

## Topographic Wetness Index Explanation for Forsythe II MMG

Topographic Wetness Index is used to quantify topographic controls on hydrological processes. Topographic Wetness Index (TWI) can also be used to characterize biological processes including forest site quality, vegetation patterns, and annual net primary production (Beven & Kirkby, 1979; Sorenson, et al., 2006).

TWI is calculated by using a digital elevation model raster layer (cell size = 9m<sup>2</sup>) in a Geographical Information System software program (i.e. ArcGIS or QGIS), then using several tools within the program to calculate the slope, flow direction, flow accumulation, tan of slope, and ultimately TWI using simple equations (see citations or online resources for specific details on calculating TWI).

TWI can be displayed in various ways depending on the user and their interests. TWI layers have been displayed for the Forsythe II project area using a default symbology of values of the TWI index with a color scheme that indicates areas with low TWI (areas that have less “wetness”) in red and areas with high TWI (areas that are bodies of water) in dark blue; other colors illustrating TWI in these maps of the Forsythe II project area are: orange and yellow (lacking “wetness”), green (moderate amount of “wetness”), teal & light blue (increasing “wetness” but not a body of water, Figure 1).

These maps can be interpreted as follows: areas that appear red or orange are areas that will not accumulate water, areas in yellow or green as areas that are neutral, and areas in teal, light blue and blue as being areas that will accumulate water at varying degrees.

TWI does not take into account precipitation or soil type, both of which are important to assess forest site index or net primary production; rather, TWI uses the topographic elements of a landscape to determine where water may flow or accumulate. TWI can be used to characterize the potential forest site index (how productive a site may be) or vegetation patterns/forest types that may be accommodated at the site, but additional information as smaller scales would be necessary for a detailed assessment.

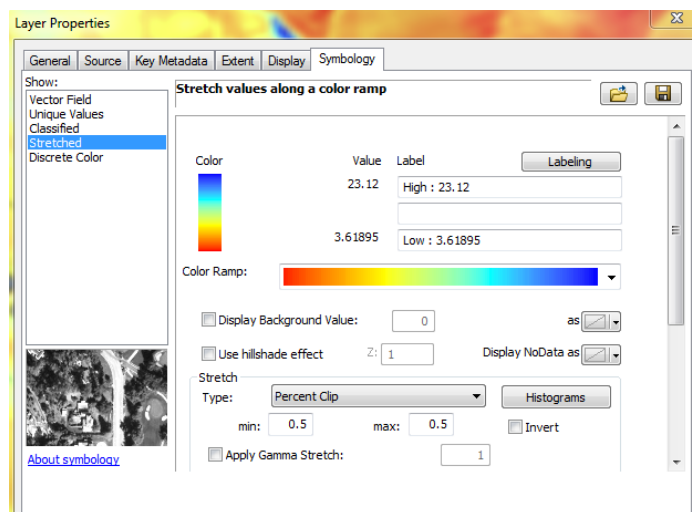


Figure 1: Symbology used for Forsythe II project area topographic wetness index maps in ArcGIS.

### Citations:

Sørensen, R.; Zinko, U.; Seibert, J. (2006). "On the calculation of the topographic wetness index: evaluation of different methods based on field observations". *Hydrology and Earth System Sciences*. 10: 101–112. doi.org/10.5194/hess-10-101-2006

Beven, K., Kirkby, M. (1979). "A physically based, variable contributing area model of basin hydrology". *Hydrological Science Bulletin*. 24 (1): 43–69. doi: 10.1080/02626667909491834

<http://gis4geomorphology.com/topographic-index-model/>

<http://gis.stackexchange.com/questions/43276/can-compound-topographic-index-cti-topographic-wetness-index-twi-produce-n/43280#43280>

