APPENDIX A. PRIORITIZATION MODEL

OVERVIEW

The following indices rate the potential of a shoreline reach, relative to other reaches for an individual stream system, to provide water quality functions. This should provide users with the ability to prioritize restoration actions in the areas that have the greatest impairment issues. For example, areas with a higher score in the water quality index have a greater potential to remove pollutants. Therefore, additional enhancement actions may increase the ability of the reach to remove and transform pollutants. Results can then be combined with maps of known water quality impairments (i.e. 303 (b) and (d) listings) to further focus actions to address specific issues.

ANALYSIS METHODS

Data sources used for this analysis were the same as those used for the Walla Walla County Shoreline Analysis Report. The Shoreline Analysis Report included an inventory and functional analysis of shoreline reaches within the County. Shoreline reaches were based on shoreline jurisdiction, and as such were highly variable in width and distance from the OHWM of the shoreline waterbody. In order to avoid discrepancies in index results due to this variability, new shoreline reaches were created using a standard 600-foot buffer from the stream centerline or OHWM for all shoreline waterbodies in the County. Index results were normalized to a range of [0 1] so that each variable was given equal weight in the index.

INDICES

Water Quality Index

Purpose: To identify key areas for removal of sediment, nutrients, bacteria, metals, and toxic organics.

Description: Pollutants not dissolved in the water column such as sediment, phosphorous, bacteria, heavy metals, and some toxic organics can move into aquatic systems by overland flow. Pollutants that are dissolved in the water column such as nitrate can move via shallow or deeper groundwater flow and discharge into the floodplain or floodway of stream systems. For surface transport of pollutants not dissolved in the water column, the buffer adjacent to an aquatic system acts to filter and retain these pollutants. Depressional wetlands and floodplains will also remove these pollutants through a process of filtering by aquatic vegetation, and adsorption and settlement (i.e. a function of retention time). Depressional wetlands can transform nitrate through the process of denitrification. The water quality index, therefore, consists of three mechanisms: filtering by the riparian zone; removal of suspended pollutants by filtering, adsorption and settlement in depressional wetlands and floodplains; and transformation of nitrate through denitrification.

Index value is from 0 to 1, with a higher number identifying areas that have a higher potential to remove or transform pollutants such as sediment, nutrients, pathogens, and toxic organics, and are a priority for protecting and restoring water quality processes. Results are classified into three quantiles for high, medium, and low scores.

Variables:

$$\text{Riparian Filtering} = \frac{\text{Area of Riparian Vegetation}^{1} \text{ for Reach}}{\text{Total Landcover Data Area}^{2}}$$

$$\text{Wetland Filtering, Adsorption \& Transformation} = \frac{\text{Area of NWI Wetlands}}{\text{Total Reach Area}^{3}}$$

Equation:

$$\text{Water Quality Index} = \frac{\text{Riparian Filtering} + \text{Wetland Filtering, Adsorption and Transformation}}{2}$$

Water Temperature Index

Purpose: To identify key areas contributing to water temperature increases.

Description: This index is designed to identify areas that are a priority for restoring temperature processes. Reaches that have both areas of groundwater discharge and loss of riparian cover should be the highest priority to restore; areas with full riparian habitat would score the lowest.

Index value is from 0 to 1, with a higher number identifying a more degraded area. Results are classified into three quantiles for high, medium, and low scores.

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[1] Includes evergreen forest, deciduous forest, mixed forest, herbaceous, woody wetland, and emergent herbaceous wetland classifications from the National Land Cover Database (NLCD 2006).

[2] Total Landcover Data Area excludes all area classified as "Water" from the total reach area. See National Land Cover Database 2006 data classifications for details.

[3] Total Reach Area is the 600-foot buffer area offset from OHWM or centerline of regulated waterbodies, which is consistent with the creation of shoreline jurisdiction boundaries. Associated Wetland boundaries are excluded from the assessment area.

Variables:

$$\text{Loss of Riparian Cover} = 1 - \left\{ \frac{\text{Area of Riparian Vegetation for Reach}}{\text{Total Reach Area}} \right\}$$

$$\text{Groundwater Discharge} = \frac{\text{Alluvial Soil}^{4} \text{ Area Intersecting Reach}}{\text{Total Reach Area}}$$

Equation:

$$\text{Degraded Temperature Index} = \frac{\text{Loss of Riparian Cover} + \text{Areas of Groundwater Discharge}}{2}$$

Sediment Index

Purpose: To identify potential areas of upland sediment loading.

Description: This index is designed to identify areas that may be contributing excess sediment to aquatic systems. The results should be used in conjunction with the Water Quality Index to identify which reaches adjacent to the source of additional sediment input may help mitigate that sediment input.

Index value is from 0 to 1, with a higher number identifying a more degraded area. Results are classified into three quantiles for high, medium, and low scores.

[4] Alluvial soil areas defined by areas classified as alluvium and/or alluvium fan in the WDNR surficial geology dataset.

Variables:

$$\text{Erosion Rating}^{5} = \frac{(\text{Land area for type 1} \times \text{SSURGO Score}) + (\text{Land area for type 2} \times \text{SURGO Score})^{6}}{\text{Total Erosion Data}^{7}\ \text{Area}}$$

$$\text{Agricultural Land Cover} = \frac{\text{Area of Cropland}^{8}}{\text{Total Landcover Data Area}}$$

$$\text{Loss of Riparian Cover} = 1 - \left\{\frac{\text{Area of Riparian Cover for Reach}}{\text{Total Landcover Data Area}}\right\}$$

Equation:

$$\text{Degraded Sediment Process Index} = \frac{\text{Erosion Rating} + \text{Agricultural Land Cover} + \text{Loss of Riparian Cover}}{3}$$

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[5] Based on SSURGO Land Management erosion hazard index for off-road and off-trail. Ratings of "very severe," "severe," moderate," and "limited" were used for this assessment. Factional scores are assigned as follows: Very Severe = 1; Severe = 0.75; Moderate = 0.5; Slight = "0.25." Areas identified as "No Data" were excluded from the total reach area denominator.

[6] For each land area with a different erosion index, entered the area as a separate "type" and multiplied by the appropriate rating score, as described above. If the entire reach area was only one of one soil erosion type, the erosion rating score was entered directly.

[7] Total Erosion Data Area excludes all area classified as "No Data" from the total reach area. See description of SSURGO Database for details.

[8] Area of Cropland is based on 2006 National Land Cover Database classification.