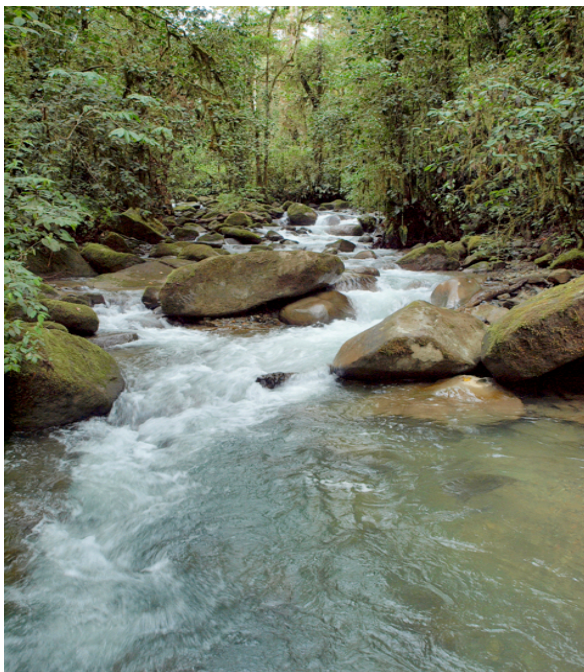


## From Scientists Concerned for Reserva Los Cedros and the Cordillera de la Plata

On June 14th, 2016 the Canadian mining company Cornerstone Capital Resources Inc. entered into a joint exploration agreement with Ecuador's State Mining Company, ENAMI(Cornerstone 2016). As part of this agreement, a large swathe of pristine Chocó cloud forest has been put into a mining concession. Much of this forest was previously protected, including most of the Bosque Protector Reserva Los Cedros and all the Cordillera de la Plata. **Together, these include some of the last major unlogged watersheds in all of Western Ecuador, in one of the most biodiverse regions on earth**(Myers et al. 2000). We, the undersigned scientists, contend that the value of this intact watershed is far greater than that of any possible mineral wealth that lies beneath it. This area should not have been placed in a mining concession and should remain a protected area.



Río Los Cedros, photo by Michael Wherley.

Cloud forests harbor exceptional biodiversity(Myers et al. 2000). The Reserva Los Cedros is well known for its critically endangered black-headed spider monkeys(Peck et al. 2008, Peck et al. 2011), but there are many other rare large mammals there too, including: the neotropical otter (near threatened, NT), margay (NT), puma (NT), jaguar (NT), and spectacled bear (vulnerable, V)(Albuja V. et al. 2012, International 2016). Smaller animals(Bronsvort 1994, Anderson and Jarrín-V. 2002), and insects abound(Brehm et al. 2005, Buestán A. et al. 2007, Cárdenas et al. 2009, Endara et al. 2010, Knee and Encalada 2014) as well as fantastic frogs, almost all rare and found only in the local cloud forests(Guayasamin et al. 2015, Hutter and Guayasamin 2015, Arteaga et al. 2016). For example, the recently described rainfrog, *Prisimantis mutabilis*, is only known from two streams, one of which is in Reserva Los

Cedros(Guayasamin et al. 2015). This remarkable frog is able to change its skin texture, a feature never before seen in frogs(Guayasamin et al. 2015).

Reserva Los Cedros is a bird hotspot(2016). At least 280 bird species have been seen(2016) on the difficult to get to and deliberately short (to maintain unbroken forest) trail system, including numerous species found only in the cloud forests of the Chocó region(Cooper et al. 2006, International 2016), and very recently described species such as the cloud forest pygmy owl(Freile and Castro 2013). In addition, these forests harbor a number of neotropical migrants that summer in Canada and the US, such as Swainson's thrush and many warblers, whose populations depend on having winter habitat. Of the birds seen at the Reserve, at least 10 are endangered, threatened, vulnerable, or near threatened due to habitat loss(International 2016).

Research from Reserva Los Cedros shows that the forest is extraordinarily rich in plant species. A field study estimated that there are 299 tree species per hectare (Peck et al. 2008), and many plants in the forest are local endemics with small ranges (Luer 1978, Luer 1993, Freiberg 1996, 1997, 1998, 2000, Cornejo 2008, Croat and Wolfersberger, Shanee and Peck 2008, Orozco and Canal 2011, Meyer et al. 2012, Policha 2012). Because of the clouds and rainfall, there are numerous epiphytic plants growing on the trees at all levels of the canopy (Freiberg and Freiberg 2000, Brown et al. 2015), including an estimated 400 orchid species (International 2016), many of which were described for the first time from the Reserve (Luer and Escobar 1988, Endara et al. 2009). This plant diversity in turn supports diversity of other organisms. Fungi abound in the forest as decomposers of the trees and other plants, or symbiotic mycorrhizal associates (Dentinger and Roy 2010, Thomas et al. 2016). The fly pollinators of *Dracula* orchid species, most of which are themselves new species (Endara et al. 2010, Policha 2014, Policha et al. 2016), spend part of their lives in mushrooms. The complexity of plant interactions and yet-to-be discovered life in these forests is staggering.

In 2000, it was estimated that more than 96% of the forests in western Ecuador had been deforested (Myers et al. 2000), more has been lost since then, and now the few remaining protected areas are being threatened. The biodiversity in this last intact watershed is remarkable, yet most of it remains to be discovered and understood. Mining represents a short-term investment with great long-term costs to the people of Ecuador. We cannot maintain the illusion that mining can be done without grave ecological and human health consequences, consequences that are well documented in scientific literature (Bech et al. 1997, Grandjean et al. 1999, Strosnider et al. 2011, Bundschuh et al. 2012, Oyarzun et al. 2012, Vezzoli et al. 2013, Li et al. 2014, Bianchini et al. 2015). As water resources throughout the world come increasingly under pressure, unlogged watersheds such as that of the Los Cedros river are accordingly precious.

The value of the biodiversity of Reserva Los Cedros and surrounding region to the people of Ecuador and the world is extraordinary. Ethical, ecologically-minded bioprospecting by Ecuadorian researchers of the vast diversity of primary forests like those of Reserva Los Cedros could bring long-term economic returns to the people of Ecuador and scientific and medical rewards for all of humanity. For example, a recently described species found at the Reserve, *Cuatresia physalana* (Orozco and Canal 2011), is related to tomatoes and potatoes and thus may contain genetic materials valuable for agriculture. Furthermore, *Cuatresia* are known to contain anti-malarial compounds (Deharo et al. 1992, Krugliak et al. 1995).

Responsible development of the region's infrastructure, with an eye for long-term sustainability, education, ecotourism, and research represents a more sustainable way forward for Ecuador's last uncut cloud forests, and the people who call them home. This is a model of development at which Ecuador has excelled in the past: the country today reaps benefits both for its own economy and the international community at large with its careful management of the Galapagos Islands. In 2008 Ecuador set a new moral standard for the world, when the National Assembly included the rights of Nature in the Constitution of Ecuador (Assembly 2008, Nacional 2008), articles 72–74. We, the undersigned, hope that Ecuador understands and seizes this opportunity to honor their commitment to the natural world, and to future generations of Ecuadorians.

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