Intrinsic Potential of Streams to Provide High Quality Rearing Habitat for Anadromous Salmonids: Assessment and Use in the Coastal Province of Oregon

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Introduction

This poster illustrates a topographically based approach to assess the intrinsic potential of streams to provide high-quality rearing habitat for salmonids. The Aquatic Component of the Coastal Landscape Analysis model (CLAMS) will calculate intrinsic potential to help managers prioritize streams throughout the Coastal Region of Oregon for restoration, protection, and development, high-intensity forestry. This approach will be applied to each stream in the CLAMS area, focusing on only coho salmon and steelhead in Sweet and Knowles Creek.

Intrinsic Potential

Intrinsic potential was determined from channel gradient, valley constraint, and mean annual discharge. Presumed species-specific relationships between these attributes and valued rearing habitat were developed from available literature and field observations. For each stream reach, known barriers, the intrinsic potential score was calculated as the geometric mean of three (Hovmoller and Warner, 1991) of the independent habitat values for channel gradient, valley constraint, and mean annual discharge.

Mean Annual Discharge

Mean annual discharge was calculated as a function of drainage area derived from 30-meter-resolution digital elevation models (DeCrey et al., 1997) and precipitation from RHIS (rainfall-hydrological information system) on independent digital models (Burnett et al., 1998), using the equation developed by Wijayasundera et al. (2002). The projected potential relationships between habitat quality and mean discharge reflect that coho salmon are thought to rear primarily in small to mid-size streams (Sandercock, 1991) of the interpreted habitat value for channel gradient, valley constraint, and mean annual discharge.

Channel Gradient

Channel gradient was determined from 30-meter DEMs generated at the 1-kilometer pixel size. Mean percent reach gradient was calculated as the modeled stream length and the estimated length of the channel but the minimum length was 500 m. Presumed species-specific relationships between habitat value and channel constraint reflect that densities of juvenile coho salmon tend to be higher in unconstrained than in constrained reaches (Hicks, 1989; Burnett, 2001) but that juvenile steelhead may avoid unconstrained reaches (Burnett, 2001). Channel gradient and valley constraint are the two most important predictors of juvenile coho salmon and those with gradients exceeding 10% were not used in juvenile coho salmon

Valley Constraint

Valley constraint was approximated from the 10m DEM as the length of a transect intersecting valley walls above the channel at a height of 10m. ACW was modeled from data collected by ODF&W and mean annual discharge. Presumed species-specific relationships between habitat value and channel constraint reflect that densities of juvenile coho salmon tend to be higher in unconstrained than in constrained reaches (Hicks, 1989; Burnett, 2001) but that juvenile steelhead may avoid unconstrained reaches (Burnett, 2001).

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Prioritizing 7th-Code Hydrologic Units

Each 7th-code HU will be prioritized according to intrinsic potential and management-related watershed condition index. Those with high intrinsic potential may be good candidates for protection when relatively unaffected by past management and for restoration when management influences have been greater. Conversely, 7th-code HUs with low intrinsic potential and high management may be good candidates for future initiatives. For all other 7th-code HUs, evaluation of the ecological and spatial context may be essential in determining management priorities.

Conclusion

The methods described here can be used to identify those landscape units where the intrinsic potential of streams to provide high-quality rearing habitat for salmonids is greatest. By combining additional information on land ownership, access, and current land management practices, this information can be used to prioritize efforts to support fish populations. Further research and development are needed to develop techniques for assessing the cumulative effects of land use and management practices on the intrinsic potential of streams to provide high-quality rearing habitat for salmonids.