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# SUSTAINING *QUERCUS HUMBOLDTII* *AND COLOMBOBALANUS EXCELSA* ON THE COLOMBIAN LANDSCAPE: PRESERVATION OR CONSERVATION – A RESEARCH PERSPECTIVE

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## ABSTRACT

The Tropical Andes in Colombia is in the top 25 biodiversity hotspots in the world (Myers and others 2000). It has the highest level of species endemism in the world and they comprise 12 percent of the world's species. Humans have lived in the Colombian Andes for over 12,000 years. Population estimates of native peoples at the time of Spanish contact range between 3 to 5 million and about 60 percent of them lived in the Andes (Colmenares 1997, Etter and van Wyngaarden 2000). Today, about 45 million people call Colombia home, and 66 percent of them live in the Andes (Etter and van Wyngaarden 2000). Over the past several thousand years, the Andes region has progressively become a highly fragmented landscape, where only 30 percent or less of the original forest cover remains (Etter 1993, Cavelier and Etter 1995, Armenteras and others 2003, Etter and others 2006). Deforestation and conversion to agricultural land uses have eliminated much of the native ecosystems in the Andes region. Brooks and others (2002) state that the extent of habitat loss is a good predictor of the number of threatened or extinct endemic species because many biologists recognize fragmentation of habitat and its loss as the principal cause of biodiversity loss in the world (Armenteras and others 2003).

In the Colombian Andes, grazing occurs on approximately 42 percent of the land, subsistence, commercial or shifting agriculture occurs on another 20 percent of the land, and the remainder is in forest cover (Etter and others 2006, Aubad and others 2008). In this region, coffee growing is a significant industry, with over 500,000 private landowners producing coffee largely on small ownerships. Conversion of forests to agriculture on steep mountain slopes has caused great concern and a desire to protect the remaining forests for wildlife, water yield and quality, and biodiversity conservation. *Quercus humboldtii* and *Colombobalanus excelsa* are important endemic species throughout this region and they are valued by the people for their high quality timber and fuelwood. Colombia ranks third in fuelwood use in South America, with each family using an average of 5 to 8 tons/yr. Armenteras and others (2003) identified the Andean oak forests as the most threatened ecosystem and a priority for conservation efforts, while Etter and others (2006) stated that they were at an intermediate

level of threat and noted that the humid mid-Andean and the humid and sub-humid high-Andean forests were vulnerable to clearing (Etter and others 2006). *Q. humboldtii* is listed as Low Risk-Conservation Depending and *C. excelsa* is Vulnerable in their conservation status (Calderon 1998, Oldfield and Eastwood 2007). Preservation of existing primary forests in national parks, laws that regulate the cutting of *Quercus* spp. on private lands, and reforestation are strategic directions and actions being taken to reverse the loss of forest and reclaim marginal crop fields to forests. The challenge to preserve and conserve healthy and productive native ecosystems and minimize species loss is complicated because the people live by subsistence and local economies based on farming, grazing and forestry and they own 67 percent of the forest land. It will take a coordinated program of preservation and conservation that integrates human communities within a landscape made up of a patchwork of natural and managed ecosystems to achieve the goal of sustainable communities and ecosystems.

Parks and reserves are important for protecting the remaining primary forests. The national park system in Colombia protects forests on about 10 percent of the land base (Wikipedia 2010). Maintenance of forest cover in parks and reserves is assured provided illegal use and deforestation is controlled. What is less certain is the sustainability of the current stocking of *Q. humboldtii* and *C. excelsa* in these forests. Much is unknown of the biology and ecology of these two species, and it is uncertain if their populations are sustainable in national parks and forest preserves. Monitoring is essential to determine if regeneration and subsequent recruitment into the forest overstory is sufficient to sustain these species under current natural disturbance regimes. It is unclear how historic disturbance regimes led to the presence of mature oak in the forest canopy, and how they may differ from factors operating today that regulate forest regeneration and development, or how forest processes will be altered by a

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changing climate. In other regions of the world where oak forests are common, oak dominance is in decline due to altered disturbance regimes that favor other species over oak (Johnson and others 2009).

Conservation on private lands is critical to achieving regional and national goals for sustainable ecosystems and economies. Comprehensive conservation programs would include research and development, education, and economic and marketing components. Management systems and silvicultural practices are needed that promote *Quercus* and *Colombobalanus* in both natural and agroforest environments (Fig. 1). Alternative strategies for the management of these and other valuable tree species are needed that achieve conservation and ecological objectives while providing income and subsistence to landowners on small- to moderate-sized properties. The incorporation of these species in farm and coffee plantation settings using agroforestry practices, or in reforestation of degraded lands has the potential to meet both ecological and social needs of the forests across a large portion of the Colombian landscape. Education is critical for the development of resource and management professionals, and to foster an informed community of landowners and agricultural associations and cooperatives. Markets that bring added value for products that are grown and manufactured using conservation practices are important to encourage landowner adoption of best management practices and participation in regional conservation programs. Conservation of these species and the ecosystems they occur in will require a landscape strategy and approach that integrates a gradient of forest states from agroforests to primary forests in a connected and functional patchwork that maintains ecological integrity in this Andean Region (Fig. 2). It will take strong partnerships between organizations such as Fundación Natura, Cenicafe, universities, governmental agencies, and community organizations such as the regional coffee grower associations working with private landowners to sustain these valued species.

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Figure 1—Forest management and silvicultural systems are needed to sustain *Q. humboldtii* and *C. excelsa* in (A) primary forests, and to improve forest quality and productivity while restoring them in (B) old fields, (C) degraded secondary forests, and (D) over-grazed shrublands. Agroforestry practices are needed that incorporate *Q. humboldtii* and *C. excelsa* into (E) silvopastures, (F) living fences, and (G) intercropping plantings with traditional agricultural crops such as shade-grown coffee.

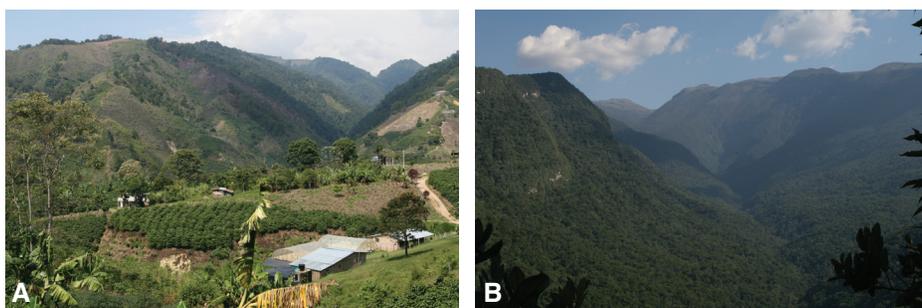


Figure 2—In addition to site-specific conservation practices that promote *Q. humboldtii* and *C. excelsa* in farm and forest, landscape plans are needed that integrate the many varied forest states from (A) agroforest to (B) primary forests spatially on the Andean landscape to meet regional and national conservation and economic goals.