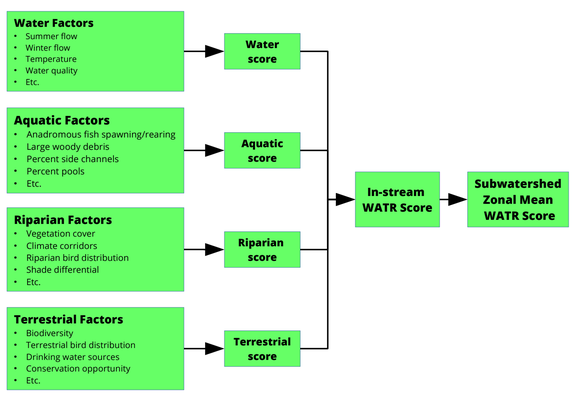
Climate Change Resilience Modeling of the North Santiam River Basin

Introduction

The North Santiam river basin is located in the Willamette River watershed in western Oregon. Like other rivers around the world, it is at risk of degradation due to climate change. Funding to mitigate this degradation is limited; therefore, prioritization is necessary to identify those portions of the watershed that are most at risk. In summer 2016, Sandra Coveny, LLC modeled the resilience of the watershed using Geographic Information Systems (GIS) based techniques.

Method

The analysis consisted of a multi-criteria decision analysis using a simplified Analytic Hierarchy Process. For each pixel in a modeled riparian buffer, a resilience score was computed by raster addition of four classified category rasters: water, aquatic, terrestrial, and riparian. The composite score was dubbed the "WATR" score. The category rasters were each similarly derived by raster addition of several classified datasets. The simplified process is depicted in the flowchart below.



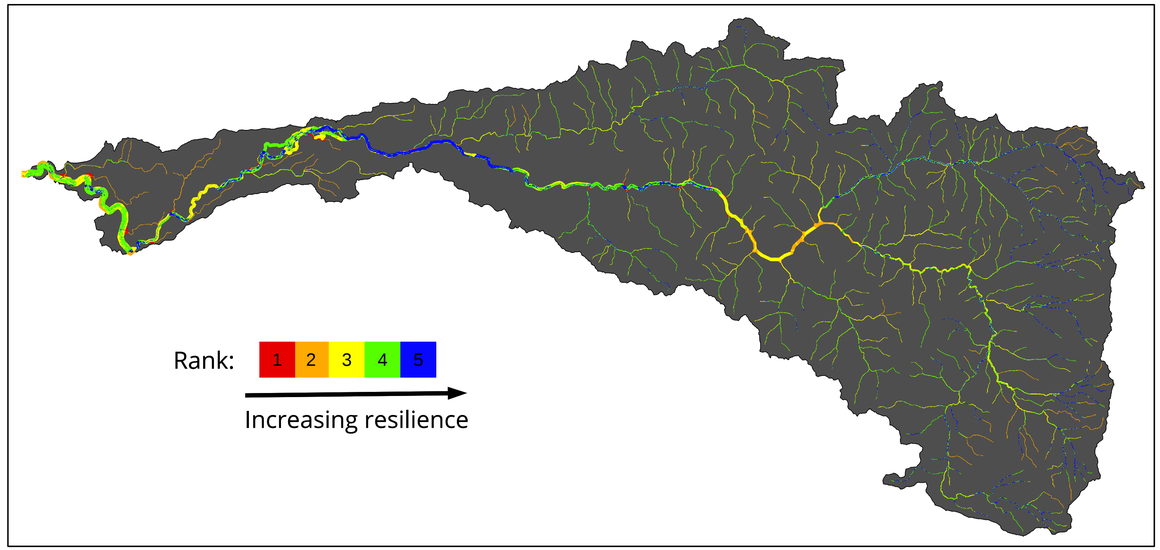


Figure 1. In-stream WATR Score

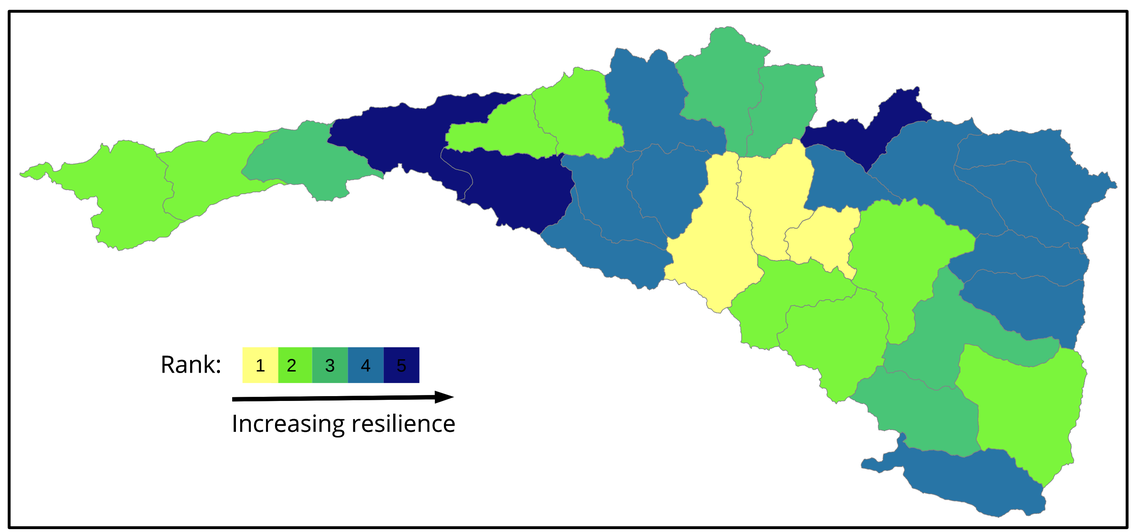
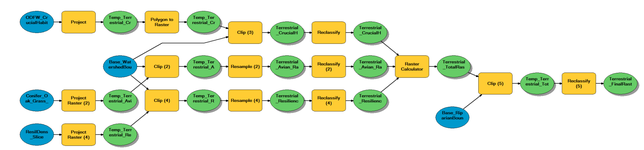


Figure 2. Subwatershed Zonal Mean WATR Score

Method (continued)

The in-stream WATR score is depicted in Figure 1. Using the in-stream WATR raster, the zonal mean WATR score was computed for each subwatershed in the North Santiam basin. The zonal mean score is depicted in Figure 2. The analysis was implemented using ArcMap and ModelBuilder. The portion of the model used to compute the Terrestrial category score is shown below.



With the exception of the steps to determine class breaks, the entire process is automated. This allows the process to be easily replicated as new data is obtained. The input data used were derived from datasets provided by the Bonneville Education Foundation that were aggregated at the Willamette basin level. This allows the model to be replicated for other watersheds within the Willamette with changes to only a few parameters.

Outcomes

The model provides the North Santiam Watershed Council and other stakeholders with an important tool to identify which stream segments and subwatersheds are most in need of conservation and restoration efforts. The automated implementation facilitates easy replication of the process for the North Santiam or other watersheds within the Willamette basin.

Bonneville Environmental Foundation

North Santiam Watershed Council

Sandra Coveny, LLC