

# When and Where to Actively Restore Ecosystems?

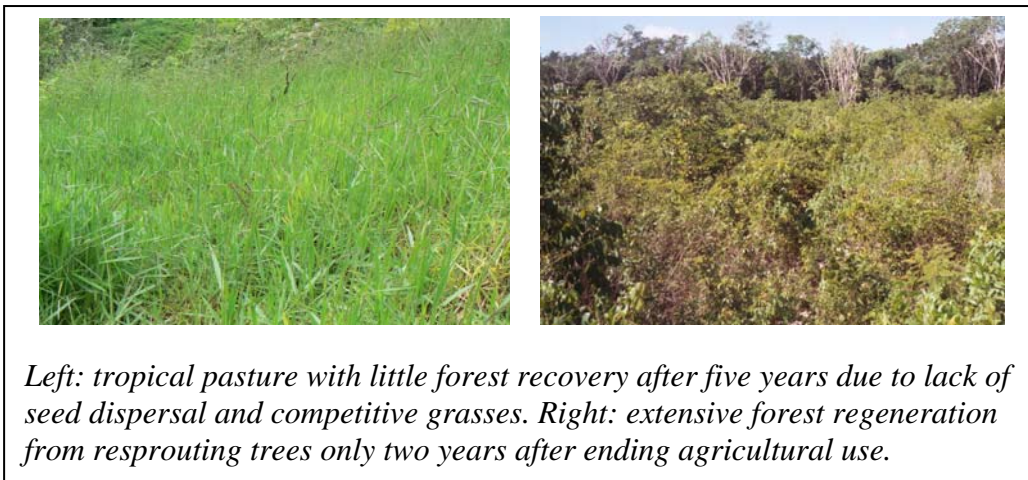
## Strategically Planning Restoration can Result in Better Outcomes and Cost Savings

Dr. Karen D. Holl  
University of California, Santa Cruz

Dr. T. Mitchell Aide  
University of Puerto Rico

### ISSUE

- Conservation efforts are increasingly focusing on restoring degraded lands to provide ecosystem services and biodiversity given the large areas of degraded lands worldwide.
- Some ecosystems naturally recover rapidly from human disturbance, whereas in other cases degraded areas may show little recovery without human intervention.
- Resources for restoration are limited, which means that land managers should carefully consider to what extent to actively restore ecosystems.



### FACTORS TO CONSIDER IN CHOOSING A RESTORATION APPROACH



*The degree of intervention ranges along a gradient from passive restoration (no human action) to active restoration (e.g. restoring the topography, seeding and/or planting trees). Several factors should be considered in selecting a restoration strategy*

- *Ecosystem resilience.* Ecosystems vary a greatly in how fast they recover naturally depending on their adaptations to disturbance, such as whether the plants can resprout and the rate of growth.
- *Past land-use.* Sites that have been used for longer time periods and more intensive past land-uses (e.g. cattle grazing, large-scale agriculture) recover more slowly.
- *Surrounding landscape.* Nearby remnant forest patches can serve as sources of seeds that speed up natural recovery and trees in the agricultural land uses facilitate movement of seed dispersers.
- *Goals.* Land managers should clearly identify ecological and social goals of restoration projects.
- *Resources.* Funding and labor available for restoration should be considered.

## QUESTIONS TO GUIDE SELECTION OF A RESTORATION STRATEGY

*If we take a passive restoration approach, what results do we expect?*

- Visiting nearby sites, reviewing the literature, and waiting a few years to assess natural recovery can help to answer this question.

*If intervention is necessary, how and when should we intervene to achieve the project goals?*

- Minor restoration actions (e.g. eliminating grazing, controlling fires) may be sufficient to initiate or accelerate the natural regeneration process in systems where there are sources of plants and animals within the site or nearby. In such case, extensive intervention (e.g. using heavy machinery to recontour the site, planting trees) is not only costly, but also may actually slow natural recovery.
- Early-successional, common species often naturally colonize moderately disturbed systems. In such cases, restoration efforts should focus on introducing rare species once appropriate site conditions have developed.
- In highly degraded systems (e.g. former mines, eroded cattle pastures), intensive restoration efforts, such as planting or seeding, are often necessary to facilitate recovery of the ecosystem.

*At a landscape or regional scale, how can restoration resources be used most efficiently?*

- Where public funding is involved, the relative merits of several projects should be compared at a regional scale to most efficiently allocate funding.



*Left: naturally regenerating forest in the Dominican Republic.*

*Right: a 5-yr old former coffee planted with trees to restore forest.*

## SUMMARY

Understanding the natural recovery process of a given ecosystem and evaluating the goals and resources available for a restoration project, prior to selecting a restoration strategy will result in a more efficient use of restoration resources both within and among projects and should maximize the success of restoration efforts.

For a more detailed discussion see K. D. Holl and T. M. Aide. 2011. When and Where to Actively Restore Ecosystems? *Forest Ecology and Management* 261: in press. To request a copy contact Dr. Karen Holl, [kholl@ucsc.edu](mailto:kholl@ucsc.edu).