Recovery Potential Metrics
Summary Form

Indicator Name: NATURAL CHANNEL FORM

Type: Ecological Capacity

Rationale/Relevance to Recovery Potential: Retention of natural channel form is one of the most basic requirements for physical processes (e.g., flow regimes, sediment transport dynamics) to occur within a natural range of variability, and for biotic communities to become established. Although a wide variety of natural channel forms exist and some may be unstable or impaired for other reasons, the absence of any natural channel form (i.e. channelization) provides no generally preferred habitat as a starting point for biotic or natural fluvial process recovery. (see also Channelization under stressor indicators)

How Measured: Because channelization may occur in straight-line segments that join at angles, original detection is best done manually by visual ID on mapped or remote data (high resolution preferably) and cannot be fully automated. Once detected, the linear % of total reach length in natural channel form can be measured with common GIS software in a two-step process. Some monitoring programs note channel form among other field-gathered data, and this is occasionally adaptable to a metric.

Data Source: High-resolution National Hydrography Dataset (See: http://nhd.usgs.gov/index.html), state/locally compiled channelization metrics from previous studies, or other digital source.

Indicator Status (check one or more)

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

Comments: Applicable for rivers and streams nationwide

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

- NOTE: see also extensive literature out-takes under channelization indicator, as these are highly correlated concepts described by much of the same literature.
- (Brooks et al 2002) Loss of habitat heterogeneity is generally considered to be one of the most serious problems threatening the persistence of natural communities (Bell et al. 1991; Pickett et al. 1996; Dobson et al. 1997). The damming and straightening of stream channels have reduced spatial and temporal variability in flow (Ligon et al. 1995; Poff 1997; Graf 1999). Within stream reaches, the removal of physical structures such as woody debris or beaver dams has eliminated important types of stream habitat (Naiman et al. 1986; Frissell & Nawa 1992; Shields & Smith 1992). Despite this, we were unable to distinguish differences in community structure between high and low habitat heterogeneity treatments. Power analysis indicated that macroinvertebrate populations were more sensitive to individual site conditions at each riffle than to the heterogeneity treatments, suggesting that increasing habitat heterogeneity may be an ineffective technique if the restoration goals are to promote macroinvertebrate recovery in denuded streams. These results do not support our prediction that the recovery of stream invertebrate community structure is influenced by physical habitat heterogeneity. ... we were unable to reject or accept our initial hypothesis that increasing habitat heterogeneity

would lead to faster recovery of invertebrate populations. [study done at riffle scale not reach scale; hi variability, fugitive and mobile taxa confound results, suggest not that hetero is unimportant but that it is weakly correlated with benthos in particular at the very fine scale.]

- (Wang 2001) Dyer *et al*. (1998a) applied a multivariate forward stepwise regression model to determine the relative importance of water chemistry and habitat on biological indicators in the Little Miami River watershed. Their study concluded that the habitat quality was primarily responsible for the biological integrity of receiving waters in the watershed.
- (Paul and Meyer 2001) For example, hydrologic regime is a master variable in streams (Minshall 1988), influencing channel form, biological assemblages, and ecosystem processes (355).
- (Novotny et al., 2005) Instead of or in addition to an irreversible dominant surrogate stressor expressed, e.g., by percent imperviousness or percent urbanization, other stressors may be significant and more manageable. Obviously, for nonurban streams landscape features such as percent forested or agricultural area of the watershed (Wang et al., 2000; Van Sickle, 2003), riparian zone conditions and buffers, geology of the watershed and morphology of the stream, ecoregional attributes (Omernik, 1987; Omernik and Gallant, 1989) or hydrologic stressors such as flow variability (Poff and Ward, 1989) are important. The other surrogates of stresses such as agricultural or forest land become important as the dominating effect of urbanization diminishes at low percentages of imperviousness but may have the same drawbacks as using percent imperviousness (189).