Recovery Potential Metrics Summary Form

Indicator Name: LANDOWNERSHIP COMPLEXITY

Type: Social Context

Rationale/Relevance to Recovery Potential: High amounts and high variety in types of private landownership in a watershed or stream corridor are likely to complicate efforts to restore an impaired water, and landownership pattern can rank among the highly influential factors. Negotiating management practices, easements or land purchases becomes complicated in fragmented ownership. Public lands often are the site of many restoration projects as a result. Single ownership-dominated watersheds, particularly where public land predominates, may optimize landownership pattern for likelihood of restoration success.

How Measured: Possible to measure on a watershed or corridor basis, as desired. One more simpliified option is to measure percent the area in the watershed/corridor that is in private or public ownership.

Data Source: The Bureau of Land Management contains land ownership and use information for public lands through LR2000 (See: http://www.blm.gov/lr2000/index.htm). The Protected Areas Database also includes information on protected lands (See: http://www.protectedlands.net/dataportal/find.php). ArcGIS online contains an updated federal lands dataset that can be opened directly in ArcMap (See: http://www.arcgis.com/home/item.html?id=8047eda3656e4241b75463a5451ba9e2). Finer-scale property boundary data is often available through local governments.

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: Operational but potentially can be refined to better accommodate small private landownership effects.

Supporting Literature (abbrev. citations and points made):

- (Roy et al., 2007) High amounts of private land ownership coupled with the inability to require retrofit of riparian buffers limit complete protection of riparian buffers and challenge policymakers to adapt regulations for the existing mosaic of land cover within basin and riparian areas (399).
- (Bernhardt and Palmer 2007) Not only is property more expensive in urban catchments, property ownership is more finely subdivided, thus acquiring the necessary land for large-scale stream restoration requires complex negotiations with multiple landowners. By default, many restoration projects are implemented in lands already owned by the municipal, local or regional government. Interview surveys with practitioners from throughout the United States showed that restoration site selection was much more likely to be driven by available land opportunities in urban catchments than in catchments with other types of land use (Bernhardt et al., 2007) (746).
- (Russell et al., 1997) The socio-political factors that contribute to restoration decisions were not taken into account. Such factors as engineering capability, cost, land ownership, and legal mandates admittedly play a major role in determining if, when,

where, and how a restoration project comes into being. Though beyond the scope of this project, these factors could, to some degree, be considered within a GIS environment (66).

- (Dodds and Oakes 2008) Establishing or protecting riparian zones or large watershed areas that mitigate impacts of human land use on water quality may be costly or politically difficult, particularly in areas where much of the land is privately owned (368).
- (Radwell and Kwak 2005) Our research revealed several insightful findings applicable to river ecology and management. First, we found that physical characteristics were more influential in ranking rivers in terms of ecological integrity, relative to biotic attributes. Among physical attributes, those at the watershed level, including land use, ownership, and road density, were the most influential components, playing a major role in discriminating among rivers. However, fish density, biomass, and occurrence of intolerant fishes were influential biotic factors, as well as invertebrate density and taxa richness (806).
- (Radwell and Kwak 2005) Fish density, number of intolerant fish species, and invertebrate density were important biotic variables responsible for the rankings. Contributing physical variables included riparian forest cover, nitrate concentration, turbidity, percentage of forested watershed, percentage of private land ownership, and road density both in the watershed and in a 100-m buffer (806).
- (Pringle 2001) Finally, many alterations in hydrologic connectivity are outside reserve boundaries and beyond the immediate control of managers [making them difficult to manage] (Pringle 2000*b*) (982).
- (Ekness and Randhir 2007) The riparian width that has maximum habitat gains may not always be possible in most watersheds. An effective approach is to protect riparian areas with maximum possible riparian width, to protect all four vertebrate groups. Another approach is to follow a variable width policy that allows variability in riparian protection depending on local factors like land availability, habitat needs, and other community needs. Zoning regulations (Wenger and Fowler, 2000; Grant, 2001) can be used to reduce land disturbance to riparian areas. A variable buffer zone can be identified and protected using regulations. The variable width of the riparian buffer can be determined based on tradeoffs in location-specific benefits and costs of land protection. The recommended minimum width of riparian buffers is 7.6 m. A popular recommendation is to have three zones in a riparian buffer, namely undisturbed forest, managed forest, and the runoff control area (Welsch, 1991), that have a combined width of 30 m. In Massachusetts, a width of 7.6 m is required in urban areas 61 m in rural areas (River Protection Act). Buffer width policies could be developed based on the marginal gains identified in this study. An ideal is to have a variable width (Spackman and Hughes, 1995; Wenger and Fowler, 2000; Corlett, 2001) policy that uses optimal riparian width depending on local attributes. Subsidies and incentives that are spatially targeted can be used to encourage voluntary installation of riparian buffers (1478-1479).