

# ***Political Ecology, Ecological Economics, Landscape Change and Management of Cerro El Roble Nature Sanctuary in Central Chile***

by  
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## ABSTRACT

Habitat destruction, climate change, overexploitation, and pollution are forcing the biological diversity of our planet towards a mass extinction, the first ever caused by human activity. This imminent threat raises an urgent need to create protected areas that sustain the Earth's remaining species. However, the creation of protected areas generates social conflict, changes in land use from production to conservation, and raises a number of complex management issues that need to be resolved in order to maintain existing species diversity and ecosystem services.

I have studied the processes, conflicts, and outcomes related to the creation of the Cerro El Roble Nature Sanctuary, a conservation area located 47 Km northwest of Santiago, Chile's capital city. The creation of the 998.1 hectares Cerro El Roble Nature Sanctuary in 2000 produced social conflict within the nearby community of Caleu (pop. 430). We conducted an in-depth, interdisciplinary study of the consequences of establishing the Nature Sanctuary by collecting data using focus groups, surveys, extensive interviews, field observations, and remote sensing satellite imagery. We focused on the social conflict, the ecological economics of ecosystem use, the state of the El Roble hill ecosystem, and a sustainable management plan for the Sanctuary.

The conflict surrounding the creation of the Cerro El Roble Nature Sanctuary was complex, having different levels and domains that emerged primarily because of the power struggle and divergent views between the ancestral, less educated locals, and the richer, more educated newcomers. As documented in this study, following the creation of the Sanctuary, there was a significant reduction ( $p < 0.05$ ) in the use of ecosystem services by the community of Caleu. However, as a result, the local people, especially older "Calegüanos", lost a range of valuable resources that supplemented and sustained their daily lives, and that, consequently, led to further impoverishment.

The analyses of long-term changes in the Cerro El Roble landscape, using a series of Landsat satellite images taken between 1975 and 2012, indicated that the core oak forest has been declining in area and increasing in fragmentation for

at least the past 38 years. Local weather records that cover the same period show no significant change in average precipitation. However, there is been an increase of 1.2 degree C° in average temperature in the area, double than world temperature increase in the same period. On-site observations and a number of related studies support the hypothesis that the deterioration of El Roble hill ecosystem has resulted primarily from anthropogenic disturbance and likely for indirect global warming effects. While the establishment of the sanctuary has helped to reduce these perturbations, at current rates of change the core oak forest will be reduced from 120-140 hectares in 1975 to just 10-15 hectares of increasingly fragmented habitat by 2050.

Finally, state-of-the-art, science-based approaches to the management and conservation of ecological reserves are reviewed with the aim of crafting a new management strategy for the Cerro El Roble Nature Sanctuary that replaces the current, inadequate plan. The plan proposed here lays the foundation for realizing the sustainable use of the sanctuary, and will promote the recovery of the centrally important oak forest.