Method Details for the USFS Riparian Tool

The page is initially focusing on the work of Dr. Sinan Abood (USFS), who has been developing ideas and software for delineating riparian areas. He's happy to share ideas and software, so please feel free to post ideas and questions in the "Comments" section and we'll try to get a dialog going.

One of the main ideas of this work is that a fixed or really even a per-segment Euclidean distance buffer around streams is a poor way to approximate "riparian" areas. There are a variety of interesting questions in here, starting with exactly what the definition of "riparian" should be. Regardless, various users might see ways to leverage the delineations for their own scientific studies. It might be interesting to see if this type of approach would also be useful for defining "wetlands" that are either on- or off-stream.

- presentation: "Mapping Variable Width Riparian Areas Utilizing GIS & Open Source Data"
- article: "Modeling Riparian Zones Utilizing DEMS and Flood Height Data"
- article: "Modeling & Classifying Riparian Ecotones via GIS Utilizing Geophysical and Vegetative Inputs: A New Approach"
- article: "Modeling Riparian Zones Utilizing DEMS and Flood Height Data"

An image taken from Sinan's presentation is great food for thought.

His approach relies on a flood height (usually the 50 year) that the user specifies. The image below shows an example of the impact of this choice.
For more information on the tool see [here](#). The tool requires the following minimum inputs for this analysis:

1. 10 meter DEMs. Acquired all CONUS 10m DEMs from Curtis Price along with a mosaic-ing and projecting tool.
2. NHDPlus Version 2 flowlines. NHDPlus version 2 from horizon
3. Sub catchments of area of interest. HUC8's were used in this analysis.
4. National Wetland Inventory. Acquired CONUS layer from USFWS.
5. NHD High Res Waterbodies
6. 50 Year flood heights

The tool basically walks up the river course and searches out a specified extent and samples the DEM based on a specified flood height. This tool then finds areas along the river course that would correspond to this specified flood height and essentially does a cut and fill operation. It also looks for water bodies, wetlands and specific soil types (poorly drained soils) that are tangent to the water course which may also indicate a riparian area. We have all the input data needed nation-wide and have the tool up and running. **We were able to get some test results but the question I am posing to this group concerns the estimation of flood heights.**

The tool allows for calculating flood heights based on NWIS Field Measurement Data. These data are compiled from NWIS. The idea is to transfer 50 year flood heights to the NHDPlus flowline layer for input to the tool. Before running the model, a determination of an appropriate 50-year flood height for each stream order for all flow lines is necessary for input into the tool. To estimate flood heights, data is compiled from NWIS sites which occur within or near each of the areas where riparian areas are being delineated.

To calculate 50 year flood heights, the following NWIS data is used: the annual average stream flow, channel velocity, channel area, and channel width. The annual average flow rate measurements are organized by year and sorted from fastest (peak) to slowest for each stream gage location. After sorting, the annual flow rate measurements are ordinally ranked, so the fastest (peak) flow rate receives a value of 1. To calculate the recurrence interval, the rank number is divided by the number of measurements. The flow rate is plotted against the logarithmic recurrence interval to develop a flood occurrence regression (Bedient and Huber, 2002). As an example, an individual site regression is shown in Figure 2a below. The cross-sectional area (flow rate divided by velocity) is plotted against flow rate measurements (Figure 2b). Figure 2c shows the regression of width versus cross-sectional area. The width and cross-sectional area are determined from the previous regressions and the stream height calculated by dividing the cross-sectional area by the width (Mason, 2007). Using the regression equations for each site, 50-year flood heights are determined.
This 50-year flood height calculation is repeated for all available gages within or in a close proximity of the area of interest. The next step is plotting calculated (if there are more than one gage on the same stream order an arithmetic average is used) 50-year flood height values vs. streams order then fit a second order polynomial equation to estimate 50-year flood height values for streams order with no gages (graph below). Then these values are attributed to the NHDPlus flow line layer as an input to the riparian tool.
note that there are also comments attached to the Trial Areas page, as well as in the forum.