A Primer on Forest 'Rehabilitation': Quoted remarks (various)

What's so special about forests?

"The world's forests provide many important benefits: Home to more than half of all species living on land, forests also help slow global warming by storing and sequestering carbon. Forests are sources of wood products. They help regulate local and regional rainfall. And forests are crucial sources of food, medicine, clean drinking water, and immense recreational, aesthetic, and spiritual benefits for millions of people. Yet, in many parts of the world, forests are being rapidly cleared for agriculture or pasture, destructively logged and mined, and degraded by human-set fires. The clearing and destructive logging of forests is the single greatest cause of species extinction worldwide. It is also the source of one-fifth of humankind's annual emissions of carbon dioxide, the most important greenhouse gas. Under current trajectories, most of the world's remaining large tracts of intact, biodiversity-rich forests -- from the Amazon Basin and Indonesia to Maine and Alaska -- will be gone by mid-century" -- The Union of Concerned Scientists.

Definitions:

Afforestation: Planting of new forests on lands that have not been recently forested.

Reforestation: Replanting of forests on lands that have recently been harvested.

Deforestation: The removal of forest stands by cutting and burning to provide land for agricultural purposes, residential or industrial building sites, roads, etc., or by harvesting the trees for building materials or fuel.

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"Ecosystem conservation that is oriented toward preserving small representative samples of various vegetation and habitat types--the familiar living-museum approach (Noss and Harris 1986)--does not address the problem of habitat fragmentation. Small, isolated samples of ecosystems will be depauperate from species-area effects, edge effects, and other problems associated with habitat fragmentation (Noss 1983; Harris 1984; Wilcove et al. 1986; Wilcove 1987; Noss and Csuti 1994). Preservation of species composition and integrity in these areas--even if they are rich in species at the time of establishment as reserves--cannot be expected. Successful ecosystem conservation must emphasize protection of large, interconnected landscapes (Noss 1983, 1992). In heavily fragmented regions, the sizes of reserves may be gradually enlarged by protecting and restoring adjacent lands. A long-term goal should be the reestablishment of natural connections between reserves. In all these cases, ecological restoration plans must be a primary component of conservation. Although restoration ecology is not yet a well developed science, degraded ecosystems should not be dismissed as lost causes." (Endangered Ecosystems of the United States: A Preliminary Assessment of Loss and Degradation,Reed Noss,Edward T. LaRoe III, J. Michael Scott, http://www.google.com/url?sa=U&start=1&q=http://biology.usgs.gov/pubs/ecosys.htm&e=10313)

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"Large areas of the world's forest have been degraded. Some degraded ecosystems are able

to recover naturally but many do not. There may be various reasons for this. In some cases it is because too few of the original plant and animal biota remain at the site or because pests and weeds have colonised the site. In other cases some component of the biophysical environment such as soil fertility has changed or repeated disturbances prevents successional development occurring. Even at sites where natural recovery is able to take place, however, the process may be slow. This increases the chance of further disturbances reoccurring and degrading the site even more. For these reasons human intervention may be needed to either initiate the recovery process or to accelerate the rate at which it proceeds.

A variety of approaches might be used. These range from those where the objective is to restore the original ecosystem and recover the former biodiversity through to those where the aim is to simply use the site for some productive purpose such as agriculture. These different approaches have fostered a confused terminology. A distinction is made here between restoration and rehabilitation. **Restoration is used only for those situations where the intent is to recreate an ecosystem as close as possible to that which originally existed at the site.** The site then contains most of the original plant and animal species and has a structure and productivity matching that originally present. (There is some doubt whether Restoration, as defined above, is ever possible, especially at sites that have been used or managed by humans for long periods of time. However, it is usually feasible to attempt to recreate species-rich systems that resemble the composition and structure of the originally communities).

Rehabilitation, on the other hand, is used where the original productivity or structure is regained and some, but not all, of the original biodiversity. This might be because commercial imperatives demand certain agricultural or timber species be included to justify the rehabilitation effort or because the site is now unsuitable for some of the original species. The term **Reclamation is used for those situations where productivity or structure is regained but not much biodiversity**. In fact, native species may not even be used at all. In such cases there are no (or few) benefits to regional biodiversity but there may be social or economical advantages or functional gains such as in improved watershed protection. The three approaches differ in the extent to which they enable the original biodiversity to be regained. The approaches are similar, however, in that they all seek to establish a productive and stable new land use." Source *David Lamb, "From local changes to landscape changes: how to restore degraded landscapes as well as degraded lands?*" (Emph. Added **-- See attached.**)

Further in the same article some of the **difficulties of type and scale** are noted:

"It is comparatively simple to treat small areas of degraded land but more difficult to address land degradation at a landscape level. This has been referred to as the paradox of management – one can most easily create an effect at a small scale but success only comes from changes over a large scale. There are obvious financial and resource difficulties involved but there are also some other problems. These usually involve a mix of biophysical and socioeconomic factors. Four key questions are:

(i) **How much land must be treated to obtain a benefit?**
This obviously depends on how much of the landscape is degraded (and how much is already protected in some way). In some situations it might be desirable to rehabilitate as much of the landscape as possible (e.g. when salinity is widespread or where overall biodiversity is severely threatened). In other cases it might be appropriate to treat only certain key areas (e.g. areas of severe erosion or the habitats of threatened species)

(ii) **Which land in the landscape should be treated?**
In some cases this is socially determined (e.g. the only land available for treatment is that not wanted for agriculture such as steep hill slopes or areas with poor soils). In some cases it is economically determined (e.g. the land chosen for treatment is that which is most – or least – severely degraded). Or it may be ecologically determined such as buffer strips along rivers, corridors between patches of residual forest or erosion-prone areas. These are important because of the significance they have for limiting erosion or for facilitating the movement of plants or animals across the landscape.

(iii) **How many species should be used?**
It is difficult to reestablish all of the original plant species at a site. But we have only an imperfect knowledge of the relationship between diversity and ecological function. Are all species needed to restore ecological function? Must a certain minimum be used to cross some kind of ecological threshold? Or is the types of species used that is the crucial factor? These questions are currently the subject of ecological research in many parts of the world.

(iv) **What are the consequences of different forms of diversity**?

Diversity can be assessed at several scales. For example the numbers of species can be measured in a particular area (e.g. one hectare) or as the cumulative number present across a large landscape. Which measure of diversity has the greater ecological significance? The question can be posed in terms of two alternative forms of plantation – a mixed species plantation involving three species or three separate monoculture plantations of the same species spread over the same area. The latter format is obviously easier to manage than the former. At present we do not know the answer to this question although it is probably depends on what ecological function is being targeted (e.g. erosion protection? Habitat creation? Salinity reduction, etc.)."
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"Forests are critically important for wildlife habitat, clean water and air, stable climate, resources such as timber, recreational opportunities, and spiritual renewal. When practiced sustainably, forest management can be a very positive land use, providing ecologically sound and renewable resources, while also maintaining the forest's other attributes. It can help save the environment by **creating value in standing forests that might otherwise be converted to non-forest uses, such as agriculture, in order to yield an economic return**. Many environmental groups think that timber management is most appropriate when practiced in non-endangered and second-growth forest types, and that it should be discouraged in the earth's remaining pristine, old-growth, and endangered forest types, which should be protected instead.

Despite forestry's inherent potential as an ecologically desirable form of land use, poorly managed logging operations can also have **serious ecological impacts**, such as:

· depletion of high-quality timber inventories, including larger, older trees and
favored species;
· over-simplification of forest structures and composition necessary for proper
ecological functioning;
· clearing of diverse natural forests for conversion to ecologically impoverished tree farms;
· degradation of water and soil quality;

· loss of wildlife species, as well as endangered, old-growth and high conservation value forests types;
· boom and bust cycles of development that do not support stable jobs and communities;"

http://www.fern.org/pubs/reports/behind/btlrep.pdf

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"**Reforestation Issues**

Small-scale reforestation programs are often a viable development option. They can, however, have **adverse environmental effects**, including:

- **Loss of local biodiversity, including useful niche species**
- **Introduction of exotic or non-native tree species**
- **Use of agrochemicals on tree plantations**
- **Conversion of natural forest to tree plantations**
- **Disruption of local communities' current land uses**

Potential Environmental Impacts

Biodiversity conservation. Plantation programs that establish an extensive area of monoculture (planting with a single species) may offer certain benefits, such as restoring protective forest cover and producing valuable timber and non-wood forest products. Typically, however, such **plantations are spread across an area without regard for its basic topography**. Native plants suited to special locations—such as stream bottoms, ravines, or niche habitats for wildlife conservation—can be disturbed or destroyed. Plantations also use exotic tree species (e.g., Eucalyptus spp.) in lieu of disappearing local species with lower short-term economic value. For example, Eucalyptus are often planted on degraded lands, as well as on slopes and ridges that lack topsoil, in the hope that they will restore soil quality, prevent erosion and generate quick economic returns for impoverished families. Unfortunately, these species neither prevent erosion nor restore soil quality.

The Dilemma of Exotic Species. No discussion of the effects of these activities would be complete without addressing the controversy over the use of exotic species. Typically, concerns are voiced about their replacement of local species that may be disappearing.

An outright ban on the use of exotic species for plantations makes little sense and sets a disturbing precedent—after all, many agricultural crops are, in effect, "exotic species." Nevertheless, project planners should examine whether a local species might be used with the same success to produce the desired commodities, quickly and at a reasonable cost, and thereby meet the needs of the local people.

Plantations and agrochemicals. Like their counterparts in agriculture, single-species forest plantations often require extraordinary measures to protect them from pests and diseases. These measures often have substantial materials and labor costs, require farmer training, and pose serious toxic risks. On degraded sites, efforts to increase

productivity may also require the use of fertilizer, which could lead to non–point source pollution (pollution from diffuse sources, often carried via runoff).

Conversion of natural forests. Reforestation programs can replace wood and other forest resources unsustainably harvested from threatened natural forests. The idea is to plant new forests on deforested or otherwise sparsely wooded terrain. **Unfortunately, strong promotion and extension efforts, or attractive reforestation incentives, may encourage these programs to also convert secondary natural forests (which have already been harvested or high-graded) into tree plantations**. **This should be avoided, since *managing an existing natural forest often costs less than starting and maintaining a new plantation* and provides a wider range of environmental benefits. "**

http://www.encapafrica.org/EGSSAA/current_EGSSAA_sections/EGSSAA-Pt2Ch07-Forestry.pdf

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Guidelines for Reforestation Projects

• Don't replace natural forests (even secondary forest).
• Consider the effect of reforestation on all existing uses of the land.
• Prefer native to exotic species.
• Avoid large blocks of monoculture; leave natural vegetation in special areas
• Stagger ages of different planted areas
• Make it easy to transport timber without eroding soil
• Include firebreaks and access to fire equipment as needed
• Use soil conservation measures when clearing land for planting
• Close off degraded marginal slopes
• Use integrated pest management; follow USAID guidelines if applying agrochemicals

Sector Program Design—Some Specific Guidance

Using reforestation and plantation technology can be exceedingly complex and costly. It involves many steps, from seed collection and nursery production to plantation protection and maintenance. To make a project as sustainable as possible, planners need to consider these critical elements: **(1) site/species match; (2) genetic selection of seed source; (3) site preparation; (4) timely planting; (5) weeding; and (6) protection from fire and grazing animals.**

Projects can help avoid environmental damage by following these guidelines:

Plantations should not replace natural forests, not even secondary forests that have already been harvested or high-graded.

Reforestation plans should consider the effects they may have on the land-use mosaic of the area around the plantation, including impacts on natural forests, biodiversity conservation and alternative land uses.

Native species should be preferred to exotic species. Any exotic species should be fully

tested in an introductory trial under conditions similar to those at the site, to ensure its adaptability and avoid introducing noxious weeds.

Every effort should be made to **avoid large-scale, contiguous blocks of monoculture plantations**. Site planning should take into account natural topography—such as ridges, valleys and the margins of watercourses—and, where possible, leave natural corridors of native vegetation suited to such areas.

To enhance the plantation's robustness, **include areas of different ages** to spread out the eventual impact of harvesting.

The plantation's layout should make it easy to transport harvested timber without causing soil erosion or siltation in adjacent watercourses.

In areas that are prone to wildfires, the forest layout should include firebreaks and provide access for fire equipment.

To forestall soil degradation and hydrological problems from clearing land for planting, the design should include:

o contour planting or bunding (making earth embankments that follow the contours of the land; intended to hold soil and moisture on medium slopes)
o buffer strips of native vegetation, and/or gully plugging (constructing a series of barriers in a gully to prevent erosion).
o On steep and marginal slopes in need of rehabilitation, close the area to protect it from fire, grazing animals and illicit tree cutting. It is more cost-effective, per unit area treated, to let the vegetative cover grow back naturally rather than reforest the area. If vegetative cover does not regenerate, other lower-cost options include direct seeding, use of cuttings, and bare-root planting stock.
o All use of agrochemicals should conform to USAID regulations and every effort should be made to foster integrated pest management approaches.

http://www.encapafrica.org/EGSSAA/current_EGSSAA_sections/EGSSAA-Pt2Ch07-Forestry.pdf