Cal Dept of Fish + Game
BIG Salmon Creek

California Regional Water Quality Control Board
North Coast Region
William R. Massey, Chairman

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To: **Bruce Gwynne, Environmental Specialist**
TMDL Development Unit

From: **Cherie Blatt, Water Resources Control Engineer** Cherie Blatt
Russian/Mendocino Unit
Timber Harvest Review Division

Date: **June 2, 2004**

Subject: Request for Big Salmon Creek Watershed Placement on the Clean Water Act, Section 303(d) List for Sediment Impairment

Thank you for this opportunity to request that Big Salmon Creek be placed on the Clean Water Act, Section 303(d) list for Sediment Impairment. Big Salmon Creek contains a high level of fine sediment throughout the watershed. Current proposed activities in the watershed do not improve the fine sediment loads. The watershed contains populations of Coho Salmon and Steelhead Trout, both threatened species under the Federal Endangered Species Act. Other large watersheds on the California Coast have 303(d) listing influencing extra precautions on land activity performance. CWA listing is crucial to funding for anadromous fisheries improvement projects. The documents and water quality data attached show that Big Salmon Creek now qualifies for CWA 303(d) listing and the protection that follows.

The Big Salmon Creek watershed, located between the Albion and the Navarro River watersheds in northwestern California, contains 8600 acres. Approximately 40 percent of this watershed has been harvested for timber in the past 10 years. Note that 14 percent of the timber harvesting was using the clearcut prescription method. Approximately 800 acres of this total area has been harvested twice. Also, 55 percent of the watershed was harvested from 1974 to 1993, totaling 4,728 acres. Again, approximately 800 acres of this total area has been harvested twice. Note that some of the watershed is not forested and contains grasslands largely in the lower portion of the watershed near the coast. Timber harvest activities may be the largest contributor to sediment loads in the watershed. Old railroad grade construction and use in the fish bearing watercourses, tractor skidding of logs down old ephemeral channels, and roads in the riparian zone all contributed sediment that still lies on the channel bed.

The Regional Board's first formal recognition of the sediment problem in Big Salmon Creek watershed began in 1993. Inspections, observations, and memos on the condition

of the watershed were performed and completed due to the submittal of Georgia Pacific's Timber Harvest Plan (THP) 1-93-391 MEN. Copies of those memos (attached) indicate high sediment load in the watercourses, dirt roads in riparian zones, and lack of large woody debris structure for salmonid habitat.

The California Department of Fish and Game is lead agency for Permit No. 1600-2002-0765-3, a large woody debris placement project on the main stem of Big Salmon Creek. This document demonstrates the salmonid habitat problems including the lack of adequate large woody debris in the channel and sedimentation. The project, proposed by Hawthorne Timber Company (as a penalty for a past sediment discharge), will place 14 large woody debris structures in the main channel for fish habitat and sediment metering.

Two large timber harvest plans are planned for implementation this summer. The latest proposal is Timber Harvest Plan 1-02-061 MEN. In this THP, Hawthorne Timber Company proposes to harvest 317 acres in the watershed, 50 percent of which includes the clearcut prescription method. The Cumulative Watershed Effects section of this THP discusses the degradation in the stream. This section of the THP also contains 2000-2002 McNeil sediment sieve sampling results. A sediment size of less than 0.85 millimeters is common in the stream bottom at all sampling sites (tables attached).

THP 1-02-014 MEN harvested in 2002 contains 1993-2000 McNeil sediment sieve sampling results. Again, sediment size of less than 0.85 millimeters is common in the stream bottom at all sampling sites (tables attached). The total 10 years of data show no improvement in sediment leaving the stream system.

Please place Big Salmon Creek on the CWA Section 303(d) list for sediment impairment.

If you have any questions regarding these comments, please telephone me at (707) 576-2755.

Attachments: Memos and Tables

STATE OF CALIFORNIA THE RESOURCES AGENCY GRAY DAVIS, GOVERNOR
DEPARTMENT OF FISH AND GAME
CENTRAL COAST REGION
(707) 944-5520
Mailing address:
POST OFFICE BOX 47
YOUNTVILLE, CALIFORNIA 94599
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7329 SILVERADO TRAIL
NAPA, CALIFORNIA 94558

COPY

Notification Number: 1600-2002-0765-3
Salmon Creek, Mendocino County

Stephen Levesque
Campbell Timberland Management, LLC
P.O. Box 1228
Fort Bragg, CA 95437

PROJECT DESCRIPTION and PROJECT CONDITIONS

Description

The Salmon Creek watershed is located in Mendocino County on the North Coast of California. The Watershed drains approximately 8600 acres and continues to support relatively small but robust populations of steelhead trout and coho salmon. The mainstem channel of Salmon Creek is a low gradient, moderately entrenched, alluvial channel. Field observations and habitat surveys both indicate that the lack of in-channel large woody debris (LWD) may be a limiting factor for salmonid production in the watershed.

In an effort to increase the potential of Salmon Creek to produce salmonids, Hawthorne Timber Company, LLC proposes to implement a LWD restoration project. The proposed restoration project will be accomplished in general accordance with the methods outlined in the California Salmonid Stream Habitat Restoration Manual (3rd Edition, January 1998). A total of fourteen individual structures will be created within the thirteen selected stream segments. Individual structures will be an aggregate of native materials limited to native logs and rootwads.

Conditions

1. Work within the stream/riparian corridor shall be confined to the period June 15th through October 15th of 2003, 2004, 2005, and 2006.

2. The placement of in-steam structures shall generally follow the methods outlined in the California Salmonid Stream Habitat Restoration Manual (3rd edition, January 1998).

3. No heavy equipment shall operate in the live stream, except that an excavator/log loader operated from the bank may reach into the stream to slowly lower and place (not drop)

rootwads, logs and/or rocks in the watercourse.

4. Root wads and log placement shall not result in the loss of pool habitat for salmonids. For example, once a structure is installed, it shall not occupy the existing pool volume to such an extent that salmonids are excluded from the pool.

5. The installation of structures shall avoid excavation in the bed or banks of the stream.

6. An authority (i.e. fisheries biologist, hydrologist, Aquatic Resource Manager or Maintenance Supervisor) who can halt work activities and recommend measures for avoiding adverse effects to salmonids and their habitat shall be present on site during project implementation.

7. The operator shall take whatever precautions are necessary to minimize the discharge of fine sediment from the work site to the waters of the state.

8. Gravel to be used to improve spawning bed conditions shall be washed river run material, ranging in size from one to three inches in diameter.

9. Staging/storage areas for equipment, materials, fuels, lubricants and solvents, shall be located outside of the stream's high water channel and associated riparian area. Stationary equipment such as motors, pumps, generators, compressors, and welders, located within the dry portion of the stream channel or adjacent to the stream shall be positioned over drip-pans. Vehicles shall be moved out of the normal high water area of the stream prior to refueling and lubricating.

10. If the Operator needs more time to complete the authorized activity, the work period may be extended on a day-to-day basis by Corinne Medlin at (707) 944-5526, or, alternatively, to the Yountville office at (707)-944-5520.

11. A copy of this agreement must be provided to the contractor and all subcontractors who work within the stream zone and must be in their possession at the work site.

12. Building materials and/or construction equipment shall not be stockpiled or stored where they could be washed into the water or where they will cover aquatic or riparian vegetation.

13. Debris, soil, silt, bark, rubbish, creosote-treated wood, raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances which could be hazardous to aquatic life, resulting from project related activities, shall be prevented from contaminating the soil and/or entering the waters of the state. Any of these materials, placed within or where they may enter a stream or lake, by Operator or any party working under contract, or with the permission of the Operator, shall be removed immediately.

14. Department personnel or its agents may inspect the work site at any time.

15. The Operator is liable for compliance with the terms of this Agreement, including violations committed by the contractors and/or subcontractors. The Department reserves the right to suspend construction activity described in this Agreement if the Department determines any of the following has occurred:
    A). Failure to comply with any of the conditions of this Agreement
    B). Information provided in support of the Agreement is determined by the Department to be inaccurate.
    C). Information becomes available to the Department that was not known when preparing the original conditions of this Agreement (including, but not limited to, the occurrence of State or federally listed species in the area or risk to resources not previously observed)
    D).The project as described in the Agreement has changed or conditions affecting fish and wildlife resources change.

Any violation of the terms of this Agreement may result in the project being stopped, a citation being issued, or charges being filed with the District Attorney. Contractors and subcontractors may also be liable for violating the conditions of this agreement.

Amendments and Renewals

The Operator shall notify the Department before any modifications are made in the project plans submitted to the Department. Project modifications may require an amendment or a new notification.

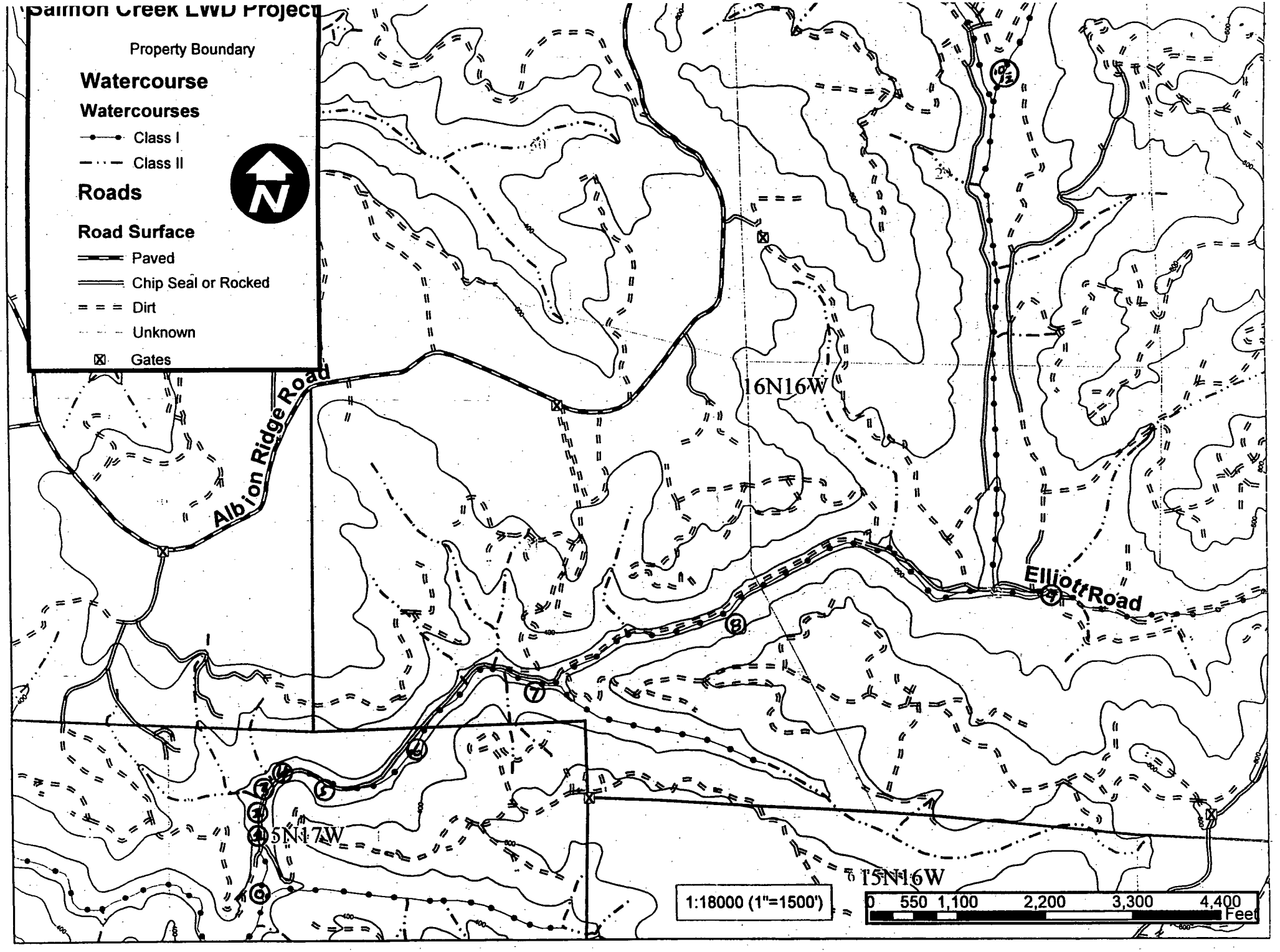
This Agreement is transferable to subsequent owners of the project property by requesting an amendment.

To renew the Agreement beyond the expiration date, a written request for a renewal must be submitted to the Department (1600 Program, Post Office Box 47, Yountville, California 94599) for consideration at least 30 days before the Agreement expiration date. A renewal requires a fee. The Fee Schedule can be obtained at www.dfg.ca.gov/1600 or by phone at (707) 944-5520. Renewals of the original Agreement are issued at the discretion of the Department.

To modify the project, a written request for an amendment must be submitted to the Department (1600 Program, Post Office Box 47, Yountville, California 94599). The fee for an amendment is one-half (½) of the original fee. Amendments to the original Agreement are issued at the discretion of the Department.

Please note that you may not proceed with construction until your proposed project has undergone CEQA review and the Department signs the Agreement.

I, the undersigned, state that the above is the final description of the project I am submitting to the Department for CEQA review, leading to an Agreement, and agree to


Salmon Creek LWD Project
Property Boundary
Watercourse
Watercourses
Class I
Class II
Roads
Road Surface
Paved
Chip Seal or Rocked
Dirt
Unknown
Gates
N
Albion Ridge Road
16N16W
Elliott Road
15N17W
15N16W
1:18000 (1"=1500')
0 550 1,100 2,200 3,300 4,400
Feet

Draft Initial Study/Negative Declaration for the Proposed Campbell Timberland Management, LLC Salmon Creek Instream Enhancement Project Mendocino County, California

Lead Agency:

State of California
The Resources Agency
Department of Fish and Game
Central Coast Region
PO Box 47
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September 2003

1. Introduction and Summary

1.1 Environmental Review Process

Campbell Timberland Management, LLC (CTM) is proposing to enhance instream habitat within Salmon Creek, tributary to the Pacific Ocean near the town of Albion, Mendocino County, CA. Instream enhancement will consist of placing up to 13 large wood structures into Salmon Creek and two of its tributaries, Donnelley Gulch and Hazel Creek, to enhance instream habitat for Pacific salmonids (herein after referred to as the Project).

California Department of Fish and Game (CDFG) is the lead agency. This Initial Study (IS) and a Negative Declaration (ND) was prepared on behalf of CDFG for the proposed Project pursuant to the California Environmental Quality Act (CEQA), as amended (Public Resources Code Section 21000 et seq.) and in accordance with CEQA Guidelines (California Code of Regulations Section 15000 et seq.). The ND will be considered for adoption after the public review period concludes and public comments are evaluated and the CDFG finds there is no substantive evidence that the proposed project will have a significant adverse effect on the environment. The Project is anticipated to result in beneficial effects to Pacific salmonids and their habitat in Salmon Creek.

The purpose of this IS is to determine whether implementation of the proposed Project would result in potentially significant effects to the environment and, if so, to incorporate mitigation measures to reduce or eliminate the proposed Project's significant or potentially significant adverse effects to a less-than-significant level.

1.2 Summary of Findings

Section 4 of this IS contains an Environmental Checklist identifying the potential environmental effects by topic and a brief discussion of each potential effect as a result of the proposed Project. Based on the environmental checklist prepared for the proposed Project and the supporting environmental analysis, the proposed Project would have no adverse impacts or less than significant adverse impacts for the following issues: cultural resources, biological resources, land use and agricultural resources, population and housing, recreation, geology and soils, hydrology and water quality, noise, air quality, transportation and circulation, energy and mineral resources, public services, utility and service systems, aesthetic and hazards.

As provided in CEQA, Section 21064, a ND could be prepared for a project subject to CEQA if the proposed Project will not have a significant adverse effect on the environment. There is no substantial evidence that the proposed Project would have a significant adverse effect on the environment as indicated by the information and analysis presented in this IS, therefore, CDFG will prepare and adopt a ND pursuant to CEQA Guidelines.

2. Project Location, Description and Purpose and Need

2.1 Project Location

The Project is located on lands owned by Hawthorne Timber Company, LLC and managed by CTM within Salmon Creek, a tributary to the Pacific Ocean near the town of Albion, Mendocino County, California (Appendix A). CTM proposes to restore large wood in Salmon Creek and two of its tributaries, Donnelley Gulch and Hazel Creek, in locations depicted in the *Salmon Creek LWD Project Map* (Appendix A). The project area is within the Salmon Creek watershed, located off of State Highway 1 near the town of Albion, CA. The project area is bounded by Albion Ridge Road to the North and Navarro Ridge Road to the South. CTM manages lands within the project area for industrial timber production.

2.2 Project Description

The proposed Project consists of placing up to 13 large wood structures (redwood and fir logs and rootwads) into Salmon Creek and two of its tributaries to enhance instream habitat for Pacific salmonids.

The Project is anticipated to begin in the summer of 2004 (pending approval of environmental permits) and the project duration is anticipated to be 8-12 weeks total. If environmental permits are delayed and the Project starts later than anticipated, all work will be completed during low flow periods as soon as permits are obtained, and will be completed prior to October 15th. Short term extensions to this ending date may be requested by the project proponent through consultation with the local CDFG contact in the event that logistical complications result in project delays. Any such extensions would be limited to no more than seven days and work would only occur during dry weather and soil conditions. All operations would cease if significant rain is predicted. Erosion control measures on any exposed soils (e.g. associated with equipment operations) would be implemented prior to significant rain events. Monitoring actions associated with the Project will extend over a three-year period.

The proposed instream structure designs were based on recommendations contained in the California Stream Habitat Restoration Manual (Flosi *et al.* 1998). However, it is proposed that the structures will be anchored using root wads, boulders and other natural means rather then cables. Stream channels undergo a consistent series of adjustments over time to accommodate changes or alterations in driving variables, such as inputs of large wood. Unanchored large wood reduces the risk of unintended consequences (high and dry structures, bank erosion caused by subsequent channel adjustments, etc.) and structures may adjust to the stream's natural hydraulic regime. Thus, large wood will be placed and stabilized using rootwads or the weight of the structure, which will allow the structures to readjust as the channel seeks equilibrium with the structures.

In September 2002 CTM prepared the Salmon Creek Project Work Plan (Appendix B), which contains an assessment of channel conditions in Salmon Creek, a description of the large wood placement project proposed herein, a map showing the project reaches, and photographs of the types of large wood structures to be implemented.

Field observations and surveys both indicate that a lack of in-channel large wood may be a limiting factor for salmonid production in the watershed. CDFG records from the 1980's document the removal of large wood to enhance fish migration. These actions degraded habitat conditions for salmonids. However, improving trends in riparian conditions and habitat quality, as well as increasing numbers of spawning adults and juvenile salmon have been observed by CTM.

The specific configuration of each wood structure will vary by site depending on site-specific conditions and identified objective (Table 1). CTM has identified objectives by site (Table 1) and will use different configurations of large wood to promote channel roughness, gravel sorting, habitat complexity, cover and wood jams. Individual structures will be an aggregate of native materials including rootwads and logs. Project implementation will not require felling of live trees as materials have been stockpiled near the sites. At many of the sites, existing down trees that are spanning the creek will be cut and allowed to fall into the creek to form structure and cover. Down trees that are cut may be moved so that ends point downstream to maximize habitat enhancement by causing scour and providing cover. All of the down trees proposed for use in habitat enhancement are still attached to root wads. These logs will be stabilized or anchored by leaving at least two thirds of the log on the bank and one third will extend into the channel.

Table 1. Restoration objective by site.

Site #	Channel Roughness	Gravel Sorting	Habitat Complexity	Provide Cover	Promote Wood Jams
0	X	X	X		
1	X	X	X		
2			X	X	
3	X	X	X		X
4	X		X	X	
5	X		X	X	
6			X	X	
7	X	X	X		X
8	X	X	X	X	X
9			X	X	X
10			X	X	
11			X	X	
12			X	X	

The Project was designed to minimize ground and vegetation disturbance. Heavy equipment (excavator or heel boom loader) will be used to place logs in or near the stream channel; hand labor and tools will be used to make final adjustments to the structures. Heavy equipment may also be used to adjust logs, anchor logs into streambanks and to place the anchoring structures (root wads). Heavy equipment will stage on the existing haul road but may need to traverse into riparian areas for short distances to reach the proposed sites. Equipment will then stage on or near streambanks and will reach over into the stream channel to place the structures. If equipment disturbs ground cover or exposes bare soils, erosion control measures will be implemented including raking soil duff back over exposed soils, mulching bare soils, and installing silt fences, straw bales and/or down logs if disturbed areas slope towards a watercourse. Erosion control measures would be implemented on all exposed soils prior to significant rain events. To allow for operational flexibility and uncertain environmental conditions the project proponent desires the option to remove up to five trees per 100 meter reach of stream, but only if necessary to allow for access to the site. No trees over 12 inches diameter breast height (dbh) shall be cut without prior consultation with CDFG. Any felled trees shall either be utilized in structure construction, as erosion control structures or left on site.

In addition to the equipment noted above, some of the structure design and installation may be completed by the California Conservation Corps (CCC) hand crews. All work will be done in accordance with the California Stream Habitat Restoration Manual (Flosi *et al.* 1998).

CTM will provide all of the large wood pieces required for the Project and has stockpiled the wood on existing landings within the Project vicinity. The logs and root wads were formerly down material and/or cull logs from prior timber harvest plans. As mentioned earlier, additional dead and down trees that are currently spanning Salmon Creek will be felled into the creek to create scour and cover for salmonids.

Use of Best Management Practices (BMPs) will be implemented at each site to help minimize erosion including:

1. *Scheduling of Project*- the Project will be implemented during the dry season in the summer of 2004; the Project will require approximately 8-12 weeks to complete; the Project will be complete by October 15th, 2004 to minimize potential for erosion and run-off. If at any time during implementation, significant rains are forecast, CTM will be on site to initiate

shutdown of operations and to ensure that erosion control measures are implemented. Operations will not resume until soils are no longer saturated.

2. *Stabilized Ingress and Egress Points*-points of access for heavy equipment will be stable areas less than 50% slope and less than 1000 feet in length off of an existing haul road. Ingress/egress points will avoid wet areas.
3. *Servicing and Refueling of Equipment*- CTM will prevent pollutants such as fuels, lubricants, bitumen's, and other harmful materials from being discharged into or near the river by refueling only in upland areas, by properly maintaining equipment prior to construction, and by washing equipment. All heavy equipment shall be reasonably clean of grease and oil prior to entering the project area. All lube and hydraulic oil leaks shall be identified and fixed prior to equipment entering the construction area. All visible deposits of petroleum products (oil, grease, etc.) that may dislodge and enter watercourses shall be removed prior to operations. No storage of fuel will occur in riparian or stream zones. Refueling of equipment will only occur during daylight hours. Oil absorbent booms or pads will be kept on site at all times during implementation.

2.3 Purpose and Need

In September 2002 CTM submitted a Notification of Lake or Streambed Alteration for the proposed Project. Although the proposed Project is beneficial in nature and is designed to enhance the condition of aquatic habitat, placement of large wood may be considered an alteration of the bed, bank, or flow, and a Lake or Streambed Alteration Agreement for the Project is warranted. Unless the Project is exempt, CDFG may not issue a Lake or Streambed Alteration Agreement until the Project has been reviewed in accordance with CEQA.

3. Environmental Setting, Potential Effects, and Proposed Mitigation Measures

3.1 Environmental Setting

The Salmon Creek watershed is located in Mendocino County on the North Coast of California. The watershed drains approximately 8600 acres and continues to support relatively small but robust populations of Northern California (NC) steelhead and Central Coast (CC) coho salmon. Hawthorne Timber Company, LLC owns approximately 51% of the watershed. Discharge rates, which are not influenced by snow pack, vary significantly between summer and winter flows. Water temperatures are moderated by the coastal marine environment and range from 7° C in winter to 15° C in summer. The mainstem of Salmon Creek is a low gradient, moderately entrenched, alluvial channel. Monitoring data collected over the past eight years indicate that sediment stored in the system from past land use practices and a lack of large wood may be limiting factors for salmonid production in this watershed. CTM has an ongoing program of addressing current sediment sources, which are primarily road-related.

The Mediterranean climate in the Project vicinity is characterized by a pattern of low-intensity rainfall in the winter and cool, dry summers with coastal fog. Vegetation in the Salmon Creek watershed is 2nd and 3rd growth coastal mixed evergreen forest originating from harvests in the1930s. Subsequent partial harvests of residual older trees and partial harvests of the younger trees resulted in under-story shrub, forb, grass, and young tree regeneration in some areas. Canopy cover varies from moderately open in recently cut areas to nearly closed in 2nd growth stands. Dominant and co-dominant tree diameters range from eighteen to thirty inches, with occasional trees in excess of 50" dbh.

Salmon Creek appears on maps in 1866 when the GLO land survey went through the area. At that time there were few notes regarding the region. The lower regions near the mouth have two separate dwellings denoted, and the Navarro Ridge and Albion Ridge roads appear to be present, granting access to most of the area. The pygmy area would seem to be covered by the 'burnt pine opening' designation. A conjecture would be that it was burnt in an attempt to convert it to agricultural uses, but given the poor soils was allowed to reforest. The upper reaches of the watershed area have the general notation of well

timbered, but a 'timber road' is shown where the Middle Ridge Road is nowadays. The only mill known in the area would have been the Albion Mill, which shows on the map. "White's Mill" which became Whitesboro near the mouth of Salmon Creek was built about 1876. Whitesboro was fed by the railroads which extended down Salmon Creek, apparently eventually connecting Pullen's mill to White's Mill and the wharf. There is also reference to a shingle mill in the area during this timeframe. Whitesboro burned down in 1894. There are reports that the rails were salved for scrap iron during WWII.

By the late 1870s families had settled in the middle and upper Salmon creeks. Homesites occurred near Ketty, Hardell and Pullen Gulches at least. Orchards were planted, areas fenced, houses and mills built. The Pullen's homesteaded near Pullen Gulch and built a mill in 1876 at the confluence of the north and main forks of Hazel creek. This mill was making 1500 ties/day by 1880 and was served by five Ox teams.

The Hardell homestead and mill appears to have been built later. These mills were served by spill dams and railways. The full extent of the railways is unknown, but an older map indicates they went from Whitesboro at the mouth and spurred up Hazel Creek and Donnelly Creek, the accuracy of this map is not the highest- it shows Hazel creek connecting to the Albion. Unlike the giant dams on Big River, the smaller spill dams would probably not be suited for log drives down river. They served to create millponds and possibly to back up water for diversion to other locations or for power. These millponds changed the character of the creeks, with some impacts extending down to current times.

Typical harvest practices of that era included slash burning following timber falling , resulting in an economic clear-cut of the area. This resulted in developing Douglas Fir and Grand Fir replacement stands combined with redwood stump sprouting. Construction of railroads and associated haul routes had a significant impact on the watersheds they were located within. Soil and debris were often deposited into the watercourses severely impacting the hydrological functions of these streams.

Since that time much of the timbered land was consolidated under the Hardells. It appears that in 1970 Boise-Cascade (a predecessor of this owner) bought much the land in Salmon Creek from the Hardells and Henrys (Leo Hardell left 5 heirs), the Henrys retaining ownership of an outblock along the 'Elliot Road'. At some point part of the 'Kitchen' ownership was obtained also. A portion of the area is also owned by Mendocino Redwood Company (MRC) and there are also many small landowners dispersed along the ridgetop roads.

Department of Fish and Game files indicate that in 1966 most of the Big Salmon Creek drainage was unsatisfactory for steelhead and Coho as the result of numerous log barriers in the channels. At the request of property owners within the watershed the barriers were removed by 1984. Fish population sampling by Wendal Jones in 1986 indicated the presence of coho salmon. More recent studies by CDFG and CDF indicate that the barrier removal may have been overzealous and large organic debris may now be lacking in the drainage.

Later logging history is less clear. It is evident that in 1968 the Hardells had awarded a cutting contract for 4.0mmbf, and at that time were projecting 1.0mmbf/year, but that escalated and in 1969 the Hardells were offering a timber sale which included most of the current plan area (all but units A and D). This was a 350-acre unit covering 4.3mmbf. Information in the bid package indicates that the roads and skid trails were already constructed and that some of the larger fir had already been removed 'several years ago'. Of the 3.5mmbf of redwood the majority was in trees 36-60" dbh and just under 0.5mmbf was Old Growth, while the 0.8mmbf of Douglas-fir was under 30" dbh. The prescription was all merch. trees 22" DBH and greater and an unspecified amount of smaller timber which were marked. From this information it would seem that a tractor high grade removed the overstory Douglas-fir sometime in the mid 1960s, and that this overstory removal was the first major entry since the initial logging in the 1880s-1930s.

The old Union Lumber Company (ULCO)/Boise-Cascade maps from the early 1970s show some cutting, but unspecified as to what manner, and they may be the early FPR entries. Prior to passage of the Forest Practice Rules, there was a field trip by the Board of Forestry that included Salmon creek. Unfortunately the report of this has gone missing from our forestry library. One of the pictures of that field trip depicts an apparent Humboldt crossing, massive slash in the creek, and clearly evident CAT tracks entering and leaving the creek. The exact location is unknown, but from the general time frame it could have been one of the crossings in Donnelly Gulch.

Outside of timber harvest, the main activity in the watershed is probably the urbanization along the ridges. This has a negative side in that it is a form of permanent impact, (something noted in the NDDB regarding Pygmy sites is that the greatest threat is urbanization), and by introducing greater numbers of people to the area has not helped the trespassing issue.

Logging activities conducted prior to the forest practice act, historic road construction, grazing and other land use activities are still contributing to the bedload of Hazel Creek, Donnelly Gulch and Big Salmon Creek. Recent monitoring activities conducted in order to quantify the present condition and trends within the watershed have been submitted to the CDF in recent THPs. Stream habitat surveys, sediment, temperature and vertebrate population monitoring information for Salmon Creek are included in section V.

Currently, harvest is conducted under the California Forest Practice Rules and CTM's lands in the Salmon Creek watershed have been in uneven aged management resulting in a mosaic of both even and uneven aged stand types. Surveys of large wood in Salmon Creek were conducted by CTM in 2000 and indicated that wood levels were low. The combination of past logging practices that removed large conifers from recruitment zones along streams and "stream cleaning" efforts that occurred in Salmon Creek in the 1980s have contributed to the current low levels of large wood.

Pacific salmonid habitat in Salmon Creek has been impacted by past land use and roads, and sedimentation from roads continues to impact habitat. However, the watershed has revegetated and overall instream habitat is on a trajectory of recovery and has historically supported relatively small but robust populations of steelhead trout and coho salmon. CTM (2002) biologists have reported that Salmon Creek has optimal coho habitat conditions and, considering the small drainage area, has consistently had high rates of coho production.

In April 2003 coho salmon redds were observed in Salmon Creek in gravel bars and pool tailouts, as well as Pacific Lamprey redds. During this survey, CTM initially intended to count Young Of the Year (YOY) salmonids on a per pool basis, however the YOY produced during the spawning season of 2001-02 were too numerous to count effectively. In the fall of 2001, abundant rainfall occurred early in the season, creating ideal coho spawning conditions. Due to the beneficial weather conditions, most backwaters, side channels, and areas with reduced flow rates contained newly emergent steelhead and coho juveniles. In deeper pools, second year class coho salmon and steelhead were observed. Surveyors observed that the channel was aggraded and had newly deposited substrates. Embeddedness levels had significantly decreased relative to levels measured in 1995, however levels were still relatively high and deltas of bedload material occurred at many of the gulch confluences. The large cobbles and small boulders composing the channel substrate in many areas consistently had the hard angled characteristics attributed to recent erosion and deposition. Although much of the substrate appeared to be aggraded, and the cobbles armored, the numbers of larval salmonids observed in 2002 indicated that survival to emergence occurred at a successful rate. Surveyors also inspected a number of redds and concluded that areas with excessive fine sediment were not selected by fish for redd construction and that the process of redd construction actively winnows out fine sediment material from substrates.

Canopy cover over Salmon Creek was 78 % in April 2002, 37% provided by conifers and 41% provided by deciduous trees. Stream temperatures are strongly influenced by the marine coastal climate. Instream thermal data loggers that have been located throughout Salmon Creek and its tributaries since 1994 indicate that the Maximum Weekly Average Temperature (MWAT) has never exceeded 16.8° C, a target value considered to be the thermal point which, if exceeded, precludes the presence of coho (Welsh, 2000). Salmon Creek, according to the thermal data collected throughout the watershed, has optimal temperatures for coho production.

Pool habitat in the surveyed reach of Salmon Creek was abundant relative to both frequency and area, which also indicated that the creek is suitable for coho production. Large wood in the wetted channel created 55 % of these pools, and rootwads created 11%. Pools were also relatively deep: 85% of pool habitat was over 2 feet deep, and 47% was over 3 feet. CTM (2002) reported that these habitat conditions are associated with superior salmonid production in general, and coho production in particular.

CTM (2002) also reported that there appeared to be an overall paucity of large wood in the surveyed channel: Only 58% percent of the units contained LWD. Furthermore, only 40% of the units contained coniferous LWD; the significance being that deciduous wood deteriorates rapidly, decreasing instream structure and shelter values. Much of the ancient structural instream logs were removed by stream clearing crews. CTM (2002) reported that overall, this segment of Salmon Creek indicates that habitat is well on the way to recovery from the intrusive legacy effects of logging, farming, railroad construction, stream clearing, and road building activities and has many of the in-stream parameters that are optimal for coho production.

CTM (2002) recommend that two parameters be addressed to enhance productivity in Salmon Creek: sediment and large wood. The primary source of recent sediment delivery in the survey reach was the periodic locations where the historic railroad grade is still calving into the active channel. Unfortunately, there is no management solution to address this legacy problem. A considerable passage of time will be necessary for the stream to reach equilibrium between the rate of sediment supply and transport. The secondary source of sediment delivery observed was old unstable roads and crossings in the upslope tributary gulches.

Large wood was scarce in various locations in 2002. In these same areas CTM (2002) noted the "butts" of many ancient weir logs that had been extracted from the channel by stream cleaning crews in the 1980's. CTM (2002) biologists recommended that large wood be placed in the active channel.

3.2 Potential Effects and Proposed Mitigation Measures

This IS section concludes that there is no substantial evidence that the proposed Project would have a significant negative effect on the environment, either by itself or in combination with other projects. The Project will have a net beneficial effect on aquatic dependent resources as described below. Mitigation monitoring is not necessary for mitigation measures that may be proposed to mitigate impacts defined as non-significant. An environmental checklist follows this section and summarizes effects discussed below.

3.2.1 Project Conditions

On September 12, 2002, CDFG issued Notification Number R3-2002-0472 for the proposed Project, which contained a Project Description and Conditions that were not acceptable to the project proponent. On September 9th, 2002, CDFG issued a second Project Description and the following Conditions:

1. Work within the stream/riparian corridor shall be confined to the period June 15th through October 15th of 2003, 2004, 2005 and 2006.

2. The placement of in-stream structures shall generally follow the methods outlined in the California Salmonid Stream Habitat Restoration Manual (3rd edition, January 1998).

3. No heavy equipment shall operate in the live stream, except that an excavator/log loader operated from the bank may reach into the stream to slowly lower and place (not drop) rootwads, logs and/or rocks in the watercourse.

4. Root wads and log placement shall not result in the loss of pool habitat for salmonids. For example, once a structure is installed, it shall not occupy the existing pool volume to such an extent that salmonids are excluded from the pool.

5. The installation of structures shall avoid excavation in the bed or banks of the stream.

6. An authority (i.e. fisheries biologist, hydrologist, Aquatic Resource Manager or Maintenance Supervisor) who can halt work activities and recommend measures for avoiding adverse effects to salmonids and their habitat shall be present on site during project implementation.

7. The operator shall take whatever precautions are necessary to minimize the discharge of fine sediment from the work site to the waters of the state.

8. Gravel to be used to improve spawning bed conditions shall be washed river run material, ranging in size from one to three inches in diameter.

9. Staging/storage areas for equipment, materials, fuels, lubricants and solvents, shall be located outside of the stream's high water channel and associated riparian area. Stationary equipment such as motors, pumps, generators, compressors, and welders, located within the dry portion of the stream channel or adjacent to the stream shall be positioned over drip-pans. Vehicles shall be moved out of the normal high water area of the stream prior to refueling and lubricating.

10. If the Operator needs more time to complete the authorized activity, the work period may be extended on a day-to-day basis by Corinne Medlin at (707) 944-5526, or alternatively, to the Yountville office at (707) 944-5520.

11. A copy of this agreement must be provided to the contractor and all subcontractors who work within the stream zone and must be in their possession at the work site.

12. Building materials and/or construction equipment shall not be stockpiled or stored where they could be washed into the water or where they will cover aquatic or riparian vegetation.

13. Debris, soil, silt, bark, rubbish, creosote-treated wood, raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances which could be hazardous to aquatic life, resulting from the project related activities, shall be prevented from contaminating the soil and/or entering the waters of the state. Any of these materials, placed within or where they may enter a stream or lake, by Operator or any party working under contract, or with the permission of the Operator, shall be removed immediately.

14. Department personnel or its agents may inspect the work site at any time.

15. The Operator is liable for compliance with the terms of the Agreement, including violations committed by the contractors and or subcontractors. The Department reserves the right to

suspend construction activity described in this Agreement if the Department determines any of the following has occurred:

A) Failure to comply with any of the conditions of this Agreement.
B) Information provided in support of the Agreement is determined by the Department to be inaccurate.
C) Information becomes available to the Department that was not known when preparing the original conditions of this Agreement (including, but not limited to, the occurrence of State or federally listed species in the area or risk to resources not previously observed).
D) The project as described in the Agreement has changed or conditions affecting fish and wildlife resources change.

Any violation of the terms of this Agreement may result in the project being stopped, a citation being issued, or changes being filed with the District Attorney. Contractors and subcontractors may also be liable for violating the conditions of this agreement.

3.2.2 Cultural Resources

A records check of the California Historical Resources Information System (Records Check # 00-723) has revealed the presence of one historical site in the general vicinity of the project (primary # CA-MEN-2899H). This site is an old railroad grade that is primarily adjacent to Salmon Creek throughout its length. Some small spurs extend up some side gulches for short distances. Many sections of the grade have been converted to logging roads over time. Other areas have been heavily revegetated and are almost indistinguishable from surrounding timberland. The grade crossed the creek in several locations. At many of these locations nothing remains of the original crossing structures. In some areas, due to road construction, it is difficult to tell exactly where the railroad grade ends and the haul road begins. In these areas it is assumed that the rail grade ends where the current road grade exceeds 4% and no evidence of any other road grade exists. This Archeological survey examined the areas along the old Salmon Creek Railroad grade for remnants of ties and rails. No remnants of historic features were found. During the survey surface scraps were also conducted in and near proposed equipment operations, searching for pre-historic artifacts. No evidence of pre-historic features or artifacts were located. Due to the fact that much of the old Salmon Creek rail road grade has been used as a haul road, that much of it has also been reclaimed by native vegetation, the fact that no rails or ties were found along the grade, and that the entire feature on this ownership has already been recorded it is highly unlikely that the proposed minimal equipment operations will have any impact on the site.

3.2.3 Biological Resources

Fisheries

Salmon Creek provides habitat for Pacific salmonids listed under the Endangered Species Act (ESA) including California Coastal (CC) coho salmon (*Oncorhynchus kisutch*), California Coastal (CC) Chinook salmon (*O. tshawytscha*) and Northern California (NC) steelhead (*O. mykiss)*. CTM salmonid surveys have documented the presence of coho salmon and steelhead in Salmon Creek, Donnelley Gulch and Hazel Creek. Because the biological requirements of coho salmon, steelhead and Chinook salmon are similar, they are referred to collectively as "Pacific salmonids" throughout this document.

Critical habitat is designated for CC coho salmon to include all river reaches accessible to listed coho salmon from Punta Gorda south to the San Lorenzo River. The critical habitat designation for CC Chinook salmon was withdrawn in 2002. Critical habitat has not been designated for NC steelhead.

In addition to federally designated critical habitat, Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Act (MSA) require heightened consideration of commercial fish species' in resource management decisions. EFH is defined in section 3 of the MSA as "those waters a necessary to fish for spawning, breeding, feeding, or growth to maturity." Freshwater EFH

salmonids includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically, accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers, and long-standing impassable natural barriers. Thus, Salmon Creek contains coho and Chinook salmon EFH, which is the functional equivalent of critical habitat.

Coho Salmon (*Oncorhynchus kisutch)*
Adult coho salmon typically enter rivers between September and February. Spawning occurs from November to January (Hassler 1987), but occasionally as late as February or March (Weitkamp et al. 1995). Coho salmon eggs incubate for 35-50 days between November and March. Successful incubation depends on several factors including dissolved oxygen levels, temperature, substrate size, amount of fine sediment, and water velocity. Fry start emerging from the gravel two to three weeks after hatching and move into shallow areas with vegetative or other cover. As fry grow larger, they disperse up or downstream. In summer, coho salmon fry prefer pools or other slower velocity areas such as alcoves, with woody debris or overhanging vegetation. Juvenile coho salmon over-winter in slow water habitat with cover as well. Juveniles may rear in fresh water for up to 15 months then migrate to the ocean as smolts from March to June (Weitkamp et al. 1995). Coho salmon adults typically spend two years in the ocean before returning to their natal streams to spawn as three-year olds. Salmon Creek contains federally designated critical habitat for CC coho salmon.

Chinook salmon (*O. tshawytscha*)
Chinook salmon mature between 2 and 6+ years of age (Myers *et al.* 1998). Fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of the rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991). Post-emergent fry seek out shallow, near-shore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and aquatic crustaceans. The optimum temperature range for rearing Chinook salmon fry is 50°F to 55°F (Rich 1997, Seymour 1956) and for fingerlings is 55°F to 60°F (Rich 1997). In preparation for their entry into a saline environment, juvenile salmon undergo physiological transformations known as smoltification that adapt them for their transition to salt water. The optimal thermal range for Chinook during smoltification and seaward migration is 50°F to 55°F (Rich 1997). Chinook salmon spend between one and four years in the ocean before returning to their natal streams to spawn (Myers *et al.* 1998). Chinook salmon addressed in this document exhibit an ocean-type life history, and smolts out-migrate predominantly as subyearlings, generally during April through July. Chinook salmon spend between 2 and 5 years in the ocean (Bell 1991; Healey 1991), before returning to freshwater to spawn. Some Chinook salmon return from the ocean to spawn one or more years before full-sized adults return, and are referred to as jacks (males) and jills (females).

Steelhead (*O. mykiss).*
Winter-run steelhead enter fresh water between November and April in the Pacific Northwest (Busby *et al.* 1996; Nickelson *et al.* 1992), migrate to spawning areas, and then spawn, generally in April and May (Barnhart 1986). Some adults, however, do not enter some coastal streams until spring, just before spawning (Meehan 1991). Depending on water temperature, steelhead eggs may incubate for 1.5 to 4 months (August 9, 1996, 61 FR 41542) before hatching, generally between February and June (Bell 1991). After two to three weeks, in late spring, and following yolk sac absorption, alevins emerge from the gravel and begin actively feeding. After emerging from the gravel, fry usually inhabit shallow water along banks of perennial streams. Fry occupy stream margins (Nickelson *et al.* 1992). Summer rearing takes place primarily in the faster parts of pools, although young-of-the-year are abundant in glides and riffles. Winter rearing occurs more uniformly at lower densities across a wide range of fast and slow habitat types. Productive steelhead habitat is characterized by complexity, primarily in the form of large and small wood. Juveniles live in freshwater from one to four years (usually two years in the California Evolutionary Significant Units-ESUs), then smolt and migrate to the ocean in March and April (Barnhart 1986). Winter steelhead populations generally smolt after two years in fresh water (Busby *et al.* 1996).

The Project will have short- and long-term beneficial effects on fisheries habitat within Salmon Creek. The physical structure of instream habitat plays a significant role in determining the suitability of habitat for Pacific salmonids and other organisms upon which they depend for food. Structural attributes of streams vary naturally along streams in response to topography, geology, geomorphic features, hydrologic regimes, sediment load, and riparian vegetation. These spatial differences result in a variety of macro- and microhabitat attributes that are used by Pacific salmonids at various life stages. The presence of large wood is one primary factor, along with stream size and channel constriction, that determines the relative frequency of macro-habitat features such as pools, glides and riffle. Large wood creates habitat complexity by forming pools, back eddies and side channels and by creating channel sinuosity and hydraulic complexity (such as velocity complexity). Large wood also retains course sediments and organic matter and provides substrates for invertebrates. The proposed addition of large wood will increase pool frequency commensurate with the number of structures placed (up to 13), result in deeper and more complex pools as the channel bed is scoured around structures, and will provide instream cover for holding and rearing Pacific salmonids.

Heavy equipment may be staged adjacent to Salmon Creek to place and/or position large wood structures. Thus, localized disturbance of ingress and egress points along the riparian corridor of Salmon Creek may occur. Disturbance would be limited to the following: one side of the creek; a short distance between the existing haul road and the creek; the width of the equipment used; and, a for a maximum of 13 structures. Disturbance will consist of trampling or killing riparian vegetation and soil disturbance. Any disturbed soils will be mulched with native brush and duff will be raked over disturbed areas to minimize erosion. Streamside vegetation may be trampled or crushed at each equipment ingress/egress location and up to five trees per 100 meter reach of stream may be removed to access sites. Vegetation is anticipated to quickly recover or be replaced by new growth due to high site conditions in these areas. No trees over 12 inches diameter at dbh shall be cut without prior consultation with CDFG. Any trees so cut shall either be utilized in structure construction, for erosion control purposes or left on site as down wood. The number of trees that may potentially be removed is limited and only smaller trees would be removed. Thus, if tree removal is necessary to access sites, this action is not anticipated to measurably affect stream shade or water temperatures. Heavy equipment may be used to suspend logs and to place logs, which could result in some broken branches in trees in the immediate vicinity. There may be vegetation disturbance at each site due to people walking to sites or equipment accessing sites. However, vegetation disturbance shall not exceed the minimum necessary to complete the Project. Precautions will be taken to avoid other damage to vegetation by people or equipment. In streamside areas, trampled vegetation is anticipated to recover or resprout and revegetation of the small areas disturbed is anticipated to occur rapidly due to the high site conditions and adequate moisture. Due to the limited extent of the disturbance and the erosion control measures proposed, off-site sediment movement is not anticipated. Changes to overhead canopy, stream shade and water temperatures are anticipated to be negligible (i.e. immeasurable).

The channel bed and banks could be disturbed as up to 13 structures are placed. No equipment will enter the stream channel, however, there may be a short-term pulse of turbidity as the structures are placed. Instream habitat that could be potentially affected by mobilization of fines would be limited to areas in the immediate vicinity of the structure placements and areas within a limited distance downstream as flows carry fines away. Any turbidity caused by the disturbed channel bed or banks would be immediately diluted by flows. Juvenile Pacific salmonids may be rearing in the project vicinity during implementation. Pacific salmonids respond to both the duration of exposure and concentration of suspended sediment (Newcombe and MacDonald 1991). Effects of suspended sediment episodes range from changes in territorial, gill flaring, and feeding behavior for short-term, low concentration exposure (Berg and Northcote 1985) to reduced growth rates and mortality for longer duration/high concentration events (Newcombe and MacDonald 1991). Placement of the structures may produce short-term low concentration exposure. A decrease in juvenile salmonid growth or feeding abilities is not anticipated

based on the limited areas of disturbance, the short duration of the increased turbidity and the high probability for dilution of any potential project-related turbidity. Due to the proposed timing of Project implementation (in the summer when redds would not be in Salmon Creek), increased turbidity would not impact salmonid redds. Thus, since turbidity would be low and limited spatially, and turbidity would be localized as structures will not be placed simultaneously, and since flows would dilute any turbidity, the proposed Project would have negligible adverse effects to Pacific salmonids and their habitat. Refer to the following sections on Hydrology and Water Quality for more discussion.

Wildlife and Amphibians

The following species may occur in the project vicinity:

Northern Goshawk (*Accipiter gentilis*)

The summer and winter range for the Northern Goshawk includes Mendocino County, primarily east of Highway 101, however there have been some detections of nesting goshawks in the Redwood Region. Goshawk nesting habitat is normally north facing slopes of dense, mature and old growth forests. It uses snags and dead top trees for prey observation. The Goshawk usually preys on birds and small mammals. In addition to mature conifer and deciduous forests, riparian areas are also important to the Goshawk, especially for nesting habitat. Overall, Northern Goshawks are infrequently found within the redwood forest type. The project area does contain habitat for northern goshawks; however, a NSO (MD-393) currently occupies this habitat. This habitat consists of a specific 28-30 acre uncut 2nd growth stand dominated by Douglas fir. It is approximately 90 years of age. This stand has been occupied by this NSO for the last 7+ years. This stand has been monitored for NSO's for the last 10+ years. During all of this monitoring no evidence of goshawk activity has been noted. Per the project proponent's biologist Douglas Meekins, who has observed goshawks in the past, it is highly likely that if there were a goshawk present it would have been noted during these surveys. It is also highly unlikely that a goshawk would co-inhabit the same stand as an NSO, thus no significant adverse impacts to this species are expected.

Bald Eagle (*Haliaeetus leucocephalus*)

The Bald Eagle is uncommon to the coastal range during the summer, but most of California is listed as its winter range, including Mendocino County. The Bald Eagle's main food source is fish. Therefore, large bodies of water or rivers are needed. The project area does not contain any potential habitat, thus due to the lack of habitat and historic presence, no significant adverse impacts are expected.

Golden Eagle (*Aquila chrysaetos*)

All of Mendocino County is within both the summer and winter range for the Golden Eagle. However, Golden Eagles are not present in heavily forested areas as they forage in areas with large open grassy areas. Nesting habitat is usually on cliffs or in large trees that are in the open. The project area does not contain potential habitat, thus no significant adverse impacts are expected.

Peregrine Falcon (*Falco peregrinus*)

All of Mendocino County is considered both the winter and summer range of the Peregrine Falcon. Hunting is done from the air, rarely from a perch as other raptors. Common nesting habitat is near a water source and on high cliffs or banks. The project area does not contain habitat for this species, thus no significant adverse impacts are anticipated.

Marbled Murrelet (*Brachyramphus maramoratus*)

The Marbled Murrelet occurs during both the summer and winter along the coast of most of California. Marbled Murrelets are believed to stay on the ocean through the majority of the winter period. The typical distance for inland roosting habitat is up to five miles inland. However, murrelets have been seen as far as twenty-eight miles inland. The Marbled Murrelet typically nests in mature Douglas fir and Redwood forests or second growth forests with necessary limb structure. No potential Murrelet stands have been identified within the project area. Operations will not occur within 0.25 miles of known

Salmon Creek LWD Project Work Plan

Salmon Creek Large Wood Restoration Project Work Plan

Watershed Overview

The Salmon Creek watershed is located in Mendocino County on the North Coast of California. The Watershed drains approximately 8600 acres and continues to support relatively small but robust populations of steelhead trout and coho salmon. Hawthorne Timber Company, LLC owns approximately 51% of the watershed (Figure 1). Instream conditions such as discharge, thermal properties, and gradient typify many of the characteristics commonly associated with small Northern California watersheds. Discharge rates, which are not influenced by snow pack, vary significantly between summer and winter flows. Instream water temperatures are moderated by the coastal marine environment and range from 7°in winter to 15° C in summer.

The mainstem channel of Salmon Creek is a low gradient, moderately entrenched, alluvial channel. Field observations and habitat surveys both indicate that the lack of in-channel large woody debris (LWD) may be a limiting factor for salmonid production in the watershed. Fish and Game records from the 1980's document the deliberate removal of wood structures to "enhance fish migration". In reality, the removal of in-channel wood by Fish & Game representatives resulted in degraded habitat conditions for salmonids and reduced the overall carrying capacity for the stream channel. Fortunately, current riparian conditions and an improving trend in habitat quality is reflected in the number of spawning adults and subsequent juvenile salmon observed this season in Salmon Creek.

Monitoring data collected over the past 8 years in Salmon Creek suggest that fine sediments accumulated in the channel also have the potential to limit salmonid production. Frequent observations of bedrock in the channel, however, suggest sediment may actually be limited in some reaches. In addition, the landowner is already engaged in an aggressive road upgrade and abandonment strategy that is focused on treating controllable sources of sediment within the watershed.

Project Objectives

The proposed restoration activities are intended to accomplish the following objectives:

1. Increase channel roughness,
2. Improve gravel sorting and retention processes,
3. Enhance the complexity associated with in-channel habitat units,
4. Provide cover for juvenile salmon and steelhead rearing, and
5. Promote the development of channel-spanning wood jams.

Project Summary

In an effort to increase the potential of Salmon Creek to produce salmonids, Hawthorne Timber Company, LLC proposes to conduct a LWD restoration project for the reaches of Salmon Creek (including the Hazel Gulch Tributary) depicted on Figure 2. These low gradient stream reaches have an inherently high productive capability relative to the remainder of the watershed and is readily accessible from the adjacent truck road.

The proposed restoration project will be accomplished in general accordance with the methods outlined in the California Salmonid Stream Habitat Restoration Manual (3rd Edition, January 1998). One key diversion from the methods outlined in the California Salmonid Stream Habitat Restoration Manual is that structures proposed for this project will not be anchored, bolted or cabled in place. The landowner has recently demonstrated in Mill Creek (Ten Mile Watershed) that a more "hands-off" approach to LWD restoration also provides the same if not better desired outcome.

A total of thirteen stream segments are proposed for treatment (Table 1, Figure 3). A total of fourteen individual structures will be created within the thirteen selected stream segments[1]. Individual structures will be an aggregate of native materials including but not limited to: rootwads, logs and rocks. Native materials are abundant on site; therefore, project implementation will not require the felling of live trees from the Class I WLPZ. Four to six trees will be tipped over with a CAT off-site (outside of WLPZ and not associated with a THP) in order to obtain rootwads still attached to at least 10 feet of stem. Heavy equipment used to transport and manipulate LWD will avoid operations in the active channel to the extent possible.

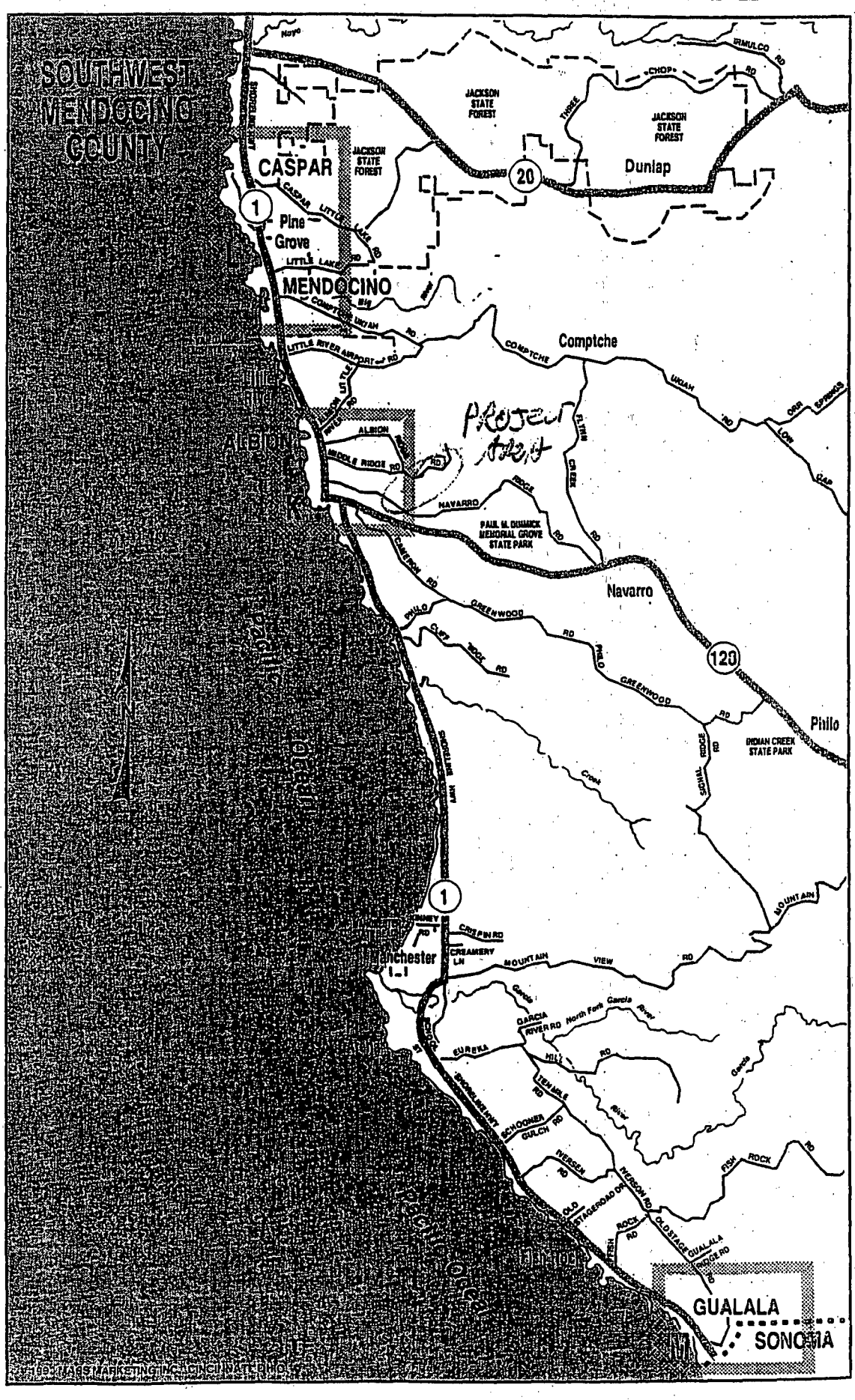
Table 1. Related Objectives by Stream Segment.

Segement #	Channel Roughness	Gravel Sorting	Habitat Complexity	Provide Cover	Promote Jams
0	X	X	X		
1	X	X	X		
2			X	X	
3	X	X	X		X
4	X		X	X	
5	X		X	X	X
6			X	X	
7	X	X	X		X
8	X	X	X		X
9			X	X	X
10			X	X	
11			X	X	
12			X	X	

Estimated Project Costs:

Total projects budget is estimated at $18,500. This estimate is primarily based on experience, existing site considerations and the heavy equipment required to complete the project.

[1] Two structures will be created at Segment # 0, located downstream of the Iron Gate bridge.



ATTACHMENT 1
(Draft Initial Study/Negative Declaration for the Salmon Creek Instream Enhancement Project)

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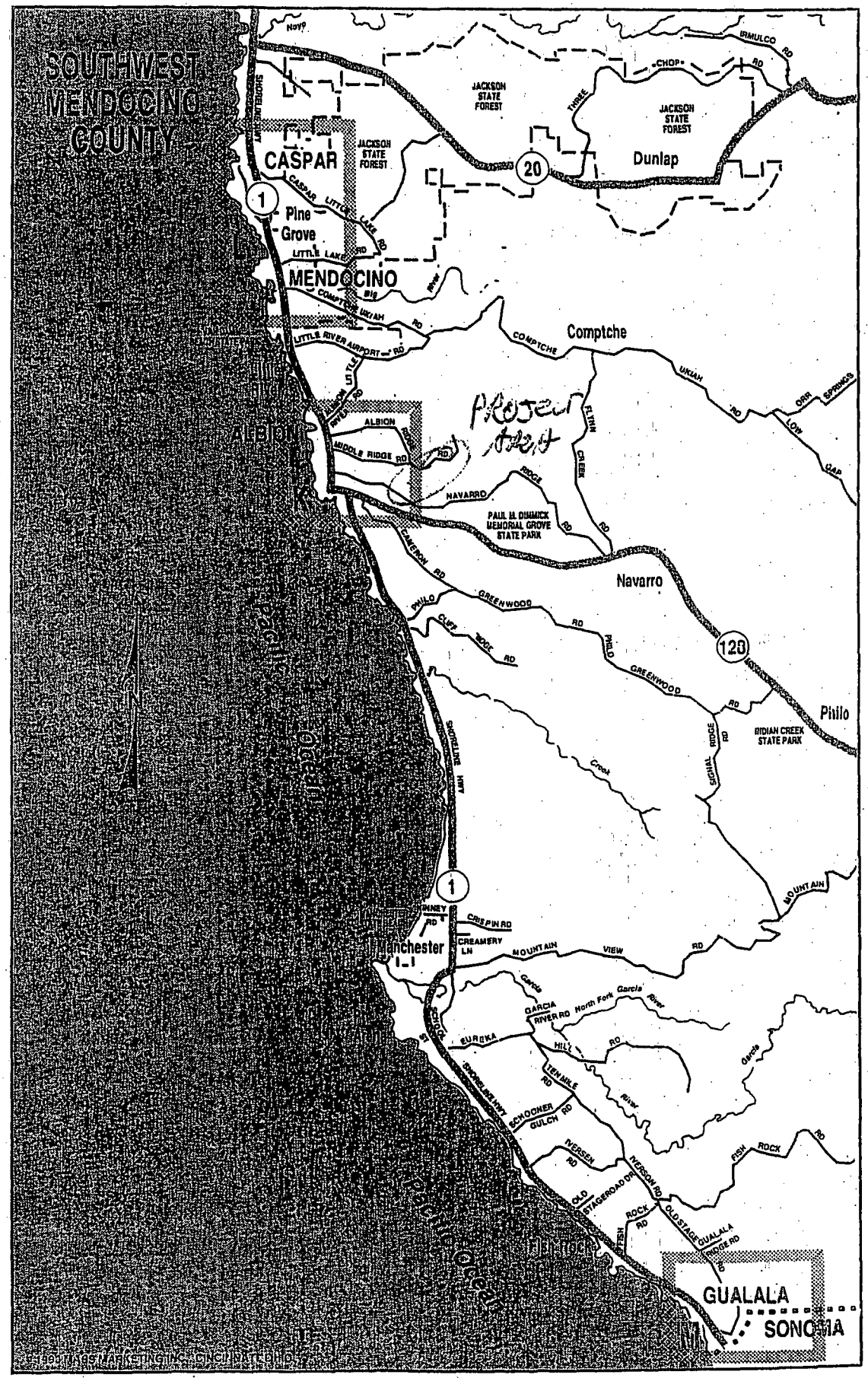
Appendices


SOUTHWEST MENDOCINO COUNTY
Navy9
IRMULCO RD
"CHOP" RD
JACKSON STATE FOREST
THREE
JACKSON STATE FOREST
Dunlap
20
CASPAR
JACKSON STATE FOREST
CASPAR LITTLE LAKE RD
1
Pine Grove
LITTLE LAKE RD
MENDOCINO
Big
COMPTCHE UKIAH RD
LITTLE RIVER AIRPORT RD
Comptche
COMPTCHE
UKIAH RD
ORR SPRINGS
LOW GAP
ALBION
ALBION RIDGE RD
MIDDLE RIDGE RD
FLYNN CREEK
RIDGE
NAVARRO
PAUL M. DIMMICK MEMORIAL GROVE STATE PARK
RD
CAMSPON RD
Navarro
PHILO GREENWOOD RD
CLIFF ROOF RD
PHILO GREENWOOD RD
128
Philo
INDIAN CREEK STATE PARK
SIGNAL RIDGE RD
Creek
SHORELINE HWY
1
MOUNTAIN
KINNEY RD
CRISPIN RD
CREAMERY LN
Manchester
MOUNTAIN VIEW RD
Garcia
GARCIA RIVER RD
North Fork Garcia River
EUREKA HILL RD
Garcia River
TEN MILE RD
SCHOONER GULCH RD
IVERSEN RD
IVERSON RD
FISH ROCK RD
OLD STAGE RD
STAGEROAD DR
ROCK
GUALALA RIDGE RD
GUALALA
SONOMA
Pacific Ocean

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3	X	X	X		X
4	X		X	X	
5	X		X	X	X
6			X	X	
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Salmon Creek Large Wood Restoration Project Work Plan

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The mainstem channel of Salmon Creek is a low gradient, moderately entrenched, alluvial channel. Field observations and habitat surveys both indicate that the lack of in-channel large woody debris (LWD) may be a limiting factor for salmonid production in the watershed. Fish and Game records from the 1980's document the deliberate removal of wood structures to "enhance fish migration". In reality, the removal of in-channel wood by Fish & Game representatives resulted in degraded habitat conditions for salmonids and reduced the overall carrying capacity for the stream channel. Fortunately, current riparian conditions and an improving trend in habitat quality is reflected in the number of spawning adults and subsequent juvenile salmon observed this season in Salmon Creek.

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Salmon Creek LWD Project Work Plan

FROM THP 1-04-061 SON

Table 3-7. Results of Hillslope Hazard Analysis
(percentage of stream miles)

Watershed	Erosion and Mass Wasting (percent)			Streamside Landslides (percent)			Road (percent)		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
2 Upper Indian Creek	4	96	0	4	96	0	100	0	0
3 Lower Indian Creek	0	100	0	0	100	0	73	13	14
5 Piercy Creek	0	100	0	0	100	0	0	86	14
6 Standley Creek	0	0	100	0	100	0	0	0	100
7 Bear Pen Creek	0	50	50	0	50	50	92	8	0
10 Wild Cat Creek	0	0	100	0	0	100	100	0	0
15 Hollow Tree Creek	0	100	0	0	100	0	60	40	0
16 Low Gap Creek	0	10	90	0	0	100	0	90	10
28 Dutch Charlie Creek	61	39	0	85	15	0	100	0	0
Eel River Basin Total Percent	7	71	22	9	75	15	68	22	11
9 Upper Usal Creek	13	55	32	13	72	15	6	19	76
19 Lower Usal Creek	18	57	26	0	100	0	70	30	0
Usal River Basin Total Percent	15	56	29	7	84	9	33	23	44
27 Dehaven Creek	0	0	100	0	0	100	7	39	53
30 Wages Creek	16	0	84	7	15	78	0	9	91
34 Chadbourne Creek	15	85	0	15	0	85	85	15	0
36 Abalobadiah Creek	0	0	100	0	41	59	18	0	82
53 Mill Creek Cleone	100	0	0	100	0	0	100	0	0
Small Coastal Basins Total Percent	16	8	76	13	13	74	23	15	62
37 Little North Fork Ten Mile River	10	40	50	0	70	30	10	7	83
38 Lower North Fork Ten Mile River	4	71	25	6	69	25	6	71	23
39 Upper North Fork Ten Mile River	51	25	25	51	49	0	63	22	15
41 Lower Ten Mile River	0	81	19	0	81	19	0	81	19
42 Lower Clark Fork Ten Mile River	0	57	43	0	96	4	57	30	13
43 Middle Clark Fork Ten Mile River	0	75	25	0	83	17	64	18	18
44 Upper Clark Fork Ten Mile River	15	85	0	15	85	0	52	48	0
45 Lower South Fork Ten Mile River	6	64	30	6	80	14	40	60	0
46 Middle South Fork Ten Mile River	0	74	26	0	74	26	59	41	0
47 Redwood Creek	0	100	0	43	57	0	0	100	0
48 Upper South Fork Ten Mile River	12	88	0	0	100	0	0	57	43
Ten Mile River Basin Total Percent	8	67	25	9	77	14	34	48	18
52 Little Valley Creek	100	0	0	100	0	0	0	100	0
55 Pudding Creek	41	41	19	24	76	0	41	44	15
Pudding Creek Basin Total Percent	46	37	17	31	69	0	37	49	14
56 Lower Noyo River	53	0	47	15	85	0	15	0	85
57 Middle Noyo River	14	0	86	14	86	0	8	53	39
58 Upper Noyo River	94	0	6	100	0	0	23	43	34
59 Lower South Fork Noyo River	61	0	39	52	48	0	0	39	61
Noyo River Basin Total Percent	46	0	54	39	61	0	10	39	50
65 Little North Fork Big River	100	0	0	100	0	0	52	20	28
69 Lower Big River	58	42	0	29	71	0	58	0	42
70 Lower Middle Big River	18	78	4	18	82	0	0	13	87
71 Laguna Creek	100	0	0	100	0	0	0	100	0
Big River Basin Total Percent	50	48	2	41	59	0	24	20	56
78 Salmon Creek	13	87	0	84	16	0	19	19	61
Salmon Creek Basin Total Percent	13	87	0	84	16	0	19	19	61
Total	20	52	28	19	66	15	35	34	31

Table 3-9. Continued

Watershed	Sediment Deposition			Channel Scour			Bank Erosion			Reduced Pool Formation		
	Low Sensitivity	Intermediate Sensitivity	High Sensitivity	Low Sensitivity	Intermediate Sensitivity	High Sensitivity	Low Sensitivity	Intermediate Sensitivity	High Sensitivity	Low Sensitivity	Intermediate Sensitivity	High Sensitivity
52 Little Valley Creek	0	0	100	0	100	0	0	0	100	47	53	0
55 Pudding Creek	0	57	43	44	15	41	41	59	0	59	24	17
Pudding Creek Basin Total Percent	0	52	48	40	23	37	37	54	10	58	27	15
56 Lower Noyo River	0	15	85	0	30	70	32	38	30	53	32	15
57 Middle Noyo River	0	41	59	14	14	72	40	20	40	46	41	14
58 Upper Noyo River	14	31	55	21	25	55	60	14	26	55	21	25
59 Lower South Fork Noyo River	14	53	33	32	40	28	25	23	52	61	17	22
Noyo River Basin Total Percent	6	37	57	17	24	59	39	22	38	52	30	18
65 Little North Fork Big River	0	51	49	0	100	0	28	0	72	57	43	0
69 Lower Big River	0	12	88	0	29	71	29	42	29	100	0	0
70 Lower Middle Big River	4	15	81	0	18	82	18	28	54	40	60	0
71 Laguna Creek	0	50	50	0	50	50	50	50	0	50	50	0
Big River Basin Total Percent	2	23	76	0	36	64	26	31	43	62	38	0
78 Salmon Creek	0	39	61	35	43	22	10	25	65	39	61	0
Salmon Creek Basin Total Percent	0	39	61	35	43	22	10	25	65	39	61	0
Total	21	38	42	14	45	41	27	33	40	34	47	19

Table 3-11. Continued

Watershed	Habitat Complexity - High Quality	Habitat Complexity - Medium Quality	Habitat Complexity - Low Quality	Fine Sediment - High Quality	Fine Sediment - Medium Quality	Fine Sediment - Low Quality	Coarse Sediment - High Quality	Coarse Sediment - Medium Quality	Coarse Sediment - Low Quality	Shade - High Quality	Shade - Medium Quality	Shade - Low Quality
57 Middle Noyo River	22	61	17	0	20	80	83	17	0	38	50	12
58 Upper Noyo River	0	86	14	0	28	72	74	12	14	86	14	0
59 Lower South Fork Noyo River	14	77	9	52	17	31	78	22	0	87	13	0
Noyo River Basin Total Percent	18	68	14	11	18	72	80	17	3	56	39	5
65 Little North Fork Big River	100	0	0	0	52	48	52	48	0	48	52	0
69 Lower Big River	59	41	0	0	0	100	100	0	0	42	29	29
70 Lower Middle Big River	5	95	0	0	42	58	96	4	0	23	77	0
71 Laguna Creek	50	50	0	0	0	100	50	50	0	100	0	0
Big River Basin Total Percent	39	61	0	0	26	74	87	13	0	41	50	9
78 Salmon Creek	27	73	0	0	50	50	49	51	0	94	6	0
Salmon Creek Basin Total Percent	27	73	0	0	50	50	49	51	0	94	6	0
Total	9	60	31	20	45	35	53	32	16	56	34	9

Table 6 summar
Riffles fully measure
Mean percen
Mean perc

STREAM INVENTORY REPORT
WATERSHED 78 OVERVIEW

WATERSHED OVERVIEW

Salmon Creek is a tributary to the Pacific Ocean (Figure 1). Elevations range from sea level at the mouth to 1,200 feet in the headwater areas. Salmon Creek's legal description at the confluence with the Pacific Ocean is T16N R17 Sec35. Its location is 39°12'4" N. latitude and 123°42'56" W. longitude according to the USGS Elk 7.5 minute quadrangle. The following results are an analysis of the segment of Salmon Creek included in Georgia-Pacific Planning Watershed #78. This segment of Salmon Creek drains a watershed of approximately 8,600 acres and three Class 1 tributaries: Hazel Gulch, Donnelly Gulch and Ketty Gulch. In the Salmon Creek Watershed, there is one additional unsurveyed tributary located off Georgia-Pacific property. The results of Watershed 78 are presented in three parts: the surveyed tributaries, the mainstem and an overall summary of the watershed which includes the data from the mainstem and tributaries combined.

WATERSHED 78 TRIBUTARIES HABITAT INVENTORY RESULTS

The total length of surveyed stream in Watershed 78 tributaries was 28,051 feet (5.3 miles, 8.5 KM) (Table 1).

Table 1 summarizes the Level II Riffle, Flatwater and Pool Habitat Types. By percent occurrence Riffles comprised 14%, Flatwater units 30% and Pools 53% of the habitat types (Graph 1). By percent total length, Riffles comprised 8%, Flatwater 49% and Pools 40% (Graph 2).

Eighteen Level IV Habitat Types were identified and are summarized in Table 2. The most frequently occurring habitat types were Mid Channel Pools 26% and Step Runs and Runs, both at 14% (Graph 3). The most prevalent habitat types by percent total length were Step Runs at 32%, Mid Channel Pools 20% and Runs 15% (Table 2).

Table 3 summarizes Main, Scour and Backwater Pools which are Level III Pool Habitat Types. Main pools were most often encountered at 51% occurrence and comprised 51% of the total length of pools.

Table 4 is a summary of maximum pool depths by Level IV Pool Habitat Types. Pools with depths of three feet (.91 m) or greater are considered optimal for fish habitat. In Watershed 78 tributaries, 146 of the 397 pools (37%) had a depth of three feet or greater (Graph 6).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the pool tail-outs measured, 8% had a value of 1, 1% had a value of 2, 1% had a value of 3 and 89% had a value of 4 (Graph 7).

Of the Level II Habitat Types, Pools had the highest mean shelter rating at 26 (Table 1). Of the Level III Pool Habitat Types, Scour Pools had the highest mean shelter rating at 31 (Table 3).

Of the 397 pools, 11% were formed by Large Woody Debris (LWD): 7% by logs and 4% by root wads (calculated from Table 4).

Table 6 summarizes dominant substrate by Level IV Habitat Types. Of the Low Gradient Riffles fully measured, 86% had gravel as the dominant substrate (Graph 8).

Mean percent closed canopy was 88%: 68% coniferous trees and 20% deciduous trees. Mean percent open canopy was 12% (Graph 9, calculated from Table 7).

Table 7 summarizes the mean percent substrate/vegetation types found along the banks of the stream. Mean percentage right bank vegetated was 74% while mean percent left bank vegetated was 76%. Grass was the dominant bank vegetation type in 36% of the units fully measured. The dominant substrate composing the structure of the stream banks was Sand/Silt/Clay, found in 94% of the units fully measured.

WATERSHED 78 MAINSTEM HABITAT INVENTORY RESULTS

The total length of surveyed stream in Watershed 78 mainstem was 21,218 feet (4.0 miles, 6.4 KM) (Table 1).

Table 1 summarizes the Level II Riffle, Flatwater and Pool Habitat Types. By percent occurrence Riffles comprised 11%, Flatwater units 32% and Pools 57% of the habitat types (Graph 1). By percent total length, Riffles comprised 6%, Flatwater 37% and Pools 57% (Graph 2).

Fourteen Level IV Habitat Types were identified and are summarized in Table 2. The most frequently occurring habitat types were Mid Channel Pools 29%, Glides 13% and Runs 11% (Graph 3). The most prevalent habitat types by percent total length were Mid Channel Pools at 29%, Step Runs 16% and Glides 14% (Table 2).

Table 3 summarizes Main, Scour and Backwater Pools which are Level III Pool Habitat Types. Main pools were most often encountered at 51% occurrence and comprised 50% of the total length of pools.

Table 4 is a summary of maximum pool depths by Level IV Pool Habitat Types. Pools with depths of two feet (.61 m) or greater are considered optimal for fish habitat. In Watershed 78 mainstem, 146 of the 239 pools (61%) had a depth of two feet or greater (Graph 6).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the pool tail-outs measured, 4% had a value of 1, 13% had a value of 2, 20% had a value of 3 and 63% had a value of 4 (Graph 7).

Of the Level II Habitat Types, Pools had the highest mean shelter rating at 93 (Table 1). Of the Level III Pool Habitat Types, Scour Pools had the highest mean shelter rating at 104 (Table 3).

Of the 239 pools, 23% were formed by Large Woody Debris (LWD): 15% by logs and 8% by root wads (calculated from Table 4).

Table 6 summarizes dominant substrate by Level IV Habitat Types. Of the Low Gradient Riffles fully measured, 100% had gravel as the dominant substrate (Graph 8).

Mean percent closed canopy was 91%: 41% coniferous trees and 50% deciduous trees. Mean percent open canopy was 9% (Graph 9, calculated from Table 7).

Table 7 summarizes the mean percent substrate/vegetation types found along the banks of the stream. Mean percentage right bank vegetated was 91% while mean percent left bank vegetated was 89%. Deciduous trees were the dominant bank vegetation type in 66% of the units fully measured. The dominant substrate composing the structure of the stream banks was Sand/Silt/Clay, found in 92% of the units fully measured.

WATERSHED 78 HABITAT INVENTORY RESULTS

The total length of surveyed stream in Watershed 78 was 49,269 feet (9.3 miles, 14.9 KM) (Table 1).

Table 1 summarizes the Level II Riffle, Flatwater and Pool Habitat Types. By percent occurrence Riffles comprised 13%, Flatwater 31% and Pools 54% of the habitat types (Graph 1). By percent total length, Riffles comprised 7%, Flatwater 44% and Pools 48% (Graph 2).

Nineteen Level IV Habitat Types were identified and are summarized in Table 2. The most frequently occurring habitat types were Mid Channel Pools at 27%, Runs 13% and Step Runs 12% (Graph 5). The most prevalent habitat types by percent total length were Step Runs at 25%, Mid Channel Pools 23% and Runs 11% (Table 2).

Table 3 summarizes Main, Scour and Backwater pools which are Level III Pool Habitat Types. Main pools were most often encountered at 51% occurrence and comprised 50% of the total length of pools.

Table 4 is a summary of maximum pool depths by Level IV Pool Habitat Types. In second order streams pools with depths of two feet (.61 m) or greater are considered optimal for fish habitat. In Watershed 78, 292 of the 636 pools (46%) had a depth of two feet or greater (Graph 6).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the pool tail-outs measured, 7% had a value of 1, 5% had a value of 2, 8% had a value of 3 and 79% had a value of 4 (Graph 7).

Of the Level II Habitat Types, Pools had the highest mean shelter rating at 47 (Table 1). Of the Level III Pool Habitat Types, Scour Pools had the highest mean shelter rating at 52 (Table 3).

Of the 636 pools, 16% were formed by Large Woody Debris (LWD): 10 by logs and 5% by root wads (calculated from Table 4).

Table 6 summarizes dominant substrate by Level IV Habitat Types. Of the Low Gradient Riffles fully measured, 89% had gravel as the dominant substrate (Graph 8).

Mean percent closed canopy was 89%: 60% coniferous trees and 29% deciduous trees. Mean percent open canopy was 11% (Graph 11, calculated from Table 7).

Table 7 summarizes the mean percent substrate/vegetation types found along the banks of the stream. Mean percent right bank vegetated was 80% while mean percent left bank

...iduous trees.
...nks of
...egetated was also 80%. Deciduous trees were the dominant bank vegetation type in 36% of the units fully measured. The dominant substrate composing the structure of the stream banks was Sand/Silt/Clay, found in 93% of the units fully measured.

DISCUSSION

The information gathered in the process of habitat typing will provide Georgia-Pacific with baseline data on the current condition of this watershed and the available habitat for salmonids. These data can be used to identify components of the habitat in need of enhancement so appropriate conditions for Watershed 78 can be obtained over time.

Level II habitat types by percent occurrence and length

Overall, Flatwater habitat types comprised a medium percentage of the units by both percent occurrence and percent length at 31% and 44% in Watershed 78 (Table 1 and Graph 1). Watershed 78 tributaries had a low percentage of flatwater habitat types by percent occurrence at 30% and a medium percentage by percent length at 49%. Watershed 78 mainstem had a medium percentage of flatwater habitat types by both percent occurrence and percent length at 32% and 37%. These unit types usually do not provide optimal spawning or rearing habitat for salmonids.

Riffle habitat units comprised a low percentage by both percent occurrence and percent length at 13% and 7% in Watershed 78 overall. The tributaries had a low percentage of riffle habitat units by both percent occurrence and percent length at 14% and 8%. Riffle habitat units comprised a low percentage by both percent occurrence and length at 11% and 6% respectively in the mainstem.

Pools comprised a medium percentage by both percent occurrence and percent length at 54% and 48% in Watershed 78 overall. The tributaries consisted of a medium percentage of pools by both percent occurrence and length at 53% and 40% respectively. The mainstem also consisted of a medium percentage of pools by both percent occurrence and length at 57% each.

Riffles usually provide good spawning habitat while pools provide important rearing habitat. In addition, Mundie (1969) reported that invertebrate food production is maximized in riffles while pools provide an optimum feeding environment for coho. In fact, the most productive streams are those consisting of a pool to riffle ratio of approximately one to one (Ruggles 1966).

Pool Depth

According to Flosi and Reynolds (1994), a stream with at least 50% of its total habitat composed of primary pools is generally desirable. Primary pools are at least two feet deep in first and second order streams and at least three feet deep in third order streams. The information from Graph 6 on maximum depth in pools was used to determine percentage of primary pools. Watershed 78, which consists of a fourth order stream, is composed mainly of shallow pools with only 46% of the pools having a maximum depth of two feet or greater.

The tributaries, which are second order streams, are composed of shallow pools with 37% of the pools having a maximum depth of two feet or greater. However, the mainstem, a fourth order stream, consists of deep pools with 61% of the pools having a maximum depth of two feet or greater.

Instream Shelter

Instream shelter ratings are derived from two measurements: instream shelter complexity and instream shelter percent cover. The first is a value rating which provides a relative measure of the quality and composition of the shelter, and the second is a measure of the area of a habitat unit covered by shelter. The various types of instream shelter include LWD, SWD, boulders, root wads, terrestrial vegetation, aquatic vegetation, bedrock ledges and undercut banks. Of the Level II habitat types in Watershed 78, Pools had the highest shelter rating at 47. Of the Level III habitat types Scour Pools had the highest shelter rating at 52. These values are low since Shelter values of 80 or higher are considered optimal for good rearing habitat (Flosi and Reynolds 1994).

Of the Level II habitat types in the tributaries, Pools had the highest shelter rating at 26. Of the Level III habitat types Scour Pools had the highest shelter rating at 31. These values are low.

Shelter values in the mainstem were higher than those in the tributaries are considered adequate for providing good rearing habitat. Of the Level II habitat types in the mainstem, Pools had the highest shelter rating at 93. Of the Level III habitat types Scour Pools had the highest shelter rating at 104.

Large Woody Debris

The presence of Large Woody Debris in streams is a significant component of fish habitat. Woody debris creates areas of low flow, providing a refuge for fish during periods of high flow (Robison and Beschta, 1990). Woody debris also provides cover for fish, lowering the risk of predation. The percent of pools formed by LWD in Watershed 78 overall was 16%. The Tributaries had 11% of its pools formed by LWD while the mainstem had 23%. Whether these numbers are high or low, relative to the needs of salmonids is difficult to ascertain since the optimum amount of woody debris in streams has not been specified (Robison and Beschta 1990). However, based on data from Georgia-Pacific's 1995 Aquatic Vertebrate Study, the only coho found in the Ten Mile River Basin were in stream reaches where approximately 50% of pools were formed by large woody debris. Those reaches that did not support coho had a significantly lower percentage of pools formed by large woody debris (Ambrose et al, 1996). This suggests that a low percentage of LWD formed pools could adversely affect juvenile Coho Populations (C.S. Shirvel 1990).

The above LWD analysis pertains only to pools formed by logs or root wads as described in Flosi and Reynolds (1994): Lateral Scour Pool Log Enhanced, Lateral Scour Pool Root Wad Enhanced, Backwater Pool Log Formed and Backwater Pool Root Wad Formed. Other pools containing LWD as a component were not included in the calculation. For example,

plunge pools may be formed by boulders, bedrock or LWD but are not described as such by habitat unit types. Therefore, the LWD formed pool calculation is limited to four pool types and does not quantify the total amount of LWD in Watershed 78.

Canopy

There are two important benefits of canopy cover in coastal streams. Canopy keeps stream temperatures cool as well as providing nutrients in the form of leaf litter and organic material (Bilby 1988). This leaf litter, organic material, and their associated nutrients are utilized as a food source by benthic macroinvertebrates (aquatic insects). The macroinvertebrates, in turn, are major food sources for most fish species in forested areas (Gregory et al., 1987). Mean percent canopy cover for Watershed 78 overall was 89%. This is relatively high since a canopy cover of 80% or higher is considered optimum, Flosi and Reynolds (1994). Mean percent canopy cover was relatively high for the tributaries at 88% even higher for the mainstem at 91%.

Coniferous trees occupied a larger portion of the canopy than deciduous trees in Watershed 78 overall. Coniferous trees comprised 60% and deciduous trees 29% of the canopy. Wood from coniferous trees deteriorates less rapidly than wood from deciduous species (Sedell, *et al.* 1988). Therefore, more LWD would be available in the future for fish cover and LWD formed pools in this watershed and other creeks dominated by coniferous species.

Deciduous trees occupied a larger portion of the canopy than did coniferous trees in the mainstem however, in the tributaries the majority of the canopy was comprised of coniferous trees. Coniferous trees comprised 68% of the canopy in the tributaries and 41% in the mainstem.

Embeddedness

High embeddedness values (silt levels), such as those found in Watershed 78, have been associated with many negative impacts on salmonids. These negative impacts can be observed in important environmental components of salmonid habitat such as pool habitats, dissolved oxygen levels and water temperatures.

High silt levels also impact dissolved oxygen levels. They do so by reducing water circulation within the substrate, thus lowering the oxygen levels needed by salmonid eggs (Sandercock, 1991). This can hinder the survival of the eggs deposited in the redds.

Water temperature is impacted by high silt levels in several ways. Hagans et al (1986) reported the following impacts to water temperatures: 1) the loss of a reflective bottom; 2) darker sediment (as opposed to clean gravels) storing heat from direct solar radiation which is then transferred to the water column; and 3) a reduction in the flow of water through the substrate interstitial spaces thereby exposing more of the water column to direct solar radiation.

Another means by which water temperatures are increased is through the widening of stream channels: over time, high silt levels increase the substrate surface level of the creek, resulting in a wider, shallower stream channel (Flosi and Reynolds 1994). In shallow streams

more surface area is exposed to the sun relative to the volume of water, leading to an increase in solar heating which in turn leads to higher water temperatures.

Substrate embedded with silt in varying degrees were given corresponding values as follows: 0-25% = value 1, 26 - 50% = value 2, 51 - 75% = value 3 and 76 - 100% = value 4. According to Flosi and Reynolds (1994), creeks with embeddedness values of two or higher are considered to have poor quality fish habitat. In Watershed 78, 92% of the pool tail-outs measured had embeddedness values of two or more. The embeddedness values for the tributaries and the mainstem were similar, with the tributaries having 91% of its pools with values of two or more and the mainstem 96%.

It is important to consider, however, that the above embeddedness values were obtained in the summer during low flow conditions. In winter and spring, flows are usually higher due to the rainy season and the lowered evapotranspiration of the trees. This higher flow can carry some of the previously deposited silt to sites further downstream. Therefore, embeddedness values may fluctuate throughout the year along different sections of the stream.

Substrate

In Watershed 78, 89% of the Low Gradient Riffles had gravel as the dominant substrate. The tributaries had 86% and the mainstem 100% of their riffles with gravel as the dominant substrate. The high concentration of gravel in riffles indicates that there is a sufficient amount of substrate available as potential spawning habitat. While this watershed had sufficient substrate for spawning in the riffles surveyed, the overall percentage of riffles in the surveyed portions of the watershed was relatively low at 13% (Table 1). The tributaries and mainstem also had a relatively low percentage of riffles at 14% and 11% respectively. Subsequently, there may be a lack of sufficient spawning habitat in this watershed. Another point to consider is that regardless of the amount of substrate or spawning habitat available, this habitat may not be suitable for salmonids if it is highly embedded.

Overall, the surveyed portions of Watershed 78 appear to have sufficient canopy and a sufficient amount of substrate for spawning. However, this watershed also appears to have a relatively low percentage of primary and LWD formed pools as well as low shelter values and high embeddedness values. In addition, while there was sufficient substrate for spawning, habitat for spawning appeared to be limited.

The tributaries appear to have a high percentage of LWD formed pools, sufficient canopy and sufficient substrate for spawning. However, the tributaries also appear to have a low percentage of primary pools, low shelter values and high embeddedness values. There also appears to be limited habitat for spawning.

The mainstem appears to have a high percentage of primary pools and sufficient substrate for spawning. However, there is also a low percentage of LWD formed pools, low shelter values, high embeddedness values, insufficient canopy and insufficient habitat for spawning.

Georgia-Pacific recognizes that there are areas of the Watershed 78 in need of enhancement, and where feasible will attempt to restore those areas over time as part of its

an increase

long term management plan. The company will also attempt to facilitate a healthy environment for salmonids in this watershed through sound management practices.

RECOMMENDATIONS

Watershed 78 should be managed as an anadromous, natural production watershed.

Sources of stream bank erosion should be mapped and prioritized according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediment entering the watershed. In addition, sediment sources related to road systems need to be identified, mapped and treated according to their potential for sediment yield to the watershed.

Where feasible, design and engineer pool enhancement structures to increase the depth of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

Shelter values throughout Watershed 78 could be increased by addition of large logs and root wads, boulder clusters, log and boulder wiers and log and boulder deflectors. These need to be placed carefully to prevent washing out in high flows. The Stream Habitat Restoration Manual, by Flosi and Reynolds, 1994, provides detailed descriptions for restoration efforts.

Increase the canopy in Watershed 78 by planting willow, alder, redwood and Douglas-fir along the watercourses where shade canopies are not at acceptable levels. Planting efforts need to be coordinated to follow bank stabilization or upslope erosion control projects.

Log debris accumulations retaining large quantities of fine sediment should be modified if necessary, over time, to avoid excessive sediment loading in downstream reaches.

SURVEY MEMOS

The following memos were taken in the field at the time of survey. All distances are approximate and measured in feet from the confluence.

Watershed 78 Mainstem - Salmon Creek:

75	RBA site
217	hobo temp pool
1367	channel type done here and is an F4
2015	tributary enters right bank at 53'
2738	5 redds observed
3400	2 redds observed
4889	3 redds

5255 log jam in middle of pool, mostly SWD and root wad: 6'H x 20'W x 12'L
6013 one redd observed
7906 kingfisher observed
8514 tributary entering left bank at 41'
9165 bridge crossing over end of unit at 26' ends at 43'
9572 log jam over pool, mostly LWD 5'h x 15'w x 8'l
9718 one redd observed
9880 tributary entering right bank at 7'
10378 bridge crossing over road; approximately 18'l
11461 two redds observed
11645 3 redds observed
12400 log jam over unit 13'w x 5'h x 20'l
13219 4 redds observed
13549 tributary entering right bank at 103'
14012 tributary entering right bank at end of unit
14108 3 redds observed
14409 RBA site
14472 hobo temp pool site
14728 2 redds observed
14975 Ketty gulch enters left bank at 8'
15675 one redd observed
16141 tributary entering right bank at 22'
17432 tributary entering right bank at 59'
17793 tributary entering right bank at 10'
18841 tributary entering right bank at end of unit
19714 creek enters right bank at 36'
19901 3' undercut bank on right bank
21031 hobo temp site
21045 RBA site
21218 End of survey

Watershed 78 Tributary – Donnelly Gulch:

115 hobo temp pool
153 RBA site
349 left bank melange
386 right bank melange
428 left bank melange
538 channel type here, B4
850 tributary enters right bank
4167 melange trench
4211 road crossing, culvert 6'

4221 turns into a trench 1-2' wide
4642 tributary entering left bank at 29'
5549 End of survey; melange channel bottom in this unit and previous 10 units; creek barely flowing; for last 5 or 6 pages channel bottom comprised primarily of franciscan melange with no fish observed in last 3 pages; loss of suitable spawning habitat- ocular survey for 1/4 mile upstream no fish, no habitat, no creek

Watershed 78 Tributary - Hazel Gulch:

290 substrate 100% silt; bridge crossing
410 substrate 100% silt
478 substrate 100% silt up to unit # 24
1064 channel type here, B4
6736 major log jam, much LWD, 10'x 12' x 20'
8432 RBA site
8458 hobo temp pool; dry tributary entering right bank at 14'; begins with a 10' bedrock sheet with approximately 12% slope
11985 channel type changes to F4
12255 old foot bridge is the 100% canopy
14591 left bank melange
14613 left bank melange
15053 RBA site
15130 hobo pool
18294 melange
20777 End of survey; channel has become a wide trench dominated by silt; no suitable habitat for spawning; flow reduced to trickle/intermittent; gradient approximately 10% around corner

Watershed 78 Tributary - Ketty Gulch:

420 substrate is franciscan melange
1669 End of survey; creek a 2' wide trench, highly silted substrate; fish only present for first two pages

DIH

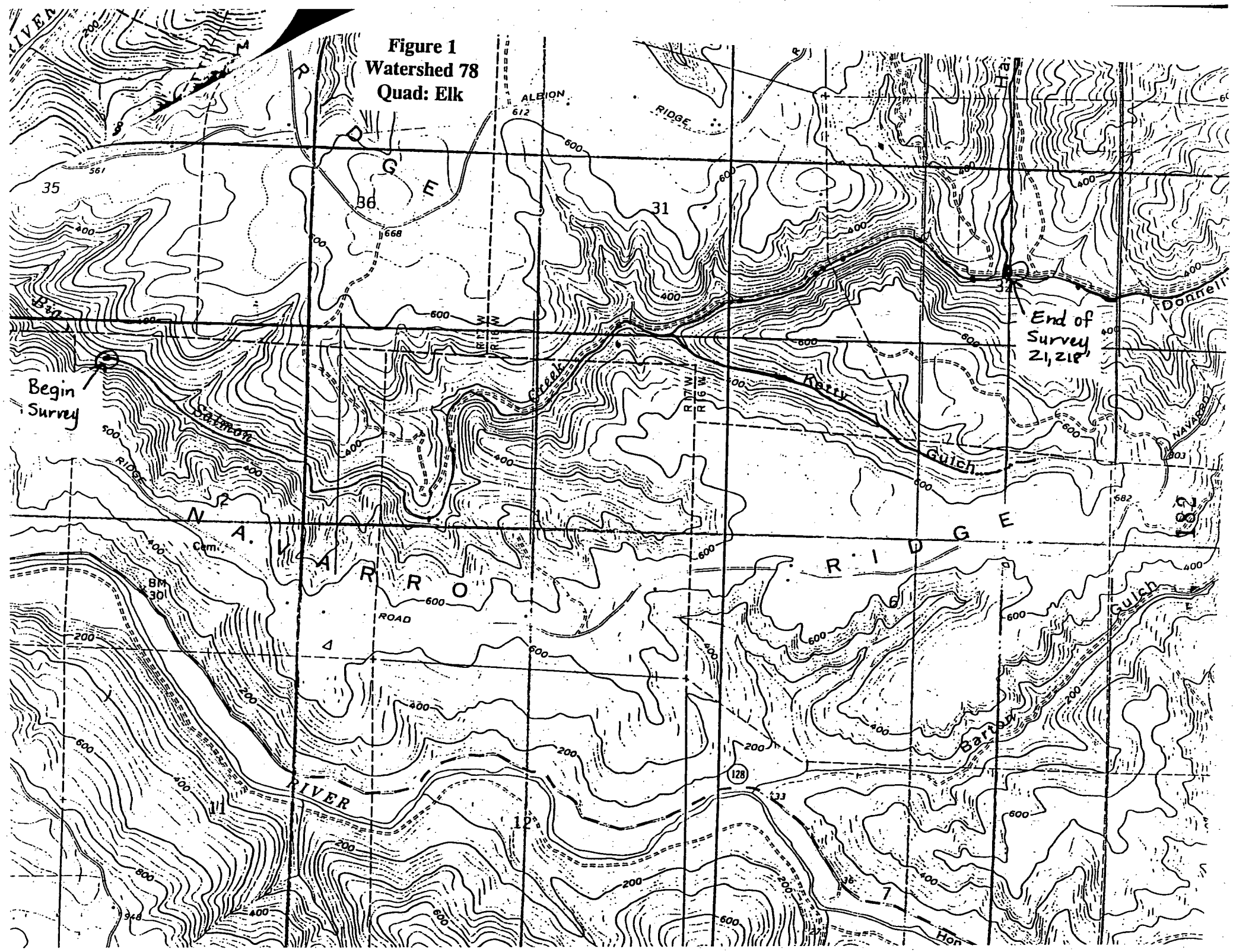
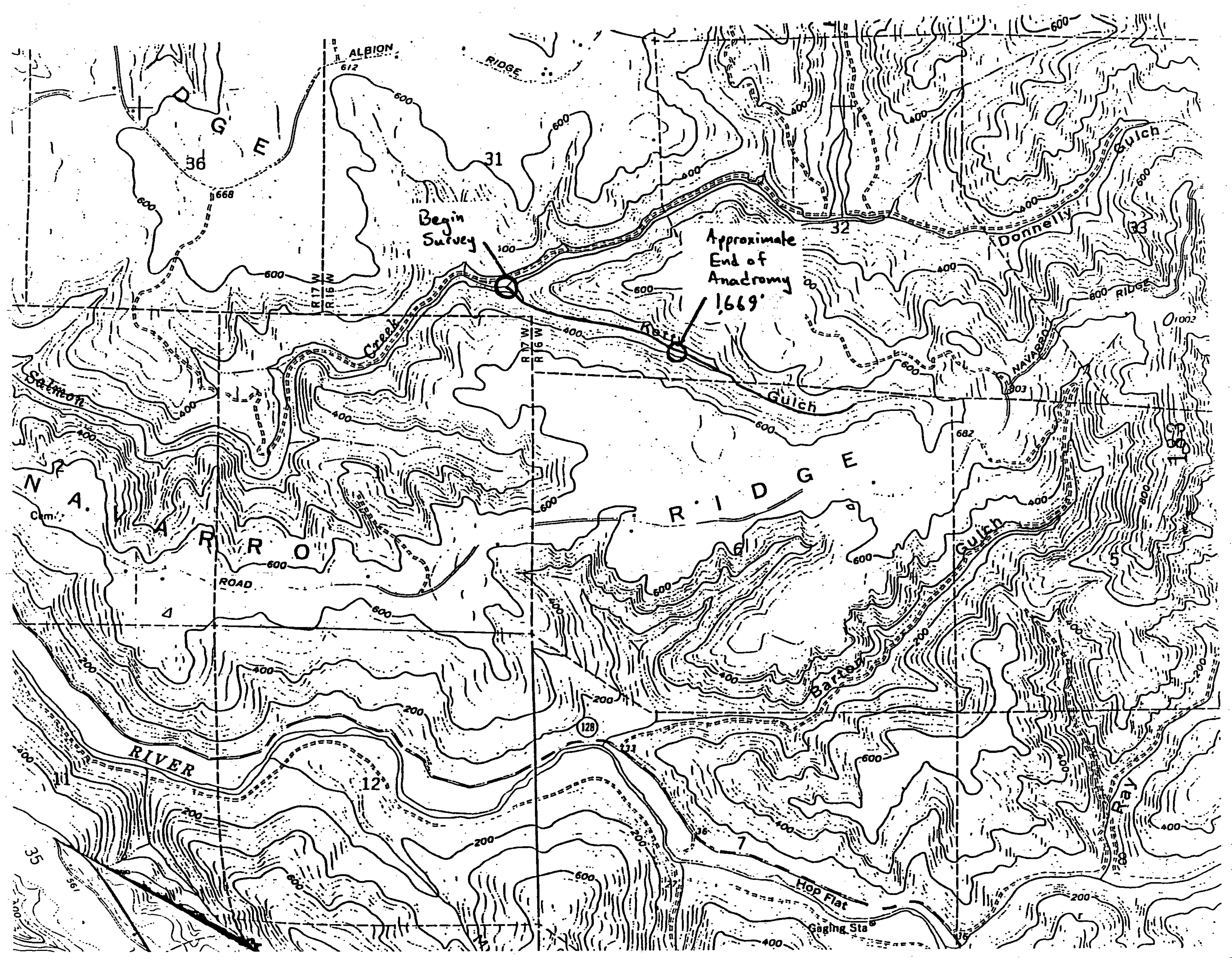
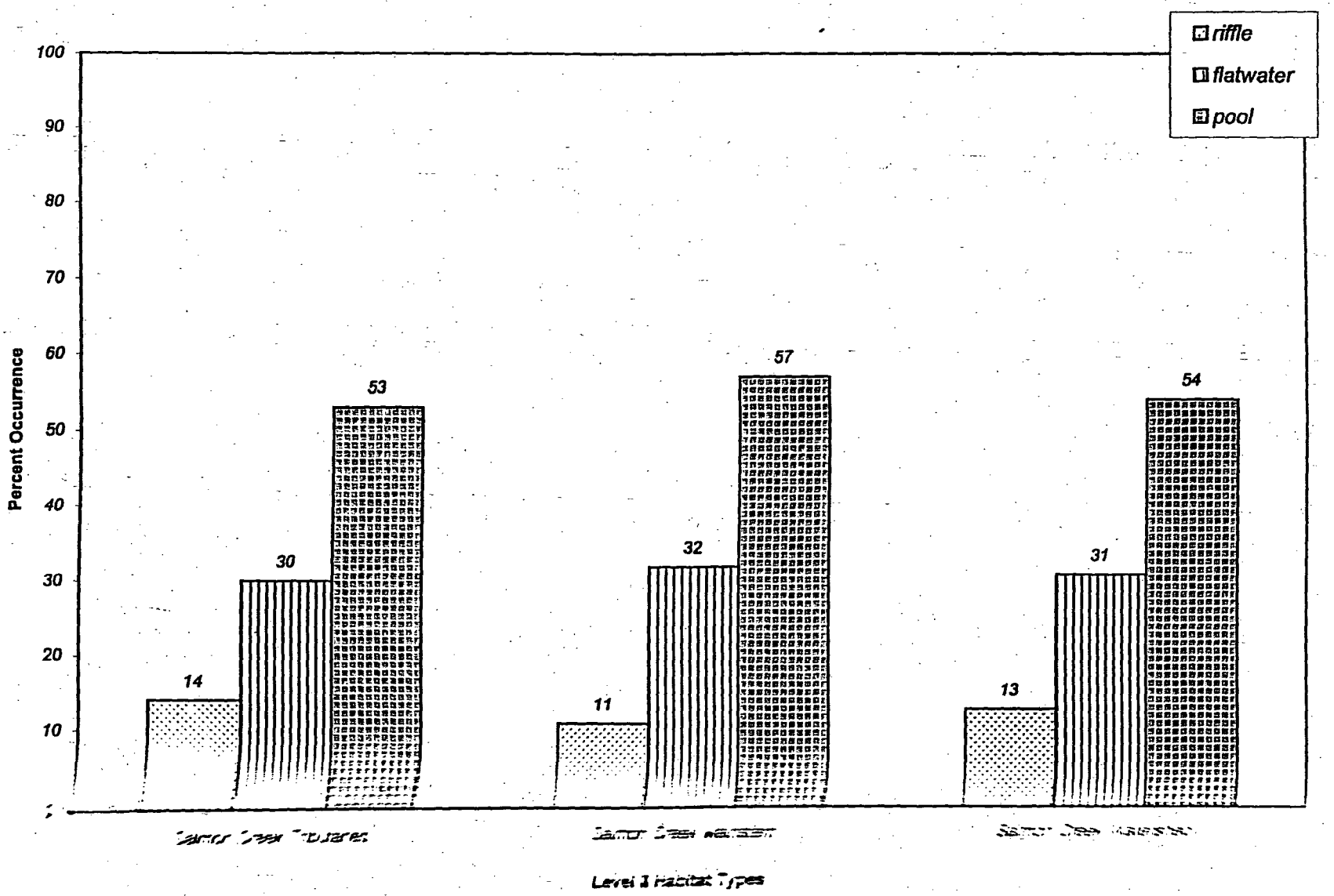


Figure 1
Watershed 78
Quad: Elk
Begin Survey
End of Survey 21,218'
Salmon Creek
Kerry Gulch
Donnell
NAVARRO RIDGE
NAVARRO ROAD
Navarro Cem.
Gulch
RIVER
ALBION RIDGE
35
36
31
1
2
6
7
11
12
T 17 N
R 13 W
R 14 W
128

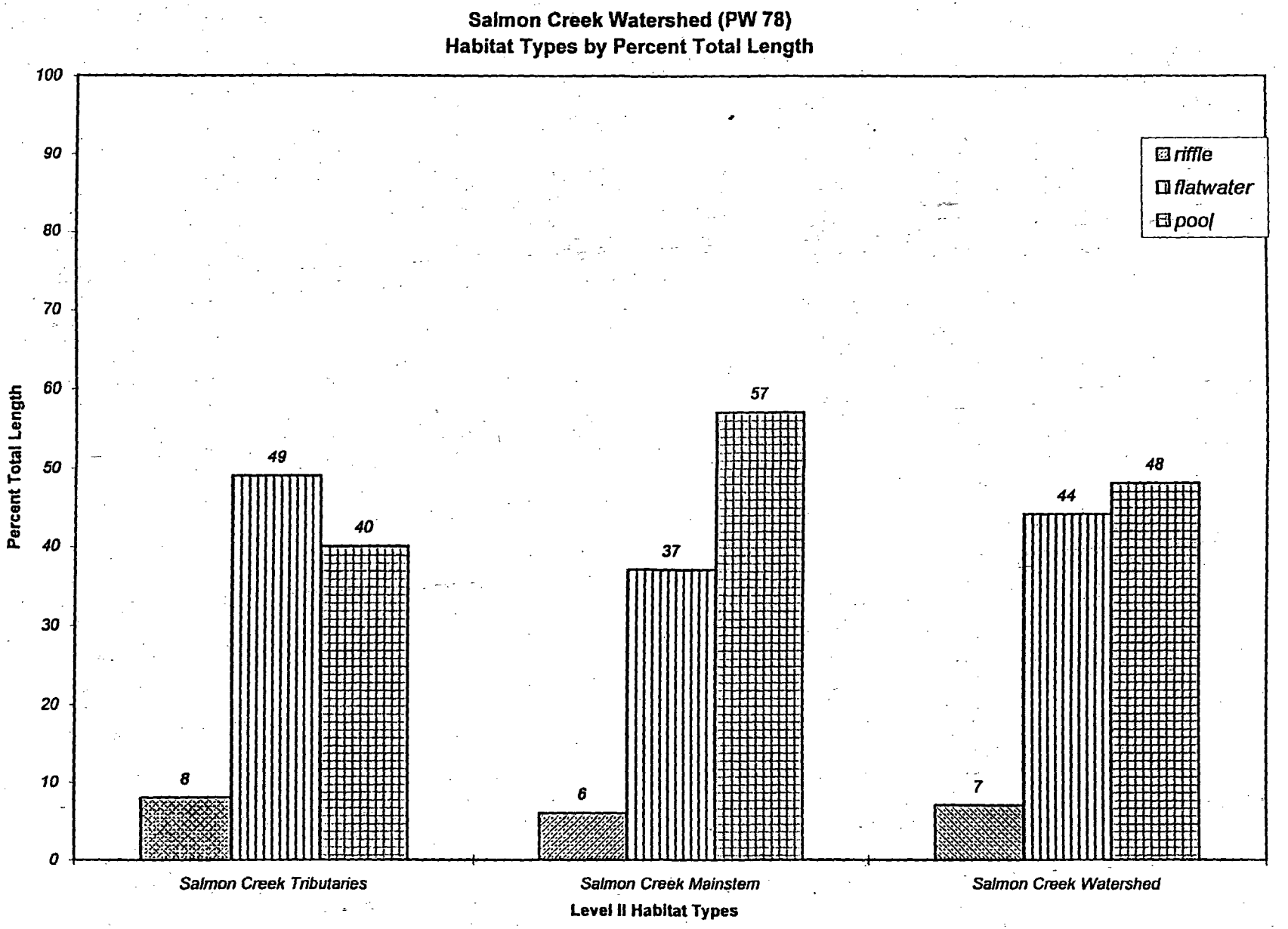

Begin Survey
Approximate End of Anadromy 1,669'
ALBION RIDGE
Salmon Creek
Kerr Gulch
Donnelly Gulch
NAVARRO RIDGE
NAVARRO RIDGE ROAD
Barton Gulch
Ray Gulch
RIVER
Hop Flat
Gaging Sta
R 17 W
R 16 W
31
32
33
36
12
7
6
5
4
35
128
Cem
612
668
682
803
1002
600
400
200

Graph 1

Salmon Creek Watershed (PW 78)
Habitat Types by Percent Occurrence

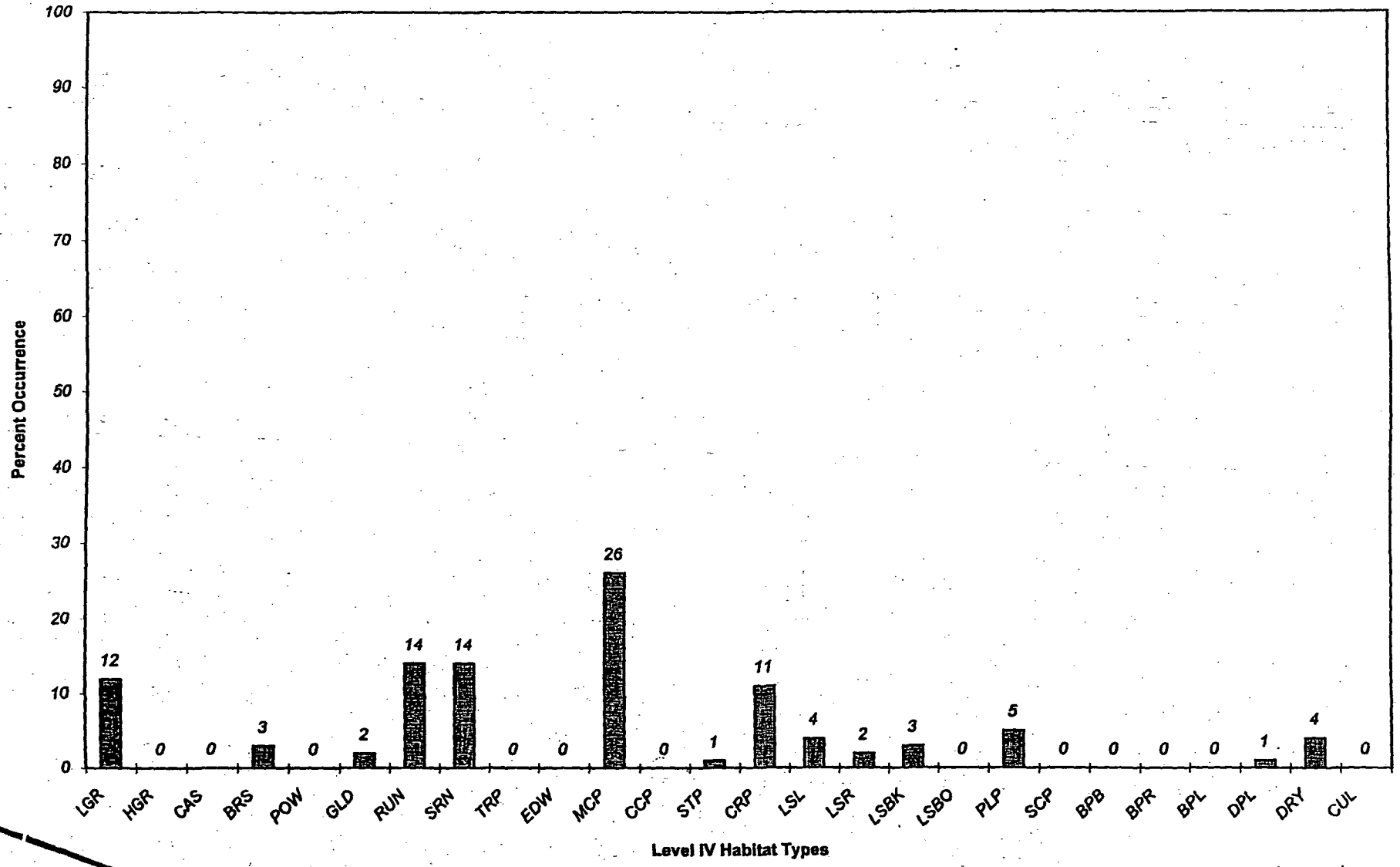


Graph 2


Salmon Creek Watershed (PW 78)
Habitat Types by Percent Total Length
Percent Total Length
100
90
80
70
60
50
40
30
20
10
0
riffle
flatwater
pool
8
49
40
6
37
57
7
44
48
Salmon Creek Tributaries
Salmon Creek Mainstem
Salmon Creek Watershed
Level II Habitat Types

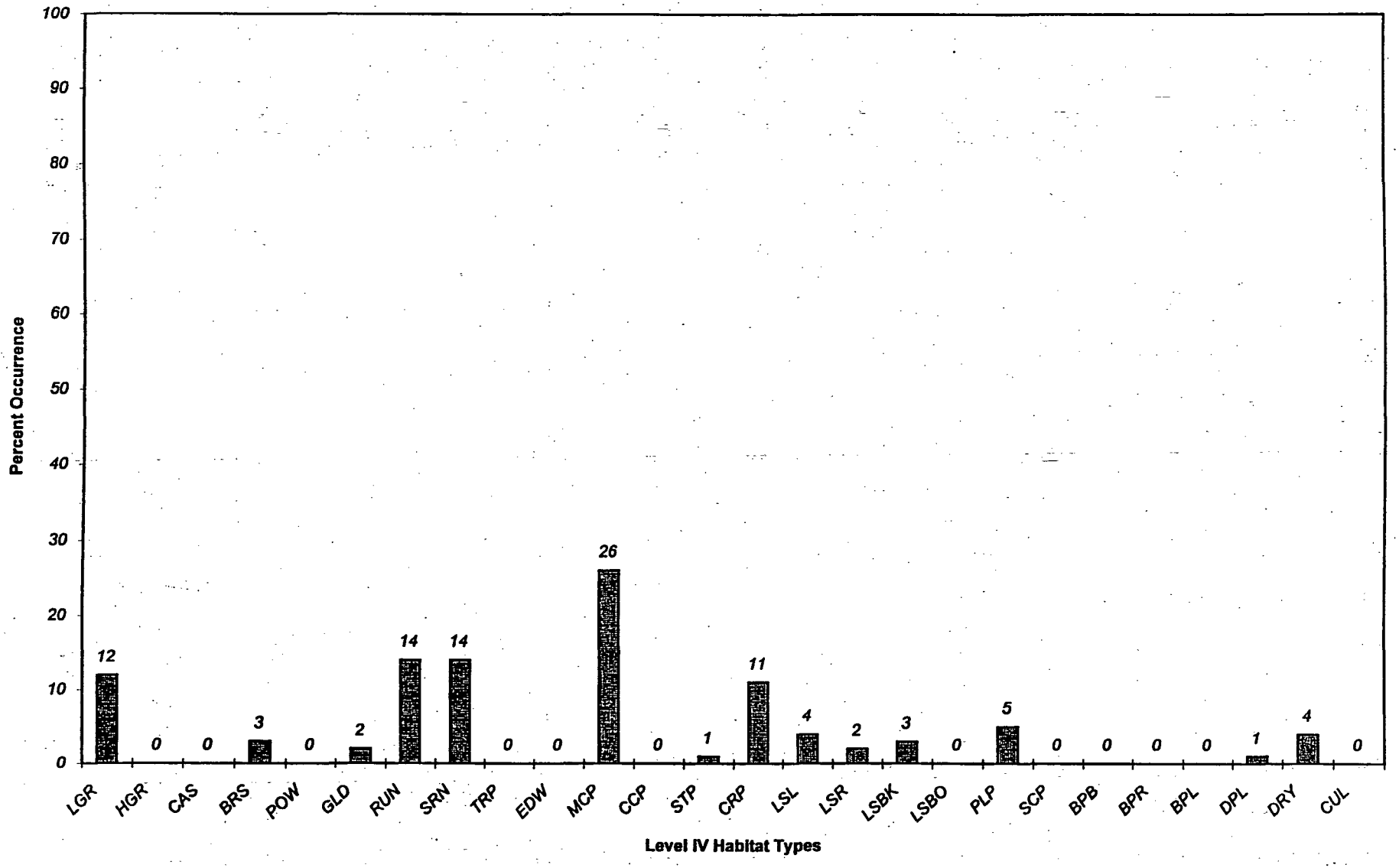
Graph 3

Salmon Creek Tributaries (PW 78)
Habitat Types by Percent Occurrence



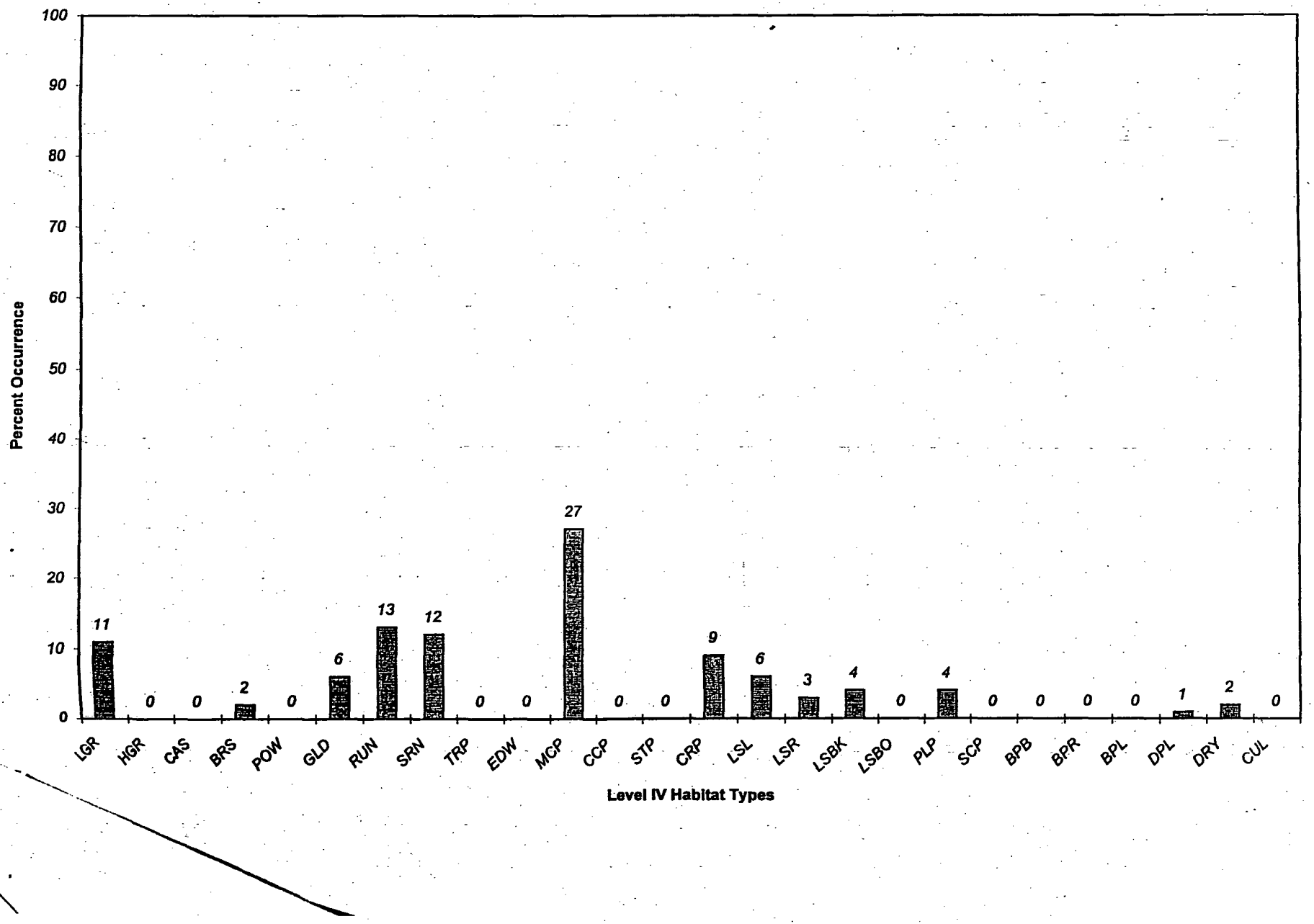
Graph 4

Salmon Creek Mainstem (PW 78)
Habitat Types by Percent Occurrence



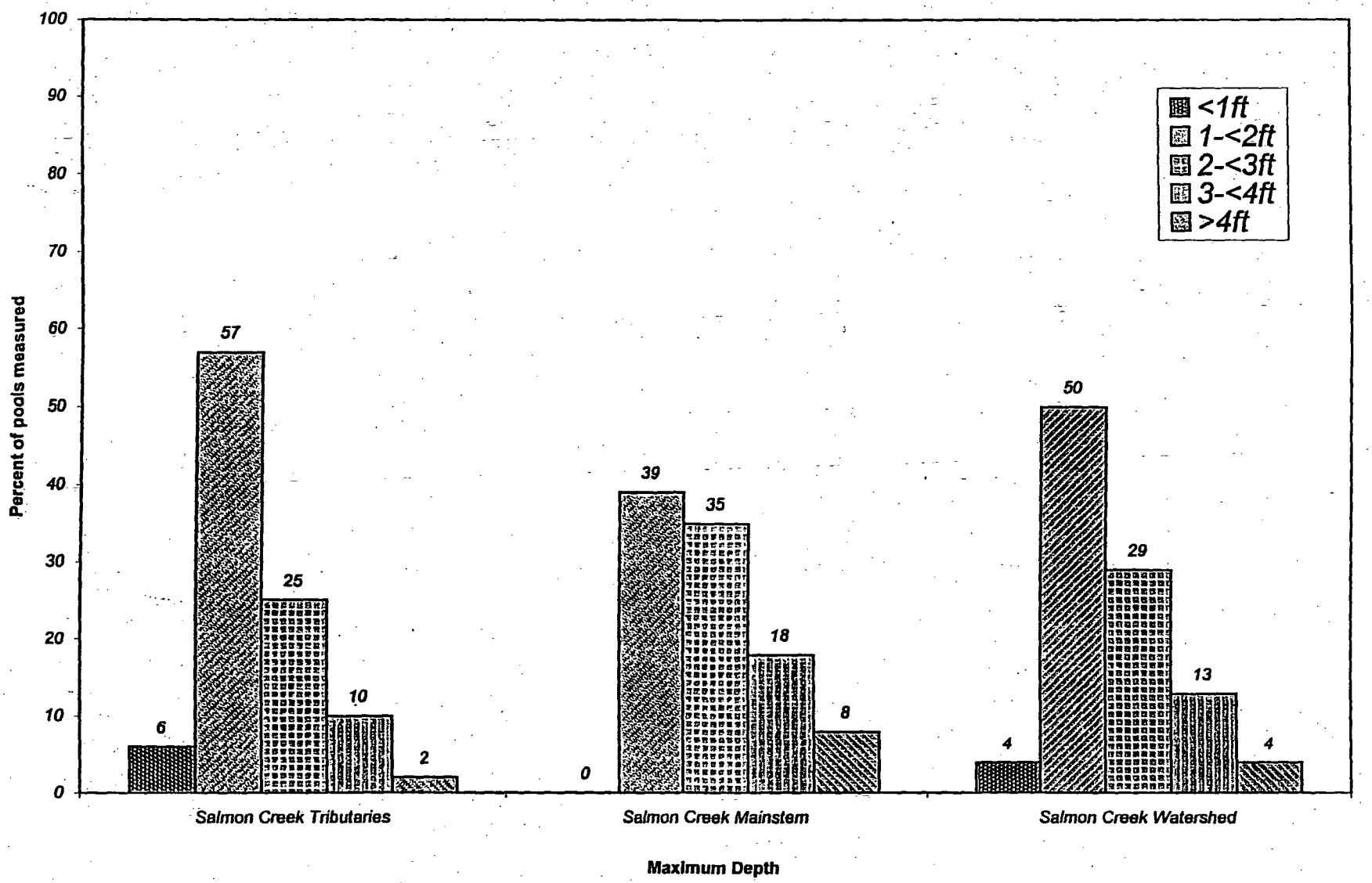
Graph 5

Salmon Creek Watershed (PW 78)
Habitat Types by Percent Occurrence

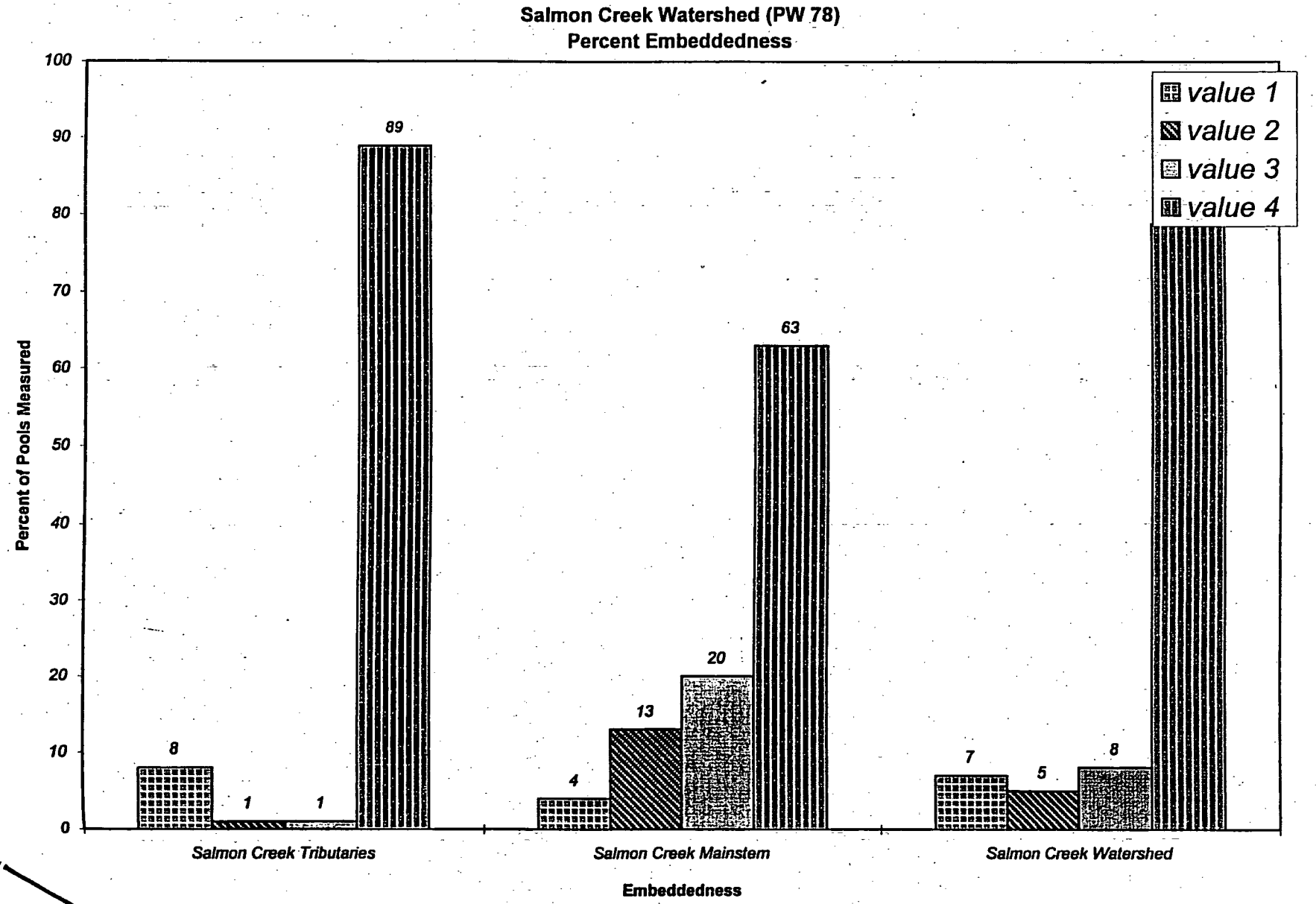


Graph 6

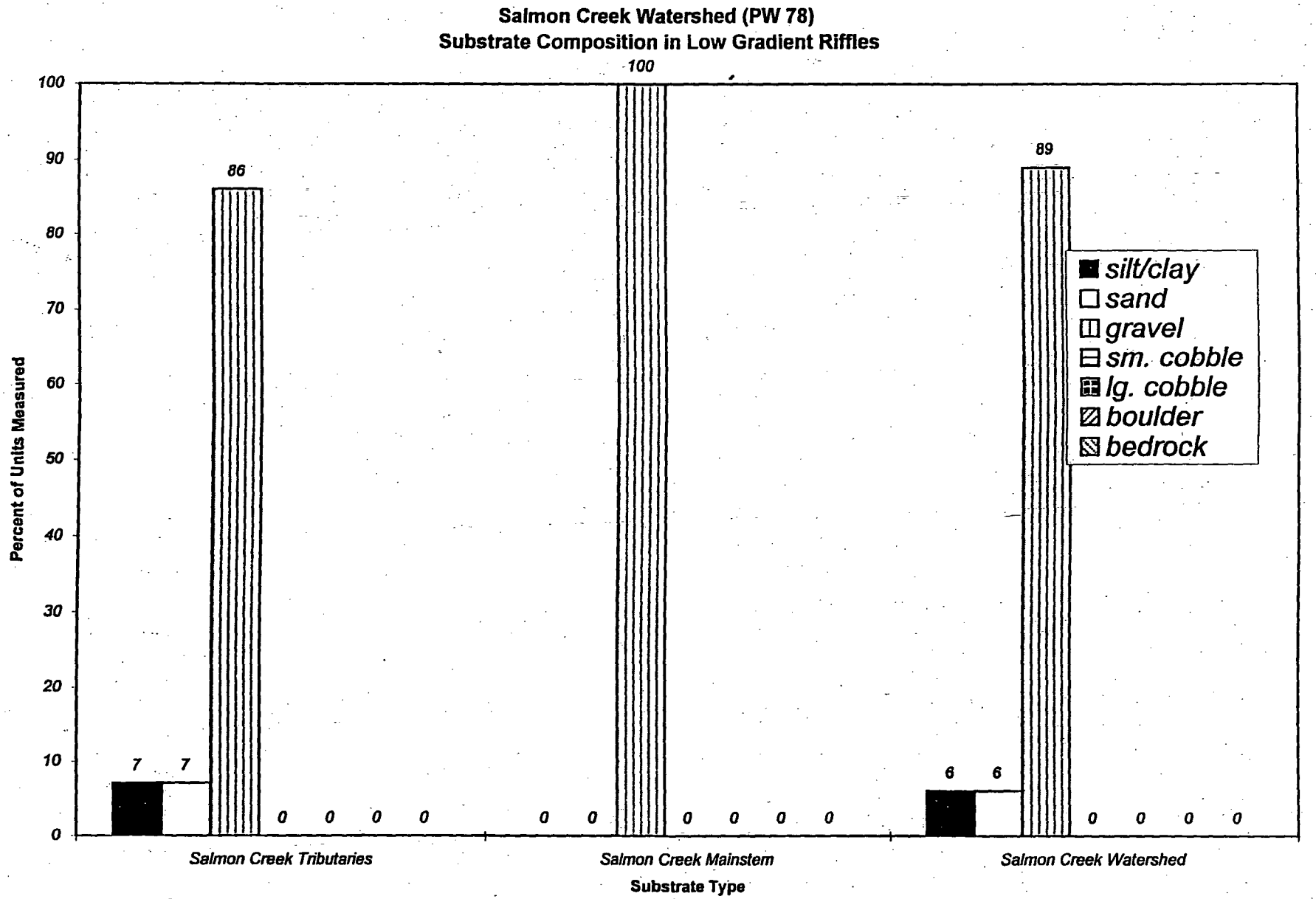
Salmon Creek Watershed (PW 78)
Maximum Depth in Pools



Graph 7

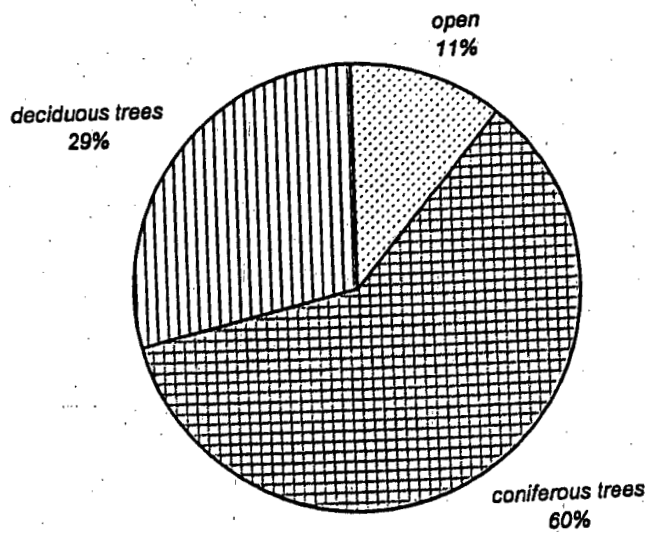

Salmon Creek Watershed (PW 78)
Percent Embeddedness
Percent of Pools Measured
100
90
80
70
60
50
40
30
20
10
0
value 1
value 2
value 3
value 4
8
1
1
89
4
13
20
63
7
5
8
Salmon Creek Tributaries
Salmon Creek Mainstem
Salmon Creek Watershed
Embeddedness

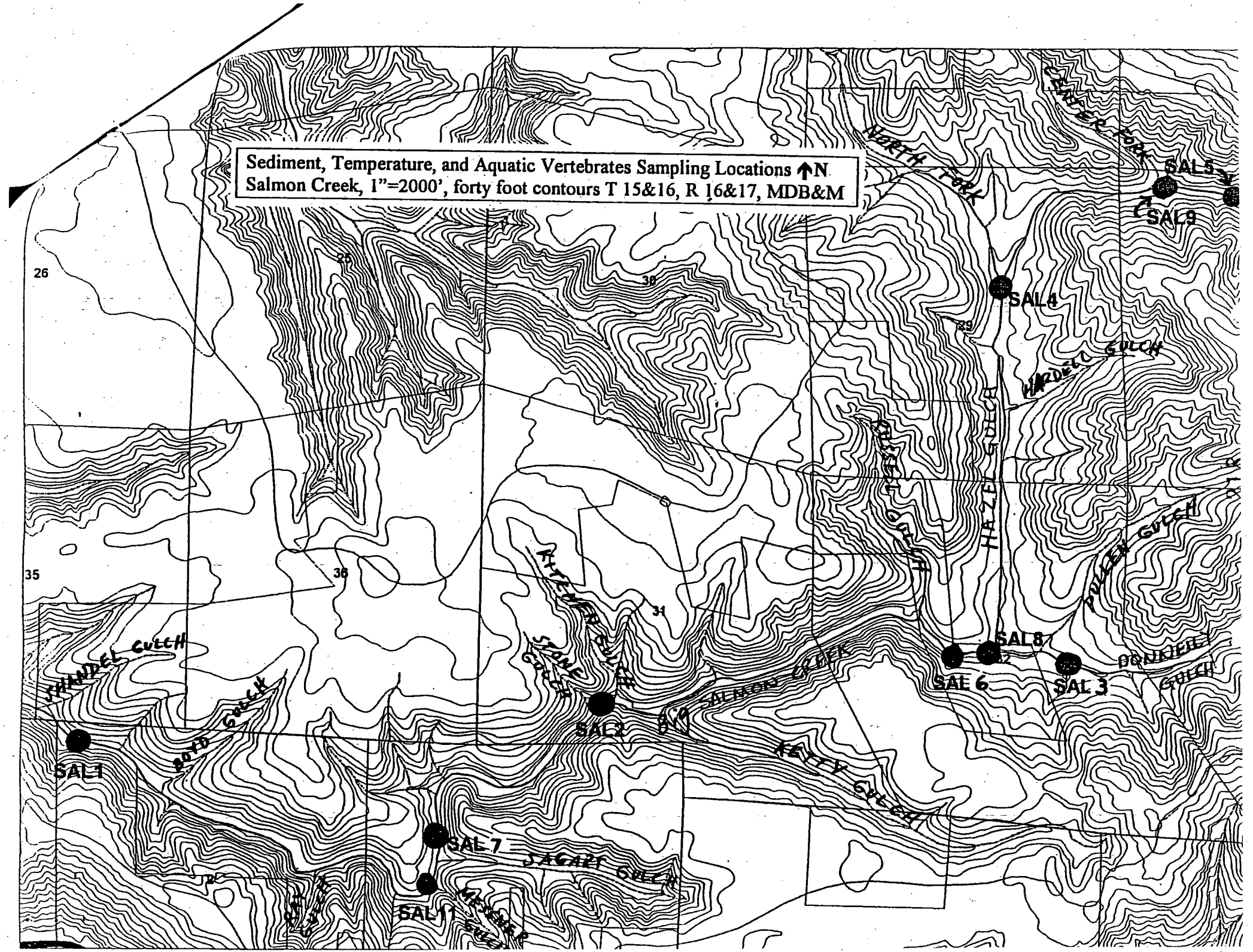
Graph 8


Salmon Creek Watershed (PW 78)
Substrate Composition in Low Gradient Riffles
Percent of Units Measured
100
90
80
70
60
50
40
30
20
10
0
7
7
86
0
0
0
0
100
0
0
0
0
0
6
6
89
0
0
0
0
silt/clay
sand
gravel
sm. cobble
lg. cobble
boulder
bedrock
Salmon Creek Tributaries
Salmon Creek Mainstem
Salmon Creek Watershed
Substrate Type

Graph 11

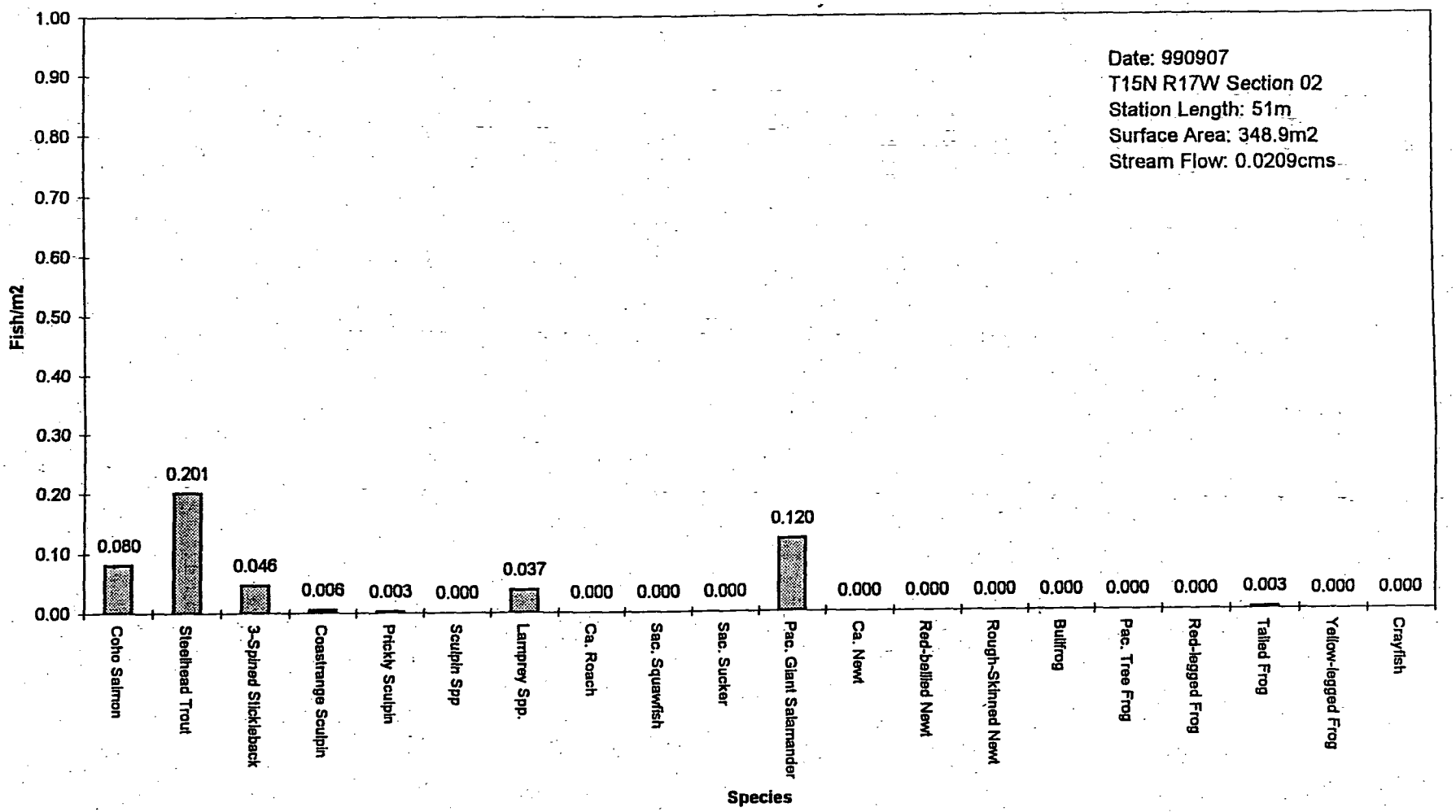
Salmon Creek Watershed (PW 78)
Percent Canopy

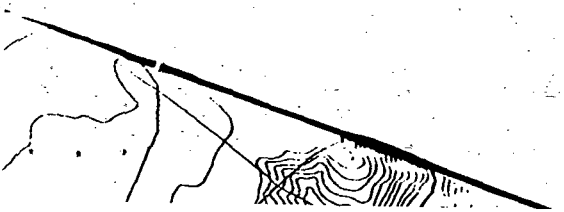



Sediment, Temperature, and Aquatic Vertebrates Sampling Locations ↑N
Salmon Creek, 1"=2000', forty foot contours T 15&16, R 16&17, MDB&M
NORTH FORK
CENTER FORK
SAL5
SAL9
SAL4
HARDEL GULCH
HAZEL GULCH
PARKER GULCH
SAL8
SAL6
SAL3
DONNELLY GULCH
KITEMER GULCH
STONE GULCH
SAL2
SALMON CREEK
KELLY GULCH
SAL1
BOYD GULCH
SAL7
SAGART GULCH
SAL11
26
25
30
29
35
36
31
32

Estimated Aquatic Vertebrate Populations. The Timber Company. Fort Bragg, CA

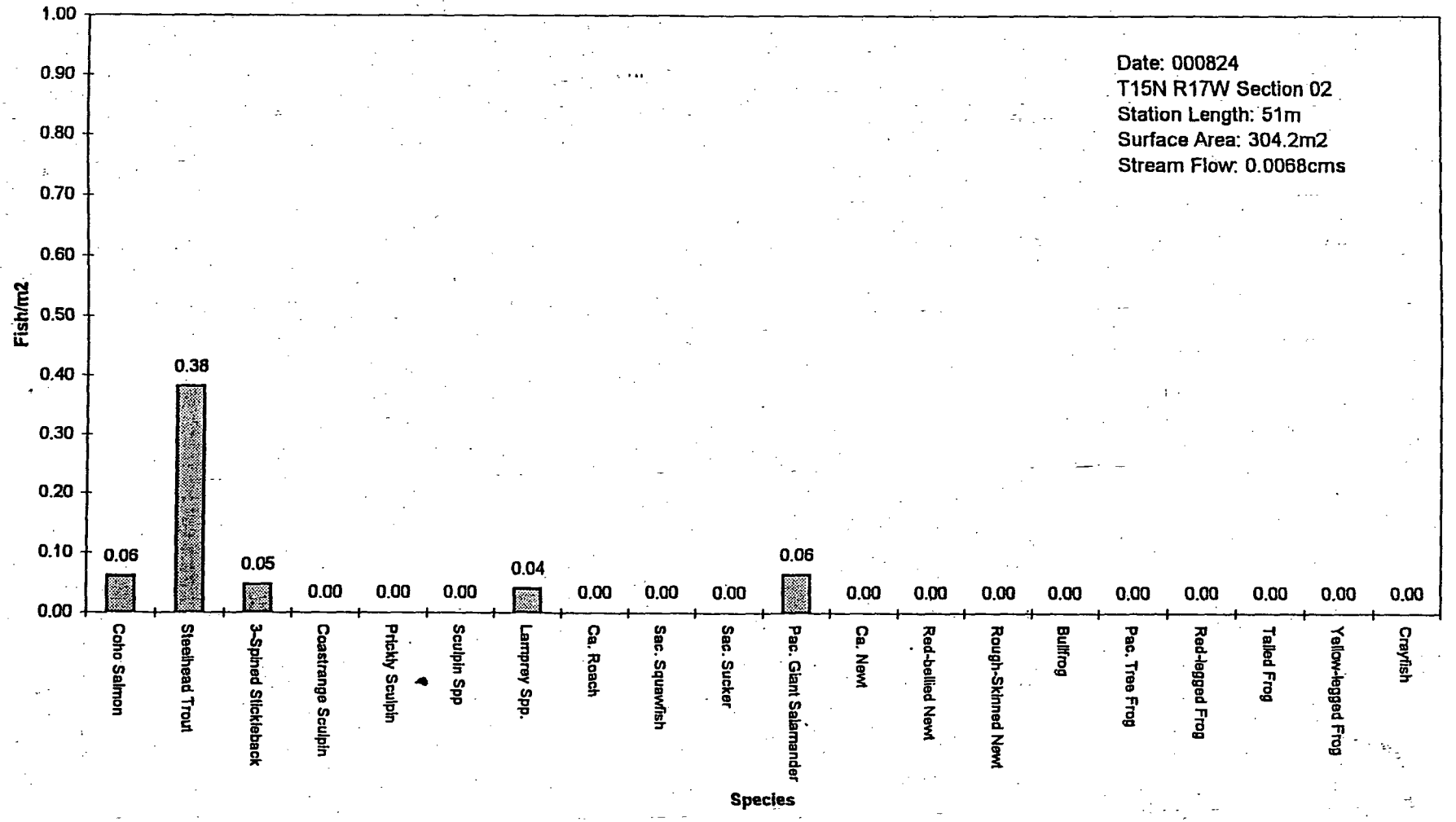
Sample Location: Lower Salmon Creek (SAL 1)





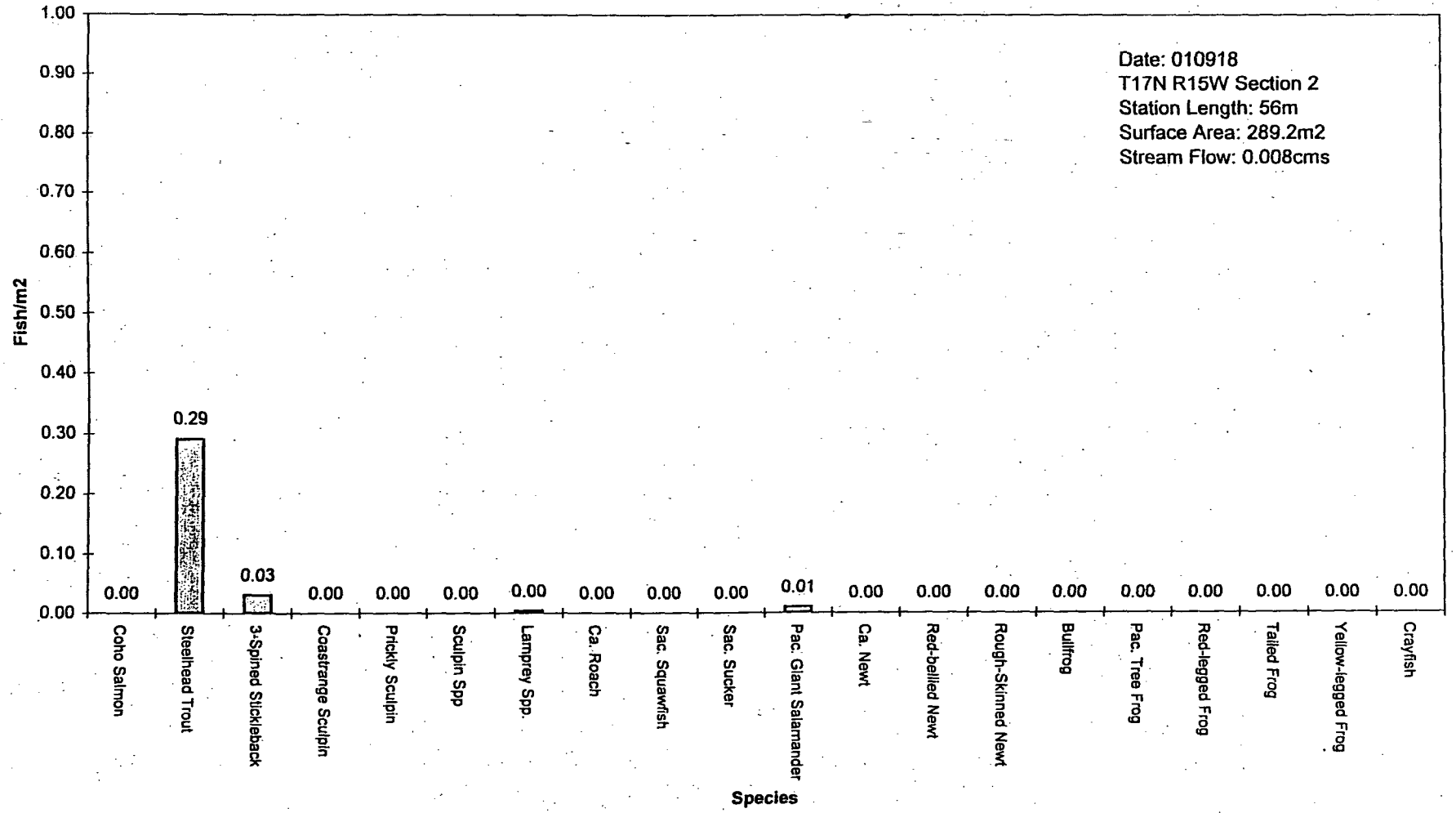
Estimated Aquatic Vertebrate Populations. Campbell Timberland Mgt., Fort Bragg, CA

Sample Location: Lower Salmon Creek (SAL 1)



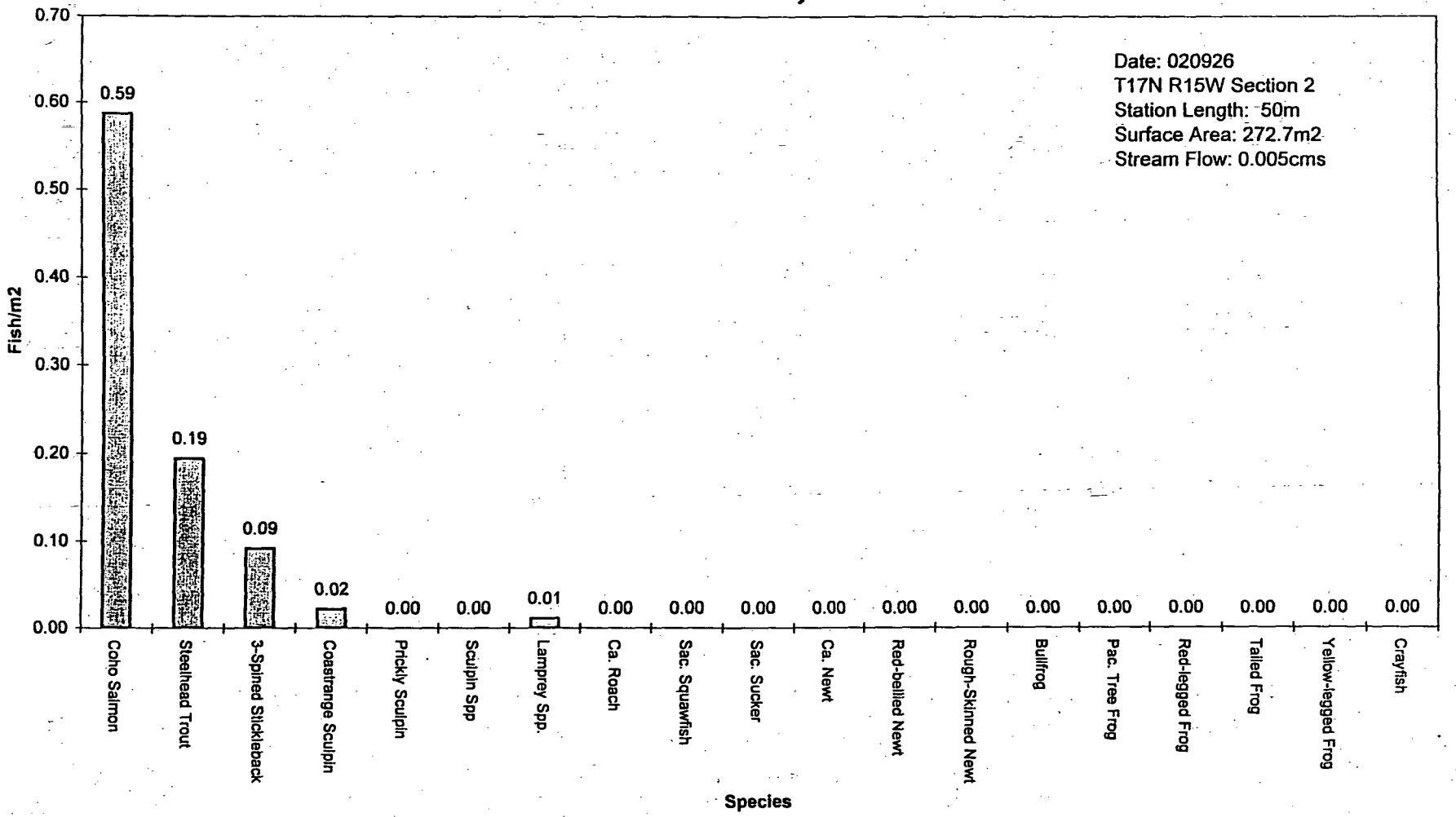
Estimated Aquatic Vertebrate Populations. Campbell Timberland Mgt., Fort Bragg, CA

Sample Location: Lower Salmon Creek (SAL 1)



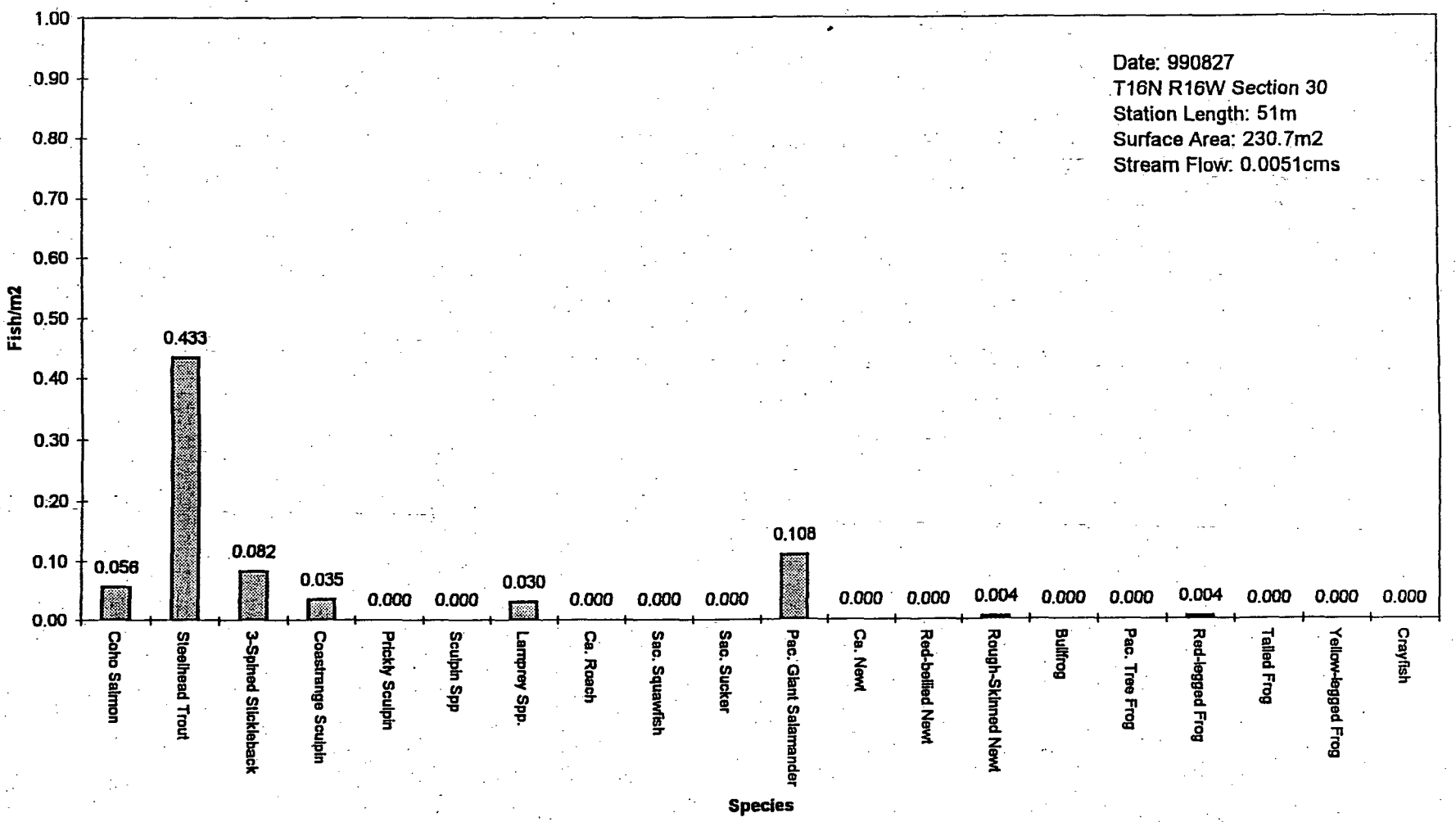
Estimated Aquatic Vertebrate Populations. Campbell Timberland Mgt., Fort Bragg, CA

Sample Location: Lower Salmon Creek (SAL 1)



Estimated Aquatic Vertebrate Populations. The Timber Company. Fort Bragg, CA

Sample Location: Salmon Creek at Ketty Gulch (SAL 2)

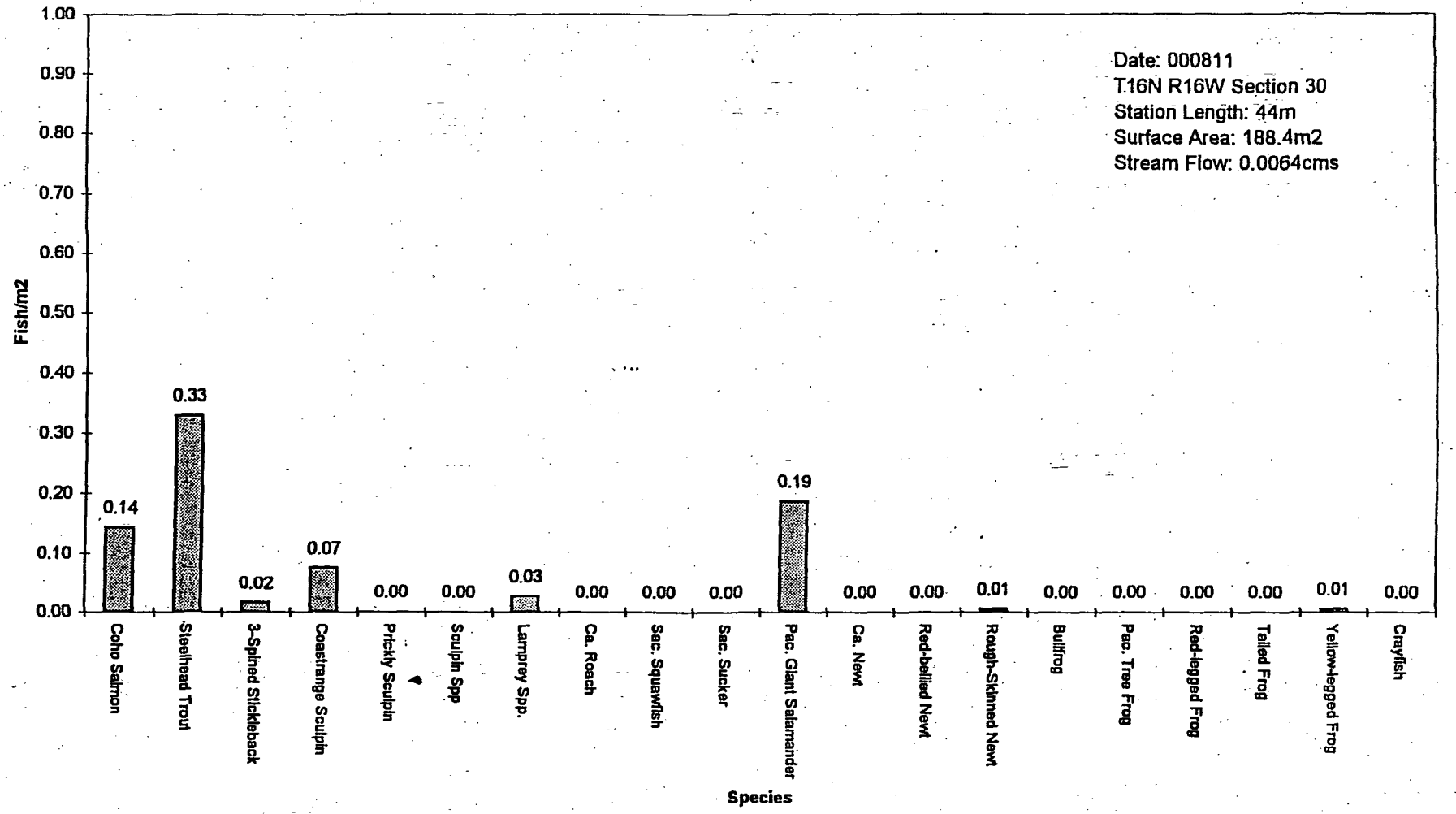


223

0.70

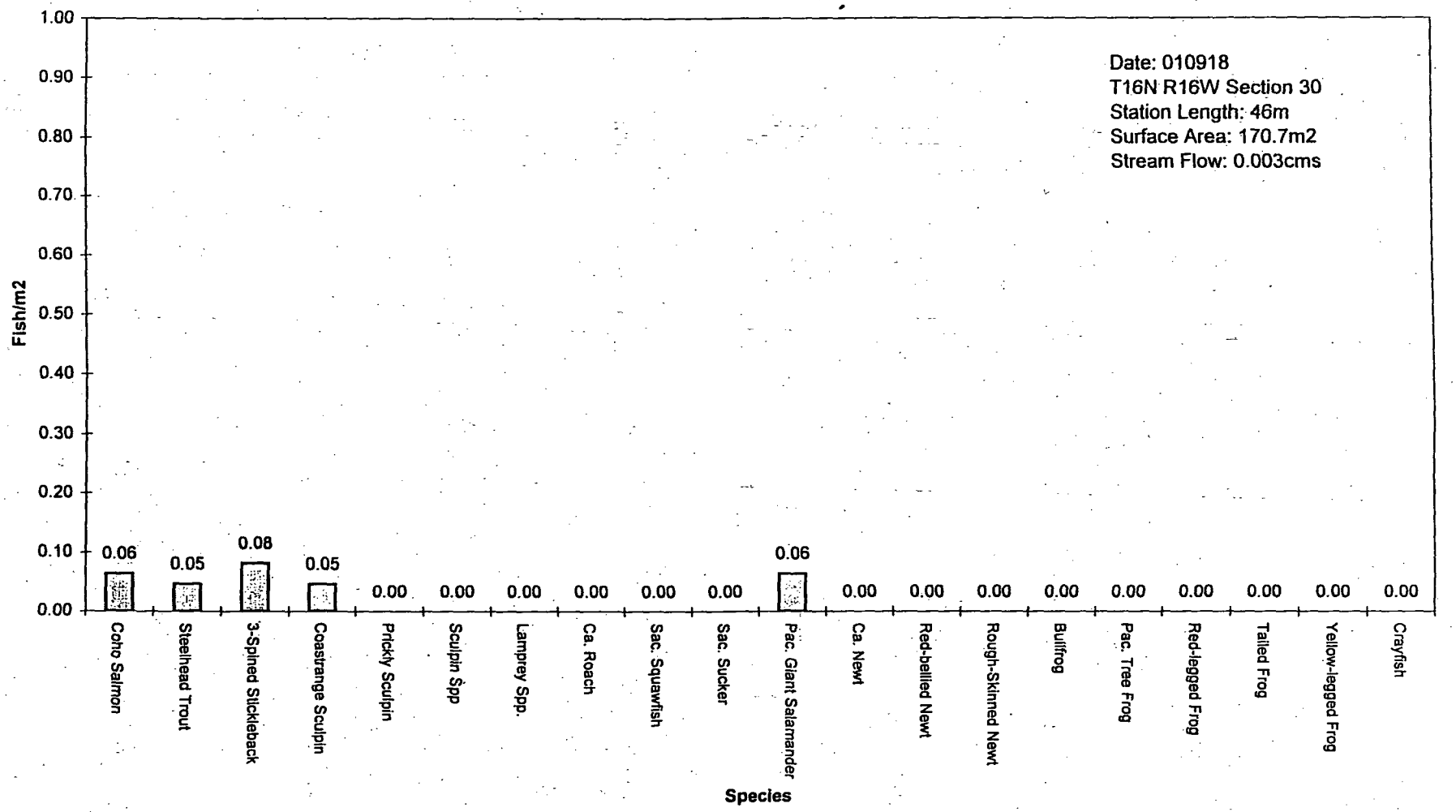
Estimated Aquatic Vertebrate Populations. Campbell Timberland Mgt., Fort Bragg, CA

Sample Location: Salmon creek at Ketty (SAL 2)



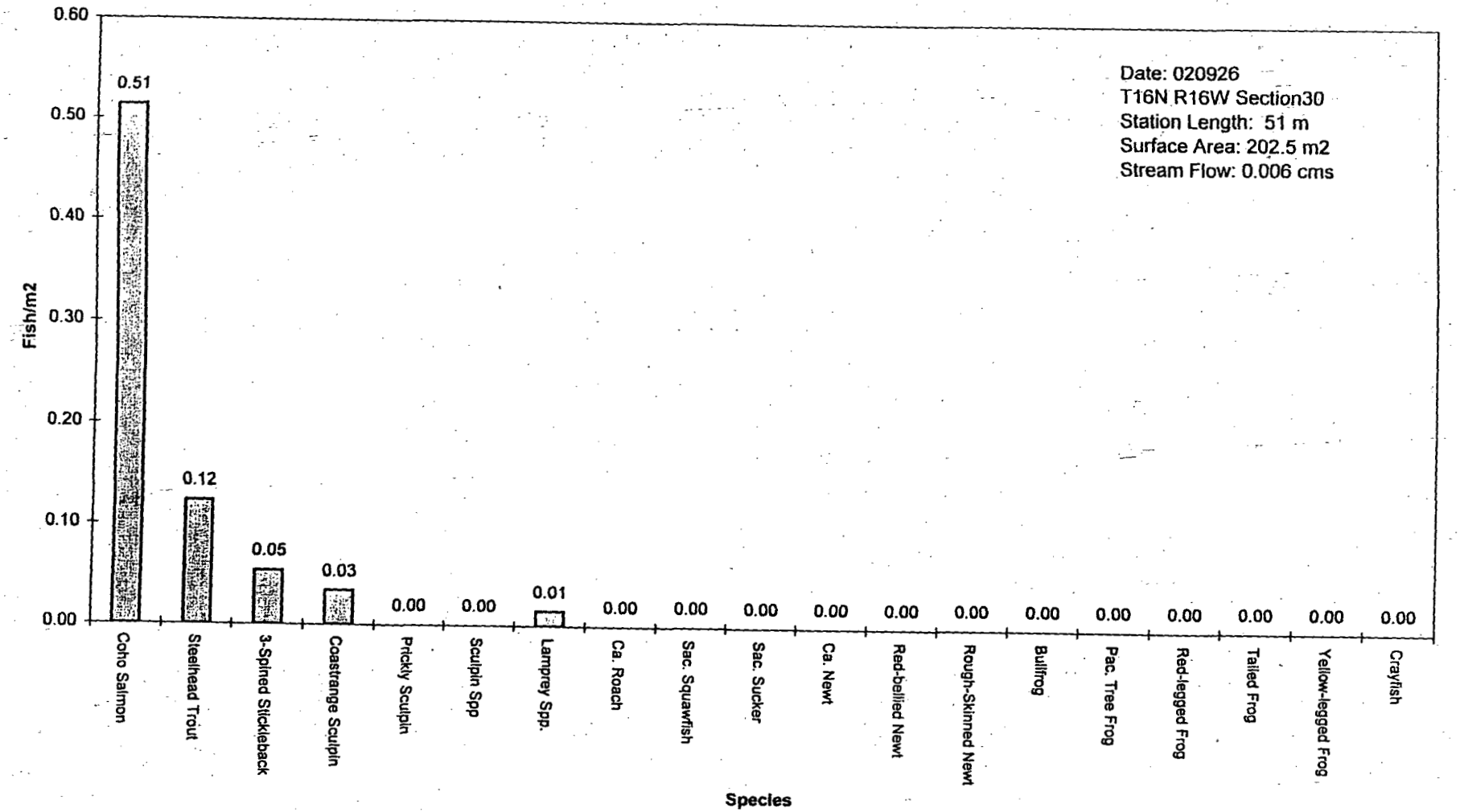
Estimated Aquatic Vertebrate Populations. Campbell Timberland Mgt., Fort Bragg, CA

Sample Location: Salmon Creek at Ketty (SAL 2)



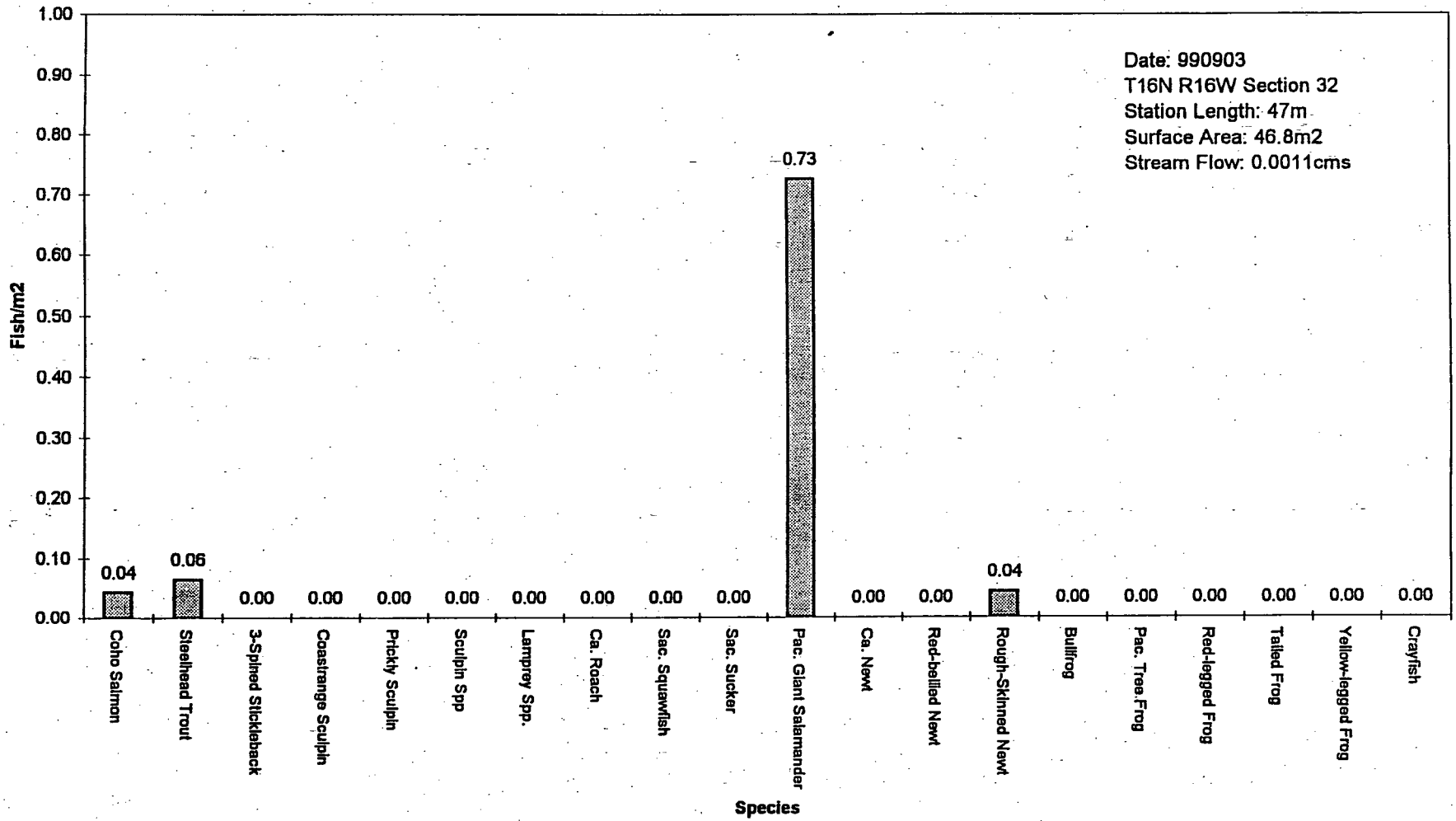
Estimated Aquatic Vertebrate Populations. Campbell Timberland Mgt., Fort Bragg, CA

Sample Location: Slalmon Creek at Ketty Gulch (SAL 2)



Estimated Aquatic Vertebrate Populations. The Timber Company. Fort Bragg, CA

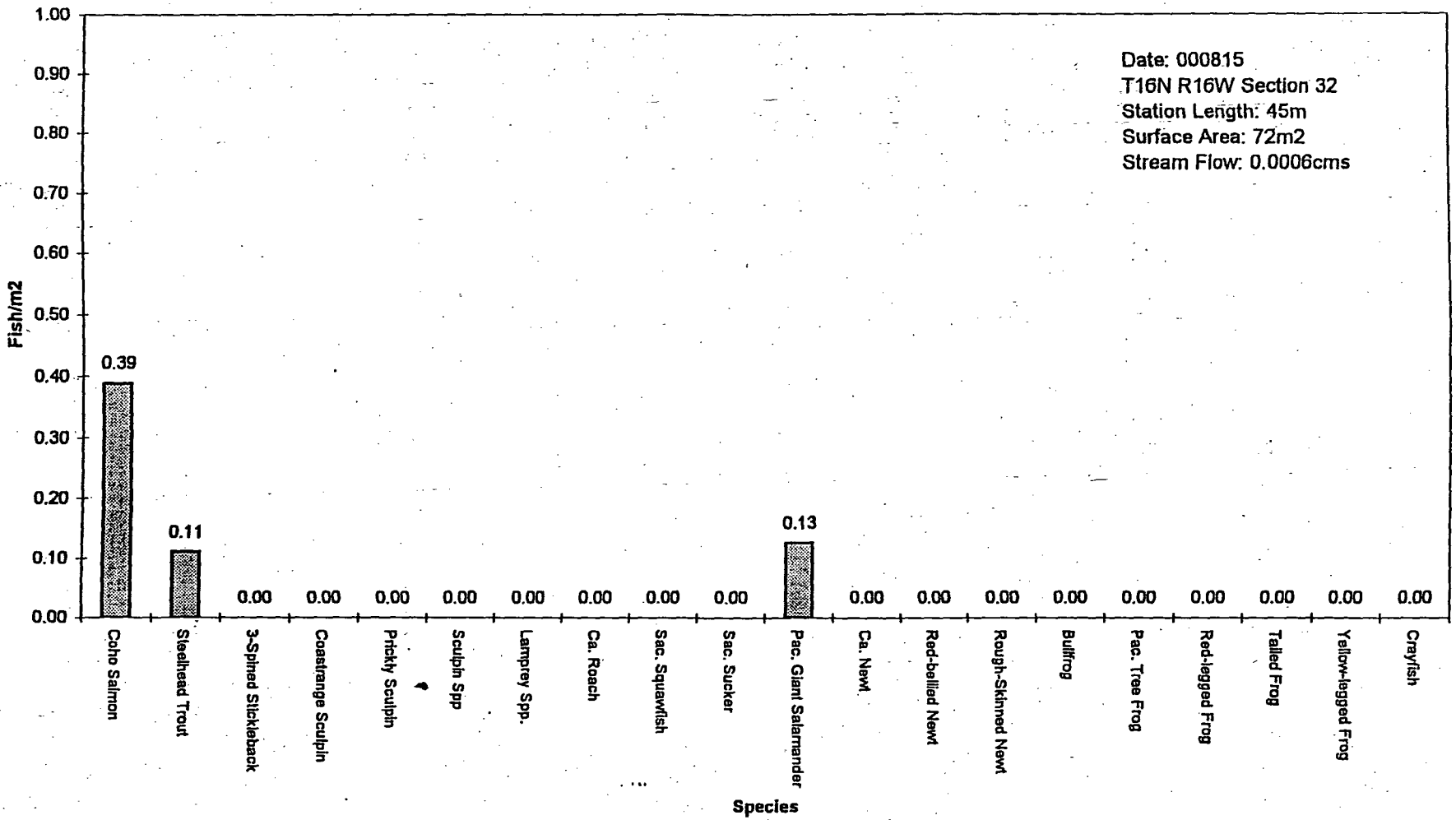
Sample Location: Donnelly Gulch (SAL 3)



0.60

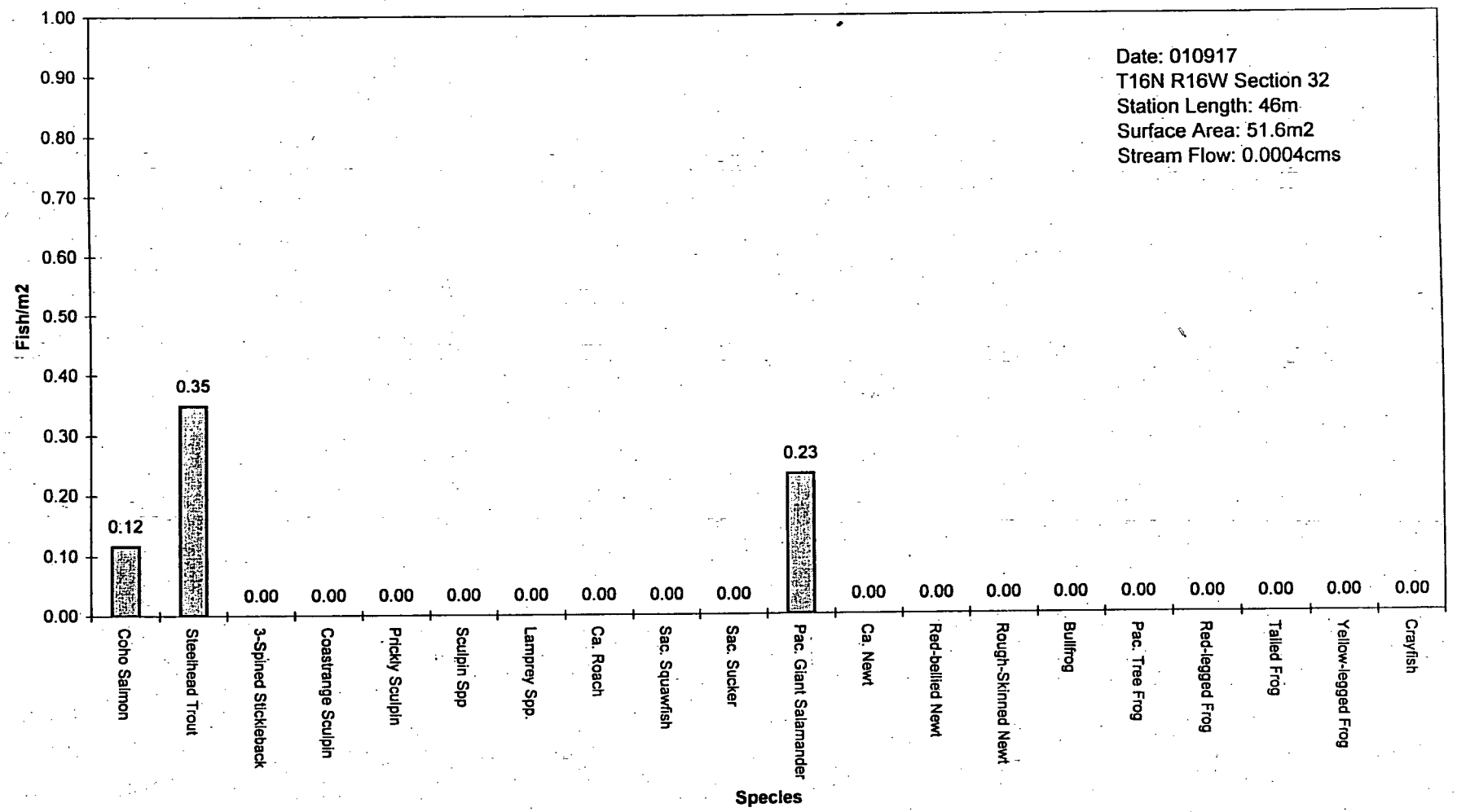
Estimated Aquatic Vertebrate Populations. Campbell Timberland Mgt., Fort Bragg, CA

Sample Location: Donnely Gulch (SAL 3)



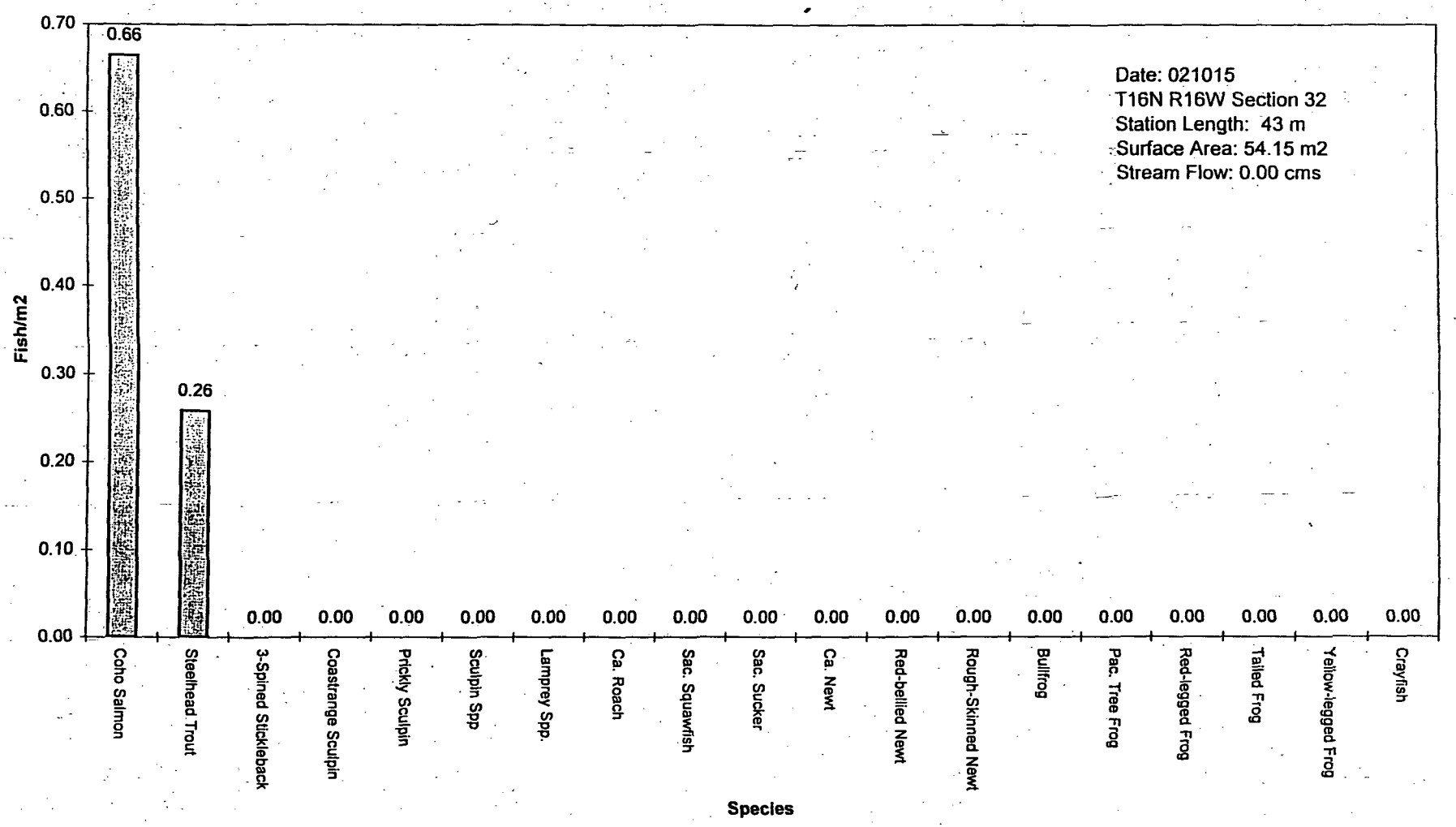
Estimated Aquatic Vertebrate Populations. Campbell Timberland Mgt., Fort Bragg, CA

Sample Location: Donnelly Gulch (SAL 3)



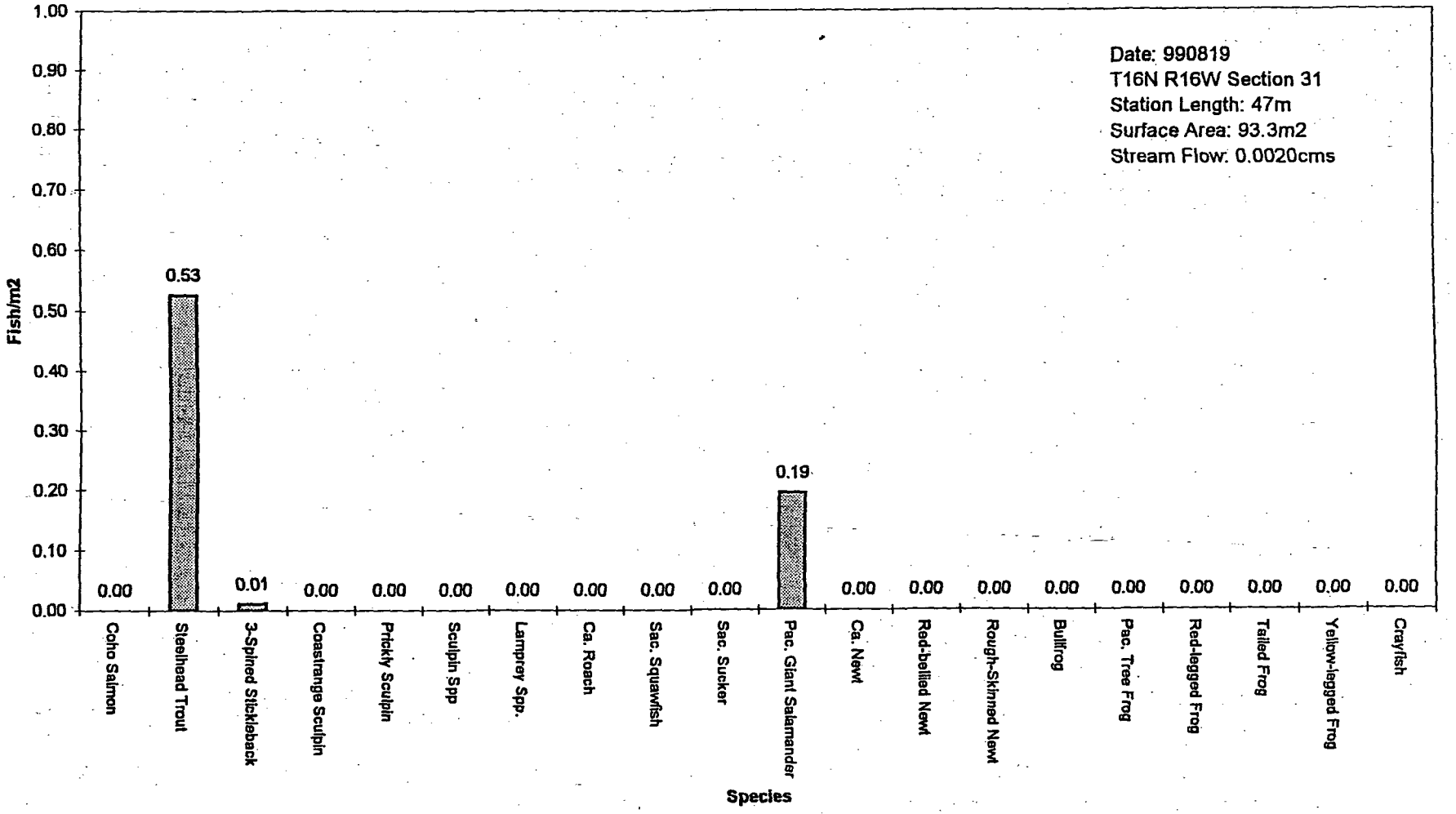
Estimated Aquatic Vertebrate Populations. Campbell Timberland Mgt., Fort Bragg, CA

Sample Location: Donnelly Gulch (SAL 3)



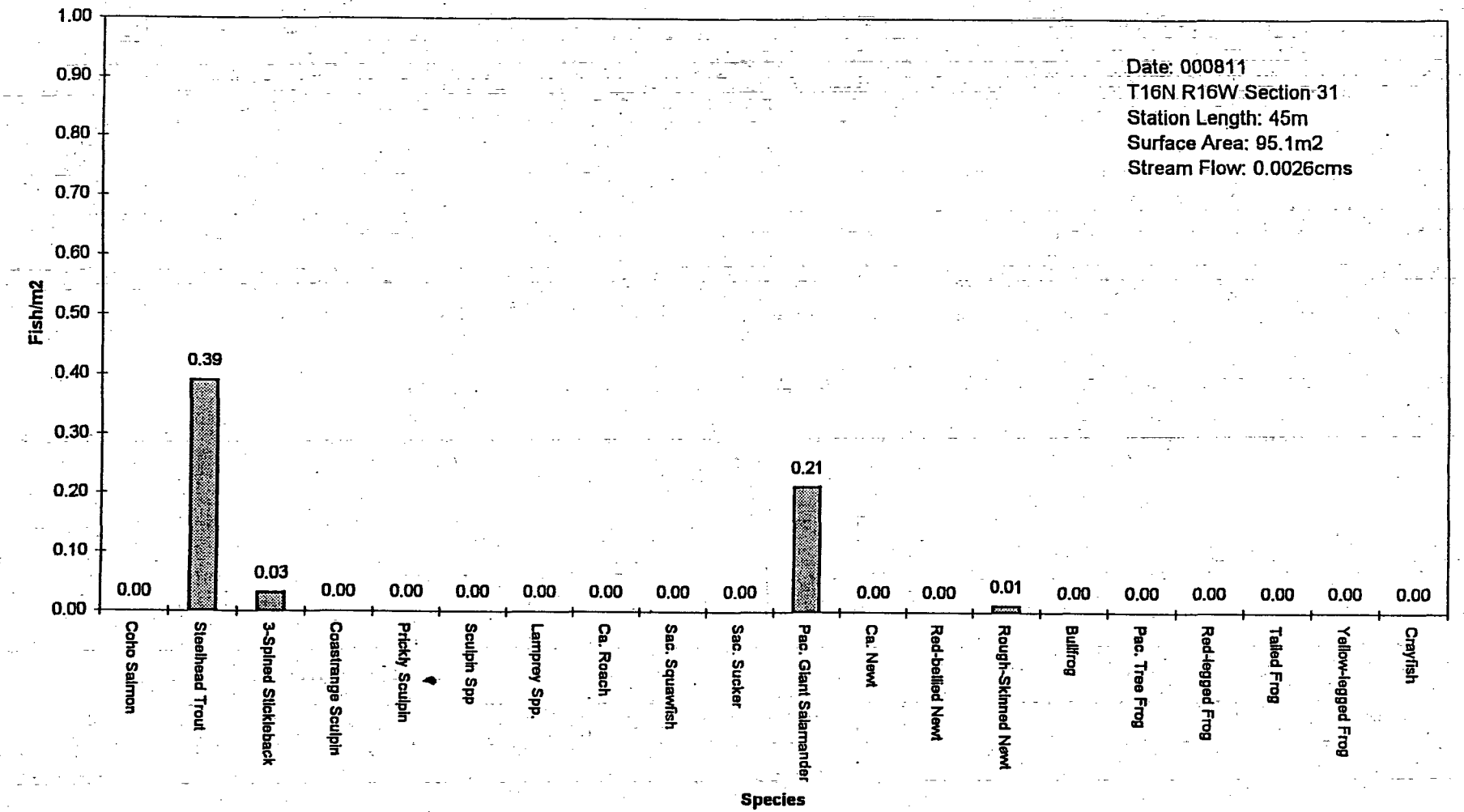
Estimated Aquatic Vertebrate Populations. The Timber Company. Fort Bragg, CA

Sample Location: Waterfall Hazel Creek(Sal 4)



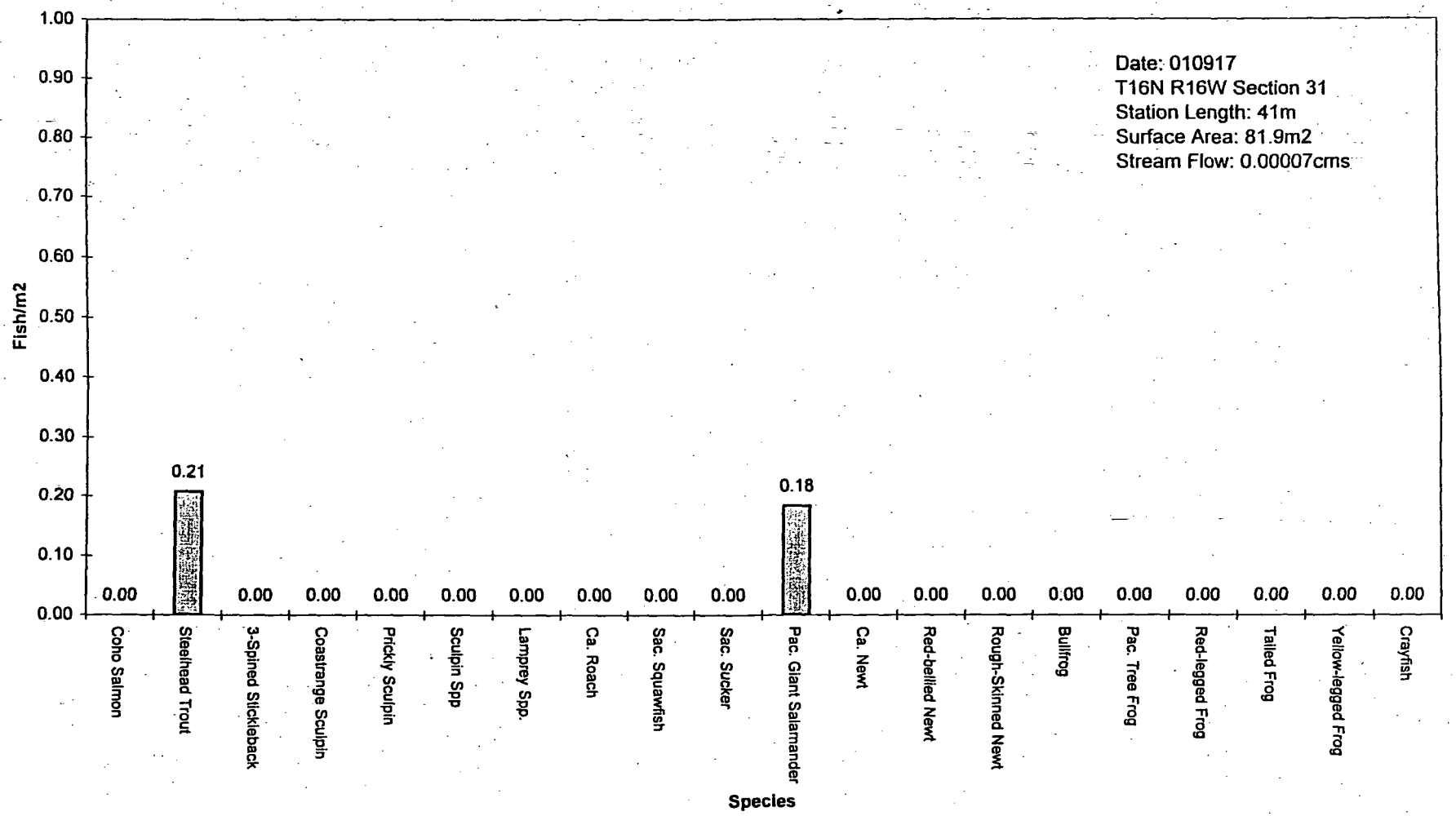
Estimated Aquatic Vertebrate Populations. Campbell Timberland Mgt., Fort Bragg, CA

Sample Location: Hazel Creek Waterfall (SAL 4)



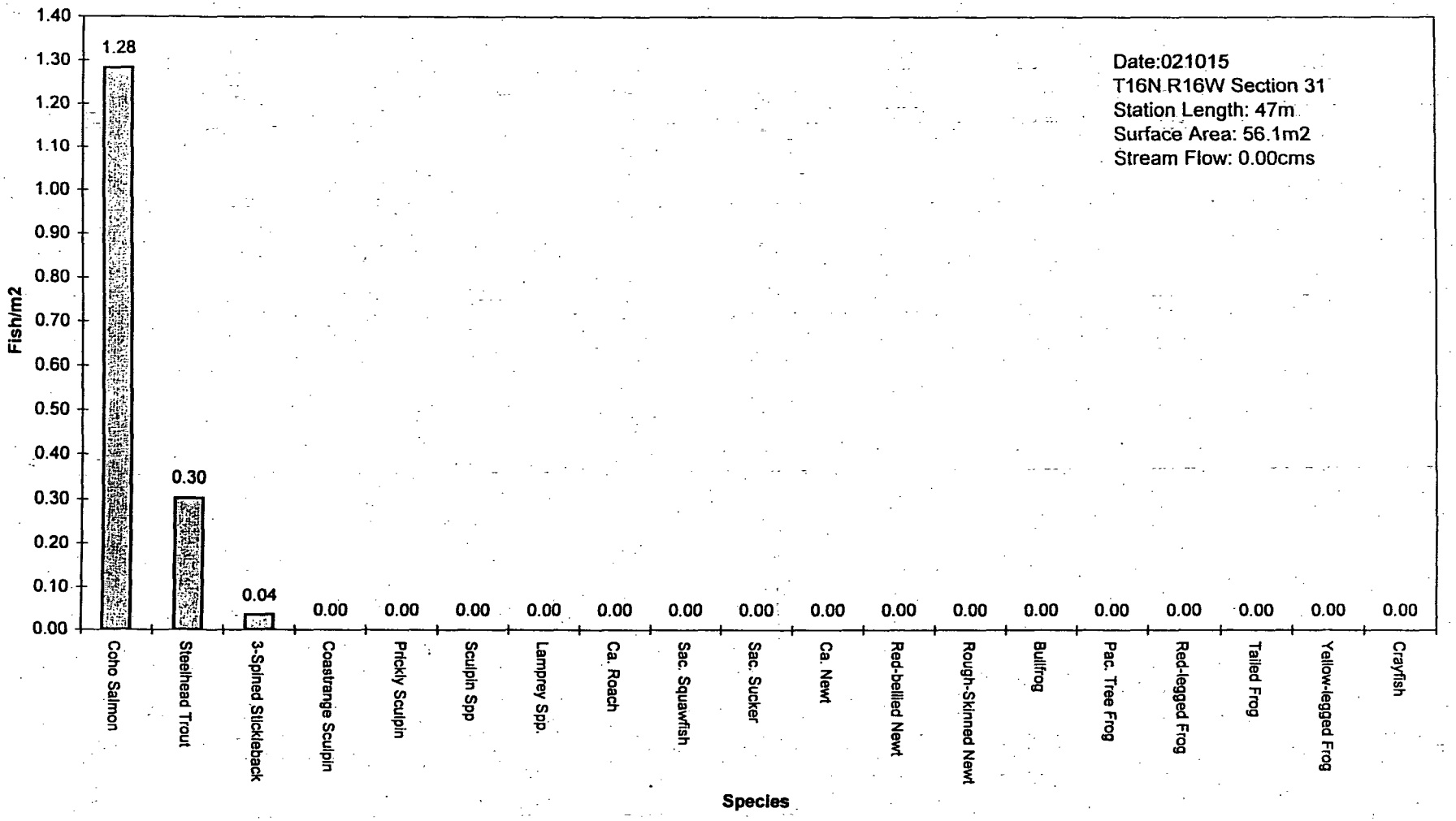
Estimated Aquatic Vertebrate Populations. Campbell Timberland Mgt., Fort Bragg, CA

Sample Location:Waterfall Hazel Creek (SAL 4)



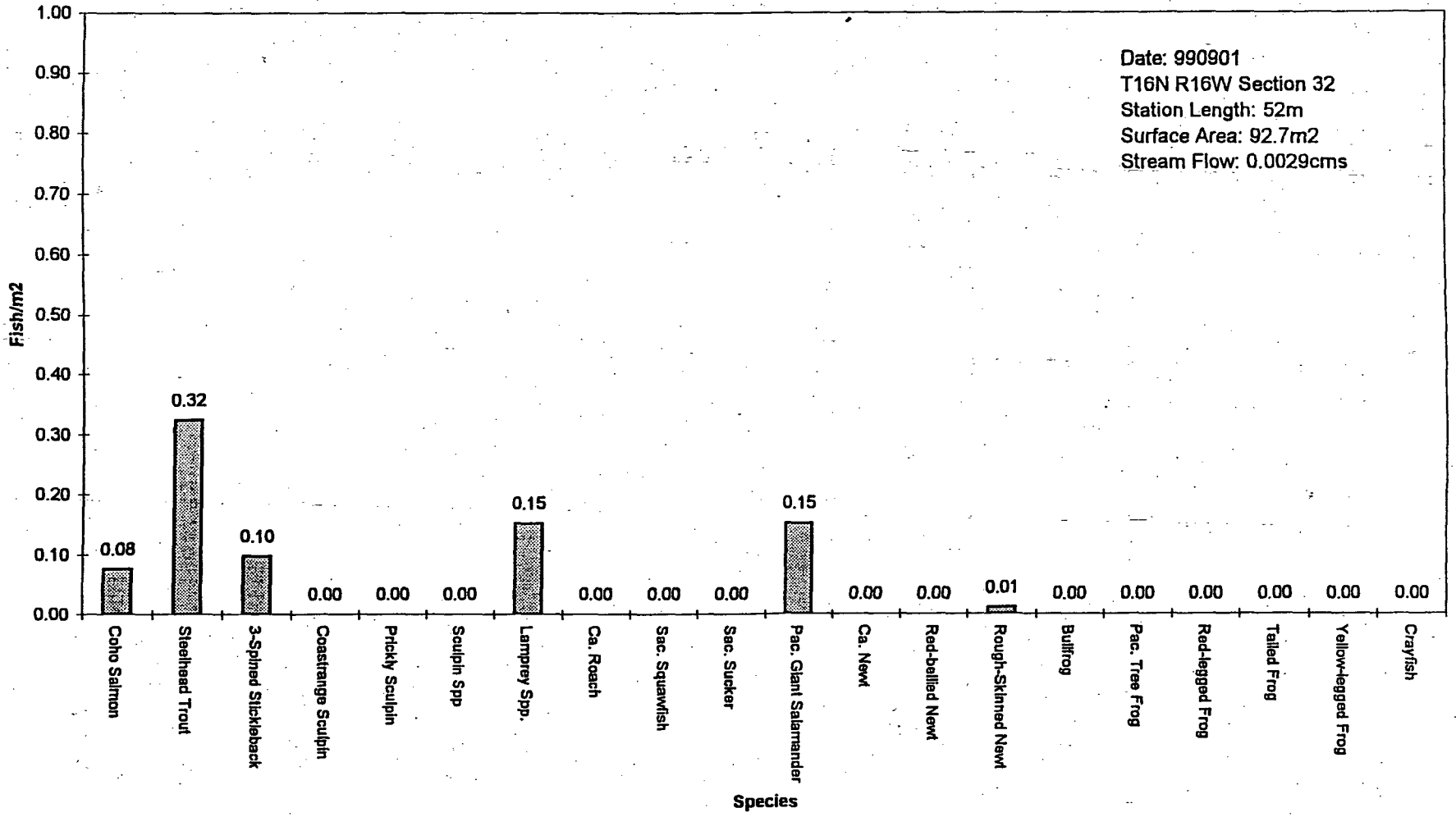
Estimated Aquatic Vertebrate Populations. Campbell Timberland Mgt., Fort Bragg, CA

Sample Location: Waterfall Hazel (SAL 4)



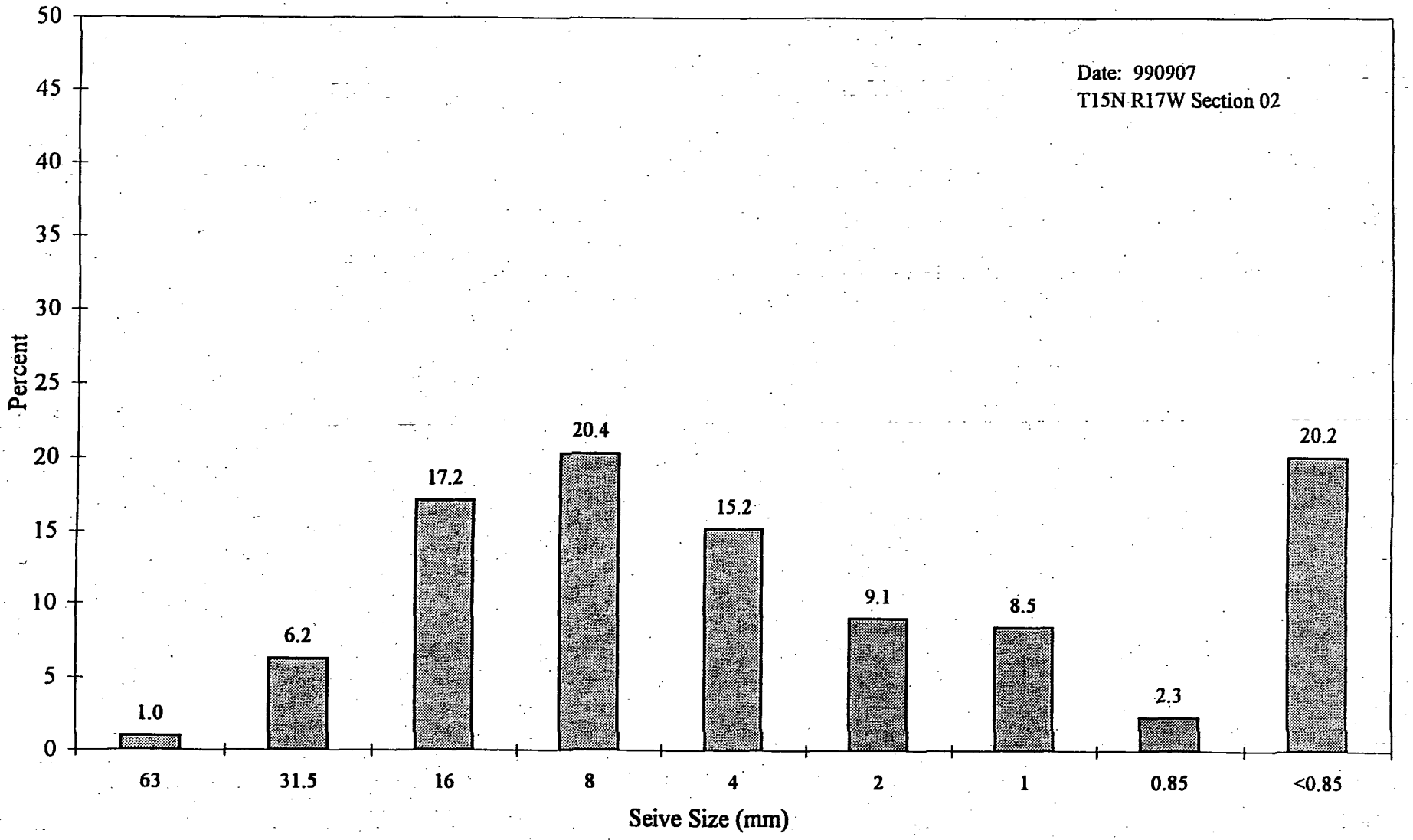
Estimated Aquatic Vertebrate Populations. The Timber Company. Fort Bragg, CA

Sample Location: Lower Hazel Creek (SAL 8)



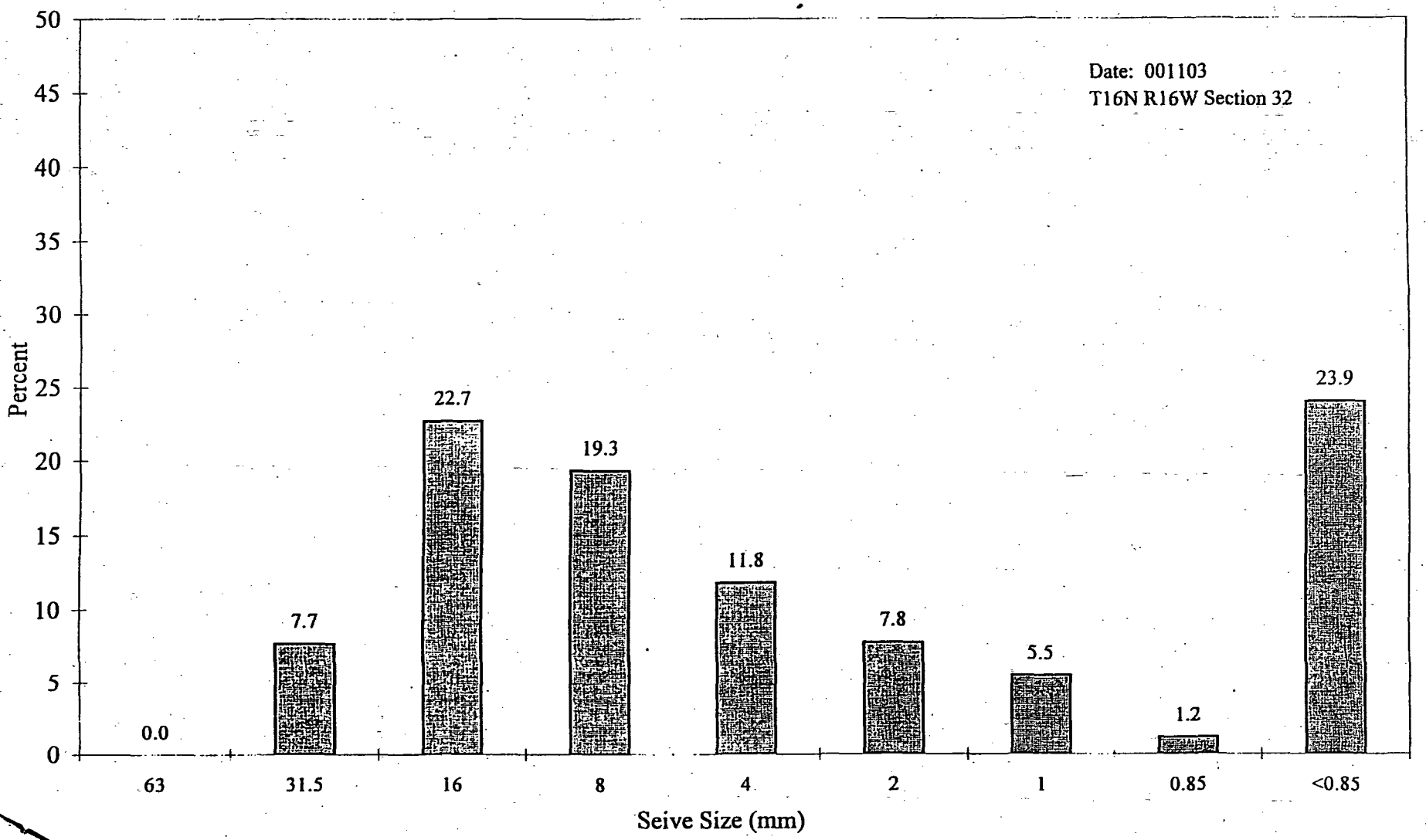
Average McNeil Sediment Samples (eight samples)
The Timber Company, Fort Bragg, CA

Sample Location: Lower Salmon Creek (SAL 1)



Average McNeil Sediment Samples (eight samples)
Campbell Timberland Management, Fort Bragg, CA

Sample Location: Donnelly Gulch-Sal3

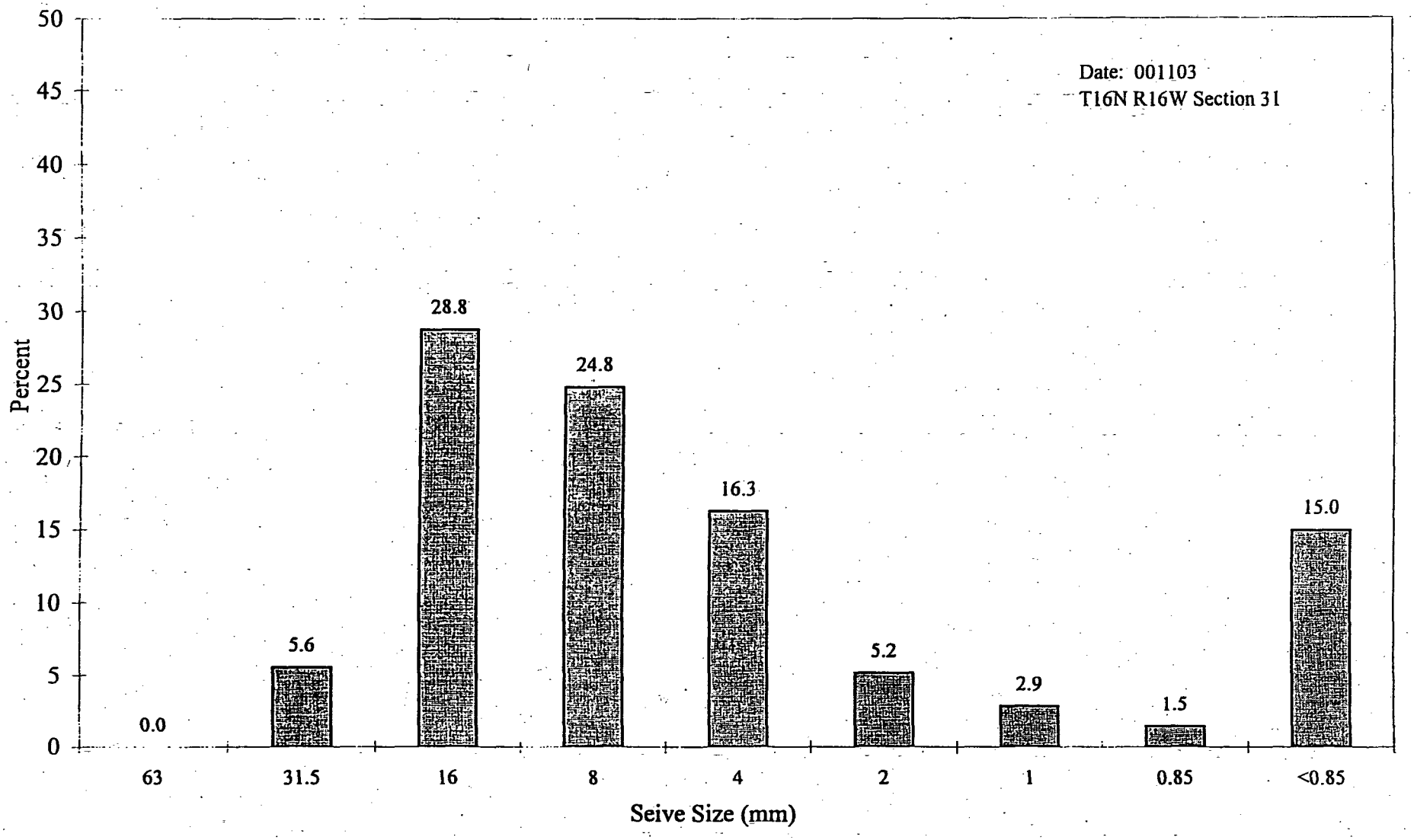


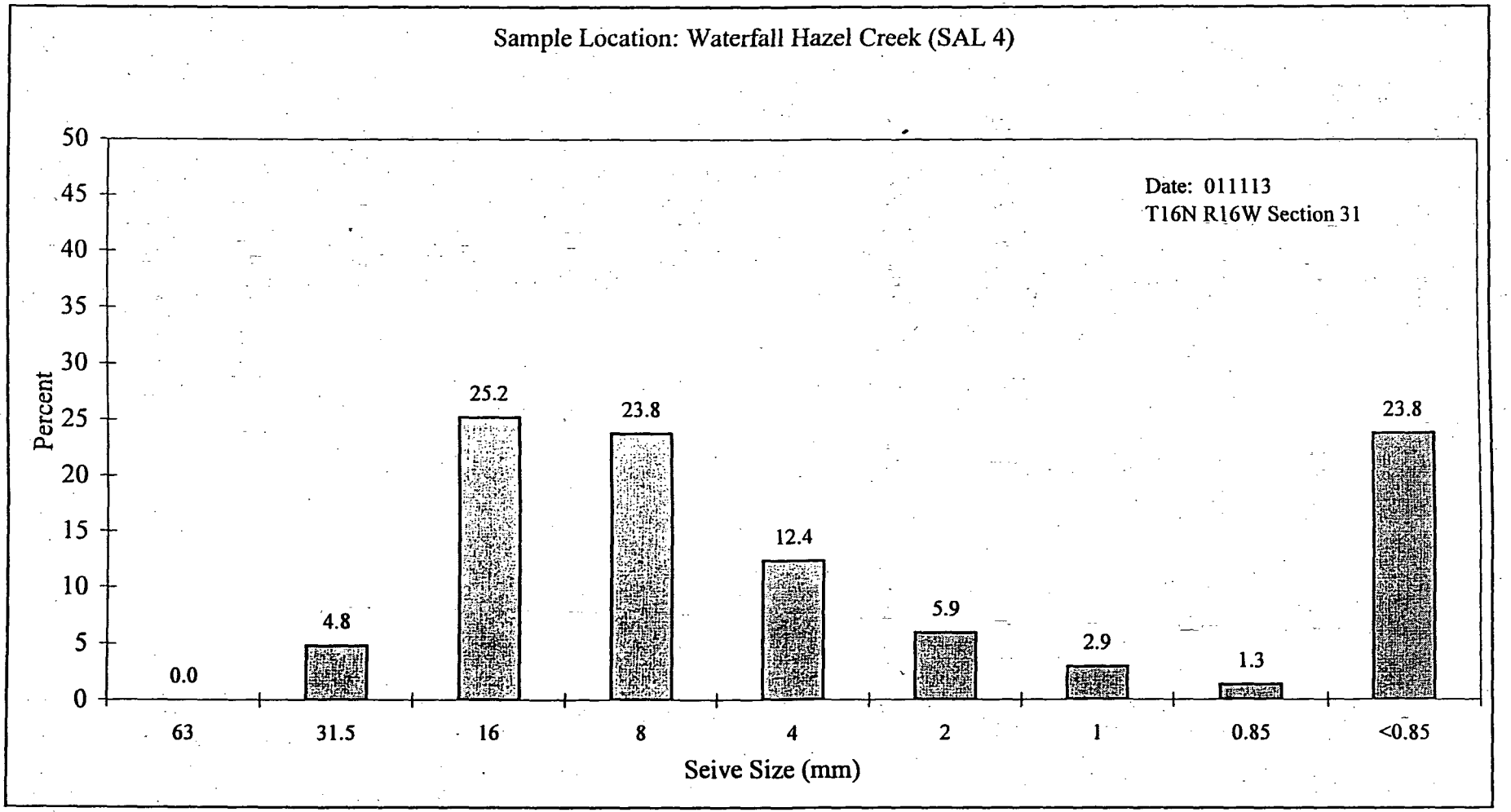
255

50

Average McNeil Sediment Samples (eight samples)
Campbell Timberland Management, Fort Bragg, CA

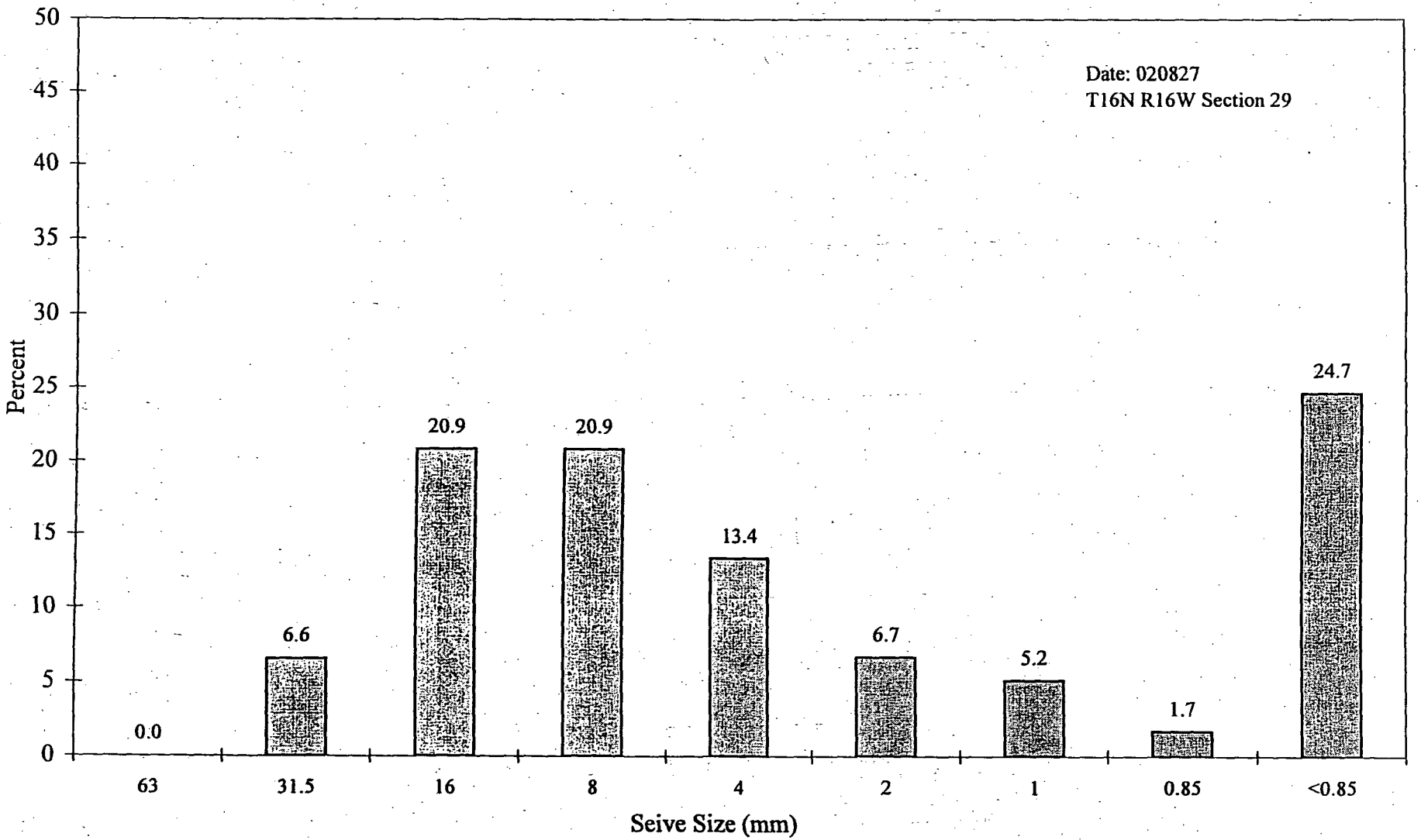
Sample Location: Waterfall Hazel Creek-Sal4

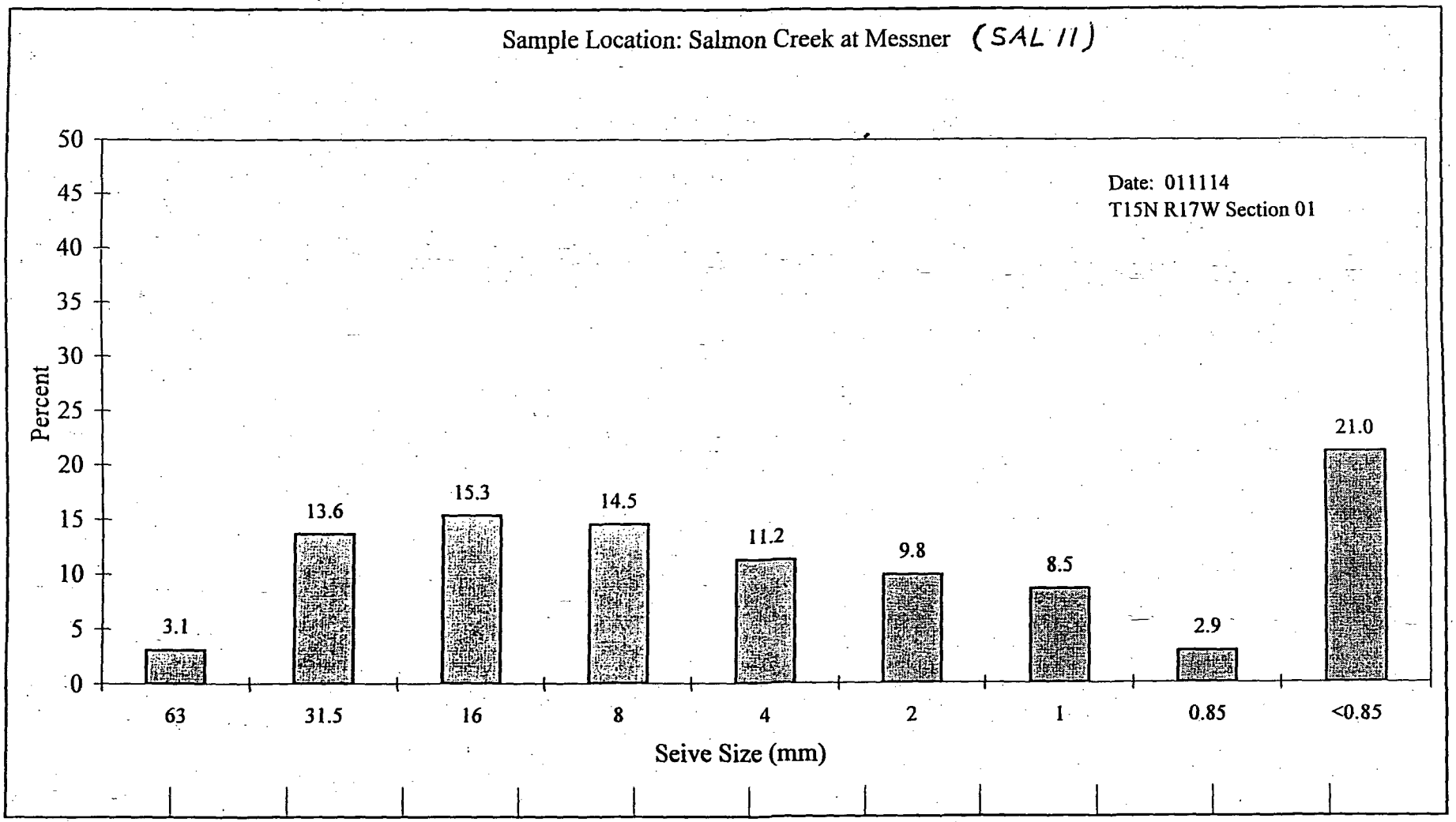


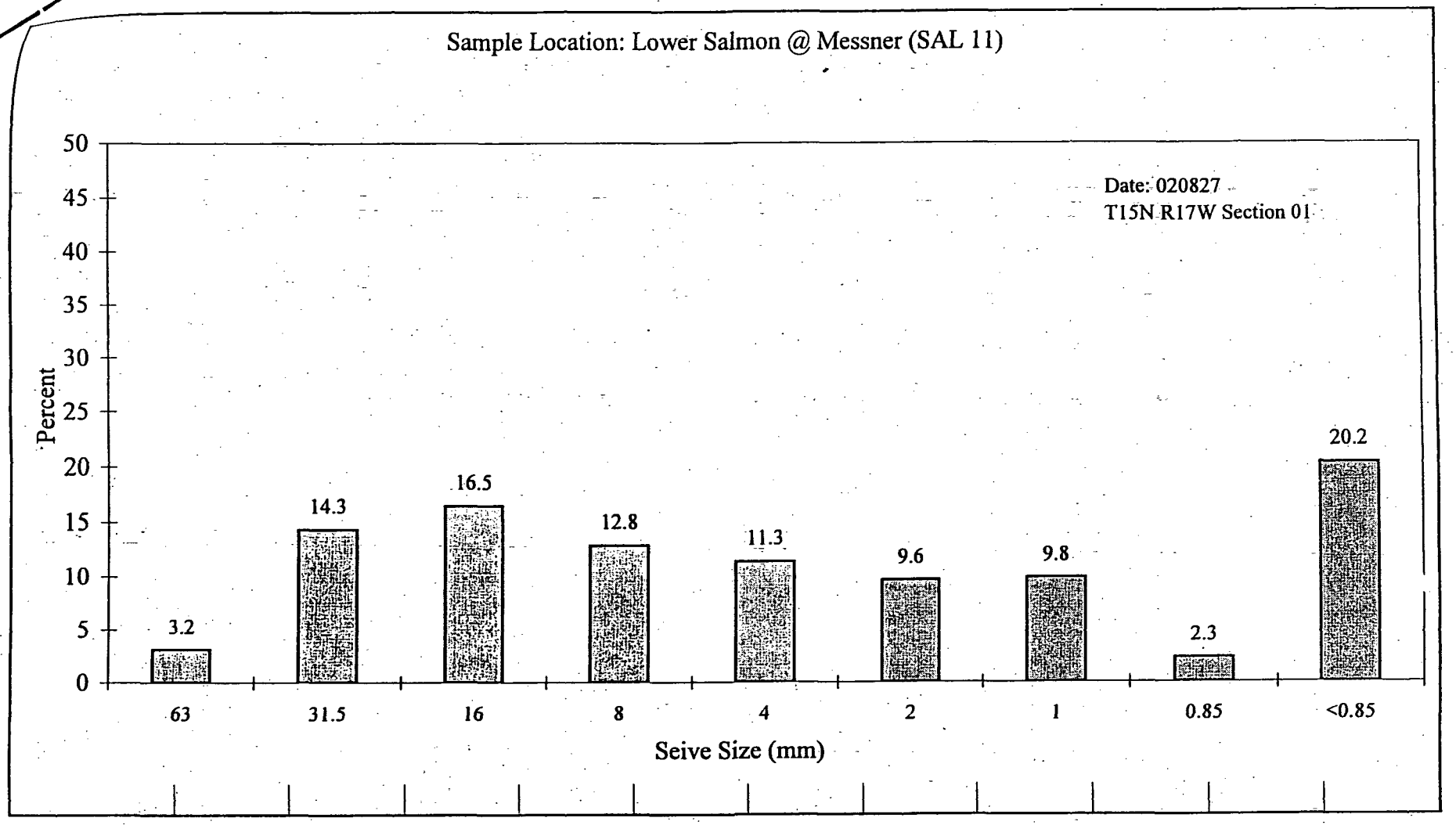

Sample Location: Waterfall Hazel Creek (SAL 4)
Date: 011113
T16N R16W Section 31
Percent
50
45
40
35
30
25
20
15
10
5
0
0.0
4.8
25.2
23.8
12.4
5.9
2.9
1.3
23.8
63
31.5
16
8
4
2
1
0.85
<0.85
Seive Size (mm)

Average McNeil Sediment Samples (eight samples)
Campbell Timberland Management, Fort Bragg, CA

Sample Location: Waterfall @ Hazel Creek (SAL 4)




Sample Location: Salmon Creek at Messner (SAL 11)
Date: 011114
T15N R17W Section 01
Percent
50
45
40
35
30
25
20
15
10
5
0
3.1
13.6
15.3
14.5
11.2
9.8
8.5
2.9
21.0
63
31.5
16
8
4
2
1
0.85
<0.85
Seive Size (mm)


Sample Location: Lower Salmon @ Messner (SAL 11)
Date: 020827
T15N R17W Section 01
Percent
50
45
40
35
30
25
20
15
10
5
0
3.2
14.3
16.5
12.8
11.3
9.6
9.8
2.3
20.2
63
31.5
16
8
4
2
1
0.85
<0.85
Seive Size (mm)

ref: CAL FISH & GAME

APPENDIX

SALMON CREEK

HABITAT INVENTORY REPORT

Hab. Unit #	Stream Length	Memo
053	3752	Looks like a blown out logjam. Most fish seen in creek so far. YOY (coho and steelhead), stickleback. Fish in sun. Water temp. 59°.
059	4180	Looks like a log jam is forming.
061	4285	Log jam, retaining gravel, downcutting.
063	4387	Looks like a log jam is forming.
070	4901	Looks like a log jam is forming.
073	5206	Log jam, retaining gravel, downcutting.
081	5817	Landmark - old growth log with ferns growing out of it in the center of the channel. Fern boat.
087	6280	Looks like a blown out log jam.
088	6334	Possible restoration site. Rootwad anchor.
090	6577	Looks like a log jam forming.
096	7159	Looks like a blown out log jam, retaining gravel, downcutting, possible restoration site.
098	7289	Confluence-water temp.55. Run off from a vertical face with lots of silt being deposited. Left bank flag.
105	7772	Landmark - large single redwood.
112	8354	Log jam, retaining gravel, downcutting. Possible restoration site. Bedrock and LWD present.
113	8491	End of reach. Confluence of Big Jack Creek. Water temp. 56°. Double log jam. Retaining major gravel. Lots of YOY present.

GENERAL RECOMMENDATIONS

1. Salmon Creek should be managed as an anadromous, natural production stream.
2. There are many log debris accumulations in Salmon Creek that are causing or have the potential for causing erosion. The modification of some of these debris accumulations is recommended, but it must be done carefully to preserve existing habitat provided by the woody debris.
3. Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing cover is from small woody debris and undercut banks. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion. In many areas the material is at hand. Some areas may benefit from single and opposing wing-deflectors, or from low-stage (low profile) wiers, and channel constrictors. Many site specific projects can be specially designed to increase pool frequency, volume and shelter.
4. Map sources of upslope and in-channel erosion, and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream. Riparian planting should be incorporated to provide bank stability.
5. Continue outreach to landowners and community members regarding watershed education and fish restoration efforts on Salmon Creek.

COMMENTS AND PROBLEM SITE INVENTORY

Hab. Unit #	Stream Length	Memo
009	602	Log jam, retaining gravel, no downcutting.
012	729	Spawning activity last winter.
015	963	Fence on on both sides of creek also trail out.
017	1140	Log jam.
018	1222	Possible restoration site. Pool with no shelter. Bedrock present.
029	2005	Log jam.
039	2651	Possible restoration site.
044	3074	Log jam, retaining gravel, no downcutting.
046	3275	Possible confluence, marked with two orange flags.
047	3405	More cattis fly and YOY present.

One site was electrofished in Salmon Creek on October 25, 1996 by DFG personnel Wendy Jones and Scott Harris along with NEAP personnel Giselle Reaney and Robert Baxter and Coastal Land Trust project manager Dobie Dolphin. All measurements are fork lengths unless noted otherwise. The site sampled was approximately .5 mile from the survey start. The sample included 5 coho, ranging in size from 71mm to 86mm, 17 steelhead ranging from 48mm to 136mm, 29 prickly sculpin ranging from 56mm to 100mm, 5 Pacific lamprey ammocete ranging from 98mm to 122mm, one crayfish 94 mm in length and a tree frog. Coho and steelhead were observed throughout the reach during the habitat survey.

DISCUSSION

F4 channels are low gradient (<2%), meandering stream reaches that have gravel dominated substrate. The F4 channel type is generally suitable for fish habitat improvement structures. F4 channels are well-suited for bank-placed boulders to improve fish habitat. They are fair for low-stage wiers, single and opposing wing-deflectors, channel constrictors and log cover.

Water temperatures recorded on the survey days ranged from 56° F to 59° F. Air temperatures ranged from 61° F to 64° F. This is a very good water temperature for salmonids, and indicates that Salmon Creek would be good for summer rearing needs.

Pool habitats comprised approximately 62% of the total length of this reach. This is a good percentage of pools, since DFG recommends a pool/riffle ratio of 50/50. Salmon Creek is a second order stream which means primary pools must be at least 2 feet deep. The pool must occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Seventy-three percent of the pools on this reach are primary pools, which is very good pool habitat. over summer rearing refugia !!

Mean shelter rating for pools was low, at 53. Shelter rating in flatwater habitats was even lower at 20. A pool shelter rating of approximately 100 is desirable. The cover that now exists is mainly being provided by small woody debris, with large woody debris and undercut banks contributing smaller amounts. Log and root wad cover structures in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest for both adults and juveniles from water velocity, and also divides territorial units to reduce density related competition.

The 6 low-gradient riffles had gravel as the dominant substrate. This is generally acceptable for spawning salmonid. Overall, gravel was the dominant substrate in 64% of the habitat units surveyed, with sand dominant in 32% of the units.

Twenty-four percent of the pool tail-outs measured had embeddedness ratings of one, and 54% had a value of 2. This is considered fair to good spawning habitat.

Mean percent canopy for this reach was 94%. This is a good percentage of canopy, since 80% is generally considered optimum in north coast streams.

probably much closer to good/excellent considering the geology "ancient sand dune" and Franciscan melange and what the system can provide/recruit into the stream channel

Fourteen habitat types were identified. Data are summarized in Table 2. The more frequent habitat types by percent **occurrence** were lateral scour pools log enhanced 25%, lateral scour pools root wad enhanced 20%, and step runs 11% (Graph 3). By percent total **length**, lateral scour pools log enhanced made up 23%, lateral scour pools root wad enhanced 21%, and step runs 17% (Table 2).

Seventy-three pools were identified (Table 3). Scour pools were most often encountered at 89%, and comprised 91% of the total length of pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Seventy-three percent of the pools were greater than two feet in depth (Graph 5).

Shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Pool habitat types had the highest mean shelter rating at 53. Riffle habitats followed with a rating of 29 (Table 1). Of the pool types scour pools had the highest mean shelter rating at 55, with main channel pools rated 41 (Table 3).

Table 6 summarizes dominant substrate by habitat type. Gravel was the dominant substrate observed in 100% of the 6 low-gradient riffles. Gravel was also the dominant substrate in 64% of the habitat units surveyed, while sand was dominant in 32% of the units surveyed.

Depth of cobble embeddedness was estimated at pool tail-outs. Of the 72 pool tail-outs measured, 24% had a value of 1, 54% had a value of 2, 22% had a value of 3, and 0% had a value of 4. On this scale, a value of one (<25% embedded) is best for fish (Graph 6).

Only six percent of the survey reach lacked shade canopy. Of the 94% of the creek covered with canopy, 89% was composed of deciduous trees and 11% was composed of evergreen trees (Graph 7).

Graph 8 summarizes mean percentage of the dominant vegetation on the banks. Grass covered 23% of the banks, brush 17% and deciduous trees 57%. Graph 9 shows the mean percentage of dominant substrate composition of the banks. Silt/clay was the dominant substrate comprising 64% of the banks, with cobble/gravel 28%, and boulder 5%.

BIOLOGICAL INVENTORY

Adult carcass surveys were conducted on this same reach in the winter of 1995-96. One survey per month was conducted from December through March. A total of 4 coho carcasses, 6 live coho, 1 unknown skeleton and 14 redds were found.

Results of an outmigrant study done on Salmon Creek from April-June 1995, show 116 coho and 225 steelhead yearlings captured, in addition to 197 unidentified salmonid young of the year (YOY), 10 coho YOY and 17 steelhead YOY. "Salmon Creek coho and steelhead were found to weigh less (were thinner) than in other streams sampled...This seems to be contradictory to the fact that the lengths of the coho were generally longer here than at other streams trapped." (*1995 Outmigrant Studies in Five Mendocino County Streams"*, by Michael Maahs for Salmon Trollers Marketing Association).

Riffle, flatwater, and pool habitat types
Habitat types and measured parameters
Pool types
Maximum pool depths by habitat types
Dominant substrates by habitat types
Mean percent shelter by habitat types

Graphs are produced from the tables using Lotus 1,2,3. Graphs developed for Salmon Creek include:

Riffle, flatwater, pool habitats by percent occurrence
Riffle, flatwater, pool habitats by total length
Total habitat types by percent occurrence
Pool types by percent occurrence
Total pools by maximum depths
Embeddedness
Pool cover by cover type
Percent canopy
Bank composition by composition type

HABITAT INVENTORY RESULTS

ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THIS REPORT

The habitat inventory of July 25 - August 15, 1996 was conducted by Giselle Reaney and Robert Baxter, displaced fishers employed by Coastal Land Trust under a NEAP federal grant funded through the Humboldt County Resources Conservation District. Technical support was provided by Bob Coey, DFG Basin Planner and Weldon Jones, DFG Inland Fisheries Biologist. Administrative support was provided by Curtis Ehle and Gary Friedrichsen, Humboldt County Resources Conservation District. Total length of stream surveyed was approximately 1.6 miles. The survey started at the west boundary of the Thomas property, approximately 1 1/4 miles from the mouth of Salmon Creek. Coastal Land Trust was denied permission to survey downstream from this point. The survey ended at the east boundary of the Bush property (the west boundary of Georgia Pacific). Flow was estimated to be 1.9 - 3.8 cfs during the survey period. A flow of 0.32 cfs was measured on October 25, 1996, approximately .5 mile from the beginning of the survey with a DFG flowmeter.

This section of Salmon Creek is an F4 channel type for the entire reach. F4 channels are low gradient (<2%), well entrenched, meandering streams with a predominantly gravel substrate. → Thermal refugia

Water temperatures ranged from 56° F to 59° F. Air temperatures ranged from 61° F to 64° F.

Table 1 summarizes the riffle, flatwater and pool habitat types. By percent **occurrence,** pool habitat types made up 65%, flatwater types 26% and riffles 10%. (Graph 1). Pool habitat types made up 62% of the total survey **length,** flatwater types 31% and riffles 7% (Graph 2).

(none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300, and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes.

8. Canopy:

Stream canopy is estimated using handheld spherical densiometers and is a measure of the water surface shaded during periods of high sun. In the Albion River, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results recorded.

9. Bank Composition:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In the Albion River, the dominant composition type in both the right and left banks was selected from a list of eight options on the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual.*

Biological inventory was conducted in Salmon Creek to document the fish species composition and distribution. One site was electrofished in Salmon Creek using a type 12, 200 volt electrofisher. The site was end-blocked with nets to contain the fish within the sample reach. Fish were counted by species, measured and weighed, and returned to the stream.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat Runtime, a dBASE 4.1 data entry program developed by the California Department of Fish and Game (DFG). This program also processes and summarizes the data.

The Habitat Runtime program produces the following tables:

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated. Flows should also be measured or estimated at major tributary confluences.

2. Channel Type:

Channel typing is conducted according to the classification system developed by David Rosgen (1985). This methodology is described in the California Salmonid Stream Habitat Restoration Manual. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are four measured parameters used to determine channel type: 1) water slope gradient, 2) channel confinement, 3) width/depth ratio, 4) substrate composition.

3. Temperatures:

Both water and air temperatures are taken and recorded at each tenth unit typed. The time of the measurement is also recorded. Temperatures are taken in fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry".The Albion River habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. Channel dimensions were measured using a tape measure and stadia rod. Unit measurements included mean length, mean width, mean depth, and maximum depth. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were taken in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In the Albion River, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4).

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In the Albion River, a standard qualitative shelter value of 0

STREAM INVENTORY REPORT

SALMON CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on a section of Salmon Creek to assess habitat conditions for anadromous salmonids. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids. The objective of the biological inventory was to document the salmonid species present and their distribution in the stream. Recommendations for stream restoration and enhancement were prepared after analyzing the information collected.

The objective of this report is to present results and findings of the inventory and to recommend options for potential enhancement of habitat for coho salmon and steelhead trout.

WATERSHED OVERVIEW

Salmon Creek is a second order stream located in Mendocino, California (See map)) approximately one mile south of the Albion River. Its legal description at the confluence with the Pacific Ocean is T16N R17W S28. Its location is 39°12'57"N latitude and 123°46'10"W longitude. Total length of blue line stream is 8.3 miles according to the Albion 7.5 minute quadrangle. Salmon Creek drains a watershed of approximately 10.83 square miles. Most of the watershed is owned by Georgia Pacific and is used for timber production. Other smaller privately owned portions are in the lower three miles below the confluence with Jack Creek.

METHODS

The habitat inventory conducted on the above reach follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1994). This inventory was conducted by a two person team, both of whom were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). The crew performed a 100% sample survey on this reach.

HABITAT INVENTORY COMPONENTS

The standardized habitat inventory form found in the *California Salmonid Stream Habitat Restoration Manual* was used for the habitat inventory. There are ten components to the inventory form: flow, channel type, temperature, habitat type, embeddedness, shelter rating, substrate composition, canopy and bank composition. Comments and problem sites were noted on the bottom of the form.

STATION Sa 6.0

Drainage: SALMON CREEK Stream: SALMON CREE Date: 10/13/83 Start Time: 10:15 Stop Time: 14:30
Township: 15N Range: 7W Section: 02 Quarter Section: NE Elevation: 160 ft Station Length: 30 meters
Personnel: Shocker: KID Netter #1: D P Netter #2: AIN Netter #3: TER

Station Enviromental Data

Time: 9:00 Air Temperature: 17.0 C Dissolved Oxygen: ppm Water Temperature: 14.0 C
Ph: Conductivity: micromhos/cm Turbidity: NTU

Cover Rating: Surface Turbulence: Object Cover: Undercut Banks: Overhanging Vegetation: Spawning Habitat:
Estimated Bottom Composition: Clay: Silt: 2% Sand: 8% Gravel: 90% Cobble: Boulder: Bedrock:
Estimated Stream Surface: Pool: 30% Riffle: Run: 70% Estimated Canopy: 50% Gradient: 1%

Measured Flow: 1.2 cfs (0.0 cms) Estimated Flow: 1.3 cfs
Water Surface Area: 128 square meters Water Volume: 16.3 cubic meters

Notes:

Catch Data

ID Number	Species	Catch By Pass 1	2	3	Total Catch	Population Code	Estimate	CI	Density	Biomass Grams	Density
1	PACIFIC LAMPREY	16	23	13	52	2	52		0.0	77	6.0
9	COHO SALMON	5	0	0	5	2	5		0.0	30	2.0
11	RAINBOW TROUT	38	17	3	58	4	63	13.2	0.0	206	16.0
47	THREESPINE STICKLEBACK	25	25	11	61	4	108	15.5	1.0	34	3.0

Population density is measured in fish per square meter
Biomass density is measured in kilograms per hectare
Code 1: Single pass; Code 2: Sum of passes; Code 3: Two pass method; Code 4: Leslie method
The population estimate + or - CI approximates a 95 % confidence interval

****
Stream name: Salmon Creek
Drainage name: Salmon Creek
Date: 10/11/83
Species: Coho Salmon

Number caught: 5
Range: Minimum = 73 , Maximum = 90
Mean: 82.2
Median: 81
List of frequency (mm - frequency): 73 - 1 , 80 - 1 , 81 - 1 , 87 - 1 , 90 - 1

	P.E.	Standing P.E.	Crop Eff.
SS	5	.0239	2.3474
SH	59	.4617	16.3969
STB	84	.6573	3.6635
AM	104	.8138	12.0501

****
Stream name: Salmon Creek
Drainage name: Salmon Creek
Date: 10/11/83
Species: Steelhead

Number caught: 58
Range: Minimum = 45 , Maximum = 141
Mean: 71.03793
Median: 66
List of frequency (mm - frequency): 45 - 1 , 49 - 3 , 51 - 1 , 52 - 4 , 54 - 1 , 55 - 1 , 56 - 2 , 57 - 2 , 58 - 1 , 59 - 1 , 60 - 3 , 61 - 1 , 62 - 1 , 64 - 2 , 65 - 2 , 66 - 3 , 67 - 3 , 68 - 1 , 69 - 4 , 72 - 1 , 74 - 1 , 76 - 1 , 77 - 3 , 78 - 1 , 79 - 1 , 80 - 1 , 82 - 1 , 93 - 1 , 101 - 1 , 103 - 1 , 106 - 1 , 108 - 1 , 110 - 2 , 134 - 1 , 140 - 1 , 141 - 1

****
Stream name: Salmon Creek
Drainage name: Salmon Creek
Date: 10/11/83
Species: Brook Trout

Number caught: 61
Range: Minimum = 22 , Maximum = 54
Mean: 36.37705
Median: 36
List of frequency (mm - frequency): 22 - 1 , 24 - 2 , 27 - 1 , 28 - 3 , 29 - 1 , 30 - 1 , 31 - 1 , 32 - 1 , 33 - 6 , 34 - 3 , 35 - 4 , 36 - 8 , 37 - 5 , 39 - 7 , 40 - 4 , 41 - 3 , 42 - 3 , 43 - 1 , 44 - 3 , 46 - 2 , 54 - 1

****
Stream name: Salmon Creek
Drainage name: Salmon Creek
Date: 10/11/83
Species: Ammocetes

Number caught: 52
Range: Minimum = 51 , Maximum = 175
Mean: 87.88462
Median: 84.5
List of frequency (mm - frequency): 51 - 1 , 61 - 1 , 66 - 1 , 71 - 1 , 72 - 1 , 73 - 1 , 74 - 1 , 75 - 1 , 76 - 1 , 77 - 1 , 78 - 1 , 79 - 1 , 81 - 1 , 82 - 1 , 83 - 1 , 84 - 1 , 85 - 1 , 86 - 1 , 87 - 1 , 88 - 1 , 89 - 1 , 90 - 1 , 91 - 1 , 92 - 1 , 93 - 1 , 94 - 1 , 95 - 1 , 96 - 1 , 97 - 1 , 98 - 1 , 99 - 1 , 100 - 1 , 101 - 1 , 102 - 1 , 103 - 1 , 104 - 1 , 105 - 1 , 106 - 1 , 107 - 1 , 108 - 1 , 109 - 1 , 110 - 1 , 111 - 1 , 112 - 1 , 113 - 1 , 114 - 1 , 115 - 1 , 116 - 1 , 117 - 1 , 118 - 1 , 119 - 1 , 120 - 1 , 121 - 1 , 122 - 1 , 123 - 1 , 124 - 1 , 125 - 1 , 126 - 1 , 127 - 1 , 128 - 1 , 129 - 1 , 130 - 1 , 131 - 1 , 132 - 1 , 133 - 1 , 134 - 1 , 135 - 1 , 136 - 1 , 137 - 1 , 138 - 1 , 139 - 1 , 140 - 1 , 141 - 1 , 142 - 1 , 143 - 1 , 144 - 1 , 145 - 1 , 146 - 1 , 147 - 1 , 148 - 1 , 149 - 1 , 150 - 1 , 151 - 1 , 152 - 1 , 153 - 1 , 154 - 1 , 155 - 1 , 156 - 1 , 157 - 1 , 158 - 1 , 159 - 1 , 160 - 1 , 161 - 1 , 162 - 1 , 163 - 1 , 164 - 1 , 165 - 1 , 166 - 1 , 167 - 1 , 168 - 1 , 169 - 1 , 170 - 1 , 171 - 1 , 172 - 1 , 173 - 1 , 174 - 1 , 175 - 1

****

Stream name: Salmon Creek
Drainage name: Salmon Creek
Date: 10/11/83
Species: Coho Salmon

Number caught: 5
Range: Minimum = 73 , Maximum = 90
Mean: 82.2
Median: 81
List of frequency (mm - frequency): 73 - 1 , 80 - 1 , 81 - 1 ,
87 - 1 , 90 - 1

	P.E.	Standing P.E.	Crop Eq.
SS	5	.0239	2.3474
SH	59	.4617	16.3969
STB	84	.6573	3.6635
AM	104	.8138	12.0501

****

Stream name: Salmon Creek
Drainage name: Salmon Creek
Date: 10/11/83
Species: Steelhead

Number caught: 58
Range: Minimum = 45 , Maximum = 141
Mean: 71.62793
Median: 68
List of frequency (mm - frequency): 45 - 1 , 49 - 3 , 51 - 1 ,
52 - 4 , 54 - 1 , 55 - 1 , 56 - 2 , 57 - 2 , 58 - 1 ,
59 - 1 , 60 - 3 , 61 - 1 , 62 - 1 , 64 - 2 , 65 - 2 ,
66 - 3 , 67 - 3 , 68 - 1 , 69 - 4 , 72 - 1 , 74 - 1 ,
76 - 1 , 77 - 3 , 78 - 1 , 79 - 1 , 80 - 1 , 82 - 1 ,
103 - 1 , 111 - 1 , 103 - 1 , 106 - 1 , 108 - 1 , 110 - 2 ,
139 - 1 , 140 - 1 , 141 - 1

****

Stream name: Salmon Creek
Drainage name: Salmon Creek
Date: 10/11/83
Species: Stickleback

Number caught: 51
Range: Minimum = 22 , Maximum = 54
Mean: 36.07705
Median: 36
List of frequency (mm - frequency): 22 - 1 , 24 - 2 , 27 - 1 ,
28 - 3 , 29 - 1 , 30 - 1 , 31 - 1 , 32 - 1 , 33 - 6 ,
34 - 3 , 35 - 4 , 36 - 8 , 37 - 5 , 39 - 7 , 40 - 4 ,
41 - 3 , 42 - 3 , 43 - 1 , 44 - 3 , 46 - 2 , 54 - 1

****

Stream name: Salmon Creek
Drainage name: Salmon Creek
Date: 10/11/83
Species: Ammocoetes

Number caught: 52
Range: Minimum = 51 , Maximum = 175
Mean: 87.88461
Median: 66.5
List of frequency (mm - frequency): 51 - 1 , 52 - 1 , 53 - 1 ,
61 - 1 , 62 - 1 , 63 - 1 , 64 - 1 , 65 - 1 , 66 - 1 ,
71 - 1 , 73 - 1 , 74 - 1 , 77 - 1 , 78 - 1 , 80 - 1 ,

Stream: Salmon Creek 1983
Species: steelhead

Removal Pattern: 38 17 3

Total Catch	=	58
Population Estimate	=	59
Chi Square	=	1.932
Pop Est Standard Err	=	1.789
Lower Conf Interval	=	58.000
Upper Conf Interval	=	62.581
Capture Probability	=	0.690
Capt Prob Standard Err	=	0.068
Lower Conf Interval	=	0.555
Upper Conf Interval	=	0.826

The population estimate lower confidence interval was set equal to the total catch. Actual calculated lower CI was 55.41858 .

Stream: Salmon Creek 1983
Species: steelhead

Removal Pattern: 38 17 3

Total Catch	=	58
Population Estimate	=	59
Chi Square	=	1.932
Pop Est Standard Err	=	1.789
Lower Conf Interval	=	58.000
Upper Conf Interval	=	62.581
Capture Probability	=	0.690
Capt Prob Standard Err	=	0.068
Lower Conf Interval	=	0.555
Upper Conf Interval	=	0.826

The population estimate lower confidence interval was set equal to the total catch. Actual calculated lower CI was 55.41858 .

STATION Sa 6.1

Drainage: SALMON CREEK Stream: SALMON CREE Date: 10/11/83 Start Time: 10:15 Stop Time: 11:30
Township: Range: Section: 02 Quarter Section: NE Elevation: 160 ft Station Length: 30 meters
Personnel: Shocker: KID Netter #1: D P Netter #2: AIN Netter #3: TSR

Station Enviromental Data

Time: 9:00 Air Temperature: 17.0 C Dissolved Oxygen: ppm Water Temperature: 14.
Ph: Conductivity: micromhos/cm Turbidity: NTU

Cover Rating: Surface Turbulence: Object Cover: Undercut Banks: Overhanging Vegetation: Spawning Habitat:
Estimated Bottom Composition: Clay: Silt: 2% Sand: 8% Gravel: 90% Cobble: Boulder: Bedrock:
Estimated Stream Surface: Pool: 30% Riffle: Run: 70% Estimated Canopy: 50% Gradient: 1%

Measured Flow: 1.2 cfs (0.0 cms) Estimated Flow: 1.3 cfs
Water Surface Area: 128 square meters Water Volume: 16.3 cubic meters

Notes:

Catch Data

ID Number	Species	Catch By Pass 1	2	3	Total Catch	Population Code	Estimate	CI	Density	Biomass Grams	Density
1	PACIFIC LAMPREY	16	23	13	52	2	52		0.0	77	6.0
9	COHO SALMON	5	0	0	5	2	5		0.0	30	2.0
11	RAINBOW TROUT	38	17	3	58	4	63	13.2	0.0	206	16.0
47	THREESPINE STICKLEBACK	25	25	11	61	4	108	15.5	1.0	34	3.0

Population density is measured in fish per square meter
Biomass density is measured in kilograms per hectare
Code 1: Single pass; Code 2: Sum of passes; Code 3: Two pass method; Code 4: Leslie method
The population estimate + or - CI approximates a 95 % confidence interval

STATION S-1 6.1

Drainage: SALMON CREEK Stream: SALMON CREE Date: 10/11/83 Start Time: 10:15 Stop Time: 11:30
Township: Range: Section: 02 Quarter Section: NE Elevation: 160 ft Station Length: 30 meters
Personnel: Shocker: KID Netter #1: D P Netter #2: AIN Netter #3: TER

Station Enviromental Data

Time: 9:00 Air Temperature: 17.0 C Dissolved Oxygen: ppm Water Temperature: 14.0 C
PH: Conductivity: micromhos/cm Turbidity: - NTU

Cover Rating: Surface Turbulence: Object Cover: Undercut Banks: Overhanging Vegetation: Spawning Habitat:
Estimated Bottom Composition: Clay: Silt: 2% Sand: 3% Gravel: 90% Cobble: Boulder: Bedrock:
Estimated Stream Surface: Pool: 30% Riffle: Run: 70% Estimated Canopy: 50% Gradient: 1%

Measured Flow: 1.2 cfs (0.0 cms) Estimated Flow: 1.3 cfs
Water Surface Area: 128 square meters Water Volume: 16.3 cubic meters

Notes:

Catch Data

ID Number	Species	Catch By Pass 1	2	3	Total Catch	Population Code	Estimate	CI	Density	Biomass Grams	Density
1	PACIFIC LAMPREY	16	23	13	52	2	52		0.0	77	6.0
9	COHO SALMON	5	0	0	5	2	5		0.0	30	2.0
11	RAINBOW TROUT	38	17	3	58	4	63	13.2	0.0	296	16.0
47	THREESPINE STICKLEBACK	25	25	11	61	4	108	15.5	1.0	34	3.0

Population density is measured in fish per square meter
Biomass density is measured in kilograms per hectare
Code 1: Single pass; Code 2: Sum of passes; Code 3: Two pass method; Code 4: Leslie method
The population estimate + or - CI approximates a 95 % confidence interval

(stream is supporting twice as many salmon as steelhead). However, because of the serious extremely large log jam barriers, the spawning and nursery potential of the stream is not realized and the successful migration of the smalt is impaired. Removal of the log jams would increase the number of fish spawning by permitting access to spawning areas (primarily in Hazel Gulch and Donnelly Gulch), would favor successful nursery by lowering water temperatures and by encouraging common insect reporduction (caddis fly apparently just returning after a previous elimination of population from stream) and would permit the timely return of the year's hatch to the sea.

The current logging damage to the central portion of Big Salmon by Aborigine should be rectified for preservation of nursery area and fish traffic , the current logging damage to Hazel Gulch by H. J. Gray should be repaired for this area is of primary importance to the drainage as spawning grounds.

Recommendations:

1. Clearance of the 31 log jam barriers, as delineated on attached map.
2. Inspection of H. J. Gray's current logging operations to determine whether clearance of debris has been made.
3. Inspection of Aborigine's current logging operations to determine whether clearance of debris has been made.

Sources of Information:

1. Personal Observation.
2. S.T. Novella, rancher at mouth, owns south side of stream.
3. James Sansi, Little River Rd., leasee of land at mouth of sheep grazing.
4. Foreman of Gray's Logging operation.
5. Williams of William's Ranch
6. Mr. Hardell, Hardell's Gen. Mds. Store, Fort Bragg.

Edward R. J. Primbs/ls

12/22/66

Fish Population

1. Silver Salmon and Steelhead

The following parr were netted, identified, and examined before release in representative samples:

	Actual Size	Size Range	Size Average	Condition
Salmon	112	2"-3½"	2½"	Heavy, well proportional
Steelhead	48	1½'-7"	2"	" " " " "
Total	160			

The populations of steelhead and salmon below optimum.

2. Other Fish Netted and Identified

Three-spine stickleback: actual count 19.

Access

Confluence of Hazel Gulch and Donnelly Gulch:

Access by new Hardell Ranch Rd., which joins the Albion Ridge Rd (county) 6½ miles east of the post office of the village of albion. A small house just north of the entrance marks this site. The old Hardell ranch rd., about a mile north of the new rd., is currently impassible because of a washout. A mile from the entrance on the new rd., an old logging rd. joins the Hardell ranch rd., which logging rd. leads to the mouth of Hazel Gulch and Donnelly Gulch. From this point an old logging road follows Big Salmon downstream for 2½ miles, but is currently impassable, because of washouts and windfalls. During survey it was not checked in its entirety; it may be feasible to repair it.

Central Part of Big Salmon 1/2 mile Below End of Logging Road From Hardell's Ranch Road:

Access by new Aborigine Logging Co. Rd., which joins the Navarro Ridge Rd. 3½ miles up the Navarro Ridge Rd. from Highway #1. The aborigene Rd. passes through an old ranch, the gate to which was unlocked at time of survey. The gradient of this Road requires either a 4 wheel drive or a wieghted pickup.

At Mouth:

Access to mouth by road (paved) joining Highway #1 on west side, 100 feet south of Rickfield Service Station at village of Albion. A former logging road runs along the stream from the mouth to a point 2½ miles upstream from mouth. Locked gate at mouth, key to which is available from James Sousi, Little River Rd., leasee of land from Polly Anderson, owner. Road from mouth is currently inpassable even by jeep. Anderson intends to reopen road, however, purchasing land from Novello for this purpose. Rd. used for logging about 6 years ago.

Comments:

Big Salmon Cr. is of primary importance for silver salmon, secondary for steelhead

SUPPLEMENTARY SURVEY

5YRS ABOVE 1ST RECORD BY JONES

Big Salmon Creek | Mendocino County | July 25, 1966

Stream Identification:

Mouth T16N, R17W, Sec. 28; Big Salmon Creek flows into the Pacific Ocean 1/2 mile south of the Richfield station at the village of Albion on Highway 1 at the bridge crossing over Big Salmon Creek; highway bridge signs reads "Big Salmon Cr.".

Extent of Survey:

Entire drainage by foot with exception of these tributaries which have been surveyed separately: (1) Hazel Gulch, (2) Donnelly Gulch (Donley Gulch), both of which representing the headwaters of Big Salmon Cr. Period of Survey: 24 July 1966.

Environmental Conditions:

Stream Flow:
Immediately above tide water at mouth: 1.30 cfs.
Temperatures:
Immediately above tide water at mouth: 1700: air 62°, water 64°; weather fair, wind 20 mph.
Spawning Gravels:
1. evaluation: good
2. description: 12' in width; course gravel - fine g avel bottom with considerable silt in and below current logging areas; 3'-4' winter water coverage; gradient very slight throughout, which favors algae blooms in treeless areas.

Aquatic Insects:
1. type: mayfly nymphs, caddis fly larvae (young population), unidentified black beetle, microscopic insects in algae areas.
2. abundance: the traditional salmonid food, may fly, caddis fly, e.g., are quite limited, because of the character of the stream. The current caddis fly larvae population appear to be recently established. Apparently because of the scarcity of food, in more ideal environments, the parr tend to congregate in the treeless, warmwater areas, where algae blooms occur and where apparently many microscopic forms of insects thrive.

Logging Operations
1. Much silt has been deposited near the confluence of Hazel Gulch and Donnelly Gulch, apparently from the current logging operations on Hazel Gulch by H. J. Gray and Company.
2. Aborigine Logging Co., Caspar Cr., is currently logging along the streambed of Big Salmon for about 1/2 of a mile. There is at the time of this survey logs and slack in the stream from this operation.

Barriers:
1. Total: 31 log jams
2. Size:
   a. 17 small to moderate jams
   b. 14 large jams:
      #4 - 42'L, 18'w, 8'h; #5 - 24'1, 18'w, 10'h; #6 - 24'1, 24'w, 8'h; #7 - 50'1, 30'w, 10'h; #16 - 48'1, 30'w, 5'h; #19 - 100'1, 12'w, 4'h; #9 - 18'1, 24'w, 6'h; #11 - 36'1, 30'w, 10'h; #20 - 150'1, 40'w, 8'h; #22 - 60'1, 12'w, 4'h; #23 - 36'1, 45'w, 6'h; #24 - 36'1, 12'w, 5'h; #25 - 150'1, 18'w, 4'h; #26 - 100'1, 36'w, 5'h.

Note: area of stream near mouth, boulder bottom and narrow channel, may jam any logs or debris moving across, although it is now free of any barriers.

Pools - Pools are good; estimate 25 pools per 200 ft. and the size average is 2 to 3 ft. square and 1 ft. deep. Fewer pools will exist during the heavier run-offs as the gradient is considered relatively steep and these pools will be continued into one cascading flow.
Shelter - Shelter is abundant. Logs form 25% of the shelter at present. Other shelter consists of overhead and instream vegetation.
Barriers - Log and skid roads form 4 barriers in this gulch. They are scattered in even frequency and are composed of; dirt which is being pushed down to form the road; of silt which is being backed up by the road crossing; along with accummulated logs and debris.
Diversions - None observed.
Temperatures - The water temperature for this date was 53° F., and the air temperature was 80° F., at the junction with the Big Salmon Creek.
Food - It is considered adequate. Mayfly and insects were common, but not overly abundant as compared to other streams.
Aquatic Plants - None noted.
Winter Conditions - Winter conditions believed to be a maximum run of 5 c.f.s. Evidence of flows of this amount exists in the deep gulches cut in the earth down to the bedrock. Some of these gulches are 6 ft. across and 3 to 10 ft. deep in the upper section. Other sections average about 3 ft. deep and follow the stream width.
Pollution - None observed.
Springs - Numerous springs of no fishery value were observed at this date. Most of them were of an oozing consistency, or dry. One tributary to the north with a flow at this date of approximately .03 c.f.s. contributes to this gulch. This contributing tributary has a fishery value of 1/8 mi.; hence, a rock barrier
FISHES PRESENT AND SUCCESS - Steelhead and/or rainbow trout were observed. The average size was 1-1/2 in. The abundance was considered light, the average, from 3 to 4 per pool. As to success: It is believed that the summer die-off is high due to the near drought conditions of this stream. The condition of the existing fish was good; they appeared vigorous and healthy. Natural propagation, yes. Local residents remarked that this area has had heavy runs of steelhead but the jams and summer droughts have contributed to a high mortality in these fish, as well as to the distribution problem.
OTHER VERTEBRATES - Deer, racoon were observed.
FISHING INTENSITY - None observed.
OTHER RECREATIONAL USE - Recommend hunting, camping and limited fishing.
ACCESSIBILITY - Six and one-half miles from the town of Albion on the Albion ridge road, then one mile down a dirt logging road to the first fork, branch right for a short distance, thence you will arrive at a flat; then bear left and cross a small bridge. The creek you will cross at this point is the Big Salmon; the creek on the right after crossing this bridge is Donley Gulch. This road will parallel this creek to the end of the fishery value. This past was considered general access. Immediate access to the stream is relatively easy. There are some sections that are inaccessible due to the dense vegetation; otherwise, it is considered easy foot access.
OWNERSHIP - Ownership is believed to be private, but not posted as such.
POSTED OR OPEN - There were no postings observed either in the general access or the immediate stream.

Donnelly Gulch Mendocino County July 20, 1966

Identification: mouth R16W, T16N, Sec. 32 - Headwater tirbutary to Big Salmon Creek. Joins with Hazel Gulch to farm Big Salmon Creek.

Method of Survey: stream was surveyed on foot.

Date of Survey: July 19, 1966

Access: Approximately 6.5 miles east on the Albion Ridge Road, the Hardell Ranch Road turns off. This road goes to the mouth of Donnell Gulch. Before reaching the mouth, the road parts. The main fork turns north while the road to the mouth heads southeast. The road continues from the mouth of Donnelly Gulch to the end of fish value, but needs to be cleared of slash.

Stream Characteristics

1. Flow
   a. At mouth est. .1 cfs; stream width 2-4feet, average 3 feet; winter width 5-6 feet.
2. Temperatures
   a. At mouth - air 76°, H_2O - 60°; canapy open, weather clear, wind 10-15 mi. at 1130 hrs.
3. Barriers
   Twelve barriers were observed on main stream and its tributary. Three of these were log jams in combination with a road crossing the stream bed. None were of major proportions.

4. Logging
   No recent logging has been done on main stream. Tributary has been logged within last few years. No logging is presently taking place on any of the watershed.

5. Fish abundance
   The only place fish were observed was near the mouth of the stream. The only species identified was silver salmon. The fish were in fair condition, size 2½".

6. Aquatic Insects
   Insects were observed near the mouth of the stream. Only caddisfly were seen. All the riffle areas of the upper portions of the stream were dry or had so little flow that insects were not present. General observation - stream has little insect food to support fish during summer months.

7. Spawning or Nursery Areas
   Excellent spawning gravels from mouth to end of fish value. Stream bottom has an abundance of coarse gravel and rubble.
   Stream has little value as a nursery area, small flow and lack of insect life.

(4" - 5") as well as this year's (1½" - 2"), which suggests considerable stream blockage, interfering with parr migration. Moreover, while the east branch is primarily a spawning area, the nursery water is currently underused. Only 5 parr were noted in the west branch, which has little nursery as well as negligible spawning value.

Access - By new Hardell ranch road, which joins the Albion Ridge Road (county road) 6 1/4 miles east of the post office of the village of Albion. A small house just north of this entrance marks this site. The old Hardell ranch road, about a mile north of the new road, is currently impassable, because of a washout. A mile from the entrance on the new road, an old logging road joins the Hardell ranch road, which logging road leads to the mouth of Hazel Creek. The new Hardell ranch road itself follows Hazel Gulch Creek to the Hardell ranch and thence follows the east branch of the east-west fork to the current logging operations in the headwater area. The old Hardell ranch road follows the west fork to the headwater area.

Comments - The primary value of Hazel Gulch Creek is to be found on the east branch of the East-West fork of the stream at the Hardell ranchhouses. Here spawning grounds are located, excellent in quality, but burdened by recent logging operations on the stream. Few old logging barriers exist. However, those that do exist cannot be removed by floating, since Hazel Gulch Creek below the fork is a continuous area of dense thickets, branches, and roots and would certainly jam any moving debris.

The west branch is of little or no value: Little spawning gravel exists, and the summer flow is negligible. Moreover, an 18', 45° slopes, bedrock drops at mouth, while not a complete barrier to fish, because of 3' - 4' steps, certainl handicaps movement of both parr and adults.

Recommendations

1. Clearance of 10 small old log jams on east branch of east-west fork and below east-west fork.
2. Removal of 3' soil sink in grass pasture above 30' high bridge at Hardell's.
3. Removal of 5' log-boulder falls above 30' high bridge at Hardell's.
4. Inspection of H. J. Gray's current logging operations to determine whether clearance of debris has been made.
5. No clearance of west branch of east-west fork.

Sources of Information

1. Personal observation.
2. Mr. Hardell of Hardell's General Store, Fort Bragg.
3. Unidentified loggers.

/s/ Edward R. J. Primbs

mb

HAZEL GULCH CREEK

Mendocino County

July 19, 1966

Stream Identification: Mouth: T16N, R16, Sec 32; Hazel Gulch Creek flows into Big Salmon Creek at the mouth of Donnelly Gulch Creek, which is located 1 mile on Hazel Gulch Creek below the southern Hardell ranchhouse and 1 1/4 mil on the new Hardell ranch road from the Albion Ridge Road. An old logging bridge of soil and logs marks this site. Hazel Gulch Creek was referred to in the original report as Unnamed Tributary #5.

Extent of Survey - Entire drainage by foot with only cursory attention to area of current logging. Period of survey July 18, 1966.

Environmental Conditions

1. Stream Flow: At mouth: 0.09 cfs.
2. Temperatures: At mouth: 1730: air 74°, water 57°, weather fair, wind 5 mph.
3. Spawning Gravels
   - (A) On east branch of East-West Fork at Hardell ranchhouses:
     - (1) Evaluation: excellent
     - (2) Description: average 4' wide, coarse-fine gravels, 1' - 2' winter water coverage; gradient slight; stable.
   - (B) On west branch of East-West Fork at Hardell ranchhouses:
     - (1) Evaluation: poor
     - (2) Description: primarily mud bottom; poor fish access (18', 45° slope, bedrock drop at mouth); little gravel near northern Hardell ranchhouse.
   - (C) Below East-West Fork:
     - (1) Evaluation: fair
     - (2) Description: deep summer and winter pools; considerable silt and mud bottoms; flow broken by roots and dense thicke
4. Aquatic Insects
   - (A) Type: caddis fly larvae, and may fly and stone fly nymphs.
   - (B) Abundance: caddis fly larvae plentiful, others not abundant.
5. Diversions - 2 inch pipe and pump at Hardell's northern ranchhouse.
6. Current Logging - One mile on stream on east branch of East-West Fork, commencing about a mile above the Hardell ranchhouses. This logging is occurring in area of excellent spawning but only poor to fair nursery potential. H. J. Gray Company is logging; property owned by Hardell's. At time of survey debris is still in stream from logging and road building operations.

   (handwritten margin note: 2004 / 1966 / (38) years; Same area as "C" 17+ acre clear cut)
7. Barriers
   - (A) 18 small log jams on east branch of east-west fork and below east-west fork.
   - (B) 6-foot soil sink in grass pasture just above 30' high old bridge near Hardell's ranchhouses.
   - (C) 5' high log and boulder falls just above 30' high old bridge formerly used for passage to Hardell's southern ranchhouse.

Fish Population

1. Silver salmon and steelhead - The steelhead parr population on the east branch of the east-west fork was composed of last year's hatch

U-shaped valley with large redwoods in open, easy access area. An old skid road and/or a logging railroad, in various stages of condition, parallels 90% of this stream, - access on foot. The tributaries to this stream also contribute to the fishery value; they contribute approximately 4 mi. of the 10 mi. listed previously. The extreme headwaters of this creek are in a marshy area composed of many alders with occasional fir and redwood. Coming on down, there is considerable in-stream vegetation to the point of the junction with Donley Gulch. From here the stream obtains its park-like condition which progresses to a point approximately a mile or two from the Pacific Ocean. This mile or two area is composed of dense in-stream vegetation and pasture-like area. Approximately 60 to 100 years ago, a forest fire cleared this area. There are many burnt stumps around the surrounding terrain and much of the debris has been pushed into the stream, causing numerous log jams. The stream averages 10 ft. wide with a depth of 18 in. at this date. The average flow is 5 c.f.s. Velocity is very sluggish due to its mild gradient of about 6 ft. per 100. The bottom is predominantly rubble and gravel with occasional silt and mud. Spawning area for the overall stream is estimated at about 75%. Pools are scattered in frequency; estimate 1 to 2 pools per 150 ft. Shelter is abundant in the form of vegetation; estimate 75 to 80% of this stream covered with vegetation. There was only one barrier observed in the extreme upper section, caused by a road crossing; no diversions observed. Food is considered adequate. Access is generally easy.

RECOMMENDED MANAGEMENT -

1. I recommend that the jams listed on the jam barrier survey be removed to facilitate access to migrating salmon.
2. I recommend a road or a clearance project of the old logging railroad and/or logging road be exercised to allow easy accessibility to the general public for camping, hunting and fishing.
3. If this stream is to be eventually used as an egg-taking station, I recommend that an egg-taking station be constructed at the extreme lower section of this stream;
4. That the stream be closed to fishing.
5. Build the access road for creamer chopping study and general access;
6. Build a fish collecting trap on the dam itself.

Local residents speak of many salmon migrating in this stream in the old days (50 or 60 years ago). Their estimates were in general, "You could walk across the stream on the backs of the salmon". From this information (general as it is) one can guess what fishery value this stream once had.

I further recommend that any roads crossing this stream to other tributaries, or to the extreme headwaters, be removed and elevated to a sufficient height to allow passage of driftwood and migrating fish.

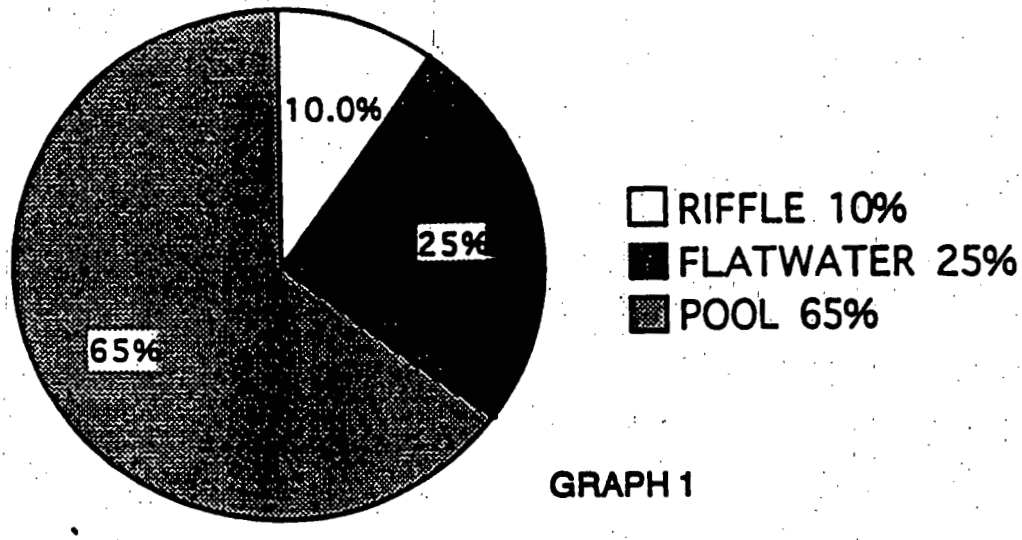
This completes the stream survey for Big Salmon Creek by Fish and Game Assistant, James Crowdus, October 6, 1961.

James Crowdus/es

cc: James Crowdus

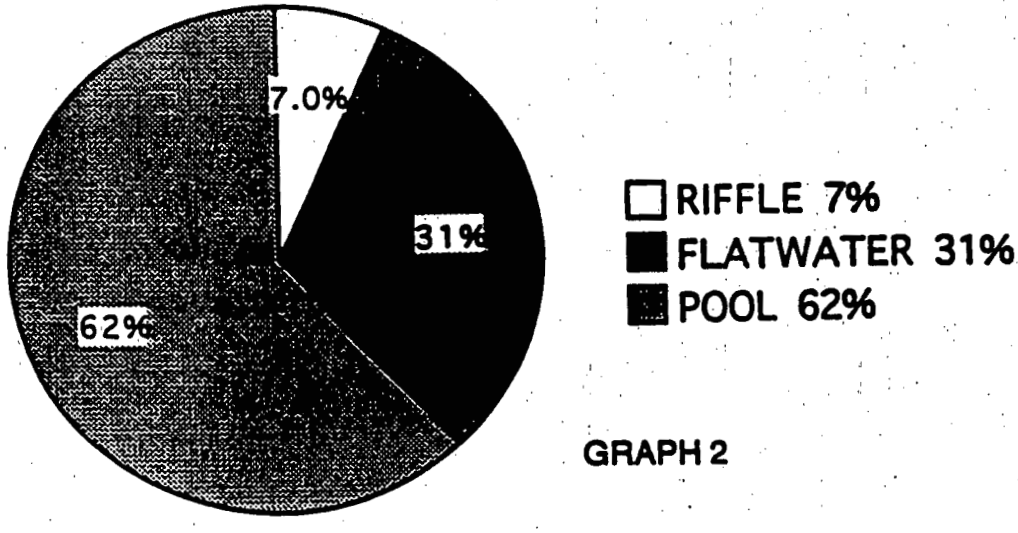
SALMON CREEK

HABITAT TYPES BY PERCENT OCCURENCE



GRAPH 1

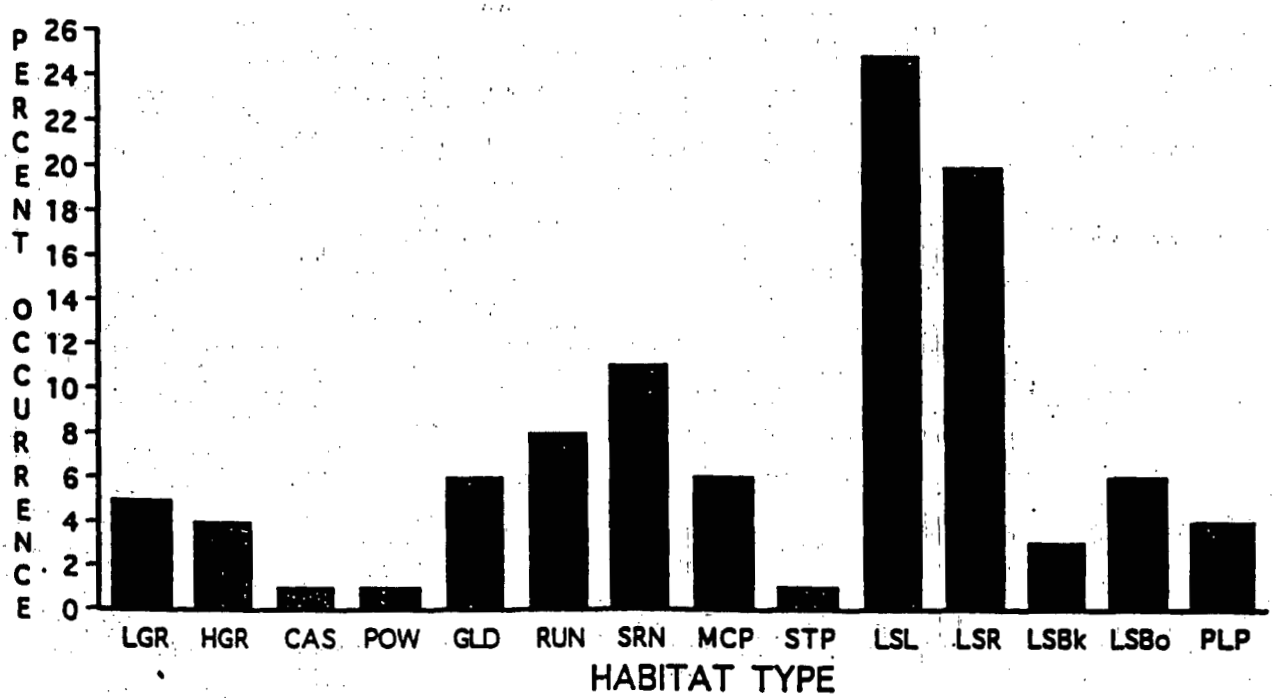
HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

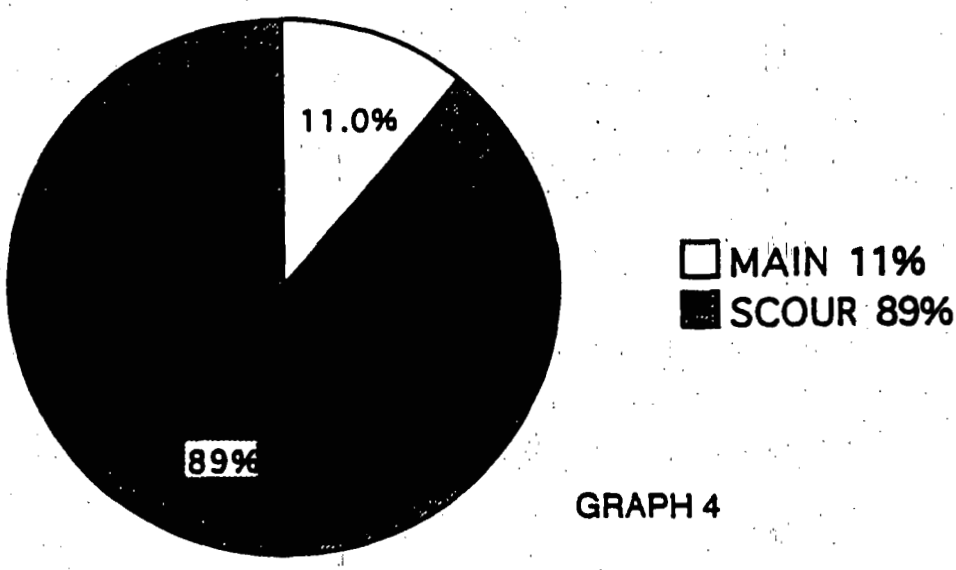
SALMON CREEK

HABITAT TYPES BY PERCENT OCCURRENCE



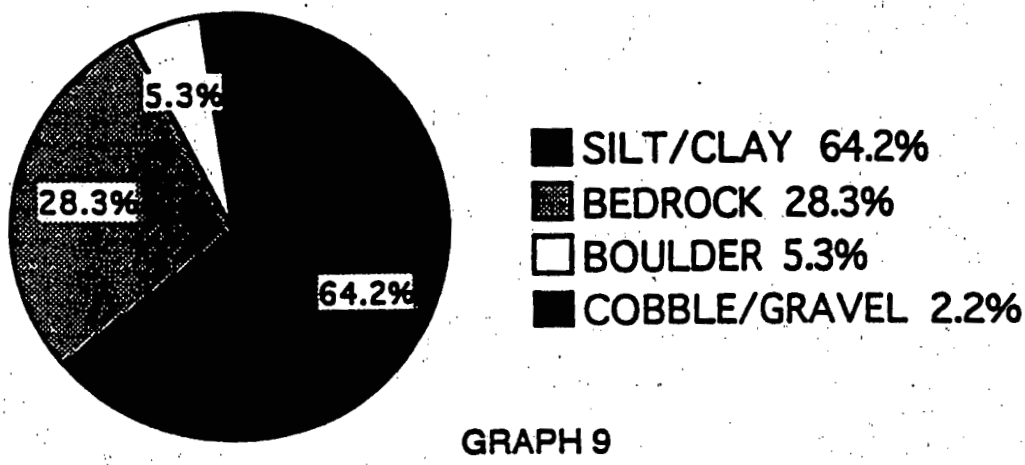
GRAPH 3

POOL HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 4

PERCENT BANK DOMINANT SUBSTRATE



GRAPH 9

Drainage: SALMON CREEK

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES Survey Dates: 07/25/96 to 08/15/96

Confluence Location: QUAD: ALBION,CA. LEGAL DESCRIPTION: T16NR17WS28 LATITUDE: 39°12'57" LONGITUDE: 123°46'10"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
11	11	RIFFLE	10	55	604	7	19.7	0.4	565	6218	278	3056	0	29
29	29	FLATWATER	26	90	2616	31	13.6	0.6	1146	33242	736	21356	0	20
73	73	POOL	65	72	5271	62	16.6	1.2	1135	82831	1399	102101	1023	53

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
113	113	8491	122291	126513

Drainage: SALMON CREEK

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES Survey Dates: 07/25/96 to 08/15/96

Confluence Location: QUAD: ALBION,CA. LEGAL DESCRIPTION: T16NR17WS28 LATITUDE: 39°12'57" LONGITUDE: 123°46'10"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
11	11	RIFFLE	10	55	604	7	19.7	0.4	565	6218	278	3056	0	29
29	29	FLATWATER	26	90	2616	31	13.6	0.6	1146	33242	736	21356	0	20
73	73	POOL	65	72	5271	62	16.6	1.2	1135	82831	1399	102101	1023	53

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
113	113	8491	122291	126513

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IG SALMON CREEK — Drainage: SALMON CREEK

ible 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 07/25/96 to 08/15/96

nfluence Location: QUAD: ALBION,CA. LEGAL DESCRIPTION: T16NR17WS28 LATITUDE: 39°12'57" LONGITUDE: 123°46'10"

BITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
6	6	LGR	5	44	261	3	17	0.3	1.5	427	2564	135	812	0	5	98
4	4	HGR	4	49	196	2	23	0.6	1.2	561	2243	314	1256	0	58	98
1	1	CAS	1	147	147	2	24	0.7	1.4	1411	1411	988	988	0	60	100
1	1	POW	1	86	86	1	24	0.6	1.2	1445	1445	867	867	0	50	10
7	7	GLD	6	76	531	6	16	0.7	1.7	1218	8526	909	6362	0	21	85
9	9	RUN	8	61	547	6	10	0.5	1.9	566	5093	337	3036	0	6	98
12	12	SRN	11	121	1452	17	14	0.6	1.8	1515	18178	924	11091	0	27	93
7	7	MCP	6	64	448	5	21	1.2	3.4	1282	8975	1675	11727	1024	41	95
1	1	STP	1	42	42	0	15	1.2	1.8	252	252	302	302	756	40	100
28	28	LSL	25	71	1979	23	17	1.2	5.0	1172	32804	1545	43256	1182	64	95
23	23	LSR	20	77	1781	21	16	1.0	3.5	1191	27396	1238	28466	868	42	97
3	3	LSBk	3	86	259	3	13	0.9	2.5	1079	3237	923	2770	601	20	95
7	7	LSBo	6	83	581	7	12	1.1	4.8	1025	7178	1371	9595	998	50	99
4	4	PLP	4	45	181	2	19	1.8	4.5	747	2988	1496	5985	1235	100	91

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
113	113	8491	122291	126513

BIG SALMON CREEK

Drainage: SALMON CREEK

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/25/96 to 08/15/96

Confluence Location: QUAD: ALBION,CA. LEGAL DESCRIPTION: T16NR17WS28 LATITUDE: 39°12'57" LONGITUDE: 123°46'10"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
8	8	MAIN	11	61	490	9	20.3	1.2	1153	9227	1504	12030	990	41
65	65	SCOUR	89	74	4781	91	16.1	1.1	1132	73603	1386	90072	1027	55

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
73	73	5271	82831	102101

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G SALMON CREEK — Drainage: SALMON CREEK

ble 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 07/25/96 to 08/15/96

nfluence Location: QUAD: ALBION,CA. LEGAL DESCRIPTION: T16NR17WS28 LATITUDE: 39°12'57" LONGITUDE: 123°46'10"

UNITS ASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
7	MCP	10	0	0	3	43	2	29	2	29	0	0
1	STP	1	0	0	1	100	0	0	0	0	0	0
28	LSL	38	0	0	5	18	14	50	6	21	3	11
23	LSR	32	0	0	7	30	11	48	5	22	0	0
3	LSBk	4	0	0	2	67	1	33	0	0	0	0
7	LSBo	10	0	0	2	29	3	43	1	14	1	14
4	PLP	5	0	0	0	0	2	50	0	0	2	50

TOTAL UNITS
73

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BIG SALMON CREEK — Drainage: SALMON CREEK

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE — Survey Dates: 07/25/96 to 08/15/96

Confluence Location: QUAD: ALBION,CA. LEGAL DESCRIPTION: T16NR17WS28 LATITUDE: 39°12'57" LONGITUDE: 123°46'10"

UNITS MEASURED	UNITS FULLY MEASURED	HABITAT TYPE	MEAN % UNDERCUT BANKS	MEAN % SWD	MEAN % LWD	MEAN % ROOT MASS	MEAN % TERR. VEGETATION	MEAN % AQUATIC VEGETATION	MEAN % WHITE WATER	MEAN % BOULDERS	MEAN % BEDROCK LEDGES
6	2	LGR	20	40	10	0	30	0	0	0	0
4	4	HGR	0	23	8	0	20	0	3	48	0
1	1	CAS	0	0	0	0	0	10	30	60	0
1	1	POW	0	5	0	0	10	0	0	85	0
7	4	GLD	18	10	5	8	58	0	0	3	0
9	5	RUN	0	10	0	0	58	0	0	32	0
12	12	SRN	20	25	13	19	12	0	0	11	0
7	7	MCP	5	19	44	9	4	1	0	17	0
1	1	STP	0	0	0	0	0	0	20	80	0
28	27	LSL	10	30	44	7	9	0	0	1	0
23	22	LSR	32	19	12	28	6	0	2	2	0
3	2	LSBk	10	35	20	10	20	0	5	0	0
7	5	LSBo	8	18	32	4	6	0	4	28	0
4	4	PLP	18	6	24	4	3	0	5	41	0

SALMON CREEK

Drainage: SALMON CREEK

: 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 07/25/96 to 08/15/96

uence Location: QUAD: ALBION,CA. LEGAL DESCRIPTION: T16NR17WS28 LATITUDE: 39°12'57" LONGITUDE: 123°46'10"

ITAL TAT IITS	UNITS FULLY MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
6	6	LGR	0	0	100	0	0	0	0
4	4	HGR	0	0	0	25	50	25	0
1	1	CAS	0	0	0	0	0	0	100
1	1	POW	0	0	0	0	0	100	0
7	7	GLD	0	43	57	0	0	0	0
9	9	RUN	0	22	67	11	0	0	0
12	12	SRN	0	0	92	8	0	0	0
7	7	MCP	0	57	29	0	0	14	0
1	1	STP	0	0	0	0	0	100	0
28	28	LSL	7	32	57	0	4	0	0
23	23	LSR	0	30	65	4	0	0	0
3	3	LSBk	0	33	33	33	0	0	0
7	7	LSBo	0	43	43	0	0	14	0
4	4	PLP	25	75	0	0	0	0	0

Table 7

Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Deciduous	Mean Percent Open units	Mean Right bank % Cover	Mean Left Bank % Cover
94	11	89	0	72.8	68.9

Note: Mean percent conifer and deciduous for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

STREAM NAME: Salmon Creek
SAMPLE DATES: 07/25/96 to 08/15/96
STREAM LENGTH: 8491 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: ALBION,CA. Latitude: 39°12'57"
Legal Description: T16NR17WS28 Longitude: 123°46'10"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1

Channel Type: F3	Canopy Density: 94%
Channel Length: 8491 ft.	Coniferous Component: 11%
Riffle/flatwater Mean Width: 15 ft.	Deciduous Component: 89%
Total Pool Mean Depth: 1.2 ft.	Pools by Stream Length: 62%
Base Flow: 2.5 cfs	Pools >=3 ft.deep: 27%
Water: 56 - 59 °F Air: 61 - 64 °F	Mean Pool Shelter Rtn: 56
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Large Woody Debris
Vegetative Cover: 71%	Occurrence of LOD: 23%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 24% 2. 54% 3. 22% 4. 0%

Shelter - The upper section is heavily vegetated above Donley Gulch. The mid section is park-like and relatively free of vegetation. The extreme lower mile of Big Salmon has very dense vegetation in and along the creek; estimate the total shelter for this stream, 70%.
Barriers - One barrier observed consisting of a road crossing in the extreme upper section. Beyond that, no other barriers observed. Many log jams have potential of becoming barriers if left to allow accumulation of debris.
Diversions - None noted.
Temperatures - The temperatures ranged from 54 °to 55° F. The air temperature ranged from 60° to 70° F. The first temperature was a water temperature.
Food - Food is considered adequate (Mayfly and various insects), but light in comparison to other streams surveyed.
Aquatic Plants - None observed.
Winter Conditions - Winter conditions believed to be three times the present flow or better, which would be approximately 15 c.f.s. The extreme headwaters show rapid run-off, due to steep gulches and deeply eroded gullies. Estimate the stream depth an average of 2-1/2 to 3 ft., with a width of approximately 20 ft.
Pollution - None observed.
Springs - Springs and tributaries were numerous. None of the springs had fishery survey value. Several of the tributaries did have and are recorded under a separate survey and barrier report.
FISHES PPESENT AND SUCCESS - Steelhead and/or rainbow trout averaging 2" in size with an abundance of from 10 to 50 per 200 ft. in the mid and lower sections were observed. These fish were in good condition; success was good; propagation - natural. Silver salmon were observed in very light quantities in the mid and lower sections (very difficult to identify and locate) - estimate 1 to 2 per 100 ft. Good success; good condition; natural propagation good. The extreme upper area is considered to have very poor fish population due to dense in-stream vegetation of grasses and small stream area.
OTHER VERTEBRATES - Deer, raccoon, domestic sheep and cattle were observed.
FISHING INTENSITY - None observed.
OTHER RECREATIONAL USE - Recommend hunting, fishing (unless the stream is closed for nursery and spawning area), hiking and camping. No recreational uses observed at this date other than occasional camping debris.
ACCESSIBILITY - Immediate access to this stream is considered good; 75% of the stream is accessible by foot. Access in extreme upper and lower sections difficult due to considerable in-stream vegetation. Occasional old logging roads from the north side of the stream and along the stream provide excellent foot access, but only for very short distances can a vehicle travel these roads. The best general access is considered 6 mi. up from Route 1 on the Albion Ridge road, then down 1-1/4 mi. of dirt road; take the first fork to the right, thence about 3 blocks and you will come to a flat. At this flat is the junction of Donley and Big Salmon Creek.
OWNERSHIP - Ownership believed to be private in most cases. The lower section is under the control of various logging companies and gypo logging operations are in progress in a small area.
POSTED OR OPEN - No posting signs were observed except for several "no trespass" signs in the extreme lower section near Route 1.
IMPROVEMENTS - None noted.
PAST STOCKING - None known; none noted. pure genetic pool
GENERAL ESTIMATE - The general estimate of Big Salmon Creek is that it is an excellent spawning and nursery area for steelhead and/or rainbow trout and silver salmon. At present there is less than 1/4 mi. that is of fishery value from the Pacific Ocean. An extension of approximately 10 mi. after log jam and barrier removal project is completed, is possible Overall, this stream has about 60 to 70% of its area in park-like condition in a wide

STREAM SURVEY FILE FORM No. 1

NAME Big Salmon Creek COUNTY Mendocino

STREAM SECTION Entire FROM - TO - Approx. LENGTH 6 Mi.

TRIBUTARY TO Pacific Ocean Twp. 16N R. 17W Sec. 28

OTHER NAMES Unknown RIVER SYSTEM Self, or Big Salmon

SOURCES OF DATA Personal Survey on foot.

EXTENT OF OBSERVATION
Include Name of Surveyor, Date, Etc.
LOCATION
RELATION TO OTHER WATERS
GENERAL DESCRIPTION
Watershed
Immediate Drainage Basin
Altitude (Range)
Gradient
Width
Depth
Flow (Range)
Velocity
Bottom
Spawning Areas
Pools
Shelter
Barriers
Diversions
Temperatures
Food
Aquatic Plants
Winter Conditions
Pollution
Springs
FISHES PRESENT AND SUCCESS
OTHER VERTEBRATES
FISHING INTENSITY
OTHER RECREATIONAL USE
ACCESSIBILITY
OWNERSHIP
POSTED OR OPEN
IMPROVEMENTS
PAST STOCKING
GENERAL ESTIMATE
RECOMMENDED MANAGEMENT
SKETCH MAP
REFERENCES AND MAPS

EXTENT OF OBSERVATION - The entire creek and its tributaries were walked out by Fish and Game Assistant, James Crowdus, and Fish and Game Seasonal Aid, Jack Santos, a distance of a total 10 miles were surveyed on October 6, 1961.

LOCATION - Big Salmon Creek is located approximately 18 airline miles south of the town of Fort Bragg on the Mendocino County coast.

RELATION TO OTHER WATERS - A good steelhead and silver salmon spawning and nursery stream for the Mendocino coast. This is entirely a separat drainage flowing directly to the Pacific Ocean.

GENERAL DESCRIPTION - Watershed - Big Salmon drains approximately 15 square miles. The watershed is typically east to west in its flow.

Immediate Drainage Basin - Big Salmon runs through a U-shaped canyon of second growth conifer for a distance of 6 mi. It has tributaries of fishery value contributing another 4 mi. to the drainage. The basin has a gentle slope on each side of what is considered foothills. The creek runs through heavily timbered country made up primarily of redwood, large alders, fir and brush. The upper section consists of dense vegetation in the form of brush in and along the stream in rather meadowy (if one could call it) meadows. The mid section is parklike with redwood and alder and fir throughout—very clean. The lower section is again open pasture and relatively clear due to a large burn 60-70 years ago. The immediate creek area contains a profuse growth of alder, brush and willow.

Altitude - Sea level - 580 ft.

Gradient - The gradient is considered moderate to very slight, with an approximate average of 6 ft. per 100. The tributaries have a steeper gradient of approximately 15 ft. per 100 on an average.

Width - Range from 2 ft. to 40 ft; average 10 ft.

Depth - Range from dry at this date to 5 ft. deep; the average depth is 18 in.

Flow - Five gallons per minute to 7 c.f.s. in range; the average is 5 c.f.s. at this date.

Velocity - Velocity is sluggish in the headwaters to generally slow throughout. A very mild gradient is the cause for this effect.

Bottom - The bottom is primarily rubble and gravel, with scattered bedrock, silt and mud throughout. The mid section of the stream is notably rubble and gravel whereas the upper and lower sections contained more of the bedrock and silt; in the extreme lower section boulders and coarse rubble was observed.

Spawning Areas - Headwaters considered poor - spawning gravel amounting to only about 5%. Mid and lower sections were most favorable for spawning with 50 to 70% area suitable. Overall estimate is high; estimate 75% of this stream has gravel satisfactory for this function.

Pools - Pools are scattered in frequency. Total pools - estimate 1 to 2 per 150 ft. Their size is 10 ft. long, 3 ft. wide and 1 ft. deep.

ref: THP 1-02-014 MEN

BIG SALMON CREEK TRIBS

FOR ADMIN. USE ONLY Amendments-date & S or M	
1. _____	7. _____
2. _____	8. _____
3. _____	9. _____
4. _____	10. _____
5. _____	11. _____
6. _____	12. _____

TIMBER HARVEST PLAN
STATE OF CALIFORNIA
DEPARTMENT OF FORESTRY
AND FIRE PROTECTION
RM-63 (1-00)

THP Name: Pullen Gulch
Management Area: Big River/Salmon Creek
(In the CDF FPS, this is "THP Description")
If this is a Modified THP, Check box: [ ]

FOR ADMIN. USE ONLY

THP No. 1-02-014 MEN
Dates Rec'd JAN 23 2002
Date Filed _____
Date Approved _____
Date Expires _____
Extensions 1) [ ] 2) [ ]

This Timber Harvesting Plan (THP) form, when properly completed, is designed to comply with the Forest Practice Act (FPA) and Board of Forestry rules. See separate instructions for information on completing this form. NOTE: The form must be printed legibly in ink or typewritten. The THP is divided into six sections. If more space is necessary to answer a question, continue the answer at the end of the appropriate section of your THP. If writing an electronic version, insert additional space for your answer. Please distinguish answers from questions by font change, **bold**, or underline.

SECTION I - GENERAL INFORMATION

This THP conforms to my/our plan and upon approval; I/we agree to conduct harvesting in accordance therewith. Consent is hereby given to the Director of Forestry and Fire Protection, and his or her agents and employees, to enter the premises to inspect timber operations for compliance with the Forest Practice Act and Forest Practice Rules.

Note to Review Staff: This THP form contains all changes incorporated from the CDF year 2000 THP form. This THP is written to comply with new regulations which became effective July 1, 2000 through January 1, 2002-. Standard form language is displayed in Arial Font. Inserted Information, paraphrased regulations, and responses are shown in Times New Roman Font, and may be underlined. Regulations cited verbatim from Title 14 of the California Code of Regulations (14CCR) are shown in Courier New font.

1. TIMBER OWNER(S) OF RECORD:
Name: **Hawthorne Timber Company, LLC**
Address: **P.O. Box 1228**
City: **Fort Bragg** State: **CA** Zip: **95437** Phone: **(707)-961-3302**

Signature: K Knox Marshall LLC Date 1/22/02
Printed Name: Knox Marshall
NOTE: The timber owner is responsible for the payment of a yield tax. Timber Yield Tax Information may be obtained at the timber Tax Section, MIC: 60, State Board of Equalization, P.O. Box 942789, Sacramento, California 94279-0060; phone 1-800-400-7115; BOE Web Page at http://www.boe.ca.gov.

2. TIMBERLAND OWNER(S) OF RECORD:
Name: **Hawthorne Timber Company, LLC**
Address: **P.O. Box 1228**
City: **Fort Bragg** State: **CA** Zip: **97258** Phone: **(707)-961-3302**

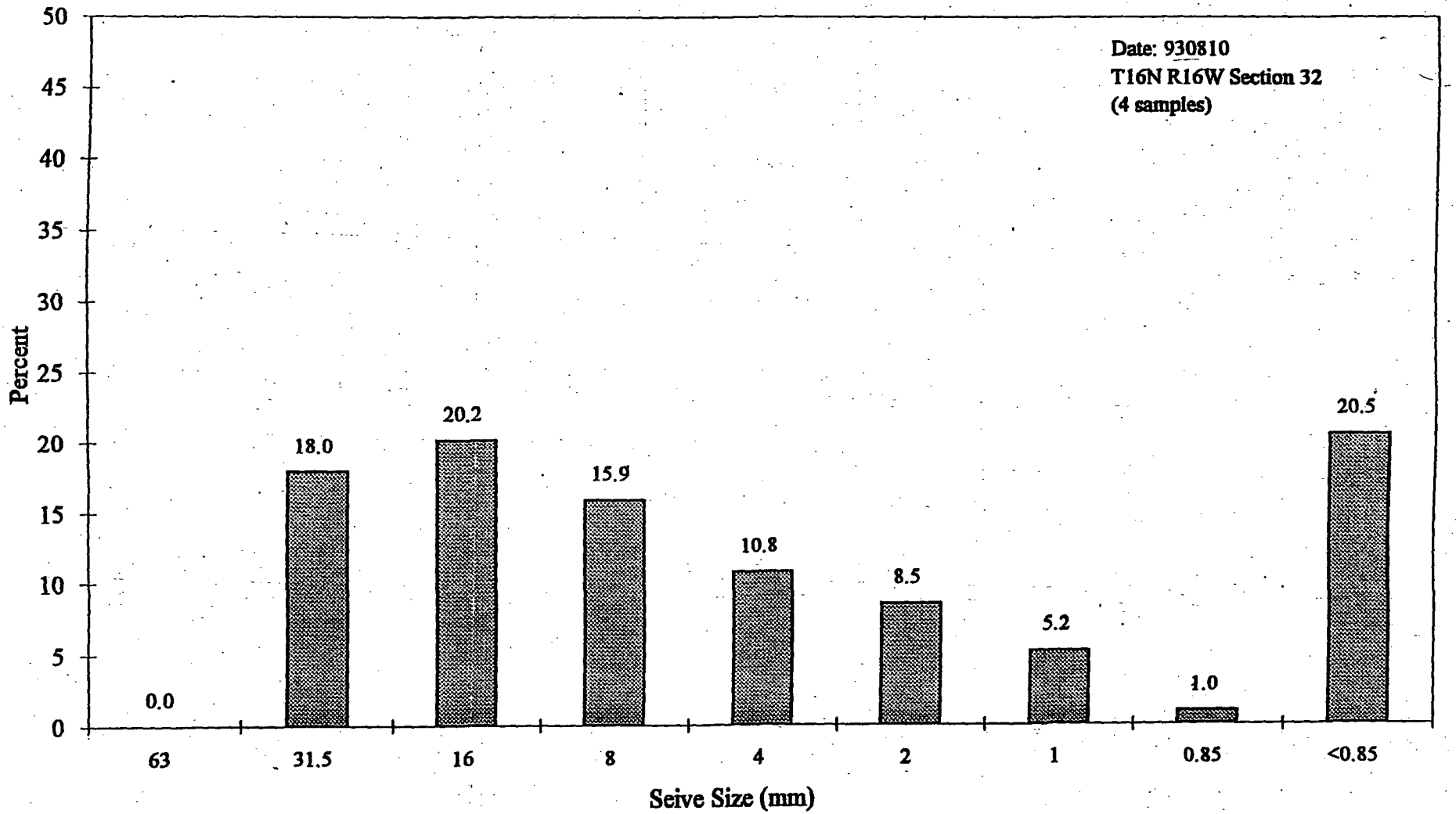
As of January 1, 2001, I have read and understand my responsibilities as timberland owner as described under 14 CCR 1035(d)(2)(A – C). I certify that I have fulfilled my legal obligation as stated in the forest practice rules, and agree to fulfill my responsibilities as the timberland owner as it pertains to this plan.

Signature: K Knox Marshall LLC Date: 1/22/02
Printed Name: **Knox Marshall**

RECEIVED
JAN 23 2002
COAST AREA OFFICE
RESOURCE MANAGEMENT

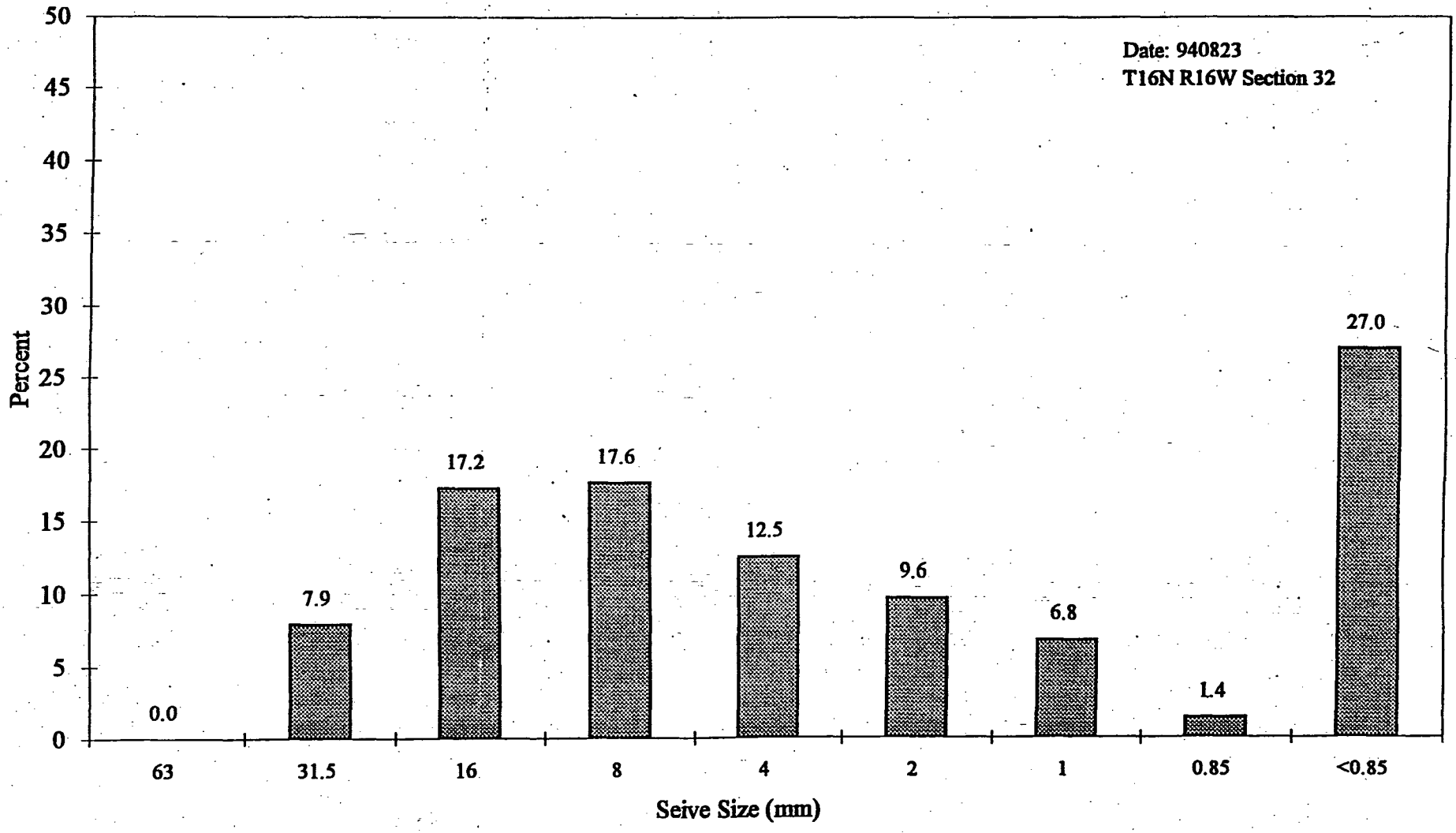
Average McNeil Sediment Samples (eight samples)
Georgia-Pacific West, Inc. Fort Bragg, CA

Sample Location: Donnelly Gulch



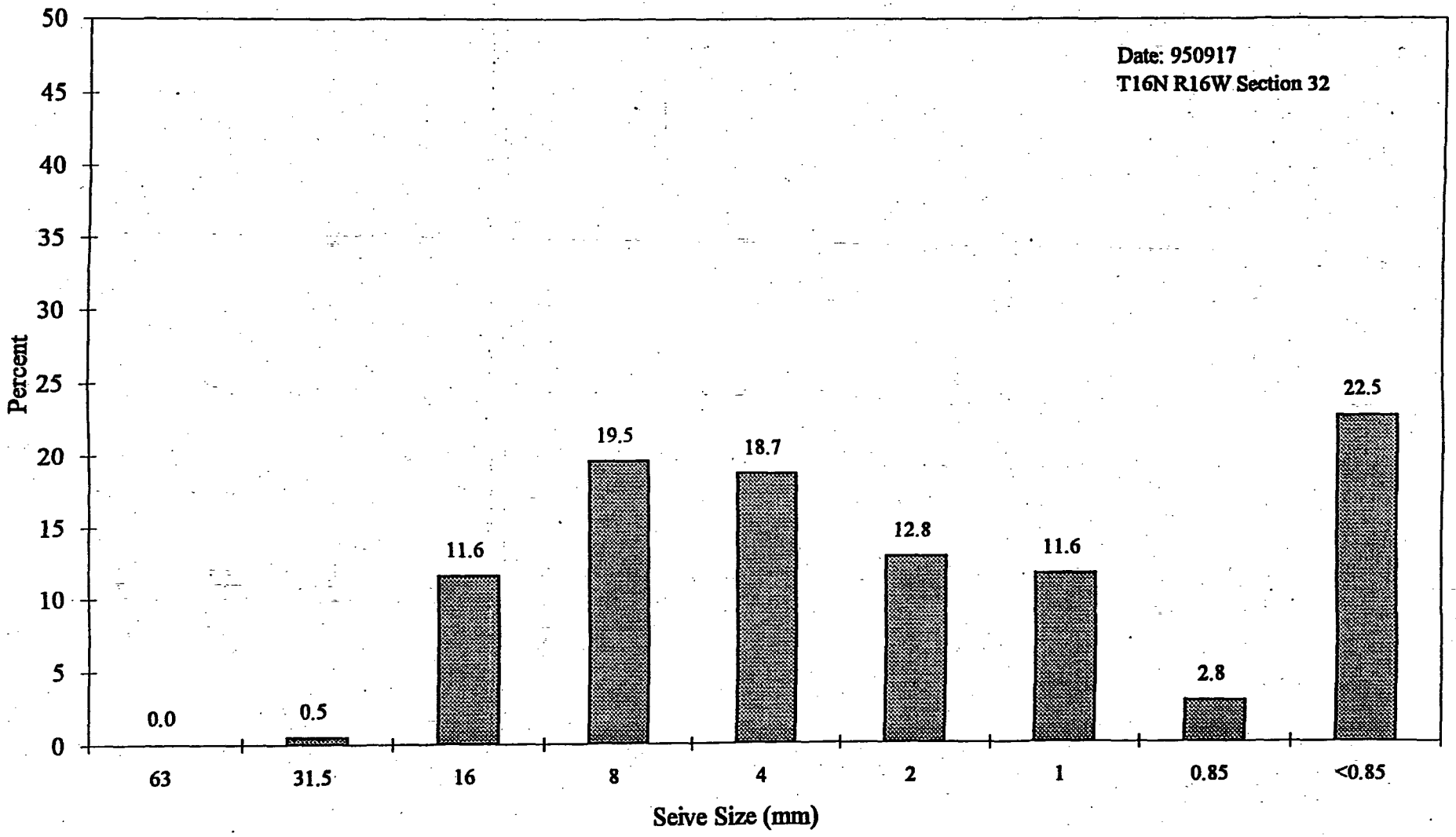
Average McNeil Sediment Samples (eight samples)
Georgia-Pacific West, Inc. Fort Bragg, CA

Sample Location: Donnelly Gulch



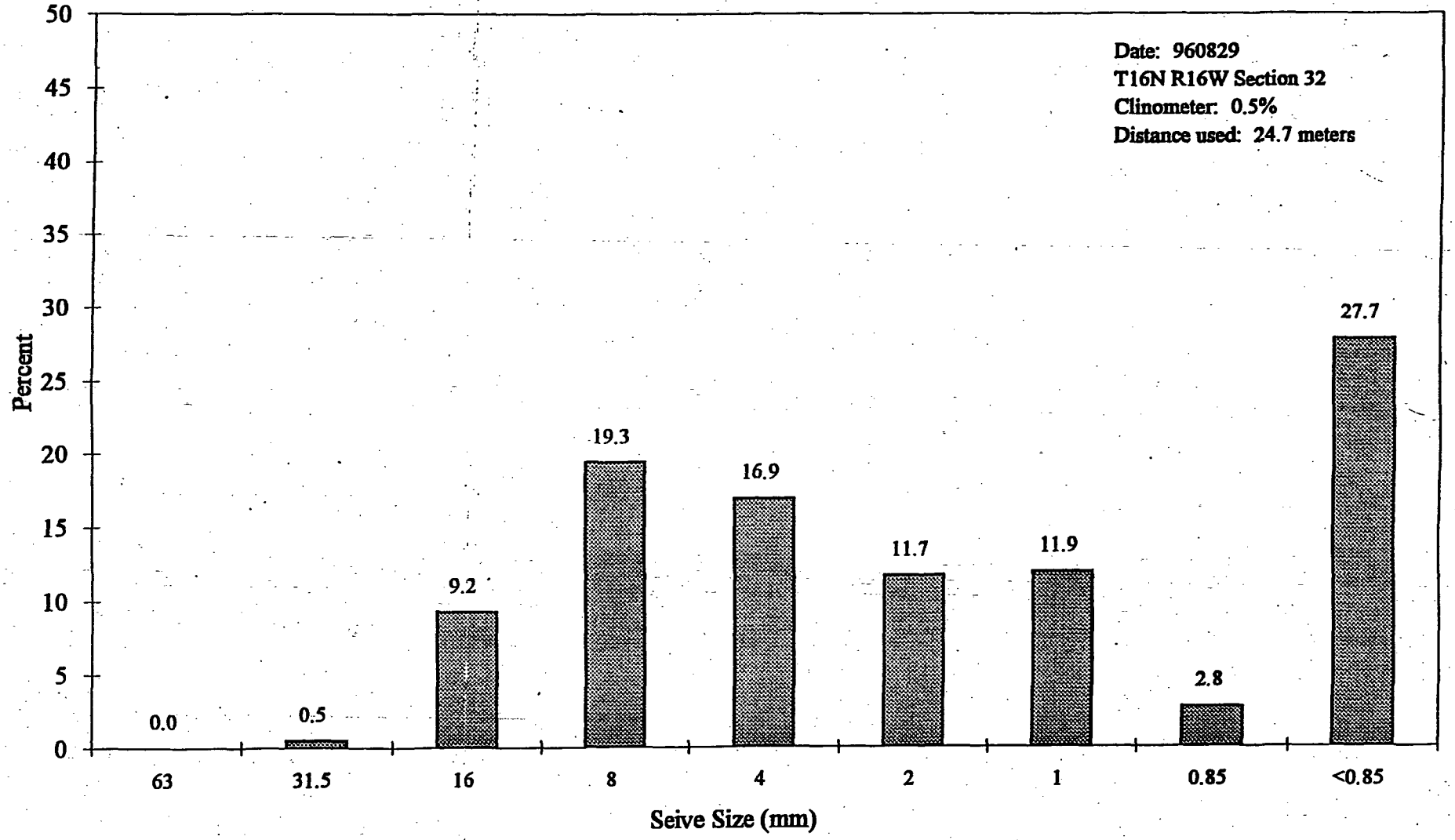
Average McNeil Sediment Samples (eight samples)
Georgia-Pacific West, Inc. Fort Bragg, CA

Sample Location: Donnelly Gulch



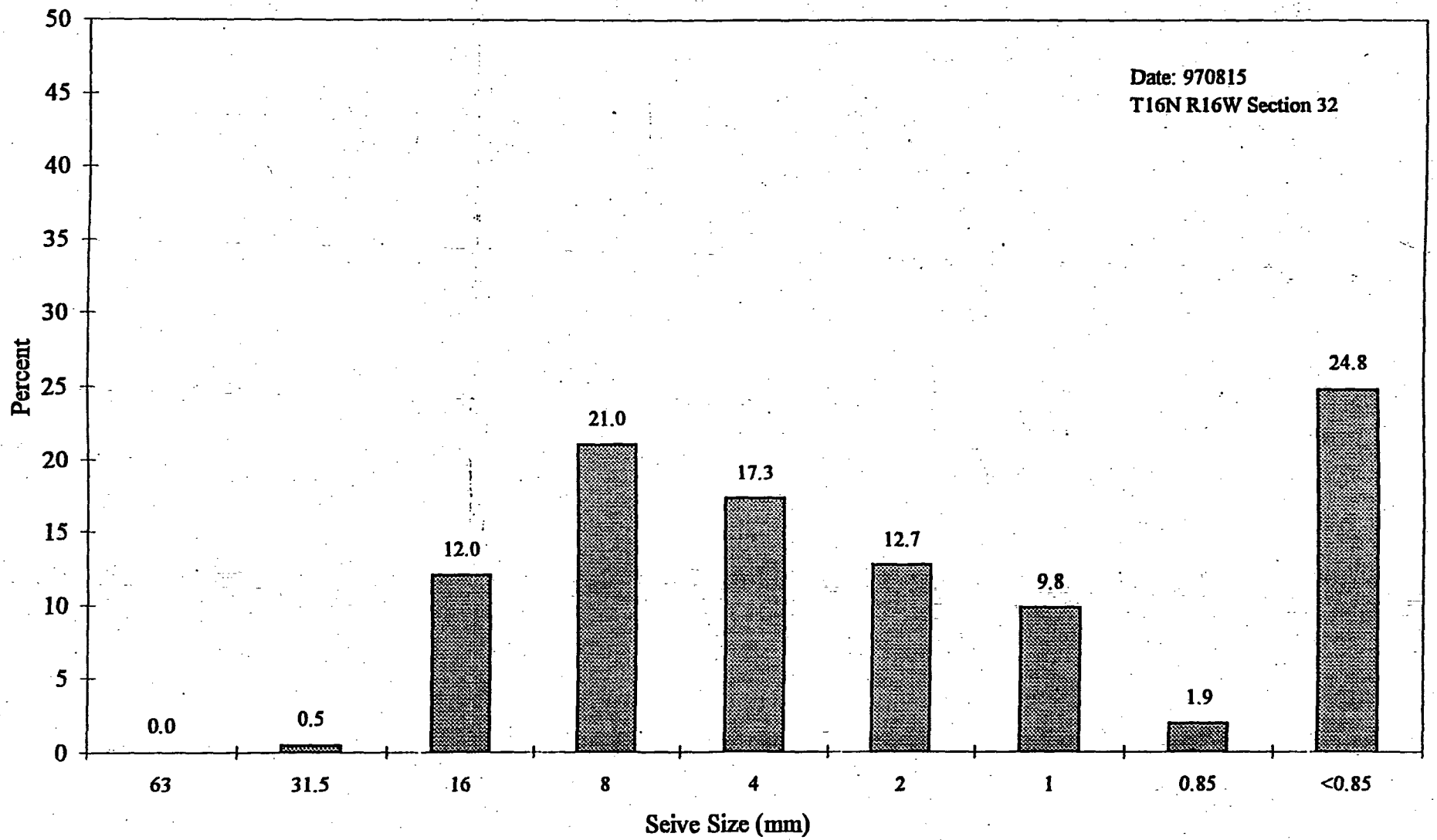
Average McNeil Sediment Samples (eight samples)
Georgia-Pacific West, Inc. Fort Bragg, CA

Sample Location: Donnelly Gulch



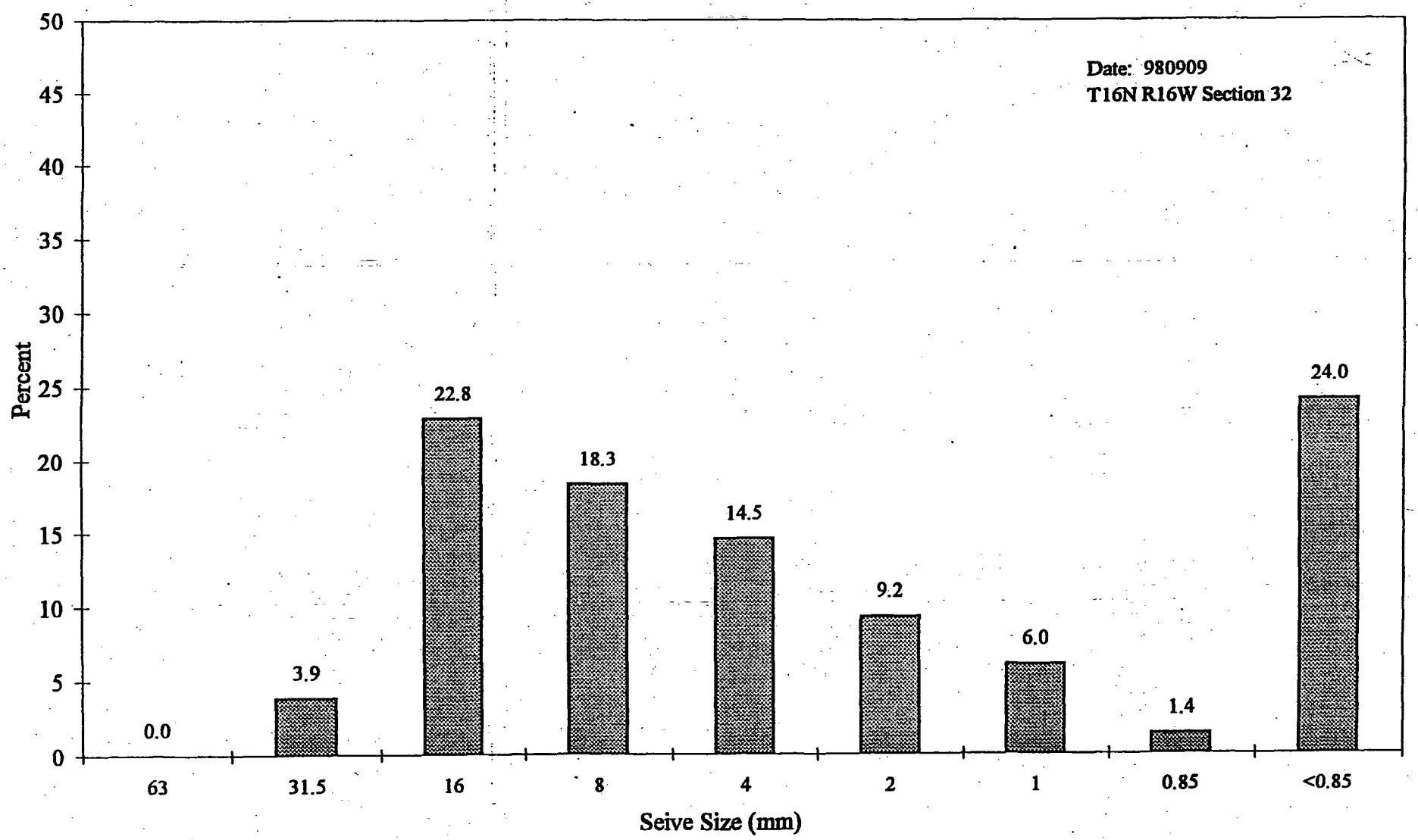
Average McNeil Sediment Samples (eight samples)
Georgia-Pacific West, Inc. Fort Bragg, CA

Sample Location: Donnelly Gulch (SAL3)



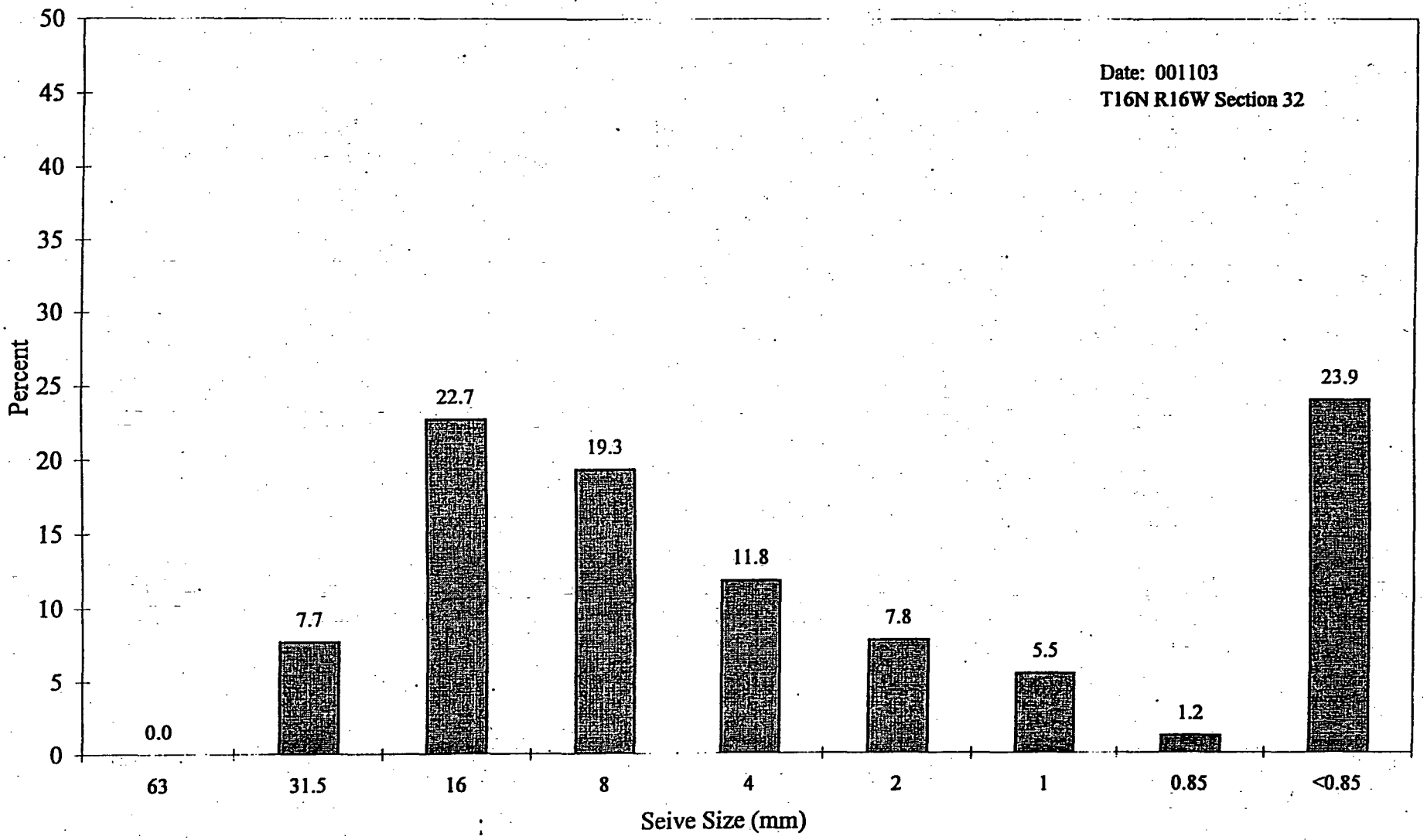
Average McNeil Sediment Samples (eight samples)
Georgia-Pacific West, Inc. Fort Bragg, CA

Sample Location: Donnelly Gulch (SAL 3)



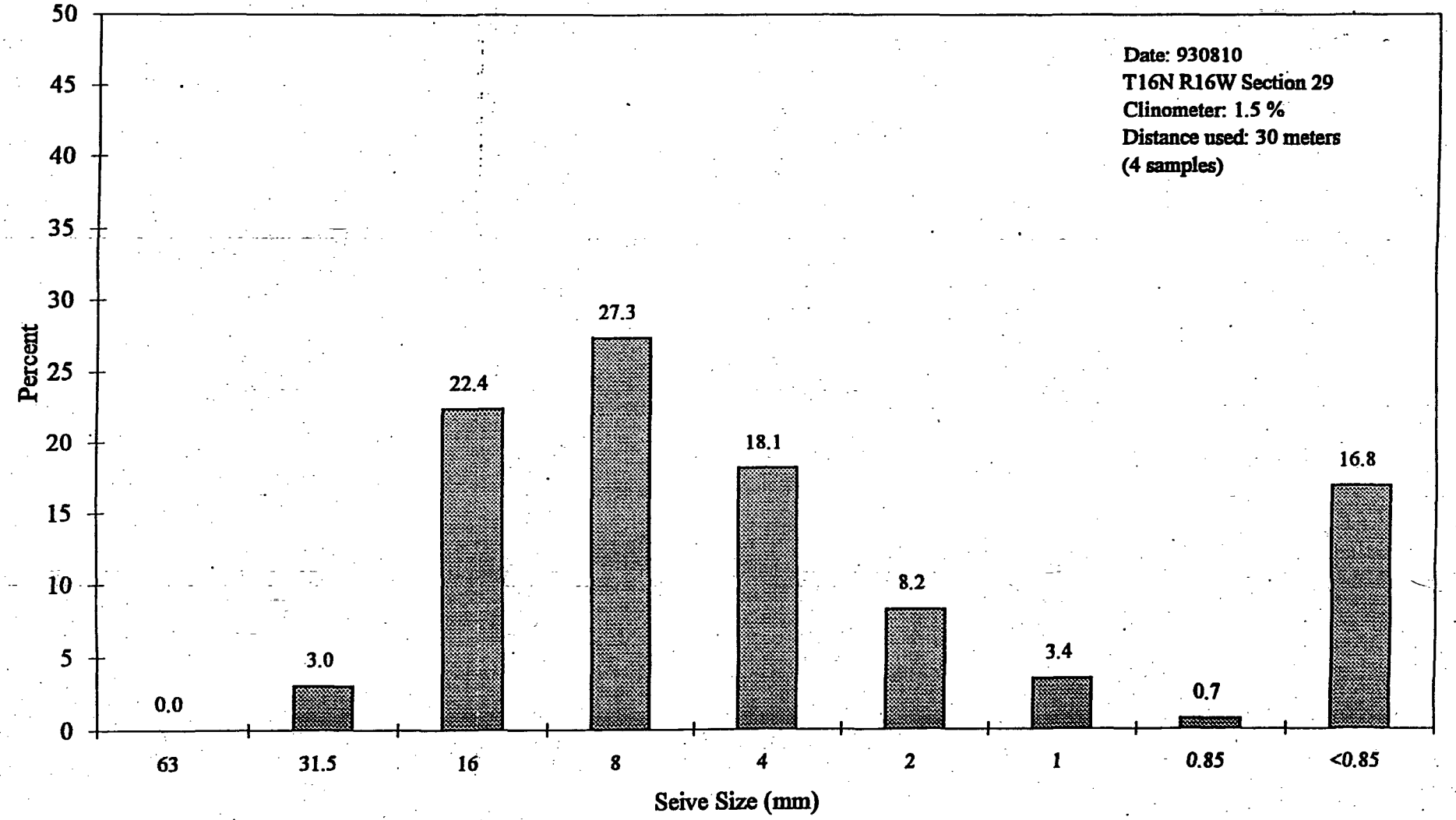
Average McNeil Sediment Samples (eight samples)
Campbell Timberland Management, Fort Bragg, CA

Sample Location: Donnelly Gulch-Sal3



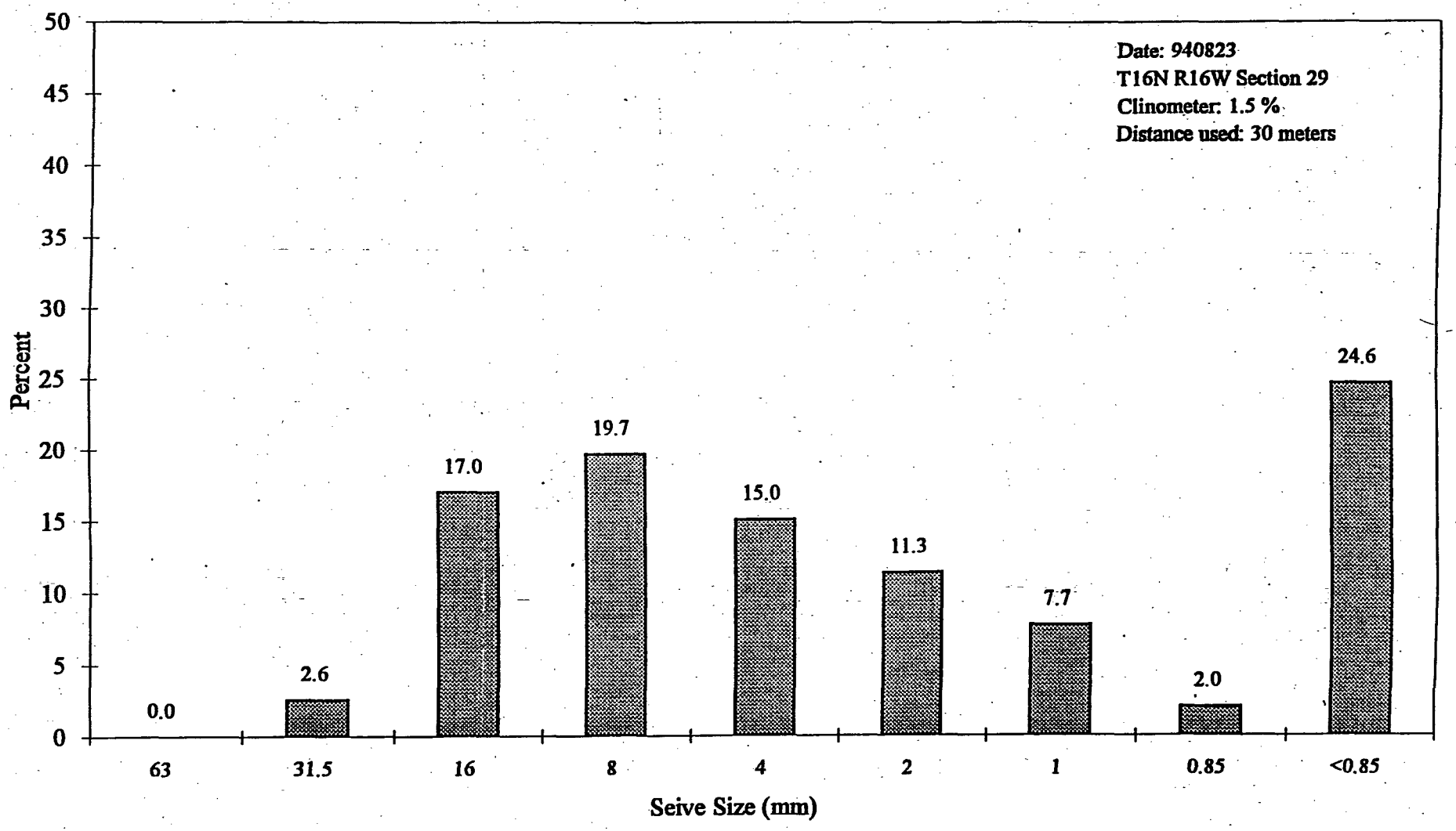
Average McNeil Sediment Samples (eight samples)
Georgia-Pacific West, Inc. Fort Bragg, CA

Sample Location: Waterfall Hazel Creek



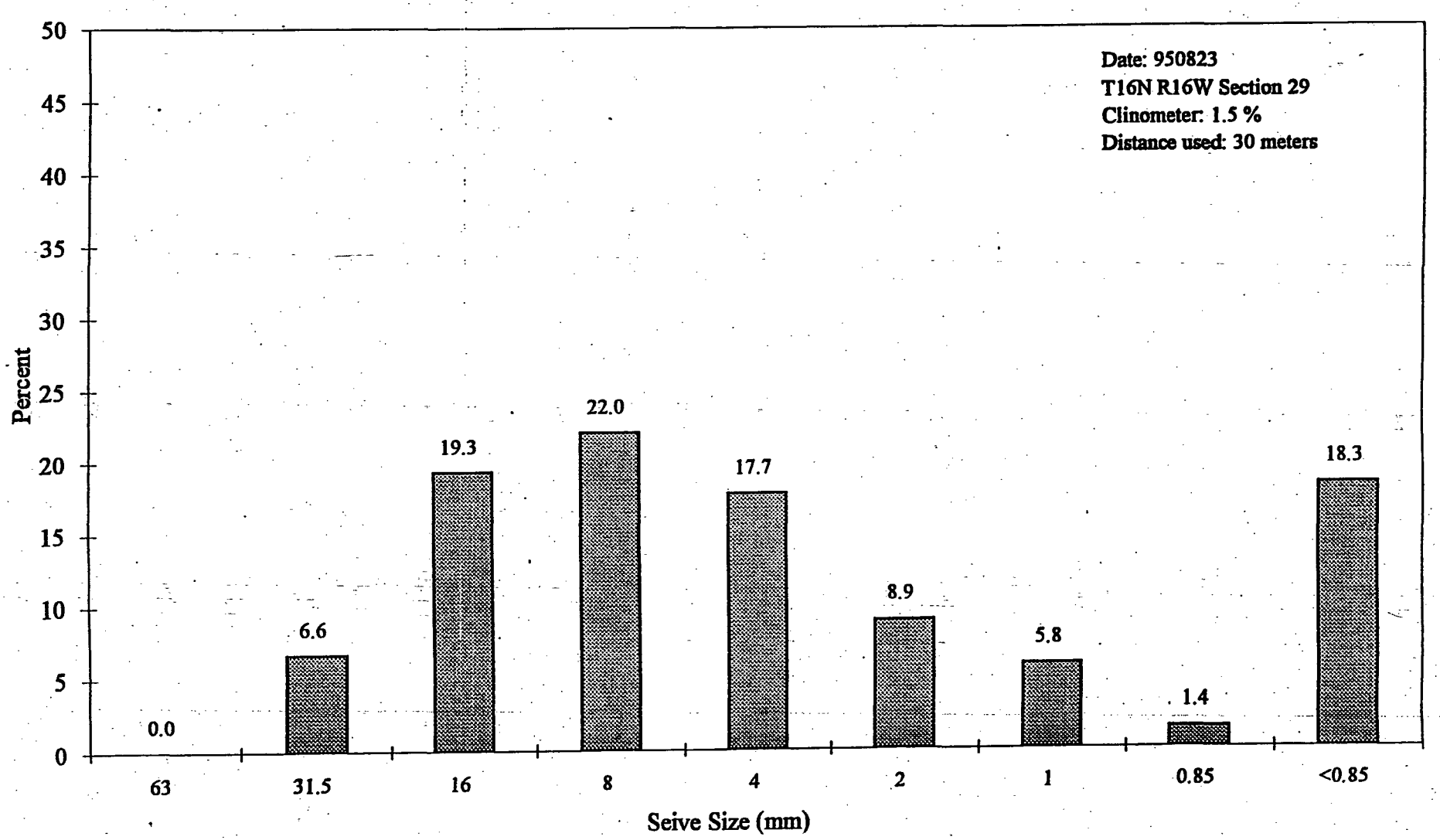
Average McNeil Sediment Samples (eight samples)
Georgia-Pacific West, Inc. Fort Bragg, CA

Sample Location: Waterfall Hazel Creek



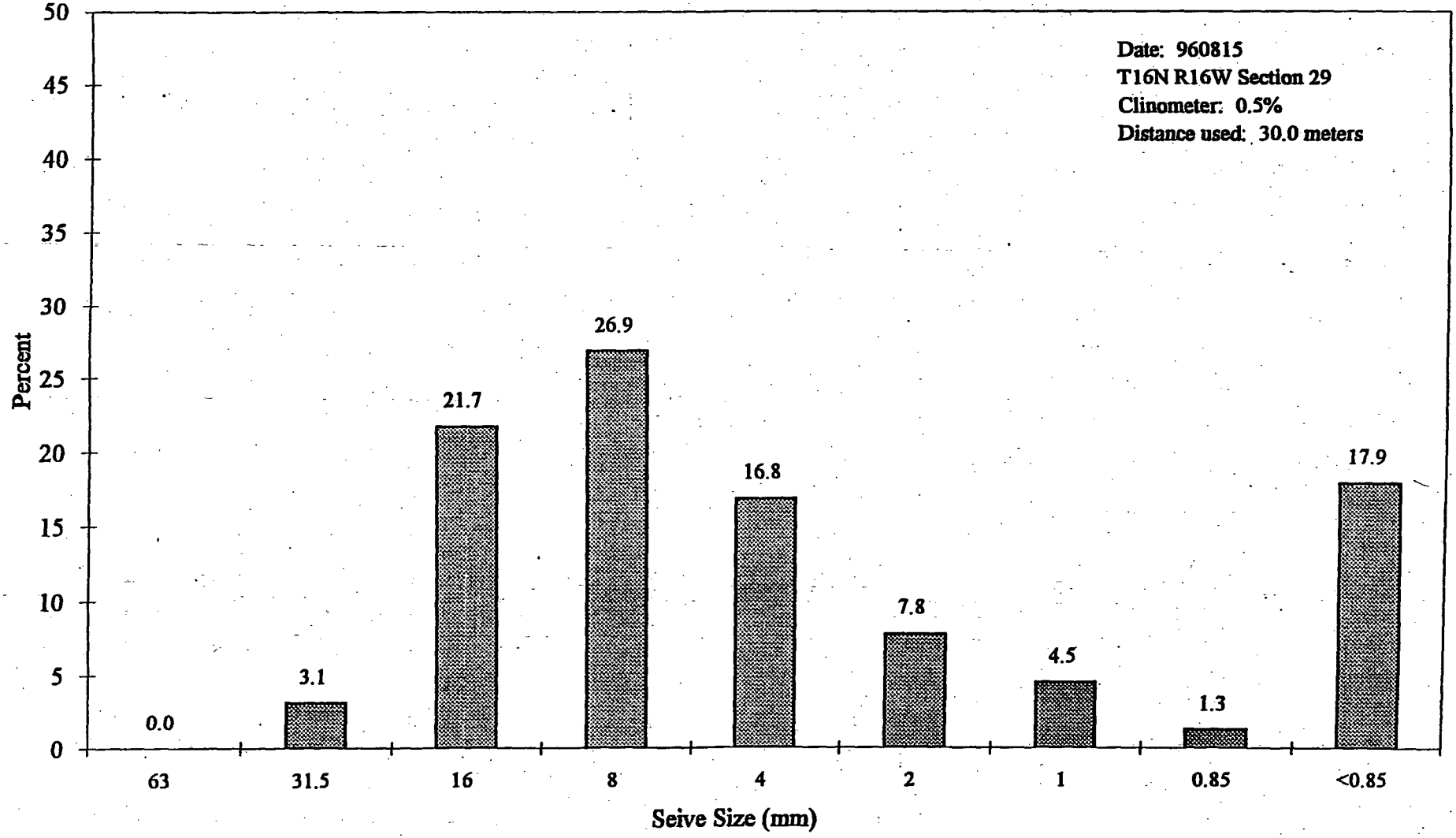
Average McNeil Sediment Samples (eight samples)
Georgia-Pacific West, Inc. Fort Bragg, CA

Sample Location: Waterfall Hazel Creek



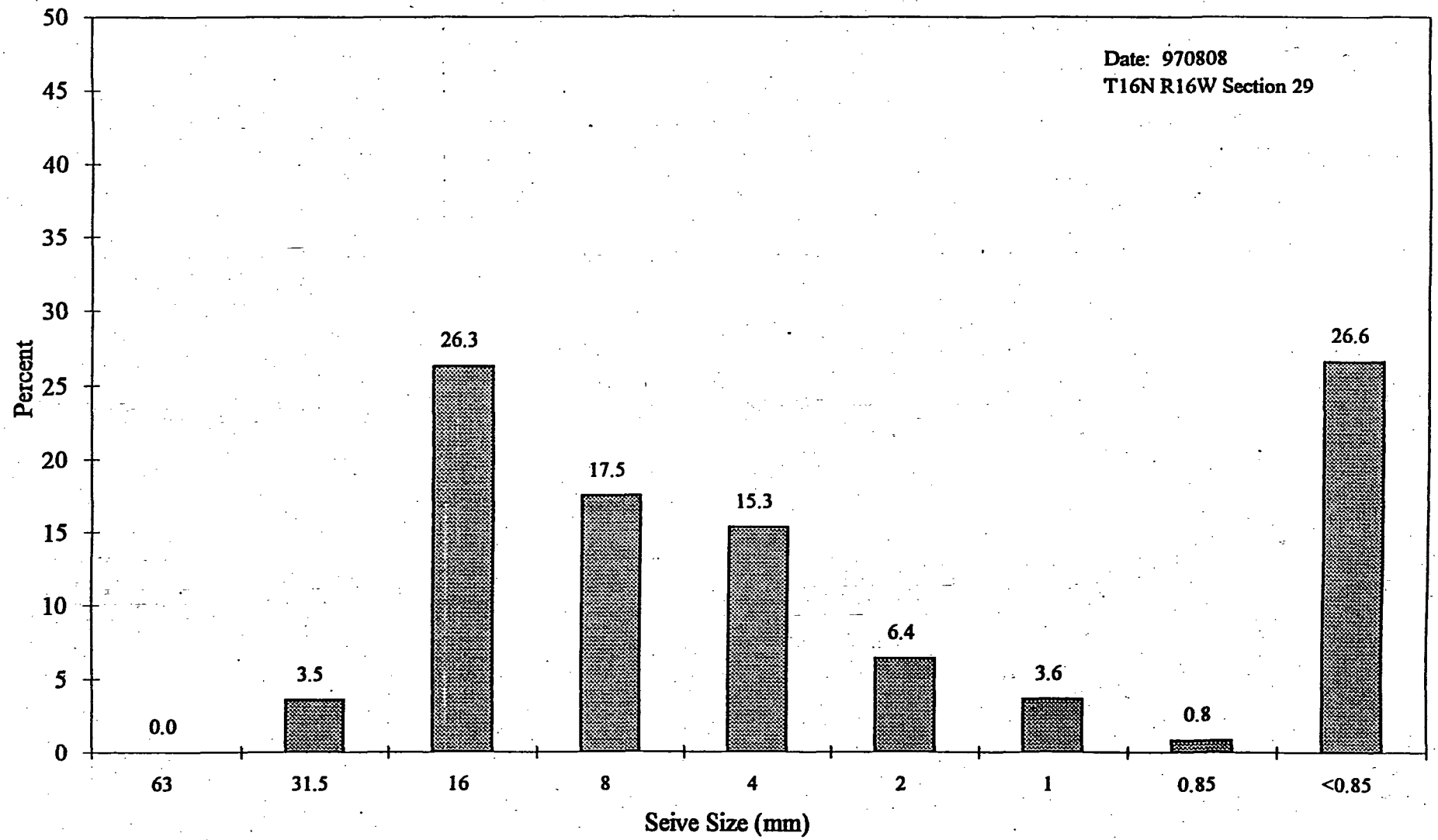
Average McNeil Sediment Samples (eight samples)
Georgia-Pacific West, Inc. Fort Bragg, CA

Sample Location: Waterfall Hazel Creek



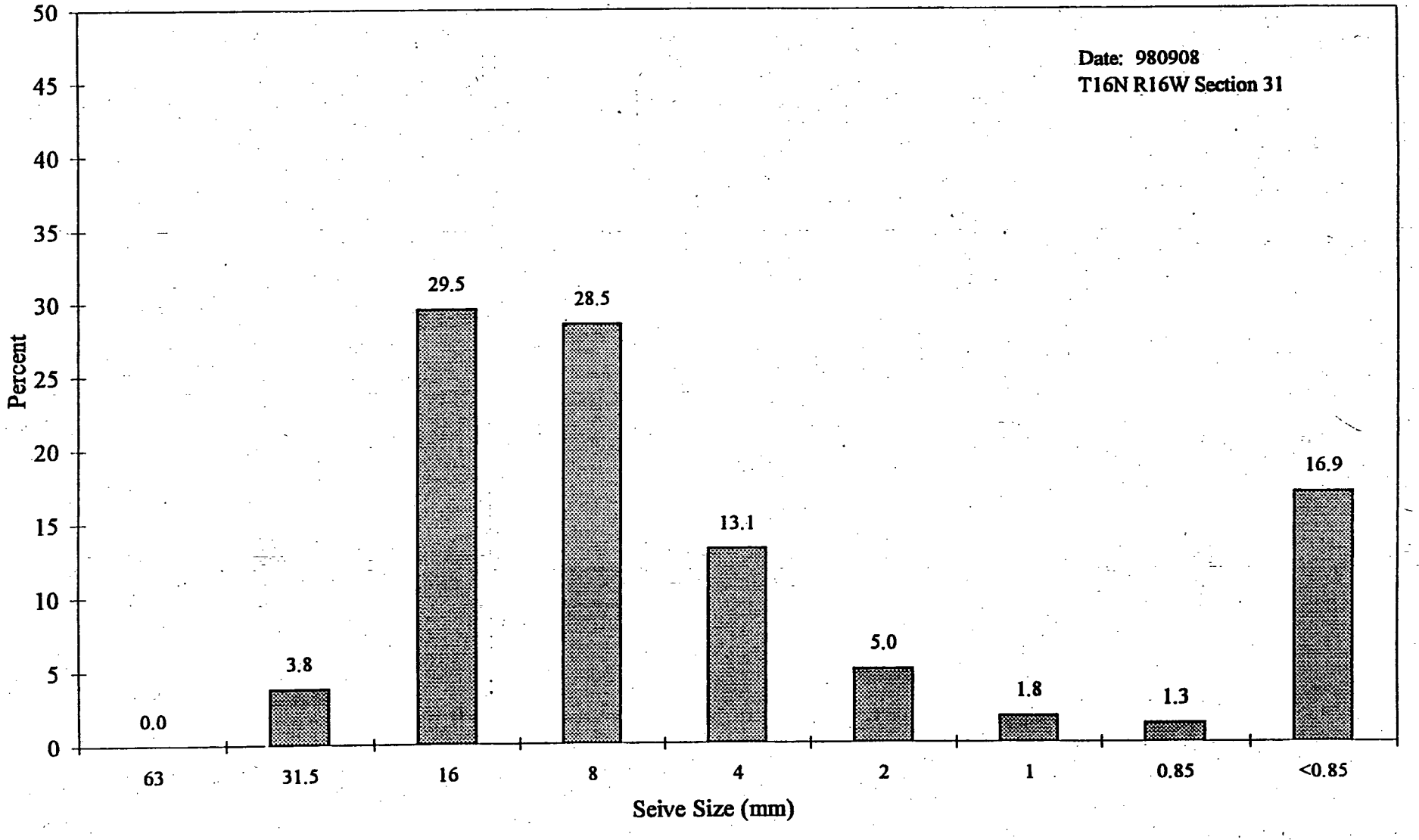
Average McNeil Sediment Samples (eight samples)
Georgia-Pacific West, Inc. Fort Bragg, CA

Sample Location: Hazel Creek at Waterfall (SAL4)
Using 6" Sampler



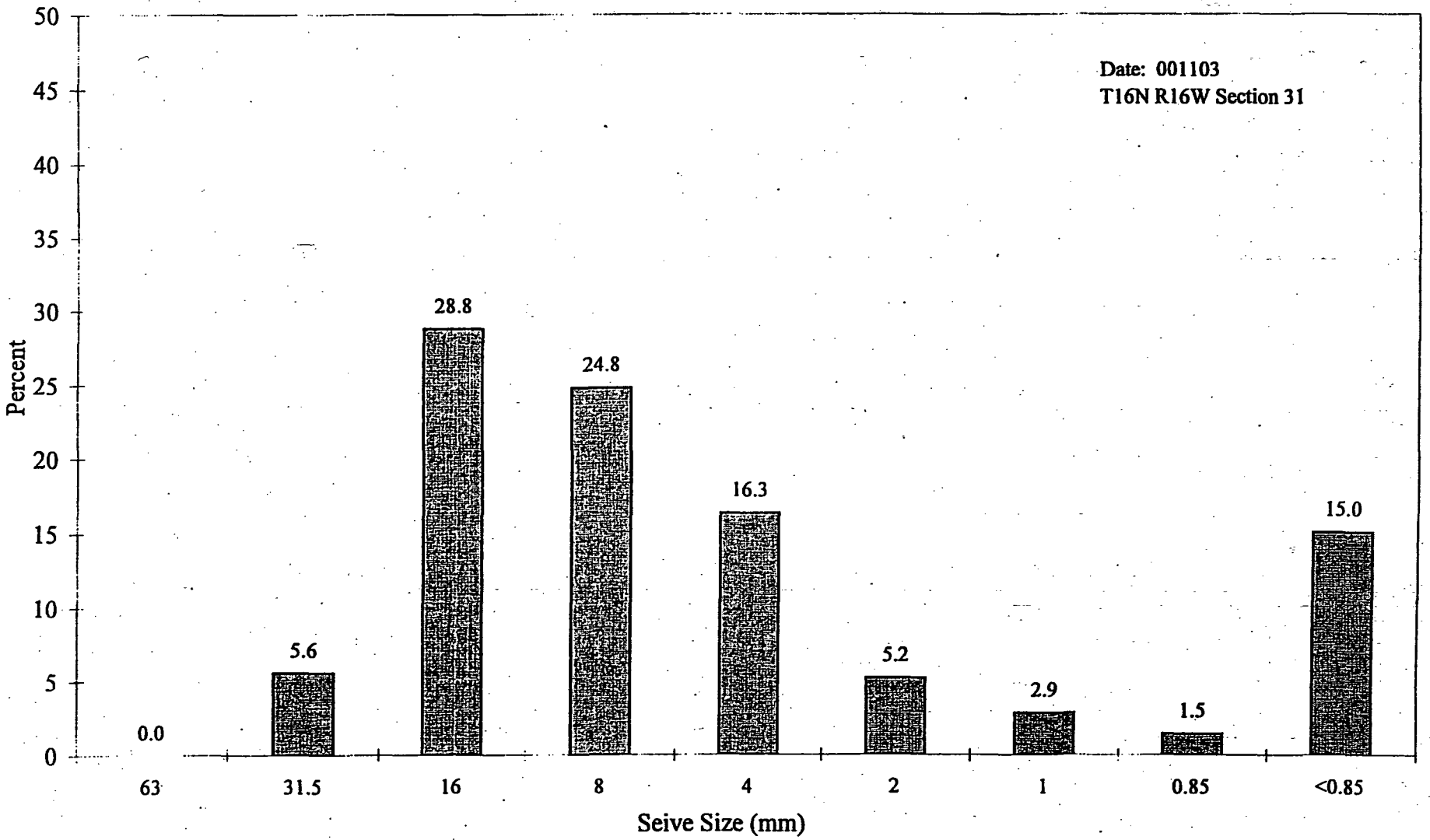
Average McNeil Sediment Samples (eight samples)
Georgia-Pacific West, Inc. Fort Bragg, CA

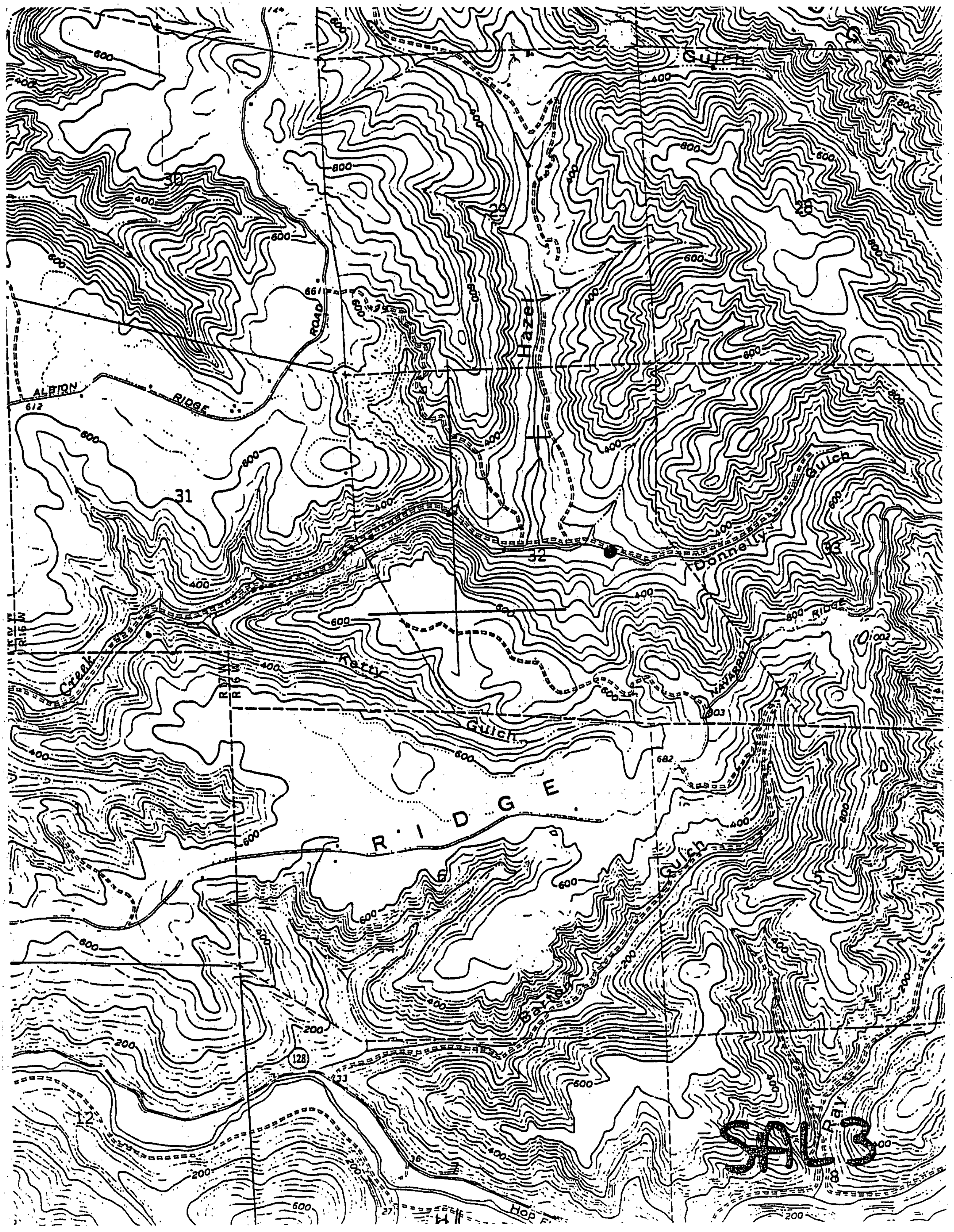
Sample Location: Waterfall Hazel Creek (SAL 4)



Average McNeil Sediment Samples (eight samples)
Campbell Timberland Management, Fort Bragg, CA

Sample Location: Waterfall Hazel Creek-Sal4




Gulch
30
29
28
Hazel
ROAD
661
ALBION
RIDGE
612
31
32
33
Donnelly
Gulch
NAVARRO
RIDGE
1002
803
Creek
Kerry
Gulch
R 16 W
R 15 W
682
R I D G E
Gulch
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Baxter
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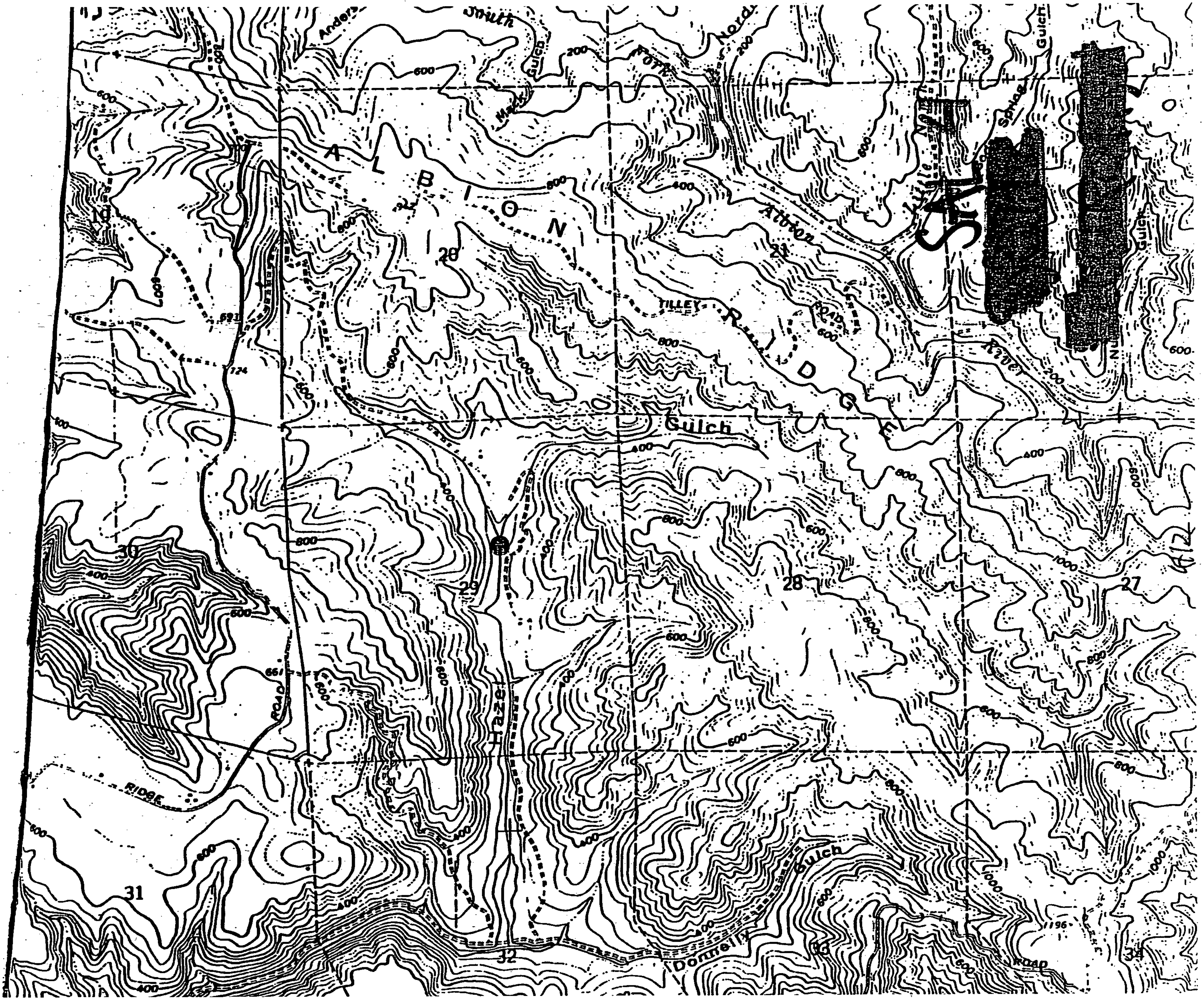
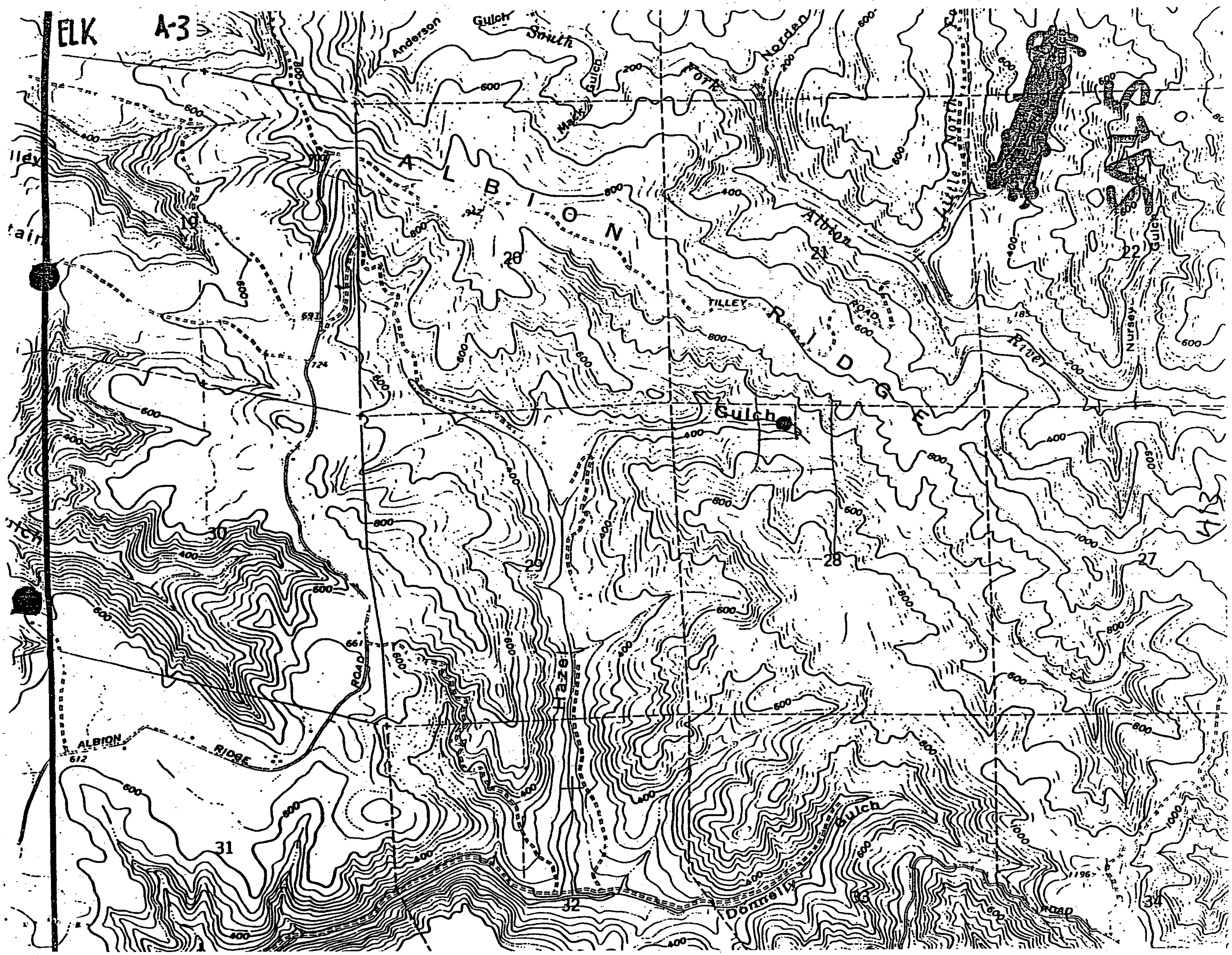
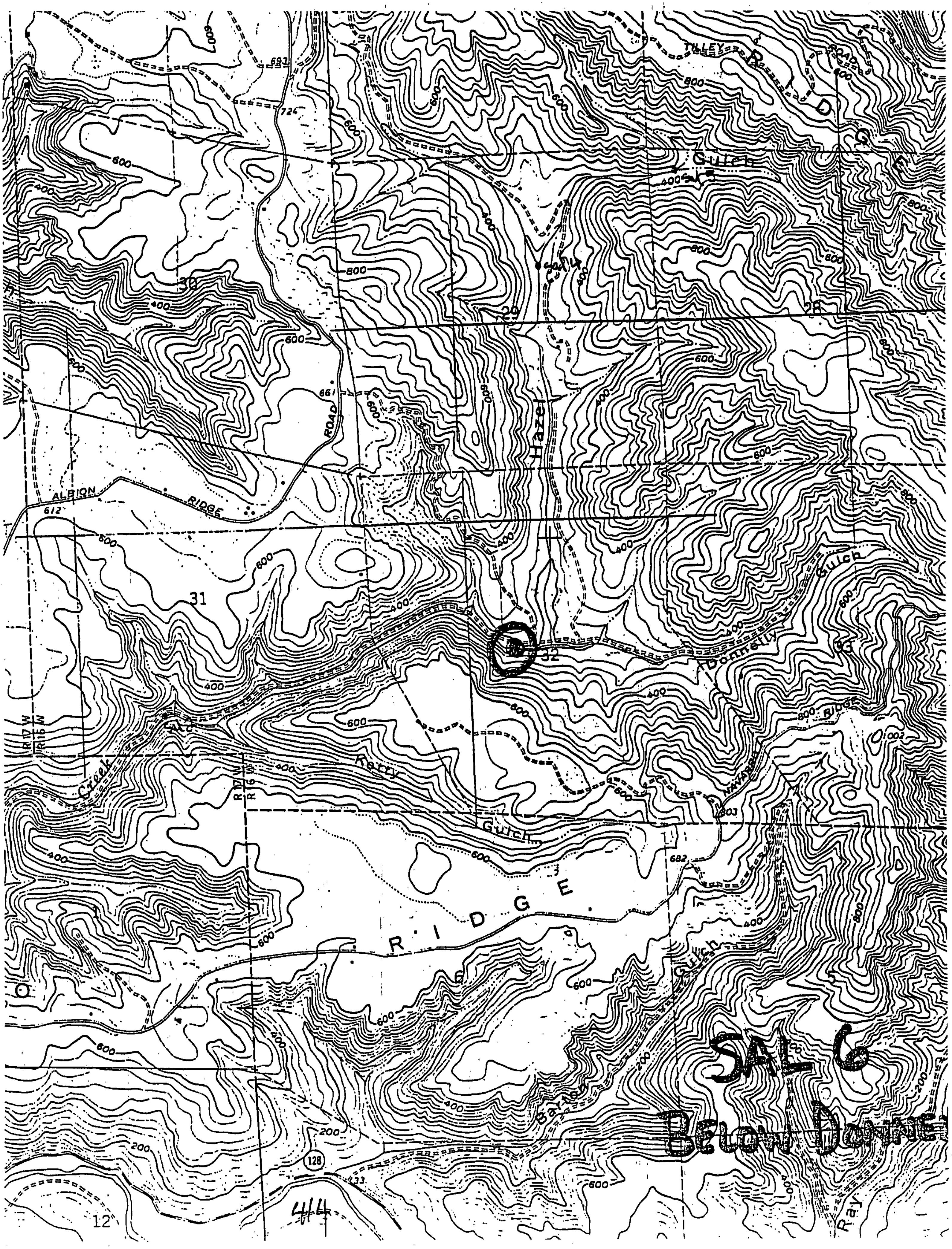
133
12
Ray
SAL3
8
400
600
800
200


ALBION RIDGE
South
North Fork
Gulch
Albion
TILLEY ROAD
Gulch
Hazel
Gulch
Donnelly
RIDGE
ROAD
[redacted]
19
20
21
27
28
29
30
31
32
33
34


ELK
A-3
Anderson
Gulch
South
Fork
Norden
Mack
Gulch
ALBION
RIDGE
Albion
Little
North
River
TILLEY
ROAD
Nursey
Gulch
Hazel
Gulch
Donnelly
Gulch
ROAD
ALBION
RIDGE
ROAD
19
20
21
22
27
28
29
30
31
32
33
34
600
800
400
200
1000
942
691
724
661
612



TILLEY ROAD
RIDGE
Gulch
Hazel
ALBION RIDGE
ROAD
Donnelly Gulch
Karry Gulch
Creek
NAVARRO RIDGE
RIDGE
Barton
Gulch
Ray
128
30
29
28
31
32
33
6
5
12
SAL 6
BELOW DONNE
44

cc: Unit
10-13-93
mc

Mr. Lloyd I Keefer
California Department of Forestry
and Fire Protection
P.O. Box 670
Santa Rosa, Cal. 95402

Date: 10-11-93
Re: _THP 1-93-394 MEN
G - P Area # : (36-26)

Dear Mr. Keefer :

Enclosed please find the additional information requested during the review of THP 1-93-394 MEN.

Sincerely,

Robert C. Ballard
RPF # 2004

RECEIVED
OCT 14 1993
Dept. of Forestry & Fire Protection
Resource Management

Received CDF
REGION 1
OCT 13 1993
RESOURCE MANAGEMENT

THP #	Silvicultural & Yarding Method By Acres
1-82-182 MEN	T SEL 34 Acres, C SEL 26 Acres
1-77-387 MEN	T SEL 23 Acres
1-77-807 MEN	T SWSC 43 Acres
1-83-39 MEN	C CC 44 Acres, T SWSC 102 Acres
1-83-172 MEN	T CC 10 Acres
1-83-234 MEN	T SWSC 40 Acres
1-83-343 MEN	T CC 14 Acres
1-83-387 MEN	T CC 13 Acres, T SWSC 3 Acres, T SEL 15 Acres
1-83-393 MEN	C SWSC 37 Acres, T SWSC 148 Acres
1-83-437 MEN	C CC 109 Acres, T SWSC 161 Acres
1-83-641 MEN	C CC 53 Acres, T SWSC 67 Acres
1-83-670 MEN	T CC 38 Acres
1-84-57 MEN	T SEL 13 Acres
1-84-178 MEN	T SWRC 177 Acres
1-84-239 MEN	T SWSC 75 Acres
1-84-298 MEN	T CC 48 Acres, T SWSC 47 Acres
1-84-330 MEN (same as 1-81-125 & 1-90-578)	T Hardwood Removal 330 Acres
1-84-551 MEN	T CC 16 Acres, T SWRC 4 Acres
1-84-572 MEN	T CC 2 Acres
1-85-117 MEN	T SWSC 121 Acres
1-85-148 MEN	T SWSC 255 Acres
1-85-216 MEN (same as 1-76-462)	T SWRC 57 Acres
1-85-452 MEN	C CC 55 Acres, T SWSC 100 Acres
1-86-139 MEN	T SWSC 42 Acres, T CC 48 Acres
1-86-181 MEN	C CC 71 Acres, T CC 39 Acres
1-86-260 MEN	C CC 54 Acres, T CC 29 Acres
1-86-363 MEN	T SEL 7 Acres, T SWRC 21 Acres
1-86-380 MEN	C CC 32 Acres, T SWSC 58 Acres
1-86-482 MEN	C CC 28 Acres, T SWSC 47 Acres
1-87-248 MEN	C CC 16 Acres, T CC 18 Acres, T SWSC 46 Acres
1-87-430 MEN	T CC 13 Acres, C CC 42 Acres
1-88-204 MEN	T SWRC 80 Acres
1-88-343 MEN	C CC 75 Acres
1-88-355 MEN	T CC 3 Acres, C CC 77 Acres
1-88-406 MEN	T CC 3 Acres
1-88-442 MEN	T SEL 36 Acres
1-88-592 MEN	Road only 22 Acres
1-88-637 MEN(same as 1-82-38)	C CC 45 Acres
1-88-648 MEN	SWRC 210 Acres
1-89-08 MEN	C CC 55 Acres, T SWRC 77 Acres
1-89-249 MEN	T SEL 36 Acres
3-89-314 MEN	T SWRC 86 Acres
1-89-532 MEN	C CC 64 Acres, T SWRC 17 Acres
1-90-567 MEN	C SEL 9 Acres, T SWRC 18 Acres, T CT 6 Acres C AP 12 Acres, C CC 16 Acres, C SWSC 10 Acres
1-90-578 MEN(same as 1-81-125 & 1-84-330)	T SWRC 80 Acres
1-91-080 MEN	Road only under construction
1-92-126 MEN	T SWRC 14 Acres, T SEL 14 Acres, T AP 15 Acres
1-92-130 MEN	C SEL 315 Acres, T SEL 112 Acres
1-92-442 MEN (under litigation)	H SWRC 39 Acres, H G SEL 105 Acres
1-93-328 MEN (submitted)	T SWPS 14 Acres

Assessment Area **8,595 Acres** **note: Where the same area has been relogged since**
Acres Logged **4,728 Acres** **since 1974 the acreage is only added once.**

Legend For Past Projects Assessment List

C CC	Cable Clearcut
T CC	Tractor Clearcut
C SWRC	Cable Shelterwood Removal Cut
T SWRC	Tractor Shelterwood Removal Cut
C SEL	Cable Selection
T SEL	Tractor Selection
C SWSC	Cable Shelterwood Seed Cut
T SWSC	Tractor Shelterwood Seed Cut
C CT	Cable Commercial Thin
T CT	Tractor Commercial Thin
C AP	Cable Alternative Prescription
T AP	Tractor Alternative Prescription
H SWRC	Helicopter Shelterwood Removal Cut
H GSEL	Helicopter Group Selection
T SWPC	Tractor Shelterwood Preparatory Cut

B. Proposed Future Projects

Present litigation efforts by the Albion River Watershed Protection Association and Friends of Salmon Creek make the discussion of future project extremely tenuous. Since the vast majority of the Salmon Creek watershed is zoned for timber production and contains many stands of high quality saw timber and it is therefore anticipated that the majority of landowners in the drainage will continue to manage their properties for timber production.
The silviculture and logging methods to be used in these harvest operations will be determined by the RPF involved on a site specific basis. All future harvesting activity is subject to constraints imposed by revisions in the forest practice rules. The following is a list of areas where harvesting may occur.

AREA	Possible Acreage
T 15 N R 17 W Section 1	87
T 15 N R 17 W Section 1 & T 16 N R 16 W Section 31	62
T 15 N R 16 W Section 6	52
T 16 N R 16 W Section 20 & 29	45

(3) Will the proposed project, as presented , in combination with past ,present , and reasonably foreseeable , probable, future projects identified in items (1) and (2) above, have a reasonable potential to cause or add to significant cumulative impacts in any of the following resource subjects?

	Yes After mitigation (a)	No After mitigation (b)	No Reasonably potential significant effects (c)
1. Watershed		X	
2. Soil Productivity		X	
3. Biological		X	
4. Recreation			X
5. Visual			X
6. Traffic		X	
7. Other (trespass)		X	

2. Are there any continuing, significant adverse impacts from past land use activities that may add to the impacts of the proposed project. Yes X No
If the answer is yes, identify the project(s) and affected resource subject(s).

Mr. Lloyd I Keefer
California Department of Forestry
and Fire Protection
P.O. Box 670
Santa Rosa, Cal. 95402

Date: 10-12-93
Re: THP 1-93-394 MEN
G - P Area # : (36-26)

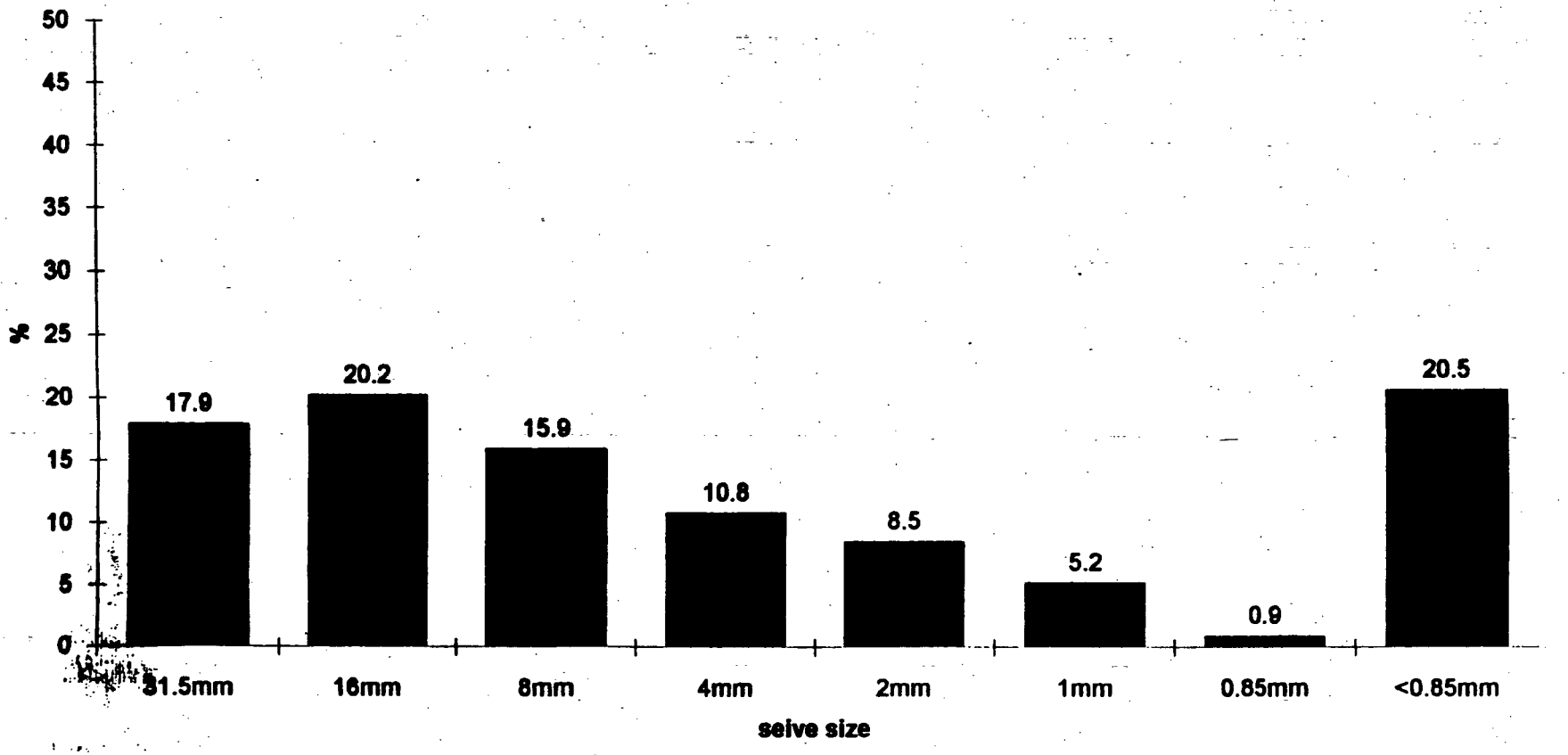
Dear Mr. Keefer :

The Following is additional information to be included in THP 1-93-394 MEN.

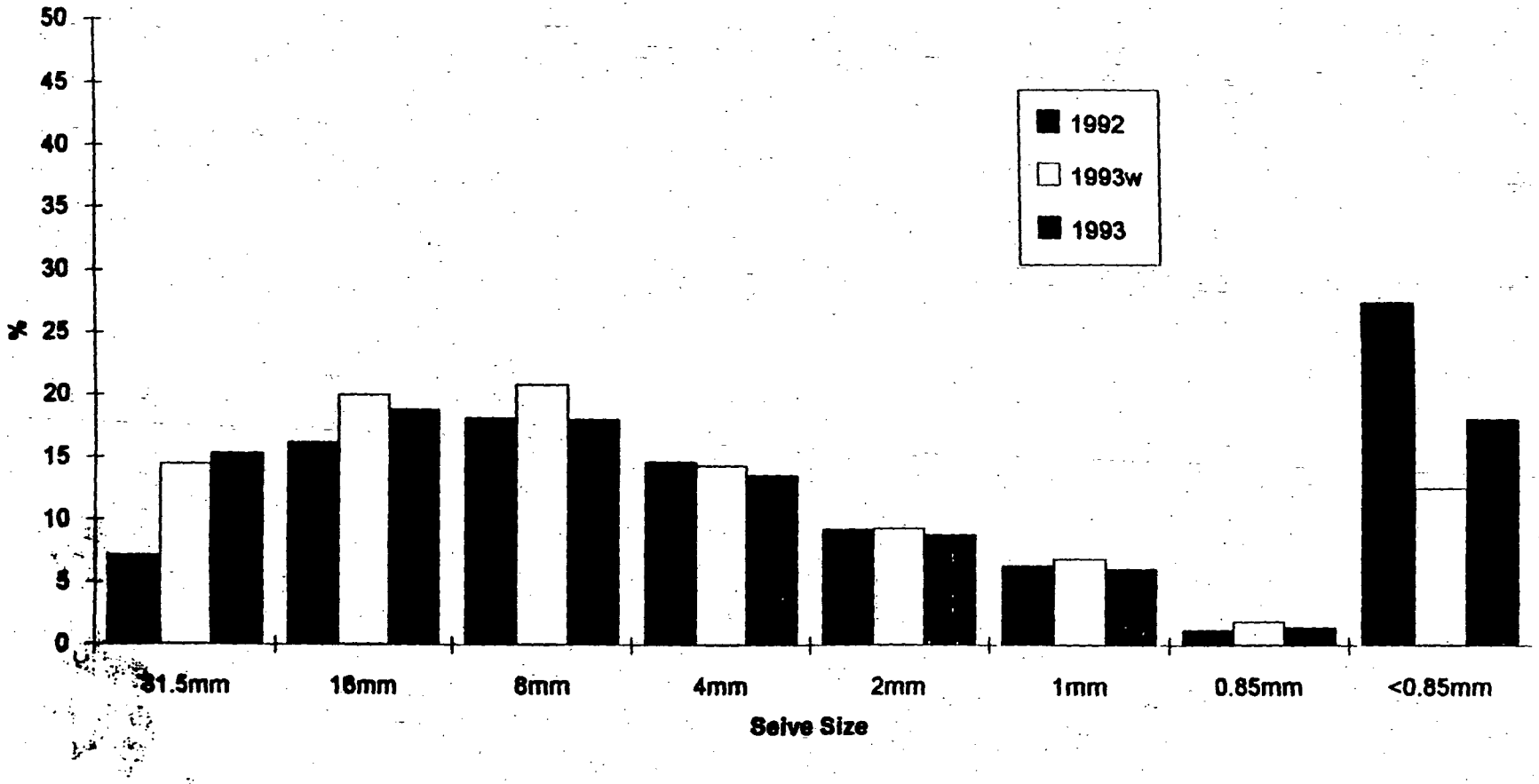
Sincerely,

Kevin N. Roberts, Wildlife Biologist

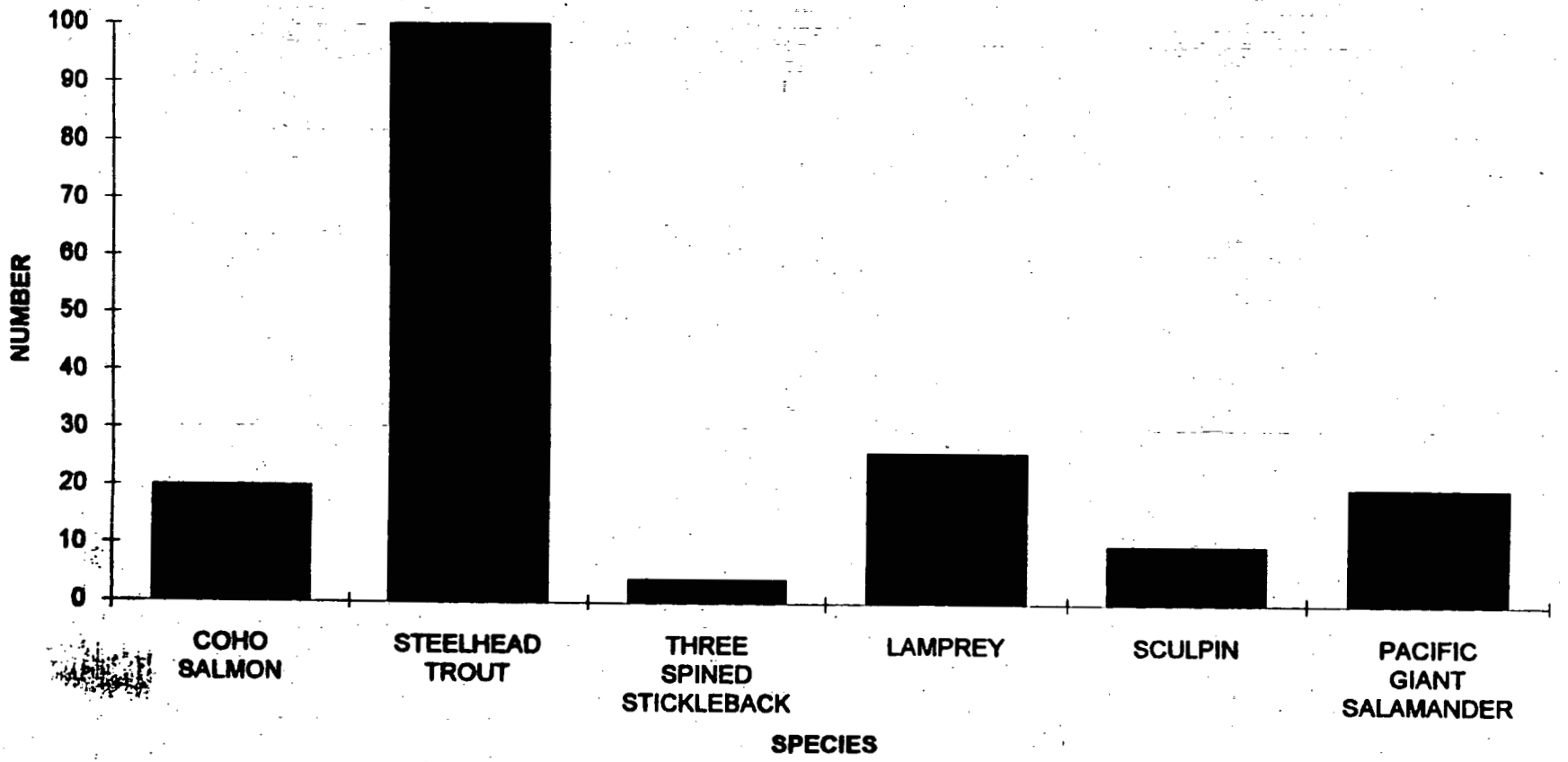
Average McNeil Sediment Sample for the mouth of Donnelly Gulch - 1993. Georgia-Pacific Corp., Fort Bragg, CA.



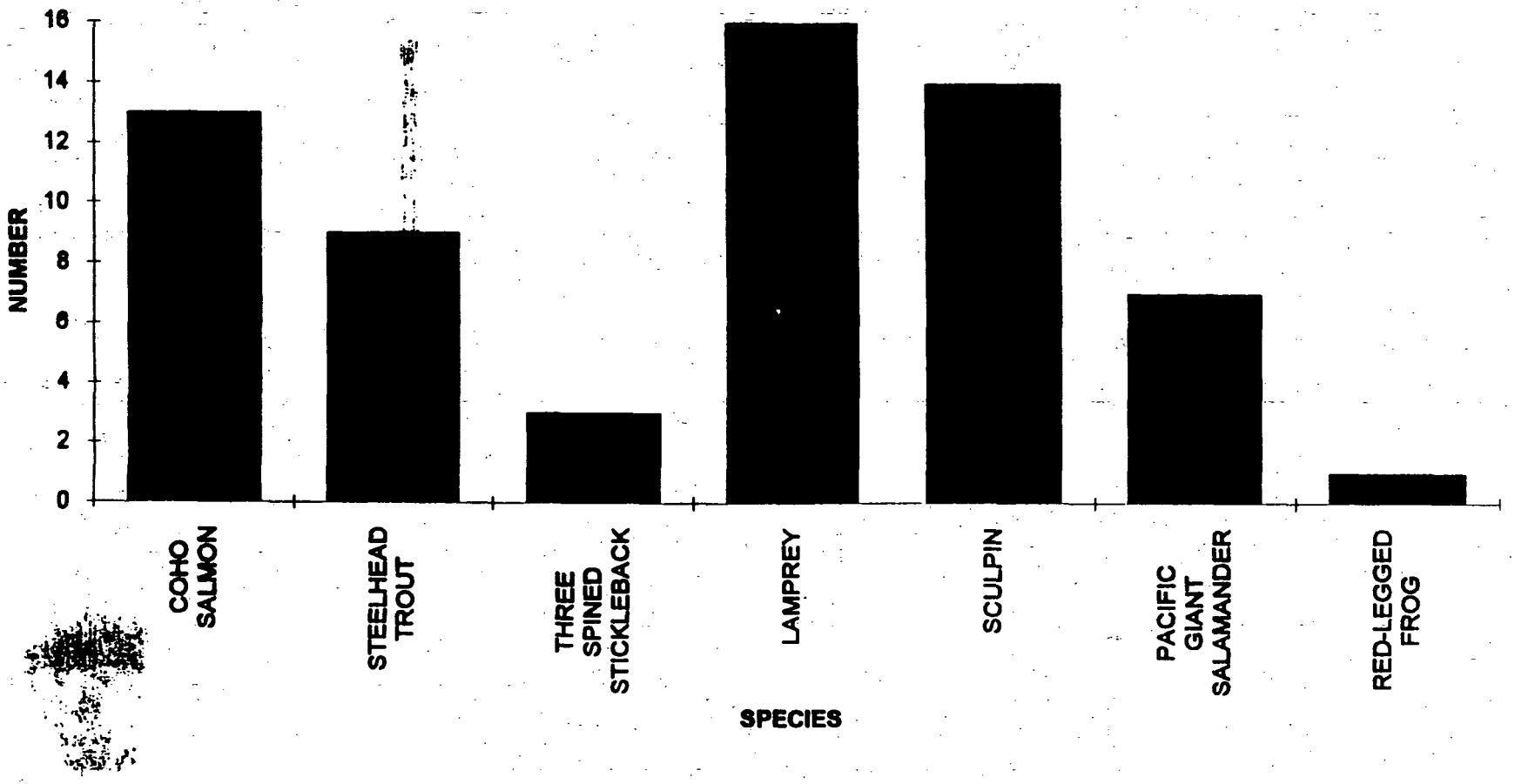
Averaged Overall McNeil Sediment Samples For Salmon Creek - 1992, winter 1992-1993, and 1993. Georgia-Pacific Corp., Fort Bragg, CA.



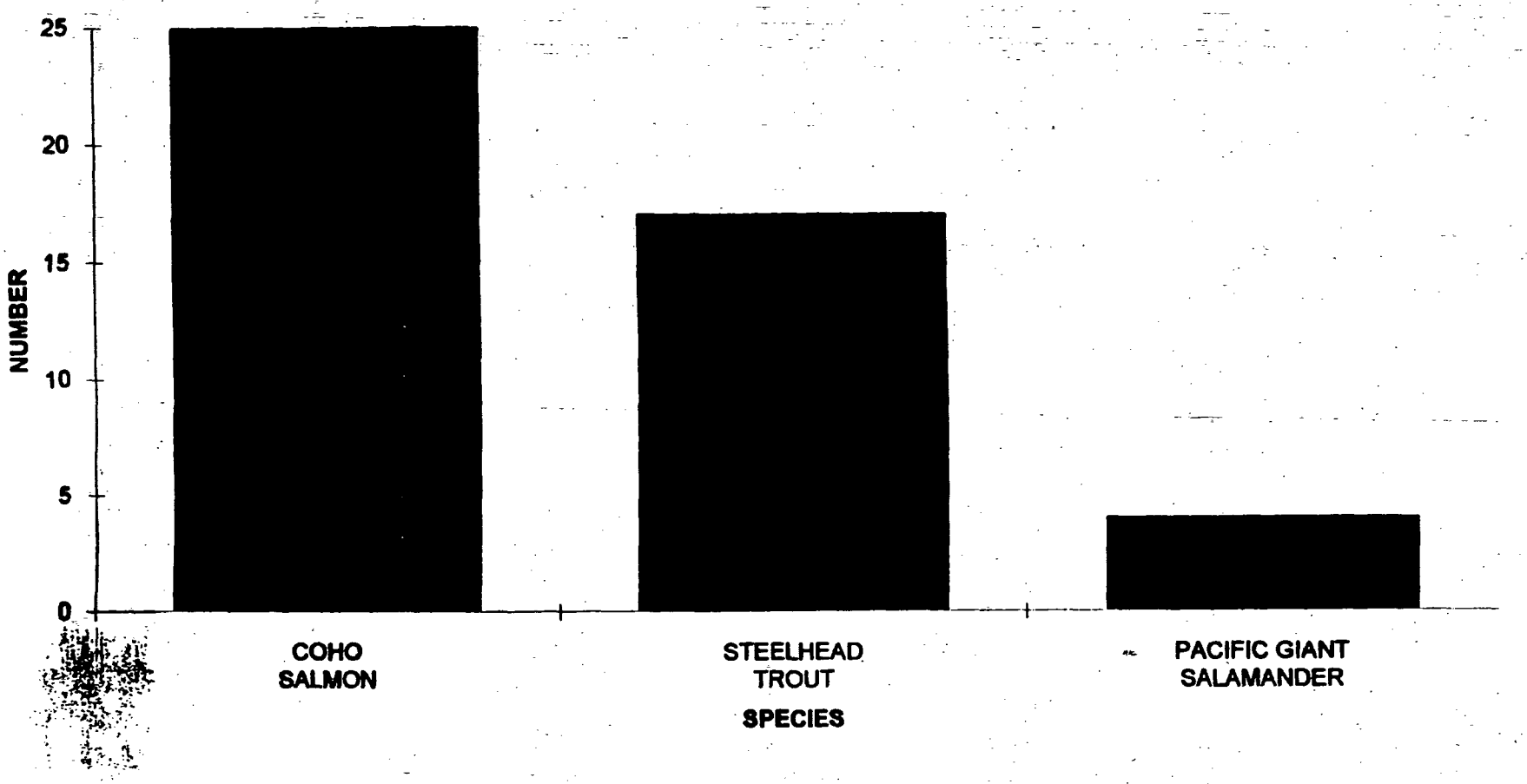
LOWER SALMON CREEK - Estimation of Fish populations, 1993 (30 M station). Georgia-Pacific Corp., Fort Bragg, CA.



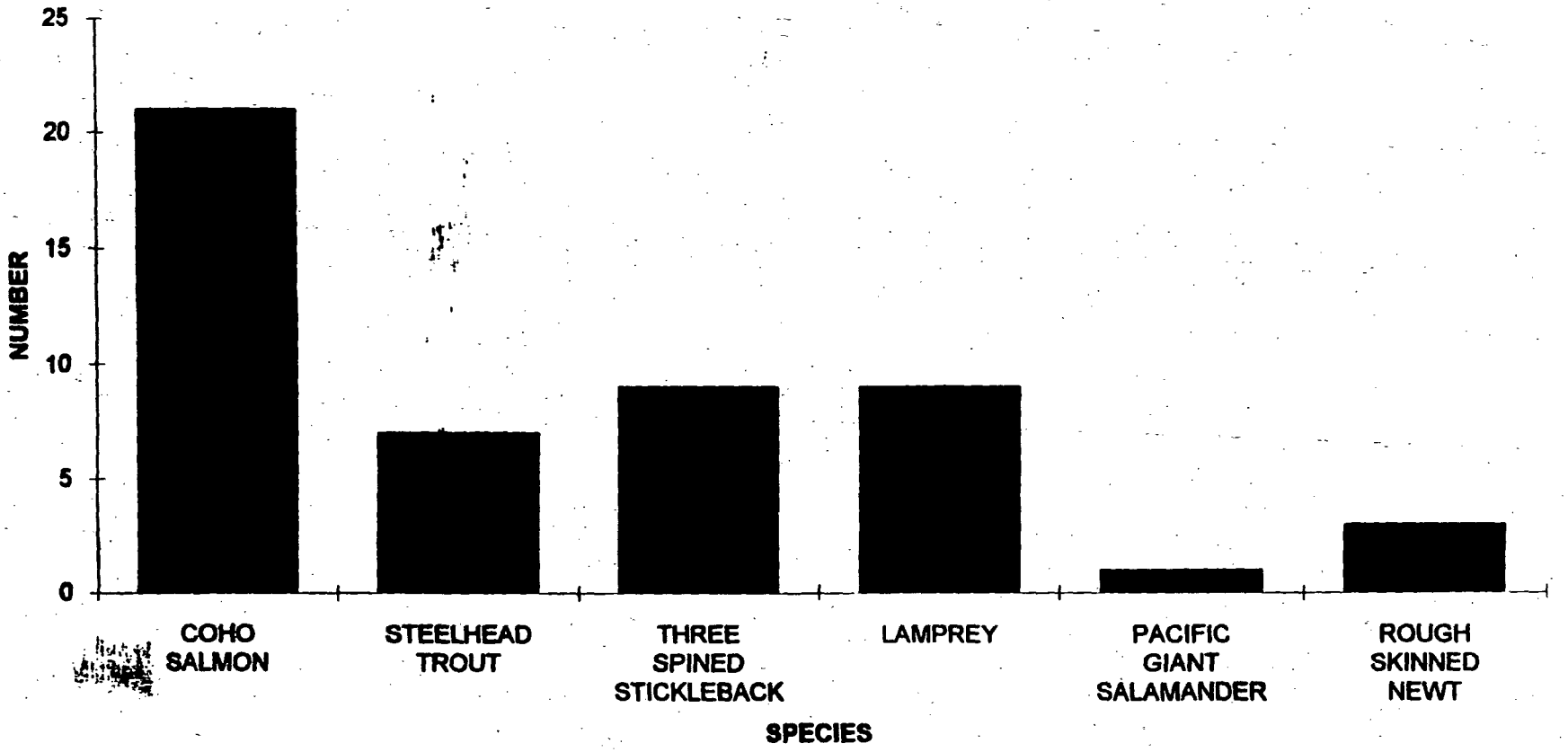
SALMON CREEK NEAR KETTY GULCH - Estimation of Fish populations, 1993 (30M station). Georgia-Pacific Corp. Fort Bragg, CA.



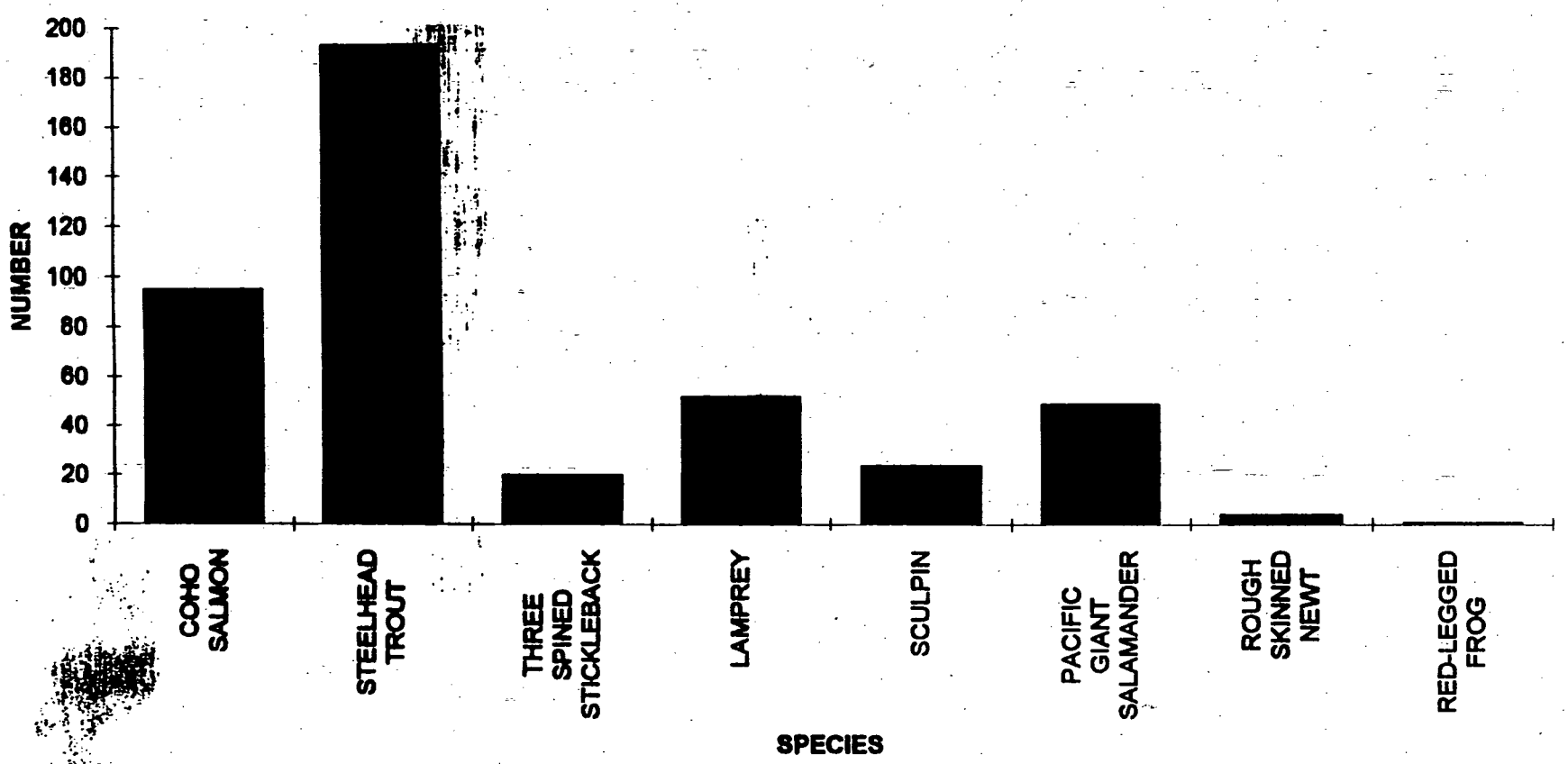
DONNELLY GULCH - Estimation of Fish populations, 1993 (30M station). Georgia-Pacific Corp., Fort Bragg, CA.



LOWER HAZEL CREEK - Estimation of Fish populations, 1993 (30M station). Georgia-Pacific Corp., Fort Bragg, CA.



SALMON CREEK - OVERALL (6 - 30M stations combined) - Estimation of Fish populations, 1993. Georgia-Pacific Corp., Fort Bragg, CA.



California Regional Water Quality Control Board
North Coast Region

Interoffice Communication

To: Frank Reichmuth
Review Team Chairman

October 19, 1993

From: Andrew Baker

Subject: Preharvest Inspection for Timber Harvest Plan 1-93-394/MEN, Salmon Creek, Georgia Pacific Corporation.

On September 29 and 30, 1993 I participated in a preharvest inspection for the subject THP. Other participants included Jim Purcell and Joel Siegers of CDF; Julie Bawcom, DMG; Robert Ballard, RPF; Kevin Roberts, Georgia Pacific Corporation.

The THP proposes to log 586 acres located within Hazel Gulch, which is a major tributary to Salmon Creek. Silvicultural prescriptions include selection and transition methods. Cable yarders will remove logs from the steeper slopes while tractors will operate mainly on upper slopes and gentler ground. The existing road system will be expanded to accommodate cable yarding. My inspection focused on evaluating watercourse protection measures and ensuring that roads and landings are suitably located and mitigated to protect water quality.

Watercourse Protection

I inspected most of the watercourses in the plan area and found all but one to be correctly classified, according to the Forest Practice Rules. Upper Hazel Gulch is incorrectly classified and should be given Class I designation, because it provides habitat for salmonids. Fish where observed approximately 1,500 feet upstream from where the THP map shows a watercourse classification change. It is recommended that the Class I designation be extended approximately 2,000 feet upstream (see recommendations).

The THP, as it is marked on the ground, provides wide buffer zones along the Class I and II watercourses. Very few trees were marked for harvest within these zones. However, THP item 50 indicates that only standard watercourse protection measures will be provided. This means that 50% of the canopy will be retained within a 50' to 100' WLPZ. During the PHI, I estimated that less than 10% of the canopy was marked for harvest in the WLPZ which was flagged at 200' to 300'. This is clearly an increase in watercourse protection. This increased protection is more accurately shown on the late seral areas map found in the THP. This increased protection will greatly reduce the impacts to Salmon Creek and is an important consideration in this evaluation. I recommend that enforceable language be included in the THP that will help ensure that no more than 10% of the stream canopy is removed and reflects the timber marked on the ground (see recommendations). If this is not done then the THP should be carefully reevaluated for cumulative impacts.

Roads and Landings

Road and landing locations were evaluated to ensure they are suitably located and mitigated to minimize erosion and sedimentation to streams. For the most part, the RPF makes every effort to relocate roads and landings away from watercourses. The existing

road along upper Hazel Gulch will not be reopened and used by heavy equipment. This will require the construction of some additional road, predominantly along upper slopes and ridges. This is preferred because it will accommodate cable yarding and eliminate disturbance near streams. Much of the existing road system within the Salmon Creek drainage is located along streams where potential impacts to water quality can occur. If these roads are to be reused they should be fully mitigated to protect water quality.

The existing roads along Salmon Creek are unimproved dirt roads that erode sediment to Salmon Creek. The Regional Water Quality Control Board staff has requested Georgia Pacific Corporation to improve these roads under our February 5, 1993 enforcement letter. Many of these improvements have been accomplished and some are included in the THP as enhancement projects. In an agreement we have with GP, dated June 9, 1993, additional roads will be upgraded in conjunction with future THP's, as they are used. This includes improving drainage on appurtenant WLPZ roads by outsloping, rocking and by replacing culverts. These improvements are included in my recommendations for this THP.

Watershed Assessment

Salmon Creek is a 8,595 acre watershed that discharges directly into the Pacific Ocean in Mendocino County. GP is the primary landowner within the watershed. The primary beneficial use includes fish spawning and rearing habitat. It provides habitat for Coho Salmon, which is now being considered for listing under the endangered species act. Past logging practices have degraded the aquatic habitat.

Past logging damage is evident, particularly along Hazel Gulch. The stream continues to downcut through old logging debris that was placed in the channel when the old railroad grade was constructed and the area was logged around the turn of the century. Impacts from subsequent road and landing construction are also evident. Unlike the main stem of Salmon Creek, upper Hazel Gulch has many areas with very unstable, eroding stream banks. These unstable stream banks are a major source of fine sediment in Salmon Creek. The stream channels are generally well shaded, except along older clearcut areas which are fairly extensive within GPs' ownership.

Earlier this year Regional Board staff conducted a stream survey of Salmon Creek with fisheries biologist from our office and the Department of Fish and Game. It was generally concluded that there is a viable juvenile salmonid population, though the stream did not appear to be "fully seeded". Habitat for salmonids is primarily afforded by pool/glide areas with undercut banks in Hazel and Donnely Gulch. The habitat was found to be lacking in complexity that could be provided by larger substrate (rubble and/or boulder) and woody debris. There appeared to be considerable bed material in storage with a predominance of finer material. We also noticed extensive mats of filamentous algae which were beginning to oxidize along the clearcut areas of the stream. Excessive growths of fillamentous alge can cause localized dissolved oxygen fluctuations as a result of algal respiration at night, and decomposition of the mats.

The watershed assessment contained in the THP appears to comply with the requirements of the Forest Practice Rules and is much better than most that I have reviewed. GP has recently begun some instream monitoring which consists of gravel sampling, temperature recording and electro fish shocking. The data is presented in the THP, however it is not analyzed or linked to activities in the watershed. Thought it is not our responsibility I consulted with our Fisheries Resources representative to help with an analysis. They provided some of the following comments.

The McNeil data indicates that there is a predominance of small substrate (<50 mm), which verifies our surveys. They do not verify GP's conclusion that the percentage of fines is not overwhelming the system. The sediment data are highly variable. To draw any inferences regarding trends would require more samples at each site. The map with sample locations is inadequate to properly locate sites.

The temperature data is helpful, though it would be useful to have more information to facilitate an analysis, this could include, extent of canopy, hillslope and elevation, etc.

The fish data is also useful and basically shows salmonids through most of the system (again validating our surveys). Yearly or twice yearly, samplings over a long period of time (7-10 years) as we discussed with GP in the field would provide some basis for inferences about population trends.

In general the assessment is useful, however it should be expanded to include an analysis of GP's studies and how the results of these studies can be used to adjust their management to better protect watershed resources. Given the predominance of small material in the stream channel, the stored material higher in the watershed, the location of roads near the stream channels and loss of canopy due to clearcutting, more recognition should be given to the damage caused by past logging practices and and how these practices are being adjusted (i.e. large stream buffers to compensate for the loss of stream canopy and large woody debris, and to add an extra buffer against sediment input to streams and solar radiation). Fortunately, the THP includes most of these improved practices, but fails to properly acknowledge them.

Conclusions

Salmon Creek contains a high bedload of fine sediment (<50 mm) which is known to limit fish reproduction. Land management must be undertaken with a high standard of care to minimize erosion and additional sediment input. The large acreage of this particular THP increases my concern about the potential for cumulative watershed effects that will retard the recovery from past logging practices.

Recommendations

1. Provide Class I designation to upper Hazel Gulch from the watercourse classification change upstream to point "A" on my PHI map.

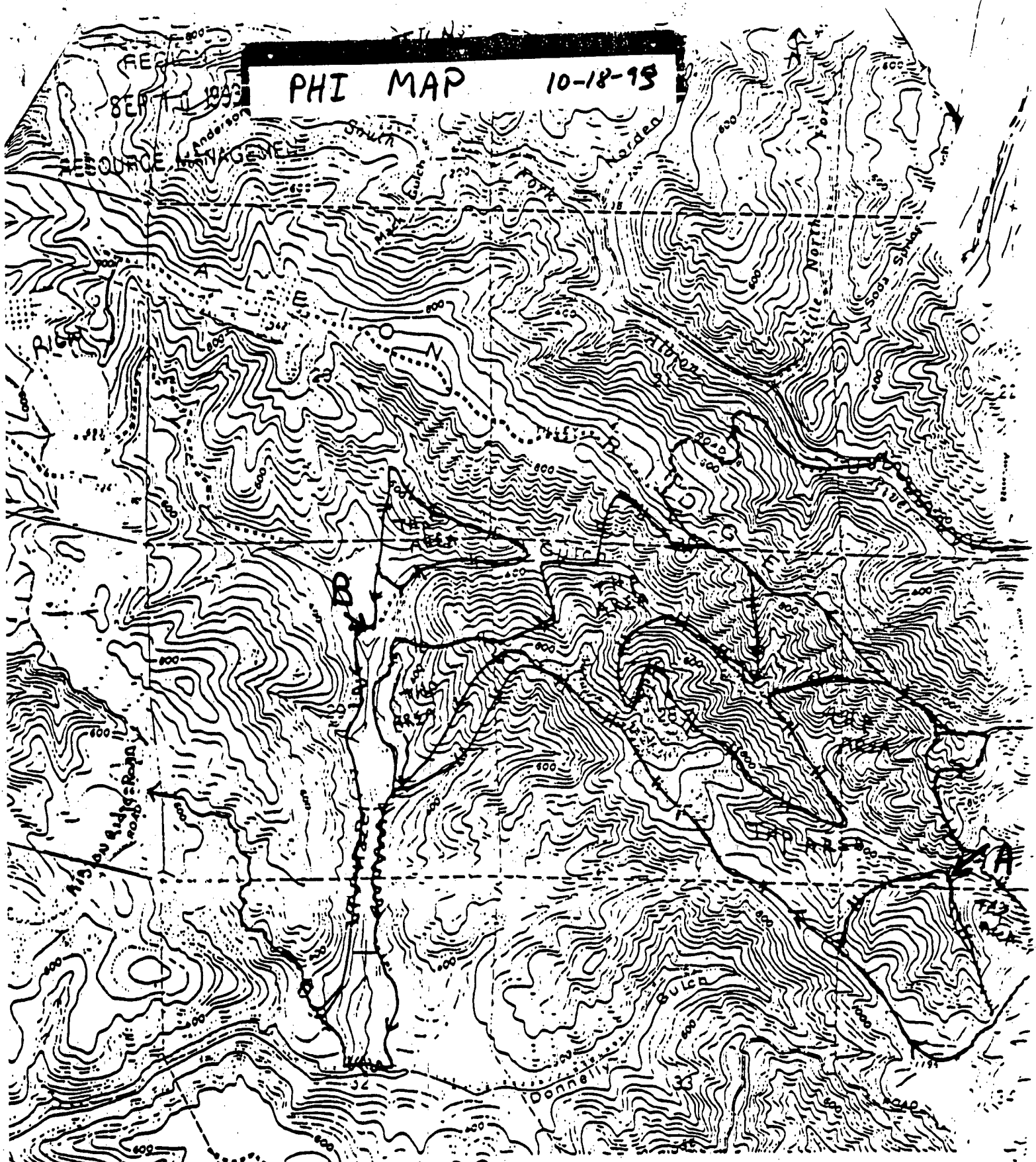
2. RPF should provide a revised map clearly showing which roads will not be reopened along Hazel Gulch.

3. The RPF should provide some enforceable language clarifying the canopy retention standards along Class I and II watercourses. This should include a statement to the effect that only trees that were marked prior to the preharvest will be harvested or less than 10 percent of the canopy within the late seral stage area will be removed. The RPF should agree not to amend the THP to obtain additional trees within the late seral stage area.

4. The appurtenant haul roads located within the WLPZ of Hazel Gulch and Salmon Creek shall be outsloped and rocked, as agreed by GP in their June 9, 1993 letter.

5. The 2 culverts on the class I stream crossing of the appurtenant haul road at PHI map point "B" shall be replaced with an appropriately sized culvert.

6. Notify Andrew Baker or Frank Reichmuth upon completion of operations so we can arrange a postharvest inspection.


PHI MAP 10-18-95
Appurtenant Haul Roads (36-26)
1" = 2000'
Haul Roads
WLPZ Roads
THP boundary

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

NORTH COAST REGION

Interoffice Communication

TO: Andy Baker **DATE:** October 19, 1993

FROM: Bob Klamt
(M.S., Fisheries Resources)

SUBJECT: Supplementary information on Big Salmon Creek

I have taken a look at the supplementary information supplied by Georgia-Pacific on Big Salmon Creek. My impressions follow:

1) The maps as supplied are barely adequate to locate a sampling site at the best. I simply could not tell where some of the sites were.

2) The McNeil data indicate a predominance of small substrate (<50 mm), veryifying our surveys this year.

3) Those sediment data are highly variable at some sampling sites. To say much more, or draw any inferences regarding trends, would require more samples at each site. We took 10 per site on the Garcia, which provided us with adequate data to statistically test.

4) The temperature data looks pretty good, though I did notice about a 5 °C range in weekly values for one site on Big Salmon Creek. More information with the data, such as extent of canopy, hillslope and elevation, etc., would facilitate analysis.

5) The fish data is nice to have, and basically shows salmonids through most of the system (again validating our surverys). Yearly, or twice yearly, samplings over a long period of time (7-10 years) as we discussed with GP in the field would provide some basis for inferences about population trends.

6) I was disappointed that the package contained no analysis, conclusions, nor linkage to activities in the watershed. I don't know what was agreed upon regarding THP review, but don't feel it's our responsibility, nor place, to analyze their data. Given the predominance of small material in the stream channel, the stored material higher in the watershed, and the location of existing roads near the stream channels, I expected to see some recognition of the damage done by historic logging, and some mention of new practices to minimize continued sediment input (rocking the roads, stabilizing old landings and roads, etc.). I stand by my assessment of May 18, 1993 that "caution" should be the watchword.

California Regional Water Quality Control Board
North Coast Region

Interoffice Communication

TO: Ben Kor
File

April 7, 1993

FROM: Frank Reichmuth

SUBJECT: Field Inspection of Big Salmon Creek on March 16, 17, 1993

On March 16, 1993, Andy Baker and I inspected Georgia Pacific Corporation's (GP) road system adjacent to Big Salmon Creek accompanied by Robert Ballard, a registered professional forester for GP. The next day we attempted to examine the stream with Bob Klamt of our staff and Rick Macedo of the Department of Fish and Game. The March 17th inspection included numerous inspectors from other agencies including Marc Jameson, Pete Cafferata, Joel Segers, Brad Valentine, and Merv Pyorre of CDF; Ted Wooster of DFG; Tom Spittler of Division of Mines and Geology; Tom Ray, Ken Roberts, Bob Ballard and J. Ambrose of GP. There were scattered rain showers on March 16, however, the stream was clear and the effectiveness of erosion control facilities could be evaluated. The March 17 inspection was hampered by significant rainfall/runoff which clouded the stream and prevented examination of the streambed of Big Salmon Creek by Bob Klamt and Rick Macedo. The purpose of the two day inspection was to reevaluate the condition of the road network observed on January 26, 1993 and to acquire additional expert analysis of the aquatic habitat of Big Salmon Creek and its tributaries.

The attached map identifies the area inspected on March 16, 1993. We drove to the confluence of Hazel Gulch and Donnelly Gulch and walked the the length of Big Salmon Creek from culvert location 1 to the quarry downstream. The road is not rocked and has an inside ditch and cross drain culvert system for drainage. The length of the road had been graded and waterbarred last Fall. This section of road is located within or in close proximity to the WLPZ of Donnelly Gulch and Big Salmon Creek. The vegetation between the road and Big Salmon Creek offers very little buffering capacity for road runoff. The inside ditch is not well constructed. In some locations it is filled with sediment causing drainage to flow down the road surface. Due to the low slope position of the road, the road area is very wet. In a few locations, overland flow from upslope areas was sufficiently concentrated to erode portions of the road fill. Excluding cross drains, several of the road culverts had been overtopped by high streamflow, resulting in the erosion of fill. In my judgement, these failed culverts were inadequate to convey the runoff from the recent storms. From the rainfall information available to date, the return period of the recent storms was two to five years. The culverts were either undersized or plugged with debris or a combination of both factors.

There is old logging damage to Big Salmon Creek and Donnelly Gulch as evidenced by an old railroad grade and logging debris in the stream channel. The upper portion of Donnelly Gulch appears to be downcutting through old logging fill deposits. The streambanks are nearly vertical, stable and covered with riparian vegetation. The stream gradient appears to become flatter (<3%) as we walked downstream. The stream channel has little structure downstream of Hazel and Donnelly Gulches to form pools except where it is provided by bed rock or occasional windfall or old logging debris. The flood plain contained debris and sediment indicating recent flooding had occurred. The stream bed of Big Salmon Creek is made of a high percentage of fine material less than gravel size overlying a bed rock base. A review of McNeil samples taken last year and compared to

recent samples following the January storms indicates a decrease in fines. This may indicate a build up of fines during the low flow period of the drought of the last several years and flushing of sediments during the January storms. Andy Baker did indicate the stream channel bedload appears to have been reduced from his inspection of January 26, 1993.

The Department of Fish and Game has conducted several stream clearance projects in the late 1960's and early 70's in Big Salmon Creek. The early log jam removals reportedly opened up large areas of the Big Salmon Creek watershed for fish spawning and habitat. The location of the road in close proximity to the stream probably facilitated log jam removal. It is probable, that large woody debris which would be considered beneficial to fisheries habitat under current practice, was removed.

Since Andy Baker's inspection of January 26, 1993, GP has repaired much of the erosion damage on the road. A backhoe was used to deepen the waterbars. Straw mulch was spread on repaired waterbars and other eroded areas. Sediment and debris was excavated from the inlet of at least one culvert. Filter fabric was installed on the inlets of several cross drains to capture fines. These structures will require frequent maintenance to maintain their effectiveness and efficiency. Grass was seeded following the January 26 inspection from approximately culvert location 1 to culvert location 4. The grass sprouted and is approximately 3 to 4 inches tall. This effort appears to have reduced sheet erosion on the upper road. Grass seed has been spread on the remaining portion of the road as part of the erosion control effort and has yet to sprout.

GP has stated that much of the erosion due to the failure of the water bars was due to vehicle damage by trespassers. During our inspection we did observe horseshoe tracks and wheel tracks from motor bikes. We also observed a wide foot print tire track on the road near the quarry. We did not see any damage to the recent erosion control work completed by GP. Wet weather vehicle traffic will damage the waterbars constructed in the low cohesive soil in Big Salmon Creek. We understand GP's problems with trespassers, however, GP must still assume responsibility for maintaining the road. If GP is unable to control trespass, they should consider installing erosion control measures that withstand all traffic on the road.

We examined nine culverts and one log stringer bridge along Donnelly Gulch and Big Salmon Creek. These culverts were measured and culvert sizing calculated on the attached schedule A. All the culverts appear to be under designed except for culverts 2 and 3. Other cross drain culverts not shown on the map appear to be satisfactory. I have calculated the size of a 50 year return period designed culvert and recommended replacement culvert(s) or bridge based on actual topographical conditions. Nearly every culvert examined was overtopped by recent streamflow and eroded a portion of the fill. Some of the culverts were plugged with sediment or debris which resulted in overflow of the fill. Along with increased culverts sizing, trash racks should also be installed. Since many of the culverts are seriously undersized, GP should check the size of all of the other culverts which we did not observe.

The bridge over Hazel Gulch was overtopped by flood flow during the recent storms. A log stringer was actually lifted by high flows and deposited downstream. GP should consider elevating the bridge or making it a seasonal bridge.

I discussed the potential abandonment of the roads adjacent to streams in the Big Salmon Creek watershed with Bob Ballard. Apparently, GP has been discouraged by Mendocino County public works department from log hauling on both the Navarro Ridge road and the Albion Ridge road. I contacted Mr. Belliston of the Mendocino County public works who confirmed that Mendocino County requires a permit and maintenance fees for log hauling on either the Navarro Ridge or Albion Ridge roads for repair of road damage. Log truck hauling during the winter period is particularly damaging. They have encouraged GP to use only one of the roads to minimize road maintenance. This may limit GP's options in abandoning roads along Big Salmon Creek. The main haul road along Big Salmon Creek is needed to access the Albion Ridge Road. This provides further justification for upgrading the drainage and hardening the road surface.

During the March 16th inspection, we drove the road from the confluence of Hazel Gulch and Big Salmon Creek to point A on the attached map. This road surface was more stable than the Big Salmon Creek road because it is covered with vegetation with the exception of the tire tracks. The road was within the WLPZ of Hazel Gulch, but less frequently than along Big Salmon Creek. We walked a portion of the road between map point A and B and observed a small gully down the road and a lack of waterbars. The road was apparently last used during a logging operation conducted in 1986. We also walked down to the forks of Hazel Gulch at map point C and to an old homestead at approximately map point D. The streambed of Hazel Gulch contains a high percentage of fines less than gravel size similar to what was observed in Big Salmon Creek. We also observed the remnants of an old railroad crossing on Hazel Gulch. My main concern with this area is the lack of waterbars between map points A and B. GP should revisit some of these older harvest plans to determine if the lack of erosion control facilities is more widespread or isolated to the area observed.

GP has asserted that Regional Board staff does not have jurisdiction in enforcing water quality regulations on THPs in Big Salmon Creek watershed. During Andy Baker's inspection of January 26, 1993, CDF was uncertain on the portions of the road which fall under their enforcement authority for corrective actions. Regional Board staff's position is that we consult and defer any enforcement actions to CDF where they have primary jurisdiction. In this case, CDF required corrective action on a portion of the road on the east side of Hazel Gulch. CDF has provided us a map (attachment 2) which defines the portion of the road on which they can take corrective action. The road and culverts along Big Salmon Creek and Donnelly Gulch are not within CDF's jurisdiction for enforcement of the Forest Practice Rules with the exception of approximately 500 feet of road and the bridge crossing of Hazel Gulch. Since they do not have jurisdiction, it is Regional Board staff's position that we have a responsibility to enforce our Basin Plan prohibitions and guidelines through the use of the Water Code. Furthermore, we consulted with the CDF Resource Manger in the Ukiah Office who supported the Regional Board staff's intention to seek corrective action from GP.

Attachment 3 is Bob Klamt's field notes of March 17, 1993. The flood conditions were not suitable for fish habitat evaluation and a second field trip will be necessary. Two age classes of Coho Salmon were identified. Coho Salmon have been identified as a species at risk by the American Fisheries Society. The presence of Coho Salmon provides important justification for the control of fine sediment discharge to Big Salmon Creek and its tributaries.

Conclusions and Recommendations

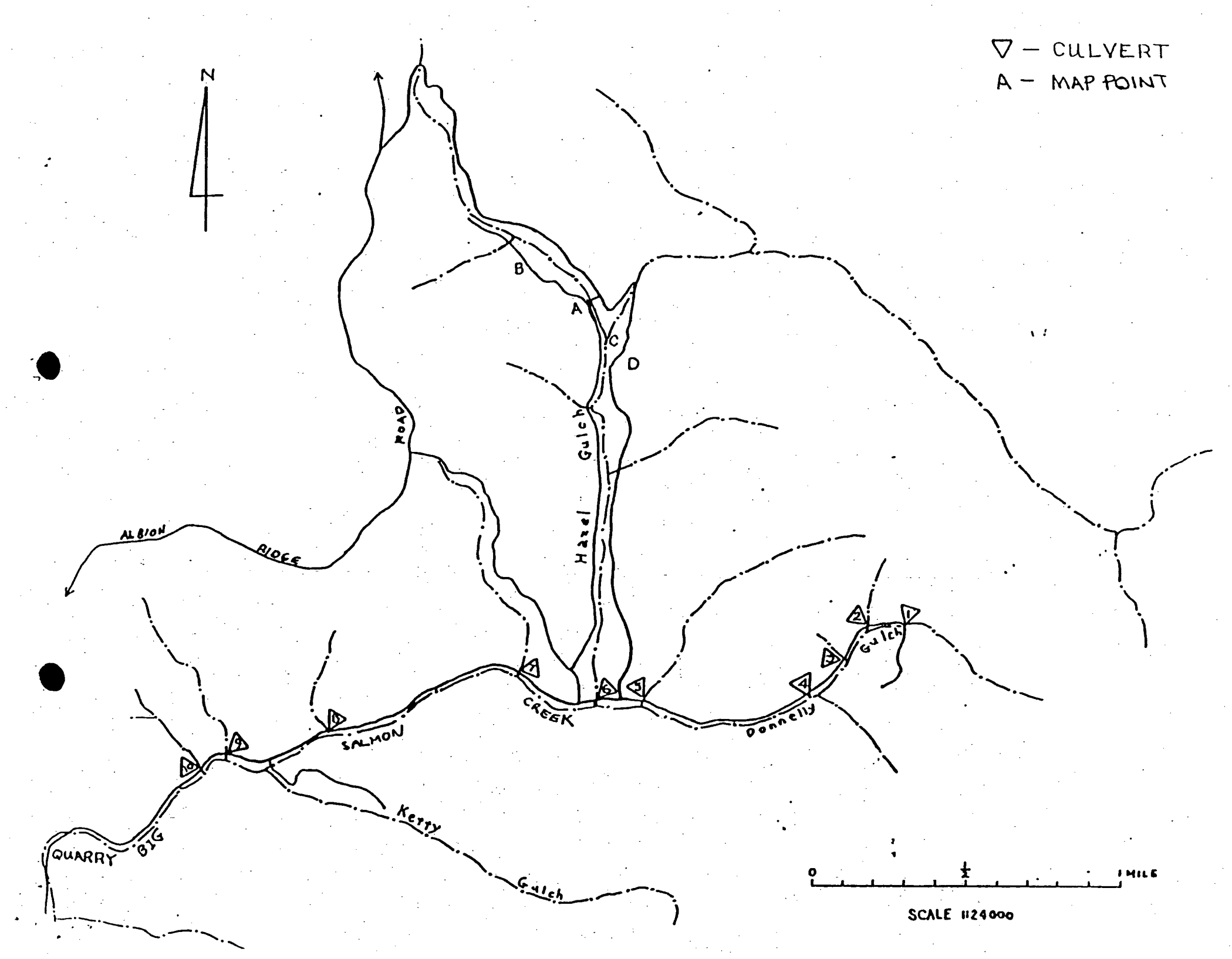
The condition of Big Salmon Creek and its tributaries is a result of all past activities including railroad logging, log jam removal, homestead activities, road construction prior to current forest practices, overlain with current logging practices. Much of the sediment in Big Salmon Creek can be attributed to old logging practices which significantly filled in the stream channel. This old sediment is still a major contributor of fines as evidenced by downcutting of stream channel particularly in the upper reaches of the watershed. The tributaries to Big Salmon Creek carry a significant amount of sediment and debris as evidenced by the plugging of culverts along the Big Salmon Creek road. The current road network adjacent to Big Salmon Creek and its tributaries also contributes sediment to Big Salmon Creek. The recovery of Big Salmon Creek will take many years. Reuse of facilities near streams such as old logging roads must be controlled. Careful evaluation of alternatives must take place to insure that inadequately engineered roads and appurtenant facilities are upgraded or eliminated. The sustained recovery of the stream with its important beneficial uses requires this level of attention. I believe the current road management activities and planning need improvement to further reduce the contribution of sediment from the road to Big Salmon Creek.

The road maintenance/erosion control workplan requested in the letter of February 5, 1993 is justified. The permanent culverts observed in the field are undersized to carry the 50 return period flood as required by the Forest Practice Rules. The current design of the existing Big Salmon Creek road is an insloped road with culvert cross drains and waterbars. The road ditch and culvert inlets require frequent maintenance to remove obstructions and maintain drainage. GP has satisfactorily repaired the surficial damage to the waterbars and has grass seeded the road surface.

I recommend that GP outslope the road and rock its surface and roll the road grade to provide drainage. This will reduce the maintenance of the road and will result in the road being resistent to damage. Since GP is planning to continue the use of this road for the long term, a rocked road surface will provide a greater resistance to surficial erosion. The rocking of the road need not occur in one year but can be phased in over time as THPs require the use of the WLPZ road. The culverts identified as undersized should be upgraded to handle a 50 year return period storm or bridges should be installed.

Since we observed only a portion of GP's road system, I suspect that similar problems may exist on other roads in the Big Salmon Creek watershed. I believe the request for a technical report is justified and should contain an 1) inventory of the location and size of culverts on GP's roads within Big Salmon Creek watershed 2) a description of the measures that will be employed to stabilize the road surface and control erosion and drainage of the road 3) a description of GP intent to abandon or reuse roads in the WLPZ.

(gpsalmon)


▽ — CULVERT
A — MAP POINT
N
B
A
C
D
ROAD
Hazel Gulch
ALBION
RIDGE
CREEK
SALMON
Donnelly
Gulch
Kerry
Gulch
QUARRY
BIG
0
1 MILE
SCALE 1:24000

Field Notes
Big Salmon Creek
March 17, 1993

weather - overcast w/ rain, approx. 1.5' night prior

Hazel Creek upstream of confluence w/ Donnely Gulch ≈ ¼ mile
bank-bank width ave. 10'
water turbid w/ visibility <0.5 ft
est. depth at bridge ≈4 ft
confined channel, reasonably sinuous
moderate high canopy, good streambank canopy from herbaceous plants
good flood plain, but 4-5 ft above the streambed (more?)
couldn't see, but suspect stream has some pool/riffle structure
fresh silt depositions on banks
shocked 5 yearly Coho from backwater stream-right upstream bridge

Donnely Gulch upstream of confluence for ≈ ½ mile
bank-bank width ave. 6 '
water turbid w/ visibility 0.5-1 ft, increased during our stay
depths ranged from 1 to 3 ft
incised, confined channel, reasonably sinuous
some fairly good structure
flood plain 4-6 ft above streambed
deposition of material ½" and less up to 0.5 m in some areas - in transport?
moderate high canopy, good streambank canopy from herbaceous plants
shocked 4 Coho (1 yearling, 3 YOY), 1 steelhead YOY

Salmon Creek downstream of confluence for ≈ 100 m
larger, similar channel, appeared straighter
couldn't get into it, too turbid to see

Overall impression - Need to see it when it is clear, but it appears that the streambanks are in good shape. There is well-defined flood plain, though quite a distance from the streambed. That plus the loose deposited material in Donelly Gulch could indicate a lot a material in transit. Heartening to see the Coho, but I need to look at the streambed and more of the drainage to assess the stability of the system and the presence of fish habitat.

Robert Klamt
N. Coast Regional Water Quality Control Board
March 27, 1993

State of California

Memorandum

To : Benjamin D. Kor
Executive Officer
North Coast Regional Water
Quality Control Board
Suite A
5550 Skylane Boulevard
Santa Rosa, CA 95403

Date: April 8, 1993

From : Frances McChesney
Staff Counsel
OFFICE OF THE CHIEF COUNSEL
STATE WATER RESOURCES CONTROL BOARD
901 P Street, Sacramento, CA 95814
Mail Code: G-8

Subject: REGIONAL WATER BOARD AUTHORITY UNDER WATER CODE SECTION 13267(b) ON TIMBER HARVEST LANDS

ISSUES

1. May the Regional Water Quality Control Board, North Coast Region, (Regional Water Board) require under Water Code Section 13267(b) that a discharger prepare a technical report that describes the existing threats to water quality and describes measures to control those threats?

2. May the Regional Water Board issue information request letters under Water Code Section 13267(b) on lands that are or were subject to timber harvest plans approved by the California Department of Forestry and Fire Protection (CDF)?

CONCLUSIONS

1. The Regional Water Board may require under Section 13267(b) that a discharger prepare a technical report that includes a workplan.

2. The Regional Water Board may issue Water Code Section 13267(b) requests concerning activities on lands used for timber harvesting. On lands that are subject to active timber harvest plans, the Regional Water Board has concurrent jurisdiction with CDF. The Regional Water Board would, in that case, comply with the State Water Board/CDF Management Agency Agreement (MAA) to coordinate enforcement. If, however, after full compliance with Forest Practice Rules a water quality problem still exists, the Regional

Water Board would have authority to require further action. On lands that are no longer subject to an active timber harvest plan, the Regional Water Board has primary responsibility for protecting water quality.

ANALYSIS

Regional Water Board Executive Officer Has Authority to Request Technical Report Under Section 13267(b)

Water Code Section 13267(b) authorizes the Regional Water Board to require any person who has discharged, discharges, or is suspected of discharging or who proposes to discharge waste that could affect the quality of waters within the Region to furnish "those technical or monitoring program reports as the board may specify." Such reports may be required with regard to actions of the Regional Water Board related to its Water Quality Control Plan (Basin Plan) or other requirements of the Water Code. The burden, including costs, of a report must bear a reasonable relationship to the need for the report and the benefits to be obtained from the report.

The Regional Water Board has delegated its authority under Section 13267 to the Executive Officer, as provided in Water Code Section 13223. See Regional Water Board Resolution No. 85-14. The Regional Water Board has also specifically authorized the Executive Officer to use 13267(b) to request information from any individual or firm engaged in timber operations, road building, or related activities as necessary for investigations or to carry out the Basin Plan. See Basin Plan p. IV-34.

The scope of a technical report required under Section 13267(b) can be very broad so long as the burden of the report bears a reasonable relationship to the need for and benefits from the report. The technical reports prepared under Section 13267(b) may be used for planning and enforcement purposes. Regional Water Boards have used Section 13267(b) to require workplans for investigation and remedial actions and to require reports on chemical usage, property ownership, and quality control. The State Water Board has approved the Regional Boards' use of Section 13267(b) to require significant water quality monitoring programs and long-term technical studies. See State Water Board Order Nos. WQ 82-8 and 83-2. In determining the scope of the report, the Executive Officer should consider the threat to water quality and the information necessary to evaluate and remedy the threat. See State Water Board Order No. 89-19. Section 13304 could also be used to obtain such information. Violations of orders issued under Section 13304 are subject to a larger civil liability than are violations of Section 13267 orders.

Regional Water Board Executive Officer Has Authority Under Section 13267(b) With Respect to Active and Inactive Timber Operations

The Porter-Cologne Water Quality Control Act designates the State and Regional Water Boards as the "principal state agencies with primary responsibility for the coordination and control of water quality." See Water Code Section 13001. In keeping with this responsibility, the Basin Plan contains an action plan for logging, construction, and associated activities. See Basin Plan p. IV-30 to 36 (updated as of September 26, 1991). The Basin Plan prohibits the discharge or disposal of soil, silt, bark, etc. from any logging, construction, and associated activities into or near streams in quantities deleterious to the beneficial uses of the water body. In the Basin Plan, the Regional Water Board directed the Executive Officer to investigate and review logging operations and associated activities to determine the effect of such activities on water quality, to consult with individuals associated with logging operations and associated activities having an effect on water quality, and to coordinate with other interested agencies to obtain information from them concerning activities regulated by them that have impacts on water quality.

The Regional Water Board has primary responsibility for the control of water quality with respect to any activity that causes or threatens to cause discharges in violation of the Basin Plan, including the Basin Plan's prohibition concerning logging, construction, and associated activities. CDF has authority to regulate timber harvest operations and to enforce the Forest Practice Rules. As directed by the Regional Water Board and in accordance with the MAA the Executive Officer coordinates Regional Water Board actions on timber lands with CDF and other appropriate agencies. The Regional Water Board staff participates in the timber harvest plan review process and coordinates with CDF in the enforcement of timber harvest plans with respect to water quality protection.

CDF has jurisdiction to enforce the Forest Practice Rules for protection of water quality on lands subject to active timber harvest plans. The Regional Water Board has concurrent jurisdiction to enforce the Basin Plan and Water Code for protection of water quality, but does not have authority to enforce the Forest Practice Rules. If, for example, logging operations or associated activities conducted under an active timber harvest plan cause or threaten to cause discharges that may effect waters of the state and beneficial uses, the Regional Water Board would defer to CDF's enforcement of the Forest Practive Rules and would not take duplicative action. If, however, after full compliance with Forest Practice Rules, the

activities sill cause or threaten to cause a violation of the Basin Plan prohibitions, the Regional Water Board would have authority to take further action, including a request for a technical report under Section 13267(b).

The Forest Practice Rules describe management practices for water quality protection. The Rules have been submitted to but not yet approved as best management practices (BMPs) by the U.S. Environmental Protection Agency. Even if the Rules are approved as BMPs, the Rules are not considered to be the water quality standards. The water quality standards are established in the Water Code and the Basin Plan. Adherence to the Rules does not automatically ensure that the applicable water quality standards are being met. See Northwest Indian Cemetery Protective Association v. Peterson, 795 F.2d 688 (9th Cir. 1986).

If activities of the discharger cause or threaten to cause a discharge to waters of the state on lands that are not subject to an active timber harvest plan, CDF has stated that it does not have jurisdiction to enforce its regulations. In such case, the Regional Water Board staff would take appropriate enforcement action, after coordinating with CDF and other appropriate agencies, as specified in the Water Code and Basin Plan, including the issuance of Section 13267(b) requests.

State of California The Resources Agency

M E M O R A N D U M

To: Tom Osipowich
Resource Manager

Date : May 26, 1993
Ref. : IMD 5-26
THP 1-92-442

From: Department of Forestry and Fire Protection
Region I

Subject: Field Review, Salmon Creek, for Water Quality Concerns

On May 18, 1993, I attended a field review of portions of the Salmon Creek watershed to evaluate watershed concerns. This was a follow-up trip to our March 18 filed review, as observations during the earlier trip were impeded due to turbidity resulting from recent rains. Also in attendance were R. Ballard, J. Ambrose, and M. Van Vlett (Georgia Pacific); R. Macedo (Fish & Game); A. Baker, Elmer Dudik, and B. Klampt (Reg. Water Quality Control Board).

During the field review, the water was clear. We revisited the same areas as during the first review, and additional areas. The attached map shows the approximate locations of the field review, with reference locations indicated. We first visited the lower reaches of Hazel Creek, then the lower reaches of Donnelly Creek, and then a reach on Salmon Creek between the Donnelly Gulch/ Hazel Creek confluence and Ketty Gulch. We then drove downstream to where downed trees blocked the road, walked along the road to downstream of the quarry, and walked upstream back up to Ketty Gulch. Finally, we drove to the forks of Hazel Creek and walked up the east fork almost to the road crossing. Andy Baker and Elmer Dudik, continued further up the east branch a short distance.

Observations from each location include:

Lower Hazel Creek -- Stable banks, substrate of channel fine with particles up to ≈ 0.8 cm diameter. In-channel depth of sediments measure with a metal probe up to ± 1 meter. In longitudinal profile, the channel was poorly formed and somewhat shoot-like; pools were usually less than 25 cm residual depth. One pool was found to be deeper and was associated with a recently fallen hardwood. Despite the probe frequently hitting imbedded woody material (as per Klampt), large-woody-debris visible at the channel surface or along the banks was nonexistent. Evidence of recent (± 5 year) jam removal was apparent.

Donnelly Creek -- The characteristics of Donnelly Creek clearly differed between the reach upstream and downstream of a small tributary from the north. In both reaches, the stream

banks were stable, and in-channel large woody debris was almost non-existent.

In the lower reach of Donnelly Creek, substrate in-channel cycled in roughly equal proportion between areas with A) unembedded large gravels / small cobbles up to ± 7.7 cm diameter, and B) sand / medium gravel up to ± 1¼ cm diameter. Cobbles up to the maximum size observed in the low-water channel were found recently deposited about ¼ m above the present water surface on top of herbaceous vegetation, evidence that the winter's peak flows had substantial power. As in lower Hazel Creek, in longitudinal section the channel of the lower reach was poorly formed with residual pools being shallow and not substantially differentiated from the run/riffle areas. Only one pool was noted greater than ± 30 cm residual depth, and it was associated with an in-channel log. The stream flowed in a nearly straight, shoot-like channel. In the lower reach, the sediment accumulation as determined with the metal probe generally ranged from 10 to 45 cm, although the margin of one pool had sediment depths greater than 150 cm. Recent deposits of 2-3 cm of sand were noted a few locations along the channel's margins in areas that would have been backwaters or eddies during the recent high flows. Near the upstream limit of the lower reach, clay "bedrock" and sandstone bedrock became a component of the channel bottom.

In the upper reach of Donnelly Creek, the stream was relatively better developed both in longitudinal section and aerially. Instead of being nearly straight, the channel exhibited sinuosity. Associated with that condition was a better developed pool - riffle condition. Gravels were much like they were in the downstream section in terms of size distribution and embeddedness. Large in-channel logs were absent in this area also, but the stream meandered around root systems of snags and trees.

"Middle" Salmon Creek -- Only a short section in the middle reach of Salmon Creek was walked. Particles in the channel were very angular and measured up to ± 20 cm. Bedrock spanned the channel bottom in places. Blow-down of WLPZ trees had opened the canopy along the south side of the channel. At one location, a gully with evidence of recent down-cutting resulted from a waterbar on the road discharging runoff from both the road and an upslope skid trail into the WLPZ. About a 1.5 m x 4 m area appeared to be down-cut by the discharge during this winter / spring's storms, judging by the freshness of the exposed soil.

"Lower" Salmon Creek -- Channel conditions varied along the lower reach. Stream banks appeared to be very stable as raw soil was observed at only two locations -- one was associated with a downed hardwood and the other with a small (3m x 2m) slump. The slump was vegetated on its channel face. Generally, pool / riffle sequences were fairly well developed. However, depth of the pools was strongly related to the presence of large woody debris (which was generally sparse) or other in-channel obstructions (boulders). The boulders seemed to produce less depth variation than woody debris. One large log-jam was observed, but it was not a barrier in its present condition (floating, and loosely enmeshed). Many of the pools in the lower gradient areas were of uniform depth, and somewhat shallow (≈ 30 cm). Fair recruitment of logs was imminent in a stretch of stream adjacent to a recent clearcut in which the WLPZ suffered substantial wind-throw. Through one stretch in the vicinity of the two drainage from the north, the channel was characterized by cobble - boulder. Bedrock comprised a large portion of the channel, especially where the stream flowed adjacent to the clearcut.

Upper Hazel Gulch -- Gravels, where deposited, were up to 5 cm diameter and moderately imbedded in fines. Stream banks were relatively less well vegetated than the downstream reaches observed and raw soil faces were present. However, mass wasting from the banks was not evident. The channel gradient through this reach was greater than the other reaches observed, with bedrock falls and deep scour holes common. Woody debris in-channel was again nearly non-existent, and stream clearing was evident. The group split as the flats were approached. Andy Baker and Elmer Dudik, walked upstream along the east fork farther than the remainder of the group and, upon reuniting, reported that they had observed unstable banks in that reach.

Salmonids were observed by someone in the group in all reaches walked. In addition, Pacific Giant Salamanders and Rough-skinned newts, as well as caddis- and dragon-fly nymphs were common. R. Klampt and R. Macedo took temperature readings at several locations and these should be available in their reports. The timing of our field review was too early in the season for temperature records to be of value in terms of evaluating the thermal suitability of the stream, or how timber harvest has affected that suitability.

As I suggested in my first review summary, to fully ascertain the condition of the watercourse relative to sediment carrying capacity is difficult -- especially trends. While I am not a hydrologist nor a geologist, my interpretation as a biologist of

the current stream's condition follows. Bedrock is currently controlling the base level of the stream along the reaches we reviewed. Some of the low gradient areas appear to have aggraded substantial sediments in the past, probably both through natural stream channel dynamics and human's land uses (timber, livestock, and agriculture). Flows (especially recent flows) appear to have had adequate power to transport particles up to at least 7.5 cm diameter via saltation, not simply bedload. However, there does appear to be substantial transport of fine materials as evidenced by sand accumulations in backwater locales. The poor pool / riffle formation observed in most of the low-gradient reaches is probably due to filling of pools by sediment. Bedrock controls will constrain the ability of the hydrology to re-establish the pools. The source of the sediment load was not directly observed during the field review (except an area reported by Andy Baker upstream on Hazel Gulch), although in-channel storage is strongly suggested based on my observations of stable banks, poor pool formation, and the depth of deposits as measured by the metal probe. Additionally, the inability of pools to form through purely hydrological forces (vertical and horizonal "meandering") may be due to the sediment load still being in a state of flux from destabilized storage resulting from channel-clearing activity. The straight stretches in which the stream's appearance is flume-like may be the result of earlier in-channel equipment operations (eg., logging operations or jam removal), or they may be naturally straight. Because of the apparently heavy sediment-load which I believe moves through the system, better development of pools and riffles in the more alluvial portions of the stream is likely to be a slow process. Still, as I stated in my earlier memo, the sediment load appears not to be so great as to cause bank instability. I would expect bank instability if the sediment carrying capacity of the stream were significantly exceeded.

The amount of large woody debris in the stream reaches which we observed was deficient, with the exception of the stretch adjacent to the one clear-cut. Evidence of jam removal was observed. The absence of large logs in the channels is likely to be a cause of the high active sediment load and the poor development of deeper pools (in addition to other functions of logs in streams). I believe that the removal of logs in Salmon Creek in the past has been excessive and future removal should not proceed without very close scrutiny of both its justification and implementation. Indeed, during the field review, the need to add structure was discussed. New LWD would be especially useful in areas where there is currently poor development of pools. By converting some of the horizontal energy of the stream into verticle energy, deeper pools can be scoured and sediments will be sorted. WLPZ trees which have fallen should not be salvaged in order that they may become incorporated into the stream's

dynamics. Future harvesting in the drainage should retain substantial WLPZ's, with emphasis on retaining all trees, including redwood, leaning toward the stream. Further, the WLPZs of future plans in the drainage should be closely evaluated for shade retention, given the high wind-throw rate observed and the potential for cumulative water temperature effects.

LLOYD I. KEEFER
Chief, Region I

By: Bradley E. Valentine
Regional Biologist

cc: Ballard (GP)
✓Baker (WQ)
Klampt (WQ)
Macedo (DFG)

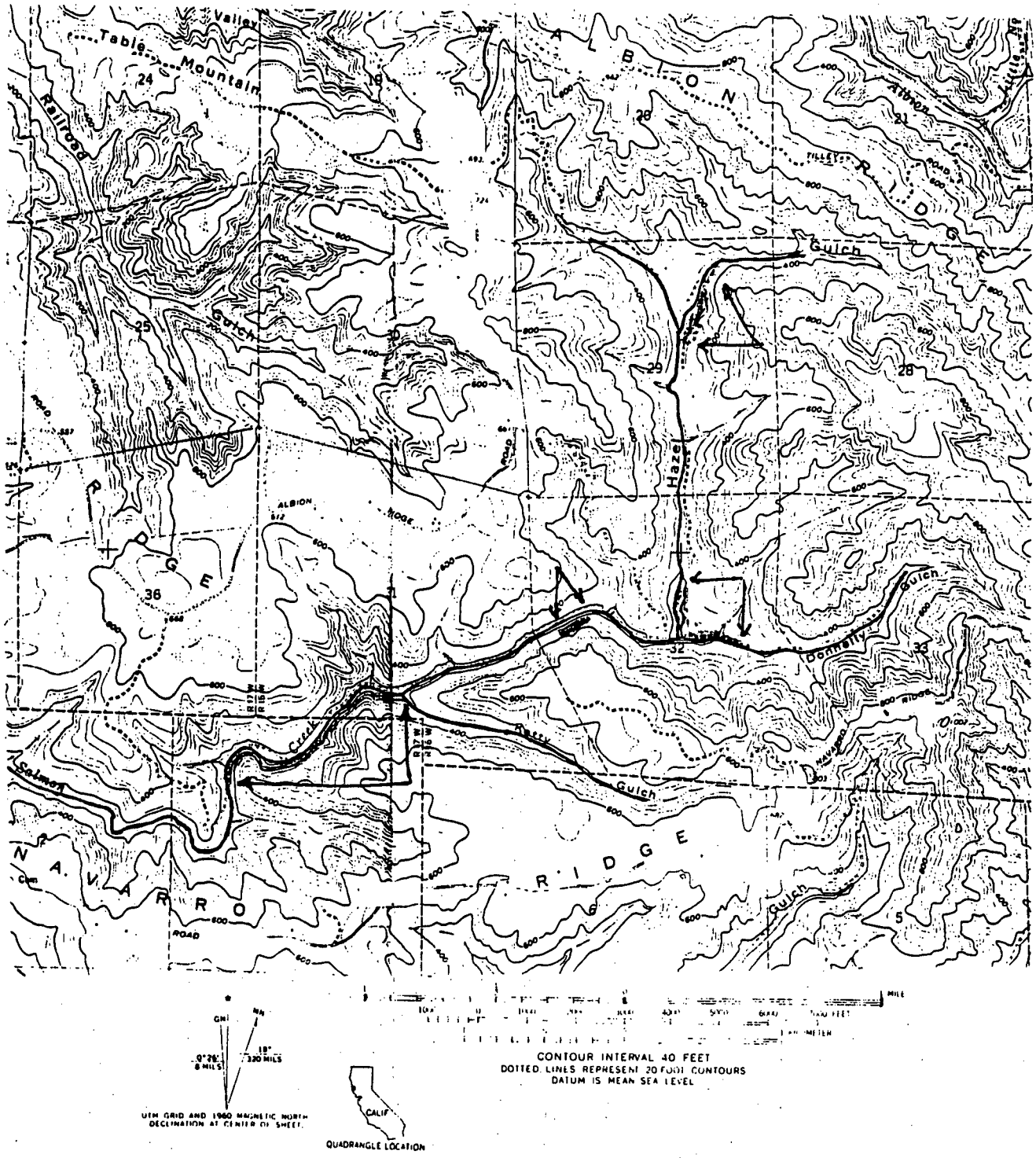


Fig. 1. Map of Big Salmon Creek showing the reaches field reviewed on May 18, 1993.