Traditional View

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Figure 2.1. The different options for the improvement of a degraded ecosystem expressed in terms of the two major characteristics of structure and function. Used in its proper sense, restoration implies bringing back the ecosystem to its original or previous state in terms of both structure and function; there are then a number of other alternatives, including rehabilitation in which this is not totally achieved, and replacement of the original by something different—usually termed reclamation... Mitigation is a different consideration.

Hobbs & Norton 96

BOX 11.1. Research Priorities in Restoration

Questions are organized into categories parallel to the discussion.

Investigate Recovery Processes
1. What are the rate-limiting steps to recovery in different biomes?
2. What degree does the species pool of early-establishing species affect the trajectory of recovery during restoration?
3. Does the sequence in which species are introduced to human-disturbed sites affect the successional trajectory or the speed of recovery?
4. To what degree does establishing appropriate abiotic conditions result in the establishment of the complement of native species? For example, since it would be impossible to reintroduce all soil microorganisms, does restoration of appropriate soil texture, nutrients, and temperature result in the reestablishment of the majority of species?
5. To what degree do we need to restore ecosystem processes such as nutrient cycling and water fluxes to restore native species and vice versa?
6. To what degree does the physical architecture of a community's components determine its species composition?
7. How is the trajectory of succession during restoration affected by other human-induced changes, such as climate change, elevated CO₂, and increased N availability? For example, will altered precipitation patterns favor the establishment of seedlings of non-native species in restored areas, thereby reducing the potential for recovery of native species?

Analyze and Synthesize the Results of Species Introductions
1. What are the effects of introduction of genotypes on restoration success and surrounding populations?
2. Are there rules of thumb for maintaining local adaptations?
3. What is the influence of numbers of individuals and genetic variation of the founding population on the success of reestablishing native species?

4. Can we predict the invasion probability of species from easily defined traits?
5. Can we create "designer ecosystems" composed of species that normally do not co-occur that allow us to address specific conservation goals yet do not, themselves, impose threats (e.g., the escape of non-native species)?

Consider Spatial Scale
1. How does the surrounding land-use matrix affect movement of organisms and materials into and population dynamics in restored areas and vice versa?
2. For example, could restored areas serve as sink populations? Or, can restoration of habitat surrounding protected areas help to minimize edge effects within the protected area?
3. At what scale do we need to manage for natural temporal and spatial variability in restoration? Can we develop rules of thumb for minimum sizes of areas to restore for certain types of disturbance regimes or species?
4. What combination of tools (e.g., small-scale experiments, large-scale experiments, models) are useful in predicting success of restoring species at larger scales?

Implement and Analyze Monitoring
1. Which parameters should be selected for monitoring?

To what degree do early indications of restoration success suggest long-term establishment of native species?

Consider Policy Questions
1. What funding tools are most appropriate to ensure long-term success of restoration?
2. How can legislation be designed to better accommodate the dynamic nature of ecological systems?
3. What strategies could be used to coordinate policies and legislation to aim for regional restoration plans?

Note: Those priorities marked with an asterisk are those we consider to be most important.
Figure 1. The separate strands contributing to the development of restoration ecology. Developments within each strand have contributed to the complexity of the field.

Ehrenfeld 2000

Zedler and Callaway '99

Figure 2. Changes in soil and plant canopy attributes at San Diego Bay from 2 to 11 years after planting in 1985. Squares, constructed marsh; diamonds, natural reference marsh. Total Kjeldahl nitrogen of surface soil (A). Soil organic matter (loss on ignition) (B). Spartina foliosa (cordgrass) total stem length (m/m²), measured at the end of the growing season (C). Number of cordgrass stems taller than 90 cm (D).

References from Lecture on Restoration:


