Recovery Potential Metrics
Summary Form

Indicator Name: EDUCATIONAL LEVEL IN WATERSHED

Type: Social Context

Rationale/Relevance to Recovery Potential: Greater understanding of restoration activities and goals is generally associated with greater community support of restoration. This support may be associated in turn with specialized efforts to inform stakeholders about the local restoration setting, with general ability to understand restoration techniques and goals, or with both. Communities with generally higher levels of education may more quickly understand the advanced and complex descriptions typical of a restoration project and the environmental processes it will address. This metric may provide insight about earlier communication opportunities for reaching stakeholders, but may not necessarily imply higher support ultimately.

How Measured: Metric requires proportionally merging county-level educational attainment data from the Census with the watersheds being assessed, where watersheds overlap with multiple counties.

Data Source: This metric requires proportionally merging county-level educational attainment data from the Census with the watersheds being assessed, where watersheds overlap with multiple counties. The metric is assigned a score per watershed. Data on educational attainment are available for the U.S., states, counties, and subcounty statistical areas (such as zip codes and block groups) from 1940 to 2010 (http://www.census.gov/hhes/socdemo/education/data/index.html).

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: Developmental, as higher education generally shows evidence of a relationship but with considerable uncertainty as to the significance of specific levels of education.

Supporting Literature (abbrev. citations and points made):

- (Sondergaard and Jeppesen 2007) The most cost-effective way to restore streams may also include information campaigns to farmers on best management practices (1089).

- (Sondergaard and Jeppesen 2007) Improvement of river and stream health may not just be a matter of applying a suitable method, but also of environmental education. Based on results from 30 deer farms in southern New Zealand, Rhodes *et al*. (2007) found no significant effects of informing farmers about best management practices, but observed consistent improvements in stream health within 2 years when the best management practices were voluntarily adopted. They concluded that it is likely that a positive association between information and stream health will manifest with time, consistent with conclusions on the importance of engaging Finnish farmers actively on a voluntarily basis to control nutrient runoff to lakes (Ventelä *et al*., in press) (1092).

- (March et al., 2003) Also, managers and policymakers should encourage water conservation through outreach and education, through government-subsidized shifts to more water-efficient technology, and through ascending water-pricing rate structures that require users to pay higher rates the more water they use (Gleick 2000) (1077).

- (Ekness and Randhir 2007) An information and education program can be used along with disturbance ranking by landowners to revise land management practices so as to achieve lower disturbance levels (1479).

- (Ekness and Randhir 2007) Education is another important policy tool that can be used to encourage voluntary adoption of conservation practices at optimal spatial locations in the watershed (Andrews et al., 2002; Ramsey and Hungerford, 2002). Successful community-based environmental education needs to use a strategy that builds local skills and supports voluntary actions (Andrews et al., 2002). To implement sustainable practices, education and outreach are required at local, state, and national levels. Longterm protection of watersheds depends on voluntary adoption of conservation strategies by members of the community that use and are familiar with the areas that are habitat to species.. This requires dissemination of spatial information on ecosystem processes, conservation practices, and the nature of human impacts. Education can be effectively used to encourage communities to protect and restore areas identified as critical for the maintenance of habitat within a watershed (1480).

- (Walsh et al., 2005) For example, urban stream attributes with limited ecological values, such as mowed grass riparian zones or paved streamside paths, may have amenity values for some urban communities (e.g., Tunstall et al. 2000). Sometimes, value placed in such altered, unnatural environments can be a product of people not missing what they never had (Rosenzweig 2003), and stream ecologists might play a role in educating communities on how streams more closely resembling natural conditions might be more desirable. However, for such education of urban communities to be effective, restoration actions and attainable restoration goals must be appropriately balanced (Table 2) (716).
- (Walsh et al., 2005) Changes in public attitudes and amenity of the neighborhood and its waterways are likely to result in tangible economic benefits, such as increased real estate values, which in turn, if coupled with educational programs designed to increase public awareness about the social and ecological advantages, are likely to increase and reinforce acceptance of LID by management authorities (Fig. 3).

  Thus, the challenge for stream ecologists in furthering our understanding of streams in urban areas is to not only better understand interactions between catchments and stream processes, but to integrate this work with social, economic, and political drivers of the urban environment (719).
- (Rahel 2007) Importation bans may be implemented for particularly noxious species such as snakehead fish in the family Channidae (Federal Register, 2002), but public education about the dangers of releasing unwanted pets may be the best way to curb introductions of ornamental aquatic organisms for the foreseeable future (Padilla & Williams, 2004) (704).
- (March et al., 2003) When evaluating the effects of dams or other anthropogenic disturbances, it is important for managers to have a good understanding of the ecology of the specific streams they are managing (1077).
- (Ekness and Randhir 2007) A spatially variable policy that is based on stream order, riparian distance, and land use can be used to maximize watershed ecological benefits. Wider riparian zones with variable widths, protection of headwaters and lower order subwatersheds, and minimizing disturbance in riparian and headwater areas can be used in watershed policy. These management objectives could be achieved using targeted economic incentives, best management practices, zoning laws, and educational programs using a watershed perspective (1468).