Part III: ECOLOGICAL CONSIDERATIONS

Threats to the Watershed

Guiuan is blessed with large tracts of dense tropical forests. Much of the wooded area is found in the Timberland, a protected zone along the Pacific Ridge. This area contains some of the best examples of the natural diversity of plant life in Guiuan, however, many patches of diversity are found in areas to the west of the ridge in isolated sinks and hills of the Peninsula and outlying islands (Slide 23). Recognizing the value these intact landscapes have in protecting the watershed should prompt deliberate efforts for protection by local leadership. Threats to these ecologically significant areas are found throughout the rural areas. Small scale quarrying of the limestone to produce construction aggregate and larger stones is a common rural occupation. Clearing elevations or sink areas to expose the rich terra rosa for cultivation is also found throughout the municipality. Clearing is also necessary to provide for new relocation housing associated with the typhoon. Logging of old growth trees in the higher elevations was also observed during the survey.

The use of these natural resources is intimately related to the livelihood of rural residents and competes with preservation efforts. Creative strategies should be promoted among the local citizenry to increase awareness of the value that these diverse areas have and the long-term benefits they provide in the larger picture of a sustainable and resilient landscape. Necessarily, these strategies should balance the reality of increased disturbance both natural and anthropogenic and the needs of the residents to make a living. Many residents in the areas surveyed have an intuitive understanding of the importance of having healthy plant life above the watershed and the environmental services it provides. They have an appreciation of the natural beauty that is inherent in their unique, diverse and self-sustaining landscape and understand that it helps to ensure a healthy water table and fresh water supplies. When they

understand the full worth that these natural areas have, they will hopefully provide the innovation and leadership to preserve them. When landscapes undergo a severe disturbance as in the case of a super typhoon, in nature's design there are mechanisms to recover. Much of the vegetative cover was stripped bare by Yolanda and in other cases uprooted, however, in a tropical environment, the regenerative process is accelerated. As is experienced near Mt. Pinatubo, even landscapes that once lay bare or covered by layers of ash, plant species re-colonize relatively quickly. In less than a decade, areas that seemed incapable of supporting life are once again verdant (Marler 2011).

In evaluating vegetative recovery after a disturbance, it is necessary to be able to distinguish between "pioneering" versus "invasive" species of plant. Invasive species are imported either deliberately or inadvertently by human activity, colonize an area, and choke out any attempt of other species to thrive. As is common in the Philippines, cogon grass and

kudzu are viewed as invasive and have growth patterns that eliminate competing species. In some cases, these species dominate because they are the only plants that can grow in the newly disturbed environment (Stilling 2002). Pioneering species on the other hand, are natives that exploit their new environment and are an essential part of the ecological principle known as forest succession. Pioneering species are the early colonizers of a disturbed ecosystem. They serve to stabilize the soil and prepare it for later succession of plant species that makes up the diverse and stable landscape (Brown 2005). Throughout the recovering landscape of Guiuan, there is ample evidence of this process taking place. Relatively speaking, the tropical forested areas were more resilient during the onslaught of Yolanda and are recovering quickly. Also, when there is a disturbance that upsets the ecological balance of the landscape, these sheltered and diverse patches provide a "seed bank" that will ensure there is a healthy variety of plant species to re-colonize the affected areas (Lin 2008).

Seeds originating from these diverse plant communities are transported by the wind or other means and establish themselves in the soil of the surrounding areas. The seeds either lay dormant in the soil or sprout and the small seedlings wait for clearance to grow. Fast growing shallow rooted species dominate at first and stabilize the soil for the slow growing, longer-lived species such as the hardwoods to take root and flourish. The climax species will be last to emerge as the dominate vegetation and crowd out the fast growing species as the forest reaches the last stages of natural succession (Stilling 2002). The species best adapted to the transformed environment will succeed at first and then later the gradual transition to the stable and resilient natural landscape will occur. Of course, this natural process can be, and is very often altered or accelerated by human intervention. One prominent example in Guiuan of such intervention is the replanting of the mangrove forests lost during Yolanda in the tidal margins to the south of the peninsula.

Also, there is ample evidence of the people of Guiuan taking advantage of the disturbance to the landscape in the cultivation of vegetable gardens among the fallen coconut trees. Also commonplace is the harvesting of fast growing ipil-ipil for many uses such as firewood and fencing (Slide 24). Invasive or pioneering, papaya trees also dot the landscape throughout Guiuan. Ipil-ipil is a small fast growing hardwood similar to the Mimosa.

Coconuts and Ecological Succession

The devastation of the coconut plantings by Yolanda throughout the area is a stark reminder of the effects of the storm (Slide 25). While coconut trees are ubiquitous though out the tropical latitudes worldwide, they are believed by some to be an invasive species imported by man. Native to Africa, studies have shown that coconuts are unable to survive the severe environment of the sea for long times and cannot self-propagate via the ocean currents as once was thought. Human intervention and the mastery of the sea by early settlers can best explain the wide distribution of the species in the tropics (Heyerdahl 1950). The first mass plantings of

coconuts in the Philippines were instituted by the Spanish to produce fiber to be used as ship caulking to support the Galleon trade between the Philippines and Mexico. The coconut industry in the Philippines started as a colonial crop forced on the natives by the Spanish Colonial Governor's edict in 1642, and later expanded by the American colonial administration to support foreign demand for coconut oil (PCA 2014).

The historical development of the Coconut Industry in the Philippines is a classical case study of how political and economic power of the developed world has had a detrimental effect on the livelihood of individuals in rural areas of the Philippines. The influences of the global economy are allied with the centralization by the national government of the control of raw material purchases and marketing abroad. Few benefits flow to the majority of the small coconut growers and the arrangement only serves to enrich a few powerful individuals.

Declining prices in the world market for coconut oil due to product substitution have exacerbated the inequalities (Boyce 1992).

By reducing the number of coconut trees, Yolanda has transformed the environment in many ways. Other than providing a plentiful source of needed lumber for rebuilding efforts (Slide 26), the storm reduced the number of invasive coconut palms and the need on the part of the coconut farmers to keep the understory clear of competing growth below. This expands dramatically the amount of resources in terms of nutrients, water, and sunlight available to native species that are now flourishing. The volunteer speculates that if the development of the landscape is left to nature's design, a stable, diverse forest may emerge, one similar to what may have existed in Guiuan before the arrival of humans. The wooded areas may contain a balanced and sustainable number of coconut trees along with hardwood trees as a climax species in a natural tropical landscape.

Despite the obvious vulnerability of the coconut to powerful storms, property owners are busy restoring their coconut plantations and groves in Guiuan post typhoon. Those actively involved in the replanting effort reported to the surveyor that a coconut tree planted today would start to yield fruit in10-12 years. Given the long-term commitment required for coconut production in terms of land and other resources, the vulnerability of the coconut to disturbance, and the scarcity of arable land in Guiuan, planners and local leaders may give alternative land uses a fresh look. In any case, the value that a stable and diverse ecosystem has in terms of environmental services, facts that the local leadership and residents are well aware, needs to be considered in land use planning. The more land devoted to coconut production the less land available for more productive and sustainable uses. The more land for the coconut means that the pressures on the remaining timberland by residents will increase.

In Guiuan, there is evidence that the effects of the typhoon are pressuring farmers into the higher elevations (Slide 27). This is the case as residents from the lowland areas are displaced and their new homes are located inland bordering the forest areas. Areas critical to watershed and recharge area protection are being cleared and cultivated. The slopes of hills and mountainsides bordering and contained in the Timberland are often areas not well suited to agriculture. Unfortunately, the local government does not have final say in the control and management of the public natural resources within the territory of Guiuan. Control of the protected timberland along the Pacific Ridge is exercised by the federal government. There is evidence that the forest conservation policy introduced in 1908 by the US Administration and evolved into the Forest Reform Code (PD No: 7051) is largely ineffective in protecting the forest (Reyes 1983).

Traditionally, lands such as the timberlands in the public domain have been regarded as a community resource and belonging to no one. Thus, taking the forest products or farming in public land for local subsistence agriculture has been tolerated. Generally, logging of the timberland ecosystem by human activity is protected by the steep grades and generally inaccessibility of the highlands, however logging of high-valued species reaches into the steep and remote locations. In sampling of two paths into the timberland, the surveyor found the paths terminate at felled old growth hardwood tree species. One of the trees was fresh cut as indicated by the fresh foliage. Whether the second tree was felled by Yolanda or fresh cut could not be determined. Like the abundant coconut lumber, a ready supply of hardwood for domestic purposes is available due to the typhoon disturbance. Groups of individuals can be seen with bundles of well-dried limbs, culled from among the storm debris. Once this windfall

source is depleted, and if a fast growing hardwood species such as ipil-ipil cannot keep up with demand, gathers may move into the slopes and higher elevations looking for fuel.

Promoting Reforestation

It is to the benefit of the people of Guiuan that they make best use of all its areas and to avail of the many resources of the ecosystem in a sustainable way. In the case of critical watershed areas, a realistic multiple use policy must be pursued while ensuring the adverse ecological effects are kept to minimum and acceptable levels. Areas, cleared of invasive or pioneering growth for agriculture could be interplanted with timber species that will eventually take over the area. Fast growing hardwood tree plantations under local control and management could allow for harvesting and immediate replanting, thus reducing the pressures on the existing natural forest areas both inside and outside of the publicly owned areas.

Whatever reforestation programs that currently exist or already being undertaken at the national and regional level should be promoted and accelerated by local leadership. Similar to the mangrove replanting in the coastal areas, the active replanting model should be applied to the elevated areas. In this way, local leadership can ensure that critical watershed protection, wildlife habitat, and natural beauty of the landscape be restored. Because of the potential of negative long-term effects on sustainability and resiliency, preservation and conservation efforts in critical recharge areas that are now undergoing natural regeneration should be a priority in the recovery efforts.