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Demonstrating Sustainable Community Forestry in Ecuador

Peter Pinchot, Senior Fellow

Ecuador's northern coastal plain is the epicenter of rapid deforestation in Ecuador. Over the last few decades, the rich coastal rainforests have been reduced to less than 10% of their original range, and they continue to diminish due to the rapid expansion of the agriculture frontier. The primary causes of deforestation are settlement by colonists who clear forests for small-scale agriculture and the rapid growth of industrial oil palm and cacao plantations, that clear large blocks of native forest each year.



The Chocó forest region, which is restricted to the coastal plain in northern Ecuador and southern Colombia, supports one of the most diverse plant communities in the world, with 20% of the plant species found only in this forest region. Most of the remaining forests, whether inside or outside of designated reserves, are inhabited by poor indigenous and colonist

communities, like Cristobal Colon, which are dependent on forest resources for their subsistence living.

The conservation strategy of EcoMadera is based on establishing an economic incentive for conserving forests by making sustainable forest management financially competitive with agriculture. To accomplish this, EcoMadera is evolving as a rapidly growing forest products company that practices sustainable forest management and produces wood products for export markets. By creating many new community jobs and providing families with a market for sustainably produced timber, EcoMadera is creating an economic alternative to pervasive forest exploitation. The goal is to build an enduring community enterprise which manages large areas of the land-

scape in a system of small reserves, managed native forests, forest plantations, and forest restoration projects. In order to provide this alternative, EcoMadera, like any new business, must become a well-run and profitable venture so it can attract investors and talented professionals and can provide new sources of local employment.

"The conservation strategy of EcoMadera is based on establishing an economic incentive for conserving forests..."

But the challenges are great: EcoMadera works in the midst of well-organized market forces that support forest exploitation. The watershed where the business operates is largely outside the rule of law. The forests are extremely diverse and poorly understood, and most of the timber species have poor markets. No conventional business in Ecuador has attempted to

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A century ago when the U.S. was still a developing nation, Gifford Pinchot asserted that forest conservation would be successful in the long term only where it was proven to be environmentally sound, economically viable, and socially responsible. As we are approaching the International Year of the Forest in 2011, the EcoMadera project is showing that this conservation philosophy applies in other developing nations as well, and demonstrating that sustainable forest management can be an environmental, economic, and social asset even to struggling rural communities in tropical forests. This is why it works. And it can work elsewhere. The Pinchot Institute—with the support

of key partners like the MacArthur Foundation, the Overbrook Foundation, the Switzer Foundation, and the World Land Trust—is committed to seeing the EcoMadera effort through to where there is no question that it can be self-sustaining, before turning its attention to replicating this model in other tropical forest communities. Yet the attention EcoMadera is attracting is steadily increasing its value as a learning tool for others who will take these lessons and apply them in other forests and other communities. Many thanks to Peter and his team, and to our many faithful and persevering partners in this important research and demonstration project.

— Al Sample

Demonstrating Sustainable Community Forestry in Ecuador

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address the challenges of deforestation in Ecuador's coastal plain. And with no economic incentives to work with, conservation NGOs have had very limited success in reversing deforestation. Both approaches are necessary concurrently. Consequently, EcoMadera has evolved as a hybrid social venture, part non-profit conservation project and part for-profit business enterprise.

The EcoMadera Business Enterprise

EcoMadera began in 2004 as a 100% community-owned wood products business with technical assistance support provided by two NGOs—the Pinchot Institute for Conservation and our Ecuadorian partner, Fundación Jatun Sacha. Funding for business infrastructure and working capital was provided largely by the founding investor, Peter Pinchot. By 2007, it had become clear to Pinchot, to the community shareholders, and to the NGO professionals that the existing community forestry business structure would not lead to a profitable venture that could meet the commonly held goals of conservation and community economic develop-

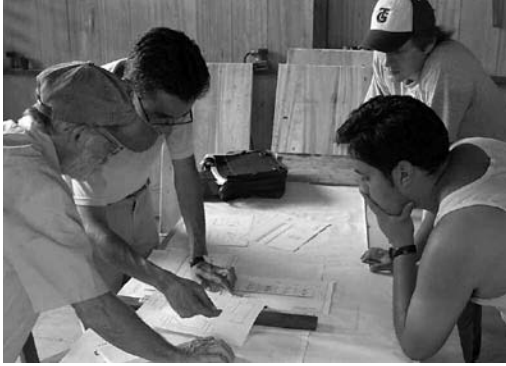
ment. It lacked the business leadership skills, capital, and experience necessary to launch a competitive wood products business. What was needed was a more conventional business structure with entrepreneurial leadership that could command the resources and innovation necessary to reach profitability and continued growth. Furthermore, the existing

community ownership structure specifically precluded outside investors, which was critical to accessing capital in order to expand.

To address these needs, the community shareholders agreed to enter into a new business structure, which would provide much greater potential for business success and for achieving



EcoMadera site map.



EcoMadera planning meeting.

the community goals. In spring of 2008, a new US corporation, EcoMadera Forest Conservation, LLC was founded, and a new Ecuadorian company, Verdecandé, SA, was established as a full subsidiary of the US LLC.

EcoMadera is still a community-focused business under this new structure, with the goals of forest conservation and community economic development. However, it is now led by two American entrepreneurs (Peter Pinchot and Garrett Seigers), it is managed by Ecuadorian professionals (including two community members), and is funded by outside investors. The original community forestry enterprise now acts as a stakeholder with a strong voice in major business and conservation decisions. The result is that EcoMadera is now constituted as an American social venture company, with the capacity to grow rapidly through access to capital, to address the complexity of demanding markets through professional management, and required to work closely with community leadership through continued local ownership.

Finding the right wood products for EcoMadera

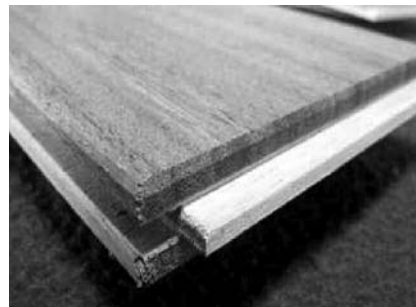
From 2004 to 2007 EcoMadera tried to establish a business producing and selling hardwood millwork products to Ecuadorian markets. EcoMadera sold dimensional lumber to secondary manufacturers and floor-

ing, doors, and cabinets to housing contractors. However, several factors made this venture unprofitable. There are well over 300 tree species in the watershed where EcoMadera operates, and very few are abundant.

In 2007, EcoMadera developed a strategy for utilizing many species by combining them into three-layered engineered flooring. The business produced samples, sent them to the US, and made a preliminary market tests demonstrated significant interest from housing contractors in Pennsylvania and New York City. Although a feasibility study suggested that it could be a profitable venture, it would require over \$1 million in financing to launch such a business.

EcoMadera decided to shift to an alternative, balsa wood laminates, as its first high-volume product. Balsa laminate production has several strong advantages. 1) It is a globally well-known species; 2) there is a large market of industrial uses that exists in every continent; 3) Ecuador is the world leader in production of balsa laminates; 4) the production technology is well-known and relatively simple; 5) the processing infrastructure is relatively inexpensive; and 6) the market is expanding, especially in China and India, where wind energy production (which uses balsa laminates) is growing very rapidly.

By refocusing its production on the balsa laminate market, EcoMadera



EcoMadera flooring boards.

would be able to establish a profitable business foundation that could demonstrate the basic business skills of cash flow management, managing employees, serving the needs of customers, keeping good financial records, paying taxes, working with investors, and servicing loans.

Gearing up for balsa laminate production: In 2008, EcoMadera began to upgrade its hardwood millwork facility to function as a manufacturing plant for balsa wood laminates. The original wood products plant had been built in 2003 as a US Peace Corps project, with limited funds and limited technical expertise. Every element of the plant had to be updated or replaced. A consultant designed several new pieces of equipment including a kiln furnace, a sawdust extraction system, and a block press. EcoMadera built new pre-dryers and made major improvements to the



Loading balsa boards into the kiln.

kiln, expanded the original production shop, made new roads for a forklift, imported Taiwanese and Brazilian wood-processing machinery, and installed a large diesel generator.

In January, 2009, EcoMadera began producing and selling balsa blocks to its first client, Balsaflex, a Spanish balsa laminate maker with a factory in Ecuador. The largest market for balsa wood is in the production of industrial composites that use balsa laminates as the core material in its sandwich structure. Balsa wood is in high demand because it is very light, yet very strong for its weight, due to a natural honeycomb cellular structure.



Wind turbines.

The strongest market now is the production of wind turbine blades, where its lightweight and strength make it the preferred material for the thinnest part of the blades, where strength is essential. Due to the very rapid growth of wind turbines, especially in China, demand for balsa laminates did not decline heavily in 2008, and by mid 2009 had recovered fully.

EcoMadera buys balsa in logs or in cants from small sawmill operators throughout much of the coastal plain, which are sawn into different dimensions in the plant in Cristobal Colon. They are then dried in the kiln, dimensioned with saws, planers, and jointers, and finally glued together in large blocks. These blocks are sold to Balsaflex, who then cuts the blocks across the grain with a bandsaw to produce end-grain laminates. These are exported to North America, Europe, and Asia. EcoMadera now has a stable client who wants all the balsa blocks that EcoMadera can provide. Thus EcoMadera's entrepreneurs have begun learning the most important fundamental of any business, how to manage cash flow, the lifeblood of any business, on a weekly and monthly basis. But by 2009, it became apparent that EcoMadera's production was severely limited by its kiln capacity. Despite a strong demand from the client, EcoMadera's average monthly production of balsa blocks was limited to about 20,000 to 25,000 board feet, which was well below the break-even point of the business.

Raising capital to expand the production facility: In order to become a profitable business venture, EcoMadera needed to raise a significant amount of capital to expand the balsa plant. In 2009, Peter and Garrett visited several balsa block facilities, talked extensively with the manager of Balsaflex about how to design better kilns and a more efficient plant, and developed cash flow models to understand how large the business needed to become in order to be viable. The new business plan called for a balsa plant that could reach five times its current production.

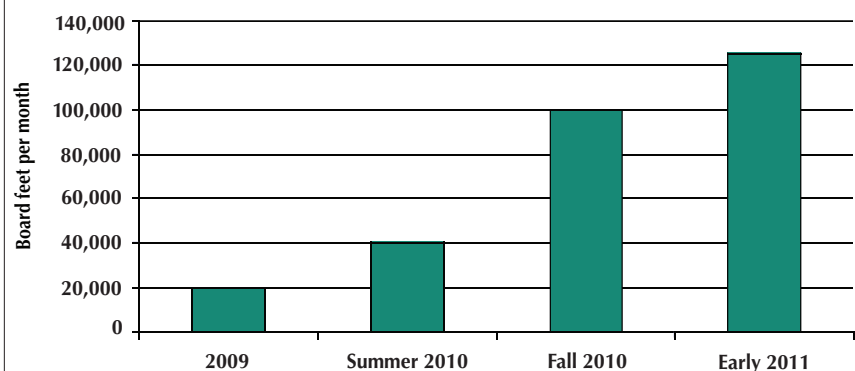
Just as EcoMadera set out to raise several hundred thousand dollars in loans or equity investment, the market crashed, and risk aversion became the watchword of creditors and investors. Throughout 2009, Peter Pinchot, as the entrepreneur, talked to banks, Program-Related-Investment (PRI) programs at foundations, social investor organizations, including Root Capital and the Calvert Foundation, international loan organizations such as the Overseas Private Investment Corporation (OPIC), and to several private equity investors. The key obstacles EcoMadera faced was that 1) the business had never produced a profit, 2) it was operating in a poor, developing nation with a high-risk profile, 3) it had an untested business management team, and 4) with a strong social mission, the busi-

ness could not project high enough returns on investment to appeal to many private equity investors. However, in March of 2010, with support from close family members, EcoMadera was able to secure two private loans totaling \$450,000. This investment allowed the business to start its Phase Two construction.

The plant, which includes a large steam boiler, three new kilns, a sawdust extraction system, a much larger shop facility, and high-volume production machinery, can produce 125,000 board feet of product per month, 5 times the 2009 production. As this new equipment becomes operational, it is expected that by November, the business will have generated sufficient revenues to reach profitability. After seven years of uncertainty, it is now becoming clear that the business will survive, and more than that, is poised to grow rapidly and profitably.

In 2004, EcoMadera employed 12 local technicians, most of whom were running chainsaws and working in the illegal timber supply chain before they were hired. EcoMadera now employs 29 people, and by 2011, we expect to have roughly 50 full-time employees in a watershed of 250 families. The key is that EcoMadera is providing employment to families that are desperately in need of income to meet their subsistence needs. These are people who will no

Balsa Monthly Production

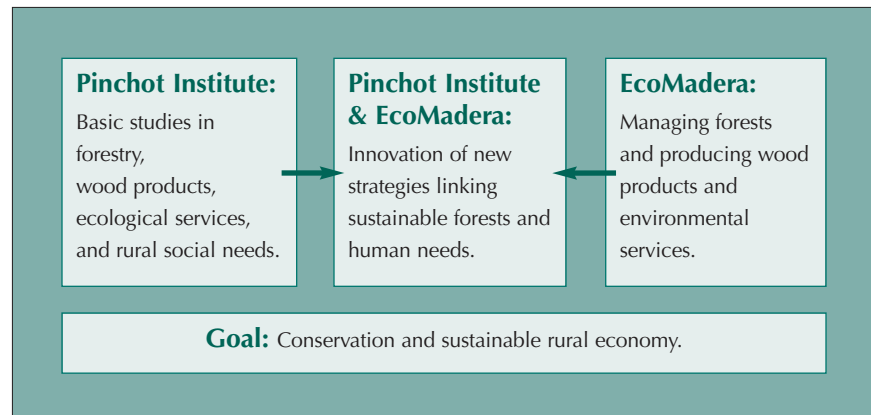


longer be cutting illegal wood from the forests for their livelihood. This is the beginning of the establishment of an alternative local economy based on conserving and restoring forests, rather than clearing them for agriculture.

The EcoMadera Conservation Project: The Pinchot Institute as NGO partner in a hybrid social venture

In order to make the transition from forest exploitation to an ecologically sustainable management of forests, which supports a forest products industry and also benefits communities, EcoMadera must carry out basic research on forest ecosystems, wood technology, wood products, and environmental services. This research, and the innovations which result, have the potential to link well-managed forests to profitable wood products markets. The problem is that in Ecuador, as in many developing nations, basic knowledge about forests and wood products is very scarce. This poses a fundamental structural barrier to the development of sustainable supply chains that provide an economic incentive for conserving forests.

Compare this to the North American experience of the late 1800's. At that time, the United States was at the peak of its own period of forest exploitation. However, by the first decade of the 1900's, land grant colleges, private universities, and the USDA Forest Service had started programs of basic research in forest taxonomy, silviculture, forest ecology, and wood technology. The US Forest Service, state forestry agencies, and the emerging forest products industry began to implement this evolving scientific understanding by innovating new ways to market and manage their forests more efficiently. Businessmen like Fredrick Weyerhaeuser had practiced destructive logging for decades but were now beginning to see that these new practices, based on long-



The role of Pinchot Institute as an NGO partner.

term management of forests and developing valuable wood products, were more profitable over the long term. One such innovation was the production of standard dimensional lumber that could be utilized in the new building technique of balloon frame construction. Through a series of these kinds of innovations in forest management, wood products, and marketing and distribution supply chains, forests became sufficiently valuable as suppliers of resources to justify (for some) the transition to sustainable management. New rural industries in forestry and wood products emerged, which gradually

became the dominant economic forces and major employers in many rural regions.

In countries without this kind of basic forestry and wood product research, the innovations for the evolution of sustainable forestry are not possible without outside assistance. Thus the Pinchot Institute's fundamental role with EcoMadera is to support basic studies of forests species, wood products, environmental services, and innovations in sustainable forest management, that have the potential to link forests to strong market demand.



Balsa nursery.

Pinchot Institute Research Programs 2009–2010

Balsa Plantation Trial: EcoMadera's balsa plant is located in a heavily forested watershed where balsa is not very abundant and exists largely in riparian zones and abandoned farmland. In order to compete economically, EcoMadera's balsa business must have access to a local supply of balsa trees. Balsa is a pioneer species, which regenerates naturally in zones of significant disturbance. However, balsa plantations have rarely been established in zones with such high rainfall, nutrient deficient soils, and abundant pastureland, as exist in the watershed.

In late 2008, the Pinchot Institute established a program of balsa plantation trials, utilizing 20 hectares on land owned by EcoMadera and 10 hectares on land owned by several community members. Darwin Rosero, EcoMadera staff botanist, established balsa tree nurseries and started trial plantations in several kinds of sites. These included the conditions most commonly available in the watershed: abandoned cattle pasture, former cropland, and early stage secondary growth. 18 months later, we were surprised to see that balsa plantations established directly in degraded pasture grew much better than expected. In many cases, the plantations grew poorly for the first six to eight months, but then after nine or ten months, they began to grow rapidly. Based on the positive results from the plantation trials, EcoMadera is preparing to raise significant venture capital to establish a balsa plantation program. EcoMadera's current goal is to expand production to 250,000 board feet of balsa blocks per month (a \$3 million per year business).

Based on this target and on the yield predictions from our plantation trials, EcoMadera should manage about 800 hectares of plantations, divided into six age classes. (Balsa plantations are usually harvested in

their fifth and sixth year). Thus each year we would need to plant 130 hectares, and in the fifth year we would harvest our first crop. This program is projected to employ 15 to 20 local technicians the first year, and by the 5th and 6th year, with 800 hectares in plantations, it should require 35 to 40 local technicians.

EcoMadera will establish 70 hectares of plantations per year on EcoMadera's own land, and 60 hectares a year on plantations established by local families on their land. Working with families to manage plantations will provide them a new source of income. We will support plantations only on land that has already been cleared for other purposes. The business will pay families a large portion of their labor and all the materials needed to plant and manage their plantations. EcoMadera will also provide intensive training, monitoring, and technical assistance as needed. At the harvest, the business and the families will share the revenues. Based on this plan, EcoMadera is now talking to investors to raise \$500,000 to establish and manage balsa plantations. We project that investors should be able to realize a 10 to 14% annualized return on their investment, taking risks into account.

Secondary/degraded forest restoration study: Roughly 20% of the Río Canandé watershed where Eco-

Amy Rogers Receives Conservation Award

Based on her research in Ecuador, (see page 14) Research Fellow Amy Rogers was recently selected as recipient of the Luis F. Bacardi Advances in Tropical Conservation Award at the 2010 Association for Tropical Biology and Conservation meeting in Bali, Indonesia, attended by 900 leading scientists in her field. (See www.tropicalbio.org. Click on "News," scroll to "Announcements," then select "Bacardi Award-2010.")

She is currently editing three scientific manuscripts on this research and will be submitting them to international, peer-reviewed journals in the near future.

Madera operates has been cleared and another 20% has been heavily exploited or is in early stage secondary forest. Consequently, one of EcoMadera's priorities lies in determining how to accelerate the recovery of forest diversity and ecological function in these areas. To address this challenge, the Institute hired Dr. Amy Rogers, a forest research ecologist, in 2008. Amy's doctoral research focused on developing an innovative new strategy for restoration in tropical secondary forests, based on using nature itself as an instructive model. Along with a team of twenty-some field assistants, she tested the five factors most commonly cited as predominant obstacles to early stage (i.e., pre-canopy) tropical forest regeneration, both by themselves and in every possible combination. The result was nothing short of astonishing. Despite preconceptions and decades of theories about soil fertility, weedy understory competition, distance to seed sources, and predation by animals as fundamental limiting factors in the recovery of secondary forests, Amy's results revealed that the true cause of failed primary forest seedling establishment is simply a lack of dispersal. Seeds of the majority of species that were tossed onto the forest floor within test plots (in combinations mimicking seed fall in a healthy primary forest) germinated and established without a hitch, most surviving for up to 6 years later according to the latest census.

This significant finding may pave the road to highly efficient, low-labor, low-intervention reforestation in the tropics; however, its broad-scale applicability must first be assessed in different forest types and across elevational gradients. Amy's team is now initiating that process.

One other piece of the puzzle is also under investigation. In 2009, five years after the research plots were established in secondary forest, it was confirmed that although most seedling species were still present, their growth had largely stagnated. This is not surprising, as primary forest seedlings are built to wait patiently for years beneath canopy shade until a light gap opens to allow for their growth. In the Río Canandé watershed, however, our aim is to accelerate the recovery of these degraded areas and add them to the pool of forest available for sustainable management. To that end, Amy and Ecuadorian master's student Rocío Manobanda recently completed a series of experiments in which different secondary forest strata were removed to determine how to 'jump start' continued seedling growth via increased light availability. Although final analyses are still underway, preliminary results suggest that removing dense sub-canopy colonies of *Palicourea* species (or their equivalent) may do the trick. Future monitoring of sapling growth in these plots will be conducted, along with investigations of other liberation techniques in 'intervened' or heavily logged forest stands.

The take-home message of this pioneering research is that it may be possible to restore a large percentage of the diversity in young secondary

forests by simply intervening in seed dispersal. If found to be generalizable, this strategy will significantly shorten the time required for the human-mediated restoration of diverse rain forest systems—until now, considered an untenable goal by most tropical foresters.

inhabitants, and sapling liberation during balsa harvest. If balsa acts analogously to secondary forest, this strategy will accelerate the transition from pioneer vegetation to canopy cover while simultaneously providing a powerful economic incentive for reverting abandoned pastureland to forest.



2- to 3-year-old balsa plantation.



Rocío Manobanda with seedlings.

Dovetailing with EcoMadera's balsa plantation initiative, Amy has also been developing a research protocol to assess the utility of balsa as a nurse crop for mature forest seedling establishment in pioneer vegetation. Prior research indicates that despite successful germination, most seedlings fail to establish in these areas due to desiccation and crowding. Our research indicates that canopy shade is the missing ingredient. Trials will consist of hand-broadcasting primary forest seeds twice monthly beneath mixed balsa and *Inga* (a nitrogen-fixing legume genus) plantations, periodic censusing using trained local

Forest Taxonomy and Silviculture:

The native forests in the lower foothills of the western flank of the Andes have extremely high rainfall, from 4 to 7 meters per year, depending on altitude. Isolated from the Amazonian forests by the Andes and restricted to a narrow latitude range by the effects of the Humboldt Current, Ecuador's coastal rainforests have exceptional levels of endemism (over 20% of plant species exist only in this region). Approximately 90% of the coastal rainforests have already been converted to agriculture, and rapid exploitation is now underway in the Andean and coastal mountain foothill forests.

A key obstacle to conserving these forests is a deficiency of basic ecological knowledge on harvestable species regarding their 1) growth rates; 2) strategies for natural regeneration; and 3) diameter distribution. In 2008, the Pinchot Institute, through its local partner Fundación Jatun Sacha, hired Nubia Jaramillo and Darwin Rosero, both of whom had extensive experience in native forest management. They installed permanent parcels in both the primary forest and in the degraded and secondary forest. Five local forestry technicians were hired full-time to work

“EcoMadera’s strategy is to establish a new kind of community forest, one owned by both the local community and outside investors, and managed in partnership with professional foresters and community stakeholders.”

on all aspects of forest research and management.

Three types of parcels were being installed: 1) a control parcel with no harvest, 2) a parcel that will have a light harvest, and 3) another parcel that will receive a more intensive harvest. All trees above 10 cm in diameter were tagged and identified where possible. In smaller subplots, seedlings and saplings were identified to study regeneration success of each species. Samples from the unidentified species were taken to the National Herbarium where skilled botanists compared EcoMadera samples with herbarium specimens to gain a positive genus and species identification. In addition, the forestry crew has started an inventory of the 500 hectares EcoMadera purchased in 2008. This will include a complete census of all trees large enough to harvest, and a sampling inventory of all size classes. This will be basis for EcoMadera’s first forest management plan that will be not only legal, but will be based on long-term sustainable management principles.

Reduced Impact Harvest: In Ecuador, especially in remote regions, the primary method of timber harvest is by chainsaw milling, where, after tree felling, logs are milled into boards

with a chainsaw right there in the forest. The boards are then frequently dragged by mules to the nearest river or road for transport to market. This method is wide-spread because it is cheap, portable, and well adapted to the subsistence economy of colonist and indigenous communities. However, it is very inefficient at gaining value from trees, with a net yield in boards of less than 30% of the log. The low yield and the low quality of chain-sawn boards dramatically reduce the value of the forest, and thus contribute to the rational economic decision to convert forests to small-scale agriculture.

In 2008, the Pinchot Institute developed a partnership with the USDA Forest Service to develop a new strategy for timber harvest in the steep and very wet foothill forests. The key objectives were:

- ❶ To avoid building roads, since they promote invasions and new colonization
- ❷ To significantly raise the yield from each tree when compared with chain saw milling
- ❸ To reduce the impact on the residual forest



Portable sawmill.

- ❹ To increase the profitability of sustainable forest management

In January 2009, Blair Rynearson recruited two local loggers as a team to develop and test innovations for timber extraction and to form the nucleus of a sustainable timber harvest crew. Blair and the extraction team did a brief study of the existing extraction methods using chainsaw milling and extraction by mules. However, pasturage was a problem. In the end, the team found a more effective technology in two Swiss-built chainsaw winches, which can haul large logs up even relatively steep slopes.

Next, the team tested operation of a portable sawmill, which can achieve yields of 60% or more of well-dimensioned wood, ready for secondary processing. Working closely with the Forest Service, they designed a cable extraction method using small-diameter cables that can transport cants and boards from the milling site in the forest to the nearest river or road several kilometers away without the need for new roads or skid trails. The new cable system enabled the crew to gain access to the EcoMadera forestland located five kilometers from a navigable river.



Extraction crew and Forest Service consultants.

With the cable system installed, the crew is using the portable sawmill in the field to extract well-dimensioned lumber for the first time.

Now that there is a sustainable way to extract hardwoods, EcoMadera can begin to harvest dimensional lumber suitable for making flooring. We have made a preliminary alliance with a German flooring manufacturer in Ecuador. Like EcoMadera, they are looking to develop products that utilize as large a percentage of the trees species in the forest as possible. We will continue to develop this partnership in the future as we start managing forests and producing wood products. With the US housing market still in a slump, it has been a good time to avoid entering the flooring market. However, EcoMadera has begun exploring the potential for entering the Chinese housing market, where a rapidly

growing middle class and the largest demographic shift in history to urbanization will create a dynamic market for hardwood flooring.

Sustainable forest management of primary forests

With the balsa business moving towards profitability, EcoMadera is preparing to return to its original conservation strategy, which is purchasing large blocks of native forest, in order to implement sustainable forest management, produce hardwood products that raise the value of the forest, and sell them to high value markets, thus creating a model for a widely disseminated alternative to the forces driving deforestation.

In 2008, EcoMadera purchased about 500 hectares, 70% of which was primary forest. The conservation goal over the next two years is to

purchase 10,000 hectares of native forestland and to initiate a program of sustainable forest management. EcoMadera's strategy is to establish a new kind of community forest, one owned by both the local community and outside investors, and managed in partnership with professional foresters and community stakeholders. A major focus of the Pinchot Institute's Ecuador program into the future will be on developing the forest management and investment strategies to make it possible to purchase and conserve this quantity of threatened forestland. There are many pieces to integrate in order to make this possible. ■



Connecting Human Health and Forest Conservation in the Rio Verde Canandé Watershed

Ariel Pinchot

The Andean lowland forest of the Rio Verde Canandé watershed in northern Ecuador is home to three thousand people who have relied largely on timber harvesting and conversion of forest to pastureland for their livelihood. This places pressure on the forests and on the diversity of species in the watershed. EcoMadera LLC, in partnership with the Pinchot Institute, has been working to alleviate these pressures on the forest, by addressing its root cause—chronic rural poverty.

Rural poverty has long been a driving force for deforestation worldwide. In the Rio Verde Canandé

watershed, the forest serves as a kind of health insurance for its residents. When an individual becomes sick or suffers an accident, the forest resources are often harvested in order to pay for medical care. USAID has also long recognized that the health of the surrounding forests is strongly linked to the health of individuals in rural communities. A community that has no access to health care finds it difficult to break out of the cycle of poverty that keeps individuals from planning long-term for its forest resources. A local primary school teacher reported that students in Cristobal Colon, the largest village in the watershed, miss a significant num-

ber of school days due to illness, thus impeding their ability to advance academically. Sickness often prevents employed individuals from going to work. This problematic convergence of factors significantly increases the pressure on forest resources.

In 2007, two young volunteers for EcoMadera, Ariel Pinchot and Julia Przedvorski, recognizing the link between lack of health care facilities and poverty, conducted a comprehensive assessment of both the health conditions within the community and the healthcare resources available to the community. The results revealed a harrowing picture of poor health in