

Is Community-based Conservation an Effective Tool in the Llancahue Watershed, Chile?

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Introduction

The Llancahue watershed (1,300 ha), in southern Chile (Figure 1), has been owned by the Chilean government since the 1920s, and the property protects the water-supply watershed for the city of Valdivia. Unfortunately, the property currently appears abandoned in recent years due to a lack of resources dedicated to the protection and maintenance of the property. Consequently, the Chilean government granted the concession of Llancahue watershed to the University Austral de Chile in September 2008, with the mandate to develop a peri-urban park for Valdivia (around 130,000 inhabitants). The hope is that this public-private partnership will provide better management of the watershed and benefit the city of Valdivia by converting Llancahue into a recreational and educational space. Specifically, the university's goals for Llancahue include (1) maintaining or improving the water supply; (2) developing a peri-urban park for the city of Valdivia; (3) incorporating the local, rural community, Lomas del Sol, in the creation and maintenance of the park; (4) creating an outdoor, educational forestry laboratory; and (5) conserving the biodiversity of Llancahue, one of the best examples of old growth forest left in the Valdivian ecoregion. The Valdivian ecoregion is one of the most important hotspots for biodiversity in Chile and worldwide, due to the high number of endemic species present, and the rapid loss of native forests that has occurred in south-central Chile during the past 40 years (Armesto et al. 1998; Myers et al. 2000; Smith-Ramirez, 2004).

Llancahue watershed could be a conservation success story if the university can successfully partner with the local rural and urban communities to achieve conservation goals. In their ideal peri-urban park, the university would protect ecosystem services by engaging the neighbors of Llancahue to become good stewards of the land. The neighboring community, Lomas del Sol, would assist in, and benefit from, the education, ecotourism, restoration, and silviculture activities that the university would implement, through expanded employment and education opportunities. The final result would be a model park that is

Figure 1. Location of Llancahue Watershed, Valdivia, Chile.



sustainably managed, and where the citizens of Valdivia could enjoy and learn about the importance of old-growth forests, watersheds, and biodiversity.

Yet, the Llancahue watershed comes with its own challenges. Members of the Lomas del Sol community have noticeably been extracting wood and grazing cattle in the watershed since the mid-1990s. This community is willing to work with the university on this project, but they need alternatives to their current economic activities. They have little training or education in anything other than charcoal production and timber extraction. To further complicate matters, the university received the concession of this property without any financial assistance. They have aspirations to auto-finance the property through sustainable forestry management, private donations, or a management fee that would be added to the water bill, but all of these solutions will take time to implement. Thus, the two biggest challenges in Llancahue are working with the Lomas del Sol community to prevent destructive exploitation of Llancahue, and working with all stakeholders to develop concrete plans that can creatively and strategically use stakeholder resources and expertise to make this project a success.

Methods

The International Union for the Conservation of Nature (IUCN) model for community-based conservation in protected areas, also known as the protected landscape approach, provides guidelines on how to improve community participation in conservation management plans. The goal of this approach is to integrate biodiversity conservation, cultural heritage protection, and sustainable use of resources while fostering stewardship by the people living in the landscape (Brown, Mitchell, and Beresford 2005). The first step in the community-based conservation planning process is to determine the attitudes of local people toward conservation initiatives, and identify potential ways that local communities can benefit from the conservation area (Infield 1988; Fiallo and Jacobson 1995). During the Chilean summer of 2008–2009 (November through February), we used a mixed methods approach to determine stakeholder attitudes towards the Llancahue watershed, and will use this information to develop clearer management strategies for Llancahue.

A combination of semi-structured interviews ($n = 70$), formal meetings ($n = 3$), focus groups ($n = 5$), documentation of informal interactions, and observations was used to conduct the stakeholder analysis (Figure 2). Stakeholder groups can be divided into two major categories: the local campesino community, and institutional. The local campesino community, Lomas del Sol, lives beside Llancahue. Some members of this community use the watershed to harvest wood and graze their cattle. Institutional stakeholders in the region include governmental agencies, non-profit organizations, private industry, and the university. Eighty percent of the institutional stakeholders work in the field of natural resource management and the other 20% work in rural development, education, or tourism. The techniques used to engage these stakeholder groups varied slightly, and two different interview questionnaires were developed. The overall interview response rate was high (97%). Saturation was achieved in the responses to all of our main research questions. We found that having key informants in both the Valdivian community and the Lomas del Sol community was critical.

Results

Everyone interviewed (100%) felt that the Llancahue watershed needs protection, “even if it is not convenient for me” as stated by one resident of Lomas del Sol. Many Lomas del Sol residents suggested that the watershed should be closed completely through enforcement. When we asked participants about the biggest environmental change they had witnessed in their own lifetime, responses varied, but over two-thirds of all respondents cited the conversion of native forests to exotic plantations. This is reflected in the fact that the number one industry of the region is forest products, largely for export. The loss of native forest has put increased pressure on remnant native forest on which local, rural communities depend on selling firewood and charcoal to urban residents of the region—thus Llancahue is not an isolated conservation case in the region.

The Lomas del Sol community hopes (100%) the creation of the peri-urban park will create alternative livelihoods for them, yet they have their doubts about when this might occur. The Llancahue peri-urban park has been discussed for seven years before the concession was granted to the university in fall 2008. The community believes that the university can effectively manage Llancahue (100%) because they have the expertise. The Lomas del Sol community hopes to receive training, education, and better services, such as an improved roads and electricity, as a result of the peri-urban park. Many expressed concern that they were not ready to receive visitors who will come to the Llancahue peri-urban park in the future. There was an overwhelming interest within the community to receive capacity training in all types of activities from trail building, gardening, cooking, ecotourism, chainsaw certification, and forestry management. Additionally, many want to receive basic education, since most residents never completed an elementary education. Many Lomas del Sol residents have spent their lives cutting trees in the forest and making charcoal. When asked what type of work they would prefer, the majority of residents stated they would like to continue participating in forestry vocations such as thinning the forest, cleaning the forest, and trail building. Fewer residents had an interest in being guides, due to their lack of education.

Many residents want work to supplement the production of charcoal. Charcoal production is an important link between the community and the forest, and provides an important cultural aspect to the park. Charcoal is very important in Valdivian society because many social gatherings are centered around ‘the asado,’ or outdoor barbeque, where charcoal is used to cook large pieces of meat. Charcoal production in Lomas del Sol is unique, in that they build hand-made, earthen ovens each time they cook the charcoal (Figure 3). The production of charcoal could tell an important cultural story by linking the forest to the asado, and demonstrating this process to visitors (Figure 4).



Figure 2. The authors met with the Lomas del Sol community in December 2008 to discuss the university’s and community’s visions for Llancahue, and to solicit feedback on potential benefits and challenges of the project.



Figure 3. Photo of the home-made, earthen oven used for the production of charcoal.



Figure 4. Community members are explaining the process of making charcoal to institutional stakeholders from Valdivia during a focus-group tour of natural and cultural resources in Llancahue.

The current level of charcoal production and firewood extraction is unsustainable. The current wood demand by the community for charcoal production is at least 0.6 solid cubic meters per month per family, or 144 m³ per year for the entire community. This figure excludes extractive firewood demand which is greater than 0.6 m³ per month for 10 or more families. The university only plans to manage 10 ha of secondary forest per year which would produce about 140 m³ of wood on an annual basis. They hope to use half of this wood to pay for the implementation of the peri-urban park annually. The university needs to work with the community to employ them in the development of the peri-urban park, which can provide alternative income sources and reduce their dependence on carbon production. Yet we do hope to encourage a sustainable level of carbon production in Lomas del Sol to preserve this cultural aspect of the community. For these reasons, we suggest that the Lomas del Sol community is the most immediate challenge to managing the watershed sustainably as they

directly threaten the integrity of the forest. This community can, however, also be Llancahue's most important asset due to the fact they provide a ready and willing workforce and add cultural significance to the park.

Although the university has many objectives for the watershed, stakeholders ranked the protection of the water supply and the protection of the old growth forest as their first and second priorities for management. Some stakeholders expressed concern about the impacts of recreational uses of the watershed on the water supply and the old-growth forest. The university must use science to monitor any new activities that are implemented in the watershed to insure that ecosystem services are not negatively impacted. The hope of the university is that they can demonstrate that the thinning of the secondary growth forest will increase water production, restore old growth conditions and produce revenue to finance the peri-urban park, as well as provide alternative economic opportunities for the Lomas del Sol community. The use of science and adaptive management will allow effective decision-making as to the uses of the watershed. Scientific monitoring of management decisions will additionally benefit the university as they have existing research expertise. Llancahue can provide an ideal and convenient location for applied graduate and undergraduate research in a variety of fields including forestry, ecology, geosciences, rural development and tourism.

Even though the university has exceptional research expertise, many stakeholders acknowledge that the assistance of and collaboration with other institutional partners is necessary for success. We feel that the creative and strategic use of stakeholder institutions to pool people and resources is necessary due to the lack of resources currently available to support this project, one of the most commonly cited concerns of institutional stakeholders.

Finally, an interesting result is that although Llancahue provides 80% of the cities water on an annual basis and is one of the last old-growth forest near the city, almost no stakeholders (<3%) thought that the citizens of Valdivia were aware of the Llancahue watershed or its importance. This may be due to the fact that Valdivia is surrounded by large rivers. These rivers are used for water production for about 20% of the year (during the summer dry period), but the cost of producing water from these rivers is six times more than the cost of producing water from Llancahue (Azurmendi 2004). Thus, there is a direct monetary benefit to the citizens of Valdivia if water production can be maintained or increased in Llancahue. A survey of articles in the *Diario Austral*, the daily newspaper in Valdivia, revealed that only two articles had been published on the Llancahue watershed during the past five years. Clearly another important first step in Llancahue will be to increase public awareness through outreach programs and environmental education in schools, the creation of a friend's group and use of the media.

Discussion

We suggest that engaging various stakeholder groups in Llancahue watershed will encourage them to become effective stewards and partners of the Llancahue peri-urban park. The Lomas del Sol community can be a great asset to the park by providing a willing work force and an important cultural aspect to the park. Institutional stakeholders can support the park through various university/institutional partnerships that can be incorporated into the man-

agement plan. Finally, the residents of Valdivia must be introduced to and educated about the importance of Llancahue watershed so they will identify with the park and want to protect the watershed for future generations.

For conservation initiatives to be a success in the future, conservation and development must occur simultaneously (Berkes 2004). From our perspective, this project could be a model of conservation that has benefits from the local to international level. The Lomas del Sol community will benefit if they can obtain better education, diverse employment opportunities, better services and preserve their cultural tradition. Valdivian citizens benefit by protecting their water supply and natural heritage, developing a space for recreation and environmental education and creating new revenue through ecotourism. If successful, this project could provide a model for sustainable community-based conservation and development in the region. Finally, this project is of international significance because it will help conserve one of the last old-growth forests in the Valdivian ecoregion, a hotspot for biodiversity in the one of the world's most diverse and endemic ecoregions that is quickly disappearing.

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