Recovery Potential Metrics
Summary Form

Indicator Name: HISTORICAL SPECIES OCCURRENCE

Type: Ecological Capacity

Rationale/Relevance to Recovery Potential: Although single-species oriented, this metric is appropriate where a restoration target or even a water quality criterion directly addresses a species of concern (e.g., naturally reproducing salmon or trout populations), or indirectly alludes to an aquatic condition exemplified by a keystone species (e.g., Eastern Brook Trout exemplifying a coldwater biotic community target). Verified historical occurrence does not necessarily ensure recovery potential due to the many additional factors that may interfere, but should provide a starting point for comparative evaluations of numerous potential restorations involving that species as a target. Verified historical absence is valuable for avoiding inappropriate restoration investments.

How Measured: A simple scoring approach allows for the following three ranking categories (lowest to highest):

0. historically not found
1. unknown historical occurrence
2. known historical occurrence

Data Source: Limited to individual species of concern that have been researched sufficiently to establish historical presence/absence data. Requires distributional information on historical presence/absence of the species of interest, which may not exist for many species. Threatened and Endangered Species Habitat can be found through the USFWS Critical Habitat Portal (See: http://criticalhabitat.fws.gov/). Historical information may be available through State Fish and Wildlife Service, as is the case in Oregon (See: http://www.fws.gov/oregonfwo/Species/Data/). Biodiversity organizations and state natural heritage programs may have data on other major aquatic taxa of interest.

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. Widespread in principle, but frequently data-limited. Compilation of Eastern Brook Trout data at the 12-digit watershed level by Hudy et al. from Maine through Georgia is a prime example of geo-spatial data from which this metric can be extracted and used with other recovery metrics in restoration planning and priority setting.

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

- (Palik et al., 2000) Our approach to prioritization uses the conservation status of an ecosystem, as expressed in current and historical rarity, to assess benefits associated with restoration of that ecosystem. For instance, restoration of ecosystems that were historically abundant, but are now rare, will likely result in high conservation benefit. This approach has similarities to gap analysis (Scott et al. 1993), but on a local scale, whereby we compare the potential distribution of reference ecosystems to the area and distribution of protected areas of each ecosystem (200).

- (Filipe et al., 2004) To select priority areas for conservation of watercourses in the region according to the predetermined conservation goals, it is necessary to maximize biodiversity representation based on the available species data. Therefore, for the second step we used a method that ranks stream reaches according to probability of occurrence of a species, taking into account whether the species is endemic to a particular area and whether it is rare or abundant (193).
- (Kirkman, Coffey, Mitchell and Moser 2004) The life histories of established and colonizing species influence the rate of succession following disturbance of plant communities, especially in understorey and ground cover strata (Brewer 1980; Gross 1987; Kindscher 1994; McLachlan & Bazely 2001). Mechanisms of seed dispersal, flowering phenology, growth form and persistent soil seed banks have been shown to influence post-disturbance changes in species richness in some forest and prairie communities (Tilman 1997; Eriksson & Jakobsson 1998; McLachlan & Bazely 2001). Thus, elucidating the life-history traits that restrict persistence or species recruitment following soil disturbance is a primary step in developing appropriate restoration strategies, including reintroduction (Pyke & Archer 1991; Pywell *et al* . 2003). Furthermore, the presence of species that are vulnerable to disturbance, or of groups of such species, can be used as an indicator of recovery of restored sites moving towards the composition of less disrupted, high-quality reference sites (Kindscher 1994; Masters 1997; Lindenmayer 1999).
- (Louette, Declerck, Vandekerkhove and Meester 2009) Overall, the use of historical habitat-specific samples offers a major opportunity for evaluating restoration success in great detail. Community structures may directly be compared, the gain or loss of specific species can accurately be documented, and more insights in the observed patterns be obtained.
- (Swetnam, Allen and Betancourt 1999) As a first approximation, past environmental change can be measured by finding the site of a historical photograph, reoccupying the original camera position, and making a new photograph of the same scene. Differences between then and now provide a basis for identifying and quantifying changes, while the new photograph establishes a benchmark for future evaluation (Malde 1973). Repeat photography is a simple, inexpensive, and elegant tool for reconstructing past environmental changes and monitoring future ones; it is particularly well suited for the relatively open landscapes of the western U.S. Re-photography in the southwest, for example, has focused on key ecological concerns that are relevant to management of public lands, including shrub and tree encroachment upon grasslands, climatic effects on demographic trends in woodlands, post-disturbance histories, and geomorphic, hydrologic, and vegetation changes in riparian areas (Hastings and Turner 1965, Dutton and Bunting 1981, Rogers et al. 1984, Humphrey 1987, Bahre 1991, Webb 1996, Allen et al. 1998).
- (Vander Zanden et al. 2003) The restoration of a native species assemblage may be thwarted by food web alterations and changes in species abundance resulting from species introductions. Similarly, might there have been historical prey resources, habitats, and energy flow pathways that were critical for supporting native species or species assemblages but are now no longer available? Addressing the implications of these questions can provide us with a basis for understanding the restoration potential of native aquatic communities.
- (Vander Zanden et al. 2003) We argue that knowledge of food web alterations is needed to characterize the restoration potential of any aquatic community, an issue of central importance in lakes of the Tahoe basin and elsewhere.