Coos Bay Lowland Assessment and Restoration Plan

Chapter 2

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Components Assessed

This assessment is based on scientific data gathered in the field, and background information researched which represents a selection of watershed processes and land management characteristics. This chapter describes the relationship between watershed processes and the components studied.

Land Use

Understanding land use and ownership help to characterize general land management issues and objectives. Land use activities influence the landscape by changing the timing and intensity of natural processes. Residential development, agricultural practices and forest management activities have the potential to significantly change the drainage patterns of water by increasing the amount of impervious surfaces. These issues are farther described in Hydrology, below.

Hydrology

Hydrologic data were used to study major factors within the sub-basin that have an effect on the local water cycle. These factors included precipitation, stream flow, land use and water use. They were used to develop a rating of the risks to altering stream flow. In addition to OWEB WAM hydrology assessment results, we also looked at the Oregon Water Resources Department's water availability and water use allocations within the lowlands.

In 1996, the Oregon Plan for Salmon and Watersheds outlined the Coastal Salmon Restoration Initiative which called for the development of Stream Flow Restoration Priority Areas in which ODFW and OWRD were to assess all Water Availability Basins (WABs) in Oregon based on stream flow and consumptive use issues. Prioritization was based on a combination of biological factors and consumptive water use. ODFW identified areas where flow enhancement was needed to support fish populations. OWRD identified areas where opportunity existed to enhance flow based on consumptive water use, or water right permits.

Aquatic Habitat

Aquatic habitat conditions arise from the interactions between landform and land use. The CoosWA performed aquatic habitat surveys to characterize the status of in-stream salmon habitat features. Distribution and abundance of salmonids within a watershed or sub-basin varies with habitat conditions. Due to the complex life histories of salmon, different features and areas of the stream system are used during different parts of their life cycle. Understanding key aquatic habitat components and their trends is a key step in achieving and maintaining suitable conditions.

Aquatic habitat survey data were used to qualify and quantify current stream conditions. CoosWA surveys were the sole source of information for the aquatic habitat analysis except where otherwise noted. Survey data were compared to ODFW salmonid habitat benchmarks, (more on benchmarks in Appendix A), and resulting analysis will be used to direct and focus habitat restoration efforts. The aquatic habitat survey parameters used in this assessment include unit type, substrate type, pool depth, riffle sediment, large wood, and bank stability (in this assessment bank stability data are presented in the Sediment Sources sections). Channel morphology data were also collected as part of the CoosWA aquatic habitat surveys - see Appendix B.

Aquatic habitat survey areas were split into reaches within each sub-basin and assigned a name. A map of aquatic habitat study reaches is presented for each sub-basin. CoosWA attempted to avoid displaying the data in a way that will make it useable for regulatory purposes by conglomerating data into reaches based on valley and channel form.

Wetlands

Assessment of wetland conditions helps to characterize contributing influences to issues associated with stream-floodplain interaction. Historic estuarine and other hydric soils, along with historic vegetation communities, indicate the extent and nature of pre-settlement wetlands and inland extent of tidal influence. A rough assessment of current wetland conditions provides insight to potential restoration areas. Strategic wetland restoration could help to improve nearby pasture drainage and productivity, while improving water quality and fish habitat.

Sediment Sources

Fine sediment, beyond natural background levels, is detrimental to fish and their habitat in many ways. When substantial erosion occurs spawning gravels become embedded often causing high rates of egg mortality. More than 10-15% fine sediment (silt/organics) reduces the flow of oxygenated water to the eggs (FRS, 2003). In the case of adult salmon, high concentrations of suspended sediment may delay or divert spawning runs (Mortensen et al. 1976). Additionally, as pools collect sediment, depth decreases and solar heating occurs more rapidly. Healthy pool depths provide important thermal, as well as predatory, refuge for salmonids. Aggradation, or raising of the streambed, can influence flow levels, flooding and erosion.

The Sediment Sources component of this assessment evaluated the following four sources of sediment: 1) Bank stability (see aquatic habitat survey methods), in which the percentage of stream bank in each surveyed reach was determined as a being either covered or uncovered, and stable or unstable. 2) Slope stability, in which each sub-basin was evaluated for % of area at risk of slope failure in four risk categories from low to extremely high. 3) Road and landing surveys, in which roads and road drainage features were examined for erosion potential and compared to ODF Best Management Practices. 4) Stream crossing capacity evaluation, in which stream crossing sites were rated for their flow capacity compared to a 50-year event and their risk of failure. Sediment deposition within the stream channel was also reflected in the aquatic habitat analysis.

Slope Stability

Unstable slopes often lead to shallow slope landslides and deep seated soil creeps. It is important to note that landslides are a natural process that is important to streams by recruiting gravel, boulders, and large woody debris in to the stream channel. However, acceleration of this process by human activities can have serious impacts to the aquatic ecosystem. Slope, vegetation, and geology all have direct relationships to the slope stability of an area.

Presence of mature vegetation is important component of stable slopes. "There is some evidence that the removal of trees on steep slopes (greater than 80%) makes an area vulnerable to shallow landslides and can lead to temporary acceleration of the landslide rate. This vulnerability begins when many of the finer roots of the harvested trees become rotten(about 4 years) and ends once the replacement stand has developed a dense root network (about 30 years for wet portions of the state)" (OWEB, 1999). Many of the upland slopes in the Lowlands area are commercial forests on short harvest rotations, most are harvested in 30 or 40 year rotations. Because of this, there may be chronic slope problems from this type of land management. Adhering to Best Management Practices during forest harvesting is important to minimize loss of soil on unstable steep slopes.

Road and Landing Survey

Hydrologic connectivity occurs when road drainage is discharged directly into channels via culvert outflow or drainage ditch relief near stream channels (assumed to be within 100 feet). Either one of these conditions will potentially increase sediment transport volumes and flood stage elevations downstream.

Road surveys were conducted on the lowland tributaries for three primary purposes: (1) to identify fish passage impediments at road stream crossings, (2) to determine the degree of road failure risk, and (3) to identify locations where hydrologic connectivity of road drainage ditches to live stream networks could be altered to filter road sediment before it reaches the stream.

Stream Temperature

Water temperature is commonly used as an indicator of stream health for many reasons. According to the Oregon Department of Environmental Quality, "the purpose of the temperature standard is to protect the beneficial uses of the waters of [Oregon] and to preserve the health of aquatic ecosystems." (Boyd and Sturdevant 1997) Water temperature affects many aspects of stream health, including dissolved oxygen, productivity, algae and bacteria levels, as well as the physiology and metabolic rates of aquatic organisms.

The stream temperature standard of 64°F (17.8°C) was identified as the maximum acceptable level for general salmon and trout use. The goal of the standard is to maximize the time that cold-water rearing habitat is available for juvenile salmonids and to minimize the warm water stress that can occur when these cold-water fish are exposed to elevated temperatures. This standard for water temperature is not an indicator of the highest levels fish can tolerate, since salmonids commonly live in streams that exceed 64°F. However, physiological and behavioral changes often occur in fish when temperatures approach 70°F. Temperatures above 77°F alone can be directly lethal to fish, but temperatures lower than these also affect their metabolic rates and their ability to reproduce and fight off disease (Oregon DEQ, 2000).

The 7-day maximum is a good method to determine the response of fish to high water temperatures. Water temperature has a cumulative effect on fish health similar to a toxin -- the longer fish are exposed to high temperatures, the lower their chances of survival. Fish can likely endure one day of 75°F water by eating more or moving into cooler areas, but an extended period (multiple days to weeks, depending on the fish) at water temperatures in the mid-70°F or above will cause death due to breakdown of physiological regulation of vital processes (Roberts, 1973; Heath and Hughes, 1973).

There are many factors affecting stream temperatures, both human-caused and naturally-occurring. Human-caused affects can be addressed through restoration actions, and therefore, are discussed here in detail. Water withdrawals reduce in-stream flow and velocity, and both provide more opportunity for solar radiation to increase water temperatures (Oregon DEQ 2000). Tide gates and dams both act as obstructions to the normal flow of a stream, affecting its ability to mix and flow and can strongly affect stream temperature. Because tide gates cause freshwater stagnation and restrict tidal inflow, they tend to increase upstream water temperatures (Giannico and Souder, 2005).

Channel engineering, including straightening, dredging, diking, removal of large wood, rip-rap, and channelizing/culverting affects stream temperature in several ways. These actions decrease the interaction between a stream and its floodplain. It also reduces the ability for groundwater to move into the stream, decreasing the additions of beneficial cooling water. Such channelization increases down-cutting, which lowers the stream surface, again distancing the stream from the floodplain and draining ground water adjacent to the stream that could have a cooling influence. These practices also reduce stream complexity which can change the stream substrate. Large woody debris plays an important role in keeping gravel in streams. Wood removal can cause increased velocities and can wash gravel and cobble downstream leaving bedrock and boulders. Such channel changes can also increase levels of fine silts from erosion and sedimentation can vastly change the streams ability to dissipate heat energy. (Poole and Berman 2001)

Reduction of upland and riparian vegetation is one of the most influencing human-caused effects on stream temperature. Activities that decrease riparian vegetation and canopy cover have been shown to increase the water temperature of adjacent streams (Newton and Zwieniecki, 1996). By reducing the amount of shade on streams, the solar load to the stream is greatly increased. Of the many factors effecting stream temperature, direct solar loading is has the greatest influence on elevating temperatures above natural background levels (Adams and Sullivan, 1989).

Salmonid Distribution

Fish use extents are important to consider when evaluating conditions and planning restoration actions based on salmonid habitat requirements. This assessment includes maps of fish use gathered from Oregon Department of Forestry and the Oregon Department of Fish and Wildlife. These determinations will help inform habitat restoration designed to improve conditions for a specific fish species. The most abundant anadromous fish species in the Assessment area are coho salmon and cutthroat and steelhead trout. Typically, steelhead will utilize higher gradient stream habitat than coho. Above natural anadromous barriers, native cutthroat populations are common. The upper extent of these native cutthroat populations usually defines the end of fish use in these streams.

Limiting Factors Analysis

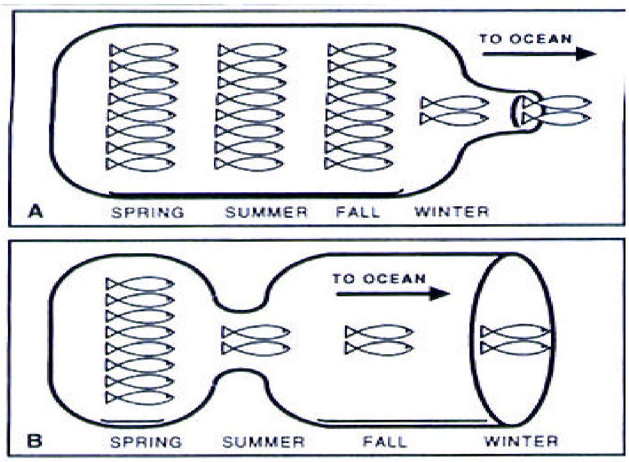

Figure I-3 Bottleneck Concept (Reeves et al., 1991)

Ecologists and resource managers have used different theoretical approaches to formulate management plans for watersheds and their fish populations. Some of the early conceptual frameworks include: Limiting Factors Analysis (Reeves et al. 1989, Nickelson 1992) and Watershed Analysis (FEMAT 1993). These were followed in the late 1990s by Ecosystem Diagnosis and Treatment (EDT) (Lestelle et al. 1996), and more recently by Ecosystem Management Decision Support (EMDS) (Reynolds 2002; Reynolds and Hessburg 2005).

This assessment will examine watershed health and determine "bottlenecks" to coho salmon production in the six lowland sub-basins using the Reeves et al. method of Limiting Factor Analysis. The premise of the limiting factors concept is that the upper limit to population size is determined by the habitat resource in least supply. If the amount or quality of that habitat is increased, the population can theoretically grow until constrained by the next most limiting habitat. This process provides carrying capacity estimations for spawning, summer and winter habitats based on aquatic habitat inventories and stream temperature data.

Figure I-3 shows the "bottleneck" to fish production where the limitation occurs (A) during winter before seaward migration of smolts, or (B) during the previous summer. Thus, improvements to habitat should be informed by the fish populations and the habitat carrying capacity of a stream based on specific seasonal needs of rearing fish.

Using a biological limiting factors analysis is useful in addressing the habitat needs of a specific species; however, the risk of this approach is that restoration planning would focus on treating the symptoms of watershed problems and not the natural processes that create ideal habitat. In determining limited habitat with this process, CoosWA has found that sediment issues, specifically spawning gravel embeddedness, do not come into play as well as they should. Also, there is little historical information available to evaluate the habitat that was available before modern land use impacts. Species specific limiting factors analysis can be useful in helping to prioritize restoration, but should be considered with other information about watershed health.

Input from Landowners

Local landowners were engaged primarily through a series of 'Coffee Klatch' meetings held in the Lowland area to inform landowners of the surveyed watershed conditions, collect input from landowners to be used in the Assessment as additional resource issues for restoration prioritization, and to enlist landowner participation in watershed restoration efforts. It is understood that implementation of restoration projects is dependant upon the acceptance, understanding and will of landowners. This particular area of the Coos Watershed has a very high proportion of private landowners managing relatively small acreages, and so participation of the community will be essential to successful restoration.