Mapping Aquatic Resources in the Colorado River Basin Region

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Abstract

The California portion of the Colorado River Basin falls within the State Water Board Region 7. It is an arid region receiving <4 inches of rainfall. The goal of this project is to identify and map the locations of potential perennial streams within the Colorado River Basin Region. Existing datasets of hydrologic features include the National Hydrography Dataset (NHD) and National Wetlands Inventory (NWI). Both datasets contain a large quantity of high quality data, but have some limitations on a local scale due to the methods used to create them. Using these two datasets as a starting point, we will attempt to increase their accuracy using additional spatial data.

Initial layers of potential streams were developed from high resolution elevation rasters (NED). NEDs covering the entire region were combined using Mosaic Raster. Spatial Analyst Hydrology tools were used to calculate flow direction (FlowDir) and accumulation (FlowAcc). The stream flow accumulation raster indicates the cumulative number of upstream cells that contribute flow to a cell and can be used to predict the potential location of streams by adjusting the lower threshold value of the raster. Some studies have used a threshold of 5000. This threshold creates a stream layer that generally agrees with NHD, but it may need to be adjusted for this region. In order to define the stream threshold, an iterative process is being applied. 1) A threshold value is assigned to the FlowAcc raster to create a stream raster; 2) The total length of streams in the resulting raster will be compared to the total NHD (natural, non-channelized) stream length for the region and the threshold value which most closely approximates the NHD stream length will be used as a base value.

NHD classifies streams as Perennial or Intermittent (FTYPE), providing the best available test case for determining the Perennial/Intermittent threshold values in the stream raster. Since factors other than flow accumulation are also involved in this threshold, other GIS layers will be used to modify this threshold. The primary tool will be the Normalized Difference Vegetation Index (NDVI), which uses multispectral imagery containing a near-infrared (NIR) band to detect live green vegetation. The tool will be tested and optimized as an indicator of riparian vegetation in RB7 by first analyzing NAIP imagery in regions of known perennial streams. The range of NDVI values found in these areas will be used as boundaries to create GIS layers of similar vegetation in the rest of the region. Attention will be paid to the shape of features (e.g. clusters

of vegetation) as well as the NDVI value, since areas of artificial irrigation will most likely exhibit more regular shapes (circles and rectangles) than natural riparian corridors (elongated strips). The riparian vegetation layer will then be compared with the stream raster layer throughout the region.

In addition to vegetation imagery, geology and soils layers will be used to determine areas of likely perennial stream locations based on permeability and hydrologic soil groups.