

# ECOLOGICAL RESTORATION

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# Goals of Restoration: What Is “Natural”?

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If an ecosystem passes naturally through many different states and all of them are “natural,” and if the change itself, caused by wildfire, flood, and windstorm, is natural, then what is its natural state?

And how can restoration that involves such disturbance occur without damage to human life and property?

Can we restore an ecological system to any one of its past states and claim that this is natural and successful restoration?

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The major tenets of a belief in the balance of nature are as follows:

- Left undisturbed, nature achieves a permanency of form and structure that persists indefinitely.
- If it is disturbed and the disturbance is removed, nature returns to exactly the same permanent state.
- In this permanent state of nature, there is a “great chain of being,” with a place for each creature (a habitat and a niche) and each creature in its appropriate place.

These ideas have their roots in Greek and Roman philosophies about nature, but they have played an important role in modern environmentalism as well.

# What Is Usually Restored?

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Ecosystems of all types have undergone degradation and need restoration.

However, certain kinds of ecosystems have undergone especially widespread loss and degradation and are therefore a focus of attention today.

# Rivers, Streams, and Wetlands Restoration: Some Examples

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Rivers and streams and wetlands probably are restored more frequently than any other systems. Thousands of streams have been degraded by urbanization, agriculture, timber harvesting, and channelization (shortening, widening, and even paving over or confining the channel to culverts).

## Applying Ecological Knowledge to Restore Heavily Damaged Lands and Ecosystems

An example of how ecological succession can aid in the restoration (termed reclamation for land degraded by mining) of heavily damaged lands is the ongoing effort to undo mining damage in Great Britain, where some mines have been used since medieval times and approximately 55,000 hectares (136,000 acres) have been damaged. Recently, programs have been initiated to remove toxic pollutants from the mines and mine tailings, to restore these damaged lands to useful biological production, and to restore the attractiveness of the landscape.

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One area damaged by a long history of mining lies within the British Peak District National Park, where lead has been mined since the Middle Ages and waste tailings are as much as 5 m deep. The first attempts to restore this area used a modern agricultural approach: heavy application of fertilizers and planting of fast-growing agricultural grasses to revegetate the site rapidly. These grasses quickly green on the good soil of a level farm field, and it was hoped that, with fertilizer, they would do the same in this situation. But after a short period of growth, the grasses died. The soil, leached of its nutrients and lacking organic matter, continued to erode, and the fertilizers that had been added were soon leached away by water runoff. As a result, the areas were shortly barren again.

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When the agricultural approach failed, an ecological approach was tried, using knowledge about ecological succession. Instead of planting fast-growing but vulnerable agricultural grasses, ecologists planted slow-growing native grasses, known to be adapted to mineral-deficient soils and the harsh conditions that exist in cleared areas. In choosing these plants, the ecologists relied on their observations of what vegetation first appeared in areas of Great Britain that had undergone succession naturally. The result of the ecological approach has been the successful restoration of damaged lands.



# Criteria Used to Judge the Success of Restoration

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Criteria used to evaluate whether a specific restoration has been successful, and, if so, how successful, will vary, depending on details of the project and the target (reference) ecosystem to which the restoration is compared. Criteria used to judge the success of the Everglades restoration (with issues of endangered species) will be much different from criteria used to evaluate the success of naturalization of an urban stream to produce a greenbelt. However, some general criteria apply to both.

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- The restored ecosystem has the general structure and process of the target (reference) ecosystem.
  - The physical environment (hydrology, soils, rocks) of the restored ecosystem is capable of sustainably supporting the stability of the system.
  - The restored ecosystem is linked with and appropriately integrated in to the larger landscape community of ecosystems.
  - Potential threats to the stability of the restored ecosystem have been minimized to an acceptable level of risk.
  - The restored ecosystem is sufficiently adapted to normally withstand expected disturbances that characterize the environment, such as windstorms or fire.
  - The restored ecosystem is, as nearly as possible, as self sustaining as the target (reference) ecosystem. It therefore undergoes the natural range of variation over time and space; otherwise it can not be selfsustaining.

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In the final analysis restoration broadly defined to include naturalization, is successful if it improves the environment and the well-being of the people who are linked to the environment. An example is development of city parks that allow people to better communicate with nature.