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The Need For Ecological Mangrove Restoration (EMR)

Submitted by Mangrove Action Project
July 4, 2011

Prologue

Mangrove Action Project (MAP) is now actively pursuing an innovative and collaborative ***Ecological Mangrove Restoration and Training (EMR) program.*** This project is slated to take place in both Latin America and Asia over a three to five year timeframe and will train and engage mangrove forest communities in conserving, restoring and maintaining coastal mangrove forest ecosystems. Restored mangrove forests will provide flora and fauna habitat, restored fisheries, local sustainable income opportunities, shoreline protection, increased carbon sequestration and protection from sea level rise and climate change-induced weather events.

Background

Mangrove forests are vital for healthy coastal ecosystems in many regions of the world. They support an immense variety of sea life in intricate food webs associated directly with the mangrove trees themselves. They are both nursery and refuge for juvenile fish, crabs, shrimp and mollusks. Mangroves are also prime nesting and feeding sites for hundreds of migratory bird species. Additionally manatees, crab eating monkeys, Bengal tigers, fishing cats, sea turtles and Mud Skippers utilize and depend upon mangrove wetlands.

One particularly noteworthy feature coming into prominence today is that healthy mangrove forests play an important role in carbon sequestration—their ecosystems and corresponding wetlands account for nearly a third of the world's terrestrial carbon stores (Ramsar Secretariat 2002). Intact mangroves also form a natural coastline buffer against floods, storms or other natural disasters such as tsunamis and hurricanes. Beyond these irreplaceable ecosystem services, mangroves also provide important socio-economic benefits to coastal communities. In regions where the forest has been destroyed, local rural communities are left without traditional livelihoods and shelter. Conservation and restoration programs in these areas would therefore sustain and rebuild this protection and increase the potential for sustainable development. Moreover, since mangroves sequester carbon from the atmosphere, this approach will contribute to climate change mitigation through avoided destruction and restoration of ecosystems. The improvement of mangrove ecosystems will also enhance its function as a natural water treatment system and spawning grounds for fish, improving health and fishing possibilities, further benefiting marginalized local communities otherwise dependent on seafood for their protein diet.

In spite of those important functions, more than 50% of the global mangrove forests have been destroyed over the last 100 years, most of this loss occurring in the last 30 years, mainly caused by human development, especially from shrimp aquaculture expansion along the coastlines of tropical and subtropical nations. Tourism, oil exploitation, urban and agricultural expansion, dam building, port construction, mining and water pollution all contribute to the rapid rate of mangrove losses we are witnessing worldwide today. In addition to anthropogenic threats, mangrove ecosystems, coral reefs, sea grasses and salt marshes are vulnerable to negative effects caused by climate change such as rising sea levels, higher temperatures and natural disasters.

Despite the increasing intensity of these threats and the realization of the intrinsic value of what we are losing, very few organisations so far have dealt effectively with mangrove conservation and restoration, and relatively few experiences exist demonstrating successful, long-term mangrove rehabilitation. Moreover, adaptation to

change and increased disaster risk via cost-effective natural coastal buffers such as mangroves is a relatively new concept and relies on ecosystem services instead of engineering technologies and hard infrastructures to reduce the severity of disasters. Additional benefits for biodiversity and the livelihood of marginalized rural communities are accrued by effective conservation and restoration programs. Though successful restoration projects are still rare, Ecological Mangrove Restoration holds much promise in ensuring restoration of a more biodiverse, resilient mangrove wetland. Early successes in EMR, though still small-scale, can then be replicated to restore mangroves in other communities, regions or countries.

Why Ecological Mangrove Restoration?

The Ecological Mangrove Restoration concept that MAP now promotes is based upon the work of MAP board member, R. Robin Lewis lll, who has been perfecting this technique for over 30 years. EMR is based upon a set of basic ecological principles capable of restoring a much more naturally functional and biodiverse mangrove ecosystem when compared to other more capital and labour intensive methods such as hand planting alone. This practice of hand planting propagules and seedlings has been aptly described as the "gardening method," whereby monoculture plantations of usually one or two varieties of mangrove are established. In tropical areas where there may be two or more dozen mangrove species, it makes little sense to label this "gardening" approach as "restoration" because the natural biodiversity and productivity (ie resilience) of the original healthy mangrove forest is not an outcome of this simplified technique. Too often, due to short-sighted economic reasons and established forestry practices favouring pole or charcoal production, single species mangrove plantations are established- most commonly planting the rhizophora or "red" mangrove species, which are easiest to plant by hand and raise in nurseries. One reason for this is that specific species can produce more desirable wood products that can be sold on local markets and therefore improve the livelihood of the people living in the surrounding communities.

A major and often fatal fault with these plantations, other than the fact that they are monocultures, is that they are too often established in mud flats, salt flats and even sea grass beds, thus converting one viable and important ecosystem into another, which is not a wise solution when attempting to "restore" ecosystem functions, even if these projects do successfully establish some mangroves. Most often, these "gardening" efforts are aimed at economic objectives, but fail to establish any significant mangrove cover (Lewis 2005, 2009, Sampson and Rollon 2008). A compromise between economic value and biodiversity must be found. The EMR approach can be a first step to re-establish an ecosystem that benefits nature and livelihoods at the same time, while producing a more resilient natural ecosystem capable of surviving the increasing vagaries evident today on a planet in transition due to human-induced climate change.

Despite their ecological and economic significance, mangrove forests are in severe decline around the world. For instance, in a recent study compiled for the IUCN's Red List of Threatened Species, 40% of the mangrove species present in Central America are severely threatened. This makes the region one of the most vulnerable in the world to species extinction, and ultimately irreversible forest loss. Globally, major pressure is exerted on these ecosystems and their unique biodiversity by human activities, including coastal development, modifications for aquaculture and fuel wood consumption. Many of these pressures are mounting unabated, and government authorities lack the capacity or resources to ensure the protection and sustainable use of rapidly dwindling mangrove forests.

Even designated areas of protection and conservation are being encroached upon and degraded, such as the recent incursion of shrimp farm establishment in the 1,000th Ramsar wetland site of international importance in the Gulf of Fonseca, Honduras. Jorge Varela of CODDEFFFAGOLF personally documented extensive illicit clearing of mangroves in this so-called "protected" area last year.

An EMR Training Workshop in Jiquilisco Bay- Along the Mangrove Corridor

Partnering with EcoViva and the Mangrove Association of El Salvador, MAP is planning an EMR training workshop at Jiquilisco Bay in El Salvador from July 11-14, 2011. Similar to its neighbors, El Salvador exhibits an increasingly dense population and rapidly diminishing forest resources. Only 2% of its national territory still retains primary natural forest cover, one of the lowest levels in the world. To address these trends, El Salvador has enacted legal measures to protect remaining upland forests and mangroves under the nation's Environmental and Protected Areas laws. Despite these protections however, government enforcement schemes have been largely ineffective, and mangroves continue to face overwhelming pressure from an encroaching population and unregulated development. Severely inhibited by limited staffing and resources, public agencies tasked with overseeing forest conservation are simply unable to ensure their protection. Turning instead to the civil society and non-government sector, government authorities rely on outside entities to manage the country's natural resources. This method of delegating management authority, known as "co-management," is common throughout Central America, and often disregards the necessary training, knowledge and long-term support that local organizations need to carry out their responsibilities as effective forest managers. In El Salvador, 84% of intact forests and mangroves are protected by "co-managers" - largely local organizations with limited institutional capacity.

This initiative will provide scientifically-proven techniques in Ecological Mangrove Restoration, offered to a wide array of institutions active in the management of mangroves and their sustainable use in Central America. It will also target the formation of a network of restoration practitioners among "co-managers", including government, non-government, academic and local community-based organizations. Many of these stakeholders currently enact various mangrove conservation and sustainable management initiatives, but do so in isolation and without proper training or institutional support. Spanning the length of Central America's Tri-National Mangrove Corridor through the Pacific coast of El Salvador, Honduras and Nicaragua, this network will provide a venue to further the knowledge and training necessary to more effectively manage mangrove ecosystems well beyond the period of this project. It will likewise institute a more coordinated, multi-stakeholder approach to mangrove protection, providing greater opportunities for collaboration in order to work effectively with government authorities in implementing existing forest and mangrove policies.

This EMR training workshop at Jiquilisco aims to rehabilitate coastal mangrove forests, thereby safeguarding those endangered ecosystems and generating sustainable income opportunities for rural communities, while simultaneously offering protection against hurricanes and storm surges. The project also aims to improve the disaster management capacities of local rural communities living in the vicinity of mangrove forests. Through adequate mangrove management and restoration measures, a protective shield against natural disasters will be maintained and respectively rebuilt. The mangrove restoration will be based upon Ecological Mangrove Restoration*[1] emphasizing the importance of biodiverse forest ecosystems, which is in accordance with the proclaimed UN International Year of Forests in 2011.

To ensure the success and the longevity of the project, local communities will be directly involved in the conservation and restoration of mangrove ecosystems, as well as involved in forming sustainable solutions that will benefit them directly. With the restoration, the natural functions of the mangrove ecosystem will be revived. Water quality, health and fish fauna will be improved and new income opportunities will be created, positively affecting the livelihood of the rural communities. As well, mangrove conservation and restoration will ensure that additional carbon will be sequestered and stored, thus contributing to climate protection. According to UNEP's recent "Blue Carbon" report:

"Coastal ecosystem services are worth an estimated US$25,000 billion annually. Blue Carbon sinks (coastal ecosystems such as mangroves, salt marsh and seagrass) store approximately 235–450 Tg C every year, the equivalent of up to half of the emissions from the entire global transport sector (1,000 Tg C yr–1) and 3–7% of total anthropogenic emissions (7,200 Tg C yr–1)."

Over the course of the five program, the EMR methods that will be implemented in selected pilot projects at the Bay of Jiquilisco in El Salvador will be followed by others in Honduras, Nicaragua, Mexico, Cambodia, Bangladesh and/or India. Each EMR workshop will involve training of core groups of restoration practitioners for the region who will exchange their views and experiences on how to best implement an EMR project. Following the training workshop, the participants will have the opportunity to put into practice the main points of EMR by working on one or more small-scale interactive restoration projects in the vicinity of the workshop itself, learning the necessary skills to implement EMR directly in the field.

In this next step, working together with local mangrove ecologists and selected local community members, suitable sites for pilot projects will be identified and a hands-on EMR restoration project of 5 ha or more will be undertaken. This will further hone the EMR skills of workshop participants, while bringing in motivated local community participation to the restoration process itself, which is vital to the long-term objectives of EMR. The chosen sites will then become the demonstration sites for EMR. Monitoring and further assessments both on and off site would follow for three to five years, and these sites could then be part of a set of model sites for EMR that can showcase the techniques. To assess the project's success, baseline data at the restoration sites would be measured before the projects commence, and at intervals of from three to six months for a three to five year period following the restoration to test for natural seed recruitment, biodiversity, water quality, soil accretion or erosion, plant and associated fauna health, etc.)

Involving Local Communities

Beneficiaries of the EMR Program are the local communities in El Salvador and other selected country sites who inhabit the coastal areas most impacted by the loss of mangrove forests and consequent loss of their livelihoods. Members of these communities will be trained and directly involved in the conservation, restoration and management of local mangrove ecosystems, as well as involved in forming sustainable solutions such as alternative, supplemental livelihoods that will benefit them directly.

Web Sites and Literature Cited

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*NOTE: Ecological Mangrove Restoration Defined:

Ecological restoration has been defined as "the process of repairing damage caused by humans to the diversity and dynamics of indigenous ecosystems" (Jackson et al. 1995) Ecological Mangrove Restoration is a holistic approach to mangrove restoration that also includes a view of the proposed plant and animal community to be restored as part of a larger ecosystem with other ecological communities that also have functions to be protected or restored. EMR aims at the restoration of certain ecosystem traits and the replication of natural functions. It has been reported that mangrove forests around the world can self-repair or successfully undergo secondary succession over periods of 15-30 years if: 1) the normal tidal hydrology is not disrupted and 2) the availability of waterborne seeds or seedlings (propagules) of mangroves from adjacent stands is not disrupted or blocked (Watson 1928, Lewis 1982, Cintron-Molero 1992).

Because mangrove forests may recover without active restoration efforts, it has been recommended that restoration planning should first look at the potential existence of stresses such as blocked tidal inundation that might prevent secondary succession from occurring, and plan on removing that stress before attempting restoration (Hamilton and Snedaker 1985, Cintron-Molero 1992). The second step is to determine by observation if natural seedling recruitment is occurring once the stress has been removed. Only if natural recovery is not occurring should the third step of considering assisting natural recovery through planting be considered.

Unfortunately, many mangrove restoration projects move immediately into planting of mangroves without determining why natural recovery has not occurred. There may even be a large capital investment in growing mangrove seedlings in a nursery before stress factors are assessed. This often results in major failures of planting efforts.

Six Steps To Successful Mangrove Forest Restoration

In collaboration with communities, organizations and local government, MAP will work to:

1. Understand both the individual species and the community ecology of the naturally occurring mangrove species at the site, paying particular attention to patterns of reproduction, distribution, and successful seedling establishment.
2. Understand the normal hydrology that controls the distribution and successful establishment and growth of targeted mangrove species.
3. Assess the modifications of the mangrove environment that occurred and that currently prevent natural secondary succession.
4. Select appropriate restoration areas through application of Steps 1-3, above, that are both likely to succeed in rehabilitating a forest ecosystem and are cost effective. Consider the available labor to carry out the projects, including adequate monitoring of their progress towards meeting quantitative goals established prior to restoration. This step includes resolving land ownership/use issues necessary for ensuring long-term access to and conservation of the site.
5. Design the restoration program at appropriate sites selected in Step 4, above, to restore the appropriate hydrology and utilize natural volunteer mangrove recruitment for natural plant establishment.
6. Utilize actual planting of propagules or seedlings **only** after determining through Steps 1-5, above, that natural recruitment will not provide the quantity of successfully established seedlings, rate of stabilization, or rate of growth as required for project success.