Recovery Potential Metrics Summary Form

Indicator Name: CORRIDOR SLOPE

Type: Ecological Capacity

Rationale/Relevance to Recovery Potential: Mainly relevant as low-gradient land surfaces near waters tend to develop less gullying and destabilized floodplain features that may perpetuate some impairments or make restoration more difficult, complex or expensive. These low-slope areas may also have superior water retention and favor more stabilizing vegetative growth. Note that corridor slope and channel slope are different metrics that do not have identical implications for recovery potential.

How Measured: Digital elevation model (DEM) data or topographic data in many cases have already been mapped into slope classes, which can be merged with a selected corridor width to yield % in selected slope classes or a mean % slope for the corridor lands overall. Note that lower slopes are generally associated with higher recovery potential. Thus the values will be need to be reversed to be used as an ecological metric.

Data Source: Slope information can be obtained through the USGS Elevation Derivatives for National Applications (EDNA) (See: http://edna.usgs.gov/) For finer resolution, use local Digital Elevation Model (DEM) data or topographic data.

Indicator Status (check one or more)

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

Comments: widespread applicability.

Supporting Literature (abbrev. citations and points made):

- (Ducros and Joyce 2003) Land use in the Yorkshire catchment featured a high proportion of crops, which in this system was not rated highly for buffer zone effectiveness, but the landscape was also characterized by positive attributes, namely gentle slopes and few rills or gullies (Figure 1) (262).
- (Ducros and Joyce 2003) The Wiltshire buffer zones featured a number of positive attributes. Most were over 40 m wide, none had severe erosion indicators such as rills and gullies, and slope and soil characteristics were generally well suited to water retention and denitrification (Figure 1). Some streambanks in the Wiltshire catchment were steep, with few plant species and low cover (especially the lower banks), but most were stable and featured little or no undercutting. Buffered stream channels were also characterized by excellent supplies of organic detritus and good habitat quality and vegetation diversity, but more variable retention features (262).
- (Ducros and Joyce 2003) High scores were due to gentle landscape and buffer slopes, wide buffer zones, little or no erosion, and soils that are suited to retain water and promote denitrification.

  The Devon catchment received an unweighted score for its buffer zones (73%) that was just below the Wiltshire catchment score and exhibited the best vegetation-related scores of the three catchments (Figure 2). This was due to the abundant cover and high diversity of vegetation in the buffer zones and on their stream banks. In contrast, the hydrology-weighted and, particularly, hydrology-only scores were relatively low for the Devon catchment, largely because the soils were likely to be ineffective for water retention and denitrification (262).

- (Ducros and Joyce 2003) The buffer zones in Wiltshire were generally wide and located on gently sloping land with slowly permeable soils and few rills or other erosion features (Figure 1), which should encourage water retention, and consequently opportunities for denitrification (Burt and others 1999). Nonetheless, apparent weaknesses were identified on the Wiltshire buffer zones, particularly concerning bank vegetation diversity and cover. There was a uniformity of vegetation along the stream channel banks and a lack of bank habitat features, although these could be remedied through soft engineering techniques (e.g., tree planting, stream deflectors, planting shrubs and trees for bank stability) (263-264).
- (Ducros and Joyce 2003) One such use would be for scoping studies to ascertain whether buffer zones are likely to be effective management tools for any given catchment and to target buffer enhancements where they are more likely to yield greater benefits. Use of the BZIEF in this study suggested that in agricultural catchments an evaluation of physical characteristics is important, including soil and vegetation types, topography, and hydrological regime, although previous land use does not seem to be as important (265).
- (Norton and Fisher 2000) Riparian forests may have minimal impact on reduction of N in overland runoff (Verchot et al., 1997) and long-term sediment-bound P (Whigham et al., 1988). The larger component of stormflow as well as higher stream slopes may explain the higher stream TP concentrations in streams of the Chester as well as the inability of forest to effect stream N concentrations (Fig. 11) (358).
- (Meixler and Bain, 2010) Only riparian areas with slopes of 1–10% are considered suitable for vegetative buffer strips, as runoff from slopes > 10% will tend to flow through the buffers too quickly, reducing trapping efficiency, and runoff on slopes <1% will likely pool (Hayes and Dillaha 1992).
- (Haberstocok, et al., 2000) Since factors such as sedimentation and reduced water quality reduce the quality of salmon habitat, slope and optimal buffer width vary directly. Slope has a strong relationship with erosion potential and other water quality factors such as retention or conversion of nutrients and chemical pollutants (Phillips, 1989a, 1989b; U.S. ACOE, 1991; Welsch, 1991; Ohio EPA, 1994; Chase et al., 1995; Chesapeake Bay Program, 1995; Murphy, 1995; Spence et al., 1996; Mitchell, 1996; Kahl, 1996; Correll, 1997; Chesapeake Bay Program, 1997; USDA Forest Service, 1998). Among all variables considered in the method, slope has the greatest (weighted) influence on calculated width.
- (Moreno-Mateos, Mander and Pedrocchi, 2010) Slope is a restrictive factor in wetland construction and restoration. The main design considerations and construction budgets rely on it. The lower the slope, the cheaper the construction project, as a consequence of the smaller amount of earthwork needed. Extensive earthwork also involves higher energy expenses. Irrigated agricultural farmlands need flat areas as they are watered by flooding and gentle slopes (<10%) if sprinkling is used. There is a greater need for wetlands in areas with more farmland, which are usually larger in flatter terrain.