

Lewis River Case Study Final Report

A decision-support tool for assessing watershed-scale habitat
recovery strategies for ESA-listed salmonids

Appendix H: Riparian Function Model

May 2007

Riparian Function Model

The assessment of historical conditions and field verification of vegetation showed that deciduous trees, particularly Black Cottonwood, were the dominant tree species in the lower Lewis River watershed. Red alder, cottonwood, and big leaf maple are important riparian species in the upper watershed as well (Appendix B). Thus, we include effects of deciduous tree cover in our models of riparian function. We have three sub-models to describe riparian function: shade, recruitment of pool-forming conifers, and wood recruitment. Each submodel considers both coniferous and deciduous tree cover (i.e., tree crown cover) and conifer size (diameter at breast height, dbh). In each sub-model, we use bankfull width (Appendix G) to separate streams into small and large size categories; this division differs for each of the modeled riparian functions. For each submodel, we also identify naturally poor conditions separately from management-related poor conditions. Naturally poor conditions represent areas such as high altitudes or prairies where large trees are not expected to grow.

The shade submodel is modified from the Washington Forest Practices Watershed Board's Assessment Method (WFPB 2000). Our first approximation used the westside temperature equation for the entire watershed. However, based on recommendations given to us by the experts convened to develop the expert and landscape strategies, we learned that this model was not relevant to areas affected by volcanic activity. Therefore, we applied the eastside temperature equation to the upper Lewis watershed that was affected by Mt. St. Helen's 1980 eruption, and the westside temperature equation to the remaining areas in the watershed. The model is based on elevation (high: >1400 m; moderate: ≤ 1400 m and ≥ 500 m; and low: <500 m), stream width (small: <30 m bankfull width; large: ≥ 30 m bankfull width), and percent total tree cover. Shade ratings are determined based on percent tree cover for four categories: 1) streams at high elevations; 2) large streams at moderate or low elevations; 3) small streams at moderate elevation; and 4) small streams at low elevation. Model parameters and relationships are detailed in Figure H-1.

The pool formation submodel is based on tree size for conifers in relation to bankfull width and channel gradient (Montgomery et al. 1995). Equations relating tree size (dbh) with bankfull width were developed from research data for the Pacific Northwest (Bilby and Ward 1989; Bilby and Ward 1991; Beechie and Sibley 1997; Beechie et al 2000, USFS 1999). Pool formation ratings are determined based on conifer size for three categories, all of which have >30% conifer cover and $\leq 4\%$ gradient : (1) <4 m bankfull width, (2) 4-20 m bankfull width, and (3) ≥ 20 m bankfull width and gradient $\leq 2\%$. Model parameters and relationships are detailed in Figure H-2.

The wood recruitment submodel was modified from the Washington Forest Practices Watershed Board's Assessment Method (WFPB 2000) using similar criteria for size, dominant tree type (deciduous, conifer or mixed), and density (percent cover was used as the density metric). Modifications are mostly related to the role of Black Cottonwood providing large wood functions in the lower Lewis watershed, where we included deciduous and mixed categories, separated by stream size. Large woody debris recruitment ratings are determined for conifer-dominant, deciduous-dominant, mixed-

dominant, and naturally poor cover riparian areas. Model parameters and relationships are detailed in Figure H-3.

Qualitative ratings from each submodel were either used as final metrics, combined into an overall riparian function score for use as a modifier that reduces sediment input, or a combined score for input into the FishEye model (Appendix J).

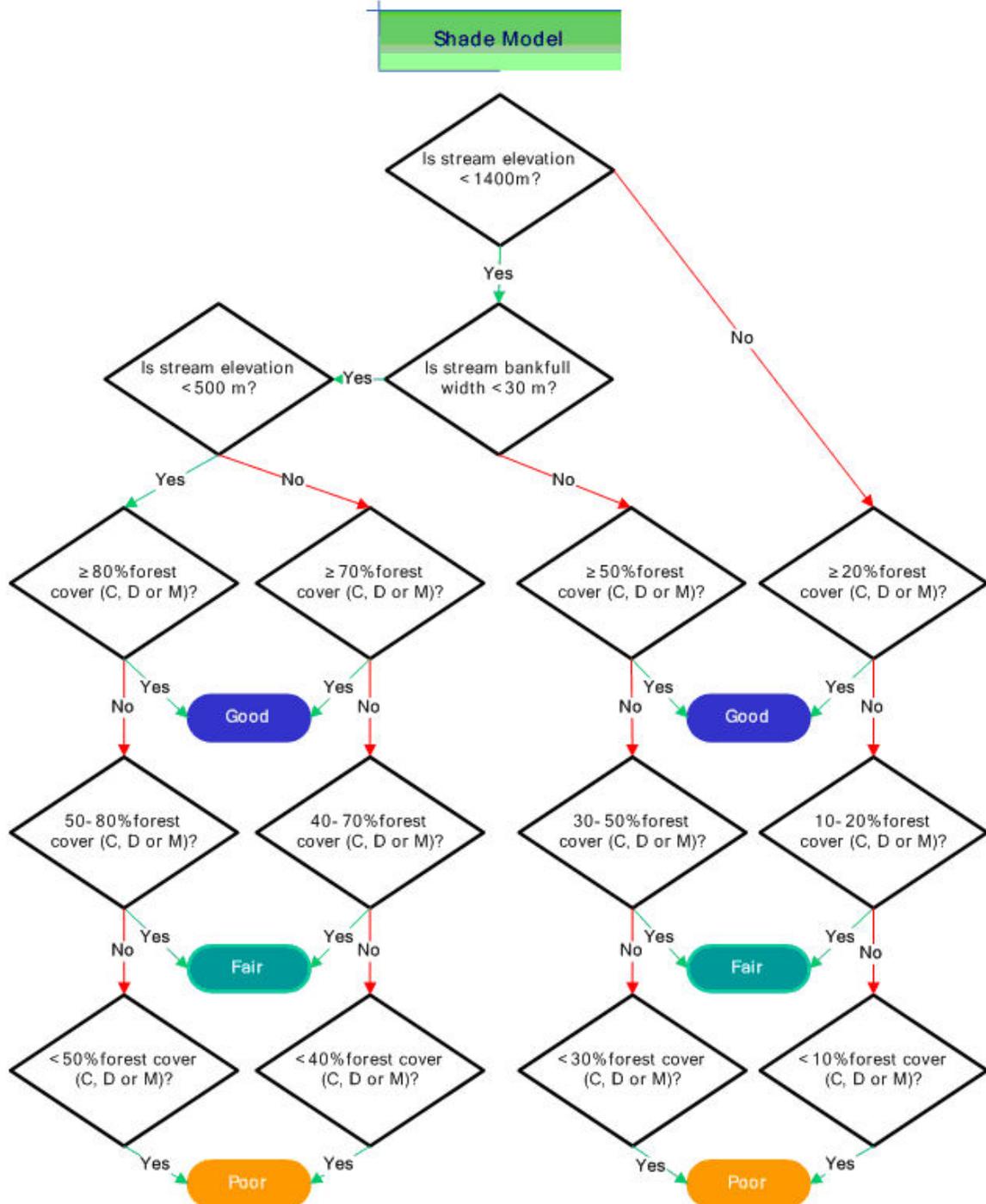


Figure H-1: Diagram of the DSS decision tree for the shade component of the riparian function model.

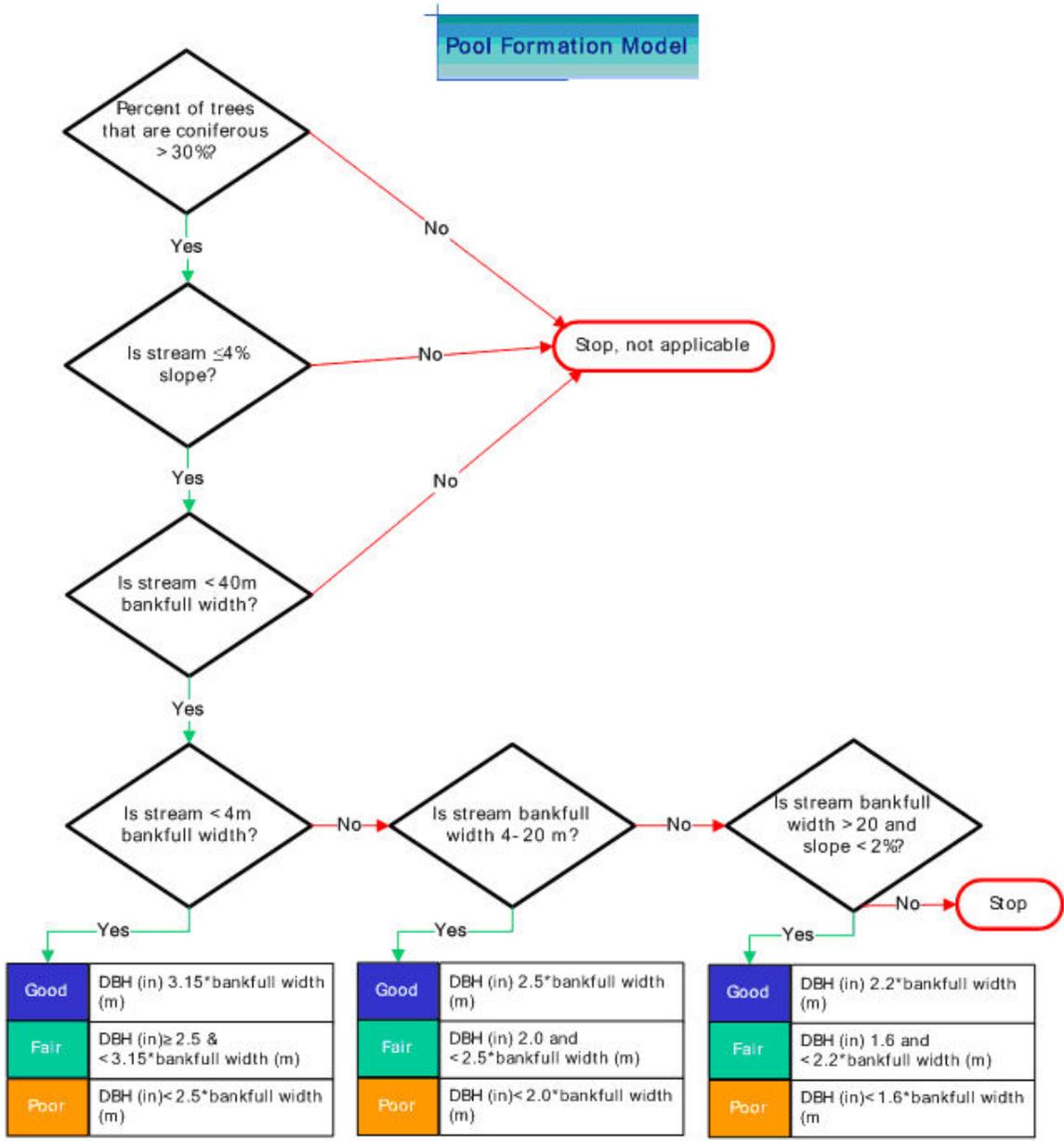


Figure H-2: Diagram of the DSS decision tree for the pool formation component of the riparian function model.

LWD Recruitment Model



Figure H-3: Diagram of the DSS decision tree for the large woody debris recruitment component of the riparian function model.

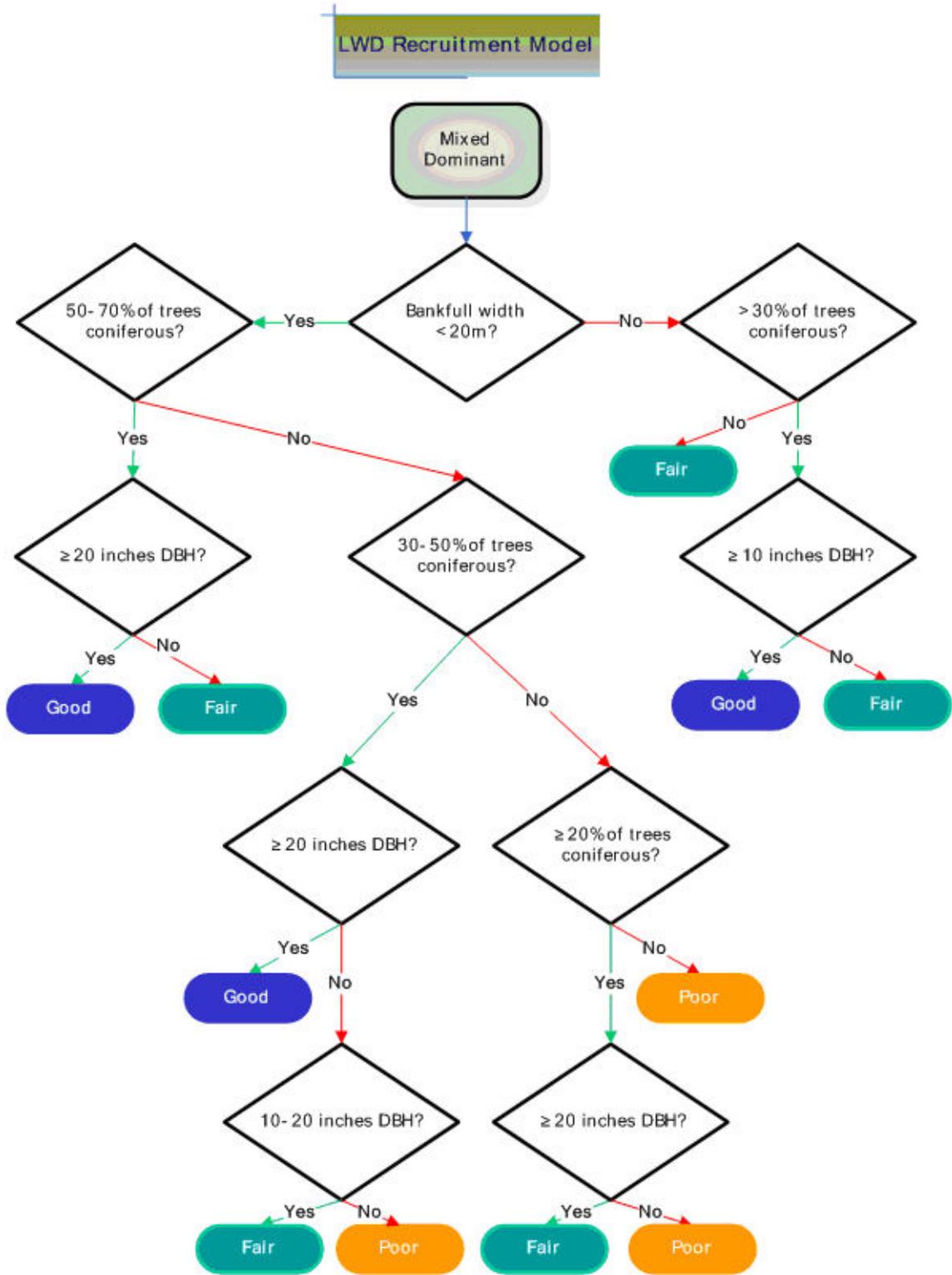


Diagram of the DSS decision tree for the large woody debris recruitment component of the riparian function model (continued).

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