Coastal Forestlands Ltd.

Attn: Art Haschak
From: Charlotte Morrison
Matthew Reischman
RE: Instream Assessment Results for Signal Creek
Date: May 28, 1997

Per your request, we have enclosed a summary of the Signal Creek instream assessment results for your Cooper timber harvest plan. We have also supplied an instream assessment report which describes, in detail, data collection and assessment protocols.

Please feel free to contact us if you have questions or require more specific information.

Thank you,

Charlotte Morrison
Wildlife Biologist

Matthew Reischman
CFL Biologist

cc: Bob Whitney
Thomas Payne

INSTREAM HABITAT ASSESSMENT

for

Coastal Forestlands. Ltd.

Charlotte Morrison * Wildlife Biologist
Summer 1997

Abstract

Sampling of instream sediments, temperatures and fish populations was initiated in 1994 for watersheds located within Coastal Forestlands, Ltd. (CFL) ownership. Although this project was designed to address immediate concerns raised under timber harvest plans, this information can be contributive in CFL's efforts to establish a comprehensive trend monitoring program of water quality parameters.

INTRODUCTION

The landscape of CFL is managed for timber production and encompasses many headwater areas of the Garcia River, Big River and Gualala River watersheds. These watersheds have historically provided spawning and rearing habitats for anadromous fish. The 1994 instream assessment for CFL was initiated as a result of the impending listing of the Coho Salmon and the paucity of scientifically documented information on the instream conditions of CFL's watercourses.

The listing process of the Coho Salmon *(Oncorhynchus kisutch)* and Steelhead *(Oncorhynchus mykiss)* under the Federal Endangered Species Act has magnified the importance of instream monitoring relative to the timber harvest plan review process across the north coast of California. Instream temperature, particle-size distribution of spawning gravels (sediment), large woody debris, nutrient input and waterflow are five critical instream habitat factors influencing Salmonid occurrence, distribution and abundance across north coast watersheds. Subsequently, instream monitoring has been locally tailored to address those critical freshwater habitat requisites for Salmonid spawning and rearing adversely affected by land management activities (FFFC 1996).

An important component in monitoring is the collection of scientifically defensible information. Instream monitoring across the north coast has been guided, in part, by protocols described and adopted by the Fish, Farm and Forest Communities Forum (FFFC), California Department of Forestry (CDF); California Department of Fish and Game (CDF&G), Environmental Protection Agency (EPA) and the American Fisheries Society. Parameters selected for assessment are usually those most important to fish and most sensitive to local disturbances (EPA 1991).

Instream assessment goals were to assess baseline conditions of CFL's freshwater habitats and gain some general knowledge of aquatic vertebrate presence and distribution across the ownership. Although the instream habitat assessment was initiated to address immediate concerns under the cumulative effects and biological analyses in timber harvest plans (THP), these assessment data can be dove-tailed into a comprehensive trend monitoring program of water quality parameters (EPA 1991) for CFL. More critically, a system of prioritization can be established from the baseline instream assessment data guiding restoration to stream reaches where those efforts can have the greatest benefit to fish.

INSTREAM HABITAT ASSESSMENT

The most critical instream conditions sensitive to land management are instream temperatures, spawning gravels, pool abundance, stream flow and nutrient input (EPA 1991; CDF&G 1994). Locally, historical land use practices adversely affected critical instream habitat factors such as instream temperature, spawning gravels and large woody debris abundance. Resultingly, the condition and availability of Salmonid spawning and rearing habitats was substantially compromised. To address these concerns, an instream assessment was initiated for CFL for the Garcia watershed in 1994 and expanded ownership-wide in 1995. Assessment data includes summer instream thermal regimes (temperature), particle-size distribution of potential spawning gravels and aquatic vertebrate distributions. To insure data reliability and consistency, protocols for data collection and analysis were commensurate with those protocols adopted by the FFFC, CDF, CDF&G, EPA and American Fisheries Society. Field forms were created to accommodate site-specific information collected during field visits.

Within a stream there are, or potentially can be, a number of reaches or channel types (Rosgen 1994; Montgomery and Buffington 1993). These reaches are influenced by a number of abiotic factors including stream gradient, sinuosity and biogeomorphic features. Each stream reach is distinctly relative to its functional use for aquatic vertebrates; consequently, analysis should account for these differences. Transport reaches, spawning sites, over-summer and over-winter habitats should be analyzed within the context of each species' life histories. Ideally, site selection for sampling stations, under standard protocols (e.g. Flosi and Reynolds 1994), is based on locating a representational reach within the drainage. Identifying representational stream reaches is accomplished by "habitat typing" the entire drainage, or a subset of it. However, habitat typing is expensive and time-consuming and was subsequently not a criteria for site selection. Site selection was based on horizontal and vertical distribution, stream gradient, adjacency to confluences, historical data and logistic constraints. The magnitude of the sampling scheme was increased in 1995 to compensate for the lack of stream reach information. Furthermore, many instream habitat assessment sampling sites overlay the channel assessment stations used for the aquatic wildlife, hydrologic and riparian functions' analysis for CFL's watershed assessment.

Results of the instream habitat assessment can provide site-specific information but may not reflect representative conditions of each reach or watershed. These data, however, when compared over time to future efforts, can provide valuable information on trends. Until then, broad-based conclusions cannot be made.

The following summarizes this investigator's instream assessments accomplished for CFL since 1994:

Instream Temperature Sampling

Water temperature is an easily measured parameter that has considerable chemical and biological significance (EPA 1991). Instream temperature measurements quantify thermal suitability of a stream for fish (EPA 1991) and can dictate Salmonid migration; spawning; egg incubation and maturation success; juvenile development; inter- and intraspecific competitive ability; and resistance to parasites, diseases, and pollutants (Armour 1991). In Mendocino and Sonoma counties, summer is a critical time for juvenile Salmonids. Summer low flows can isolate fish in small pools limiting their ability to move upstream or downstream when instream thermal regimes reach stressful or lethal temperatures. Although juvenile Salmonids have been known to survive in streams with temperatures of 22 - 25 degrees Celsius for short periods of time (CDF&G 1994), preferred stream temperatures for juvenile Salmonids in rearing habitats are between 10-15 degrees Celsius (EPA 1991).

Methods and Results

Stream temperature assessment was initiated for the Garcia River in 1994 and expanded ownership wide in subsequent years. Twenty-six instream temperature sampling locations (Hobo-Temp® stations) exist across the ownership. Hobo-Temps® are instream temperature recording devices (thermographs) used to record the thermal regime of a given stream reach for a given period of time. In Mendocino and Sonoma counties, streams reach their lowest flows and highest temperatures from mid- to late summer, the time of greatest solar incidence and ambient air temperature. The low summer flows coupled with the high instream temperatures tend to concentrate juvenile fish in pools. Subsequently, the sampling effort for CFL was conducted to identify thermal regimes of these refugia areas used by juvenile Salmonids during the summer low flow period (June - September).

Hobo-Temps® were set to record temperatures at a time interval of 2.4 hours, placed into waterproof cases and anchored in streams across CFL. The interval setting of 2.4 hours has been shown to ensure representation of thermal peaks throughout the critical summer period (Jon Ambrose, Georgia-Pacific Biologist, pers. comm. 1994). Instream and riparian measurements were taken at all Hobo-Temp® locations. Results are graphed in degrees Celsius and Fahrenheit.

Once a complete image of the instream environment is captured, inferences were made regarding thermal loading and instream habitat quality for juvenile Salmonids. According to Reeves *et al.* (1989), minimum summer water temperatures exceeding 20 degrees Celsius for 2 weeks or more during summer low flow creates a less favorable environment for juvenile Coho Salmon. The temperature threshold of 20 degrees Celsius can be used as a guideline to identify between stream reaches in need of riparian management and those suitable to support juvenile Coho Salmon.

It is important to note that a variety of interactive factors strongly dictate local thermal regimes and should always be considered when evaluating stream temperatures. In general, these factors are: topographic location, channel morphology, ambient climate, channel slope, rate of flow, type and density of riparian vegetation and water surface area exposed to solar radiation.

Particle-size Distribution of Streambed Gravels

Anadromous fish exhume pits ("redds") at the pool/riffle juncture of spawning streams, deposit their eggs and cover them with upstream substrate. Salmonid eggs incubate approximately 2-4 months in the redd depending on water temperature and sedimentation levels. Once the eggs hatch, the young fry (alevins) maneuver through the gravels to reach the water column.

High levels of fine instream sediment can: 1) reduce spawning success of Salmonids; 2) reduce intergravel flow through the redd, restricting oxygenated water from reaching the incubating eggs, thus resulting in low egg survivorship and 3) create an impermeable layer within redds, preventing emerging fry from reaching the waters' surface. Subsequently, streambed gravels are often evaluated to estimate potential spawning success and egg-to-fry survival-to-emergence (Platts *et al.* 1983).

Methods and Results

A widely recognized method of sampling streambed gravels is McNeil Sampling (McNeil and Ahnell 1964). Although biases are inherent with the McNeil method, it is the most economical method available to obtain estimates of channel substrate particle-size distributions (Platts *et al.* 1983). The McNeil method is useful in assessing the suitability of the substrate as spawning gravel (EPA 1991), and of all the current instream metrics (V*, Q*, RASI, etc...) provide the best biological link between instream gravel composition, Salmonid spawning and fry survivorship (Dr. Bill Trush, Humboldt State University, pers. comm. 1994).

Sediment sampling was initiated in the Garcia watershed in 1994 and expanded ownership wide in subsequent years. Eleven instream sediment sampling sites have been established across the ownership. Stream substrate was collected using a McNeil sediment sampler (McNeil and Ahnell 1964) with a core measuring 15.5 centimeter in diameter, 13.5 centimeter in length and capable of holding 2547.3 cubic centimeters of material.

At each sampling station a total of eight substrate cores were extracted: four substrate cores from two potential spawning riffles. Samples were processed and analyzed according to guidelines provided by Valentine (1993), the *Timber-Fish-Wildlife Ambient Monitoring Program Manual* (1994) and the *Aquatic Field Protocols* adopted by the FFFC (1996). Instream substrate samples were collected during summer low flows (late summer and early fall). Earlier collections may cause unnecessary mortality of fry emergents while later collection can bias information due to high-flow problems.

Core substrate samples were processed using standard sieves with a mesh diameter of 31.5 mm, 16.0 mm, 8.0 mm, 4.0 mm, 2.0 mm, 1.0 mm and 0.85 mm according to Shirazi et al. (1981). The remaining substrate, representing the finest material in the stream (< 0.85 mm), is measured in Imhoff cones and allowed to settle for 10 minutes. Processing occurred *in-situ* and samples were wet-sieved (volumetric method) rather than dry-sieved (gravimetric method) due to time, equipment and economic constraints. Under the volumetric method, water is increasingly retained with decreasing sieve size allowing for greater volumetric displacement of smaller sediments. Correction factors (Shirazi and Seim 1979) will account for this type error but they frequently are not used nor were they suggested by Valentine (1993). Data was transcribed onto sediment sampling forms.

Since no single statistic can serve as an effective indicator of gravel quality (Kondolf and Wolman 1993; Young et al. 1991; Chapman 1988; Platts *et al.* 1983; Beschta 1982), results are expressed in three forms: 1) Percent finer, 2) Geometric Mean Diameter and 3) Fredle Index. Percent finer is presented in graph form and represents the percent of substrate collected within a particular sieve size, quantified by volume. Geometric Mean Diameter and Fredle Index are used to describe potential suitability and composition of spawning gravels. According to Platts *et al.* (1983) methods of calculating a quality index for stream sediments (Fredle Index) allow biologists and land managers to identify the quality of gravel used for reproduction by anadromous salmonids. This technique is especially useful for measuring changes in gravel quality (within and between streams) and temporal changes in texture and permeability resulting from sedimentation from nonpoint sources in managed forest watersheds (Platts *et al.* 1983).

The management threshold of 20% fines < 0.8 millimeters endorsed by the American Fisheries Society (Waters 1995) or < 0.85 millimeters endorsed by FFFC (1996), CDF (Valentine 1993) and the Forest Service (Lisle and Eads 1991) are the most widely accepted methods of evaluating instream substrate suitability. Instream sediments are therefore considered limiting to Salmonids if data from sediment sampling indicates fines are exceeding 20% < 0.85 millimeters.

Fish Presence

Historic fluctuations of Salmonid populations and the continuing decline of Coho Salmon across the north coast has culminated into a federal "Threatened" listing of the Central California Coast Coho Salmon (Federal Register 1996). According to the National Marine Fisheries Service (NMFS), every coastal stream can potentially support Coho Salmon (Federal Register 1996). Furthermore, since Steelhead are now proposed for listing under the Endangered Species Act, any information regarding presence or absence of Salmonids along the north coast will be used as a barometer offish recovery.

Little scientifically documented fish information exists for CFL's streams; subsequently, aquatic vertebrate sampling was initiated in 1994 to identify current fish presence and distribution across the ownership. Aquatic vertebrate sampling can demonstrate habitat utilization of Salmonids during their juvenile life history stage at freshwater sites and provide valuable information on fish distribution throughout CFL's ownership. Most importantly, a general knowledge of Salmonid abundance can help refine monitoring and enhancement projects by defining areas where these efforts will have their greatest net benefit. Although sampling for presence and/or absence of fish is not a useful monitoring technique unless it is known that the fish used the stream in the past, the data collected since 1994 can serve as a baseline condition for future efforts. Fish sampling information will be essential to demonstrate to NMFS the response of fish to restoration and enhancement work.

Methods and Results

The utilization of a backpack Electroshocker is a widely recognized method of estimating aquatic vertebrate abundance, distribution and species composition. The multiple-pass depletion method was accomplished for all fish sampling stations. Stations are delineated by habitat breaks (i.e. pool/riffle, glide/riffle, pool/glide, etc.) and are a minimum of 30 meters in length. Aquatic vertebrate sampling was conducted under a cooperative effort between CFL representatives, CDF&G representatives (Wendell Jones, Fisheries Biologist and Theodore Wooster, Environmental Specialist IV) and the CDF wildlife biologist, Brad Valentine. Captures were usually weighed and measured (using fork length for fish and snout-vent length for amphibians) before being returned to the stream (Gutreuter and Krzoska 1994). Field information noted during surveys included: date, time, canopy closure, station dimensions, substrate quality, air and water temperatures. Approximately ten fish sampling stations are located across the ownership although some opportunistic sampling has also been accomplished for some stream reaches. Results are usually analyzed by CDF&G.

DATA MANAGEMENT

Documents and database files form the repository of the instream assessment data. Data is located at the CFL office in Willits. Stream temperature and McNeil sampling results are entered into a spreadsheet software program and graphed. Fish sampling data is analyzed by CDF&G fisheries biologist, Wendell Jones and CFL biologists. Mr. Wendell Jones provides graphs of Salmonid length to weight relationships and presents analyzed results as standing crop population estimates, standing crop biomass and fish/m^2.

Charlotte Ann Morrison
Wildlife Biologist

Charlotte Morrison — May 28, 1997

Signature Date

cc: Bob Whitney
Thomas Payne

Signal Creek. Mainstem Garcia

Sampling of instream sediments, temperatures and fish populations in Signal Creek was initiated in 1994. A comprehensive discussion of data collection, assessment, management and application protocols is attached (Morrison 1997). Results of instream sampling are summarized below[1]:

Instream Temperatures

1996 - (7/16/96 - 10/27/96)

Average: 13.2; Maximum Temperature: 16.7; Minimum Temperature: 8.4

1995 -(5/31/95 - 10/19/95)

Average: 15.1; Maximum Temperature: 19.4; Minimum Temperature: 10.5

1994 -(9/3/94 -11/9/94)

Average: 12.4; Maximum Temperature: 17.2; Minimum Temperature: 7.5

Instream Sediments (Expressed in Percent Finer)

1996 - 11.3 < 0.85 mm

1995 - 13.3 < 0.85 mm

1994 - 11.1< 0.85 mm

Fish Presence

1996 - Steelhead Trout juveniles

1995 - Steelhead Trout juveniles

1994 - Coho Salmon and Steelhead Trout juveniles

Instream data was reviewed and compiled by:

Charlotte Morrison — 5 · 28 · 97

Signature **Date**

5-28-97

Signature **Date**

cc: Bob Whitney
Thomas Payne

[1] **Field forms and graphical representations of data results can be supplied upon request.**