh, that was really good for the fish. That increased the fish probably four-fold.

J.R.: You think so?

L.L.: Yeah. The fish could get up, the salmon could come up, the cutthroat trout followed them in from the bay, the steelhead followed the cutthroat trout and the drainage ditch coming into it made a little dead water spot where it came into the stream. There was a dead water spot for the steelhead and the salmon would lay and rest and spawn. Where there was gravel and salmon, they'd spawn there too.

J.R.: You think one of the problems is that they can't get up through the vegetation?

L.L.: They can't get up through the vegetation and the vegetation is holding the silt in and silting the stream bed in. The fish can't spawn in that, [they] spawn in gravel and sand. Even though that's a peat bog down there, there was always gravel and sand in that creek bottom.

J.R.: That's real silty now. I fell in that thing one day...

L.L.: It's plugged up with mud and peat.

J.R.: So, that used to be silt and gravel?

L.L.: Yeah, you get that stream down in there five feet, six, seven feet where it belongs, then there's all gravel and sand.

J.R.: What do you mean six, seven feet -- six, seven feet deep?

L.L.: Deep, yeah. That ditch was down in there. When I used to walk up to the stream when I was a kid you could fall four or five feet into the creek bottom.

J.R.: Before it was dredged?

L.L.: No that was after it was dredged. Before it was dredged it ran all over that field back there. It came down through there meandered here and meandered there and everywhere.

J.R.: What do you suppose the solution to the salmon problem would be? What do you suppose would improve the salmon runs?

L.L.: The only thing that's going to improve the salmon runs is to get rid of the predators, to control the predators like the seals and the sea lions. You don't got to kill them all, get rid of some of them though. When I say predator, well man is also a predator. There's things going on in Puget Sound, I never did have any use for. These gill net boats over in Hood Canal are absolutely ridiculous. These Indians in these mouths of these rivers and the rivers and beaches ... shouldn't be allowed. There shouldn't be a net inside of Port Angeles, the way I see it, Port Angeles across to Victoria there should not be a fishing in that water. Commercial fishing has gotta go, and I mean everybody -- the Indian, the Swede, the Dutchman.

J.R.: You think it should all be sport fishing?

L.L.: It should all be recreational. They keep talking about bringing the wild runs of salmon back.

J.R.: You think the native runs are all gone?

L.L.: Well, there might be a few left but I doubt if there's very many and I don't think there's enough of them to bring the run back. I'm familiar with the west end. I've been out there ever since I was a young man.

J.R.: The west end?

L.L.: Yeah, the Bogachiel, and the Sol Duc and the Hoh and all those rivers, the Elwha. And there's just simply no fish out there anymore -- not like there used to be.

J.R.: When you say familiar with them, you used to take your boat and fish them out or walk up the creek?

L.L.: No, we went out there elk hunting and we'd fish in the little streams coming out of the rivers. I never was a steelhead fisherman, but then they started something out there. When the fish really started declining was when the Indians started netting them out in the mouths of the rivers. You don't take the breeders and sell them commercially. You leave them go up, let them have their young and catch them out in the ocean.

J.R.: Well, harvesting is a big problem. I don't know if it's the main problem on Chimacum creek, but that's what we're trying to figure out.

L.L.: Well, as far as I know there's nobody netting Chimacum Creek now. The silvers are laying down by the hundreds off the mouth of Chimacum Creek. Right about now they'll start. If you want to see the fish come out of Chimacum Creek, put on chest waders and take a ride and go crabbing some night. When the tide is low we'll go wading.

J.R.: They come in at night?

L.L.: They come to the light. Any fish will come to the light if you go wading. When you wade they're down there waiting for rain water to run. But a majority of those salmon are going to run to Chimacum School. There were very few silvers that ever went beyond Chimacum School.

J.R.: That's strange because we've seen..we've seen the fry up in the high water tributaries.

L.L.: Some of them got lost and went right on up the stream to spawn. That's good. At Brown's place out at Center, we ditched that one time when the salmon were running. That stream used to come in there and went back and forth and just meandered all over that big field. Well, the Soil Conservation Corps they went in there to survey it. We had the job of straightening that creek out both directions. What you call Barnhouse Creek and then up towards the Brown's place the other way. We were on that farm for probably a week and we straightened that stream all the way across. In the process we cut off big curves [meanders]. It was salmon running time. In those days there weren't any rules or regulations. When we cut off couple of them curves, I took a five gallon bucket and went and gathered up the

trout, and there were seven spawning salmon also, in the big curves that I picked up and [threw] back into the stream. You know they were about dead anyway but I didn't know whether they'd spawned out. It didn't cost me to pick them up and throw them back into the stream. Then there's another thing about that silt. Let me tell you another incident that happened to me when I was working at ditching.

J.R.: Tell me again what year was that?

L.L.: 1948 and '49. We started on the drainage going from Leland Lake pretty near to the Little Quilcene River just above a sheep rancher. Anyway we started in there and in the old days they shot that drainage ditch with black powder.

J.R.: What do you mean?

L.L.: Black powder -- they blew the ditch. It's been 40 for 50 years since they blew the ditch. But anyway we had to go in there and open that up and re-dig it. The Soil Conservation Corps again surveyed and graded it for us so we could follow the grade. We had to put the machine on mats. These were 14'x5' mats and we worked off three of them. When you shoot peat it never goes back together. Not solid, it stays liquid. Anyway, we started right in salmon running season and we came all the way up there to Frank Diamond's farm where the Church place is now.

J.R.: At Leland lake?

L.L.: Yeah, right across from the road where the Fisheries are. Anyway we dug that right in salmon running season and when we got up on Frank's farm where the fields were open and we could see, [we realized that] all the time we were digging those salmon were going right by us through all the silt and mess and going right into Lake Leland. They were not only going to Lake Leland they were coming out of Lake Leland and spawning in the little streams that come in. There's a big argument about what time of year to dig ditches. I saw that with my own eyes and I could hardly believe that they had run through that mess. Of course we were digging in that ditch eight or nine hours a day , but then you know that peat didn't clean out quickly, and there wasn't much flow anyway.

J.R.: You're talking about the spawning in Leland Lake, do you know where the salmon used to spawn in the lakes up in Chimacum, like Gibbs Lake, Anderson? No, they didn't do that?

L.L.: There's not enough water for them to get there.

J.R.: They can't get up Naylor's creek?

L.L.: No. Let me tell you a joke on the fisheries. They got this idea in their heads that there was drainage out of Anderson Lake. That the salmon could run in. They

planted Anderson Lake with coho salmon. Thousands of them, thousands of them. When they found out that they couldn't get out, when they were about 14-15 inches long, they opened up Anderson lake for people to fish. My sons and nephews went up there and sat on the bank and caught those silver salmon, 13-14-15 inches long.

J.R.: Anderson lake drains down and becomes Putansu Creek, right?

L.L.: Yeah. And the old Bishop dam. There's another Bishop water works.

J.R.: Yeah I saw that, huge cement.

L.L.: It's all drained. They dynamited it and destroyed it when they got rid of it.

J.R.: You're not talking about the big cement one that's up on the logging land now?

L.L.: Yeah, right up the big canyon, right up Bud Peterson's, right up that stream back at the bottom there. There was a big Bishop water works by Chimacum and Chimacum School with water when I was a child.

J.R.: Yeah, that dam is still in there, it's not holding water back anymore.

L.L.: It's not holding water back anymore but it's all filled up and they dynamited it when they got rid of it, when they blew the middle out of it.

J.R.: Do you remember whether Putansu creek used to have better spawning gravels before then?

L.L.: As far as I know there was never any salmon went up there.

J.R.: [The substrate is] all sandy...

L.L.: This is something that's been created by what's going on today [due to Wild Olympic Salmon Restoration projects] because of the drainage ditch going across the fields through Chimacum creek out there.

J.R.: Through Jim Shaw's place?

L.L.: Yeah, across Brown's place or the old Bishop place. That thing was never kept open enough for salmon to get up as far as Bud Peterson's farm.

J.R.: Because of the dam?

L.L.: Because of reed canary grass and bull rushes and stuff you see.

J.R.: Do you think that there was as much reed canary grass and bull rushes before the dredging or do you think that reed canary grass grows on the dredge spoils? What brought that in?

L.L.: Well, I know what brought it in here. It was seeded. We had to seed it because reed canary grass is a wetland product. My dad seeded his swamp to it and it is still down there from his seeding, and he's been dead for years and years and years. And I mow it, I mow it.

J.R.: Is that good for any cows?

L.L.: Oh they eat it, but it's a very poor feed. The reed canary grass really wasn't here before the farmer brought it in.

J.R.: And that was in 1950?

L.L.: Oh I don't know, probably in the '30's and '40's the farmers seeded that and they brought in this fescue. They seed that now. You can see the reed canary grass growing in my swamp down there.

J.R.: What was it before then, before the reed canary grass or was it in reed canary grass your whole life?

L.L.: Oh no. No, that down there was nothing but swamp brush. We plowed it underneath and my dad seeded. The willows never used to be out there. I was a child when that was a pure peat bog. Then they grew up and then that flooded down there one year, which killed all the willows and now that it's stopped flooding the willows are growing back.

J.R.: Did your dad talk about what it looked like when he got here?

L.L.: Well that peat bog...I can remember my older sisters and brothers went down over in the left hand corner which you can't see from the house, and stripped off about an acre and a half. [The plants] had burned. It was on fire. The bog was on fire.

J.R.: They stripped off the burnt stuff?

L.L.: They stripped off the swamp brush that was growing back, but the peat bog was still on fire on the north end.

J.R.: Underneath the ground?

L.L.: Underneath the ground, it burned for years. All of them down in the valley burned for years but that's the way it was in those days. They cleared the land and

they had these big brush piles and they'd light them on fire and the peat would catch on fire and it took years for the water rising and going down to put it out. Once that peat bog gets on fire you can't put it out. But anyway they stripped it down there and my dad and mother and older brother and sisters put in a potato patch down there in the spring in 1934 or '35 I guess it was. My dad raised about eight or nine ton of spuds down there and that was the only crop that he ever raised. The mineral was in that peat to raise that one crop of potatoes and never raised nothing after that.

J.R.: Really? After that one season?

L.L.: That one season. He planted potatoes down there, we planted potatoes all over that swamp all during my life time -- never did raise another bunch of potatoes like that. But anyway all peat bogs were on fire when I was a little kid because people were clearing the land and burning and it would just naturally get on fire and like I say there was nothing in those days to put it out with. So, old mother nature over the course of the years, she put it out.

My dad cleared this land was with a dredging hoe and fire. But he knew when we came here that the peat bog was on fire on the north end of it and he knew not to put fire down in there. Everything we took off of that swamp we carried from sight and burnt on high land.

J.R.: And did he buy this land from Yarr? I'm just curious -- she said she was born down here.

L.L.: Mrs. Yarr was born on this property but a person by the name of Miskin bought the Strands [Yarr's grandparents] place and my dad bought ten acres here from the Miskin heir, Phoebe Harris. There was an old barn here and a well and chicken houses right out here when we first came here. Dad cut some poles, my brother and dad got poles and they took that two room house that set down there and put it on poles and they put a block on the big stumps up here and towed it up the old foundation.

INTERVIEW WITH RAY LOWRIE

Interview with Ray Lowrie regarding the history of Chimacum Creek -- and its salmon runs. Ray taught at Chimacum High School, located at the confluence below the East fork (Beaver Valley) and West fork, for 30 years. He founded and ran the school hatchery, and supervised student salmon habitat surveys. Interview conducted on September 12, 1995 by Judith Rubin. Information in brackets [] was added by the interviewer for clarification.

J.R.: Tell me how long you've been here, your memories of fishing and salmon spawning on the creek.

R.L.: Well, I started teaching at Chimacum in 1960. Chimacum Creek runs the eastern border of Chimacum School. I was teaching sixth grade the first year I was here and did things we called bird walks. On nice days the kids were a little antsy so we'd call time out to the lesson plans and walk the creek. Or we'd go over to Brown's grove of trees and check the birds, hike up the big rock and check everything. It wasn't just an outing it, [it was a] science period. We did a lot on the creek, we had maps, all this sort of thing. One thing led to another. There was a fairly good run of fish in the creek: dogs and silvers.

J.R.: Back in 1960?

R.L.: Yeah. There were also a lot of kids in the creek and those early dogs [chum salmon] got slammed dunked quite extensively with the salmon smackers, poachers.

J.R.: By whom?

R.L.: The kids. The kids would smack them. They had little contests: going down there with machetes and see who could kill the most in a day. I remember one boy telling me about how he, his brother and another kid would go down there and in one day they had the contest with the machetes and Gerald killed 105, his brother killed 99 and he killed 94, dog salmon -- hit them with the machete. It was fairly easy to do, the creek wasn't very wide or deep, and of course they were spawning in the riffles and very vulnerable. And kids were very athletic. So, I thought, "Nothing like a reformed hooker," maybe I can get these kids involved in the stream. Over the previous years I'd been fantasizing some sort of class that would do that. At that time we had superintendant [of schools] that was really receptive. He and I talked about it quite a bit in '68 or '69. Nothing much came of it, until I was in Kodiak, Alaska fishing on a salmon boat summer of '70... when I came back he'd received a grant from the state for $20,000. He said, 'It's yours. I've told the principal you're going to run [a salmon program]; we'll set you up in the kind of class we've talked about and here's your [fish] hatchery. ' So we built the hatchery

and we started some other [projects]. Essentially that was the foot in the door, the next year I got a three year, $100,000 title 9 grant.

So, we built a boat, and we added to the hatchery. We had about seven different programs going, some were mountain climbing, some were surveying. Essentially the class was investigating the watershed. With some of those monies I hired an associate teacher who was a geologist. He took the kids from the top to bottom of Chimacum Creek -- they did eleven and a half miles of the stream. In one of the base studies they did gravel sampling. That was the beginning of it, and we were on the creeks all the time. Then a guy named Ray Johnson from Department of Fisheries [US Fish and Wildlife or the State?] came by and he let us do things that at that time were not Fisheries policy or in some cases even legal.

J.R.: Like what?

R.L.: Sample, do things on the creek. He took us several times. He told me at that time that Fisheries policy was to let the little streams go [not regulate for fish production], that they were a pain in the behind to patrol -- the fish were vulnerable, there was nothing but kids in there harassing the fish anyhow. [According to] Fisheries thinking at the time, [small streams like the Chimacum] had no real significant volume of fish. My cousin was in the Fisheries Department at the time and he told me that their idea: if they got ... the seven major rivers in the state which support all the salmon that anybody can use, up and running the way they visualized [using hatcheries], then the little streams could go to the developers and whoever. Well, time proved them wrong. By that time a lot of damage had been done. Johnson didn't agree with that so that's why he let us play on the little creek and do things. He came with his equipment, and we'd do gravel sampling, find redds and determine what kind of fish were there, and count the numbers [of returning salmon].

J.R.: What kinds of fish did you find?

R.L.: We found steelhead, he felt they were native, he could find no records that they had been planted.

J.R.: So what year did you find steelheads?

R.L.: The fall of '70.

J.R.: How about now? Can you find steelheads now?

R.L.: Well, we're planting a lot of them. Another program came along a little later: a guy named Dr. Alvar who was big dog in U.S. Fish and Wildlife. They had plans of obtaining some property down towards the mouth of the creek and duplicating their little White Salmon River facility on the Columbia River. They were going to put

in an experimental lab where they were going to do all kinds of magic things and it was going to be another one in the chain in their experimental wet labs and [the Chimacum] would be an experimental river. Well, for three years we went on that premise while they were trying to put together land deals and he was working to get money. At about that time there was a big change in Congress, something like what happened recently. Essentially about the same kind of people [right wing Republicans] got in and they went thumbs down on everything...well, like [the Federal funding cuts] now. So, that dream went down the drain.

J.R.: So, wait. Go back to the steelhead for a second, didn't you also plant native steelhead?

R.L.: No, those all came from the Columbia River. So, they came for three years they brought 2,500-3,000 silver [coho] smolt and 3,000 steelhead smolts. They put them in our horse trough, as we called it, our little hatchery down there, for about two weeks to acclimatize them to the water chemistry in Chimacum Creek. Then we set up a situation where there were two or three fishery guys and three or four of my [students] who would tag them and weigh them and measure them and put them in the creek. And then we took some eighth graders down there one year and built a weir.

J.R.: What year was that?

R.L.: That would be somewhere about '74 or '75: we built the weir the year we expected the returns from the first planting. One night there was a freshet, and we went down and looked at the trap and there were probably about 350 silvers in it. We were getting ready to set up the crews to come down and work with these fish the next day. Well the freshet turned into a gully wash and washed everything out.

J.R.: Flushed out the weir?

R.L.: Everything. It came clear up over...

J.R.: Where was that?

R.L.: Just below what we call the Pondit (?) bridge. So, it would be about 200 yards upstream from the mouth of the creek.

J.R.: Was that the same as the Irondale failure?

R.L.: No, the Irondale failure came almost 10 years later. We have a downpour every once and a while, but not anything like the one that washed out the fill or the upper end. But those fish all got up stream of course. Then we never attempted to take any others.

J.R.: What do you mean...?

R.L.: No, see that was the one thing we weren't allowed to do. Our hatchery was functioning by that time. We were putting in between 4,000 to 90,000 fingerlings each year. Usually we'd have 40,000 or so.

J.R.: You'd raise them from eggs?

R.L.: Yeah, and that was the problem.

J.R.: What do you mean?

R.L.: Kids and eggs.

J.R.: Why?

R.L.: Some years the kids would work like mad, in cold weather and everything, and it [the hatchery] was out in the open -- there was no enclosed [place] where you could stand up, you had move around over things and crack the ice. So, it took pretty dedicated kids. Some years I had them and some years I didn't. So, some years there were a lot of [egg mortalities] and some years there weren't. That was just part of the process. But the steelhead that we planted I think are still continuing. Those are the only planted steelheads that I know of that were in that creek. There were about 90,000 in three years.

J.R.: You think they're still around then?

R.L.: Yeah, if there's any steelhead in there. I know afterwards there were because the kids were fishing them. It's a closed stream, never open to fishing, but the kids would fish in it.

J.R.: What other types of fish do you remember -- the dogs?

R.L.: The dogs and then the two runs of silvers.

J.R.: Which runs of silvers? What times did they run?

R.L.: Well those hatchery fish came up about the end of September, early October before the stream got high and you could see them all over the place.

J.R.: So, they kind of got caught?

R.L.: They got blitzed pretty good sometimes.

J.R.: Because there wasn't enough flow?

R.L.: Yeah -- well, they're just so visible. It was nice you know. It was weather like this and people were down there digging around.

J.R.: What do you mean they got blitzed?

R.L.: Killed, poached. Salmon smackers were all over the place. By this time the kids had kind of bought in and they were looking at them as "their fish." So, people were starting to get reported and caught.

J.R.: You said there was a hatchery run in September.

R.L.: And the later run around Christmas. Evidently they were the natives.

J.R.: And then what about the chum run -- isn't there an early chum run?

R.L.: They came about from late in the second week or early in the third week of September. When there was a big run you'd see them a little earlier, when there weren't so many you'd see them maybe in the first week in October.

I was a gill netter for years. In the 60's you could fish Oak Bay, in the early 70's you could fish around here. We were fishing kings [chinook] in Oak Bay and we'd started picking up these big dogs that were hanging around -- we'd get it in the king gear. They were around 14 to 20 pounds and would get in with the king. Evidently they were early dogs going somewhere.

J.R.: You're talking about Oak Bay right now?

R.L.: Yeah, Oak Bay. So, that would be in August. Usually you don't see dogs around here in August. They were either Chimacum Creek dogs or Quilcene dogs.

J.R.: Do you remember say in 1960, '65 or so how many coho [silvers] there were and how big what size they were.

R.L.: Yeah. We dealt mostly with the dogs. We were down there about three times a week. Fisheries told us that if we would mark the dead fish that we found, number them, keep track of them, and send that data in then they would note it. They had a magic formula of some kind that they'd plug these numbers in, this data in, then they could tell what size the run was and the quality of the run, and be able to better manage all this sort of thing. So, for years and years and years we'd [tag the spawned out carcasses]. For several years [students took] data -- the size of the fish, the sex of the fish, whether it had been spawned out or killed or died whatever before it could spawn, etc. They liked to put all kinds of things down. I don't know if was significant but it was fun and it gave them better powers of observation. They were looking for a lot of different things -- as many things that they could find. And the

idea was that you know we'd mark these fish and if we saw them again we would record that we'd seen them you know the second time or the third time. We'd always put [our marker] around the lower jaw because observation seemed to indicate that that was the toughest part of the fish and usually the last to dissolve. So, we'd go through the season and three times a week until we could find no more live fish or dead fish or any kind of fish and then we would tag them. It kind of came out that we were marking about one third of the run.

So, some years we'd have 300, some years 150.

J.R.: So that was their magic formula, you counted a third of the run?
[Both laughing]

R.L.: Yeah, that's about what it boiled down to. You know the kids figured this out long before we heard it officially from the state. At a meeting here a month ago all the gurus from the state were here, and we were talking about just this. [I recalled the] years and years of records and data we sent in. It started in 1970 and went through, '86 or '87, and this geneticist says, "God I'd give my eye teeth to have those records." And I said, "well you should have them." That was part of the deal with the state: we had to send records in. "If you people were not round filing it, it ought to be around there some place." And Rich Colt, the guy were sending it to was sitting there and he kind of goes 'gulp'. I think he just dumped it.

J.R.: Really?

R.L.: Ah yeah.

J.R.: Do you have copies of that?

R.L.: I did. You know I put all of my junk in one bundle and gave it to the library, the school.

J.R.: It must be there.

R.L.: God, I hope it is. I wouldn't hold my breath.

J.R.: Let's talk a little bit about the habitat. Let's talk about the fish decline on Chimacum creek. When did you first notice it?

R.L.: Well, it was very dramatic. When that fill went out.

J.R.: What year was that?

R.L.: We just had about three days of rain, really heavy rain that winter. Let's see they were playing basketball...it might have been...so it might have been '82, winter

of '82 or '83 that that went out. I remember I was at a basketball game and people were coming in asking for me because the salmon were swimming across the road down here at the cemetery bridge and some guy stopped traffic and there was about this much water going over the road.

J.R.: About how much?

R.L.: Well, about four inches because the fish were sticking up out of the water. It was shooting through underneath [the road] then pouring through there at such a rate that the fish couldn't negotiate it. They were all lined up along the bank and then they'd just nose up and go across the road. While people watched 20-30 went across. So, people I didn't even know were really excited about it, and they came up looking for me at the ball game, for pete's sake, to tell me about all this stuff. So, that was kind of phenomenon.

J.R.: So, what happened?

R.L.: Well, two things happened. You'd walk along the creek and look at the riffles and everywhere and the pebbles, the boulders and the rocks -- all the different gravels were all up on top. It looked okay until you tried to dig your heel in, and then it was hard as this table! We got some axles from the bus barn and some picks and went down [below the fill failure, downstream from the bridge] and we tried to break up areas about the size of this table (6'x6') so that salmon could spawn. We knew we had to get down 18 inches or so and, god! we worked -- but we could hardly make a hole in it.

J.R.: Like cement?

R.L.: Yes, all those fine sediments that were in the road [bed washed down].

J.R.: So, where did the fines come from again?

R.L.: The whole fill washed out -- I don't know, maybe 20,000 yards of material. It just covered the bay. I mean the bay was outside, like the Mississippi at a bad time, and so a lot of it went out there.

J.R.: So it destroyed a lot of the lower spawning grounds?

R.L.: Well, there had been a heavy spawn in here, been about 1,500 dogs in the lowest mile of the stream that year. We figured 3,000-5,000 silvers came up that year. In one day we tagged nine hundred and some-odd silvers just in Powell's field. Powells up at center -- BG Brown's.

J.R.: So, it's Holdt's now?

R.L.: Holdt now, yes. That's the daughter, Jodie Holdt.

J.R.: You tagged 900 up there?

R.L.: 900, almost 1,000.

J.R.: Below Nisbit?

R.L.: No, we went from the culvert up. [Nisbet is below the culvert].

J.R.: From the culvert up?

R.L.: Yeah.

J.R.: Which culvert?

R.L.: The culvert that goes across the road right there at Holdt's across Eagle Mount Road. The kids looked down below but they didn't tag anything down below. They walked down Nisbit's to see if there was anything, and fish were spawning. That wasn't one of our [sample sites] so we just made an observation and then went upstream on the Holdt's side of the culvert, and went on around all the way up through the field and went about 100 yards into the woods.

J.R.: They're logging there now.

R.L.: Well, they were logging then, too. That was in October and the weather was a lot like this [warm] and the creek was fairly low. There were a lot of live fish.

J.R.: Early run of silver that year?

R.L.: Yeah. Then the rains came. We went up there and the logger had a long tangent road come in along side the hill and that whole hillside failed of course and the creek built up a head and put the gravel down [all the wat down to] Holdt's barnyard and of course wiped out everything that was below it. That was the run, pretty much, that was the big spawning area up there.

J.R.: What year was that again?

R.L.: The winter of '82 or '83, now that I recall the ball game. That was the night of the game which was probably a Friday night which was the second day of the rain and I think it was that weekend that everything let go. It was really rare, I don't think it's rained like that the years I've been in here except that one time -- three days of very, very heavy rain.

J.R.: So, you're saying that below that gravel pit up at Holdt's all the spawning grounds were wiped out?

R.L.: Well, from where the hill failed everything came gushing down. I don't know whether the state says that one particular year was the wipe out, but the year before there had been about 1,500 silvers in that creek and there had been 500 or so dogs, so there should've been something coming back. There had been a string of probably four good strong runs for the dogs in the lower stream and three years of silvers.

J.R.: You mean in the early '80's.

R.L.: Early '80's, right. Well, it started about '79, '80, '81, '82 we were seeing a lot of fish, the kids were happy. When we went counting fish we expected to count 100 new fish almost every time we went [out to survey]. It didn't always work that way.

J.R.: That's what I hear from other people that the early '80's there were a lot [of salmon here].

R.L.: And then the next year we thought, well, there ought to be a bunch of fish, but there were maybe 300 silvers, not many dogs at all.

J.R.: And were you counting in the same sights every year?

R.L.: Right. We thought, well, if we could smash up some gravel they'll spawn, they'll come to that. Well, they tried. We saw lots dog salmon with no tails, they literally wore their tails off trying to spawn -- they couldn't swim. They were just nubs there. There really weren't many that year.

J.R.: So, you think those two fill failures were responsible for the salmon decline?

R.L.: That was only part of the spawning problem: the degradation of the lower gravel. The upper gravel was pretty good -- there was a lot of gravel recruitment, but there were no fish, nor have there been since. So, fisheries all thought, "Its El Nino." Well, according to Fisheries there's been El Nino every year since '83! But I would guess high seas fishing and Alaska/Canadian [confrontations] increase commercial fishing off our coast and Canadian/Alaskan coast. There's also been a real increase in the number of recreational fisherman. Every day is a derby between Olympia and Neah Bay. When I was a kid if you saw a dozen other boats that was the peak of the season, unless of course you were fishing around Seattle. All my relatives lived in Seattle, they all had boats. In the summer I'd work in Seattle and we'd go fishing in the evening hours. If there were 100 boats out there but that was at the peak of the season.

J.R.: So you think that commercial and sport fishing have caused a lot of decline. What about fresh water habitat?

R.L.: Well, there's been degradation of that, too. Development, road building, logging... Logging has really hurt it [the fish habitat] here. Mainly the road building, I think, and the logging [harmed freshwater habitat].

J.R.: Do you know of any culvert blocks on Chimacum Creek?

R.L.: At the Gould farm there's a private culvert where the water would come through and literally just shoot out about six feet. Mrs. Gould loved the salmon, so she'd watch... they used to put up a kind of a dam and they backed the creek up in the summer time and kids would swim there.

J.R.: Why would they do that, just for fun? They put in their own little private dam?

R.L.: Yeah. [The pool] was probably quarter mile long. Fisheries knew about it of course and they just said, like they told all the farmers, "yeah, have it out of there by September 15th " -- all the farmers had to pull their little dams [at that time].

There was a rock pile down at the bottom, and the fish couldn't negotiate it very well, so she'd watch, and when she'd see the fish stacking up and she'd call the school and I'd take a bunch of kids up their and we'd dip them up with nets and then we'd have a gang of kids going up over the berm.

J.R.: You're kidding me, wow.

R.L.: Oh yeah, we sometimes passed 200 fish over the top.

J.R.: Why didn't she just change the culvert?

R.L.: Well, she didn't have the bucks, you know.

J.R.: They changed it now. Do you think its still a fish passage problem?

R.L.: I doubt it. I don't know if anything is really a fish passage problem any more. There don't seem to be any fish. I found fish above it -- that was where we found most of the fish. The fish were spawning just below and then above it. There's that beaver dam down stream of Neudorfers Bridge and there weren't any fish.

J.R.: Were there more beaver ponds in the past?

R.L.: Yeah, down in here there were quite a few. This area in through here had a lot of beaver dams. We would go down there and the salmon would be blocked off --

we'd see 40-50 salmon below the dams there, the major dam. So, fisheries wanted to blow the dam! The Game Department said leave it alone for the trout habitat up stream. The Game Department knew more about salmon than the fisheries did because they said the salmon need the beaver dams -- they need them. You want silvers in the creek, you need the dams.

J.R.: Can you explain why you think the silvers need the beaver dams?

R.L.: Sure. Its easy. They need wintering over and summer over places.

J.R.: They need flooded areas, is that what you're saying?

R.L.: Well, my understanding that the productivity of the stream is a function of it's surface area, not necessarily the volume of water. Of course there's other things to consider. These creeks, if you can widen them out some how, put little beaver dams, then that little creek becomes a much larger stream, a more productive stream. Symbiotic relationship between the silvers and the beaver -- you have beaver in a stream, you have good silver habitat.

J.R.: Now what do you say to the people who think that the silver can't get up past the beaver dams?

R.L.: Like Fisheries [staff], I think they're nuts -- that's why they call the [salmon] "The Leaper." Obviously the fish make it. Some don't, you know. But they have evolved an ability to negotiate these things.

J.R.: Otherwise they wouldn't be up in Barnhouse creek.

R.L.: Yeah. And when Fisheries got that landing barge and their little bulldozer and went down on Hood Canal and ran their dam bulldozer up and down the streams there "mitigating" the beaver dams so the water would flow and the fish could get up and down, they showed that they had no clue as to what they were [doing]. [Department of Fish and] Game seem to understand this. They had better observers, they had more people in the field. I dealt with both [organizations] at that time in the '70's and it seemed Game was light years ahead of Fisheries. Fisheries were more concerned with managing a commercial product and they had no clue what the hell happened ...

J.R.: To the habitat?

R.L.: Yeah.

J.R.: So, we're talking about beaver dams and flooding -- do you recall whether the high and low flows were different historically in the summer time and in the winter time than they are now?

R.L.: I think they're pretty much the same.

J.R.: [How about water quality]?

R.L.: I had at least one kid a year who didn't care one rat for a salmon, and didn't really like going out and getting sweaty and dirty; kind of a "nerd" who loved chemistry and that sort of thing. So, I'd use those kids as my rocket scientists, and I'd brag them up. They did a lot of nice work, and a lot of them were old enough to drive. So they'd take water samples at four different places between the fill and then the bridge going from Ness' corner and Hadlock. Over on the bridge by the cemetery.

J.R.: Center road?

R.L.: Yeah. Well, we'd go as far south as the culvert there in Nisbit's. It's easy to get up there. We had two stations at the hatchery -- we had the creek, which told us a lot about the health of the water in the valley and of course we kept track of [water quality] in the hatchery. So, a lot of times we'd see it would be down to 4 in the creek.

J.R.: Four what?

R.L.: Parts per million. [I think he meant mg/liter, the standard unit of measurement for oxygen.]

J.R.: Of what?

R.L.: Oxygen.

J.R.: Where would it be 4?

R.L.: Where we took the water into the hatchery and it would be 9 or 10 in the trough.

J.R.: 9 or 10 in the trough at the hatchery?

R.L.: Yeah, after it went through our pumps.

J.R.: So, you were oxygenating the water?

R.L.: Yeah, that was a big concern of ours, keeping that oxygen [level] up. It didn't always didn't get down, but we'd get down to four.

J.R.: Are you talking about the summer time?

R.L.: No, sometimes we'd do it in the winter if we had a prolonged cold spell; if we had three weeks or so of no precipitation and low temperatures. The [water level of the] creek would go down. It seemed to stabilize at about 14 inches or so. It was ten feet across the hatchery and with no taper, it came down and went across.

J.R.: Steep sides?

R.L.: Steep banks and dredged. We had a gauge there, and it never got below a foot at the gauge.

J.R.: As for oxygen, 4 was about as low as it would get?

R.L.: Ever got.

J.R.: In the winter time.

R.L.: Or the spring. The summer we didn't take [measurements].

J.R.: We took them all summer [1995].

R.L.: The worst times [for oxygen level] seemed to be when the fields had flooded up above us. When they started to drain after the precipitation then the water lays out in the fields and warms up and there's all kinds of organic matter in it. Then it would start to [drain], and we had real trouble with the filters, and we had trouble with oxygen.

J.R.: So, you were getting a lot of organic matter and low oxygen coming in after the fields had drained?

R.L.: Yeah, high temperatures, relatively high temperatures.

J.R.: So, what would a high temperature be in the middle of winter?

R.L.: Well, this wasn't necessarily winter. This would be anytime [except summer]. The water temperature was high when they got up in the high 50's, low 60's which was fairly rare. The highest I recall was about 68°, and we lost a lot of fish then. We had fingerlings they seemed to get lethargic. They were trying to find a place in the trough where it was better for them. We didn't see them cork screwing off or anything but we did see some weird growth, and they started getting warm water diseases.

J.R.: At around 68° farenheit?

R.L.: Yeah, and it stayed that high for about four or five days until it basically drained off and then it went back down. The [watershed] is kind of a spring-fed system. [Water temperature] doesn't vary a great deal. There are variations but no wild swings. This was a real heavy rain and there was a lot of canary grass in the system, which that naturally blocks things. That flooded the fields real quick out there at Short's and then it cleared off and it was really warm. I think it was May and it got very warm for several weeks so the temperature went up. That was the worst time that I remember, ever. We had some bad times one winter; Shorts were dumping their liquid fertilizer in the creek. It was cold and the creek was at minimum flow. It wasn't super cold but it would freeze every night and then it would get up in the low, mid 30's in the day and go down from 14° or 15°, to around 20° to 35° or so. That went on for quite a bit of time and these big, mustard colored clouds -- remember, the creek is really clear -- would come down with 14 inches of water, you couldn't see an inch into it, [the water] would turn opaque. So, they were doing this three days a week.

J.R.: So, basically, [it was] manure water?

R.L.: Right. And so we complained to EPA. They sent somebody up to check with Shorts and this got to be a big thing. I guess they told Short they would be there like 10:00 on Tuesday and Thursdays to check them out. Well, the guy that blew the whistle on Short was the fish cop -- he walked the creek and he found a spigot, a six inch main just spewing this stuff [manure] out into the creek. He didn't do anything, he came to me and said, 'do something, you have more power than I do.' So, I thought, god, that's weird. So, I did and so they made this program..well, geez, wonderful.

J.R.: What do you mean 'they made this program'?

R.L.: EPA came up they worked out a [monitoring] program. They were going to come in on schedule and lo and behold! The creek was clear [when they came to check]. So, they wrote me a letter and told me that they could find absolutely nothing wrong. They said the water was nearly pristine and the material that was in the water was just a normal background level of organic matter. I wrote back and told them that they were full of it, and I also said that I knew about the schedule, and that it didn't take a great deal of intelligence to figure out that if you turn the spigot off at about 9:00 things would clear up by 10:00. Of course the samples would be made and then they would go on about their business. So, this guy got all fluffed up. He called, and was going to charge me with all kinds of things. He was going to take me to court because I'd sullied his [reputation], suggesting collusion and all this sort of thing. Well, it turned out that one of his field [assistants] was a former student of mine from Port Townsend: Bruce Chesterfield. He was up visiting his folks and he came by [the hatchery] on a Monday and he wanted to talk to me about this [issue]. He said it was very serious, this Robinson guy was going to take me to court, sue me, sue the [school] district, he's going to sue me personally and he's

really outraged. We were down at the hatchery talking about this early in the morning and he said, 'I've run the test on this stuff and there's no problem.' And we're standing there looking at the Creek and it was running beautifully clear. He said, 'honest to God, Robinson said he'd drink out of it.' I was looking up stream and I could see this enormous mass coming; it was awful, [like] the stuff we saw all the time. So, I just kind of kept him with his back to it for a while and talked and I said, "I tell you what. I'll get a five gallon bucket and I'll dip up some of that water, and old Robinson can drink out of any part of it. He said okay and he kind of glanced back: "Oh my god." So, I got a five gallon bucket and I sent it to [Robinson] with a real nasty note told him that he'd hear from my lawyer, big time. So, I got a big letter of apology and they went after Short.

J.R.: Now he sprinkles it [the manure] on his field?

R.L.: Right. Well, he had a problems about that. I don't know just which Short was doing it either. Roger now is a lot more enlightened than his dad and uncle.

J.R.: Yeah, he's been real cooperative.

R.L.: Oh yeah. Well he's light years ahead of those two guys..they were real deals. Anyhow, it wasn't until another farmer threw a fit, Bishop I believe it was, then all of a sudden EPA descended on that place and they got Short..they were threatening him with $5,000/day fines I understand. They made him transfer...he was hauling [manure] up on the hill across the road -- he had a pond up there that he was dumping it in, and that gave way and it all came down the hill. Came down across the road, it was almost three feet deep.

Hundreds of thousands of gallons of this stuff, it looked like, came down and went all the way down into his yard. It was amazing. So, here's the County out there with all their equipment scooping up this stuff, the ditches are running with it both ways you know. It was wonderful. Then he started digging those big pools across the other side, so it changed things. Then he found out it was better to do it that way because that [manure was valuable to him]. Of course Roger [already] had that figured out. Once he got by the old guys then he started running that [farm] like there was some intelligence behind it.

J.R.: So, do you have any ideas for a solution to the salmon problem?

R.L.: In the creek?

J.R.: Yeah. Or in the whole watershed. What would you do?

R.L.: If I could do anything I wanted to do? The habitat is, in my estimation, better now than it was in the 60's.

J.R.: Why?

R.L.: Because there are more people concerned about it, and there are more things being done. The cows aren't in the creek like they were, there are very few farmers in the watershed that are farming with the same practices that they did in those days. There's people like Roger Short -- I really give him a lot of credit because he's trying a lot of different things and he's going along with other people's ideas which were unheard of in this valley [not long ago]. When I got that $20,000 I had two farmers, Huntingford and I forget the guy's name, come to me and say hey if you really want to put that money to good use never mind messing with the salmon, dredge the creek -- you know dredge it out down here by the school. Take out this barrier so it really drains that land up there you know. That was the thinking.

J.R.: So, what do you think of that?

R.L.: I think it's bogus. You can't drain peat land without depressing it. Florida has proved that. Also, it's my observation that Short's pasture floods a lot easier now. The more they cultivate, and the more they mess around with their equipment up there the quicker they're going to return that whole area to permanent water. They're not very far from that right now. You can see the old creek bed showing up more and more every year.

J.R.: So, what would you do if you were 'King of Chimacum'?

R.L.: King of Chimacum. I'd just continue the course it's on now. I think it's good that all these different groups are involved. I think it has to be that way. A lot of people have to be involved. As far as the fish are concerned, one thing I would do is find out how many fish are actually going out of the system.

J.R.: By going out the mouth?

R.L.: How many emerging. How many are going out. That would then indicate to me whether there's a problem. What can a watershed do? Nothing but hatch and nurture a population of juveniles. That's all it can do, that's all any watershed could do. What the hell happens at the other part of the life cycle, in the ocean, we can't control that. We're not getting the returns we used to get. So, we need to know whether we are actually putting fish into the system.

J.R.: How would you count that?

R.L.: Oh it's pretty simple. I'd just trap the young guys going out, the smolts. We did that on Putansu creek, the high school kids did that.

J.R.: Are you talking about silvers?

R.L.: Well, you can do it for any of them.

J.R.: No, but on Putansu, did you trap?

R.L.: Yeah, we trapped. We counted a couple hundred at half way. We put an equal number of fingerlings into the system above the trap as we did below the trap. And we assumed that there may be as many as two hundred down below too because we made twenty six little bands down there, there were all kinds of little pools.

The question that I have in my mind is what is the system producing. I'd have a trap on the tributaries, I'd trapped the tributaries, and the mainstream.

J.R.: Have a baseline to compare things to?

R.L.: Yeah and just do it for three years or four years .

J.R.: But in terms of habitat enhancement do you see any possibilities?

R.L.: Well, if you find that, say, Naylor's Creek is producing 100 smolt a year, and similar tributaries, ones that come closest to size and everything, aren't producing but six or eight then maybe we'd take a look at Naylor's to see why is this [producing] and why aren't these [others aren't].

J.R.: Is there anything else you want to tell me about either historic or current or potential around Chimacum.

R.L.: I disagree with Fisheries. I know and respect Chuck Bariski, but he and I had a big argument. One day about he learned that ... I put eighty some thousand fingerlings in the creek and that he just put seventy, I think; he thought a hundred and fifty thousand fingerlings overwhelmed the whole system. And I thought that would be maybe a tenth of what there ought to be, the way I looked at it. I know you can get too many fingerlings in, but there's a certain carrying capacity of every watershed and I don't believe the hundred and fifty thousand fingerlings is a carrying capacity or even close to carrying capacity.

J.R.: Are you basing that on historic information?

R.L.: He's basing it on what he knows. He figured a hundred and fifty fish back in this creek was one hell of a run.

J.R.: One hundred and fifty fish?

R.L.: Yeah.

J.R.: Are you talking about silvers?

R.L.: Yeah, that's what he's saying. I said, "where are you coming from..geez we had over 1,000 many many times." Seven years ago, the time he'd been around the creek here, I said there was one day my kids tagged nearly 1,000 silvers, dead ones, spawned out ones and there were still hundreds of them spawning. That was just one mile. 'No, no, no, God no. Hundred and fifty fish is about all you can expect,' he said, "don't you understand that this stream is producing at about 90% of it's capacity?" Well, the [according to the] statistical [method] with which fisheries does their calculations, it is. They just say, 'it's degraded, so it can only product 200 fish.'

J.R.: I see. They're not talking about the potential?

R.L.: No, no, and it's not degraded. It's much better shape than in those days.

J.R.: Got to get those other areas fenced off though.

R.L.: I guess. I've talked to fisheries people and they just shake their heads... I believe hatcheries do one thing well and that's hatch eggs. I can't see why they can't just hatch out a jillion eggs and then as soon as they swim up you know they're button up fry, put them in the creek and let nature take it's course. I don't call those "hatchery fish," you know what I mean. If they took every fish from Chimacum Creek and trapped them at the mouth or trapped them at the mouth of the tributaries and then hatched them out and put them back as fingerlings, they'd be light years ahead. You could build up a run a hell of a lot faster. There might be a lot of work but I think this creek has lots of people to help. They say it won't work.

[Pause]

J.R.: Tell me about the floating cannery.

R.L.: Well, I don't know much about it. I was talking to Ollie Kilmer and he was talking about his dad. They evidently they brought the cannery up to the mouth of Chimacum Creek and they would fish in the general vicinity.

J.R.: What year was that?

R.L.: Oh, around the turn of the century or just after. I don't know how late into the century that he continued to do this. There were about 400 Chimacums I guess at one time living here, and they drew a lot of energy from the salmon that they got here. You know that they didn't just live on salmon, but they used them. Then they had the cannery there until the fish [declined to the point where] it wasn't worth ... having the cannery. [This] would indicate to me that there were pretty strong fish runs coming here over a period of time. The earliest fish come in somewhere mid- to late September and the last fish come in maybe as late as late

January or early February. That's quite a chunk of the year to have "fresh meat" swimming up the creek.

J.R.: At least at the mouth.

R.L.: Yeah.

J.R.: Cutthroat too.

R.L.: The cutthroat, lampreys, too, for that matter. There's a lot of life in the stream. When I first started messing around in 1960 or '61, there was a tremendous number of cray fish.

J.R.: Crawdads you mean?

R.L.: Yeah. Then they kind of disappeared as time went on now they're coming back. The last few years that I was there we were seeing them. And there are two kinds of clams, you know the big fresh water clams?

J.R.: Down at the mouth you mean?

R.L.: No, no right here in the creek. Also the little pea clam, they were all over the place and I don't know how strong they are. Then of course, there are the lampreys and the sticklebacks, and the searun cut[throat trout]. Of course searun cuts are a function of the success of the dog salmon. Usually they were with the dog salmon, they would come when the dogs came and they were always around them -- you could watch the dog salmon spawning and the cutthroat were all around down below the [salmon] redds, nipping at the eggs. Since the dogs have disappeared, cutthroat have gone down drastically -- used to be fantastic clatters of searuns down there. It was awesome.

J.R.: When was that?

R.L.: Up until the dogs kind of disappeared. Now there's still a few.

J.R.: You mean in the early '80's?

R.L.: Yeah. We'd go fly fishing down at the mouth in the salt water. They would spurt out. They were all from Oak Bay around into (?) Harbor and everywhere. In the summer time they were coasting all over the place and when the dogs would come, these guys would just come pouring in with them. Of course they started putting Quilcene silvers in here and the Quilcene silvers are pretty early. The hatchery silvers were coming up at about the the time the dogs were, so that was an added bonus for the cutthroat.

Chimacum Creek Wild Olympic Salmon Assessment project
Interview with Bill Matheson by Vicki Eldridge
July 19, 1994

VE: Basically what I would like you to do is your history, about your family. In whatever form you want to talk about. How you arrived here and so on.

BM: It's a book.

VE: It's a book, good!

BM: About my family, my parents?

VE: Right, tell the story like you'd like to tell the story. What do you recall about the area when you arrived? What did your parents relate to you when you were growing up?

BM: I was born in Port Hadlock in 1928. My dad came from Halifax, Nova Scotia in 1909, where he met my mother, who lived in Port Hadlock. Her name was Olivet Call. They were married and had seven children. I'm about in the middle there somewhere, of those seven children. We grew up during the hard times. It was the depression and that, so before there was television or anything like that. Us kids, we just played a great deal outdoors on the salt water beaches and sand flats of lower Hadlock and on the banks of Chimacum Creek, fishing and things like that. I attended Chimacum school where I graduated, and that's where I met my wife Bernice. We were married in 1947 and we have three children, who also graduated from Chimacum school.

VE: What do you remember about fishing at the Chimacum creek. Did you spend a lot of time there when you were growing up?

BM: My early remembrance of Chimacum Creek was that a very early age my grandparents, Lawrence and Ada Areys, would take the children to Chimacum Creek at the Irondale location. Where Chimacum Creek flowed through Irondale, it was called Irondale Creek, and to get there we would drive down to the end of 7th avenue, where the road ended, park the car, and take the trail through the woods through vacant lots, one lot in particular, as I remember, was called the Ingolson's nursery, and there was no buildings on there, but there were parts of shrubbery and trees from the nursery. We'd walk through there, and then the trail quickly descended down into the creek, where my grandmother taught us to put the worms on the hook and where abouts in the creek to fish to get the largest and the most fish. While we were there she also taught us how to peel the skin from the tender salmonberry sprouts and eat them. We did that frequently and learned all about fishing. As my brother, who is two years older than I, and I grew up, we explored the creek on our own from very the mouth of the creek to what we called Bishop's dam. That's up by the Chimacum school area. We didn't go beyond that because that we too far away from home. But we knew every little fishing hole along the creek

there. We never swam in the creek like a lot of the kids did, because we swam in the salt water, what we called the salt chucks, but occasionally we would fall in, trying to get to the good fishing spots. That's what I remember about the Chimacum Creek and the fishing. Maybe some particular areas like we used to fish, we called the Reuben Miskin, which in the early days was called the Strand ranch, and now in later years, it's been called the Bailey ranch. I think it's called the G.S. Covington place now. At that point, there, the creek forked into two branches, one coming from the West Chimacum Valley, and the other from the East Chimacum Valley. They unite there where Doug Joyce lives. We would fish there every opportunity we got.

VE: Do you remember what type of fish you caught? What kind of salmon they were?

BM: We only caught small trout and a lot of bullheads. The bullheads we would give to Rueben Miskin, whose ranch we were fishing. We would go through his ranch to get to the creek, so he asked us for any fish that we ... instead of throwing them back, if we'd give them to him, which we did. Oftentimes we would take the little ones home and cook them ourselves and eat them, which upset my mother because they were so small and more bother than anything. By the time we got 'em home they were pretty well dried up, too. Those were the good old days on Chimacum Creek.

VE: What changes have you noticed. Do you remember when you started to notice changes on the creek and the landscape?

BM: I'm not so sure that the actual creek itself has changed all that much. Where it flowed through and does flow through wooded areas, they still are wooded and not too many homesites built on or near the creek. A few more, perhaps, I think there are some by the grange down here in Chimacum, but in the valley the creek is about the same. I think there's some kind of control over that anyway but the irrigation association or something like that. It those days, I know Bishops irrigated from the creek. That's why they had the dam there. They could raise and lower the water behind this wooden dam by either inserting or removing planks to raise the water level to operate their pumps. Probably one of the changes that is probably for the worst is at the mouth of the creek, actually, where that logging barking or chipping operation is taking place down there. It has really changed the appearance of that. That whole area was very popular for recreation area for the local people.

VE: Yes, I learned to water ski in Irondale and Port Hadlock.

BM: I did, too. I spent many hours, not only in the daytime but evenings, too, with bonfires and that. And now it's difficult to get down there, and a lot of people believe that you can't get down there because it's a private area and a private road leading there, but that's not true. It's a county road, but the county doesn't take the appropriate steps, I think, that would mark so that it is

a public road.

VE: So you can actually still go down...

BM: To the mouth of the creek on a county road, but it appears to be owned by the chipping company.

VE: Is it still Crown Z?

BM: It has another name, but I forget what it's called. But the important thing to mention about the creek is how it got its name and the Indian people that lived here. I have those articles and I would like to show them to you.

VE: Would there be a possibility of taking copies?

BM: I have some copies of different stories that you can have that I have extra copies of, with the exception of this one here and this is kind of, well, condensed version of all these. It's an essay done by a young college student for his....

VE: Ah, Ethnohistory.

BM: It tells about the annihilation of the Chimacum tribe at the mouth of the creek, and also I have things here where Senator Bishop relays and told his daughter-in-law a story about the Chimacum Indians were wiped out by the Barkely Sound and Snohomish Indians. There are several versions of how the Chimacum Indians became extinct and you can draw your own conclusions.

VE: Have you drawn a conclusion?

BM: No, not really.

VE: I haven't either in all the literature that I've read.

BM: You're welcome to these. I would like to have this back because I don't have another copy.

VE: I will get a copy made as soon as possible and get this back to you.

BM: This here is taken from a book. It tells you a little bit about the Chimacum tribe. The Chimacum tribe lived here, of course. Their area extended north beyond the mouth of Chimacum Creek and they enjoyed all the elk and deer and beaver and all the salt water beaches. They had everything here that they'd want to sustain life. They enjoyed it very much, and they called their village that was located at the mouth of the creek, Gsqai. That's also the name that they give to the mouth of the creek, Gsqai Creek. That's the Indian name for the creek, but this is also the whole Chimacum valley, which was referred to then as Chimacum prairie, which maybe even the word Chimacum may be derived from the Indian word for prairie. So we have Chimacum Creek flowing through

Chimacum prairie and inhabited by the Chimacum Indian tribe. They were quite a large tribe at one time. I think they probably numbered more than 150, but at the time when they were annihilated, there was only about 90. They were very warlike and mean. They couldn't get along with any of the other tribes at all. There was always little skirmishes and fights going on and finally there became less and less Chimacums, due to the diseases that swept through here, they became a very small band. I think that's interesting, too. Not only did Win Williams' grandmother live at the mouth of the creek on what we call Kala Point today, also known as ~~Combs~~ Kuhn's Spit and Peckem Spit and of course you're familiar with ~~Combs~~ Kuhn's Spit. He was a real estate developed who would throw large clam bakes out there on the Spit and invite all his prospective customers to entice them into a real estate sale. Then the Edward Strand family, once again back to the Clifford Bailey ranch, was a large family living there on the creek. Edward Strand was from Helsinki, Finland, and he married a Snohomish Indian lady by the name of Boda. He had five girls and two boys, and many of those, our families here today are descendants of them. So I think that's history there. They must have, well they did, have a beautiful ranch. My mother tells me about going there, you know, and playing with the animals and seeing the beautiful birds and things that they had and playing with the Strand grandchildren and that. So it was right on the creek.

VE: There's so much history in this area. There's so many people, like you, that has been lost in many ways. Fortunately, a lot has been documented.

BM: Yeah, there has been quite a bit, I guess, but people like yourself now are aware that it should be preserved and put on tapes and books and things like that. I think that's great. We don't think about it until...'cause we always hear...Like I did, I always heard my folks speak of things like that, and I never taped it and then they passed on and I don't have it.

VE: My father never really talked about it. It took some tracking to find out even...I didn't realize that I was so closely linked to the Bishops until recently.

BM: In this little book here, which one is it now, that's your family there, where they first jumped ship and came here.

VE: So, you played in the creek and there were a lot of fish.

BM: Oh, there were lots of salmon, just lots of salmon, I guess of the different species. All I remember is a lot of salmon. Everybody had a smoke house. Not all the salmon came from the creek, naturally, but the majority of them did. Everybody took salmon from the creek. They wouldn't take a gaff hook because the gaff hooks were just poked into the bank different places, rather that carrying them back and forth, they would just stick them in the bank and they knew where they were and they could just down there with a gunny sack, get some smokers and bring them home and

put them in the smokehouse. There was salmon clear up past Bunk Gould, Josephine ~~Yard~~, clear up there, the salmon were seen. You could see them going upstream.

VE: Did you notice any particular spawning spots along the creek between the mouth and Josephine ~~Yard~~ Yarr?

BM: No, I don't recall anything particular that way that drew my attention that might be a spawning area or redds. I was just running up and down the stream banks and that. We also explored the creek by rowboat. We kept the rowboats down at Lower Hadlock and row up as far as we could go until the bottom of the boat was dragging. Of course, it's a beautiful area down there, now only fish but water fowl. It was a sanctuary.

VE: What type of waterfowl did you see, do you remember

BM: Well, all the ducks and any of the ducks and of course the cranes, just all of the birds. They're there today, as far as that goes. Probably not as many, but there's a lot of them. Just a wonderful area. All the salmonberries and thimble berries to eat along the way. It was always hard to leave that creek area to go home, you know.

VE: Do you know, Bill, when the habitat started changing along there? Do you have an inkling as to...?

BM: No, I don't know exactly, but I know over the years I've heard different things talking about canary grass and the trees that should shade the creek, they're not there anymore and that type of thing.

VE: Do you know what happened to them?

BM: No, I don't. I wasn't even aware that that was all that happening, to where it made that much difference, but you know how things happen, they happen gradually over a period of time and then you're not aware of it and then, boom, it hits you. Where are the fish and then you realize then that over a period of years the encroachment of the human species has crowded out the fish.

VE: Do you think logging had anything to do with it?

BM: Well, at the mouth, it no doubt have effected the salmon runs, but that was in the beginning, but since then they've imposed some pretty strong restrictions to keep those logs from obstructing the passage of the salmon going upstream.

INTERVIEW WITH BERNARD PETERSON

Summary of an interview conducted with Bernard Peterson, whose family has owned 260 acres surrounding Peterson Lake sine 1889. Mr Peterson, 84, has lived on this land for 79 years. Interview conducted by Judith Rubin on December 18, 1995.

BP: I was born in Port Blakely and I grew up among the old time homesteaders. The Chimacum Valley was thriving in those days with lots of little self-sufficient farms. Small dairy farmers would put out metal cans of cream and those would be taken to the dairy.

My grandfather came in 1889 from Ireland and lived here all his life. He held onto the land, and logged it to pay off the mortgage. When he died, he left it to the family, and I bought out the family in 1958.

JR: What kind of fish lived in the lake then?

BP: There were big native trout, 18-20" long, in the creek. And some native steelhead. There were 8-9" 'brook trout' in the Lake, but not much. I would catch trout with a horsetail snare. You'd slip a loop of horsetail around the fish and pick him up by the tail.

JR: Were there any salmon?

BP: No, there never were any salmon up here. They come up about 1/2 a mile down from here, but they don't get up to the lake. The tributary only runs between, say, October-November until April. The creek only runs 6 months a year up here. The water is too low when they're trying to spawn. Also, the pools are too small and dry during the summertime [to support juvenile salmon].

JR: Tell me your opinion about Chimacum Creek: do you think there has been a salmon decline over the years?

BP: Well, I didn't live down at the creek, so I never saw that many to start with. I did used to go down there to hunt and you'd see mink and muskrat every time you'd go. And beaver. You don't see those any more. Worst thing they ever did was to legalize the trapping of beaver. It really burns me up. The beavers create nice pools, back up the water and make wonderful hunting for ducks and trout. I brought them in to my lake here in 1948. They've been here ever since. But other than up here, you hardly see a beaver any more.

JR: Can you tell me other ways the habitat has changed in Chimacum Creek from your observations over time? Do you know what it looked like before it was farmed?

BP: Well, it has always been flooded. Always has and always will. Every 10-12 years

we're going to get a big flood. You can count on that. And no matter how much [drainage improvement] they try to do down there, it is always going to flood. They can dig all they want and plant all the trees they want to down there but it is still going to flood. These newcomer bureaucrats come in and think they're going to change things, but nature always gets the last word. Old Tom Yarr used to say, 'the more you disturb that [bottom valley] land the worse off you'll be. The less you disturb it the better.' And they [the Yarrs] always were the best farmers down there, in my opinion.

JR: Do you think that the floods persist less now than they did before the ditching during the Depression? Were the areas that are wet in the winter also wet in the summer?

BP: Well, somewhat. Roger Short's place would be wet for three months or so. Nice goose hunting there, there was. It wasn't wet year 'round, but it was wet plenty. That's why no one farmed there for so long.

JR: And what kind of vegetation grew on the banks of the creek?

BP: Willows, hardhack, and other [water tolerant plants].

JR: What do you suppose caused the salmon problems?

BP: Probably logging practices [sediment erosion] and spraying [pesticides and herbicides]. I am 100% against the use of those sprays.

JR: Do you know anything about the Chimacum Indians?

BP: Not really. Back then, the people who were part Indian would try to cover it up we didn't even say 'Indian'. Course then when the government started handing out money, people came out of the woodwork. Not that I blame them for that. But I don't know about the Chimacum Indians. Bill Matheson of the S'Klallam Tribe should be able to tell you about that.

INTERVIEW WITH JIM SHAW

Interview with Jim Shaw, lifelong resident of Chimacum Creek regarding salmon runs. Interview conducted by Judith Rubin on December 20, 1995.

JR: Tell me what you know about salmon in Chimacum Creek.

JS: Well, they used to spawn up at [BG] Brown's [at Center]. There'd be salmon and eagles just every place.

JR: When was the last time there were a lot of salmon?

JS: Oh, about 10 years ago. I feel there must be something in the creek stopping them from coming up. When I was a kid [in 1953-1955], I used to run up and down this creek from here on down to the mouth of it. And there was steelhead and salmon in that son-of-a-gun all the way.

JR: You mean from here at the Chimcum cafe on down?

JS: No I mean all the way from Brown's [Center] on down to the mouth. The whole length of the creek had fish in it. And I used to catch cutthroat. Man, you wouldn't believe the cutthroat: up to 21" out of there. And I used to raft logs out at the mouth of Chimacum Creek, used to see the silvers [coho] in there. But ever since it started flooding behind Cotton's [The old Jenkin's place]... where the Ness' corner road to Hadlock crosses the creek, a half mile upstream... In fact, one time I was down there with Harold Baily and Bob Barker, and we were shooting steelhead, which you're not supposed to do, and old Jenkins called the sheriff on us. There were lots of fish in the creek, so we never thought much of it, still we knew you weren't supposed to do that. That's where all the flooding is now, and that must be where some beaver dams are or something. If you get a big dam in Chimacum Creek you could have a problem.

JR: Were you born here?

JS: I've lived here all my life.

JR: What is different now?

JS: There's more cars that come through here in an hour than came by in a week... So many more people. If a car came past Jackson's garage while we were sitting in there, you knew everybody passing by. There were a lot more farms. We'd ship canned milk. There are hardly any farms now. And these are small compared to many others these days.

JR: Which kinds of fish were in the Creek when you were growing up?

JS: We used to catch cutthroat and steelhead. Once the salmon got up here they weren't good to eat. But there were silvers [coho] and dogs [chum], both. The dogs

came up to the Irondale Road fill and culvert. We used to see silvers all the way up to Brown's. But we never ever saw dogs up that far.

JR: Do you remember whether there was ever summer flooding?

JS: Well, this creek was dug before I was born. So I don't have any idea of what it was like before then. But the old creek used to wind through the valley. Now it's just a straight shot. The flooding hasn't changed too much in my lifetime.

JR: Do you see any other causes of salmon decline besides the blocks?

JS: Too many people. A few years ago, the chlorine got lose from the City water treatment facility past Ness' corner. And over fishing. I ran the log yard out at Quilcine. The salmon were on the decline as soon as the Judge Boldt decision went through. As soon as that decision was made, the Indians -- in Little Quil, for instance -- they'd go up and down the creek and take practically every last fish. They're working for the salmon now, its something they wouldn't do now. Just like me shooting fish when I was a kid. I wouldn't even think of doing that now. But there were so many fish and it was so different!

JR: Do you think there's any hope of restoring salmon to Chimacum Creek?

JS: Oh, well, yeah. On TV, I saw a report about some people who restored a stream in Seattle. From one end to the other. It doesn't do any good to restore them in one place but not another. Has anyone walked every step of the whole creek? I think that's what people should do: know every inch of the creek. Observe it and maintain it. For example, this year we hired someone to take all the weeds and canary grass out of the creek. I've got to spray the weeds around my fences to maintain them. Roger was telling me someone went to check the creek, and there was no oxygen there...

JR: Oh, that was me. [We talked about the results of oxygen monitoring during the summer.]

JS: Here's something I completely disagree with: planting [deciduous] trees along the creek. The leaves in the creek are just like manure.

JR: What about the shade they provide?

JS: This valley originally had big cedar and spruce. It didn't have weeds, like cottonwood, alder and willow. There was some. But you can't believe how much cedar and spruce provide shade. When I was a kid, I can't remember any reed canary grass in the creek. Al Latham kind of agrees with me on the shade issue. The first people to come cut down all the good trees.

JR: We are now comparing the vegetation pre-settlement from the cadastral maps, and they do report some marshes, crabapple and alder tree in addition to the

conifers.

JS: I think you've got to think about how it was before anybody got here, and along the creeks replant with spruce and cedar, fir... And I think you'll get enough alders and willows without planting any.

JR: What do you suppose is causing the salmon decline?

JS: It isn't just any one thing. Its everything. I hate to see all the people running around pointing their fingers at the Indians, the farmers, the loggers. It isn't any one thing: its all of us! When I was a kid I shouldn't have been shooting the fish...

JR: Tell me about the dam under the bridge...

JS: It has been here for years and years. I think it was put in when the main channel was dug. We put in about three feet of boards in the summer and take them out in the fall. It helps hold the water level up. That might be a reason why we've go more canary grass.

JR: The water is more stagnant

JS: That could be why there's low oxygen in there too.

JR: That could be.

Anything else you want to tell me about the history of the Chimacum?

JS: When everyone had small dairy farms, there were small amounts of waste [cow manure] to take care of. But now, with many animals confined, there's a lot of waste to get rid of each time. There used to be less concentration. I've got to get rid of manure twice each winter. I put it up on dry ground. But dairy farmers have liquid manure, which is harder to confine to a dry place.

JR: Is the Chimacum a good place to grow cows?

JS: It is, but feed costs and transportation costs are high. The Olympic Peninsula is better for growing trees than cows. That's the truth.

JR: One last question when you were a kid were there more or fewer beaver on Chimacum Creek?

JS: There were fewer. Thorndike creek had a lot of beavers. But the only thing on Chimacum Creek were muskrat.

There's another thing too: the fish runs are so unique. And it is such a small rum. Let's say you take a purse seiner and you're after 5,000 fish, and they just happen to catch the little run of fish migrating to Chimacum Creek, they could get caught real easily.

I think we've not only caught the fish, we've ruined the spawning grounds. It just comes back to people again, and greed. You don't just ruin a resource.

The Fisheries Department looks at farmers and loggers as if they don't care. But they have made mistakes too. The Fisheries shouldn't point a finger at the logger, and the white guy points a finger at the Indian... everybody's to blame! I think 99% of the people really want to have fish come back.

INTERVIEW WITH ROGER SHORT

Interview with Roger Short regarding the history of Chimacum Creek -- and its salmon runs -- where he was a long-time resident on the mainstem about 2 miles south of the confluence of the East and West Forks of Chimacum Creek. Interview conducted on August 29, 1995 by Judith Rubin. Information in brackets [] was added by the interviewer for clarification.

J.R.: We're trying to understand what the salmon habitat used to be like on the Chimacum and how the salmon runs and the habitat has changed so we're interviewing different people around the whole watershed. Could you tell me about your family history and your memories of fishing or fish in the Chimacum.

R.S.: My grandpa came to the Chimacum Valley in 1943, dad came at the same time: World War II. In 1945 after the war, when I was three years old we came back to the farm. The folks and grandpa had never dairy farmed and they thought the nice, tall bull rushes out there would grow anything. They didn't really know everything that was going on [out there]. We've always had a drainage problem because of the low gradient. From [the town of] Chimacum up through our place, there's two miles [of stream] with only five feet of elevation change. The [gradient is] like the curvature of the earth, no elevation change, it just sits there like a pond. I never remember the water flowing fast any time. [The channel] is wider now than it was then. It's choked with more canary grass, scum, pond weed, algae, and milfoil more than it used to be. I don't really know the reason for that.

I think canary grass started to get much more serious when we fenced our part because we were one of the first [farms] to fence [the creek] in this valley. When we fenced back from the creek that gave the canary grass a good chance to get started and then that grew right along the edges which the cows normally grazed and then it got five or six foot tall and then fell over in the heavy rain and then sprouted out in the middle of the creek. It's got rhizomes [thick perennial roots] which take root and the next thing you know [the reed canary grass is] clear across the creek. It started that way because we fenced. I'm not opposed to fencing -- I mean, the cows have to stay out of the stream, I realize that, but the fence creates a problem [because] we can't lower the banks or can't get to them to take spots of vegetation out of the creek. Jim Shaw down here he put his fence too close to the creek to be able to get a machine along side of it even to mow it.

J.R.: Let's go back to your grandparents time and your dad's time and what the vegetation was like then. You said there was bull rush. Was there other vegetation too or was it mainly like grasses and rushes out there? You had mentioned clearing out stumps and trees -- I was wondering what it was like.

R.S.: The creek was narrower and it wasn't as wide as we have it right now, but there was always vegetation in it. When I was a kid going down to try to fish you're lying in this little spot with clumps of grass here and there... the line would float down underneath and you catch your little six inch trout and you would never get it back because it would get tangled up.

J.R.: And when you looked around when you were fishing were there any trees around you?

R.S.: In the main channel there were no trees. There were some side channels, it used to be meander a little bit down through some low spots. And some willows grew in those spots. When it would flood, it would fill up with water and the water would stay there. I think it was more stickle back stranded in those spots. I don't really know if the trout were out in those spots -- little stickle backs, little with two or three spines on their back.

J.R.: What times of year did it flood?

R.S.: Anywhere from the first of November through first of May.

J.R.: Were there periods of stagnant water for a long time, or would it flood and then kind of dissipate?

R.S.: It all depended on what type of drainage -- I mean what type of maintenance was done on the creek. If there was no vegetation, if you could see water all the way to Chimacum and you could take a row boat and not get tangled up in the grass, the water comes up. If we get two inches of rain and it would be back down in couple days. The thicker the vegetation got, the longer the water stayed. In 1983 after trying to get the permits [clear out] vegetation for several years, and spending $20,000 and having some wars and bad names with different fishing people and various things we finally took...well at that point it was flooded all the way from August to August and that didn't work. We waded through mud three and four deep just to get along the edge of the creek. You could actually walk across the canary grass easier than the stream where the water was six foot deep than you could out in the fields. The cows had chewed it up then. I mean it was half a mile wide there was just stagnant mucky water. Much, much worse than it is right now.

J.R.: So then you dredged it to make it deeper in the channel?

R.S.: We did. Essentially, we took no material out except the vegetation, live vegetation. I think in a couple of spots we may have taken a trail out where cows had walked in for a drinking spot or something like that. But basically we just took vegetation. From that point and throughout our entire time we never know what we can ask for, how to present the problem. We were afraid to say, "well can we

make a hole [in the channel bottom] at this point?" [Historically] if we took anything we had to make nice smooth things with no holes on the bottom.

J.R.: That was back in the 50's, huh?

R.S.: That was back in the 60's. They wanted [the channel bottom] real smooth with no jags in it. It cost more to do that. So the next time we asked when we asked for a permit, they said they don't like it that way. It's easier when you're going along you got a spot you want to dig a hole, go ahead and dig a hole there.

J.R.: Back to the fish for a second. You mentioned going fishing as a kid, did you fish right here on your farm?

R.S.: Basically just on our farm.

J.R.: And what did you mostly catch?

R.S.: I think they were just rainbow trout.

J.R.: Rainbow trout. Do you remember seeing salmon coming up and spawning or coming up through [Naylor's] creek?

R.S.: Up Naylor's Creek, out by the culvert, by the well there, it's been plugged by canary grass and watercress at the top into the culvert and the water went clear over the top the two or three times when it rained. That's the place that we've seen the most salmon. And those are usually at Christmas time -- a week before, a week after. That's just about the only time I've ever seen any salmon. A couple earlier Decembers in about '81 or '82 we had hundreds of them going up through the flooded areas of the field . We had put woven wire fences on the creek because we had 100 geese at one time to have them eat some vegetation on the creek. They like to eat the grass on the bank rather than in the damn water! [Laughs]

J.R.: What happened to the salmon in the woven wire?

R.S.: There was more than one that got tangled in the woven wire trying to get back into the stream. The fence started at the bridge. The water was [on the fields] and the salmon went out around through the field because there was restriction. There's about [1.5 feet of] water and they came up through the field and went upstream about three quarters of a mile, half to three quarters of a mile. Then the water kind of goes back into the channel, but to get back into the channel they had to go through the woven wire fence. There was more than one that got tangled up in the fence.

J.R.: Hundreds came up and then how many would you say got up stream in to Naylor's creek?

R.S.: No. Naylor's creek was before that. These were silvers, probably hatchery fish. They all go up to Center. I remember that same period, not necessarily the same year, they said there were six to seven hundred spawned out salmon that were in Center by the sediment basin and through that place at one time and that [time they got trapped in the wire fence] was before they were all up there [at the reported big spawn at Center]. These were a little bit before Christmas, I think.

J.R.: How does that compare with when you were a kid, a ten year old kid, do you remember then at Christmas time coming up also?

R.S.: We saw a few but not very many.

J.R.: A few but not many.

R.S.: I think they just go straight through. What I mean: is you see one or two down there -- they don't hang out down there [in the mainstem].

J.R.: So, would you say there's been a salmon decline in Chimacum creek from the time you've lived here?

R.S.: I think there's been a lot of cycles. I think it's a hatchery cycle. Because the Quilcene hatchery [a stock from which some of the Chimacum releases were taken], that's not the salmon that you want in Chimacum Creek, which I didn't know at the time. The Quilcene salmon not the ones they want. They want the ones from the Dungeness or something in here. That's a whole different species over there. They didn't really know that until the last couple years I don't think.

J.R.: So, you think it has more to do with hatchery cycles...

R.S.: They dumped a whole bunch in at Center. Two, three four years ago we saw a big run come up. When I was in high school I heard a lot stories about what happens to salmon before they get here, though.

J.R.: You mean about fishing out at sea you mean?

R.S.: The fish weren't ... The people down at Irondale...

J.R.: What do you mean?

R.S.: A lot of poaching.

J.R.: Indian [people], white [people]?

R.S.: I don't think this was Indian. You hear a lot about Indian poaching at various times, but that time it wasn't Indian-White issue. Now they talk about Indian-White issue. We didn't talk about it as Indian-White issue back then -- in the 50's. We were all the same, then for some reason it changed.

J.R.: Do you remember any beaver ponds along the channel?

R.S.: Not really. [Not in] this stretch from Chimacum up to our place.

J.R.: So, not from BG Brown's up to your place?

R.S.: Right.

J.R.: Is it BG Brown?

R.S.: Yes. BG is the father of the Brad. He's the one running the dairy right now. Jodie is the sister of Brad. There's been a lot of beaver dams down below the grange hall, at the school. There's several down there. There's several beaver dams in Beaver Valley Creek, in fact there's been a lot over there. Actually some of those over there were probably beneficial because they kind of slowed the water up. There's much more gradient in Beaver Valley.

J.R.: More what?

R.S.: Much more gradient. The first several miles. It doesn't have these big pockets [ponds] like this one does. We have a big pocket here, there's one down behind Schold concrete and the grange hall. I mean it's turned into a great big wetland. Up at Huntingford's and Yarr's there are never big pockets up there.

J.R.: That's a good way to look at it. Do you remember when they did the dredging in the 50's?

R.S.: My dad was real involved in setting that plan. The channel was originally straightened in the 20's -- I think that's when it was.

J.R.: What I've heard is that a lot of the original culverts and bridges were put in in the 20's, but then they did the flood control plan in the '50s.

R.S.: Drainage control.

J.R.: Drainage control? When they laid all the drainage tile?

R.S.: It was never really completed. They started at the mouth of the creek and dredged up through our place. There's still evidence of spoils on the banks where they dredged out along through there. It was kind of a bad deal because some of them just left a mess for the landowners along [the creek]. Big mess down there.

J.R.: Is that when a lot of canary grass started coming in, or do you think or was there canary grass before then?

R.S.: Well, canary grass was introduced in the early 50's.

J.R.: As a feed grass?

R.S.: Yes, a grass that's adapted to the wet acid soil. And I think [my] father was the first one that used canary grass in this area. It was a recommendation from WSU [Washington State University]. I know which field we first started in out there -- it's a field that's a real spooky one.

J.R.: Spongy?

R.S.: It's a spongy one, it's soft, if you drive across you wonder if you'll make it sometimes. It's the lowest field we have, the hardest to grade. That was our canary grass field. I think that was in the early 50's when we first started it. I was only about eight years old so I don't really remember if there was other grass in the creek or not. I do remember canary grass, I remember seeing it. We went out with a little hand seeder. It was a new kind of grass. We were told was suppose to be good for the area. I also know how it got to Crocker lake because the people who lived there planted some at the same time we did. I know it how it got into Lake Leland, area because Joe Cowamoto (sp?) was involved with [my] dad; [he had the] same kind of land. Dad and Joe and fellow at Crocker lake, John Bolden, -- they were all in the same situation. All doing the same things at the same time. That got it spread pretty good.

J.R.: So, you told me about another thing your dad did: building the bridge and pulling out stumps, what was that all about?

R.S.: The whole valley is peat bog. Through our place we have several hundred acres of peat bog, and our main bridge is 57 feet deep in peat. We can take a two inch pipe and two people can push it down 57 feet by hand before it hits anything solid.

J.R.: And then what does it hit?

R.S.: I think it probably hits sandy gravel or glacial till -- we don't really know. In the early 50's the Soil Conservation Service ran profiles down from the slopes and they only had 50 feet of equipment so in 50 feet they didn't get quite to the middle [of the valley]. This year we put a new bridge in and we've gone 57 feet with a two

inch pipe and then earlier I had put in some old piling that was 28 feet long and with the front end loader 12 inches diameter. I pushed them in with the front end loader down 23-24 feet. So I figure, well, I can push pilings in real easy here. So we got an engineer out to try to give us an idea of what kind of support we needed for our bridge. But we forgot that on our old bridge, we had put in a bunch of supports on each end of it to hold the bridge up and we dug down 15 feet with an excavator and hit chunks of gravel, logs, stumps that we had put in there to support the end of the [original] bridge. We dug down 15 feet and then we tried pushing our piling in and it wouldn't go. We got a 40 ton pile driver. At one point 37 feet down we hit it 300 times with a 40 ton pile driver, and didn't go an inch. I think that was a spruce stump that was originally on the surface when the original channel was cut in 1920. They cut the stump off for the channel. The rest of the stump was left to support the bridge they put across and throughout the years, 75 years since they did that I think we pushed that stump down 37 feet. That's my latest theory on what we hit down there. Because on the other side of the creek we never did hit anything. I mean we hit a couple stumps in the first four or five feet, but the other side never did sink. It always stayed where it was suppose to, but this other side, the east side, just kept sinking all the time.

J.R.: So, did you hear about a lot of spruce trees before your dad got here in the 40's?

R.S.: I didn't have to hear about spruce trees, I know about spruce trees.

J.R.: Oh, tell me about the spruce trees.

R.S.: I can remember one spruce tree that probably had roots about 12 to 15 inches [each] in diameter, interwoven over an area probably 150 feet in diameter or so.

J.R.: So, how big was the trunk if the diameter was that big?

R.S.: We estimate 12 feet, probably.

J.R.: 12 foot trunk? How tall [was the tree]?

R.S.: I have no idea how tall. I have no idea if this was just one root that was 150 feet. I know is that it was all interwoven and there were roots this big in diameter [holds out both hands in a circle]. All the roots were all like a big net.

J.R.: So, were there solitary spruce trees all around or was it more like a forest?

R.S.: Oh yes, there was a bunch of dominants [solitary spruce trees]. You look at wetlands where there's spruce trees: in one area it's a dominant tree and bunch of smaller ones. I would guess that this was a great big dominant one. Some of those

you'd take the chain saw on them, the excavator, and this one I'm thinking about probably had about 20 truck loads of wood off of it.

J.R.: Twenty logging truck loads?

R.S.: Just single axle dump trucks of about four or five ton or something like that. That was right down the other side of the creek on a field on the north side.

J.R.: You said the peatbog was lumpy when you were a kid. Were there a lot of trees buried in there, or am I hearing you wrong?

R.S.: We took out a lot of wood out of every field. The only fields we haven't taken a lot of wood out of are [were previously] cleared. There's a couple fields like that, but most of the big stuff they buried. We have logs we pulled that were cut off, [buried] sixteen feet down.

J.R.: From where?

R.S.: We think the old timers, settlers, sawed the log off, dug a hole for it and buried it because they couldn't pull it out. You can't burn out there because the whole thing will start on fire. You never will get it to go out. We've had fires in the peat before. You don't see any smoke for a couple of years and all of sudden on a hot day they'll show up.

J.R.: Back to the salmon for a second. Did you ever fish in any other areas on the Chimacum creek, on the Beaver Valley fork or up in Naylor's Creek or anything like that?

R.S.: No. Naylor's creek a little, but not a whole lot.

J.R.: Was it mostly silvers you saw coming up the creek?

R.S.: The silvers I think are the ones we saw in the main channel and then the ones in the Naylor's creek... About 15 years ago in June we always had some good size cutthroat and they always had eggs so I would assume there probably were cutthroat.

J.R.: We've seen cutthroat here.

R.S.: Never had ones like this. Most of the fish we always see are the four to five inch ones, that I remember. The rainbow had to be six inches or the trout was suppose to be six inches. Most of the ones we ever found whether they were rainbow, cutthroat, I'm not really sure. They were in the four to five inch range.

J.R.: This is a question that we're asking everybody. Do you have any ideas for a solution to the salmon problem? You don't have to answer if you don't want. I don't even know if you think there is a salmon problem.

R.S.: There's a salmon problem. I kind of put it back with another question, how do you expect the salmon to survive if someone has a diesel engine, manmade nets, hydraulic winches, fish finders, radios, refrigeration, distribution systems? How can we have a sustained fish production like 50 to 100 years ago? It's real difficult. I think we could do things to improve production, I know we can in agriculture. The dairy industry has gone from three to four times production per cow. We can do the same thing with fish. The hatcheries have screwed up quite a bit, a lot of them. Quilcene Hatchery down there right now, they take the first fish that come up and forget about the others.

Those people go out and net and they only take the fish that were too small, I don't do that with my dairy industry. I take the cows that produce and I use the best genetics I can get and I keep the offspring from my best producers. They're keeping the inferior [salmon] that made it through the nets because all the good fish were in a big school, all the stragglers that got by the nets they end up in the hatchery. I think all land owners basically in the county don't have a problem with it if we're here to enhance fish. If we're here to harass the land owners, get the hell lost. We don't want it. We feel like we've been harassed a lot of times and we don't want that. We don't want finger pointed at us as being to blame. We have screwed up some things in the past, some of them even recommended to us, some of them are our own problem that we caused ourselves, some are ones that we just don't know what to do about. Some of them go back to political things like, "I don't think Peter [Bahls] knows what the heck he's talking about or Peter will think I don't know what I'm talking about. There's just stubbornness between back and forth. If the intent is to enhance fish and to get along there's not a problem. If you're here just to harass us, get the hell lost.

[JR and RS talked off the record for a few minutes about the general approach of this watershed assessment. Talked about the need to get some real baseline data to judge the effects of restoration activities & try to figure out how to meet farmers' needs met while improving salmon runs.

J.R. Tell me about this year's weather compared to other years.

R.S.: This year we've had much more rain than we've had for several years. I can remember one year not very many years ago, four or five probably, we had [so little rain that] I turned sprinklers on in May, I turned my sprinklers off on Thanksgiving day.

J.R.: So from May to Thanksgiving.

R.S.: Right. The stuff was still dry.

J.R.: Somebody yesterday said this was the wettest year in 50 years, do you agree with that?

R.S.: I remember years that were awful wet. We've got periods in here where there's just quite a bit of rain and right now there's fields that I can't chop for silage because the fields are too wet.

J.R.: How does the weather compares with, say, 50 years ago, if you can remember back -- do you think it's changing on a big scale?

R.S.: It seems like June always used to be...I remember June it was foggy every day. Your feet were wet until 3:00 in the afternoon if you walk through the tall grass. August is that way this year. But we had a pretty good May and we had a few 93° days. I remember we used to have some 100° days but we haven't had any 100° days this year, we've had some 90°, in fact we've probably had more 90°days this year than we normally have. But they were about three days in a row then we got a bunch of rain. This year has actually been a real good year for grass.

J.R.: And probably for salmon.

R.S.: I would guess for salmon too. Cooler and more water.

J.R.: I would think so.

R.S.: And the farmers cut off their irrigation, so there's more water that way too.

J.R.: I guess when the cows are stressed, the fish are stressed.

R.S.: I remember times that we pumped enough water from the stream that there was nothing going past the highway.

J.R.: No water?

R.S.: No water. So, on the dam we always put a crack in the bottom so that we allow some water to go down all the time.

J.R.: How big was the crack?

R.S.: Half to three quarters of inch on half the width of the dam -- there wasn't a whole lot of water.

J.R.: What dam?

R.S.: Down by Cenex. That's where I'm talking about. Dad helped build that. He wishes he'd never done that now.

J.R.: Why is that?

R.S.: Because that's the sore spot: there's been feuding in the valley ever since. Right now I have a problem because ... well I had a problem because the dam was in two feet. When the dam is in that much with the vegetation that's in the stream, it floods me. It was holding the water up two feet until...

J.R.: What happened?

R.S.: Dad took half the dam out and Jim took rest of the dam boards out Sunday [8/27/95] and the water has dropped about six inches in my place which means that it's not flooding back into the fields now. Gets into our property rights thing.

J.R.: Go for it. Speak your mind.

R.S.: You can't infringe on other people's property. What they're doing is flooding me out.

J.R.: Who?

R.S.: Browns. That's where our problem is.

J.R.: By keeping the dam up high.

R.S.: By keeping the dam up high it will flood. The dam is put in all the way to the top even if there's no vegetation in the creek any place, it will flood us out down at the bridge down here.

J.R.: Oh, at your bridge?

R.S.: Our bridge the one down here. If there's no vegetation in it at all there is about a four foot restriction and it will put water into all of our fields and they don't realize that. So they want the water up higher to sub-irrigate back out into their fields. Their ground's higher. If they raise the water up higher, the water will go back into their fields more, recharge the aquifer more, take more water out of the stream -- whatever you want to call it. Maintain a higher water table is what they're trying to do.

J.R.: But they maintain a higher water table all the way clear back to your place?

R.S.: Yes. [laughs]

J.R.: I see.

R.S.: And that's too high of a water table for me.

J.R.: Okay, that's why you've got your drainage systems.

R.S.: But in the peatbog we have to maintain a high water table otherwise the peat will dry out. And if it dries out too much it cracks too much, and then there's a problem that way, too. But ours never had that problem within a quarter of a mile of Chimacum Creek. I had a problem back in the field we're plowing right now which is more than a quarter mile from the creek next to the pond where dad has taken the top soil out, it cracks quite a bit because it's over-drained. That's the main reason we're plowing right now because it's so rough you can't drive across it.

J.R.: So what is the plowing going to do?

R.S.: The plowing is going to smooth the field out and all the cracks will fill back in so you got a uniform spot. Otherwise when it rains the water just goes off like a thatched roof right down through the cracks, right down into the bottom and it drains away fast. And that doesn't do us any good. Some of the dry fields, shallow peat fields are gone, most of those have down three to five feet. There's gravel underneath them so it's cracked all the way to the gravel and hits the gravel and the water is gone. Real fast way to recharge the aquifer without taking any nutrients from the soil. But don't do me any good. On a lot of that ground the only way you can get it to soak up water is to plow it up or flood it.

J.R.: Just like gardening.

R.S.: If you get a real a humus garden that dries out too much it just won't soak the water up and you have to mist fog it real lightly for three or four days, then you kick the top and it's still dusty.

J.R.: I've had that experience.

R.S.: That's the same kind of situation that the peat is.

J.R.: The milfoil is a problem because...

R.S.: The milfoil is a problem... milfoil, elodea, pond weed, scum, whatever it is, three or four or five different kinds of stuff is a problem because it restricts water flow. After the canary grass is gone, [aquatic vegetation] takes over so you take care of one thing and you got another problem, we know that. Between the main bridge

and the next bridge a half mile up stream when I mowed it with my boat at the end of June...

J.R.: What year was that?

R.S.: This year ['95]. ...the water dropped six inches at my upper bridge, which tells me that there was six inches of water restriction from that algae, milfoil, duck weed vegetation and it could be that the stuff I mowed off that helped contribute to your bad oxygen levels.

J.R.: You mean down below?

R.S.: Down below.

J.R.: Down below by Shaws and Mustin, down there?

R.S.: Yeah.

J.R.: Your talking about the [aquatic plants] that just died?

R.S.: It's just kind of floating there. Some of it cuts off real easy and some of it's attached and some of it's not attached and some it floats away, but if the water level was lowered a little bit, like by taking the dam out, I think it would go ahead and flush the stuff out.

J.R.: So, your idea, just for the record here on the tape so I can remember it later, is every 7-10 days take out the dam to flush the water so that the milfoil and vegetation doesn't have a chance to take hold in the summer time, is that right?

R.S.: I think that would be part of an overall management plan.

J.R.: Now who would that anger, if anybody?

R.S.: I've been afraid to even think of it probably because we're fluctuating the water levels. Fluctuating water levels probably doesn't sound good, but maybe it's something that we might look at. If we see water moving it's picking up oxygen, and it's not moving now.

J.R.: Currently how do you guys manage the dam?

R.S.: Browns put it in when they want: when it starts getting dry in the spring time. They take it out in the fall.

J.R.: So, the Browns control it?

R.S.: Yeah, until the other day when the Browns told Jim [Shaw] he could have control. He should take control of it. That way he is a mediator between the Browns and me.

J.R.: I see, Jim is kind of in the middle, literally between you guys?

R.S.: And a mediator, also.

J.R.: ... because you were getting mad about it flooding up here and not being able to cut your field. I probably should have talked to you a couple months ago to really figure out what all your concerns are. That's great. I can't think of anything else. Can you think of anything else you want me to know?

R.S.: Just let me do anything I want down there...[laughs] ...no. As far as trees along the stretch where there's no gradient, I'm not of favor of that. If we have to get in and maintain it or even to mow it you can't do it. The trees along Naylor's creek I don't have a problem with right now because there's a good gradient there. I don't really like them there, I just soon have visibility to see what's out on the road, see the cows and different things like that.

J.R.: Don't the cows need trees for shade?

R.S.: Not really. I have them fenced away from the creek so they don't destroy the trees. It would be nice to have them for shade, but the [cows are] going to destroy the roots of the trees. The trees are close to the creek and we'd lose riparian area that way. Along the Naylor's creek I don't have a problem because there's gradient there. When there's no gradient I'm real hesitant.

J.R.: Because you don't want to see any more water blocked up here than needs to be?

R.S.: Yeah.

INTERVIEW WITH BARBARA VODDER

Summary of a brief interview with Barbara Vodder on the salmon runs in Chimacum Creek. Interview conducted on December 18, 1995 by Judith Rubin. Mrs. Vodder has lived on the West Fork for 35 years. She watches the salmon spawn annually beneath a bridge on her property.

JR: Have you noticed a decline in the salmon?

BV: Definitely. There used to be many more. It used to be I could go down to the wooden bridge [on my land] and hear them under there. Now some years I don't see any.

JR: When were there more?

BV: Well, there were a lot more 10-12 years ago. They declined about 7-8 years ago. But this year there have been more than in recent years past.

JR: From your point of view, has the landscape changed much over time?

BV: Not where I live, no. Not much. I did fence the creek 2 years ago.

JR: What do you suppose is causing the decline?

BV: There's something haywire. I think the problem is too much fishing at the mouth of the creek. Gill netters. They can't come up to spawn if you catch them all. There's something killing the fish and I don't think it is pollution.

JR: What do you think could be done to restore the salmon to Chimacum Creek?

BV: Prohibit gill net fishing and remove the obstacles which block fish from coming upstream, such as dams.

INTERVIEW WITH JOSEPHINE YARR

Interview with Josephene Yarr regarding the history of Chimacum Creek and its salmon runs. Mrs. Yarr is 91 years old, and in good health. Interview conducted on August 29, 1995 by Judith Rubin. The first part of the interview was conducted outside, walking to and from Chimacum Creek and the Yarr residence. Information in brackets [] was added by the interviewer for clarification.

[Walking to Chimacum Creek from J.Y.'s house]
J.R.: Do you remember, were there more fish coming up Chimacum Creek in the past?

J.Y.: Oh, my yes!

J.R.: What was the creek like then?

J.Y.: It was where nature put it, you know what I mean? It was always flooded, it flooded even after it was dredged after World War I. The county agents here said they thought the valley would be improved if we dredged the creek out of its natural bed and then tax the farmers for having done that. And it didn't improve it too much, because it filled up with sand and had to be dredged again and again. It became quite an expense. Last time we had it dredged we had a man who did it very, very well and I think it's part of a permanent bed now.

J.R.: And how long ago was that?

J.Y.: Oh, that would be nine years ago.

J.R.: So, how long has your family lived here?

J.Y.: Since 1901.

J.R.: 1901?

J.Y.: Yes. And we had the old pioneer house, see where that truck is? It stood there. Part of it was log, and the other part my father built on when he came in 1901. The barn was built in 1907 and it is dilapidated, but it is used for storage of hay. This was a dairy farm, once upon a time as they say.

J.R.: What did the land look like, did you parents say?

J.Y.: Yes, indeed they did. When the early settlers came here this was practically under water because the beavers had built a dam. Well, if you came over the little bridge, from Port Townsend, it's right down there. They built a dam, smart as they

are, and flooded all this up here so if you wanted to go up there you had to walk on logs. Many of those logs inundated into the soil and I think if you dug down there you'd find some of them. Cedar.

J.R.: Cedar logs?

J.Y.: Oh yes, they will last for many, many years. Since before we dredged the last time, this was all swampy. Boy, one winter did we have birds, even a swan, and the blue heron, several varieties of ducks and sea gulls even. When a storm comes the sea gulls will come up.

J.R.: Before the dredging last time?

J.Y.: Yeah.

J.R.: Now, you were telling me about how it was when your parents came here.

J.Y.: Oh that's how it was. They drained all that. The people before papa drained it -- people by the name of Hammond lived here -- they drained it and then went off. They used to enter this farm right up here, see those trees? They had what was called a puncheon road, you know what that is?

J.R.: A puncheon road? I think so.

J.Y.: Tell me what you think that is.

J.R.: Isn't that where they put logs down...

J.Y.: Yes.

J.R.: You tell me what it is.

J.Y.: Yes, that's what is it. When the floods would come it would kind of lift those logs. But they had logs on the side that would sort of anchor those. There was a bridge up there. We've been in this house 81 years now and the bridge used to be up there but then of course they made this [house].

J.R.: I wanted to talk to you about the fish in the creek too, do you want to walk down there?

J.Y.: Yes. Since I broke my ankle seven years ago I haven't been walking much but I can walk.

J.R.: You seem to be getting around pretty well. Do you remember fishing in the creek?

J.Y.: Oh my, yes. Do I remember? I remember my grandmother. My grandmother was a Snohomish Indian and she would come up every once in a while and stay with the daughters. She went where ever she wanted. She was always welcome among her friends. We'd go all day practically up and down this creek fishing, we'd have our lunch with us.

J.R.: And what did you catch?

J.Y.: Trout.

J.R.: Trout?

J.Y.: Yeah, we'd call them trout, I don't know what they were.

J.R.: Cutthroat trout?

J.Y.: Very nice eating. You'd have to ask somebody who knows more about fish what they were. At that time nobody even thought of contamination, they just thought that anything that came out of water was clean.

J.R.: Do you remember any fish spawning up here, any salmon coming up to spawn?

J.Y.: Oh my, yes. My younger brother, Tommy, loved to spear those salmon and of course they were very easy because by the time they got up here they were almost to their spawning grounds and they were weak. Many of them didn't make it. They all laid on the banks and very often they found a real good one and to please them, mama would cook it. Oh, yes, there used to salmon galore up here, you could see them.

J.R.: Do you remember what time of year they came up?

J.Y.: Well, in the fall.

J.R.: In the fall?

J.Y.: Yes.

J.R.: So before Thanksgiving?

J.Y.: Yes. Way before Thanksgiving.

J.R.: Do you remember any coming up around Christmas time?

J.Y.: No I didn't think so. Then of course my brother would set his trap for mink. See they would come down and feed on the dead bodies of fish and he'd skin those out and send them out to Independence, Missouri.

J.R.: And so he made some money on the minks. Have you noticed a decrease in the salmon?

J.Y.: Oh my, yes. I never see any. Of course I don't get down here very much. Everybody says there aren't any coming up any more.

J.R.: So now what do you suppose caused the changes in how many salmon are coming?

J.Y.: Well, I wouldn't say. It must be that fishermen fished out the stock, don't you think so? I think it's the same everywhere. Even over where you're going to school [Vermont] they say the cod are disappearing.

J.R.: They fished out the Atlantic salmon a long time ago.

J.Y.: And that is as big a disaster as our using up our timber.

J.R.: Can you tell me then, what was the forest here like?

J.Y.: Big high trees. Early settlers got rid of those.

J.R.: What did they do, did they cut those down?

J.Y.: Oh yes. They burned most to clear. As papa used to say: "you can't eat trees!" So they cleared it for pasture and for cattle. Then my father went into the registered Holstein business. You've heard of a Holstein association, it has it main office in Vermont. Senator Bishop at one time was a very prominent Senator, he was president of the whole shebang. Chimacum valley was noted for holstein cattle. [Bishop] was half Indian.

Look at those yellow flowers [Jewel weed: Impatiens capensis] I haven't seen. Oh Marian said to be sure to tell you that in the old creek there used to be water lilies. But when they put in the new bed [ditch] we never had another water lily. They lay on top of the water, have big leaves, maybe you've seen them, and the stem looked much like a rope.

J.R.: That's very interesting because that may mean that the water used to be slower than it is now. That's more like a lake plant, or a wetland plant.

J.Y.: There was a deep hole there. This creek used to meander around like a snake and the same way it meandered down to that bridge where I told you the beaver dam was when they [Yarr's ancestors] first came.

J.R.: This [the creek] used to meander like a snake?

J.Y.: It had deep holes and grandma would go to fish and would pull out this trout. She didn't have very fancy fishing gear. She had what she called hardhack, seafoam we call it. She'd get one for us too and she bought her thread and just a hook and sinker and we caught all these fish. She'd clean up them up, wash them and we'd have enough for about six children and about four or five grown up people. Mama would fry them crisp, they were really delicious.

J.R.: Did other people come fishing here too?

J.Y.: Yes. In fact a few still come yet, in the fishing season. I don't fish at all but here several years ago anyone with a degree of Indian of blood in them had that fishing privilege. We could have fished without a license, but we never did. We also thought it was contaminated. Little children would come through here and they didn't want to take their fish home, they'd say, "Ms. Yarr you can have this." [She laughs] I'd take it but I'd never eat it. There aren't many.

J.R.: Was there a difference in the weather do you think between now and say 50 years ago?

J.Y.: Some people think there is. I think we had more rain years ago because look at the forest that produced these fir trees. They would need a lot of rain and so do the rhododendron and they had it. In 1916, and I always think of that, we had the big snow, four feet. It came in February and lasted more than a month. My father had to take one of the horses and one of my sisters usually liked to help in the barn and they'd ride the horse right through here and the water would be right up to where that electric light pole is.

J.R.: A good three feet above where the channel is. About four feet above where the water level is now.

J.Y.: And then our grocer said 'well I'm going to bring out my boat.' And he did. They went across in the boat. Yeah, I think we have less rain if you ask me.

J.R.: Is there less flooding since the dredging?

J.Y.: Well, you got to judge that according to the dredging, and we only had one little flood last year. The year before we had quite a big flood. Before this last dredging I ran the dairy for 35 years and I lost week's supply of milk because the trucks couldn't get over.

J.R.: When was that?

J.Y.: Oh that would be '51, '52, '53 and maybe later on than that. It was very pretty in the olden days, more flowers. Marian says to tell you about the cowslips. You know what that is? It looks very much like a domesticated flower, a snapdragon for instance. You know what a snapdragon is? They were butter yellow with dark brown sticks right in the...

J.R.: Why do you suppose that is? Did they like wet areas?

J.Y.: Well, that's a good question, they did like wet, but then, see that house over there used to have violets, lilies and lady slippers and star of Bethlehem, and and sweet afterdeath, all gone. And no water ever touched that because that's high over there. You understand that it didn't vary much on the bank just like a snake going down.

J.R.: I see. So, when it would flood in the winter time was it still like a snake then?

J.Y.: Well, [the fields] would be covered over. Covered over, you couldn't see where [the stream channel] was.

J.R.: So, before 1950, let's say, would the whole field be flooded in the winter time?

J.Y.: Oh yes. Since that time when it needed dredging why, see that forest, clear back to there right up to there, I used to garden right over there -- house garden, it flooded right over to there.

J.R.: So, it was flooded all the way, and that's when you'd see the fish?

J.Y.: No, there were no fish at that time where it flooded way far back then. No, the fish were a little earlier than that. I'd say October or November.

J.R.: Did it ever flood in the summer time?

J.Y.: Oh, no. Never. In fact, in 1922 we had 97 days without rain. But that was 1922. I'll always remember that. Even the pigweeds died, which are one of the hardiest weeds you could think of.

J.R.: So, you must have been quite young?

J.Y.: Oh no, I wasn't quite young. I was born in 1904.

J.R.: So, what kind of wild life do you remember on the creek?

J.Y.: Wildlife. There was the mink and the beaver and the muskrat. Now the muskrat is a bit like the beaver, doesn't build dams, I don't think, but it's hard on baby ducks. We've had mother ducks hatch on this creek with maybe a flock of 12-13 and within a few days would be all gone. Those muskrats had eaten the baby ducks. So there it is.

J.R.: You said you're part Indian.

J.Y.: Yes.

J.R.: And I was wondering if you knew any of the stories about the Chimacum Indians.

J.Y.: No, they were all...I never knew them. You see, British Columbia Indians came down and conquered them and killed all but one or two women and took them into their tribe. No, the Chimacum Indians have been long gone. I taught school 42 years right on this Peninsula all the way from Forks up to Mason county. In that time I think I had about two students with real Indian blood.

J.R.: You mean Chimacum Indians?

J.Y.: No Chimacum Indians haven't been here for years. But they named [the valley] Chimacum.

J.R.: Do you know what Chimacum meant?

J.Y.: No. I don't, you'd have to ask someone else. I'm just now thinking of it.

J.R.: I had heard that they all died.

J.Y.: Oh yeah, they all died. The British Columbia Indians were great warriors and the Chimacum Indians were few in number so they were killed and the two women were taken. So, people history says, oral history, and...no grandma came from the Snohomish tribe and her people lived in Tullalip. She owned property there.

J.R.: And she married your grandpa who lived here?

J.Y.: Yes. Well, grandpa came from Finland. 'Round the horn. He and his partner, venturesome two young men, came out thinking they would get rich in California with gold, but when they got down to the gold fields they found that a very necessary thing was money to develop your claim. They didn't have it! So they noticed a sailing vessel heading from San Francisco up this way so they jumped on that and offered to work. Grandpa was a ship's carpenter. Then they landed. The boat was headed for Discovery Bay -- there was a mill there and they were getting their cargo: lumber. Grandpa and his friend jumped ship, they all did that you

know -- that was their means of getting over, and they went back in the woods and they climbed a tree every day to see if the ship was still there. When the mast was gone they came out and they took up land. That was in '51. Grandpa was one of three first white men to come into the valley.

J.R.: So, that was 1851? That was with Eldridge and Bishop?

J.Y.: Bishops, the Eldridges and grandpa Strand. Grandpa was from Finland but the other two were from England.

J.R.: I'm interested in hearing some of your grandma and grandpa's stories of what the land might have been like when they first came.

J.Y.: As I told you it was a lake, almost like a swamp. They cleared it out, they used to clear out the creek here but all they had was a scraper. The man held the scraper and the team of horses pulled it and they would [clear] out some of the soil that had drifted in and had caused the water to back up. They did that in the fall. They had several jobs after haying, they cut the winter's wood and cleaned the creek.

J.R.: To keep the waters running?

J.Y.: Yes. Tried to keep the water running. Now of course everything was by hand in those days. Grandpa didn't live here, grandpa lived farther down the valley. Grandpa had a homestead. Do you know where the gravel pit is just where you get into Hadlock? Grandma and grandpa raised seven children there.

J.R.: So, that was where they lived down there?

J.Y.: Oh yes.

J.R.: Is that where you were born too?

J.Y.: No, I was born [here]. I'm living on the same farm I was born on. People say, 'My gosh you didn't get around.' 'No, ' I say 'I didn't. I'm glad I didn't. I've always enjoyed this place. Why would I leave?' My father wanted us to live here, but we were all teachers. If you would add the four of us, our years of service of teaching it would be 146 years. You know, the tradition of the old maid school teacher.

J.R.: You're no old maid. I want to talk to you more about he salmon.

J.Y.: Well, I tell you that's just all I know about the salmon. Their spawning grounds seem to have been way at the end. I never knew -- you know our science was very much neglected when we were kids: we didn't have any, and I suppose our teachers didn't have any. The salmon went by here and I say my brother would go out and waylay them when he was about grade school, loved to do that. He's the

one who went to Notre Dame and became a famous football player played under Knute Rockney

J.R.: What's his name?

J.Y.: Thomas Yarr. He's been dead now since 1941, left three daughters, two of which have gone into the teaching business.

J.R.: So, who lives here with you now?

J.Y.: We aren't doing anything big now because it's not necessary. It's a terrible responsibility running a dairy. I told my sisters no more of this.

J.R.: So, how much land do you own here?

J.Y.: We own 200 acres.

J.R.: Across to the forest as well?

J.Y.: Yeah.

J.R.: Is there anything else that you can tell me about the way the creek used to be?

J.Y.: It meandered down like a snake, flooded, and made deep holes in places and in others rather shallow. Now when you go beyond this bridge you come into it falls quite suddenly and it's very pretty there and it riffles over the wall.

J.R.: Beautiful. Down below the bridge.

J.Y.: Mama always told us don't ever drink that water [in Chimacum Creek], and of course, we never did of course.

J.R.: Where did you drink from, the well?

J.Y.: We had our own spring. It's right down there and we'd pump it all the way. It's right down near that bridge. There's water right up on this place, a little artesian springs. I bet it would supply the whole of Chimacum valley -- same as all the way up here.

J.R.: Are you interested in seeing this area preserved in the future?

J.Y.: I am. I just hate to see all the farms disappearing. Look at what happened to Sequim. Within a radius of five miles, it looks like any place in the United States. It was known for it's beauty and now all that is trailers and buildings, you can't help it I guess, they've got to come.

J.R.: What do you see in the future for your land?

J.Y.: Well, one of my sisters has a family, and it'll all go to them. I'm encouraging them to keep this land because I have friends in the old countries. I sponsored a Dutch boy here about 20 years ago. When he got here he was suppose to be a milker, but really no good. He was so surprised that we owned land. He said that in Holland the only ones who owned land there are those that come down from quite a few generations. It is impossible for newcomers, so to speak, to own land. I really am going to encourage my two nephews and families to try to hold onto this.

J.R.: What do you think about the future of the Chimacum Valley. I'm just curious. Do you think there will be dairy farming for a long time here?

J.Y.: No. The dairies are moving over eastern Washington. Which is logical as for the hay and the grain, that's what used to make our farm so impressive. When I was in charge here, I didn't use the local hay I sent for my hay usually in Eastern Washington and my brother's friends got so excited they said, 'Josie is crazy. She's going to lose the land here by getting such expensive hay.' 'No,' I said, 'unless you feed cows you don't get any milk.' Sure enough, I was on the board of directors for DHIA -- it was a very small affair here -- and he says, "my gosh look at the difference in this herd!" And they all began to see the light. But they're not buying any more because they can't afford it.

J.R.: What do you suppose the dairies will become here in Chimacum Valley?

J.Y.: Well, I think they'll become a small pieces of land with working people on it who work in Seattle or Tacoma or somewhere else. That's what I think. There might be a few acres of land left for beef cattle, but it's not the best place for beef. I had beef here and they all got wormy because the land's too damp -- they got plenty to eat too but the land all got damp. If you have beef cattle you have to keep them on high ground and give them good protein or you don't have very good beef. In other words, this isn't a natural beef country. The natural beef country is when you get over on the other side of the mountains. Same with the sheep. People have tried sheep in this valley and [its a] disaster. Too much rain and not the proper pasture, poor quality meat, so they can't compete.

J.R.: How else have people tried to make a living in the valley?

J.Y.: Just loggers and farmers and the people who took care of everybody - store keepers, county officers, those who worked on the road. When my father first came up here they used to take turns being what they called road supervisor and every year you got the choice of hauling a load of gravel for the road or paying a few dollars. That's how they kept up their road. The old road ran little bit back there.

J.R.: So, not where it is now?

J.Y.: No.

J.R.: Were there any places in the Chimacum that looked like the Olympic National Park when you were growing up in terms of the size of the trees?

J.Y.: Oh yeah, we had big trees here. I remember going to school along here and mama used to say watch out for the limbs as you go under those trees. I bet they were two or three hundred feet. We used to watch the squirrels go up, but [those trees] are gone.

J.R.: When were most of those logged, in the 20's, 30's?

J.Y.: Oh, different times. There was plenty of cedar back then. The man bought cedar from papa and started a mill, cedar mill, just beyond that bridge that we're talking about, and they bought other cedar and brought it there and they made shingles. But the first settlers that came in here were usually from New Hampshire and the state of Maine because you see people go to where they can use what they know. They were loggers and farmers. I was 17 before I saw a black man and woman. You see there was no reason for black people to come up here. They didn't log, they didn't farm, they had no land. So much so that when I went away to school in Seattle I saw the first black people I've ever seen.

[We talked at length about Mrs. Yarr's travels as a young woman at this point.]

J.Y.: We tried to plant trees to keep the camas grass [camas lily: Camassia sp.] back. But then the beavers came in.

J.R.: The beavers. When was that when they tried to plant trees?

J.Y.: Oh, just lately. I said to Philip, "what became of the trees?"
"Oh," he said "the beavers took every one."

J.R.: So, you have a lot of beavers here then?

J.Y.: Oh, yes. My sister planted these [cottonwoods along the driveway] in memory of a old hired man. They came up and got one of those trees, cut it down and brought it.

J.R.: Try to make a dam near the bridge or something? So, they're still at it.

J.Y.: It's strange how nature endowed those animals. They say that they could build a dam that would hold that a human being couldn't. They knew exactly where to put the sticks and where not too.

I wish I had that but my sister accidentally burned it when my brother tore down the old house, he was cleaning up he had a new barn you know. He found a slip from a fur company inIndependence, Missouri made out in 1877 for one beaver hide. They had paid the person who was living here at that time and it said "in very poor condition" and one of the neighbors laughed and said, "yes they always said they were in poor condition so they didn't have to pay much for them."

J.R.: And how much did he get for a beaver hide?

J.Y.: I think it was about a dollar. You know, a dollar in those days -- gee if you got a dollar for your birthday or Christmas you thought you were in the money.

Ms. Yarr also said that theere used to be a lot more wild flowers, elk and grouse than there are now.