Recovery Potential Metrics Summary Form

Indicator Name: WATERSHED TOPOGRAPHIC COMPLEXITY

Type: Ecological Capacity

Rationale/Relevance to Recovery Potential: Although likely not a strong causal influence on ecological condition, topographic complexity is associated with higher biodiversity, better water quality and reduced nutrient pollution in some studies. The metric may be indirectly related to limiting the extent of some forms of land use that may degrade aquatic condition, also associating it with greater recovery potential in general.

How Measured: Watershed elevation range, mean watershed slope and relief ratio are measurable from elevation datasets and are closely correlated with topographic complexity.

Data Source: The National Elevation Dataset (NED) (See: http://nhd.usgs.gov/index.html) is adequate for generalized differences in elevation. High resolution elevation data should be used for any assessment units at HUC12 level of smaller. The Elevation Derivatives for National Applications (EDNA) has been derived from the NED and is hydrologically conditioned to improve hydrologic flow representation (see: http://edna.usgs.gov/). NHD plus contains information on maximum and minimum elevation for each flowline (http://www.horizon-systems.com/nhdplus/).

Indicator Status (check one or more)

___x__ Developmental concept.
______ Plausible relationship to recovery.
______ Single documentation in literature or practice.
___x___ Multiple documentation in literature or practice.
______ Quantification.

Examples from Supporting Literature (abbrev. citations and points made):

- (potter et al 2004) The land form feature exhibiting the strongest correlation with invertebrate indices was topographic complexity. Mean elevation and relief ratio, which are closely related to topographic complexity, demonstrated relationships nearly as strong. These variables have a negative relationship with macrobenthic invertebrate tolerance to stream degradation, indicating that greater topographic complexity, relief ratio, and mean elevation are each associated with better water quality. Nonpoint pollution effects on aquatic ecosystems resulting from land use changes may be mitigated or exacerbated by the terrain, or topographic complexity may simply be a better indicator of human disturbance ....land cover variables are of greater interest to policymakers than landscape characteristics that cannot be altered.

- (Brett et al., 2005) Catchment slope was negatively correlated with TP and SRP (r2 _ 0.44) concentrations; however, the slope was not significantly correlated with the other constituents assessed (337).

- (Brett et al., 2005) The negative association between catchment slope and stream water phosphorus content is probably an artifact of the strong association between catchment land cover and slope; that is, steep catchments might be dominated by forest land cover because areas with steep slopes are unsuitable for urban and suburban development (338).

- (Brett et al., 2005) Our study also found a counterintuitive negative relation between stream water phosphorus content and catchment slope, which was a result of the strong association between catchment land cover and slope. Presumably this was because steep catchments were dominated by forest land cover because areas with steep slopes are unsuitable for urban and suburban development (341).

- (Gergel et al., 2002) More complex terrain was hypothesized to lead to greater lateral expansion of contributing areas, resulting in longer flushing times and greater nitrate export. Data from catchments in the Sierra Nevada suggest export of nitrate from catchments with greater than 20% soil cover was consistent with the VSA hypothesis, but export from catchments with less than 20% soil cover was not (Sickman, 2001) (124).

- (Grau et al., 2003) Forest recovery tends to occur in areas of marginal agriculture: at high elevations, on steep slopes, within reserve areas, far from roads, in areas with net population out-migration, and in small farm areas located near preexisting forests. Urban areas expand at lower elevations, on flat topography, and closer to roads and urban areas (Thomlinson et al. 1996, Helmer 2003). The landscape features that favor urbanization are the same ones that favor intensive agriculture. For example, between 1977 and 1994, new urban areas replaced 6% of the island’s prime agricultural lands (López et al. 2001) (1160).