

10

Conservation in the Monteverde zone: contributions of conservation organizations — Update 2014

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The Monteverde conservation organizations documented in 2000 have matured and evolved, joined by additional organizations that developed in new niches. Their primary focus has moved beyond talking about sustainability to practicing it, though there is not yet consensus on how to define sustainability and what measures to take (Gora 2013).

More publications and theses/dissertations related to the chapter topic are now available, but most sources are still "gray literature," though much has been posted on the Internet. I have carried out interviews in annual two-week visits to Monteverde, with frequent follow-up e-mail contacts. Updates to essays that were at the end of the chapter are included in the text below as (essay).

10.1 Socio-Economic Developments in the Monteverde Zone

A. General Developments

Population in the Monteverde zone has increased in the last 15 years to about 6000; at least 150,000 tourists visit each year (www.monteverdefund.org). This rapid growth put pressure on local institutions and resources and increased socio-economic problems. Years of effort led to the emergence of a local district government in 2003; it works with national and local organizations to confront environmental problems, especially those related to water and solid waste (Ewing 2007). The Santa Elena office of the Instituto Costarricense de Acueductos y Alcantarillado, AyA (Costa Rican Institute of Water and Drainage), joins with local organizations to protect springs, treat drinking water, and clean and monitor streams

and rivers, but there is not enough clean water in the dry season and treatment of gray and black water remains inadequate. In 2010, conservation organizations joined the local government to create a commission (COMIRES) to develop plans to deal with the area's solid waste to comply with a nation-wide 2010 law (Ley No. 8839). The local government now runs regular garbage pick-ups, has built a recycling collection center, involves volunteers in monthly recycling pick-ups, and has started building mini-recycling receptacles around the region (M. Díaz, pers. comm.).

The Coope Santa Elena (Coope), which dominated so many aspects of life in Monteverde from the 1970s to the 1990s, faced bankruptcy in 2001. It closed or sold its credit union, grocery store, hardware, and agricultural supply store; private businesses replaced these entities (Guindon 2001, McCandless 2008). Two Coope-affiliated organizations survived in altered form: Comité de Artesanías Santa Elena-Monteverde (CASEM) and Finca La Bella. The coffee coop producing Cafe Monteverde is in the process of closing or being transferred to a different organization in 2014 (Q. Newcomer and G. Vargas, pers. comm.).

CASEM (essay), like La Campesinita (essay), has empowered women and opened educational and economic opportunities for them since the 1980s (Stocker 2013). It became a completely independent cooperative in 2001 (Cooperativa de Comercialización de Artesanías de Santa Elena de Monteverde or CASEMCOOP R.L.). They currently have more than 85 members producing handmade crafts. In 2010, they added a restaurant that serves "typical" Costa Rican food. They face two main challenges: recruiting younger members and competing with more than a half dozen other art and craft stores that have grown up, many run by former CASEM members (P. Jiménez, pers. comm.).

Finca La Bella's (essay) trusteeship was "transferred to the Institute in 2003 when there was concern that the bank might take it when [the Coope] ... could not pay their debt" (K. VanDusen, pers. comm.). In 2013, representatives from La Bella, MVI, the San Luis Development Association, and the Monteverde Monthly [Quaker] Meeting agreed

to transfer land ownership to the farmers of La Bella but to place certain "forested areas ... in ecological easements in the name of the Asociación Finca La Bella with the University of Georgia as the partner organization responsible for assuring that these areas are being conserved in forest" (K. VanDusen and Q. Newcomer, pers. comm., Cresson 2013).

El Buen Amigo (essay) was a second experimental coop located in San Luis (update by E. Vargas):

"...Around 2004 the remaining five families stopped individually managing the dairy operation of the farm. ... They sold the 10+ ha of pastureland that had been bought through the work and effort of the ... members of the group and other support (MCL). ... With the sale income, the families were able to buy or construct another home in San Luis (two families moved to another community). The original farm (131 ha) was not sold; it continued to be a property under the care of one of the Leitón brothers and his family. I still see many reasons to think that this project had a positive impact on the lives of the participants. When I talk with the young people, now adults, that were the small children during the BA farm years I can clearly see how they were proud of themselves and empowered to pursue different or new life projects."

B. Growth of Tourism

Tourism has grown rapidly in Costa Rica since the 1990s. In 2013, the government's Costa Rican Tourism Institute (ICT), which has been promoting tourism aggressively, reported a record 2.4 million international arrivals (Madrigal 2014). Many of these arrivals were tourists who headed to the beaches and non-sustainable mega-developments primarily owned by foreign investors, but many visited more sustainable smaller scale ecotourism venues with local owners in less accessible places such as Monteverde (Honey 2008). Guide books and on-line sources continue to cite Monteverde as a must-visit location; Monteverde and Santa Elena rank number 1 of 25 "Top Experiences" in Costa Rica in *Lonely Planet* (2012). No accurate data on the number of visitors each year exist, but estimates range from 150,000 to 250,000. When the road to Monteverde is paved in 2016, there will certainly be more visitors, though they may

not stay as long. Tourism has become Monteverde's primary source of income, replacing the agricultural sector (the iconic Cheese Factory was sold in 2013 to a large Mexican company).

Facilities for tourism have expanded, especially those linked to adventure tourism, including numerous canopy tours with zip lines, hanging bridges, "sky trams," "Tarzan" swings, and bungee jumps. One hotel owner estimated that about half of his guests booked both an adventure tour and a visit to a reserve, with a quarter each on just one type of tour (P. Belmar, pers. comm.).

There are more than 20 larger hotels and many smaller types of lodging, including inns, pensions, cabins, and even one small hotel with rooms built up in trees. Restaurants, cafes, art and craft shops, and souvenir stores have proliferated. Many new educational exhibits have developed, including the Bat Jungle, the Ranario (Frog Pond), Butterfly Gardens (essay), Serpentario (Serpentarium), hummingbird gardens, and orchid gardens. Several private farms offer tours, and almost everyone runs a night tour. Chocolate, sugar cane (the Trapiche), and coffee tours include tastes and the option to buy these goods (R. LaVal, pers. comm.).

ICT developed a Certification for Sustainable Tourism (CST) in 1997; hotels have to meet extensive criteria in four different categories to receive ratings (www.visitcostarica.com/ict/paginas/sostenibilidad, Honey 2008). One hotel in Monteverde now has the highest rating. Its owner said "Our hotel was always developed in a sustainable way...CST was a way to show the world what we did in a way that could be measured... Our guests do very much appreciate the fact that we run an eco operation" (P. Belmar pers. comm., www.hotelbelmar.net, agrees with Gora 2013). Several other rated hotels emphasize their strong sustainability philosophy and practices (H. Smith, pers. comm.). Some tour agencies highlight CST certified facilities. ICT developed a separate certification system, the Blue Flag (Bandera Azul) for beach communities, nature reserves, and ecologically managed land (Honey 2008; www.visitcostarica.com/ict, www.turismo-

sostenible.co.cr); the two largest Monteverde Reserves (MCFP and CER) and some sustainable farms and schools fly the Bandera Azul.

The Center for Responsible Travel (CREST) stresses another international approach to ethical tourism, which encourages tourists to support sustainable environmental, economic, and social development of the area they visit. CREST and MVI sponsored an International Travelers' Philanthropy Conference in 2011, which led to a 3-year pilot project (funded by the Inter-American Foundation) that became the independent non-profit Monteverde Community Fund (MCF, Fondo Comunitario Monteverde, FCM) in 2013 (Wilkins 2011; www.monteverdefund.org):

"The Monteverde Community Fund ... is dedicated to mobilizing resources that bolster the work of our engaged citizenry and community organizations around themes of sustainability. Among its varied fundraising strategies is the Monteverde Traveler's Philanthropy Program, which seeks to more effectively capture resources from the influential tourism sector and equitably channel them into priority initiatives identified by the community. MCF currently provides small grants for projects related to environmental conservation, social and cultural development, as well as sustainable economic practices. Other service offerings include training and technical assistance with project proposal development and facilitating spaces where residents, businesses and non-profit organizations can benefit from peer exchanges. The organization ... operates as an independent entity with 2 staff members, approximately 30 associates and a growing network of local and national business collaborators" (J. Welch, pers. comm.).

Although tourism has brought many benefits to the Monteverde area, it also has negative effects (Chamberlain essay) beyond the obvious water and waste issues. Social and health problems include poorer nutrition and obesity (junk food replacing home grown food), drug use, and thefts. Although natural history guiding has provided many well-paying jobs and financial opportunities, economic inequality has increased; many jobs are in the low-paying service sector, and the cost of living has

increased (R. LaVal, pers. comm.). Land prices have skyrocketed, and adequate near-by housing is unaffordable for most. Tourism has become a sort of monocrop vulnerable to environmental and economic changes. The worldwide recession that started in 2008 had serious negative impacts as tourism and international donations dropped. Effects rippled through the Monteverde economy; several businesses went bankrupt (P. Belmar and R. LaVal, pers. comm.). A hotel owner stated: "For the moment, the market is keeping new development at bay, but if we were to experience another boom, the risk of overdevelopment is high" (P. Belmar, pers. comm.). There is still no zoning (H. Smith, pers. comm.). However, numerous groups are aware of these problems and are trying to do something to solve them (Honey 2008, Koens et al. 2009, Burlingame 2013, Stocker 2013).

10.2 The Quakers and Bosqueterno, SA (BESA)

In 2001, Quakers in Monteverde and other community members celebrated the 50th anniversary of the Quaker's arrival in Monteverde. They published an illustrated collection of original documents and essays on life in Monteverde over the 50 years, including material on the history of many of the organizations discussed in this chapter (Guindon 2001).

BESA, the organization that they established in 1974 to protect 554 ha of their watershed, continues to be managed by BESA's Board and protected by the Monteverde Cloud Forest Preserve (MCFP), owned by the Tropical Science Center (TSC) in San José. In 2006, negotiations with TSC produced a new rental agreement for use of Bosqueterno's trails (by ever more visitors) and for leases on telecommunication towers on its Cerro Amigo. These funds, plus new income from Costa Rica's Environmental Service Payments, allowed BESA to start a small grants program in 2008 to support "projects having to do with protection of springs, including reforestation; education focused on water quality and river ecology; prevention, elimination, or treatment of contaminated waters; general education regarding freshwater conservation; education

regarding climate change" (bosqueterno.wordpress.com). They have funded projects for local conservation organizations and schools, and Santa Elena's AyA. They made grants for biodigestors for wastewater treatment on some San Luis farms, for reforestation of springs and riparian buffer zones (CRCF), and for research on bird populations in cloud forests and biological corridors (Bosqueterno poster 2014).

10.3 The Monteverde Cloud Forest Preserve (MCFP)

The MCFP remains the most visited private reserve in the area, welcoming almost 70,000 visitors per year to its cloud forests (TSC 2006). It has 40 employees and creates about 600 jobs directly and indirectly in the area (www.reservamonteverde.com). The Preserve's size is 4025 ha, less than previously because of the 2007 settlement of the dispute with the Monteverde Conservation League (MCL) involving land purchased in the initial Peñas Blancas campaign (1986-1989). MCL kept the 5300 ha from its campaign, and some horse-trading of land parcels smoothed out the border between the CER and the MCFP (B. Law, pers. comm.).

The Management Plan of 2005 reaffirmed land use zoning: 97% of the Preserve has absolute protection; 1% is zoned for special use; and 2% is for public use in the "Triangle," (13 K of trails for tourists). In the last 15 years, several new trails have been built and most existing ones have been widened and re-hardened. A hanging bridge was added; viewing platforms at La Ventana, the waterfall, and restaurant and signs, bridges, benches, and trail edges were rebuilt with recycled plastic boards. Visitation reached a high of 80,270 in 2008 and declined afterwards (with the global recession), then increased to 67,950 in 2013 (www.reservamonteverde.com; R.W. Carlson and C. Hernández, pers. comm.). Most buildings have been remodeled with a focus on sustainable construction and practice, most notably the Casona's "rustic" lodge that can sleep 43 and the restaurant, which were certified in 2009 by the CST Program. The Reserve's web page features a tab for "Sustainability" that lists the practices the Preserve has instituted.

MCFP also received (2012) the ecological Blue Flag award for the protection of natural areas including water and waste management (M. Díaz, pers. comm.).

The Environmental Education Program (EEP) has two staff members who work with 1-6th grade students and teachers in 12 local schools; students also visit the Preserve. EEP has broadened its focus on the Preserve's forest to deal with global climate change, endangered animal species, and water and waste (Blum 2012). The Preserve continues to work with students from all Costa Rican high schools that have ecotourism programs and universities with biology and applied science programs (M. Díaz, pers. comm.). EEP's important role in the Comisión de Educadores Ambientales de Monteverde (CEAM) is discussed in section 10.8.

There have been significant developments in MCFP's support for scientific research and its applications. The new Alexander Skutch Laboratory opened in 1999 as the Monteverde book went to press. The 200 m² building has two labs, offices, and a classroom. Some basic lab equipment is provided, but researchers are expected to bring most of their own equipment. The Research Program has a Director and two assistants; its goal is to "generate information and technical and scientific knowledge that will help make management decisions relevant to the protected resources in the area..." (www.reservamonteverde.com/research.html). The 2009 Plan Estratégico de Investigación contains data from 1979 - 2009 showing that 20% of the studies were done by Costa Rican researchers and students. Chapter 1 of *Monteverde: Ecology and Conservation of a Tropical Cloud Forest* had shown a decline in the number of researchers as tourism increased; however, there was a jump in the number of MCFP projects in 2000 and 2001, followed by a decline until 2006, increasing to a high point in 2009, when there were 31 studies; a subsequent document shows the 2009 level continuing and even increasing in 2012 (Programa investigación, RBNBM, CCT 2014). The subject matter of studies from 1979-2009 was on: plants (41%), arthropods (21%), birds (18%), and the remaining 20% on other animals. The Register of Research projects for 2013

shows more individual researchers investigating the effects of climate change on various organisms. Alan Pounds was hired as "Resident Scientist" in 1999 to study climate change in the Reserve. Canopy researcher Sybil Gotsch (Franklin and Marshall College) began a study of the vulnerability of epiphyte communities to changes in climate by examining the ecophysiological responses of selected common epiphytes to water loss (S. Gotsch, pers. comm.). Costa Rican researcher L. Moreno continued her 17-year investigation on the effect of climate change on the abundance and composition of bird species in the MCFP (Y. Mendez, pers. comm.).

The Preserve has also established its own projects in cooperation with Costa Rican Universities and Instituto Nacional de Biodiversidad (INBio). In 2007, they established "Permanent Monitoring Plots" (1 ha each) in seven locations. This work built on previous projects by B. Haber, who "established long-term phenology plots around the community, with a few trees marked in the reserve." Starting in 1987, N. Nadkarni "was the first to put in hectare plots that have been continually re-measured every 5 years, with marked and measured trees (about 2500 in 5 ha, 4 in the primary forest, 1 in the secondary forest within the Research Area of the Reserve" (N. Nadkarni, pers. comm.) In 2010, MCFP set up a network of meteorological stations, and they began an Amphibian Monitoring project under the direction of A. Pounds.

The idea of a corridor to connect the conserved areas in Monteverde to the Gulf of Nicoya had been discussed for years. TSC had taken the lead with the purchase of the largest remaining forest patch on the Pacific side, a 240 ha farm subsequently called the San Luis Biological Reserve, and developed a Management Plan (Méndez 2009). MCFP has played an important role in planning the new Bellbird Biological Corridor (BBC) (Section 10.6. D.)

10.4 The Monteverde Conservation League and the Children's Eternal Rainforest (MCL/CER)

By 2014, MCL's CER grew to 22,600 ha, the largest private reserve in Costa Rica.

MCL has continued to pursue its mission "to conserve, preserve, and rehabilitate tropical ecosystems and their biodiversity" through forest protection, environmental education, reforestation, sustainable development and ecotourism, and scientific research. MCL has been recognized nationally and internationally for its successful conservation efforts, most recently including the Costa Rican Blue Flag award (Bandera Azul) for protected natural areas. CER has been supported for many years by sister organizations in Sweden, the United States, the United Kingdom, Japan, and Germany (acmcr.org, Burlingame 2013).

The League's financial difficulties in the 1990s made additional land purchases a low priority until 2002, when Rachel Crandell, a teacher, founded the MCLUS in Missouri. In consultation with MCL's leadership, in 2004 Crandell launched a new Land Purchase and Protection Campaign, using 50% of each donation for Land Purchase, 40% for protection (which includes the operation of MCL and MCLUS), and 10% for endowment. MCL established a prioritized list of properties to buy, focusing on filling out the borders of CER to natural boundaries and blocking points of easy entrance, buying land to connect pieces of CER, and buying inholdings. In a return to the original vision for the MCL, they also wanted to extend CER on the Pacific slope to help create a corridor for altitudinally migrating animals. MCL sister organizations in the U.K. and Germany and others also contributed to the land purchases. After Crandell's death in 2009, U.S. supporters continued MCLUS, renamed Friends of Children's Eternal Rainforest (FCER) in 2012 (MCLUS/FCER Annual Reports at friendsoftherainforest.org).

Following the 2007 Peñas agreement between MCL and TSC, MCL had an additional 5300 ha to protect in CER. Squatters are no longer a problem, but MCL's forest guards face serious challenges from illegal poaching, logging, capture of live animals, and removal of plants. Guards monitor endangered species; there was great excitement in 2013 when motion-sensing cameras photographed a jaguar and tapirs. MCL personnel also help researchers. The important Land Ordering Project, which began in 2006, uses GIS and GPS

to produce surveys of CER's borders that can be used in legal defenses of those borders and in pursuit of legal titles (MCL Annual Reports, Burlingame 2013).

Major improvements to CER's infrastructure have been made over the last 15 years with attention to environmental sustainability. Trails and signage, road and Internet access have been improved. The two biological stations (San Gerardo and Poco Sol) are powered by renewable energy and have gray water treatment plants; the Poco Sol station was completely rebuilt by 2010. The offices of the MCL on the Monteverde and Atlantic sides of CER and structures at Bajo del Tigre have all been remodeled. The Bajo del Tigre sector is the only part of CER that is easily accessible from the Monteverde area; it receives 75% of the visits to CER (MCL Annual Report 2013). Night walks started at Bajo Tigre in 2003 have become a significant source of funds for MCL. A native plant greenhouse was constructed in 2005, and a labeled demonstration garden was replanted around the Visitors' Center. In 2012, an observation platform overlooking a regenerated forest, a meeting/picnic area, and gray water treatment system were added; the following year, a state-of-the-art classroom was built (MCL Annual Reports, B. Law and W. Zuchowski, pers. comm.).

Although MCL's economic difficulties ended the Environmental Education (EE) Program in 1995, most of MCL's personnel continue involvement with some EE activities, including leadership roles in community recycling and roadside and stream clean-up. In 2007, MCLUS/FCER increased funding for EE. Local children visit Bajo del Tigre for EE activities, with transportation funded since 2010 by BESA, and the Finca Steller Education Center on the Atlantic side of CER. In 2012, a five-year grant provided for an environmental educator to work with schools on the Atlantic side of CER on such topics as recycling, biodiversity, animal welfare and abuse, water resources and the importance of wetlands (www.friendsoftherainforest.org/annual-report-2012).

The League's tree nurseries have produced 1.6 million trees (B. Law, pers. comm.). Most of these were planted in MCL's windbreak project and persist, as do others planted under

special projects. Finca Steller has a small native tree nursery that produces a few thousand native tree species per year. The Fundación Conservacionista Costarricense (FCC) is raising native tree species on the Pacific slope that MCL has used for reforestation of degraded pastureland. Zuchowski's ProNativa organization promoting the use of native plants that began with the greenhouse and demonstration project at Bajo Tigre has expanded (Burlingame 2013).

MCL's financial deficit, incurred when the Debt-for-Nature-Swaps and grants ran out in the mid-1990s and contributions were still earmarked for land purchase, was at its worst in 2001. Gradually, the MCL's finances began to improve. The most important new source of income was payment for environmental services (ESP) by the government program FONAFIFO (Fondo Nacional de Financiamiento Forestal) and two private hydroelectric companies. MVI's Annual Reports document the dramatic increase in the areas of CER included in ESP and an equally dramatic increase in income for the MCL, going from no income in 1996 to an average of 62% of MCL's operation's income from 2009 to 2011 (MCL Annual Report 2013). Other income is from fees for entry to trails, mainly at Bajo del Tigre; unrestricted donations for operations; the sale of merchandise in MCL facilities; and net income from the biological stations. Donations for specific projects, including land purchase, are an important source of income. Another source of funds is interest on investment, including a growing endowment fund; Rachel Crandell had made MCL the beneficiary of her substantial life insurance policy.

Unfortunately, in 2012, the Costa Rican government changed its policies on ESP, deciding to help small landholders with 50 ha or less. MCL and several other conservation organizations in Monteverde saw their incomes drop dramatically as land under ESP phased out. By 2013, inflation and increased expenses (including legal costs) had raised the estimated amount needed to run the organization to a half million dollars per year (MCL Annual Report 2013). MCL is exploring ways to increase the number of visitors to CER from the 2013 level of 7000 and find new funding, especially carbon

offset payments for forest protection and reforestation, but first they have to get legal title to all the land in CER, which will require a special legislative bill. The League's case was helped by its successful 25th Anniversary, in recognition of which the Costa Rican postal service issued four commemorative stamps on National Parks Day, August 24, 2011 (Burlingame 2013).

10.5 Santa Elena Cloud Forest Reserve (SECFR)

SECFR is achieving its goals to share "the benefits of tourism and using them as a tool for [sustainable] development where entrance fees are employed for the protection and management of the Reserve and to provide a better quality of education in the Colegio [Sta. Elena high school] and some schools of the zone" (Y.M. Arias, pers. comm.). Since 2009, there have been about 30,000 visitors per year, more than double the highest number in the 1990s. These visitors provide indirect economic benefits to tourism businesses in the community and employment as Reserve staff and guides most of whom are graduates of the Colegio, thus fulfilling another goal of SECFR (W. Bello, pers. comm.). There are new programs in environmental education, reforestation, and species monitoring.

The road to the 310 ha Reserve is now improved, thanks to adventure tourism sites just below. In 2012, the Visitor's Center was rebuilt; it and a new half k of hardened trail are handicapped accessible, making the SECFR the first in the area to meet the requirements of Law 7600 for equal access. An orchid garden whose plants were rescued from the forest floor, a small medicinal plant garden, and other native plants attract butterflies and hummingbirds. The 12 k of the four original trails and their signage have been improved. If the weather is clear, spectacular views of Arenal Volcano and Lake, the Gulf of Nicoya, and the Lake of Nicaragua await those who scale the new 12 m high metal observation tower on the Youth Challenge trail (reservasantaelena.org).

SECFR's environmental education coordinator worked closely with the Colegio students and teachers in the Ecological Tourism degree program. Blum (2012) stressed the

broader definition of EE, including environmental ethics and values, used by SECFR and the national high school curriculum compared to MCFP's more biological approach to EE. However, Blum's research was conducted in 2003 just as EE approaches in the two organizations started to converge. Both include more attention to water and waste problems in the area, endangered species, and global climate change. The Commission on Environmental Education of Monteverde (CEAM; see 10.8 below) began in 2003 under the leadership of the heads of EE at SECFR and MCFP. Also in 2003, SECFR started working with 5 primary schools around the Reserve in ways similar to MCFP, providing programs at the schools, workshops for teachers, and engaging students and teachers in activities. SECFR's EE program also works with the Grupo Amigos del Ambiente (Friends of the Environment), a group of Colegio students that that formed in 2011. The group, which had grown to 32 volunteer students by 2012, set up a recycling program in the Colegio and at SECFR and became involved in fieldwork with researchers from four Costa Rican universities monitoring amphibians, birds, and water and air quality (Y.M. Arias, pers. comm.). They also monitor mammals with 8 donated motion detecting cameras and post photos of pumas and ocelots on their website (reservasantaelena.org/proyectos [and] /Boletines). The group joins visitors and other students in a reforestation project in areas bordering the Reserve using donated tree seedlings; since 2011, about 5000 trees have been planted per year (Y.M. Arias, pers. comm.).

The Administrative Board of the Colegio continues to manage SECFR and has signed new leases every 5 years with ACAT-MINAE (Area de Conservación Arenal-Tempisque or Arenal-Tempisque Conservation Area and the Ministerio del Ambiente y Energía or Ministry of the Environment and Energy). The Conservation Area (one of 10 administrative divisions of the country) had been called ACA (Area de Conservación Arenal) and included Arenal National Park. In 2007, the Conservation Area was reorganized to include territory down to the Tempisque River (adding protected areas

as Palo Verde and Lomas Barbudal previously part of ACT or the Tempisque Conservation Area). Arenal National Park was put in a new 11th conservation area, Huetar Norte (ACAHN). Although all of SECFR is in ACAT, whose main office is in Tileran, parts of CER are now in three Conservation Areas (Y. Rodríguez, pers. comm., acarenaltempisque.org).

SECFR is a member of other environmental groups in the area such as COMIRES, CEAM, and the Bellbird Biological Corridor. They also have special international agreements with Rocky Mountain National Park in Colorado: a 2012 one through ACAT for exchange visits of department heads, and an exchange of students in 2014 from SECFR and the Park to study scientific monitoring (Y.M. Arias, pers. comm.).

10.6 New Conservation Organizations:

A. Costa Rican Conservation Foundation (CRCF)

In 2002, local residents, including biologists, established the CRCF to protect, connect, and restore "tropical habitats with a special emphasis on the deforested Pacific slope of Costa Rica ... [in] areas critical for the survival of the Three-wattled Bellbird (*Procnias tricarunculata*)" (fccmonteverde.org). CRCF grew out of George Powell's 1990s discovery that the endangered Bellbirds rely on the wild avocado fruit trees that grow in Pacific slope forests, during their post-reproductive period. Although the breeding grounds of the Bellbird and Resplendent Quetzal are well protected on the Caribbean slope of Monteverde, the decline in Bellbird numbers after 1998 was traced to habitat loss in the Pacific Rain Shadow Forest.

CRCF planned to create a 7 k biological corridor to link the protected Monteverde Reserve Complex with a lower protected zone, Cuenca Abangares, creating the Bosque para Siempre (The Forest Forever). They developed strategies to create the corridor: land purchases, conservation easements, cooperation with landowners, and pasture restoration. As of 2014, CRCF owns four wildlife reserves and has two other privately owned areas under conservation easements, providing successful protection to 77.5 ha (D. Hamilton, pers. comm.). Working with farmers and other landowners, conservation organizations,

students, and volunteers, they reforested CRCF properties and many others. Their main tree nursery is at La Calandria, a private reserve and biological station in Los Llanos. Research projects include experiments with seedling propagation, survival, and growth rates, and the most effective and cost-efficient restoration practices (fccmonteverde.org, monteverde-institute-blog.org/environmental/2013/9/18/poster...). CRCF has produced and distributed 173,000 free native tree seedlings of 93 species (D. Hamilton, pers. comm.).

CRCF continues its annual Bellbird census. Since 2009, the decline appears to have slowed; the numbers of bellbirds have held steady (D. Hamilton, pers. comm.). Many other birds depend on the corridor, including neotropical migrants, such as scarlet tanagers, rose breasted grosbeaks, wood thrushes, Baltimore orioles, and several migrant warblers. The U.S. Fish and Wildlife Services' Neotropical Migratory Bird Conservation Program has provided several grants to the CRCF. BESA and FCER (see above), along with the British Embassy, GEF from the UN Small Grants Program, and several U.S. zoos also supported CRCF with grants. Many donations and work efforts have come through a student organization, The Change the World Kids (a US non-profit), and researchers, interns, and students (fccmonteverde.org). The CRCF has recently joined other conservation organizations in the creation of two larger projects, the Bellbird Biological Corridor and the Monteverde-Arenal Bioregion Initiative (see D and E).

B. ProNativas-Monteverde (ProNativas)

Reforestation with native rather than fast-growing introduced tree species had gradually become accepted as the norm, but it took a new organization to convince people in Monteverde of the many environmental advantages of planting native ornamental plants and the environmental threats from invasive exotic plants. Willow Zuchowski, author of *Tropical Plants of Costa Rica*, founded the non-profit organization ProNativas in 2004 with the support of local conservation organizations and outside funding. She had to collect seeds and cuttings, have greenhouses built (at MCL, CFS, and MVI), and then plant gardens with help

from volunteers and one half-time employee. She created demonstration gardens with signage around these organizations and at the Biological Station, Monteverde Centro, local businesses, and private yards. At CFS, she helped establish gardens featuring specific plants to attract bats, birds, butterflies and bees. In 2007, she developed an illustrated Electronic Field Guide to Native Ornamental Plants of Monteverde (<http://efg.cs.umb.edu/efg2/TypePage.jsp>) with the Electronic Field Guide Project at U. Mass. Boston. These activities led to the formation of a ProNativas Network in 2008 with workshops, conferences, and a website (pronativas.com, W. Zuchowski, pers. comm.).

C. Curi-Cancha Reserve (Curi-Cancha)

The 83 ha Curi-Cancha opened in 2011 on property owned by the Lowther family, which they purchased in 1970 from Hubert Mendenhall, one of the original Quaker settlers. It forms a corridor linking BESA on the north and east down to land owned by MVI and CRCF and has a "mix of virgin forest, secondary growth of varying ages and some pasture" (J. Lowther, pers. comm.). CRCF has planted many native trees bearing fruits favored by bellbirds and quetzals. Curi-Cancha is legally recognized as a Refugio de Vida Silvestre Privado by MINAE and aims to be an "economically and environmentally sustainable business" (reservacuricancha.com, J. Lowther, pers. comm.). It has become popular with guides and tourists because it is less crowded than MCFP (limit of 50 visitors per day), has more open areas for animal viewing, and a lower admission cost. In 2013, 10,000 people visited the reserve, providing economic benefits for more than 25 guides and for taxi drivers (M. Ramírez, pers. comm.).

D. Bellbird Biological Corridor (BBC)

The Three-wattled Bellbird Biological Corridor (66,000 ha) aims to connect the Monteverde Reserve Complex through four watersheds and 11 life zones down the Pacific slope to the Gulf of Nicoya. In 2008, building on earlier corridor proposals to protect such altitudinal migrants as the Bellbird and the Quetzal, a local Council formed to make the corridor a reality. The seven founding members of the BBC were: the Arenal-Tempisque Conservation Area (ACAT-MINAE), CRCF,

MCFP, MCL, MVI, SECFR, and UGACR). In 2009, these groups agreed to pay for a part-time Co-ordinator for the Project. With funding from the GEF-Small Grants Program of the United Nations, they elaborated and are implementing a Strategic Plan with a mission to reestablish and maintain: biological connectivity, conservation of natural resources, and the well being of local communities (Corredor Biológica Pájaro Campana, Plan Estratégico 2011-2016).

By 2014, the Project created maps using satellite images and GIS of the physical, biological, and land-use features of the proposed corridor. They monitored bird populations, documented water abundance and quality, and produced thousands of trees for reforestation. BBC members are requesting funding for native tree reforestation around existing springs. They meet and facilitate workshops with civic and community organizations in the corridor to educate them about the BBC and learn about their concerns. By 2013, 26 organizations were affiliated with the BBC (Welch 2007, cbpc.org, N. Vargas and R. Guindon, pers. comm.).

E. Monteverde-Arenal Bioregion Initiative (MABI)

MABI, the newest cooperative conservation, research, education, and sustainable development project, was launched at a Feb. 2014 conference at the Monteverde Institute. P. Raven, in his welcoming remarks, framed the focus of the conference: "How can the talents and activities of the many organizations who have permanent facilities in this region or visit it repeatedly become a conceptual entity with more facilities, educational opportunities, more extensive conserved and restored areas, an enhanced contribution to sustainable tourism, and lasting value...[that is] fully integrated with the welfare of all the people who inhabit the region"?

(iniciativamonteverdearenal.blogspot.com/2014/02/welcoming-remarks-peter).

The Initiative grew out of a symposium organized by N. Nadkarni at the joint 50th anniversary meeting of the Association for Tropical Biology and Conservation (ATBC) and the Organization for Tropical Studies (OTS) held in San José, Costa Rica in June 2013. Entitled, "The Perfect Storm: Educational, Conservation, and Community Synergisms for

Tropical Ecology Research in Monteverde, Costa Rica," the session included presentations by six Monteverdians with different institutional perspectives (ATBC Online Web program for S-11, 25 June 2013). They examined the special interactions in Monteverde of "conservation, education, ecotourism, civic awareness, and spirituality" that made Monteverde such a productive location for scientific research even though it had no major biological research station (N. Nadkarni, pers. comm., see Nadkarni and Wheelwright 2000). How could Monteverde's success be improved and how could it serve as a model for nearby and other tropical areas?

MABI drew 55 participants including representatives from all the organizations discussed in this update and more from the larger bioregion and beyond such as MINAE-SINAC; AyA Santa Elena; the Universities of Georgia, Texas A&M, Brown, California, Stanford, Utah, and Vermont in the States and the Universidad Nacional in Costa Rica; The School for Field Studies; FCER; Conservation International and the Nature Conservancy (iniciativamonteverdearenal.blogspot.com/2014/02/instituciones-invitas-invited.html). The conference began with poster presentations by the different organizations so that everyone knew the focus, priorities, and activities of the other organizations. Emphasis was on forging "communication links between existing groups" (N. Nadkarni, pers. comm.).

Participants worked to develop a common vision. Further discussion and planning took place in committees: Education, Conservation, Research, Maps, Communication, and Funding. The leaders of each committee constituted a Coordinating Committee. The Conference blog outlines the challenges, possible solutions, and committee proposals

(iniciativamonteverdearenal.blogspot.com/2014.02...). The Research Committee is developing a website where scientists will be able to post research projects and data sets. A key next step is finding funding to hire a part-time coordinator; a follow-up conference is planned for 2015 (N. Nadkarni, pers. comm.).

10.7 Environmental Education and Sustainability at the University/College_Level Primarily for Students from North America

Costa Rica has become the leading Latin American study abroad destination (Dyer 2014, Institute of International Education 2014). Monteverde has been a magnet for college/university courses, starting with the OTS graduate Fundamentals course in 1971 (Burlingame 2002). The Monteverde Institute has offered programs for international students since 1987; in the last 15 years, three other institutions have established centers in the area.

A. The Monteverde Institute (MVI)

MVI has built on its mission of "education for a sustainable future," providing a broad range of courses supported through many institutional partnerships. It puts sustainability and conservation into practice on its campus and through its courses and community interactions. MVI has encouraged students, researchers, interns, and volunteers to develop applied research projects that generate information and options to help local communities deal with pressing issues. In addition, MVI has brought substantial educational, cultural, and economic benefits to local communities (Burlingame 2013, MVI Annual Reports, monteverde-institute.org).

By the end of 2013, MVI had provided nearly 480 courses (long and short) for about 8900 students; there are now about 25 courses each year (F. Lindau, pers. comm.). Tropical Biology and Conservation, the University of California Education Abroad Program (UCEAP) given two semesters per year since 1987, has consistently had the largest number of students. In the continuing long course, "Sustainable Futures" (SF), upper level undergraduate and graduate students in architecture, landscape architecture and planning, engage in "service learning" to develop their knowledge and skills by working (gratis) on planning and designing projects that help local communities and institutions. Projects have ranged from designs for specific facilities (including those of MVI) to large scale "scenario planning," development plotting and tracking in the area, and scenarios for the future. In 2001, a partnership with the University of South Florida produced an annual course on "Globalization and Community Health." A semester-long interdisciplinary place-based

program, "Globalization, Development, and Environment," began in 2009 as a joint venture between Mount Holyoke and Goucher Colleges. The Living Routes Program: Tropical Ecology, Development, and Social Justice (2011-2013), focused on the impact of national and international policies on local sustainability, conservation and social justice. MVI also collaborates with partner institutions to offer customized services (F. Lindau, pers. comm., Burlingame 2013).

By 2009, MVI's campus occupied 24 ha; two years later, MVI and CRCF began joint management of the newly created 14 ha Dwight and Rachel Crandell Memorial Reserve adjacent to MVI's campus (D. Hamilton, pers. comm.). This Reserve completes a corridor in the 62,000 ha of privately protected forest reserves known as the Monteverde Reserve Complex.

A new wing was added to the main building in 2002 to house the John and Doris Campbell Library. Behind it is a small classroom building, constructed in 2002 by the Fox Maple School of Traditional Building (Maine) using non-native trees. Construction of a new outside timber-framed, multi-functional, glass-enclosed classroom in 2012 was a collaborative project among local artisans, volunteers, and MVI courses (Burlingame 2013, monteverde-institute.org/facilities-at-mvi). Sustainable construction has been joined by sustainable practice at MVI, as detailed on MVI's web site. MVI has worked with homestay host families to help them improve energy efficiency in their homes, and to promote recycling and composting.

In 2013, students and volunteers developed demonstration organic "Carbon Gardens" around the new classroom, including a vegetable and herb garden, a keyhole garden, rain gardens (to use rain runoff from the Fox Maple roof), a greenhouse for raising native plants, and a native tree nursery producing saplings for reforestation. Native plants and tree saplings are planted on MVI's campus and donated to local people for their use. Volunteers tagged trees behind the main MVI building to establish an arboretum. The gardens will also be used for experiments with sustainable agricultural techniques and will provide educational opportunities and nutritional information for MVI students, staff, and local

communities (D. Hamilton, pers. comm.; monteverde-institute-blog.org).

From the beginning, MVI was interested in fostering, facilitating, and applying research in the region. Research done by international students and faculty working with MVI staff and resource people from the area continues to be made available to other researchers and the community through presentations of research findings and the collection of research papers in the library; many are now digitized. In 2008, MVI began its Integrated Water Resources Program, which builds on concerns over use of water resources and public health. The program also carries out education and community outreach, particularly through its Adopt-a-Stream Program that supervises monthly stream monitoring data collection and annual reports by students from the three high schools. "The Impact of Economic Change on Food Habits and Nutritional Health in Monteverde, Costa Rica: Mixing Agriculture and Tourism," began in 2008 with funding from the National Science Foundation and collaboration from the University of South Florida. Data indicated that as families increased their involvement in tourism, food insecurity and health problems increased. In 2012, MVI decided to promote better nutrition through demonstration gardens and to encourage more physical exercise with a "Monteverde in Motion" program (Burlingame 2013).

MVI has used proceeds from its international courses to support programs that enhance education, well being, and sustainable development and culturally enriching activities in Monteverde and surrounding communities (monteverde-institute.org/current-projects for link to PDF: Community Initiatives and Programs 2013). They collaborated with the local district council to make safe walkways along the main road a reality. In 2012, MVI reached out to a new group, local 12-15 year olds, with a camp experience. Counselors aged 16-20 and adult volunteers from seven area communities helped the younger kids have fun, engage in community service, and "develop healthy and educational links between Monteverde's youth and its community members." It is now an annual event (monteverde-institute.org/summer-camp).

MVI has provided direct financial benefits for staff, teachers, taxi drivers, cooks, guides, and for families offering homestays for MVI students, as well as owners and employees of tourism establishments and other businesses. In 2010, MVI paid out more than \$350,000 to community service providers (Wilkins 2011). These payments, in turn, flow back into the community, as does money spent by MVI's international faculty, students, and researchers. Some in the community have received individualized financial benefits such as scholarships to attend MVI courses or aid (for MVI employees) to continue their education.

MVI developed serious financial problems by 2005 as its financial debt burden grew (from the construction of its new building and library addition and from land acquisition) while income from courses decreased. Beginning in 2006, MVI's Director, working closely with the Board, instituted drastic reductions in expenses through major personnel cuts, sale or divestment of some properties, and expanded efforts to increase income and find new partnerships for offering courses on a regular basis. The leaner, more focused MVI paid off its debts by 2008 and successfully began expansion of its financial base (more courses and students) and extension of its community outreach. The Director reactivated the U.S. non-profit Alliance for the Monteverde Institute (AMVI) in 2009.

B. Council on International Educational exchange (CIEE)

CIEE is a U.S. based non-profit organization that has provided international exchanges in many countries since 1947 (ciee.org). In Costa Rica, CIEE is based in Monteverde, where it started offering a summer Tropical Ecology and Conservation Program with MVI in 1989. Alan Masters became the Director in 1993 and oversaw expansion into semester programs in 1996. MVI provided Spanish language instruction until 1999, when CIEE became a freestanding program. In 2007, CIEE added Sustainability and the Environment, with Karen Masters as Director. CIEE then moved to its own Study Center in Cerro Plano where there are classrooms, meeting areas, a library, and computer facilities with eco-friendly construction and native plant landscaping; students live with homestay families. The

Ecology Program has courses and lives at the Biological Station (ciee.org/study-abroad/costa-rica/monteverde/sustainability-environment). Both Programs take extensive field trips on the Pacific and Atlantic slopes (A. and K. Masters, pers. comm.).

The Tropical Ecology and Conservation Program is designed for biology majors, with courses in biology, conservation, and Spanish, and one that explores the historical impact of humans on tropical ecosystems, including indigenous cultures, European settlement, ranchers and farmers, ecotourists, and conservationists (A. Masters, pers. comm.; course details and reports on the website). The full texts of all research papers since 2004 are available in MVI's library digital collection; each one has an abstract in English and Spanish and the collection is key-word searchable (M. Leitón, pers. comm.; [monteverde-institute.org/mv-digital-collections-Tropical Ecology](http://monteverde-institute.org/mv-digital-collections-Tropical-Ecology)).

The Sustainability Program includes courses in conservation biology, policy, natural history, Spanish, and sustainability (K. Masters, pers. comm.). Students have completed internship projects ranging from construction of a biodigester and composting toilet for a coffee farm to designing native plant gardens and greenhouses. They built artificial wetlands to treat gray water, created a website and produced GIS maps of reforestation plots for CRCF, and worked with Hydroponics of Monteverde on "alternative, renewable fertilizers" (K. Masters, pers. comm.).

C. University of Georgia, Costa Rica (UGACR)

In 2001, the University of Georgia Foundation purchased the 63 ha Ecolodge San Luis and Biological Station in San Luis to develop a satellite campus for UGA. The property, which adjoins both the MCFP and CER, is 60% forest, 30% sustainable farm, and 10% built space (Q. Newcomer, pers. comm.). UGACR's Mission "is to advance our understanding, through instruction, research and outreach, of the interconnected nature of human and environmental systems, particularly the concepts of socio-cultural, ecological, and economic sustainability" (dar.uga.edu/costa_rica).

Over the next ten years, UGACR built campus facilities with an emphasis on sustainability. Climate is controlled in: a wet lab furnished with basic equipment, an insect collection, GIS lab, and herbarium, which includes William Haber's donation of his extensive herbarium. Indoor and open-air classrooms are equipped with the state of the art electronic equipment. There are three weather stations, one of which posts real time data on the website; fiber optics and WiFi connect campus sites to the Internet. Four bungalows house students; faculty, researchers, and interns have their own residences. The sustainable capacity is 60 people per night (Q. Newcomer, pers. comm.). The cafeteria, a computer lab, library, and offices are located in the student union. A recreation center, fields and courts for various sports, and 3 k of trails provide activity options. UGA landscape architecture students designed a 1.5 ha botanical garden, which includes medicinal plants and an arboretum. UGA rebuilt the 12-room Ecolodge San Luis, and in 2012, was awarded 4 leaves under ICT's Certification for Sustainable Tourism (CST). (UGA Sustainability Report 2010 & 2013, Q. Newcomer and A. Cruz, pers. comm.).

UGACR began tracking goals and improvements in campus sustainability in 2010 (dar.uga.edu/costa_rica). The campus has an organic farm that produces 15% of food consumption. Livestock waste is processed by a biodigester, set up as a demonstration project for local farmers. In 2013, a large biodigester was built on campus to process all human waste; it produces methane to power the kitchen stove, and 97% of the water used is returned clean to the forest (A. Cruz, pers. comm.). A native tree nursery (started by CRCF and taken over by UGACR) produces 4000-5000 seedlings of 50 species of native trees to donate for reforestation projects each year. Over 30,000 trees have been planted on San Luis farms and lower elevations, some by students seeking to decrease their carbon footprint incurred by their travel to the Campus. (dar.uga.edu/costa_rica/index.php/site/sustainability_initiatives, Q. Newcomer and L. Ramírez, pers. comm.).

UGACR runs about 25 UGA programs (semester and short-term) per year, representing

40 disciplines and 11 Colleges with about 250-275 students and 75 faculty and teaching assistants. Programs include Tropical Biology, Landscape Architecture, Tropical Reforestation Service-Learning, Veterinary Medicine, Sustainability of Tropical Agro-Ecosystems, Environmental Anthropology, Latin American and Caribbean Studies, and Theater and Film (dar.uga.edu/costa_rica). About 40-45 short programs (average 5 days) for institutions other than UGA, including OTS, bring ca. 1200 students and faculty a year. More than 700 tourists are staying an average of 4 days at the Ecologe in 2013-2014; they eat in the cafeteria and participate in campus activities. (Q. Newcomer, pers. comm., dar.uga.edu/costa_rica). UGACR actively promotes research on campus and in the area, offering information on facilities, logistical support, institutional partnerships, and research sites; research project are listed at dar.uga.edu/costa_rica.

Community involvement and outreach are part of UGACR's mission. They purchase 25% of their food and many services from local providers. UGACR joined MVI to raise funds for 12 small-farm sized biodigestors in the San Luis community; their students and other volunteers provided installation labor and aid to San Luis schools (UGACR Strategic Plan 2013, Q. Newcomer, pers. comm.). UGACR is an active partner in the BBC; they conduct water quality research at 5 sites on each of the 3 rivers in the corridor and have contributed to GIS maps of the corridor (A. Cruz, pers. comm.).

D. Texas A&M-Soltis Center (TAMU-Soltis)

Texas A&M opened its 117 ha Soltis Center for Research and Education in 2009. It is located in San Isidro de Peñas Blancas, San Ramon, adjacent to the eastern border of CER (soltiscentercostarica.tamu.edu). TAMU-Soltis seeks to: "train succeeding generations of Texas A&M students with the aid of experiential, field-based learning; catalyze and facilitate critical and innovative research in the biological, physical, and social sciences; [and] serve as a major international location for research and education in sustainability issues and wise stewardship of natural resources"

(soltiscentercostarica.tamu.edu/content/mission-vision-and-objectives).

The land and facilities of the new center were donated to the TAMU System by Bill and Wanda Soltis. Bill Soltis, a TAMU graduate, had traveled to Costa Rica on business and started buying forested land next to CER to preserve it. He donated 16 ha that had been deforested for a farm and reforested it for the campus, provided a 100 year free lease for ca. 100 ha of primary and secondary forest that he and partners own on the border of CER (E. Gonzalez, per. comm.), and underwrote construction costs for the Center, using designs by TAMU architecture students. An academic building has a wet and dry lab, 3 classrooms, library, computer facilities and WiFi, offices, and cafeteria, with 8 dormitories that sleep up to 56. All of the facilities are handicap accessible (soltiscentercostarica.tamu.edu).

The Center hosts courses run by TAMU faculty focused on Environmental Design, Water Management, Field Studies in Tropical Biology, and Geography Mapping. They also facilitate service-learning programs; in 2010, TAMU's chapter of Engineers Without Borders built a computer lab at the School of San Juan de Peñas Blancas. Students from TAMU's College of Education established an English as a Second Language Program for local children and donated English books to the school (soltiscentercostarica.tamu.edu). Non-TAMU schools and organizations, such as OTS, have brought courses, workshops, and tour groups to the Center (soltiscentercostarica.tamu.edu).

Since 2007, geographers and other researchers have been mapping and establishing benchmarks in the 100 ha of forest, gathering baseline data on biota, making species lists, and collecting data at a meteorological station that posts real time on-line information (soltiscentercostarica.tamu.edu). Monteverde scientists have contributed to baseline research; D. Hamilton and R. LaVal have collected vertebrates, and B. Haber has collected insects for his Electronic Field Guide Project (D. Hamilton, pers. comm.). Most of the current researchers come from TAMU. The Director encourages more researchers to use the site, as the site provides a unique and rich setting for

research and education activities (E. Gonzalez, pers. comm.).

10.8 Environmental Education in the Public and Private Schools

A. EE in Schools of the Monteverde Area-Overview

EE in local primary and secondary schools include more attention to water and waste issues, climate change, endangered species, and sustainable living (Blum 2012). Primary schools (grades 1-6) supported by the government include two in Santa Elena and Cerro Plano and ca. 20 other in surrounding towns. The Colegio Técnico Profesional de Santa Elena offers specialized programs or majors in agriculture, ecological tourism, and food services in addition to traditional academic subjects (See Section 10.5). Their web page states: "The protection of nature and its resources are our principal objective in teaching" [colegiosanta elena.org; author's translation]. There are also 3 private bilingual schools in the area: Monteverde Friends School (MFS), The Cloud Forest School (CFS), and the Adventist School that are now accredited by the Ministerio de Educación Pública (MEP: Ministry of Public Education). All area schools have basic curricula, including Environmental Education, shaped by MEP. Teachers in the primary schools still lack sufficient training and resources for EE and depend upon the EE Programs at the two cloud forest reserves (Blum 2012). CEAM (see below) helps coordinate EE activities.

A new initiative in sustainable development involving Colegio majors comes from a Monteverde Community Fund grant to the Colegio in 2014 to help build a biodigester to process animal waste from the agricultural program, which will keep the waste out of regional streams and produce methane gas for cooking in the Food Services Program (monteverdefund.org/mcf-newsletter-January - 2014). Students from the 3 high schools are involved in the Adopt-a-Stream program offered by MVI for monthly monitoring of the health of local streams.

B. Monteverde Friends School (MFS)

MFS had 115 students in pre-K through 12th grade in 2013-2014 (C. Evans, pers. comm.).

The school is committed to Quaker values, including "Stewardship: The school promotes an appreciation of and connection to the natural world. By increasing our awareness of our interdependence with all life on earth, we strive to use water, land, and other resources mindfully and wisely. Our resolve is enhanced by the natural beauty and biodiversity that surrounds us" (mfsschool.org/about-us). Students go on field trips to local reserves and educational nature exhibits. They carry out an independent project in their last year; e.g., following a stream from its origin to the sea, investigating the local recycling program. High school students have organized recycling at the school.

C. Cloud Forest School (CFS)

The CFS, established in 1991, has 200 students and is the only school in the area dedicated to "learning the language of a sustainable future" through environmental education and on-campus land stewardship. (cloudforestschool.org, Burlingame 2013). CFS acquired its 46 ha campus through a loan from the U.S.-based Nature Conservancy, to establish legal precedents for conservation easements in Costa Rica. The easement put the farm (72% forested) under strict protection. "Green Building" standards for new buildings were developed in 2003 and used that year in construction of the Gazebo or Kiosco (with Monteverde's first solar panel) and all subsequent construction (Burlingame 2013).

Once CFS owned the land, they hired a steward to monitor land-use plans and work with the EE Coordinator, staff, and volunteers to integrate the curriculum with stewardship activities. By 2013, more than 14,000 native trees had been planted (M. Brenes, pers. comm.). Volunteers have constructed and maintained trails and mapped all the reforestation areas (CFS Rainbow Spring 2014). An organic vegetable garden and farm, worm composting facilities, 2 greenhouses, and native plant gardens featuring a medicinal plant garden and thematic gardens to attract bats, butterflies, bees, hummingbirds, and birds provide additional EE resources.

Environmental Education has always had a central role in CFS's curriculum. Recently, the EE Coordinator introduced grade level themes based on the National Education for

Sustainability, K-12 Student Learning Standards (L. Grenholm, pers. comm.; s3.amazonaws.com/usp_site_uploads/resources/123/USP_EFS_standards_V3_10_09.pdf). This is part of a "spiraling curriculum [that] allows for an interdisciplinary approach to learning about the environment, society, and economy for CFS students beginning at the age of 3" (CFS Rainbow Fall 2013). Land stewardship is an integral part of EE, and students care for their own campus daily; they have established a campus-wide recycling program. They also take field trips to local reserves and educational nature exhibits.

CFS is enrolled in the ICT Blue Flag Program (L. Grenholm, pers. comm.). In 2013, CFS formed a new alliance with UNION VARSAN S.A., owner of a local sustainable farm, to offer students opportunities for internships, hands-on farm activities, and educational tours. The business is committed "to offer young people a career alternative to tourism" (CFS Rainbow Spring 2013, G. Vargas, pers. comm.).

D. CEAM

The Commission on Environmental Education of Monteverde (Comisión de Educación Ambiental de Monteverde; CEAM) is a cooperative group of environmental educators formed in 2003 by the MCFP, SECFR, CER, ACAT, the local government, and local office of AyA (ceamonteverde.weebly.com). They coordinate environmental activities, raise local environmental consciousness, and contribute to sustainability. From 2005-2009, they sponsored an annual prize contest for ecological stories by students from 14 schools. The 15 best stories from all these years were published in 2014 with funding from the local government and BESA (M. Díaz, pers. comm.).

CEAM, under the leadership of M. Díaz from MCFP and Y.M. Arias of SECFR, organized a 3-year training program for those concerned with environmental issues and education. Funded by ACAT and the US Fish and Wildlife Service, workshops involved 103 people from conservation organizations, local government, and agencies in the region (Menacho 2010). ACAT's CREA (Comisión Regional de Educación Ambiental or Regional Environmental Education Commission) has

more than 40 active organizations in its network (ceamonteverde.weebly.com/integrantes.html).

10.9 Conclusion: Lessons from Monteverde and Topics for Future Research

A. Recommendations for Future Work

Environmental organizations and conservation activities are rich areas for historical analysis and documentation. Many of the organizations discussed in this Update are more than 20 years old; their early records are deteriorating in quality. This history should be preserved in digital form, preferably in a central location. It would be ideal to have a single electronic database with up-to-date-records and live web-site links for all these organizations.

AyA Santa Elena and ACAT based in Tileran have become important players in conservation, EE, and sustainable development; they are both involved in MABI. The developments of these and emerging regional organizations (e.g., BBC and MABI) should be followed. EE programs started at MCL in 1986, at MCFP in 1992, and at CFS in the early 1990s. Those early students are now adults; the impacts of EE on their lives should be assessed.

Recommendations for special projects are: a) a history of the Finca La Bella community; b) analysis of the evolution of issues and players related to water in the Monteverde area; c) sustainable and organic agricultural experiments in the zone; d) the developments of personal networks linking conservation organizations and their impact on building a base for consensus decision-making.

There are many topics to explore in the growth of Monteverde area tourism, beginning with an accurate estimate of the number of tourists in Monteverde to assess environmental impacts, including water and waste. This is also critical to understand the impact of paving the road up the mountain. A study on the growth of the area's adventure tourism industry, and the effects of the commission system, will show the sector's economic contribution to the Zone. How sustainable are tourism businesses, and how do they define, value, measure, and implement sustainability? The answers to these questions will come from carefully designed social science surveys and questionnaires, which brings up another issue. MABI is in the process

of setting up a database of researchers and research in the sciences; social scientists should be included in this. Finally, this Update has shown that large changes have occurred in the last 15 years; there needs to be a mechanism to add current information to this online Update at least every five years.

B. Failures or Problems of Conservation Organizations

"There are multiple visions and practices of environmentalism operating in a scene of complicated regional social, economic, political, and ecological change" (Vivanco 2006). Conservation organizations have not made sufficient efforts to understand the differing visions and practices. "The fact that many residents see the now-protected forests as off-limits to their recreation and use reinforces the authority of the environmental organizations that police those lands, but fuels quiet talk by some people of future land invasions" (Vivanco 2006). Another anthropologist discusses conflicts between the values of conservationists and more urban Costa Ricans in Sta Elena and Cerro Plano with their development associations and their understanding of sustainability in more social and economic terms (Blum 2012). Some Costa Ricans have resented a lack of access to scientific research information generated in Monteverde but available only in English and in locally inaccessible specialized journals (Blum 2012).

Some think that the rapid development of tourism, especially adventure tourism, is destroying what was special about Monteverde. Crowds of tourists in MCFP and other tourist destinations, billboards, and heavier traffic are associated problems. In addition, tourists and the population increase they caused have strained water supplies, increased amounts of waste, and burdened infrastructure.

Financial stability remains a persistent problem for many of the conservation organizations in Monteverde. Problems were magnified with the global economic downturn by 2009; for Monteverde, this involved decreases in tourism and international donations. Organizations are aware that they need to develop endowments and more stable sources of funding.

C. Successes of Conservation Organizations

1. A traditional measure of conservation success is the amount of forest that has been acquired. By 2014, BESA, MCFP, CER, SECFR, Curi-Cancha, and CRCF had acquired 27,650 ha; these reserves are part of the Arenal-Monteverde Protected Zone of 70,000 ha. Most of them are included in ACAT's 395,046 ha which have some measure of protection.

2. Local residents are employed by the reserves as unarmed guards; they try to build good relations with people living around the reserves while protecting wildlife and plants from poachers.

3. The practice of linking forest patches to protected areas via corridors has expanded beyond buying land. CRCF has been establishing a corridor linking two protected areas, and BBC is establishing a corridor from the continental divide in Monteverde to the Gulf of Nicoya that includes people living in the area.

4. Reforestation in rural and more settled areas has continued through the efforts of many organizations and projects.

5. Environmental Education is part of the curriculum for primary and high schools. Numerous groups have provided EE for local schools and for the broader community. For example, in June 2014, CEAM, the University of Costa Rica (UCR), and the National University of Costa Rica (UNA) organized an all-day Water Fair (Feria del Agua) in Sta Elena. Almost all the conservation organizations discussed in this update had multiple representatives with tables full of literature, posters, and small give-aways. Water was the central focus of lectures, workshops, demonstrations, and lots of fun educational activities for children, who packed the place. Other forms of EE have expanded in the institutions for foreign university students, in guided tours of reserves, and in educational businesses with animals and orchids.

6. Organizations have continued to emerge: a local government, a cooperative group to solve garbage and recycling problems (COMIRES), a Community Fund, the CRCF, ProNativas, the BBC, and MABI. Volunteers serving on committees and on each other's Boards link these organizations to each other and to

continuing organizations. Monteverde's conservation organizations occupy different niches and do not compete with each other.

The successes of conservation organizations in these areas have been possible because of the following factors (Burlingame 2000):

1. Resident and visiting scientists provided basic and applied knowledge that led to the formation and growth of conservation organizations and their programs.

2. Economic prosperity and a diversified economy supported the development of conservation organizations and made an educated middle class a reality. Since 2000, tourism has surpassed agriculture as the main economic driver.

3. Successive immigrants brought new perspectives, skills and knowledge, starting with the Costa Rican settlers, followed by the Quakers, then the biologists, the tourists and business people, civic leaders, educators, and artists to create what the 2013 session at the ATBC called "The Perfect Storm: Educational, Conservation, and Community Synergisms for Tropical Ecology Research in Monteverde, Costa Rica."

4. Monteverde's conservation organizations and the people who support them have been able to change as conservation thinking evolved from a focus on preserving particular endangered species to concern about threats to biodiversity to today's more general challenge of climate change and need for ways to implement sustainable development. They learned how to tap into outside sources of funding and steer benefits of tourism to conservation and sustainable development ends. The organizations have shown resiliency and resourcefulness; their success has been possible because of dedicated, hard-working, and creative people.

5. Information access has been improving. Having the Monteverde book and Updates available on the Internet in English and Spanish with free access will be a major contribution. The proposed online MABI database will also be important. MVI's library has been building a digital collection and has created an electronic list of MCFP's library holdings. MVI has an offprint collection, but they are missing many articles; researchers need to be encouraged to

submit copies of their articles or opt for open access to their publications (L. Kutner, pers. comm.).

D. The Monteverde Zone and its Conservation Organizations as Models

Simply copying Monteverde and its conservation organizations and applying these activities elsewhere is problematic because of the unique elements in Monteverde and in Costa Rica. However, some of the conservation and educational organizations can serve as models. Monteverde's successes with ecotourism as a way to support conservation organizations and the development of ecotourism businesses can serve as a model for certain locations.

The Monteverde-Arenal Bioregion Initiative, launched in 2014, proposes to extend the synergisms of the Monteverde area that have contributed to its successes in research, conservation, and education to the larger bioregion around it.

E. "Human Voices Around the Forest"

E. Vargas' update to his (essay), "Human Voices Around the Forest" offers a concluding vision of promises and challenges to conservation successes:

"As neighbors living around the protected areas, we enjoy the beauty of landscape, the pureness of water and air, the peace of the bird's songs; but it also implies a responsibility: to care for this natural richness, as the source of life and admiration for all creatures, among them, human beings. For this purpose, it is essential that our short and medium term actions be framed by an integral, long-term vision.

"The conservation organizations and the government highlight the extension of protected forest as proof of conservation success in Monteverde and Costa Rica. However, we do not know if in a few decades, these organizations will have the capacity and the necessary resources to ensure the protection of such a large area. Will they be able to do it without the participation and support of the people living around these forest reserves? What will be the future pressures on these areas? Other actor's voices are being heard, from the inhabitants of nearby communities (e.g. Guacimal, Chachagua) defending their water sources for human consumption from the agro-industry and tourism developments pushing for

water concessions. Furthermore, public and private hydroenergy companies are creating more pressures as they construct dams on various rivers whose main water sources are in the Monteverde Reserve Complex.

"These cases offer an idea of the big challenges for the conservation organizations, governments, educational institutions, community leaders, farmers and enterprises of the region. Enduring sustainability will depend on the will among all organizations and actors involved to maintain and improve the collaborative work relationships that have distinguished our communities."

Key to Acronyms

ACAT: Area de conservación Arenal-Tempisque [Arenal-Tempisque Conservation Area; previously ACA]

ATBC: Association for Tropical Biology and Conservation

AyA: Acueductos y Alcantarillados [Costa Rican Water and Drainage Institute]

BBC: Bellbird Biological Corridor

BESA: Bosqueterno, S.A. [Eternal Forest, Inc.]

CASEM: Cooperativa de Artesanías de Santa Elena-Monteverde [Crafts Cooperative of Santa Elena and Monteverde]

CEAM: Comisión de educación ambiental de Monteverde [Commission on Environmental Education of Monteverde]

CER: Children's Eternal Rainforest [previously BEN in English]

CFS: Cloud Forest School [previously CEC in English]

CFSF: Cloud Forest School Foundation
CIEE: Council on International Educational Exchange

COMIRES: Comité de manejo integral de residuos sólidos [Solid Waste Management Committee]

CRCF: Costa Rican Conservation Foundation
CST: Certification for Sustainable Tourism [from ICT]

EE: Environmental Education

ESP: Environmental Service Payments

FCER: Friends of the Children's Eternal Rainforest [previously MCLUS]

ICT: Instituto Costarricense de Turismo [Costa Rican Tourism Board]

MABI: Monteverde-Arenal Bioregion Initiative

MCF: Monteverde Community Fund

MCFP: Monteverde Cloud Forest Preserve

MCL: Monteverde Conservation League

MEP: Ministerio de Educación Pública [Ministry of Public Education]

MFS: Monteverde Friends School

MINAE: Ministerio del ambiente y energía [Ministry of the Environment and Energy]

MVI: Monteverde Institute

OTS: Organization for Tropical Studies

SECFR: Santa Elena Cloud Forest Reserve

SINAC: Sistema nacional de áreas de conservación [National System of Conservation Areas]

TAMU-Soltis: Texas A&M University Soltis Center for Research and Education

TSC: Tropical Science Center

UGACR: University of Georgia, San Luis Costa Rica

Sources

Acknowledgments: This Update was made possible by very generous help from many individuals who provided essential oral and documentary information and/or detailed helpful feedback on drafts. I especially thank: Yaxine Maria Arias, Pedro Belmar, Wendy Brenes, Bob Carlson, Mercedes Díaz, Carol Evans, Ashley Gora, Eugenio Gonzalez, Laura Grenholm, Debra Hamilton, Patricia Jiménez, Richard LaVal, Bob Law, Fran Lindau, Julia Lowther, Alan Masters, Karen Masters, Yoryineth Méndez, Nalini Nadkarni, Quint Newcomer, Alan Pounds, John Trostle, Sue Trostle, Katy VanDusen, Eugenio Vargas, Justin Welch, Jannelle Wilkins, and Willow Zuchowski.

NOTE: Most of the sources for this Update are "gray literature," unpublished computer generated reports, newsletters, and documents available from the organizations that produced them. Also, most all of the organizations discussed in this

Update have websites with extensive information and Facebook pages; most of these are not listed below since they are easy to find and subject to change.

- Association for Tropical Biology and Conservation (ATBC). 2013. The Perfect Storm: Educational, Conservation, and Community Synergisms for Tropical Ecology Research in Monteverde, Costa Rica. atbc.confex.com/.../2013/webprogram/.../ATBC-OTS-2013_Progra...S-11 (June 25).
- Blum, N. 2012. Education, Community Engagement and Sustainable Development. Negotiating Environmental Knowledge in Monteverde, Costa Rica. Springer, London, UK.
- Bosqueterno S.A. 2010. Bosqueterno, SA. <http://bosqueternosa.wordpress.com>.
- _____. 2014. Bosqueterno [poster by K. Johnson, R. Guindon, J. Welch for the Monteverde-Arenal Initiative Conference]. BESA, Monteverde, Costa Rica.
- Burlingame, L. 2000. "Conservation in the Monteverde Zone: Contributions of Conservation Organizations." Pages 351-388 in N. Nadkarni and N. Wheelwright, editors. Monteverde: Ecology and Conservation of a Tropical Cloud Forest. Oxford University Press, New York, USA
- _____. 2002. Evolution of the Organization for Tropical Studies. *Revista de Biología Tropical* 50(2): 439-472.
- _____. 2015. History of the Monteverde Institute. Lancaster, Pennsylvania, USA.
- _____. 2013. A Short history of the Cloud Forest School (CFS) in Monteverde, Costa Rica. Lancaster, Pennsylvania, US.
- _____. 2013. Short history of the Monteverde Conservation League and the Children's Eternal Rainforest. Lancaster, Pennsylvania, USA.
- Centro Científico Tropical (photos by B. Cole). 2006. Reserva Bosque Nuboso Monteverde. CCT, San José, Costa Rica.
- Chornook, K. and W. Guindon. 2007. Walking with Wolf: reflections on a Life spent protecting the Costa Rican wilderness. Wandering Words Press, Hamilton, Ontario, Canada.
- Cloud Forest School Foundation (CFSF). 1997- date. Rainbow [newsletter] CFSF, Sewanee, Tennessee, USA. cloudforestschool.org since Fall 2011.
- Cloud Forest School (CFS/CEC). 1992 to date. Board reports to the General Assembly. CFS, Monteverde, Costa Rica.
- _____. 1995 to date. Director's Reports to Board and to Assembly. CFS, Monteverde, Costa Rica.
- Comisión de educación ambiental Monteverde (CEAM), editors. 2014. Cuentos ecológicos de Monteverde. CEAM, Monteverde, Costa Rica.
- Corredor Biológica Pájaro Campana. 2011. Plan estratégico 2011-2016. www.cbpc.
- Costa Rican Conservation Foundation. 2012-date. www.fccmontverde.org.
- Costa Rican Tourism Institute (ICT). 2014. www.visitcostarica.com/ict/paginas/sostenibilidad.
- Cresson, O. 2013. Blossoming and Building at Finca La Bella. *Quaker Earthcare Witness*. 26(2.). www.quakerearthcare.org/article/blossoming-and-building-finca-la-bella.
- Dyer, Z. 2014. Costa Rica remains most popular Latin American study abroad destination. [ticotimes.net/2014/05/23/costa-rica-remains-most-popular ...](http://ticotimes.net/2014/05/23/costa-rica-remains-most-popular...)
- Escofet, G. 1998. One million visitors by 1999? The Tico Times, San José, Costa Rica, 2 October.
- _____. 1998. Tourism boom shows slump over. The Tico Times, San José, Costa Rica, 19 June.
- Ewing, T. 2007. Community development and capacity building: A case study of Monteverde, Costa Rica. *Sociology-Dissertations*. Paper 6. http://surface.syr.edu/soc_etd/6.
- Friends of the Children's Eternal Rainforest (FCER) [previously called Monteverde Conservation League US (MCLUS)]. 2003 to date. Annual Report. www.friendsoftherainforest.org.
- Gora, A. 2013. Sustainable tourism norm transfer and the case of Monteverde, Costa Rica. Senior Thesis. Lake Forest College Publications. <http://publications.lakeforest.edu/seniortheses/7/> [Lake Forest, Illinois, USA].
- Guindon, L., M. Moss, M. Rockwell, J. and S. Trostle (eds.). 2001. Monteverde Jubilee Family Album. R.B. Sibaja, Monteverde, Costa Rica.
- Haber, W., W. Zuchowski, and E. Bello. 2000. An introduction to cloud forest trees: Monteverde, Costa Rica (2nd ed.). Mountain Gem Publications, Monteverde de Puntarenas, Costa Rica.
- Honey, M. 2008. Ecotourism and sustainable development. (2nd. ed). Island Press, Washington, D.C., USA.
- Institute of International Education. 2014. Open Doors Data. U.S. Study Abroad: Leading Destinations. iie.org/Research-and-Publications/Open-Doors/Data/US-Study-Abroad/Leading-Destinations/2010-12.
- Koens, J., C Dieperink, M. Miranda. 2009. Ecotourism as a development strategy: experiences from Costa Rica. *Environment, Development, and Sustainability* 11(6) 1225-1237. link.springer.com/article/10.1007/s10668-009-9214-3.
- Law, B., R. LaVal, and W. Zuchowski. 1998. Bajo del Tigre guide. Monteverde Conservation League, Monteverde, Costa Rica.
- Lonely Planet, N. Cavalieri, A. Skolnick, W. Yanagihara. 2012. Lonely Planet: Discover Costa Rica (2nd. ed). Lonely Planet Publications Pty Ltd., n.p.
- Madrigal, A. 2014. Tourist Flocked to Costa Rica in Record Numbers in 2013. The Tico Times. www.ticotimes.net/2014/01/17/tourists-flocked...

- McCandless, S. 2008. Partial Power, Partial Knowledge: Accounting for the Dis-Integration of a Costa Rican Cooperative. *Society and Natural Resources*, 21 310- 323.
[academia.edu/386148/Partial_Power_Partial_Knowledge ...](http://academia.edu/386148/Partial_Power_Partial_Knowledge)
- Menacho, R.M. 2010. Programa de capacitación interinstitucional para la comisión de educación ambiental y educadores de Monteverde. *Biocenosis* 23(1):14-21.
- Méndez, Y. 2009. Plan de manejo de la Reserva biológica San Luis, Monteverde, Costa Rica. Proyecto final ... por el título de Máster en Liderazgo y Gerencia Ambiental otorgado por la Universidad para Cooperación Internacional (UCI). UCI, San José, Costa Rica.
- Monteverde Conservation League (MCL) 1987-date. Annual Report/Informe anual. MCL. Monteverde, Costa Rica. acmcr.org since 2008.
 _____. Bulletin. 2009-date. MCL. [www: acmcr.org](http://www.acmcr.org).
- Monteverde Friends School (MFS). 2014. Profile 2013-2014. MFS, Monteverde, Costa Rica.
- Monteverde Institute (MVI). 1993-date. *Actas*. MVI, Monteverde, Costa Rica.
 _____. 1987-date. Annual Report/Informe anual. MVI, Monteverde, Costa Rica.
 _____. 1987-date. Executive Director's report to General Assembly MVI, Monteverde, Costa Rica.
- Nadkarni, N. and N. Wheelwright, editors. 2000. *Monteverde: Ecology and Conservation of a Tropical Cloud Forest*. Oxford University Press, New York.
- Reserva Biológica Bosque Nuboso de Monteverde (RBBNB). 2005. Plan de manejo de RBBNM. www.reservamonteverde.com/documentos.
 _____. 2008. Plan program educación ambiental. www.reservamonteverde.com/documentos.
 _____. 2009. Plan estratégico de investigación 2010-2020. www.reservamonteverde.com/documentos.
 _____. 2014. Programa investigación RBBNM. Centro Científico Tropical, San José, Costa Rica.
- Stocker, K. 2013. *Tourism and Cultural Change in Costa Rica*. Lexington Books, Lanham, UK.
- University of Georgia Costa Rica (UGACR). 2010, 2011-12. Sustainability Report dar.uga.edu/costa_rica/index.php/site/sustainability_initiatives.
 _____. 2014. Sustainability Report. static.externalaffairs.uga.edu/costarica/UGACR_Sustainability_Report_2013.pdf.
 _____. 2013. Strategic Plan 2011-2012. dar.uga.edu.
 _____. [2014]. Research Opportunities at UGA Costa Rica. UGACR, Monteverde, Costa Rica.
- U.S. Partnership for Education for Sustainable Development. 2009. National Education for Sustainability K-12 Student Learning Standards. Version 3. s3.amazonaws.com/usp_site_uploads/resources/123/USP_EFS_standards_V3_10_09.pdf.
- Vivanco, L. 2006. *Green encounters: shaping and contesting environmentalism in rural Costa Rica*. Berghahn Books, New York, USA.
- Welch, J. 2007. *Monteverde-Nicoya Biological Corridor: Biophysical Analysis, Socio-Economic Description and Project Cost Summary*. UGACR, Monteverde, Costa Rica.
- Wilkins, J. 2011. Educational and volunteer tourism in Monteverde, Costa Rica. from Proceedings of 3rd International Travelers' Philanthropy Conference. Travelersphilanthropy.org
- Zuchowski, W. 2004-2009. ProNativas Year End Report. Monteverde, Costa Rica.
 _____. 2007. Electronic Field Guide to Native Ornamental Plants of Monteverde, Costa Rica. EFG Project, U. Mass. Boston, USA. (efg.cs.umb.edu/efg2/TypePage.jsp).
 _____. 2007. *Tropical Plants of Costa Rica: A Guide to Native and Exotic Flora*. Distribuidores Zona Tropical, S.A., Miami, Florida, USA.
 _____. [2011]. The ProNativas Network. pronativas.org.