

ABSTRACT

MOORMAN, MICHELLE C. Collaborative Watershed and Forest Conservation: A Case Study of the Llancahue Watershed, Chile. (Under the direction of Drs. Susan E. Moore and Stacy Nelson.)

The loss of old-growth temperate rainforests in Valdivia, Chile, a biodiversity hotspot, is of regional and international concern. Efforts are underway to preserve the few remnant old-growth forests that remain. The University Austral of Chile joined these efforts after becoming a concessionaire of the Llancahue watershed (1300 hectares), which includes 400 ha of one of the few remaining old-growth forests in Chile's central depression. This forest is also the primary watershed for the city of Valdivia (population 130,000) and provides 80% of the drinking water. In the past, the watershed was a state-owned protected area, but the citizenry lacked awareness and the state lacked the resources to protect it from cattle grazing and illegal poaching of old-growth trees; actions resulting in watershed degradation. In attempt to protect the watershed and create a public stake in it, the university proposed to work with the local tree poachers to manage the forest and create a sustainable, peri-urban park.

This thesis presents the case study of the Llancahue watershed to examine the benefits and barriers to watershed and forest management. As part of the university's pre-implementation planning, a stakeholder analysis of the local logging community and key institutional stakeholders was conducted. Our dataset used a snowball sample to conduct 68 semi-structured interviews with 15 loggers and 53 institutional stakeholders, stakeholder meetings (n=3), focus group tours of the Llancahue watershed (n=5) and informal interactions between November 2008 and February 2009. We found that the traditional state-protected area lacked the resources to address threats to the watershed and had unofficially adopted a

policy of in-action. Although stakeholders are uncertain how a collaborative public-private partnership will work, they hope it will improve conservation efforts by collaboratively negotiating resources to achieve more effective conservation of the watershed. To help accomplish this, the University has proposed creating value-added products such as the extraction of timber from the second-growth forests, a platform for ecotourism, and environmental education programs. These products can help improve forest management, create new entrepreneurship, and promote environmental ethics and support amongst citizens, respectively. Our analysis highlights that conservation stewardship requires management and demonstrates why pure preservation efforts have failed in countries with limited resources for protected area management. This case study helps further our understanding of the multi-dimensional aspects of managing native forests with local people for biodiversity, forest, and water conservation.

Collaborative Watershed and Forest Conservation: A Case Study of the Llancahue Watershed,
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DEDICATION

To my mom, thanks for constant encouragement.

BIOGRAPHY

Michelle Moorman received her B.A. in Geography and Recreation Administration from the University of North Carolina at Chapel Hill in 1999. During her senior year, she took an internship with the U.S. Fish and Wildlife Service that influenced her to pursue a career in environmental science. Following graduation, she took a job with the U.S. Geological Survey as a hydrologic technician. Realizing there were still many things to learn, she decided to return to graduate school for a master's degree in Marine, Earth, and Atmospheric Science at NCSU in 2005. This project took her to Tierra del Fuego, Chile to study invasive species interactions in a protected area that was being highly impacted by introduced North American Beaver. During the process, she realized the need for developing an improved understanding of the processes that impact environmental management and decided to pursue a PhD program with the Department of Forestry and Environmental Resources at NCSU. The PhD allowed her to create an interdisciplinary project that combined her interests in environmental science and environmental management into an applied dissertation project that has been educational, fun, and rewarding. In her free time, Michelle enjoys the great outdoors and can often be found racing sailboats with her husband Chris or mountain biking.

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Chapter 1: The challenge of water and forest conservation

Recent scientific interest has focused on the importance of ecosystems in providing environmental services that contribute to sustaining and fulfilling human life (ESA, 1996; Daily, 1997; Bunn 1999). The idea that man is dependent on goods and services provided by nature and that these goods and services are finite was first published in the Western Literature by George Perkins Marsh in 1864, but largely ignored until the middle of the 20th century when Osborne (1948), Leopold (1948), and Vogt (1949) wrote and popularized the concept of 'natural capital' (goods and services provided by nature). Since this time, discussion and research evaluating the importance of services provided by the environment has continued. In 1981, Ehrlich and Ehrlich instituted the term 'ecosystem services' which we continue to use today. One of the most cited recent publications on this topic is a book, *Nature's services: societal dependence on natural ecosystems*, by Stanford biologist, Gretchen Daily. Daily (1997) specifically defined ecosystem services as "the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life. In addition to the production of goods, ecosystem system services are the actual life-support functions, such as cleansing, recycling, and renewal, and they confer many intangible aesthetic and cultural benefits as well (Daily, 1997, p. 3)."

Theory on ecosystem services postulates that the goods and services provided by nature are essential for human well-being and poverty reduction, but are threatened by anthropogenic changes to the environment (e.g. habitat change, overexploitation, invasive,

alien species, pollution and climate change) (MEA, 2005). Thus, the foundation of conservation planning and environmental sustainability is based on the concern that humans are using the planet's resources more quickly than they can be replaced. This violates the theory of Maximum Sustainable Yield which states that we must use natural resources at a rate equal to or lower than their replacement level (Roedel, 1975). For example, the Convention on Biological Diversity is an international accord that recognizes that species are disappearing at a rate faster than they can be replaced (CBD, 1992).

Conservation planning is our attempt to achieve balance between resource use and resource replacement. Yet, conservation management is complex because it tries to answer the ambiguous question: How should we sustainably manage our natural resources? Gifford Pinchot, the first head of the American Forest Service, defined the principles of conservation to include development, conservation and protection of the public interests (1910). In 1980, the International Union for Conservation of Nature (IUCN) adopted sustainable use as a conservation strategy. Sustainability is the idea that we manage our resources in a way that they can satisfy human needs now and in the future; in simplest terms it is the idea that a system persists (Costanza and Patton, 1995, Botequilha and Ahern, 2002). As a conceptual idea, sustainability makes sense, but in practice sustainable conservation management is more complicated. We must determine what system or system characteristics we want to sustain, how long we want to sustain them, and determine endpoints for measuring success (Costanza and Patton, 1995). In an ideal world,

society will balance social, economic, and environmental goals in order to plan for sustainable societies (Adams, 2006).

Competing theories on how conservation initiatives should be implemented exist because of the ambiguity surrounding sustainability. Different schools of thought have emerged in the western world with regards to the management of our natural resources. Traditionally, protected areas have been one solution to achieving environmental sustainability of forests, water, and biodiversity (Bruner et al., 2001). In recent years, concerns over the effectiveness of traditional protected areas have emerged, causing us to rethink best management practices for the conservation of our natural resources (Phillips, 2003). Specifically, we can identify three approaches to protected area and natural resource management that can be categorized as classic, populist, or neoliberal (Brown, 2002; Figure 1.1). Each approach has its merits and challenges and is associated with a country that has been a leader in implementing the conservation strategy (Table 1.1). Yet, the reality of most conservation management strategies is that they borrow from all three techniques, adopting a mixed-methods approach to conservation management. For this paper, we will discuss each approach and introduce the case study of the Llancahue watershed, the focus of the dissertation, to demonstrate how a mixed-method approach that is context specific can improve protected area and conservation management.

The traditional model: Top-down management for protected areas

In the past, most protected areas have been run by experts using a top-down management approach that excluded the needs of local people (Zunino, 2007). Originally, the concept of protected areas was that they were government-owned, government-run, and set aside for protection and enjoyment.

The benefit of this type of protected area is that they have clear boundaries and have proven to be successful for the conservation of biodiversity (Bruner et al., 2001; Locke and Deardon, 2005). Politically, state run systems tend to be less complicated and less difficult to manage (Kellert et al., 2000). Decisions are usually made from the top, making them easier to implement.

Despite these benefits for biodiversity protection, most protected areas are threatened by human encroachments (Liu et al., 2001). Conflicts can exist when the planning process excludes local people who have traditionally used the protected area and its resources (Phillips, 2003). For example, both Yellowstone and Yosemite U.S. National Parks were set up without the consultation of the indigenous or local people living within or beside the protected area. Their implementation caused friction between the park and the local people who were forced to adhere to new rules. In situations such where locals do not want to follow the rules associated with the establishment of the protected area, the costs associated with enforcing border protection can be quite high (Phillips, 2003).

Consequentially, the traditional model has proven less transferrable to underdeveloped and

transitional countries where local people still depend on or use resources in the conservation areas for survival and governments provide few resources for border protection (Negi and Nautiyal, 2003; Ohl-schscherer et al., 2008). This scenario can result in a phenomenon known as a “paper park”, where a conservation area is protected on paper, but on the ground, the governing agency is failing to manage the protected area for conservation purposes. Often this is because environmental conservation is a secondary consideration to poverty reduction and economic growth (McNeely, 1994; Philips, 2003; Berkes, 2004).

This traditional model of protected area management originated in the United States. The traditional approach is the theoretical basis for the National Park Service and U.S. Forest Service. Yosemite National Park was the first state-owned protected area and Yellowstone National park was the first National Park in the world (Phillips, 2003).

The populist model: Community-based natural resource management

Since the 1990s a major concept that has emerged in conservation thinking is that protected areas are not free of human influence, thus the local communities that use the protected area and their uses need to be identified and addressed in conservation plans (Fletcher, 1990). Community-based resource management is a bottom-up approach based on the assumption that the assessment and inclusion of local people’s needs in conservation planning is important for promoting the well-being of the local population and

ensuring that long-term biodiversity and conservation goals are met (Sinclair et al., 2000). For these reasons, scholars hypothesized that a community-based approach to conservation planning that addresses social and economic objectives and includes the local community in the design of the conservation area could improve conservation management (McNeely, 1994; Philips, 2003).

Research suggests that incorporating stakeholders into the design process generates public awareness which may increase future public acceptance of the conservation policy (Brown and Harris, 2005). 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 et al., 2005). Thus, the hypothesized advantage of this bottom-up populist approach is that it can jointly achieve sustainable development goals of poverty alleviation and environmental protection.

Difficulties with the implementation of the populist model include defining the local community and engaging local community participation (Agrawal, 2000). Managers are also concerned that there can be increased exploitation by the local community once they gain greater control over the resource (Agrawal, 2000). In addition, most community-based natural resource management projects have rarely proven to be more effective than state-run system in protecting the environmental resources to date (Kellert et al., 2000).

The populist model has been called the Mexican model since the management of many forest resources was returned to local and indigenous populations following the

Mexican revolution. Over half of all forests in Mexico have been community owned since the 1920s. Since, the late 20th century, between 290-479 community forest enterprises have been created where communities manage for both timber and non-timber products. This has allowed communities to manage their own forests and produce timber resulting in direct economic benefits to the community while improving the management of Mexico's forest resources (Bray et al., 2003).

The neoliberal model: Payment for ecosystem services

Payment for ecosystem services is a market-based approach that implements conservation goals by creating incentives for conservation (Jack et al., 2008). The four types of ecosystem services normally protected in this system are carbon sequestration and storage, biodiversity protection, watershed protection, and landscape beauty. Normally, there are three mechanisms used to finance the conservation of ecosystem services – conservation easements, tradeable development rights, and conservation concessions. These mechanisms finance the conservation of land in a forested or less developed state which is assumed to best protect the ecosystem service (i.e. carbon sequestration, water protection, etc.) (Wunder, 2006).

Arguments for the payment for ecosystem services approach suggest that putting an economic value on natural resource conservation will justify the costs of management. For example, estimates suggest that current worldwide spending on conservation initiatives is

approximately \$6.5 billion, but estimates suggest a budget of \$45 billion is needed for proper implementation of these initiatives (Balmford et al., 2002). Although this figure may seem costly, conservative estimates suggest that conservation initiatives deliver between \$4400 and \$5200 billion annually in ecosystem services (Balmford et al., 2002). Thus a clear benefit of the neoliberal model is that cost benefit analyses demonstrate the economic benefits to policy makers (Locke and Deardon, 2005; Daily, 1997). Additionally, payment for ecosystem services programs can provide increased revenue to rural poor, strengthen land tenure, provide a more diversified livelihood, and expand asset endowments (Wunder, 2006).

The major challenge with the payment for ecosystem services approach is that ecosystem services traditionally have been provided for free, thus there is a tendency for society to take these services for granted. One of the single largest conservation challenges with payment for ecosystem services schemes is to convince policy makers and citizens of the economic importance of conservation. This can be accomplished by making tangible links between conservation and economic gain for the local economy (Allen et al., 2008). Another issue with the neoliberal model is that incentives are often based on proxies and the ecosystem services are often measured by a proxy, thus determining if the conservation measure is adequately protecting the resource is speculative. There is no guarantee that the conservation of a service through the protection of land by a landowner in one location will mitigate effects, especially increased negative effects by the landowner in another

location (Jack et al., 2008). Finally, little is known worldwide about the value of different ecosystem services provided by different landscapes. Thus payment for ecosystem services schemes will only be successful if we can prove that the conservation of a certain landscape or ecosystem provides greater value than if it is developed (Naidoo et al., 2008).

Costa Rica is well-known for being a pioneer in the implementation of payments for ecosystem services programs. In 2000, over 300,000 ha of primary, secondary, or planted forest received funding from the first phase of a payment for ecosystem services program that paid landowners to conserve, restore or sustainably manage their forests. The money for the program came from a lump payment from Norway for carbon offset credits and hydroelectric projects (Sanchez-Azofeifa et al., 2007). Aside from Costa Rica, Mexico and Australia have also implemented payment for ecosystem services programs.

Mixed methods model case study: Llancahue watershed

There is no clear prescription on how to appropriately manage various natural resources (Lal et al., 2001). Couple this with the uncertainty of natural resource management and the fact that conservation management is severely underfunded (Balmford et al., 2002) and we can conclude that developing conservation management plans is a difficult undertaking. Part of the reason for this is that often what might be considered the most sustainable environmental practice can have negative social or economic impacts (Adams, 2006). Science can help in the decision-making process, but

ultimately sustainability goals must be a balance between environmental, economic, and social needs. Thus the best solution for conservation planners is to determine context specific strategies for a given protected area. This will include actively involving stakeholders and the general public in the conservation planning process with the aim of producing useful management strategies that stakeholders agree with and feel like they own (McNeely, 1995). This can help mitigate problems related to stakeholder disagreements (Lal et al., 2001). As Roy Chowdhury (2006) noted, local people and their livelihoods are under increasing pressure due to globalization that has fostered increased interest in both economic development and conservation. Social context is not the same for all conservation cases, but social context and the impacts of various conservation policies must be understood in order for conservation projects to be successfully implemented (Chowdhury, 2006). Thus conservation needs to be one of engaged, local-level planning and implementation that allows government, scientists, interested civilians and local inhabitants to work together toward a common goal – “conserving to produce and producing to conserve” (Garcia-Frapolli et al., 2009). Brechin and West (1990) stated that most conservation approaches need to link traditional, top-down approaches with participatory, bottom-up strategies. This thesis supports the argument that most conservation cases will not fall into one strict category of conservation management. Instead, conservation management will be context specific, relying on a mixture of strategies that are best suited to addressing the socio-economic context of the conservation area.

In order to demonstrate this, the Llancahue watershed, south-central Chile was examined as a case study for collaborative forest and watershed management and conservation of old-growth Valdivian Temperate Rainforest. The Universidad Austral de Chile (UACH) has taken over the management of this watershed that supplies water to the city of Valdivia (130.000 people) after receiving a 20 year concession for the property from the Chilean government in September of 2008. They won the concession by proposing to create a peri-urban park for the city of Valdivia while 1) protecting quantity and quality of the water supply, 2) conserving biodiversity in the watershed, 3) encouraging public use through outdoor education and ecotourism, 4) conducting scientific research on ecosystem processes, and 5) managing and financing the project through sustainable forest management (Donoso et al., 2005). Peri-urban natural parks are spaces protected from urbanization, dedicated to preservation of biodiversity, and receiving the public for educational purposes (FEDENATUR, 2004). Thus, by definition, peri-urban parks have the goal of protecting ecosystem services. Yet, as already mentioned, preserving ecosystem services requires prioritizing goals and evaluating tradeoffs.

In the case of Llancahue, the UACH will take a mixed methods approach to the management of resources. Llancahue provides several important ecosystem services, with the provision of 80% of the City of Valdivia's water being the most important ecosystem service and the conservation of the biodiversity of the 400 ha of old-growth Valdivian rainforest being a second. The current view is that protection of the old growth forest will best protect the supply and quality of water and biodiversity, yet the government has been

unable to prevent illegal logging and cattle grazing using a top-down management approach. This is largely because the government has not provided resources for protecting the park during the past few decades. During this time, the forests and water supply have become threatened by illegal uses such as the harvesting of old-growth trees and the grazing of cattle in the watershed by the neighboring, rural community, Lomas del Sol.

The UACH has proposed a more populist-based management approach to conservation management with the hope that they can work collaboratively with regional and local stakeholders through the development of public-private partnerships. Specifically they hope to manage the secondary forests of the Llancahue watershed with the Lomas del Sol community and partner with regional stakeholders to develop Llancahue for educational and recreational purposes. In order to accomplish this, the UACH will have to engage these local and regional partners in the management of Llancahue.

This introduction has attempted to present an overview of sustainability and conservation, the issues involved in defining and managing resources sustainably, and the challenge of implementing sustainable initiatives. Sustainability is a concept that originated from a concern about anthropogenic impacts on the environment. Conservation management is our attempt to reduce environmental problems through careful use of our natural resources. With this in mind, we have to ask what conservation policies will provide sustainable solutions to our environmental problems and what the role of protected areas will be in these initiatives.

Conservation management must provide context specific solutions that are designed to meet the conservation goals of the protected area or resource and the needs of local communities using the resources available. This thesis demonstrates how a context specific management plan could be created through the Llancahue case study by providing an analysis of local and regional stakeholder perceptions of the Llancahue watershed and their opinions on best approaches to management (Ch. 2). Data from our interviews with the local logging community was then used to assess the potential of implementing a sustainable forest management program as a populist-based approach to protecting the old-growth forest (Ch. 3). Data from our interviews with all stakeholders was used to help evaluate and advance the UACH led public-private partnership of the Llancahue watershed as a conservation management strategy (Ch. 4). Finally, we end with a discussion of why Llancahue demonstrates the need to understand the context of conservation initiatives before implementation in order to improve the sustainability of ecosystems (Ch. 5).

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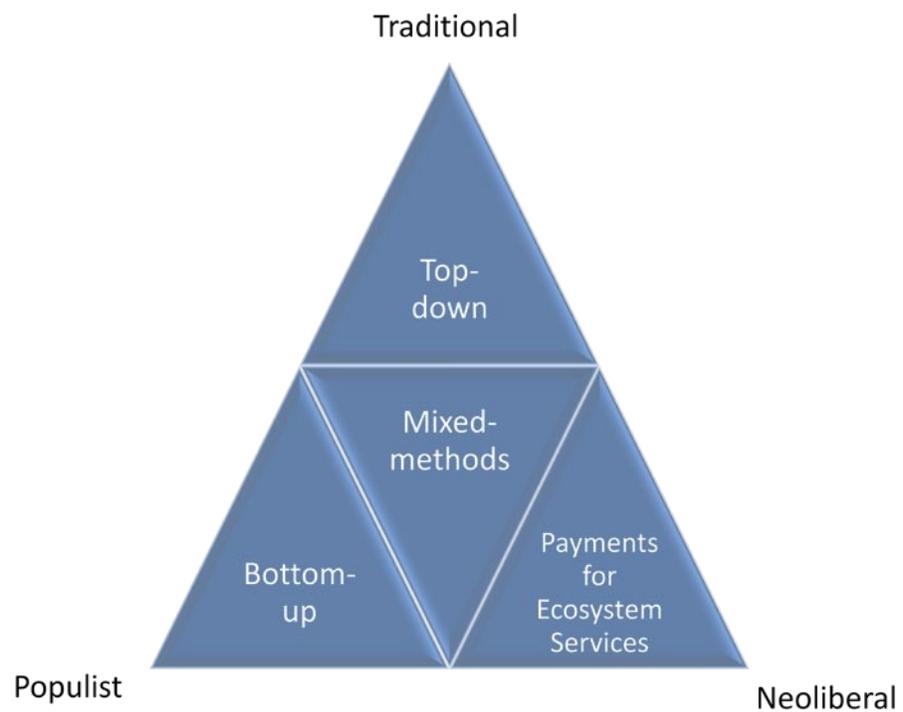


Figure 1.1. Conceptual Model of Strategies for Protected Area Management.

Table 1.1. A synthesis of the three philosophical approaches to Protected Area (PA) and conservation management.

Conservation Management Approach	Description	Merits	Challenges for implementation	Example of PA managed with this approach
Classic model	Top-down approach: Conservation management is directed by the government	Easier to implement because fewer decision makers Can ensure strict protection of biodiversity and water	Requires significant resources for implementation May cause disputes with local communities	U.S. Model: Government owned, regulated and run protected areas
Populist model	Bottom-up approach: Privately-held, communal forests and protected areas	Provides direct benefits to local communities by allowing them to manage their resources Reduces problem of “paper parks”	Communities can have internal conflict or corruption with regards to resource management Varying degrees of management of the extractive reserves	Mexican Model: Community managed forests (<i>Ejidotes</i> and <i>comunidades</i>)
Neoliberal model	Market-based approach: Communities receive direct benefits via payments for the conservation of resources	Direct benefits provided to the people implementing conservation practices	Long-term funding for program can be uncertain No insurance that communities will continue to manage resources once payments stop	Costa Rican Model: Payment for Ecosystem Services for the conservation of water and forests

Chapter 2: The importance of AND: Why conservation and development must occur simultaneously in Chile

Traditionally, the use of government-owned protected areas has been used as a solution to achieving the conservation of forests, water, and biodiversity. The assumption is that ecosystem services are best protected in non-human altered systems (Bruner et al., 2001, Kellert et al., 2004; Garcia-Frapolli, 2009). A protected area has been defined by the Convention on Biological Diversity (CBD) as “a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives” (CBD, 1992, article 2). Initially the establishment of protected areas for biodiversity conservation was based on the 10% rule; this was an endpoint established by the CBD that protection of 10% of all the world's ecosystems would ensure maintenance of the world's biodiversity. Countries rushed to establish protected areas as they received international funding for this initiative resulting in the protection of over 100,000 sites, 12% of the earth's land surface (Chape et al., 2005).

Yet research has proven, that the establishment of a protected area does not guarantee the protection of resources if the needs of adjacent communities are not considered (McNeely et al., 1994; Borrini-Feyerabend 1996; Berkes, 2004; Elbers, 2008). Scientists are beginning to suggest that we must view our world as a coupled human-natural system and improve our understanding of how humans are altering the biosphere from the global to local level (Palmer et al., 2004; Liu et al., 2007). They acknowledge the

many local threats that impact the conservation of forest and water resources. Examples include the numerous documented cases of human intervention in protected areas that has led to the phenomena of “paper parks”, i.e. the parks created at the national level to meet international treaties, but that lack sufficient funding for on the ground management (McNeely et al., 1994; Armesto et al., 1996). This has led to the degradation of protected areas, often caused by the poaching of wildlife, plants, and trees, the grazing of animals within the protected area, the unsustainable use of the protected area by tourists and/or tourism activities, and/or the poor construction of roads or trails for the extraction of resources or tourism (Liu et al., 2001; Joppa et al.; 2008, Selin, 1999).

The reality of “paper parks” has been clearly identified in Chile (Carruthers, 2001; Pauchard and Villarroel, 2002). Conservationists acknowledge that threats such as illegal logging and cattle grazing continue to occur in state-owned protected areas (Armesto et al., 1996; Lara et al., 2009). Yet, they also recognize that 200,000 people live in poverty in or on the fringe of forests and state-owned protected areas (Emanuelli, 2005). Couple this with the reality that spending on conservation in Chile equals approximately \$0.50 U.S. dollars per a hectare, 1/50th of the spending for conservation in New Zealand, and it becomes clear that the current system of government owned and run protected areas lacks the resources to achieve its conservation goals (Lara and Urrutia, 2010).

The emerging model of private-public partnerships in Chile

Conservation professionals in Chile are searching for new models of conservation to replace the traditional model of the state-owned protected area (Pauchard and Villarroel, 2002; Rozzi et al., 2006). The idea of creating public-private partnerships to jointly manage state-owned protected areas has been proposed as an avenue for negotiating more resources for conservation projects (Stackhouse, 2009). Partnership designs create joint agreements that formalize shared responsibilities for solving natural resource problems or carrying out natural resource goals (Selin and Chavez, 1995). As of 2009 there were more than 500 private protected areas in Chile (Meza, 2009), the majority created by philanthropists and international conservation non-governmental organizations (NGOs). Other private protected areas have been created by corporations, research institutions, tourism entrepreneurs, and indigenous communities (Meza, 2009). A study conducted by a team from the Economist Intelligence Unit (2009) discovered that Chile was best suited amongst 19 countries in Latin America, and the Caribbean to facilitate public-private infrastructure projects. The findings were based on research and data that evaluated and ranked the legal, regulatory, institutional and financing capabilities of a state.

One type of public-private partnerships is a collaborative, multi-party agreement between state agencies and individual, private partners (Grumbine, 1997). The private partners are provided a concession to a state-owned property and are responsible for negotiating resources through government agencies and other stakeholder groups in order

to achieve their goals. In theory, public-private partnerships will improve conservation efforts by decentralizing management and pooling resources to achieve conservation goals, but in reality will require effective collaborative arrangements in order to attain the resources necessary to achieve project goals (Berkes, 2004; Rozzi et al., 2006).

Collaborative, local organizational arrangements, although not a panacea, have been hypothesized to be important for effective and sustainable resource management, especially when resources are scarce (Borrini-Feyerabend, 1996; Agrawal, 2000; Daniels and Walker, 2001; Mahanty and Russell, 2002; Berkes, 2004). The benefits of collaboration include more effective management, better acceptance of management actions, improved environmental and social understanding, improved trust between stakeholders, reduced costs for enforcement in conservation areas, and increased public awareness (Pinkerton 1989; Borrini-Feyerabend 1996). Thus, collaboration should not be the goal of resource management, but it can be a means to more effective management if it 1) fosters the exchange of information and ideas and resources among organizations, 2) provides mechanisms for effective decision making, 3) coordinates inter-agency activities, and 4) develops capacity to deal with challenges of the future (Wondolleck and Yaffee, 2000). The downside to collaboration is that it requires a tremendous amount of time and planning prior to project implementation (Daniels and Walker, 2001; Domenici and Littlejohn, 2006).

A comparative analysis of multiple stakeholder interests and perspectives can be especially useful (Grimble and Wellerd, 1997) because it demonstrates how key partners can contribute to or hinder the collaboration process (Varvasovsky and Brugha, 2000). In

natural resource management, the term stakeholder can mean “any group of people, organized or unorganized, who share a common interest or stake in a particular issue or system” (Grimble and Weller, 1997). The two key goals of a stakeholder analysis are to improve the understanding of policies and projects on the ground and to better address the distributional and social impacts of policies and projects by separately assessing the impacts and interests of individual stakeholders (Grimble et al., 1995).

In this research, we conducted a stakeholder analysis of the Llancahue watershed, Valdivia, Chile to determine the potential for using a public-private partnership for the conservation of forests and water in the watershed. The Llancahue watershed is a new public-private partnership between the University Austral de Chile (UACH) and the Chilean Government through its Ministry of Lands. In the case of Llancahue, the UACH has outlined various goals that it hopes to achieve and the government has provided the concession with the belief that the UACH can fulfill these goals (Donoso et al., 2005). This study is part of a wider, interdisciplinary research project investigating methods for the sustainable management of forests and water in the Llancahue watershed. We hypothesize that public-private partnerships are only possible through the creation of effective collaborative agreements. In order to achieve this, our stakeholder analysis was conducted with the following research questions in mind 1) Who are the stakeholders, 2) What are the values and beliefs, positions, interests and concerns of various stakeholder groups? and 3) Is collaborative management of the Llancahue watershed through a public-private Partnership an appropriate model?

Project background

Llancahue (39°50'20"S, 73°07'18"W) is a 1300 ha peri-urban watershed, 7 km from the city center of Valdivia, a city of 130,000 people (Figure 2.1). Llancahue is the main drinking water supply watershed for city of Valdivia providing 80% of the city's water. In addition, Llancahue contains approximately 400 ha of old-growth, Valdivian Temperate Forest and is a hotspot for biodiversity (Myers et al., 2000). As a water supply watershed, it has been a state-owned reserve since 1929, but in recent years no resources have been available for the property's management or protection. During recent years, the remnant old-growth forests in Llancahue have become threatened by the pressures of illegal harvesting and cattle grazing exerted by the neighboring village, Lomas del Sol, which is comprised of 23 families.

These threats caused concern within the UACH administration. Dr. Pablo Donoso led a proposed change from a "paper protected area", owned by the state, to a peri-urban park that is actively managed by the UACH. Through his influence as a member of the forestry faculty and vice dean, Dr. Donoso led negotiations between the UACH and Ministerio de Bienes Nacionales, the Chilean Ministry of Lands in charge of national assets including both properties of natural and cultural significance, for a twenty year UACH concession on the property that began in September of 2008. The concession was granted with the stipulation that the UACH create a peri-urban park for the City of Valdivia, while conserving the ecosystem services provided by Llancahue (i.e. water supply, water quality, and

biodiversity). To accomplish this, the UACH proposed to collaborate with local and regional stakeholders in order to more efficiently attain resources to achieve the goal of economic, social, and environmental sustainability for the watershed.

Methods

The stakeholder analysis was based on data collected during field research (November 2008 to February 2009) from semi-structured interviews, focus groups, stakeholder meetings, primary and secondary documents, and informal interactions. We took on the role of participant observer to help further understand the situation. Information from key informants was used to make initial contacts with identified stakeholders. We then used a snowball approach during the interview process to expand the stakeholder group (Babbie, 2007). The snowball approach consisted of asking interviewees what other stakeholders should be interviewed and allowed us to expand the initial stakeholder group. This was particularly important because it led us to groups whose missions focused on rural development, education and other social issues (Appendix A), but also confirmed that stakeholders initially identified by the University were key players in the initiative.

Grimble and Wellerd (1997) suggested there are two types of stakeholders, those that represent groups with resources that can assist the project and those that will be directly influenced by the project outcome. Stakeholders were initially classified into two

groups, institutional (n=53) and campesino (n=15 households). Campesino is a Spanish word that means rural peasant. Separate semi-structured interviews were developed for these two groups with some questions being asked of both groups. Institutional stakeholders represented organizations with resources (i.e. money, equipment, or staff) that could assist the project and include professors and staff at the University (n=18), and employees of governmental (n=18) and non-governmental organizations (n=10) and neighboring businesses (n=7). The campesino group, Lomas del Sol, represents the neighboring, rural community, some of whom illegally used and depended on the forest. Appendix B provides a pre-translated copy of the institutional interview and Appendix C provides a pre-translated copy of the campesino interview. All interview and research design was approved by the Institutional Review Board of North Carolina State University (381-08-18), Raleigh, NC.

All interviews (N=68) were tape recorded (unless the participant specified they did not want to be recorded (n=4)), transcribed in the original language of the interview and then translated from Spanish to English where required. All other field notes collected during the focus groups (n=5), stakeholder meetings (n=3) and informal interactions were recorded in English. Data analysis used naturalistic inquiry following the methods of Corbin and Strauss (2007) with the computer software, Atlas.ti (Version 6.1.10, GmbH, Berlin, 2009) resulting in the identification of key themes from the interviews.

For the stakeholder analysis, we concentrated on emergent themes related to the positions, values and beliefs, interests, and concerns of stakeholders which were identified

from the coded data and quotes were selected to support these themes (Sidaway, 2005). In the results section, we used selected quotes as well as descriptive statistics to show support for the emergent themes related to Sidaway's model (2005). These results helped to illuminate the benefits and challenges of the collaborative process as viewed by the participating stakeholders.

Results

In order to identify stakeholders, we asked our key informants to generate a list of potential stakeholders. During each interview, we asked stakeholders to identify important stakeholders for the project. This snowball approach allowed us to exhaust all potential stakeholders that could be identified by our interviewees. In total, our stakeholders identified 45 potential stakeholders. Of these stakeholders, we contacted 33 of these different groups or organizations (Appendix A). These organizations could be subdivided into 10 different types, National Government, Regional Government, Municipal Government, Multi-national Corporation, Private Business, Neighboring Property Holder, International NGO, National NGO, National NGO, and Educational Group to help identify both their organization/group's interest and organization type.

Values and Beliefs

We found that our institutional stakeholders saw a distinct difference between conservation and preservation and had embraced the idea that conservation management

means that protected areas are managed to meet environmental, social and economic interests. Although we did not directly ask stakeholders their view on conservation versus preservation, we coded this theme in 20 of the institutional interviews 33 times, in 4 of the campesino interviews 12 times, and in our notes from the campesino stakeholder meeting. In their interviews, institutional stakeholders made direct reference to the fact that protected area management needs to “talk of management rather than conservation and closing the forest (I32)”. This includes adopting a “sustainable (I29)” and “multi-purpose (I2)” approach, where “you work with the community (I3)” “It must be used, but in a rational way (I6).” As one respondent stated, “We can’t conserve it by keeping it in a jar, with no one appreciating it or knowing its importance... So there is a need for thinking on how to give it value (I35).”

Two of the main reasons given for why Chile needed to take a multi-use approach to managing their protected areas included that the state does not allocate resources to protect their properties, and that protected areas face tremendous pressure from local communities that depend on them to survive. When asked if the Chilean environmental laws were adequate, only eight percent of interviewees responded yes (4 YES, 22 MAYBE, and 25 NO). The respondents who were unsure clarified this response by stating “I mean one thing is the laws and another thing is how they are applied (I8).”

Chile has been classified as a country with an economy in transition, and was recently accepted into the Organization for Economic Co-operation and Development due

to its relatively strong economy. Despite this economic progress, stakeholders discussed how few resources are allocated to conservation and the large number of people who still live in poverty. Most stakeholders believed the main goal of the government continued to be economic development. As one stakeholder stated,

The reality in our country is very different from the reality of a developed country. Here you need to ensure that people feel they have an advantage with respect to the proper management of natural resources. To generate reserves where nothing can be done, that is going to create even more rejection from the local community. For this reason, we are always looking at the issue of sustainable use of natural resources (132).

Thus, a major theme that emerged was that environmental conservation must provide economic and social benefits.

The majority of stakeholders from both the institutional and campesino groups expressed the belief that conservation should occur, but with benefits to local people. Many of the stakeholders had adopted the belief that conservation and economic development needed to go hand in hand, leading to their search for a new conservation model that promotes both. “I believe in conservation in the broad sense of the word. That “you work with the community, that you open the protected area, that you really create benefits, that you achieve your goals in an efficient manner (13).” Respondents stated that “a combination of strategies” was needed. They acknowledged that local people used

forests in Chile and that the government does not provide resources for forest protection so other solutions were needed. “Protected? Yes, for conservation, but not for preservation, because that would not be feasible (I19).” There was a general acknowledgement that “sometimes you have to use the native forest so they can be protected (I21).” Thus, the stakeholders see sustainable use of their natural resources by local user groups as a preferred approach to conservation management.

Finally, the stakeholders believed that environmental education is key to resource conservation. Stakeholders talked about the need to create environmental awareness amongst the Valdivian and Chilean people. This was reflected in the fact that 47 of the 53 institutional stakeholders believed the Valdivian people did not know that their water came from the Llancahue watershed. In general, stakeholders commented that they did not believe people would protect resources that they did not know and value.

Environmental education’s idea is to give resources a value, to know them, to get committed with them... it could be very important for protecting those resources in the future, so I think this is vital (I12).

This suggested that environmental education would give value to conservation initiatives and included education for the local people who use the resources.

We took the people from the community in a car to show them the Alerces, the Colun beach, people that have been living there all their life, 30 or 40 years, and they did not know those things we showed them...And then when they saw the big old Alerces they understand that it was a species that can reach 3500 years without a problem...So this was understood when people saw the giant tree and they touch it, and this is something strong when you have the opportunity to manage an area that is open to the public (I27).

This suggestion was made by the institutional stakeholders who had experience working with other communities and believed education was the most effective way to change behavior. The campesinos also stated that beyond work, training (n=6) and education (n=6) would be two additional benefits of the project. “That is the first step, to inform people well what things that can and can’t be done inside the park (C9)” and “it’d be useful for us to know what trees we have to keep (C1).”

Positions

All stakeholders, both institutional and local (n=68) held the position that Llancahue should be a protected area due to its importance as a source of water and remnant old growth forest close to the city of Valdivia. “I think it is relevant for the region, since it’s the source of life for the biggest city, the regional capital, we should be part of the conservation strategy and help to take care of this place (I30).” Many stakeholders recognized the uniqueness of the Llancahue watershed stating “it is a green dot near our city that is almost unique in Chile (I14).” Thus, there was currently consensus over the end goal – improve the conservation of Llancahue. Because the Llancahue forest is so close to Valdivia, the concession manager sees Llancahue as

a huge opportunity to have a great impact on the local society and also at a national level with the implementation of this park. It is unusual the university has a park, but behind having the park, there are so many interesting teaching and research possibilities...It’s a challenge, it’s a big challenge, but behind the challenge I think it is a unique opportunity for the university (I8).

Llancahue was viewed as an opportunity, but with the opportunity came the challenge of achieving goals in the face of uncertainty.

It benefitted the project that the government and other entities were realizing that the Valdivian Temperate Rainforests is internationally recognized due to its biodiversity. They did see this project as an opportunity for economic development through ecotourism as this has been successful in other Latin American countries like Costa Rica. “What characterizes Valdivia is the Nature, the Valdivian Forest! (17).” In 2009, the regional government adopted the position that the environment and ecotourism are important for economic development and incorporated these themes into their regional development strategies.

I think the idea now is the economic development goes hand in hand with sustainable development, then, in definitive, the guidelines that are being made at a regional level is to be able to generate new business opportunities but retain the natural heritage we have. This goes hand in hand with the tourism of special interests, to give a stamp to the region, because obviously our own resources are the resources this region has, which includes biodiversity (149).

From an institutional perspective, this suggests that stakeholders, including the regional government, currently believe that conservation can promote economic development through tourism.

This is important since stakeholders alluded to the fact that the project needed the support of the regional government to be successful because it has the ability to take actions and provide funding. “I tell you why it is so important that the local or regional

actors internalize the importance of the topic. They are able to take actions (I32).” “All must be developed with funds, obviously, from the government, regional funds, with projects (I17).” Yet in order to access these funds, stakeholders suggested that the UACH needed to present concrete projects.

Well I think the main thing, there are the regional funds, we are talking about funds that could be more important first, I think that, do a good project and present it to be funded by a regional development fund, I think it could be received well, for the importance of the place (I19).

Once this is accomplished, the UACH should have better access to resources for implementing their initiatives. “For this you need a group or entity that can submit and get the grants, because here the CONAMA [The Commission on the Environment] has lots of money like with programs like the FPA [Funds for the Protection of the Environment] (I24).”

Seventy-seven percent of the institutional stakeholders took the position that Llancahue should be turned into a peri-urban park for the City of Valdivia following the plan outlined by the UACH (41 YES, 1 NO, 11 MAYBE). Most of the uncertainty was from UACH employees (7 YES, 6 MAYBE, 1 NO) who feared that the university lacked the resources and staff for the project, and governmental employees (14 YES, 4 MAYBE) who felt they may have to take responsibility for the park. A theme emerged that UACH employees were split on the concession at the time of the transfer. Although some employees supported the project, a sub-group perceived the idea of the Llancahue peri-urban park as risky because of the uncertainty surrounding it and the responsibility that the acquisition put on the UACH. The minority point of view, reflects the one preservationist who thought that Llancahue

should not be touched under any circumstance. “All the area needs protection (I11).”

Other stakeholders were aware of this point of view stating

I know that there were difficulties and discussions in the field because there were people who did not want to touch Llancahue, and that is not consistent with the concept of "watershed management", therefore I think that's the first challenge, insure that the authority is aware that this site has to be managed, and for that you need resources (I20).

Interests

As part of the interview, we asked stakeholders to rank their interests related to the UACH's goals of: protecting water quantity and quality, the old-growth forests, environmental education, ecotourism, and sustainable forest management. Figure 2.2 demonstrates that for all stakeholders, the protection of water and forest resources was the top priority. Despite this, most stakeholders acknowledged these goals could only be achieved by addressing social and economic interests of both the campesino community and the Valdivian community. Respondents felt the goals of environmental education, sustainable forest management, and ecotourism were important because they could help demonstrate social and economic values of conservation. The UACH's plan for the watershed included creating value added products such as the sustainable management of timber from the second-growth forests to promote both water production and old-growth forest, creating a platform for ecotourism, and developing environmental education programs. The UACH hypothesizes that these products can help improve forest management, create new entrepreneurship, and promote environmental ethics and support amongst citizens, respectively.

One of the biggest challenges in Chile currently is determining how to manage resources in a way that is economically, socially, and environmentally sustainable.

So in those instances of conservation with the government we try to put on the work table, permanently, this topic: there needs to be a long term agreement where the focus is clearly the use of natural resources, but in a way where there is no risk to the sustainability and its future permanency (I27).

This viewpoint is contradictory to a preservationist viewpoint that advocates for the conservation of resources through the establishment of strict protected areas. Sustainable forest management was viewed as a way to sustainably manage the watershed while helping support the project and improve the way local people interacted with the forest. “We try to apply silviculture, which in some ways makes compatible ecological conservation and production (I2).” Even the people who were less certain about conducting sustainable forest management in the protected area conceded that it might be the only option for working with the local people: “Llancahue is a jewel, a diamond and we should not cut there, but if it is not possible to change the people from cutting the forest then it is better to make a forest management plan than nothing (I52).” The majority of the Lomas del Sol (n=14 of 15 household) also saw the benefits of sustainable forest management as it would provide jobs and help them better manage the forest that they depend on.

One of the key stakeholder interests for this project was the development of an appropriate institutional design allowing effective collaboration for sustainable conservation of the watershed.

There is no project that brings together all the entities; this could be the chance that we get together, all of us that are developing some activities linked to these issues. It would be fabulous if this project succeeds, it will open up the possibilities that we may all have, we can get the experience and everyone can participate (I10).

Thus despite the fact that we heard much rhetoric on the theme of collaboration, this comment suggests that collaborative forest and watershed management is a new concept in Chile. One stakeholder felt they needed “to do a good promotion, get agreements about the objectives, and get the needed resources so that the final objective is clear for every actor (I30).” Analysis suggests that for effective collaboration to happen, stakeholders need well defined, organized plans so concrete roles can be assigned. As one stakeholder stated, “more than anything we lack organized information that is well articulated (I41).”

The tourism industry and government have a specific interest in developing new products to help achieve the new regional strategies focused on agrifood, creative industries and tourism. They specifically stated that

Valdivia lacks products. We have a stay of three days, because in this time you can go to the city, the river, the beach...People won't stay because there are no more products, so that happens, every food and accommodation service is interested in promoting the longer stay (I16).

Our surveys suggest that people are interested in projects that promote economic development in the region, including ecotourism products.

Concerns

Most concerns about the Llancahue project related to the ambiguity surrounding the project. A recurring theme in the interviews and stakeholder meetings was the need for

concrete plans for forward progress. In fact, the point was made at the large stakeholder meeting in January 2009 that the current plan for Llancahue was idealistic, but unachievable in its current state. Several suggested, including Dr. Donoso, that with more concrete plans the UACH would be better able to attain funding. All institutional stakeholders agreed that the overall goals of the UACH needed to be broken down into more manageable parts and actions need to be taken now to move the project forward. Once these ideas and roles are defined, the

Universidad Austral must do outreach, a more clear and defined outreach, asking collaboration from community, institutions and public agencies so they have a real link with this park, I think Universidad Austral could do this and I think many agencies...would be favorably disposed to collaborate (I31).

These comments suggest that stakeholders believed that project success would require improved communication by the UACH and that they are concerned that currently this is not adequate.

One of the greatest concerns expressed the need to determine how to collaborate and pool resources to achieve conservation success.

The biggest challenge is to make compatible different interests that exist for Llancahue. Urban people's interest, politician's interests - they are related with water supply. Companies' interests, because there is a company that obtains water from there to turn it into drinking water, this company is AguasDecima. There are interests from people, the watershed is surrounded by campesinos that are illegally using the property and they are going to keep on doing it. There are interests from the Universidad Austral who wants to do investigations. So the main challenge is to make all those interests compatible and set them into a project to achieve the final objective which is the property's conservation (I14).

This concern highlights the difficulty with collaborative initiatives, that they take tremendous time and planning.

Although collaboration is seen as a goal, stakeholders directly referenced the difficulty of achieving effective collaboration. “That is where I see a big weakness with the people working on environmental issues there are few institutions that have direct connection with local stakeholders, the communities, with the actors of the territory (I32).” “The bad thing we have here, I have seen it many times before in other organizations, high levels of distrust, little teamwork and little associations (I7).” This suggested that collaboration may be an ideal in Chile, but the stakeholders have little experience in designing effective collaborative processes. Stakeholders also expressed concerns that exclusion was a problem in many projects in Chile and suggested that there are many projects where people aren’t included until after the fact. This left stakeholders feeling isolated from the project. “The development of the project needs all the necessary actors to participate on planning and developing the project. If they don’t feel part of the project, it is going to be hard to respect the agreements and work in coordination (I30).”

Stakeholders clearly see a need for more detailed planning to determine what resources are needed and how the university might carry out specific projects.

Thus it is important to be clear how much Llancahue management costs, what activities are necessary, the cost and then develop a multiple funding strategy and I do not think there is a single source and to sustain the administration not only requires money, it requires much support. That is only possible when they have a work plan with activities, with costs, that's the most important (I25).

Stakeholders defined a need for the UACH to develop specific projects. “There are no projects yet for this, that is what I know, I don’t know if the university has any, but they have to prepare a project to seek funding (I48).”

A main concern among the skeptical UACH employees was the lack of a clear vision of how the UACH would find the resources to manage and administer the park. One employee suggested this was always the greatest fear related to the Llancahue concession. “When we were talking about transferring Llancahue from the state to the university, in that meeting, most of the concerns were related to raising money there (I3).” As one UACH professor stated,

it is too dangerous. I mean because no money was associated to this donation, so the university, and mainly the faculty was just receiving a Greek present. You know with a lot of potential problems, with very little money to support and a lot of responsibility with looking after this important piece of land (I15).

Yet, the greatest concern from all stakeholders, both institutional and campesino, was related to the high-grading (removal of the best and biggest trees) of the old-growth forest by the Lomas del Sol community because this was seen as the most immediate threat. This fear underscored the UACH faculty’s push for the concession; they feared that the forest would be destroyed if no interventions occurred. This potential crisis was the antecedent condition that spurred the UACH to push for collaborative management of the park.

My main concern is that I saw these old growth forests were being harvested and it was a process that would end at some point with total destruction of this magnificent old growth forest half an hour away from Valdivia (I8).

Thus the UACH was concerned with

getting enough of an institutional arrangement and enough control of the situation so you can change or cut the inertia that has been there, that it has actually been an unmanaged area and people have done whatever they want without regulation, you see and where the state, the owners have not exerted their obligation to protect it (144).

This is also why Bienes Nacionales gave the concession to the university.

That's why we are doing this, because if the property would still be in our hands, without giving to anyone the administration, in 10 years there would be no more forest and not just because the neighbors cut it, but all the people here (in Valdivia) would search for firewood for consumption, without caring that the basin could be dried up (148).

The general results of our analysis of stakeholder values and beliefs, positions, interests, and concerns are synthesized in Figure 2.3. Themes represent general themes that arose from all stakeholder interviews, unless otherwise indicated. These values and beliefs, positions, and interests demonstrate the need for collaboration in this conservation project. The majority of stakeholders (n=40) mentioned collaboration as a strategy for the project despite our not asking them directly about collaboration. Stakeholders hoped that collaborative arrangements through public-private partnerships may improve the management of state-owned protected areas. The majority of stakeholders were interested in testing this model in the Llancahue watershed in order to see what benefits emerge. Yet, stakeholders were also skeptical because in the past, collaborative initiatives have failed due to poor communication and a lack of structure.

Discussion

The literature suggests good collaborative practices will help to negate conflicts over identified concerns such as resource allocation and resource use, but also acknowledges that collaboration can be time consuming and frustrating because it requires extensive planning (Daniels and Walker, 2001; Dominici and Littlejohn, 2006). It is best if collaborative management is viewed as a dynamic process that is flexible over time as specific goals are achieved (Selin and Chavez, 2005; Varvasovsky and Brugha, 2000). We suggest the potential for collaboration in this project is strong, if the multiple stakeholders can effectively organize to obtain positive results. Without structure, there is a high likelihood that the collaborative process will break down (Grumbine, 1997). Our results show that stakeholders have a collaborative vision for the Llancahue watershed. This shared vision is an important first step in any collaborative project as the stakeholders you hope to engage must believe in the project and believe their contribution will make a difference.

In the future, we can continue to evaluate the development of this public-private partnership through continued research. A public-private partnership relies on the collaboration of partners for the management of a conservation area. Public-private partnerships represent collaborative associations between governmental and private institutions for the purpose of improved resource management (Economist Intelligence Unit, 2009). Currently, public-private partnerships are seen as one solution for more effective resource management in Chile because they are viewed as a way to more

efficiently allocate resources for the conservation of forests, water, and biodiversity (Meza, 2009). This exploratory study provides baseline views of stakeholders toward collaborative forest and watershed management. In the future, this data can be useful for evaluating the success or failure of this public-private partnership by evaluating how the concerns and needs of stakeholders have been addressed, especially with regards to issues of planning and communication. In addition, we can determine how stakeholder interests have evolved with the project.

This case study demonstrates why stakeholders consider the traditional state-owned protected area approach inappropriate for the Llancahue watershed as well as many other cases in Chile. Sufficient resources have not been committed to manage the properties, enforce their boundaries, and work with adjacent landowners who are dependent on the resources within the reserves for survival. This is not uncommon in Chile and other countries where rural residents live in poverty or extreme poverty on the fringes of protected areas (Badola, 1998; Maikhuri et al., 2000; Clark, 2003; Pujadas and Castillo, 2007; Boissiere et al., 2009). In these cases, protected area managers must work with both institutional and local stakeholders to conserve ecosystem services, improve the livelihood of rural poor so that the pressures they exert on the protected area are reduced, and educate citizens about the importance of environmental management for the conservation of water and forests (see Agrawal, 2000; Beckley et al., 2002; Berkes, 2004; Brown et al., 2005).

We hope this case study has demonstrated why the establishment of protected areas on paper does not ensure the conservation of these areas. Rules are not effective if they are not enforced and enforcement is costly. Thus, we suggest that conservation and development must continue to occur simultaneously. In order for this to occur, the conservation projects must be relevant to regional stakeholders, who have the resources to assist with implementation, and local people who currently depend on park resources for survival. Collaborative management has been posited as one means to accomplish this, but careful investigation will be needed in the future to better understand the successes or failures of this management strategy.

In conclusion, we argue that protected areas require stewardship and management in order to achieve their conservation goals. Paper parks, although protected on paper, do not account for encroachment and exploitation from people living beside the protected area. Protected area management must consider the needs of local people and regional stakeholders, especially in Latin America where poverty reduction is an important goal. Llancahue is one example of why effective methods for collaboration are needed to ensure improved management of protected areas when the traditional, top-down model is failing.

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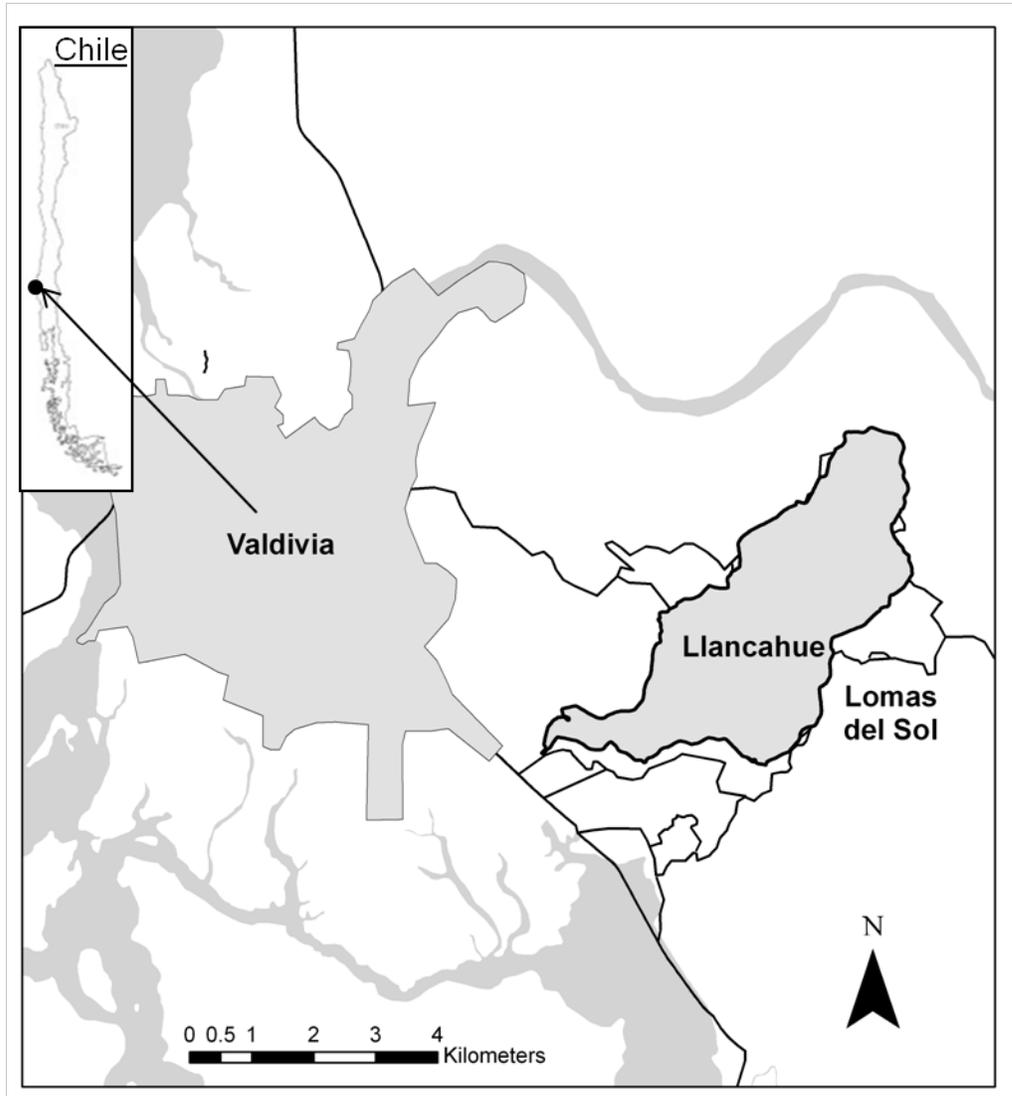


Figure 2.1. Location map of Llancahue (39 50'20"S, 73 07' 18"W).

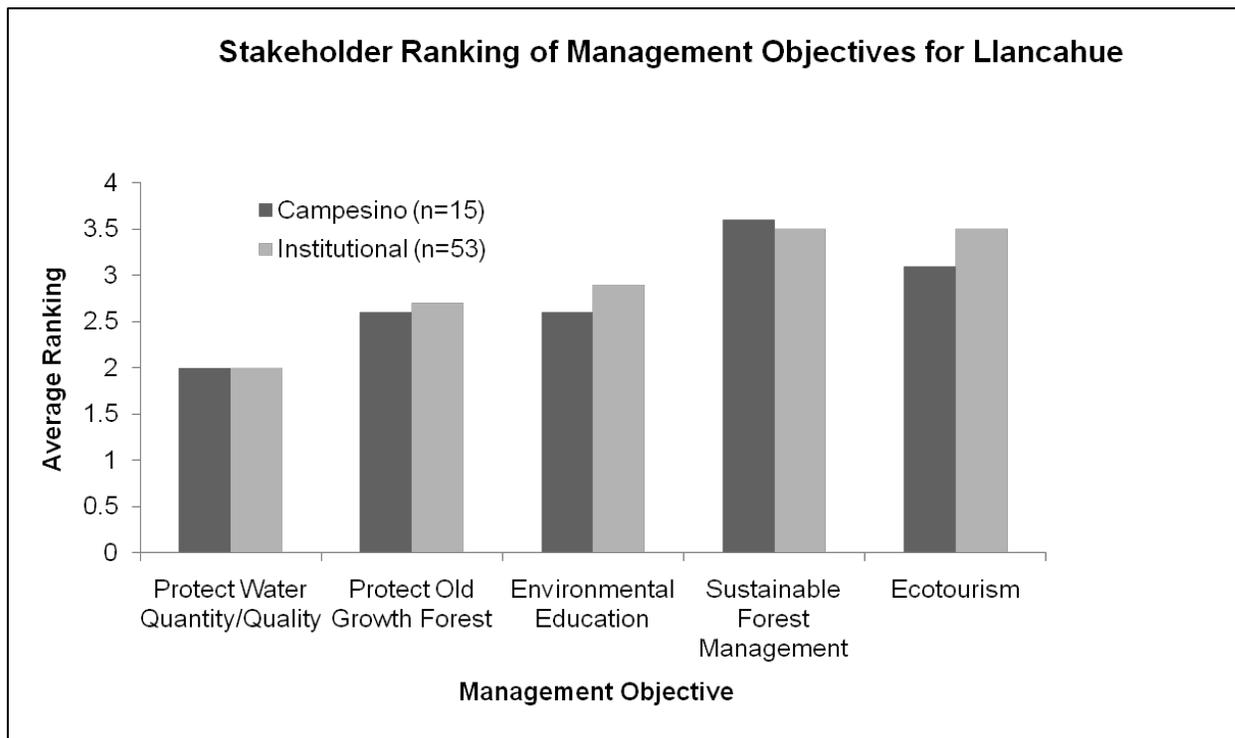


Figure 2.2. Ranking of Stakeholder interests for UCh Management goals in order of importance for the Llancahue project (1 being the most important and 5 being the least important).

General Themes from the stakeholder analysis, all stakeholders (unless otherwise indicated)

VALUES AND BELIEFS

Conservation management must be environmentally, socially, and economically sustainable
 Protected areas must have benefits for local people
 Environmental Education key because it helps demonstrate the value of conservation

POSITIONS

The Valdivian Temperate Rainforest could be an important resource for economic development
 Regional governmental support is key
 Protection occurs through wise use
Majority opinion — Llancahue should be protected following the plan outlined by the University
Minority opinion – Llancahue should be protected, but not with University resources
Minority opinion – Llancahue should be left untouched.

INTERESTS

Conservation of resources, i.e. water and forests, in Llancahue most important
 Conservation will only occur by addressing social and economic needs
 How do we engage stakeholders to achieve sustainable resource conservation?

CONCERNS

The project is currently ambiguous, concrete plans are needed
 There is little experience with collaborative projects in Chile
 How do you avoid excluding stakeholders?
 How do you foster trust?

Figure 2.3. Stakeholder Values and Beliefs, Positions, Interests, and Concerns

Chapter 3: Collaborating on conservation management at the local scale

Originally, the concept of protected area management was based on models from the developed world; protected areas were government-owned, government-run, and set aside for protection, resource management, and recreation (CBD, 1992; Phillips, 2003). These goals often excluded local people, despite their prior dependence on the reserve area and its resources (Phillips, 2003; Berkes, 2004). Such top-down approaches to protected area management have proven to be less transferrable to countries that do not allocate sufficient resources to conservation and the protection of park boundaries (Balmford, 2002). Often, if there is no border enforcement, the resources from the protected areas are poached by rural people living in poverty who depend on the natural resources in the protected area for their livelihood (Liu et al., 2001). This is the reality in Latin America where 80% of the protected areas are inhabited and/or bordered by indigenous and/or local populations living in poverty (Negi and Nautiyal, 2003; Ohi-schscherer et al., 2008), and environmental conservation is often a secondary consideration to reducing poverty (Laumonier et al., 2008).

Participatory processes that include and benefit local user groups are now viewed as necessary steps in conservation projects (McNeely, 1994; Phillips, 2003; Berkes, 2004; Tecklin and Catalan, 2005; Kandizor, 2005). This populist approach to conservation management posits that successful environmental conservation depends on simultaneously addressing environmental, social, and economic concerns, which requires integrating local and scientific knowledge into the program design (Becker and Ghimire, 2003; Brown, 2005; Laumonier et

al., 2008). The term sustainability was first used in the International Union for Conservation of Nature's (IUCN) world conservation strategy in 1980 as the idea that we manage our resources in a way to satisfy human needs now and in the future. In simplest terms, sustainability is the idea that a system persists (Costanza and Patton, 1995; Botequilha and Ahern, 2002). As a conceptual idea, sustainability makes sense, but implementation is complicated. We must determine what system or system characteristics are to be sustained, how long to sustain them, and determine endpoints for measuring success (Costanza and Patton, 1995). We must then develop programs that holistically address the environmental, social, and economic realities of the challenge at hand.

Improved forest management has been cited as a key to achieving global environmental sustainability (van Kuijk et al., 2009). Forestry accounted for 17.4 % of total anthropogenic greenhouse gas emissions in 2004 (in terms of CO₂ equivalents), primarily due to high levels of deforestation and forest degradation in developing countries (United Nations, 2010). Sustainable forest management (SFM) at the global scale was recognized at the Copenhagen talks on climate change as a means for mitigating climate change (ISSD, 2009). In addition, native forests have been recognized as important ecosystems that protect water quality and biodiversity. SFM has also been cited as a key solution to poverty reduction since there are many cases that demonstrate the positive impacts of SFM on local communities (ETFRN, 2007). The United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992, has led to the adoption of a number

of instruments and declarations promoting sustainable forest management (e.g., Agenda 21, Forest Principles). Despite this recognition, it is still unclear on how to translate lofty principles of sustainable forest management into on-the-ground projects at the local level (Simula, 2003).

In 1968, Hardin hypothesized in his essay, *Tragedy of the Commons*, that user groups with unlimited access to collective resources would overuse and deplete the resources if there was no outside intervention. In 1990, Ostrom published *Governing the commons*, as a response to Hardin demonstrating that there are cases of long-term, successfully managed collective resources. She provided a framework for achieving the sustainable management of collective resources, such as forests and set forth a series of design principles for successfully engaging local user groups in the collective and sustainable management of resources. Ostrom suggests the following principles: 1) clearly defined boundaries and rules, 2) congruence between the appropriation rules and local conditions, 3) collective choice arrangements with the individuals who are affected by the rules, 4) monitoring and graduated sanctions, 5) conflict-resolution mechanisms, 7) minimal recognition of a local user group's right to organize and 8) viewing resources management as a scale dependent issue (1990). Since the emergence of her theory, a case study analysis showed a strong, positive link between collective action and improved forest condition (Varughese & Ostrom, 2001).

The consensus is that creation of institutions for the enforcement of common rules is the basis for fostering collective action (Gibson et al., 2005; Chhatre and Agrawal, 2008). Successful collective action assumes individuals will participate if the expected benefits exceed the individual costs of participation (Ostrom, 1990). An individual's perceived benefits to participating in a resource management program that limits their use of a resource in the short-term will be higher if they are highly dependent on the resource and thus might be willing to pay higher costs for following the rules (Gibson, 2001). External intervention is a key to helping appropriators organize and follow rules (Koonz et al., 2004; Mayers and Bass, 2004). Collective action includes the development of institutions for resource management, resource mobilization, activity coordination, and information sharing (Poteete and Ostrom, 2004).

Working with local people in conservation to change the status quo of unsustainable resource extraction becomes a necessary step in conservation, yet presents its own set of challenges (Herlihy and Knapp, 2003). A description of behavior, including both internal and external detriments to change as well as current norms of the local communities' society can assist in defining the problem, determining common interests between stakeholder groups, and developing acceptable policies for behavioral change (Clark et al., 2003). This requires identifying current livelihood activities that are threats to conservation and acceptable alternatives to these activities by the local community (Carlsson and Berkes, 2005). In addition, it can be important to determine the attitudes of local people toward

conservation initiatives and potential ways that local communities can benefit from the conservation area (Infield, 1988; Fiallo and Jacobson, 1995). Participatory rural appraisals, a common community-based conservation tool, have often been cited as an effective means to determine local attitudes toward conservation, initially engage the communities in the conservation management process, and recognize the knowledge and wisdom of local people (Herlihy and Knapp, 2003). Although working directly with communities to conserve natural resources has not been successful in all cases, multiple cases have demonstrated that when communities are mobilized and involved in the conservation process, protected areas are better conserved than those that are left solely to government control (Ostrom, 1990; Barrow et al., 2005). Thus, information about the community can be used with theories of collective action to develop a framework for sustainable management of forests.

In Latin America and Chile, participatory processes that foster collective action are now viewed as a necessary step in conservation projects (Tecklin and Catalan, 2005; Kandizor, 2005.) The emerging belief in the forestry extension sector is that SFM should be based on an exchange of opinions and experiences between technical experts and rural people who use the resource to determine how to generate capacity for SFM and elevate rural forest communities out of poverty (Kandizor, 2005). The process should then set concrete goals which would include community organization, developing monetary and non-monetary incentives for change, connecting the local communities with various

governmental agencies that can assist in these processes, and determining appropriate rules and sanctions (Ostrom, 1990; Catalan, 2005). Table 3.1 provides a synthesis of lessons learned from a series of case studies of community based conservation in the South of Chile (Astorga, 2005; Catalan, 2005; Vergara, 2005). A clear trend is seen in these lessons; conservation will only be successful by engaging and building capacity in the local communities dependent on the resources.

The University Austral de Chile (UACH), was recently made custodian of the Llancahue watershed in September of 2008 (39°50'20"S, 73°07'18"W, Figure 3.1). Llancahue is a protected area that provides about 80% of the water for the city of Valdivia and is the best example of a native old-growth forest close to the City of Valdivia. The UACH received the concession because they proposed to both improve the conservation of the forest water resources in the reserve and create a peri-urban park where citizens can learn about and experience nature and recreate. At the time of transfer, the conservation of the old-growth forest in the Llancahue watershed was seriously threatened by the neighboring campesino community, Lomas del Sol, who were illegally, without control, harvesting trees and grazing cattle in the watershed despite the fact that the area had been a 'protected area' since the 1920s (Donoso et al., 2005). These problems could be viewed as problems of open access (Southgate and Runge, 1990) since the state claim to the property being a protected area had been weakly enforced since the early 1990s. As suggested by the stakeholder analysis in Chapter 2, the most immediate challenge in the conservation of the

Llancahue watershed was to successfully engage the Lomas del Sol community in the stewardship of Llancahue. Consequently, understanding the social context of the Lomas del Sol community was an important step in this project. Prior to the UACH takeover, there was little communication between the Lomas del Sol community and the government. The UACH proposed to improve the situation by including the Lomas del Sol community in the management of the secondary forests.

Through this case study we hoped to generate a better understanding of the social and economic needs of the Lomas del Sol community, a necessary step for the sustainable conservation of the Llancahue watershed (Astorga, 2005; Garcia-Frapolli et al., 2009). This includes using participatory action research to clarify the needs and perspectives of the Lomas del Sol community and their willingness to collaborate with the UACH to collectively manage the watershed through sustainable forest management. This information, along with existing theoretical constructs for collective action and social change, were used to develop a co-management policy framework for involving the community in the Llancahue watershed. This framework provides a useful tool in the deliberation process between the UACH and the Lomas del Sol community with the ultimate goal of developing a successful working partnership for the conservation of the Llancahue watershed.

Site Description

The Llancahue watershed (1,300 ha), in south-central Chile has been owned by the Chilean government since the 1920s, and the property is the main water-supply watershed for the City of Valdivia. In 2008, the property appeared abandoned, a fact that can be attributed to a lack of resources in recent years dedicated to the protection and maintenance of the property. In the mid 1990s, the water rights and water plant were transferred from the state owned enterprise, ESSAL (Empresa de Servicios Sanitarios de Los Lagos), to the privately owned enterprise, Aguasdecima (Mitsubishi Corporation), and the state stopped funding permanent park guards. Since then, monitoring has consisted of sporadic visits to the watershed by guards of the National Forestry Cooperation (CONAF). During the past 15 years, the Lomas del Sol community has had open access to the watershed with little monitoring or sanctions which has created a situation of de facto use and resource extraction by the Lomas del Sol community.

The UACH, as concessionaire of the Llancahue property, needed to solve the problems of unsustainable firewood extraction and animal grazing in Llancahue. As of February 2009, some of the members of the Lomas del Sol community were continuing to exploit wood from and graze livestock on the property, even though the property was a designated protected area. The current method of wood extraction for the community was selective harvesting with a preference for larger, old-growth trees of one species (*Ulmo*, *Eucryphia cordipholia*) of high caloric content. The current method of livestock rearing was

free range, meaning that animals were free to wander in any part of the watershed that they desire. This has had the impact of degrading the old-growth forest that the UACH hoped to create into a peri-urban park for the city of Valdivia to enjoy. Thus, the UACH was most concerned with learning about the current patterns of use in Llancahue and implementing programs to change the illegal extraction of wood and uncontrolled grazing of animals. Otherwise, they ran the risk of inheriting a forest so degraded that it lacked any educational, environmental, or aesthetic values.

Methods

Study Design

For this study, we wanted to increase our understanding through the discourses and narratives of community members of the socio-economic reality in the Lomas del Sol community, their current uses of the watershed, and their willingness to work with the UACH to manage the watershed collaboratively. This information would allow the UACH to take into account local knowledge, responses, and interpretations on how socio-economic problems reinforce unsustainable use of the Llancahue watershed. In addition, the information helped to explain the reality of the Lomas del Sol community and allowed us to provide a prescriptive framework for positive change.

Data analysis used naturalistic inquiry following the methods of Corbin and Strauss (2007) resulting in the identification of key themes from the interviews. This allowed us to make specific interpretations about community perspectives and responses from data collected in the field (Babbie, 2007). The basic tool for collecting data was the semi-structured interview. This interview was prepared in advance (Appendix C). English to Spanish and Spanish to English translations were made by a native English speaker who lives in Chile and a native Chilean who lives in the United States to validate the accuracy of the translation. We then piloted the questionnaire on several native Chileans before administering the interview in the field.

We conducted semi-structured, household interviews of residents to obtain both quantitative and qualitative data about their current economic and sustainable livelihood activities, attitudes towards the forest and conservation, and their willingness to participate in alternative livelihood activities from fuelwood collection and cattle rearing. The semi-structured interview was dynamic and we altered it on many occasions during field research, yet quantitative questions and key themes were asked of all participants. The interview was divided into five interlinked parts. The first part consisted of questions about their daily life (i.e. daily activities, hardships and benefits, economic and subsistence activities). The second part concentrated specifically on the activities of concern to the university (i.e. illegal extraction of wood and cattle grazing). The third part assessed their individual views on the conservation of natural resources. The fourth part assessed their

expectations regarding the Llancahue peri-urban park, its management objectives, and potential for involvement. Finally, the questionnaire addressed demographic information on the household. We tried to keep the interview flexible and conversational, avoid leading questions, but probe when further information was needed (Maxwell, 2005). The interview and research design was approved by the Institutional Review Board of North Carolina State University (387-08-10).

A total of 20 adults representing 15 households were directly interviewed from November 2008 to February 2009. Of the households formally interviewed, 12 households resided in Lomas del Sol and the other 3 households own property in Lomas del Sol but live in Valdivia. Specifically, four couples were interviewed together, two single men who lived together were interviewed together, one married female was interviewed individually, and 10 men were interviewed individually, four of whom were single. In addition to the semi-structured, household interview, two community meetings were held, and photographs, informal interactions, and observations were used to triangulate the data and conduct the analysis of the Lomas del Sol community. This included communicating directly with eight other male adults and three other female adults in the community during stakeholder meetings or informal interactions. Community members reported that there were 23 households with about 50 people in the community suggesting that we formally surveyed 53-65% of the households depending on how the community counted the non-residing landowners. Written or verbal permission was given by all participants. Participant

interviews were tape-recorded unless the participants preferred that we did not use a tape recorder (n=3).

We used descriptive statistics to present participant responses to close-ended questions. In addition, a participatory mapping exercise was conducted with the community to determine how specific households used resources on the neighboring lands. These data were member-checked at the final stakeholder meeting with the community and any discrepancies were noted. Responses to open-ended questions were analyzed using standard qualitative methods as prescribed by Corbin and Strauss (2007) with the computer software, Atlas.ti (Version 6.1.10, GmbH, Berlin, 2009) resulting in the identification of key themes from the interviews. This analysis was supported by observations recorded during field work (i.e. field notes, photographs, and GPS data), as well as through the analysis of secondary documents, including two previous quantitative studies of the Lomas del Sol community that were conducted by Matamala and Ruiz (2002) and by CEA (2006).

We determined the incentives required for community participation in the SFM project using a Contingent Valuation to determine the amount of money the community was willing to accept from the university to participate in the project. Carson (2000) suggests that if the Willingness to Pay and Willingness to Accept numbers are close, there is a high likelihood that the new policy will be accepted. We utilized data from our community interviews to estimate the current economic value derived from Llancahue and

neighboring forest properties by the Lomas del Sol community. These data helped us better understand the economic incentives that community members received from using the forest illegally. We also included questions to determine their willingness to participate in the SFM project and the economic incentives they expected in return for their participation as laborers on a community forest project. These figures were compared with the amount of money that the University estimated they could generate from the SFM project. All monetary amounts are reported in US Dollars (USD) using the average January 2009 conversion rate of \$550 Chilean Pesos (CLP) to \$1 USD.

Data validation

After any interaction with community members, we debriefed and took notes on our perceptions of the activity. All data, including the tape recorded interviews, were downloaded, filed and backed-up for future use. All interviews were transcribed and translated and then independently reviewed. Throughout the process, separate analytical memos based on researcher perceptions and reflections about the setting, people, and interactions were recorded and referenced to specific data. It was assumed that the majority of respondents were honest and that any incongruencies in narratives could be solved via triangulation methods, i.e. using multiple means for data collection (interviews, group meetings, and informal interactions). We assumed a saturation point of information was reached during the interviews when responses became repetitive and no new information was being learned. At the end of the summer field season in February of 2009,

we held a final community meeting where preliminary results from the interviews were presented to the community. Information was verified by the community and discrepancies were corrected. At this time, we also presented a map of current resource use in the community which was verified. We facilitated a discussion of next steps for the project and ended with a meal to thank the community for their participation.

Results

Community Orientation

Lomas del Sol – a typical rural, forest dependent community.

In Chile, about 20% of the forested land is in the hands of 200,000 small, rural property holders. General characteristics of these campesino communities include an elevated level of poverty, low levels of education, older heads of household, low capacity for sustainable management, deficiencies related to knowing commercial markets and degraded forests (Emanualli, 2005). Lomas del Sol fit this description of a typical, Chilean, rural, forest-dependent community. No jobs existed in the community, except for occasional, temporary forestry work. Residents relied on the production of charcoal and firewood as their primary source of income. Residential properties were often degraded with few remaining forest resources and poor soils, forcing most residents to rely on the Llancahue and other forest properties for wood and cattle grazing. One resident summed

up the reason for taking wood from Llancahue watershed when he stated, “There are lot of people who live by taking, I admit, they take a little bit of firewood but they don’t have other things to do because they don’t have another place to take wood from.”

Community challenges.

Unsustainable Livelihoods.

Life for the families was centered on the production of charcoal, a labor-intensive activity. Daily activities included looking for wood, building the oven, tending to the oven, making wood or charcoal, or going to Valdivia to sell charcoal. Many stated “I have been living here all my life, making charcoal and selling it since I was born.” All of the full-time residents of Lomas del Sol produced charcoal sometime during the year. It was the only option for residents to make money in the winter when the road to Lomas del Sol is impassable. In addition to charcoal, forty-seven percent of the households surveyed mentioned they produced firewood as one of their three primary economic activities. Twenty-seven percent (n=4) mentioned selling animals as a way they received revenue. Other important economic activities mentioned included temporary forest work on neighboring forest properties (33%, n=5), selling food and fermented apple cider (27%, n=4), pensions from the state (20%, n=3), forest management of exotic species on their own property (13%, n=2), and money from grown children who had jobs in Valdivia (13%, n=2).

These mixed production systems are typical of today’s campesinos in Chile, who in general do not rely anymore on incomes generated from their own lands (Donoso and

Ojeda, 2005). This increased dependence on off-land incomes is an illustration of a *descampesinización* process which means they have a forest production system that is weak in terms of generating incomes compared to incomes generated outside of their properties. Despite the fact that charcoal and firewood production were the two main economic activities in Lomas del Sol, only three of the households claimed to get all of their wood from their own property, and all of these owned over 10 ha and had planted eucalyptus or pine. The timber on a majority of properties was harvested, but the land was never replanted. The residents claimed they did not have the technical skills or resources (i.e. to buy plants for reforestation) to improve the condition of their own properties.

Due to a lack of resources on their own properties, most members of the Lomas del Sol community depended on neighboring properties for wood resources. Conversations revealed that patterns of use of the watershed within the Lomas del Sol community were not homogeneous. Community members utilized different neighboring properties for cattle grazing and wood extraction depending on the location of their house (Figure 3.2). Our interviews suggest that only a third of the households in Lomas del Sol extract wood from Llancahue. From our interviews and participatory mapping exercise, we estimate 6 to 8 families extract firewood to sell in Valdivia, at a rate of 6 m³ and 12 m³ per a household per month during the summer season (November to March). The families neighboring Llancahue posed the largest threat to the conservation of the Llancahue property; thus, their support and collaboration on the project was essential. Their current method of wood

extraction, the selective harvesting of single trees in the watershed with a preference for larger, old-growth trees, was degrading the forest. In addition, the removal of old-growth trees can have negative impacts on biodiversity because these trees provide habitat for a large number of plant and animal species such as the epiphyte *Fascicularia bicolor*.

Although any species can be used for firewood, there is a selective preference for ulmo (*E. cordifolia*) because it is the only native large tree species in Llancahue that burns well without complete drying due to its high caloric power. Other community members claimed to utilize residual wood left after harvesting on their or their neighbor's forest properties, which reduces the amount of coarse woody debris in the ecosystem (e.g. Schlegel and Donoso, 2007).

The other activity of concern to the University was the impact of animals in the watershed. Most animals in the community roamed about freely and cows or horses could often be seen on the Llancahue property. Almost all residents have animals of some type, the majority of families had either no cows (n=5 of 15, 33%) or less than 5 cows (n=7 of 15, 47%), 2 families interviewed had 5-10 cattle and one family interviewed had 26 cattle suggesting that only a few households in the community have large-scale cattle operations. All families that raised cattle mentioned that their cattle graze on the bamboo quila (*Chusquea quila*) in an adjacent property (Baeza, Llancahue, or Fried) in the winter. We repeatedly observed cattle in Llancahue during the summer of 2008-2009. Again, there seemed to be a distinct pattern of land use by cattle depending on the respondent's

location of residence. Many households also mentioned that they only know Llancahue for helping their neighbors look for animals.

Although temporary forestry work was not mentioned by all families, it appeared to be an important part of their livelihood for both supplemental income and wood when it was available on the adjacent forestry properties. The neighboring forest companies have allowed the Lomas del Sol community to take residual wood of no value to the forestry companies to make charcoal. People often abandoned charcoal production in the summer for 1.5-3 months of temporary forest work, but many commented about the uncertainty of this work. During the summer of 2008-2009 there was less work than normal for one of two reasons explained to me, either there were too many people who wanted work or because someone from the community stole the wood they helped harvest from Fried property and the boss got upset and fired everyone. The lack of forestry work during this time period may explain the observed increase in wood extraction from Llancahue noted by many residents and researchers. Alternatively, the knowledge that the UACH was close to increasing the supervision and control over the property may have been the cause.

Lack of monitoring and sanctions for illegal use of the property.

Currently the Chilean National Forestry Service (CONAF) imposes a financial penalty on anyone harvesting without a management plan and arrests anyone illegally harvesting wood. These sanctions were not adequate to prevent residents from illegally using the Llancahue property. Although we identified at least six residents that illegally harvest year

round, there have only been two arrests in the past four years. The lack of resources for on-the-ground enforcement was a key reason the government had a difficult time controlling illegal activities on the Llancahue property. This statement was reinforced by one respondent, "It has always been protected, but in some years it was abandoned. Since I was a child it has been protected, but there comes a time when it was abandoned and now it must be re-protected." Another resident talked about when the water supply plant was owned by the state, in the early 1990s, and full-time guards were present. He claimed during this time that people did not take much wood from the property. This fact was verified by, Dr. Pablo Donoso, who conducted forestry research in Llancahue in the early and late 1990s and had seen a tremendous increase in illegal logging since that time. Several residents stated that the UACH should work with the people, but first that the watershed would have to be closed to prevent illegal timber harvesting. Regardless of whether or not they removed trees from Llancahue, residents repeatedly made reference to the inflicted damage to the watershed and indicated that UACH's intervention could prevent further damage.

Despite acknowledging that the situation was illegal and having a negative impact on the forests, residents saw the removal of wood from Llancahue as their only means for generating income and maintaining their livelihood. Residents continuously spoke about the lack of jobs and income producing alternatives for them due to their lack of education. Thus, the only way they knew how to make a living was by making charcoal and firewood.

The residents were aware that the resources on their properties were limited. As one resident stated, “We are one of the few families that have some wood on our property there isn’t much left for extracting. And also, there are no jobs - that’s the matter, and most of the people don’t want to go so far [to other forest plantations] for working.”

Lack of education.

The residents have low levels of education with only 4 of the 20 the residents interviewed having a high school diploma (Table 3.2). They commented on the difficulty of finding a job in any occupation other than temporary forest work due to their lack of education. The comment was made that, “There is no one left that knows more things or that understands things easily.” One of the reasons that so few people had education was that the community had not had a school in many years. There was an elementary school in the past that provided up to a sixth grade education, but afterwards children were required to go to boarding school in Valdivia. One person interviewed talked about the hardships of this. “He put me in Huellelhue [boarding school], but in the seventh grade, because I could study up here until sixth grade. Then I was in Huellelhue and I didn’t like it, then I didn’t want to continue studying. My dad could give me my studies if I wanted to study, but I was not accustomed, I cried every day, so I didn’t study more, after that I married, I had my children.”

The education of children seemed to be an important preoccupation for the households with school aged children. Of the 15 households interviewed, 12 had children

or grandchildren of school age, including 3 of the single men. It was reported that there were about 10 school age children living in the community in total. All children who attended school had to board in Huellehue or Valdivia during the school year, making the cost of schooling an emotional and economic hardship on the families. It was mentioned that even today, some children did not attend school due to the costs of boarding children in Valdivia. Many of the families with children expressed a desire for a school in the community.

Lack of title to land.

Another problem within the community is that 53% of the residents interviewed did not have a clear title to their land and an additional 13% of the residents had no title to their land (Table 3.3). The majority of titles to these properties were still in the name of the dead parents. This helps explain why the majority of residents lacking a title had properties less than 10 ha, the land had been subdivided amongst the children, but the children had yet to file with the government to update the deed. This was a significant issue because in Chile a person cannot apply for government programs without a clear title to their land. There was currently a government program by Bienes Nacionales for helping low-income rural residents obtain their titles which may help Lomas del Sol in the future.

Poor community access.

It may seem incredible that a community located 7 km from the city center of Valdivia, a town of 130,000 people and a cultural hub of Chile could be so isolated. This can

be attributed to the fact that the road leading up to Lomas del Sol was so steep that it was difficult to climb with a truck in the summer, dry season and impossible to climb with a motorized vehicle in the winter, wet season. Due to the poor state of the road, 47% (n=7) of the households use traditional transportation (i.e. oxen, horses or walking), yet 53% (n=8) have obtained modern transportation (trucks and motorcycles). All 3 of the households that live outside Lomas del Sol used modern transportation, including a large capacity truck. Vehicle ownership had drastically changed since interviews conducted in 2002 that showed only 1 of the 9 households interviewed had modern transportation (Matamala and Ruiz, 2002). Modern transportation facilitates dry season access to Valdivia and allows residents to receive a better price for firewood by selling it themselves. For this reason, members of the community had been pushing for improved access, which began to occur in January of 2009. In general travel to Valdivia took 50 minutes to go by car, 2 hours to go by dirt bike, 1 hour to go down and 2-3 hours to return by walking and 4 hours to go by oxen drawn carts.

There are alternative access points to Lomas del Sol, but they are currently privately owned. A logging road that accessed the top of the community through Forestal Tornagaleones, a private forest company, takes 20 minutes to traverse, but only one community member has permission to use this road. There was also an old state road that was located on the Aguasdecima property, but this road was closed to motorized vehicles or oxen. There was access on the North side of Llancahue through the Forestal Valdivia property, but again this was a private entrance that was currently guarded. Although better

access was necessary for creation of the peri-urban park and community development, the current limited access should make it easier to monitor illegal harvesting if a park guard is used in the future.

Isolation in the community.

The lack of access to Lomas del Sol had created an isolated community with little immigration and emigration. Most people interviewed were born in Lomas del Sol (n=17 of 20). There were occasionally new residents who came into the community, including three of the people interviewed, but two of the new residents had a direct connection through relatives or marriage. Although Lomas del Sol appeared to be a tight-knit, closed community, the disposition of the campesino people was one of independence. As stated by one respondent, "People are not united, they are not united in the country." One resident self-described the community as people who "like to do things their own way. They are people that don't want to be told what to do, they are used to their own world." Due to their isolation he also stated, "Most of them are like this, they are quiet and shy, they are shy and I don't know, they see two unknown persons and go away, they hide." Another resident described them as the "'Tarzan' of up here". The community was especially isolated in the winter. The impassible road, the harsh weather, and the lack of electricity separate Lomas del Sol from the outside world. Even the production of charcoal becomes more difficult, "Because sometimes we have to do it under the rain and everything is wet and with everything wet, it is impossible. Everything is covered with coal. If you could see

us sometimes in the road.... pure coal, it is a very dirty job.” As a former resident mentioned, “people suffer a lot in winter.”

Like many other rural communities in Chile, the population of Lomas del Sol was shrinking (Vergara, 2005). Thirty years ago there were about 30 families and 80 people in comparison to the 23 households and 50 residents in the community in summer of 2008/2009. A main cause of this was the purchasing of property by forestry companies (Vargara, 2005). One effect was that rural communities such as Lomas del Sol have decreased so much that they no longer have enough children to support a local elementary school and children then have to leave the community to receive a basic education. The final result is that as the communities shrink, there are even fewer resources and services for the community.

Lack of true formal organization.

The community lacked formal collective organization, even though there was an attempt to create a community organization 12 years ago. The Comité Proadelanto (committee for community improvement) was registered with the municipality in an effort to get a school in Lomas del Sol, but there were not enough children. Many commented that this committee only existed on paper, although they did discuss projects to get electricity and improve access to Lomas del Sol, with little success. The claim by some members that the comité did improve access was refuted by other members who claimed that the road improvements were due to the efforts of one land owner who lived outside

Lomas del Sol. "Yes there was a committee, there was a president but he never worried about anything, and it was all dropped and nothing was done in the end." Several residents spoke about the need for the community to unite for the UACH project to be a success. One mentioned Juntas de Vecinos (an official neighborhood organization in Chile which translates to united neighbors) and another mentioned that "I think that if there is a project there will be a committee. I think that talking to people will unite them and it will rise again."

Benefits of a sustainable forest management project with the Lomas del Sol community.

Overview.

Although the challenges portrayed above may seem immense, our results show a great potential for success in this project. The community did demonstrate some of the well-cited characteristics necessary to obtain positive change in collective governance. To begin with the community was small and well-defined. Community members have lived in Lomas del Sol their entire lives and want to continue to live there which gives them a low discount rate. Although community members were not formally organized, they had frequent face-to-face communication and were well known within their community. Finally, and most importantly, once the project was explained to the community, the majority of community members saw the project as a benefit.

Low Discount rate.

Despite hardships, it was clear that the households interviewed were happy with

their campesino way of life. One resident who left the city to move to Lomas del Sol commented “I like to be in the country, I have many good things [in the city], but its better here.” They took pride in their land and their country way of life. They liked the peace it provided. Many residents expressed their dislike for the noisy and expensive city of Valdivia, and one resident recounted a funny story of visiting the capital of Santiago – an experience he never wanted to repeat. All of the former residents who were now living in Valdivia expressed a desire to return to the mountain and the forests. Thus the residents had a low discount rate meaning that they have a vested interest in preserving their community and the resources they depend on.

Frequent face-to-face interactions by community members.

We observed that community members did know and speak with each other despite the fact that the community lacks strong, formal organization. There are informal community activities such as the selling of charcoal in Valdivia that community members participate in together. We were told that in the past and in the winter community members travel to Valdivia together with their oxen drawn carts to sell charcoal. The members who live highest on the hill would begin their descent at 1:00 am and slowly gather other community members on the way down. They would meet at the last house at 4:00 a.m. in the morning and arrive to Valdivia at 7:00 a.m. Now they go to Valdivia less with carts and oxen because many people have trucks and the road improvements are dangerous for the oxen on the way down (the gravel complicates walking of the oxen). In

addition, news spread quickly amongst community members through informal conversation. Little activity went unnoticed in Llancahue by the Lomas del Sol community, including the presence of our research team. We were well known by community members whom we only briefly met once. For these reasons, we suggested face-to-face contact within the community was high and the community itself had the best current control over the watershed. They knew who was present and what activities were occurring, making their participation in this project is crucial.

Community commitment to project.

The first step in any community-based conservation project is to have a commitment to change by the community. Was the Lomas del Sol willing to work with the UACH to conserve the Llancahue watershed? Our preliminary answer was yes. Primarily, the Lomas del Sol community hoped (93%) the creation of the peri-urban park would create alternative livelihoods for them, yet many expressed doubts about when this might occur (40%).

Proposed solutions for implementation.

Overview.

The next step in the data analysis process was to utilize the narratives to evaluate acceptable alternatives as outlined by the residents. This information is used to determine short-term solutions to the problem of illegal logging in the watershed. We categorized the

solutions provided into the theoretical framework for successful community forestry projects for collective action previously outlined (Ostrom, 1990; Astorga, 2005; Catalan, 2005; Vergara, 2005). Although the majority of the community supported collective management of the watershed with the UACH, there was a distinct difference in the way community members viewed solutions to curbing the illegal harvesting of wood (Table 3.4). Those members who did not exploit wood from the watershed suggested that a park guard would be needed to stop the illegal logging.

Clear articulation of goals.

The Llancahue peri-urban park was discussed for seven years before the concession was granted to the University in Fall 2008. “Yes, it’s been a long time that we have been hearing about this.”

There are many doubts, but they are because there is nothing for sure, those are the doubts, doubts are because I think of many questions, you don’t know what jobs they are going to offer out of all of them, so that’s what everybody..., I think that everyone is going to ask this. And when is all this going to come? I don’t know. Those are the doubts.

This was most likely due to the fact that there were no concrete projects with the community prior to September 2008 when the UACH received the concession.

The majority of respondents (87%) stated that they trusted the university to make a park and successfully implement the project due to their expertise. Yet two of the respondents expressed a distinct distrust for the UACH. “The UACH will start to cut trees and

they will eventually cut them all. I don't believe the park will be created," suggesting that some of the residents were unclear on how the UACH planned to manage Llancahue.

Capacity building.

Despite the ambiguity surrounding the project, the Lomas del Sol community hoped to receive training, education and better job stability, as well as better services such as an improved road and electricity as a result of the peri-urban park. The majority of the residents saw the implementation of the project as a benefit to the community for these reasons (Figure 3.3). However, many expressed concern that they were not ready to receive visitors who will come to the Llancahue peri-urban park in the future. At a community meeting, they expressed an interest in courses on trail building, gardening and cooking, ecotourism, chainsaw certification, and forestry management. Additionally, many expressed an interest in receiving basic education since 80% of the residents never completed their basic or elementary education (n=16 of 20 residents). In addition, conversations revealed that the residents did not understand many of the direct links between their activities, i.e. cattle grazing and selective harvesting with environmental degradation of the Llancahue watershed.

Employment opportunities.

The primary benefit the community expected from this project was the creation of jobs. Ninety-two percent of the community was interested and in need of work (n=14). They stated, "We hope work will come for us" "Having work...it takes nothing more" and "I

don't care, whatever it is, it's important for me to have a job, I don't care what it is." The Lomas del Sol had spent their life cutting trees in the forest and making charcoal. This was the work they knew and were most comfortable with and this was reflected in their preference for new vocations. When asked what type of work they would prefer, 55% of the surveyed residents stated they would prefer to continue participating in forestry operations such as thinning the forest, cleaning the forest and trail building (n=11). Four of the residents (20%) responded that they would like to be park guards. Two residents (10%), both women (40% of the female respondents) stated that they would prefer to make and vend products to tourists. In general, respondents reported they would be willing to accept a salary of \$363 a month in exchange for their work on the SFM project. This was similar to the salary they made from producing charcoal which we estimated to be \$336 per a month (Table 3.5).

Our community interviews suggested great potential for collaboration between the UACH and the Lomas del Sol community in the area of community forestry. This collaboration would be key to improving the management of the forests in Llancahue and conducting applied silvicultural research with the goals of promoting old-growth conditions and improving water production. In addition, the UACH's sustainable forest management plan included many labor intensive activities that would require experienced forest equipment operators. The Lomas del Sol community provided a potential on-site workforce. The community viewed the forest as an economic resource and was likely willing to

participate in activities that would create work for the locals while providing forest resources for charcoal production.

The UACH predicts that the management of 10-15 ha of secondary forest will produce a minimum of 200 m³ per a ha thinned a summer and gross approximately \$20,000 to \$30,000. They hope to allocate half of this money to park activities such as paying a ranger's salary, developing environmental education programs, and trail maintenance, but will also use part of the money to pay forestry workers from Lomas del Sol. Thus, at a maximum, the University can pay 41 months of salary, the equivalent of paying 13 members of the Lomas del Sol community for 3 summer months to work on the sustainable forest management project, if they pay them the requested wage of \$364 a month.

In addition, the university estimates that they will have 600 m³ of wood that is unsuitable for sale from the sustainable forest management project. The current household wood requirement for the production of charcoal is a minimum of 6 m³ per household per month in the summer and 3 m³ per household per month in the winter. Thus the potential exists to allow the community use of the waste wood from the sustainable forest management project, although it is doubtful that this waste wood can meet the needs of the entire Lomas del Sol community (Figure 3.4).

When discussing the proposed sustainable forest management project with the community, the need for training in sustainable forest management became evident. Most community members stated that wood species and size were unimportant for the

production of charcoal, suggesting they could use the undesirable species removed during the thinning of second-growth forest. When asked about their current method for tree selection, some stated that they only take “the really old trees,” “the trees from the dense coigue [*Nothofagus dombeyii*] that the UACH spoke of,” or “that they don’t take the really big trees - they are too hard or rotten inside.” Others stated that they took only “the dead wood on the ground.” The reality that emerged from our conversation about tree selection is that although they were experienced tree fellers, they lack education and training on how to sustainably manage forests. For this reason, a sustainable forest management program with the UACH could provide economic and social benefits by building capacity for sound forest management.

Clear boundaries.

Whether discussing the impacts of cattle grazing or firewood extraction, an overwhelming theme was that the community needed clear limits on permitted uses. They talked about the need for the university to mark the trees and teach them what trees can and can’t be cut. The residents stated they would like to do things the legal way, “Yes, but I like the forest a lot, so I'd like to be with a management plan”. Yet, due to their financial situation, they would not change their current habits until guidance was provided. In addition, residents spoke of the impacts of the cows on the reforestation projects and suggested that fences be used to keep the cows out of sensitive areas. Several community members insisted that sensitive areas in Llancahue would need to be fenced off from

animals; otherwise the animals would eat it all. In general, those residents who currently take wood from Llancahue expressed a desire for the university to work with them to provide a legal wood source or alternative jobs immediately before too much damage was done. Other households hoped the project would bring jobs and training, but suggested that the university would need to use a park guard to completely stop the illegal logging before moving forward with the project (See Table 3.4).

Discussion and Conclusion

It has been argued that for conservation initiatives to be successful, conservation and development must occur simultaneously (Berkes, 2004). The UACH has proposed to take a more populist-based approach to forest management in Llancahue than the previous owner, Bienes Nacionales, by proposing to collectively manage the secondary forests of the Llancahue watershed with the Lomas del Sol community (Donoso, 2005). From this perspective, the project could be a successful case study for conservation with local communities, if the UACH is able to improve the livelihoods of the Lomas del Sol community, sustainably manage the forest and water resources of Llancahue and create a peri-urban park for the City of Valdivia.

Social context must be understood in order for conservation projects to be successfully implemented. Thus conservation needs to be one of engaged, local-level planning and implementation that allows government, scientists, interested civilians and

local inhabitants to work together toward a common goal (Garcia-Frapolli et al., 2009). We have shown that Lomas del Sol shares many attributes with other rural, forestry communities in the South of Chile. Thus, we suggested a framework based on Ostrom's design principles for collective action and the experience of other successful community-based conservation projects in Chile. This process should set concrete goals. These goals are to promote organization in the community, develop monetary and non-monetary incentives for change, connect the local communities with various governmental agencies that can assist in their rural development, and determine appropriate rules and sanctions for wood extraction and cattle grazing (Ostrom, 1990; Astorga, 2005; Catalan, 2005; Vergara, 2005).

There are seven ways to encourage participation by local communities as outlined by Pimbert and Pretty (1997) with consultation being a recognized top-down approach. This exploratory study began the participatory process by using top down approaches to allow Lomas del Sol to participate through consultation. Our interviews with the Lomas del Sol community suggest a high likelihood of participation if the community receives economic benefits from the project. Our results suggest that the money available from the SFM project can provide a substantial economic benefit to the Lomas del Sol community during the summer months. The SFM project is another participatory conservation management strategy that will allow community participation by providing material incentives (Pimbert and Pretty, 1997).

If the UACH wants to take a true populist-based, inclusive approach to forest management with the Lomas del Sol community, they will have to take actions to encourage participation (Pimbert and Pretty, 1997). Based on the current state of the community, their expressed willingness and desires, the following short-term goals and incentives could be initiated to encourage participation:

- Encourage the re-establishment of the Comité Pro Adelanto since this has already been legalized by the city. This will provide a formal organized body that can be recognized by the University and other institutions. The UACH can facilitate this process, but a community-elected organization would be a bottom-up participatory process that provides an official voice for Lomas del Sol and a direct point of contact for outside institutions.
- Provide clear short-term benefits for the community such as employing community members in sustainable forest management projects and scientific investigations. It is clear that men of the Lomas del Sol community have experience in forest management, thus it will be easiest to provide additional training to them in this vocation. Providing material benefits is a top-down participatory process and Lomas del Sol provides a willing and local labor force and the process will provide much needed jobs.
- Assist the community in establishing positive relationships with other institutions. For example, the university can collaborate with other

neighboring forest companies to determine other sources of wood for charcoal production. Formal agreements between the university, neighboring forestry companies and the community would provide the security of a longer-term wood supply, an important bargaining chip for the university in their negotiations. In addition, the university could facilitate the process of helping the community obtain clear titles to their land from Bienes Nacionales. This is a necessary first step for the community if they wish to participate in governmental programs that can help them with capacity building and rural development.

- Work with the community to establish new rules on the extractive uses of the watershed and determine appropriate sanctions for breeches of these rules. The university needs to negotiate a formal agreement with the community on what activities can and can't take place in the watershed and determine appropriate how rules will be enforced. This could be especially effective after the aforementioned institutional interventions that provide positive incentives to the community. A commitment from the university must be matched by a commitment from the community.
- Work with the community to restore their own properties through reforestation projects and improve the condition of forests bordering the Llancahue watershed. This will help homeowners become less reliant on

neighboring resources and teach them the value of sustainable forest management on their own lands.

- Continue communication between the university and the community. This includes articulating agendas and understanding perspectives. It is only through the course of time that trust will be built between the local community and the university.

The above actions have been shown to help promote more sustainable resource use in a large number of case studies in both Chile and around the Globe (Ostrom, 1990; Astorga, 2005; Catalan, 2005; Vergara, 2005). There is no clear prescription for achieving sustainable management of forests with local communities (van Kujik et al., 2009). An evaluation of multiple case studies suggests that participatory approaches with local communities to forest management results in improved forest condition, despite the difficulties of changing patterns of behavior (Varughese and Ostrom, 2001). The success of conservation projects depends on institutional interventions to assist with the development of an appropriate collective forest management strategy between the UACH and the community (Chatre and Agrawal, 2008; Astorga, 2005). We have demonstrated that the pure top-down approach to Llancahue management by the state has not been effective, thus the UACH is pursuing a more participatory approach that will be inclusive of the Lomas del Sol community. According to Brechin and West (1990), top-down approaches must be linked with bottom-up approaches because top-down approaches are not inclusive, but

bottom-up approaches require structuring to get the necessary financial support, develop a strategy, and connect relevant stakeholders. The UACH, as the concessionaire and expert on forest management will be responsible for facilitating this.

Through our interviews with the Lomas del Sol community, we provide evidence to support McNeely's claim that the most important principle for community participation in conservation projects is to provide benefits to the local community and meet their needs (1994). The process must be adaptive and experimental as the university attempts to change the social norms of the community to achieve a more sustainable level of resource management (Ostrom, 2007). As our stakeholder analysis indicated (Ch. 2), the Lomas del Sol community represents the most immediate challenge to managing the Llancahue watershed sustainably as they directly threaten the integrity of the forest. Yet they also represent the greatest potential ally since because live beside the forest and receive direct benefits from it. We have confirmed and outlined various bottom-up and top-down actions that the UACH can take with the Lomas del Sol community in order to facilitate their participation in the project.

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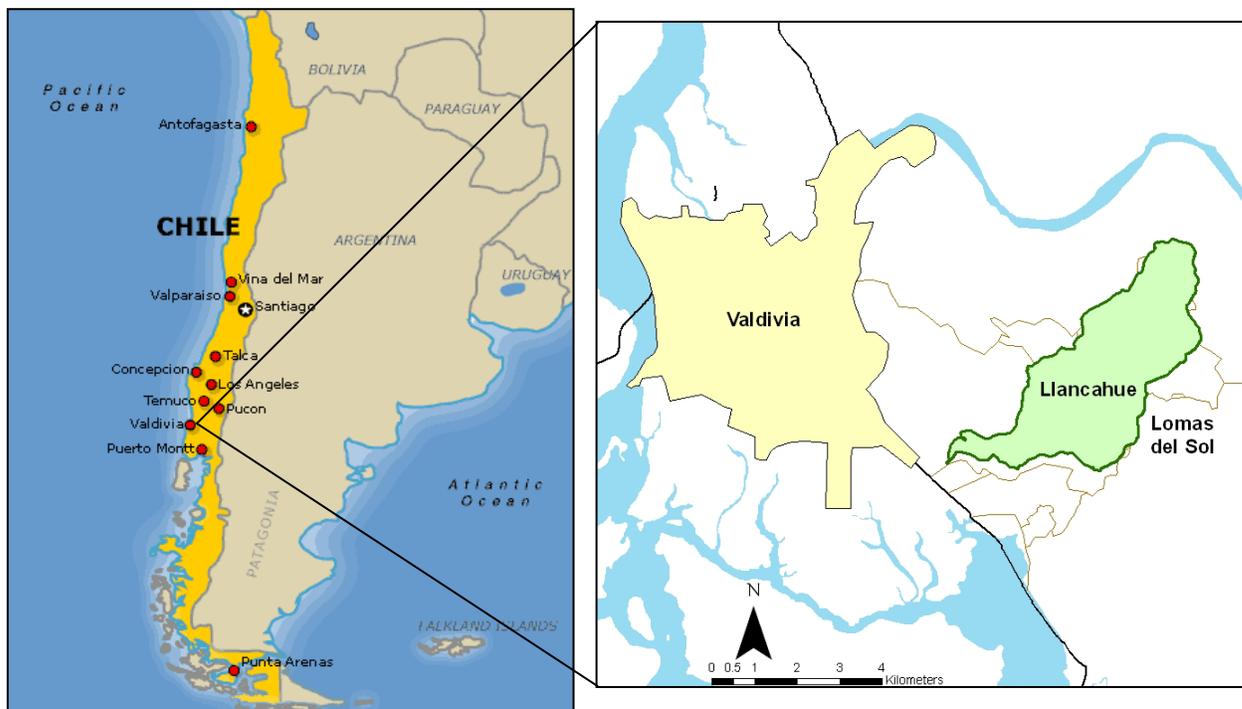


Figure 3.1. Location of Llancahue watershed outside the city of Valdivia, Chile (39 50'20"S, 73 07' 18"W).

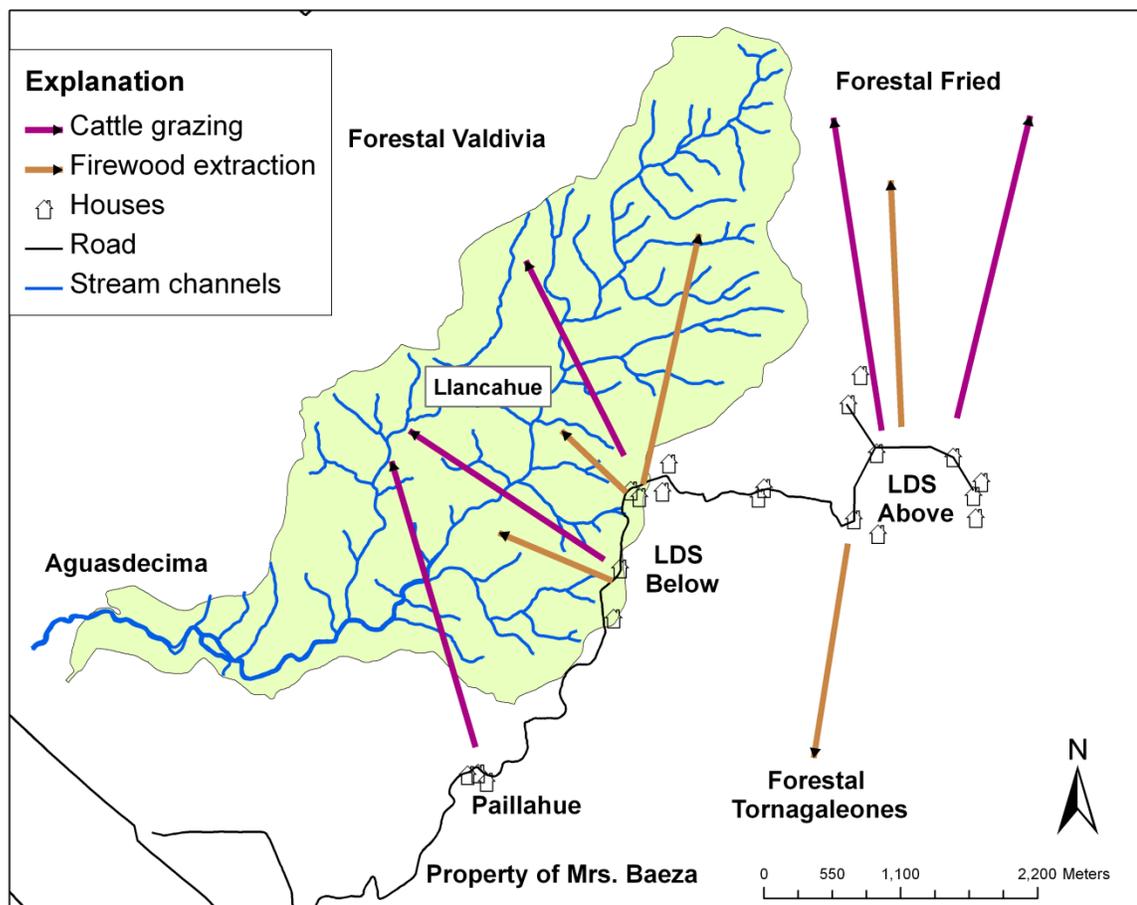


Figure 3.2. Patterns of use by the Lomas del Sol community.

This map was verified by the community in a group meeting. We see a distinct pattern where the households who live adjacent to Llancahue use the watershed and the households that live further away from Llancahue utilized the property of Fried.

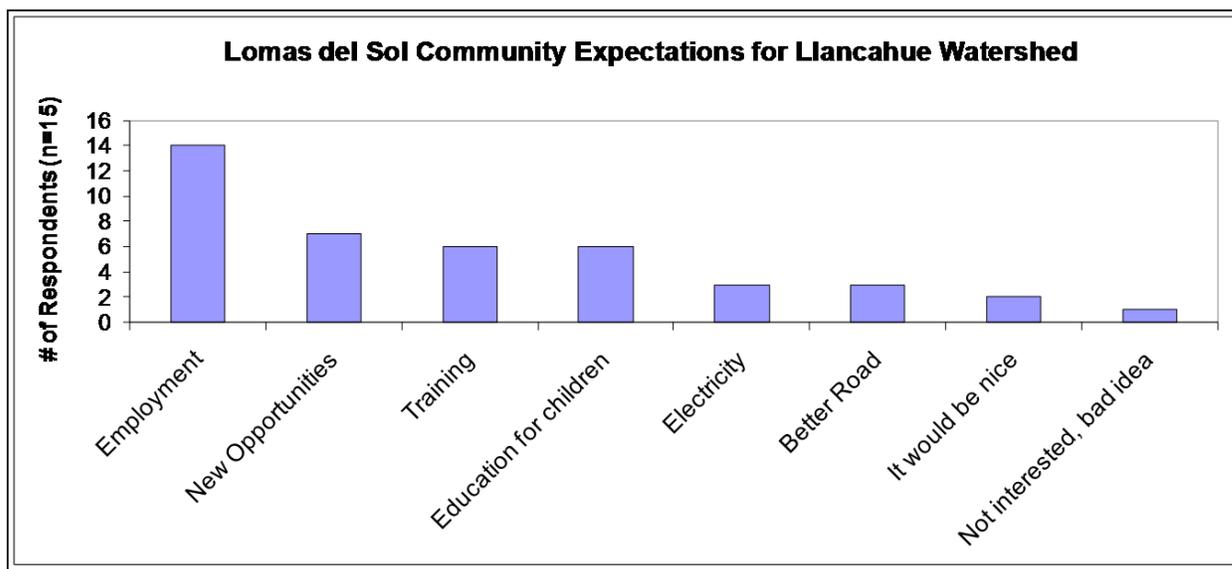


Figure 3.3. Community expectations for the Llancahue peri-urban park obtained from the semi-structured interviews.

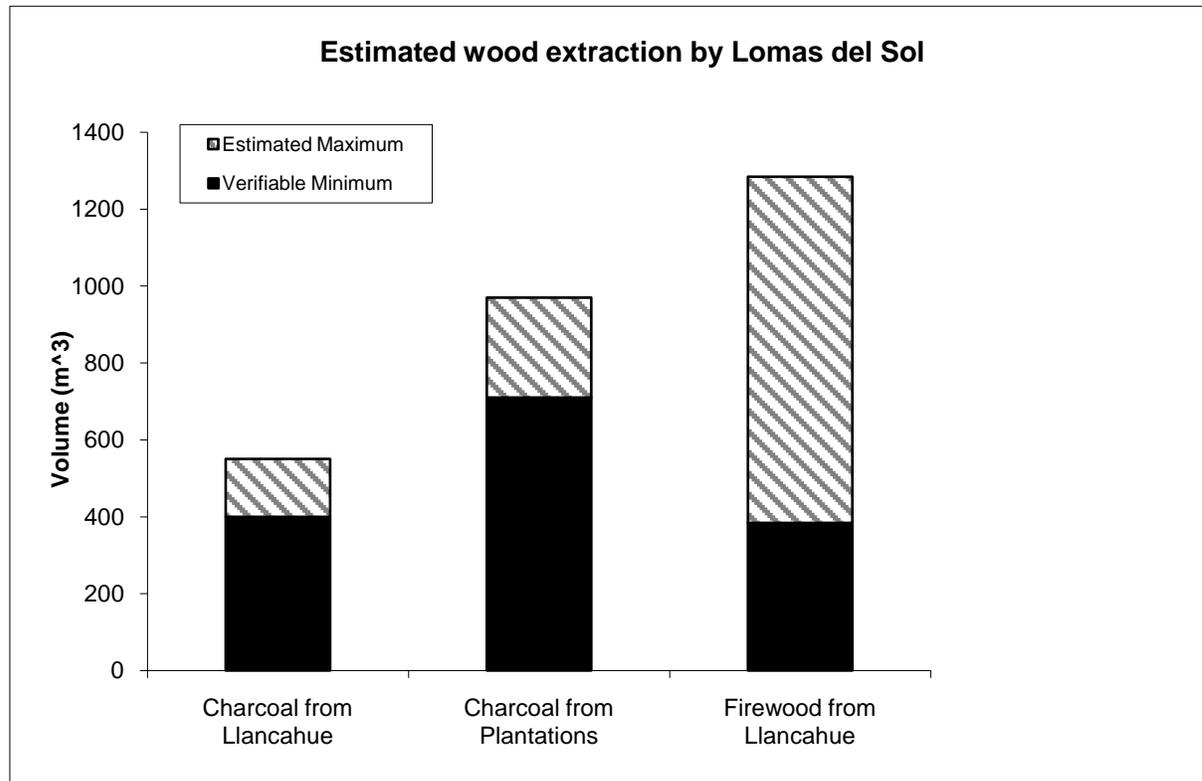


Figure 3.4. Current community wood demand for charcoal and firewood production obtained from the semi-structured interviews. Results suggest that community wood needs for charcoal production can be supplemented by the sustainable forest management project.

Table 3.1. Lessons learned from sustainable forest management in Southern Chile. The table summarizes the literature on community forestry projects and provides suggestions for positive actions that help make for a successful project and negative actions that have led to the failure of community forestry projects.

Positive Actions	Negative Actions
<ul style="list-style-type: none"> • Active engaged leaders • Collective action • Involvement of community from project initiation • Inclusion of local culture • Clear articulation of goals • Clear links between conservation and improved livelihood • Education and capacity training • Diverse, solid, influential alliances • Long-term financing 	<ul style="list-style-type: none"> • Inadequate supervision • Lack of community organization • Not knowing needs and situation in community • Loss of confidence • Lack of community development • Mistaken estimations of community education with regards to sustainable forest management • Lack of coordination • Measuring products rather than process • Incentives only support initial steps

Table 3.2. Education level of Lomas del Sol.

The semi-structured interviews suggest that the majority of residents in Lomas del Sol have a very basic education. All people interviewed with a high school education were either born outside the community or have left the community after receiving their education.

Education Level (n=20)		Born elsewhere	Live elsewhere
Did not complete Basic	16 (80%)	0	1 (5%)
Completed high school	2 (10%)	1 (5%)	1 (5%)
Technical Degree	2 (10%)	1 (5%)	1 (5%)

Table 3.3. Land Titles.

Our semi-structured interviews suggest that over half the residents do not have clear titles to their lands. This is especially true for heirs of smaller land holdings that were subdivided among the siblings. They never went through the formal process of transferring the title from their parent's name into their own.

Title to Land (n=15)	#	Own 0-10 ha	Own 10-20 ha	Own 20-30 ha	Unknown
Clear title	5 (33%)		2	3	
Title in dead parent's name	8 (53%)	7			1
No title	2 (13%)	1	1		

Table 3.4. Community Ideas for management of Llancahue.**Examples of ideas suggested by people who currently do extract wood from Llancahue**

“Well, in one hand, I think it should be protected, but giving ideas, giving jobs to people, it’d be the only way that it’s protected.”

“That’s what the university should do, come here before more damage is made, because, I don’t know, come and mark at least, I don’t know, much damage would be prevented.”

“Yes, the people should stop this because there is wood to clean, then you should mark the trees and decide which trees can and can’t be taken, things that can be cleaned and taken for wood for then, this allows you to take advantage of both things at the same time.”

“The university has to tell the people: you can cut this tree and this tree you can’t cut. I think that they understand it in that form, they don’t cut the trees that the university really wants.”

“For example, if the university says they don’t have money to give job to some people, I don’t know, if thinning could be done, at least if they could mark the trees and say to the people, this tree is marked, cut it, look for the best way to cut it, so it doesn’t make damage, I think it’d be great, because they’d be working with the community. They’d all agree. We all know it belongs to the state...what happens if the university comes with a few police officers and we are working, we’d go to jail and it has already happened.”

Examples of ideas suggested by people who currently do not extract wood from Llancahue

“What I think that the people need here is to not always have to be depending on the coal and firewood. They can have work in making trails, they can benefit from the same wood, but so they don’t come and take like crazy, that they can’t just take and take and take. That is the first step, to inform people well what things can and can’t be done inside the property. “

“It must be hard to stop the people, because the people are used to living like that, so to finish this routine...”

“F: The other thing I wanted to add, is that you have to close Llancahue...M: To protect it. F: Yes, we think it is better close it and protect it, because it is open...M: Yes, a ranger to take care of here, to make sure there is no harm. F: A ranger who is... M: Honest, before there was a ranger here.”

“Yes, I think that it takes time. Also it is so big, in the first place they would have to close it, after that, clean it ... it always takes time.”

Table 3.5. Income from charcoal production.

Our semi-structured interviews provided estimates of income derived from Charcoal Production in the Lomas del Sol community. Estimates assume that the community sells charcoal for \$7.27 a sack, 1 m³ of wood produces 100 sacks of charcoal in the summer and 50 sacks of charcoal in the winter, and a conversion rate of \$1 USD to \$550 CLP. A m³ of wood is a standard volume for which firewood is sold in Chile and is equivalent to a stack of wood cut in 1m lengths that is 10m long and 5m wide (1m³ = 1m*10m*5m).

Charcoal Production	Season (Summer = Nov.-March, Winter = April - Oct.)	M³ of wood per a household (per month)	# months	Total seasonal wood use per household (m³)	# sacs of charcoal produced	Monthly Profit (USD)	Yearly household income (USD)
Low estimate	Summer	6	5	30	60	436.36	2,945.45
	Winter	3	7	21	15	109.09	
High estimate	Summer	9	5	45	90	654.55	4,163.64
	Winter	3.5	7	24.5	17.5	127.27	

Chapter 4: Moving the public-private partnership from a state of transaction to action

The primary approaches to conservation and protected area management are based on traditional, populist, or neoliberal models. These models are typically operationalized as government-run protected areas, integrated conservation and development projects, and payments for ecosystem services, respectively (Brown, 2002). The populist and neoliberal approaches to conservation management have emerged since the early 1990s. At this time research demonstrates strict, traditional top-down approaches to conservation management are inadequate, especially if governments do not appropriate enough financing (McNeely, 1995; Phillips, 2003). In projects where financial resources are limited, populist approaches based on collaborative management through multiple partners have been proposed to be an improved conservation management strategy through the pooling of resources to achieve conservation success (Daniels and Walker, 2001; Roloff and Jordan, 1992). This may be especially true in Latin America where governments face intense and understandable pressure to focus financial resources on economic development and poverty reduction (Elbers, 2008).

The model of creating public-private partnerships to jointly manage state-owned protected areas was proposed as one avenue for negotiating more resources for conservation projects through collaboration (Selin and Chavez, 1995; Grumbine, 1997; Hardy, 2010). Technically, public-private partnership designs create joint agreements

between the government and private institutions that formalize shared responsibilities for solving natural resource allocation conflicts or carrying out natural resource goals (Selin and Chavez, 1995). With regard to environmental management, research suggests public-private partnerships have supported state initiatives rather than creating a new form of governance by converging expertise and partner interests to achieve goals given the available resources (Andonova, 2010). Perceived benefits of public-private partnerships have been that they would spread out the risk of investment between different partners (Linder, 1999) and increase the probability of stakeholder acceptance to management decisions if the process is inclusive and shares power (Grumbine, 1997).

The incorporation of nongovernmental actors such as private firms and nonprofit organizations is novel compared to their traditional roles as opponents and advocates respectively (Imperial, 1999). For this reason, the incorporation of non-governmental actors in the management of natural resources through public-private partnerships can be thought of as an innovation, as opposed to traditional styles of ecosystem management. As with any innovation, adoption by the natural resource community will take time and effort (Rogers, 2003). This effort is often spearheaded by an opinion leader and change agents whose roles are to promote and encourage the adoption of the public-private partnership by key stakeholders (Rogers, 2003). Experience has demonstrated that effective partnerships can be difficult to create and maintain due to the human dynamics that come into play during the process. Success of public-private partnerships often relies on 1) effective group facilitation, 2) management of interpersonal relationships among partners,

and 3) understanding of environmental and institutional context of the problems (Grumbine, 1997; Daniels et al., 2009). Chance for adoption may be increased, if the public-private partnership is viewed as 1) a structured process which includes the gathering of scientific information, 2) the genuine involvement of stakeholders in the development of resource management decisions, and 3) establishment of clear and measurable goals (Thackway and Olson, 1999).

Selin and Chavez (1995) provide a model depicting the social process of public-private partnerships for natural resource management. They hypothesize that stakeholder partnerships form due to an environmental context they term as 1) antecedents which serve as the catalyst for the public-private partnership and then takes stakeholders through a series of sequential steps of 2) problem setting, 3) direction setting, 4) structuring, and 5) outcomes (Selin and Chavez, 1995). Rogers suggests there is a need to evaluate innovations as they are being adopted in order to look critically at the steps that help or hinder adoptions (1995).

Study Objective

In order to better understand how public-private partnerships are created, we evaluated the social process of public-private partnership in the Llancahue watershed, Valdivia, Chile (39 50'20"S, 73 07' 18"W, Figure 4.1) during the implementation process. This proposed public-private partnership is between the University Austral de Chile (UACH)

and the Chilean Government and is incorporating other institutional actors. In the case of Llancahue, the Chilean government has given the UACH the concession of the Llancahue peri-urban park for 20 years with the belief that the UACH can fulfill the government's goal of creating a peri-urban park for the city of Valdivia. In addition, the University wants to fulfill the following five goals, 1) protect the quantity and quality of the water supply, 2) conserve biodiversity in the watershed, 3) encourage public use through outdoor education and ecotourism, 4) conduct scientific research on ecosystem processes, and 5) manage and finance the project through sustainable forest management (Donoso et al., 2005). The UACH expects to do this through the creation of a public-private partnership that is jointly managed by multiple regional and local actors.

We utilized information from our stakeholder analysis of prospective partners of the Llancahue watershed partnership to evaluate the proposed public-private partnership and used extension theory to provide suggestions on how to advance the public private partnership. Results from our stakeholder analysis demonstrated that the Llancahue stakeholders share common interests with regards to protecting the watershed. They are interested in creating a peri-urban park for the city of Valdivia, but they are less certain about how the project will be carried out. They believed the project needs to be undertaken collaboratively and will require the resources of multiple stakeholders. Common fears included the lack of available resources for the project, the ability of the University to manage the park, and threats to the integrity of the park's valuable resources such as old-growth forests and water supply. Stakeholders suggested a need for improved

institutional arrangements and communication from the University in order to achieve concrete actions collaboratively (Ch. 2). The objective of this research is twofold 1) to critically evaluate the development of the public-private partnership in the Llancahue watershed using Selin and Chavez's model, and 2) to use extension theory to provide suggestions on how to move the social process forward, increasing the likelihood of adoption.

Materials and Methods

With this information in mind, we considered how partners might achieve identified goals by evaluating needs and concerns identified by stakeholders. Stakeholders were initially classified into two groups, institutional and campesino. Separate semi-structured interviews were developed for these two groups (Appendix A and B) as institutional stakeholders represented partner organizations who could provide resources (i.e. money, equipment, or staff) for the project, while the local user group, Lomas del Sol, illegally used and depended on the forest resource (Grimble and Wellerd, 1997). All interview and research design was approved by the Institutional Review Board of North Carolina State University (387-08-10).

Data analysis took a qualitative, grounded approach following the methods of Corbin and Strauss (2007). All interviews (N=68) were tape recorded (unless the participant specified did not want to be recorded (n=4)), transcribed in the original language of the

interview and then translated from Spanish to English when the initial interview was conducted in Spanish. All other field notes collected during the focus groups (n=5), stakeholder meetings (n=3) and informal interactions were recorded in English. The software program Atlas.ti (Version 6.1.10, GmbH, Berlin, 2009) was used to code the data. This data was used to determine what had been accomplished in the project to date and conduct an analysis of stakeholder values and beliefs, interests, concerns, and perspectives on the project (Ch. 2).

In addition, we held a meeting of all stakeholders at the end of January, 2009. Thirty-two people attended, including three members of the Lomas del Sol community. During the two hour meeting, brief presentations were made to provide general information about the project and preliminary results from the stakeholder interviews. Afterward, participants were asked to break into small groups to brainstorm action plans for the four initiatives proposed for Llancahue; Environmental Education, Ecotourism, Rural Development, and Resource Management. The small groups then reported back to the full gathering. After the discussions stakeholders were asked to fill out an evaluation form of the meeting and indicate their interest in participating in various working groups (Table 4.1).

We used the combination of the above data to evaluate the formation of the public-private partnership within the context of Selin and Chavez's (1995) collaborative process model to the Llancahue watershed public-private partnership. This approach is known as action research since the activities used to collect data and test theory also helped to

facilitate the public-private partnership. Action research can be called research of a work in progress since research occurs before the complete adoption of the innovation (Bryden-Miller et al., 2003). Rogers (1995) suggests a need for more action research with regards to examining diffusions of innovation (1995). Thus, we hoped to use our research and associated theory on public-private partnerships as a means to provide tools for working with stakeholders to advance public-private partnerships for protected area management.

Results and Discussion

Accomplishments to date in the public-private partnership

Based on Selin and Chavez's model, we suggest the social process of the public-private partnership was between the stages of problem setting and direction setting based on past and present actions (Figure 4.2). We recognized that several antecedents were met. For example, the institutional stakeholders perceived illegal grazing of cattle and harvesting of trees from the watershed as a crisis and the university decided they would act to take over the management of the watershed. This was done through a mandate by the government to create a peri-urban park in Llancahue while conserving old-growth forests and water resources. The conservation of water and forests resources through effective management of the Llancahue watershed represents the shared interest of all partners.

Our stakeholder analysis confirmed and expanded the stakeholder network which is part of the problem setting stage. This network includes governmental agencies who represent the public partner and private actors including the UACH, governmental and non-

governmental agencies, private companies, the local user group, Lomas del Sol, and other research groups (Appendix A). Financing for the project, developing appropriate institutional arrangements, and halting the illegal logging of the forests were the top three problems identified by stakeholders. Most stakeholders viewed their organization as playing a supportive role to the university in this project and saw the university as having the ultimate responsibility for the project. Thus although the public-private partnership suggests sharing of responsibility, we suggest that successful public-private partnerships require a leader, in this case the UACH, and specifically the project manager from the UACH who will serve as the opinion leader for the project. Opinion leaders are ultimately responsible for influencing individual's attitude and overt behavior (Rogers, 2003).

Next Steps

Based on Selin and Chavez' model, we suggest now that general problems have been defined, stakeholders need to set directions by defining goals, determining specific stakeholders roles, and exploring options for institutionalizing the public-private partnership. As part of our action research approach, we held an initial stakeholder meeting amongst all interested parties in January of 2009. Some of the key themes that emerged from evaluation feedback were that stakeholders were interested in participating in the partnership but that 1) they required more information, 2) project goals needed to be further defined, and 3) institutional arrangements and roles needed to be clearly established. Common responses included "We have to work seriously to materialize the

ideas and objectives that have been planted” and “We lack defining the actions that will follow so we can contribute to this Project.”

We suggest that stakeholders are uncertain at this point how the public-private partnership will unfold. Many expressed hope that public-private partnerships will improve conservation efforts by collaboratively negotiating resources to achieve more effective conservation of the watershed, but are unsure what steps to take to accomplish this. As stated by one stakeholder, “I think that this is the first needed step, to define a project in common. Defining goals in common and trying to define each institution’s priorities and how they could be implemented (I4).” Thus, it appears stakeholders were still contemplating the rule making process for this public private partnership and need to work together to define how appropriate institutional arrangements can be created to achieve project goals. In order to do this, stakeholders must clearly define the goals of the partnership. This is part of the decision-making process and will ultimately help partners decide the costs and benefits of their participation in the public-private partnerships.

One action that will be required is defining stakeholder roles. The university must decide how they will incorporate various stakeholders to support the project. In all public-private partnerships, stakeholders participate because they perceive that the benefits they will receive from the project will outweigh the costs, even if the benefits are non-monetary (Grumbine, 1997). For instance, the Department of Education wants to participate because they will benefit from environmental education programs that will be created out of this

initiative even if it requires that they participate in the development of curriculum. The Tourism bureau is interested because they need an improved platform for ecotourism in Valdivia, even if participation requires that they volunteer time to develop programs. Thus a benefit of incorporating various public and private entities in this project is that it can increase the pool of available resources as long as the partners feel they are receiving a benefit from their input.

Yet it is also important not to have too many partners that work can't be accomplished causing the group to become unwieldy. The UACH has decided to create a management team comprised of 12 stakeholders. In order to make the process inclusive of all partners who can potentially contribute resources and have an interest in the project, we suggest the UACH create sub-groups charged with specific roles such as developing the environmental education program or working on the sustainable forest management project. Stakeholders indicated they would prefer this approach since it would allow them to self-select actions specifically related to achieving the benefits they hope to receive from the project. The feedback from our evaluations suggested stakeholders have a preference for participating in specific subgroups directly related to objectives of interest to their organization. "It's necessary to open the discussion to the institutions who's missions are best related to the development of a theme, this is key for advancing the development of plans for community development, tourism and environmental education." We found that

there was not interest from more than 15 people for any one subgroup out of the 30 participants.

Achieving the Goals of the public-private partnership

Based on our stakeholder feedback, we provide suggestions for advancing the public-private partnership to the action phase. First, the UACH should formalize the relationships created through the public-private partnership. This step will provide legitimacy to partners (Mitchell et al., 1997). This past year, a memorandum of understanding (MOU) was signed between 11 of the 12 stakeholders in the proposed working group for the Llancahue watershed. This suggests a first step toward developing an institutional arrangement, although failure of the private water corporation, Aguasdecima, to sign the MOU indicates that some partners are slow to adopt and may reject this innovation, potentially because they do not see clear benefits for entering the partnership at this time (Grumbine, 1997).

Second, communication channels should be increased. Both stakeholder interviews and feedback from the stakeholder meeting suggest that stakeholders want more information about the project in order to better determine their interest in participation. Rogers suggests the use of mass media to improve stakeholder communication and facilitate adoption of an innovation (1995). Thus, the creation of a listserv and website for the Llancahue watershed could serve an important role in fulfilling this task. All interested stakeholders can stay up-to-date on progress made in the watershed since project

documents and meeting minutes could be maintained on the site. The creation of the listserv would also legitimize the role of stakeholders by improving interpersonal communication through virtual interactions.

One of the important themes repeated by stakeholders is that roles and actions be clearly defined, signaling a transition to the direction setting and structuring stage as prescribed by the collaborative process model (Selin and Chavez, 1995). For this reason, we suggest that the public-private partnership needs to determine how to assign roles and elaborate tasks among partners. This will help to formalize the relationships that partners have to this process. We suggest using a planning tool such as the one provided by Mehrizi et al. (2009), to help achieve this task. They suggest working with partners to develop an $n \times m$ matrix, where n is the number of stakeholder groups and m is the number of goals to help connect policy goals to stakeholders through action plans. The matrix is a planning tool that allows stakeholders to work together to determine what specific actions are required to fulfill various stakeholder goals and then assigns specific actions to individual stakeholders. Figure 4.3 demonstrates how Mehrizi's matrix can be used to assign potential tasks for the sustainable forest management project. This tool should be filled out for all UACH specified goals in Llancahue with the partners who have the potential to contribute to the success of these goals. The tool is valuable at multiple scales and could be used to create general policies and actions with the management team and more specific goals and actions within the working sub-groups. It also helps provide a reality

check of what activities are feasible given stakeholder resources and a written record of stakeholder commitments (Mehrizi et al., 2009).

Finally, the UACH needs to focus on achieving short term outputs in addition to their long-term goals as these outputs will help the UACH achieve their goals. Although stakeholders acknowledged that this was a long-term project, stakeholders repeatedly made reference to the need for concrete action. We suggest the use of the logic model as a way to determine how they will accomplish their goals. The logic model is a planning tool that helps clarify how a program will work given certain conditions and identified problems (Bickman, 1987). In its simplest terms, the logic model requires that programmers identify inputs into a program for the achievement of outputs (i.e. activities and participants) that result in short-term, intermediate and long-term outcomes, taking into account assumptions and external factors. The logic model can be thought of as a series of if-then statements. Users of the logic model work backwards, since they often know their long-term goals, but are less certain of the outputs that are required to achieve these goals. This form of the logic model has been in existence for 20 years and has been proven to help managers connect project actions to project goals (Wholey 1983, 1987). We suggest that Mehrizi's matrix could help the UACH and associated partners develop their logic model by clarifying what inputs are available through the partnership and how these inputs are linked to project outcomes (Mehrizi, 2009). Using tools such as the logic model and Mehrizi's matrix can help verify the work of partners in achieving conservation success in the

Llancahue watershed and link specific actions to project outcomes. We provide a preliminary logic model depicting the development of the public-private partnership for the Llancahue watershed as expressed by stakeholders (Figure 4.4). By specifying how resources and actions can achieve project goals upfront, stakeholders can monitor if their efforts are producing the desired results.

Summary and Conclusions

Our analysis of the social process in the Llancahue watershed suggests the public-private partnership is moving from the problem-setting stage to direction setting. During the problem setting stage, a key factor is to define common interests so that stakeholders can share in defining the problem (Grumbine, 1997; Sidaway, 2005). During the direction setting stage, stakeholders will need to establish appropriate institutional rules to determine how the public-private partnership will achieve their desired outcomes (Imperial, 1999) Extension theory suggests that stakeholders will either adopt or discontinue the innovation during the direction setting stage (Rogers, 2003). Based on our results and the literature, we suggest the following steps for moving the public private partnerships forward and increasing the chance stakeholders adopt public-private partnerships as an effective ecosystem management strategy:

- Explicitly define goals and institutional arrangements so that stakeholders know what the goal of the public private partnerships is and what their specific role is

- within the partnership. As noted by stakeholders and the literature, formalizing relationships, assigning roles and elaborating tasks will help to facilitate activities within a public-private partnership and define stakeholder roles so that individual stakeholders can achieve specific outcomes. The use of planning tools with partners such as the logic model and Mehrizi's n*m matrix can help clarify this step (Selin and Chavez, 1995; Bickman, 1997; Mehrizi, 2009).
- Be inclusive of stakeholder groups who want to participate and can provide resources for the project, but make sure to keep all working groups small enough that they are manageable. An effective way to keep partnerships manageable is to have a managing body and create sub-groups to achieve various tasks (Selin and Chavez, 1995, Grumbine, 1997).
 - Create a website and listserv to keep partners informed about activities and developments in the project. Improving communication amongst stakeholders through the use of mass media and interpersonal connections increases the chance that stakeholders will adopt the innovation (Rogers, 2003).
 - Celebrate the successes of the project, no matter how small they are. Stakeholders need to verify the benefits of a project outweigh the costs (Rogers, 2003).
- Acknowledging and publicizing any successes helps to communicate to stakeholders that progress is being made through the partnership.

It is important to focus on interests and define necessary responsibilities in order to achieve outcomes if the Llancahue watershed is to move from a state of transaction to action in a multi-party collaborative agreement (Sidaway, 2005). Creating Institutional arrangements provides an official structure to the public-private partnership and represent an action stage (Imperial, 1999). Rogers (1995) suggests that action stages will only bring about successful change if institutions are ready to commit to action and Grumbine (1997) states that public-private partnerships will fail if appropriate institutional arrangements are not in place. Based on our results, we suggest that in order for outcomes in Llancahue to be achieved, the UACH should take steps to advance the public-private partnership.

Llancahue serves as an interesting case study for the use of public-private partnerships for resource management. Public-private partnerships are an innovation that have recently been lauded due to their perceived ability to pool resources from multiple partners in order to achieve common goals (Andonova, 2009). During the action stage when partners have to commit resources it will become apparent if they continue to see the benefit of this model (Rogers, 2003). Thus Llancahue provides an opportunity for us to evaluate the social process of public-private partnerships while it is occurring.

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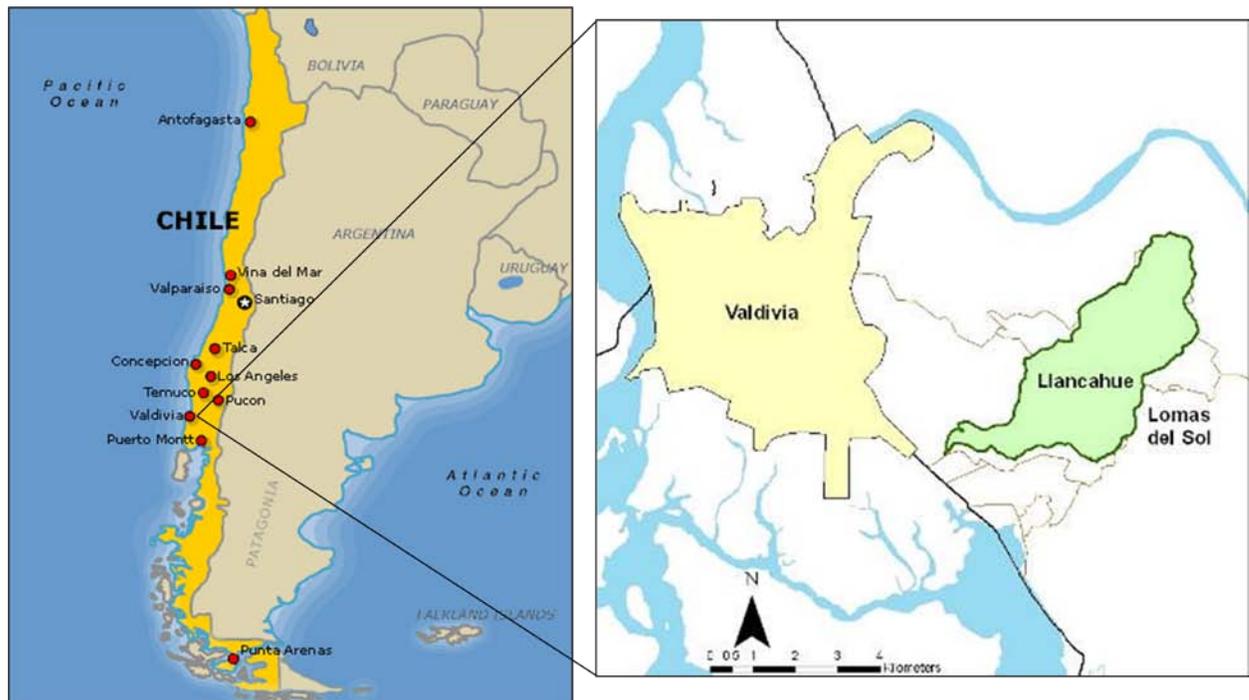


Figure 4.1. Map of the Llancahue watershed in relation to Valdivia, Chile.

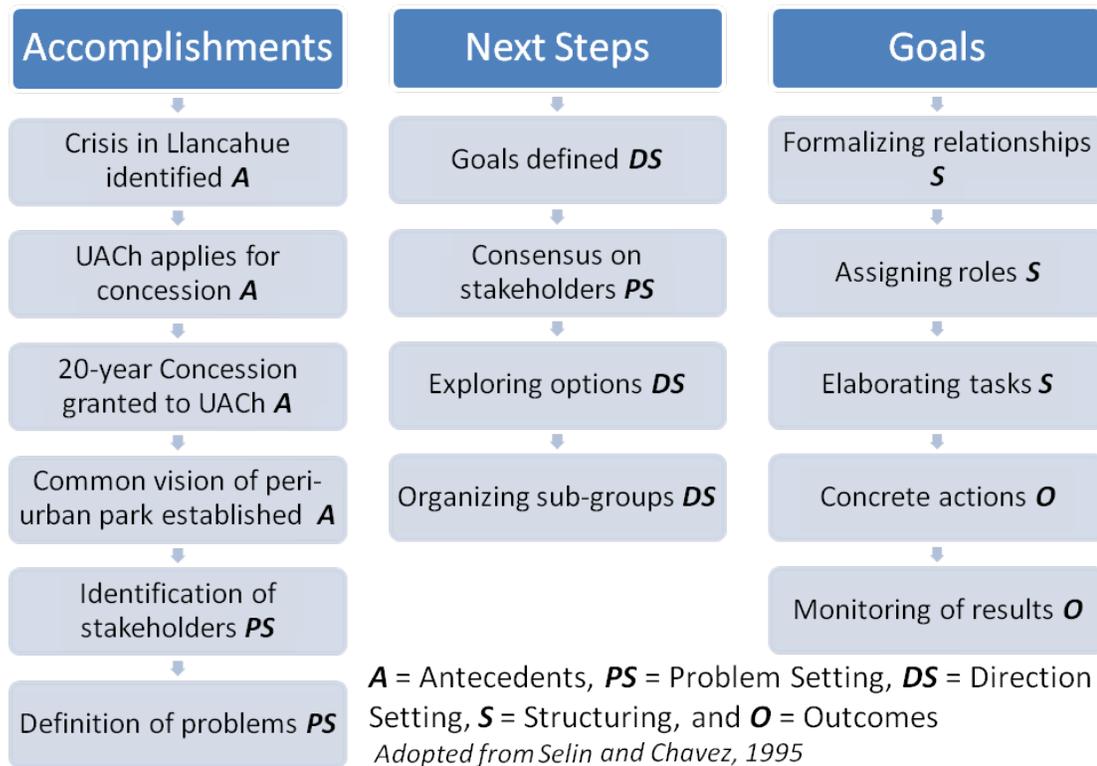


Figure 4.2. The collaborative process for the management of the Llancahue watershed, a public-private protected area.

Stakeholder / Goals	Sustainable Forest Management
UACH	Research and Monitoring
CONAF	Approving the forest management plan
AIFBN	Implementing the forest management plan
Forestal Valdivia	Providing access
Loggers	Contracts for delivering wood
Lomas del Sol	Contracted Workforce

Figure 4.3. An example of how Mehrizi’s matrix can be used to assign tasks to achieve the goal of Sustainable Forest Management in the Llancahue watershed.

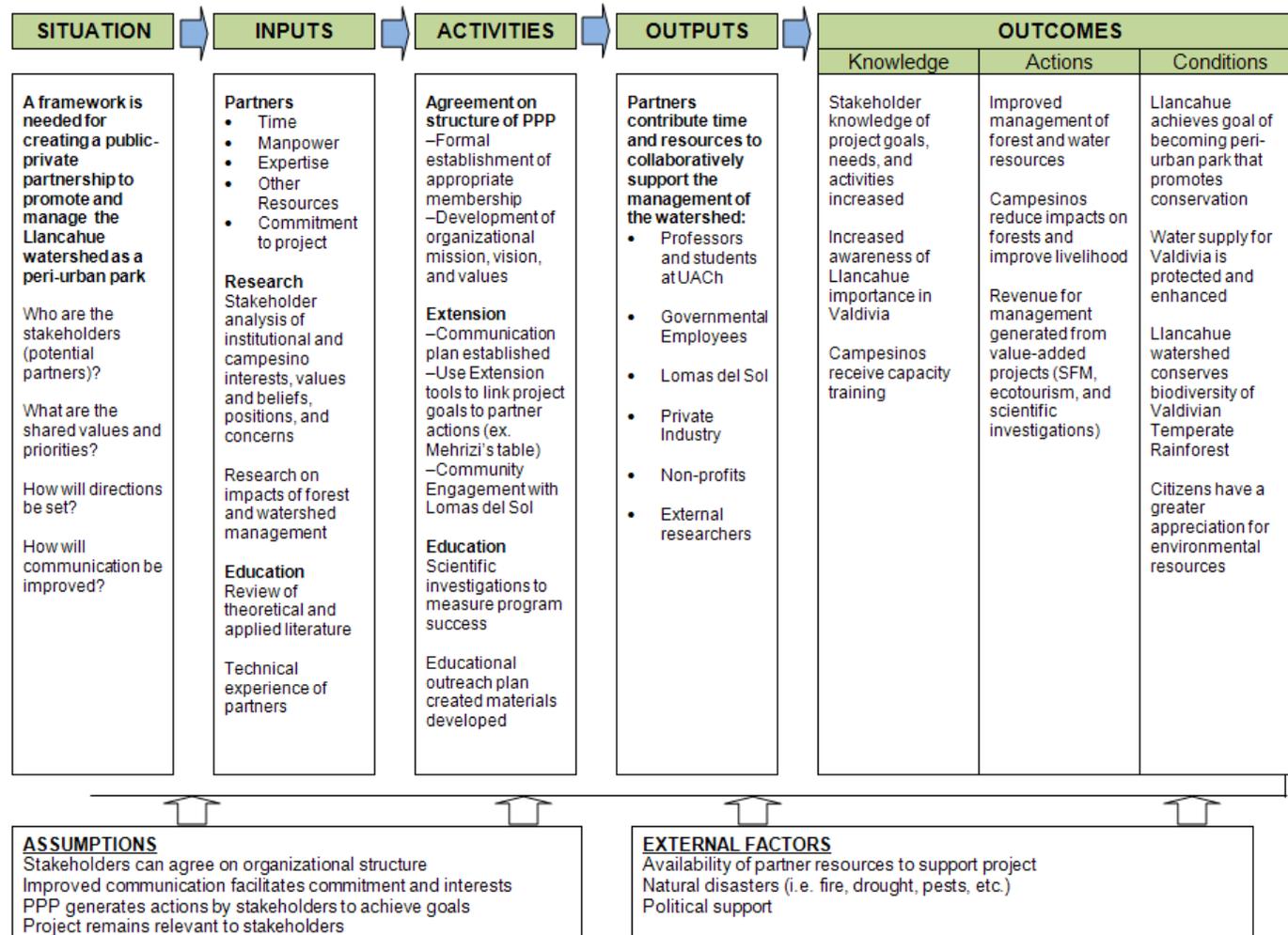


Figure 4.4. LOGIC MODEL for the creation of a public-private partnership (PPP) to promote, manage and support a peri-urban park in the Llancahue watershed

Table 4.1. Llancahue stakeholder preferences for working group participation.

*The financing working group was proposed by an attendee.

Attendees*		Working groups they are interested in participating in				
Institution	#	Resource Managemen t	Community developmen t	Environ. Educatio n	Ecotouris m	Financing *
AIFBN	3	1	1	2	1	
BienesNacionales	1			1		
Camera de tourismo	1				1	
CONAMA	3	2	1	2	1	
DAEM	2			2	2	
Forestal Valdivia	1	1		1		
Fosis	1		1		1	
GEF Siempreverde	1	1				
Gobernacion Valdivia Regional Government	1		1	1	1	
GRENER (Local NGO)	1			1		
Lomas del Sol	3	3	3	1	1	
Masisa	2	1	2	1		
NCSU	1			1		
Sernatur	1				1	
TNC	1		1			
UACH	5	1	3	2		1
WWF	1	1	1			
Total	30	11	15	15	9	1

Chapter 5: Adapting conservation management to local context

The Llancahue watershed, a 1300 ha state-owned protected area in the Valdivian Ecoregion, Valdivia, Chile, includes 400 ha of well-preserved old-growth forests, and is the main drinking water supply for the city of Valdivia. Despite its protected area status, the integrity of the watershed is threatened by illegal logging, cattle grazing, and a lack of resources for effective stewardship. In September of 2008, the University Austral de Chile (UACh) took over the concession of the Llancahue watershed. Their vision was to create a peri-urban park that is economically, socially and environmentally sustainable. Within this context, the purpose of my research was to assist with the development of a management plan for the Llancahue watershed. Specifically, I researched various approaches to conservation management (Ch. 1), conducted an analysis of the local and regional stakeholders (Ch. 2), evaluated the potential use of sustainable forest management to improve the conservation status of the watershed (Ch. 3), and provided an extension plan for advancing the collaborative efforts of this public-private partnership (Ch. 4). Through this research, I have supported the following conclusions.

There is a need to rethink traditional protected area management

Traditionally, the use of protected areas has been one solution to achieving environmental sustainability of forests, water, and biodiversity. Protected areas have been

viewed as one of the more successful tools for conservation management because the assumption is that ecosystem services are best protected in non-human altered systems (Bruner et al., 2001; Kellert et al., 2004; Garcia-Frapolli, 2009). Protected areas have been defined by the Convention on Biological Diversity (CBD) as “a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives” (CBD, 1992, article 2). Initially the establishment of protected areas was based on the 10% rule; this was an endpoint established by the CBD that protection of 10% of all the world’s ecosystems would ensure sustainability. Countries rushed to establish protected areas as they received international funding for this initiative resulting in the protection of over 100,000 sites, 12% of the earth’s land surface (Chape et al., 2005). Yet time has proven that the establishment of a protected area does not guarantee the protection of natural resources because protected areas often lack resources for effective management resulting in a phenomenon known as “paper parks” (CBD and UNEP, 2005). Due to this phenomenon, alternative approaches to conservation management have emerged with the goal of improving the management of our natural resources (Phillips, 2003).

Through this thesis, I demonstrate that conservation is complex and requires a multi-disciplinary approach at the local and regional scale in order to be effective. I demonstrated there is not a one size fits all approach and a conservation area will not fall into one strict category of conservation management (i.e. traditional, populist, or neoliberal, Brown, 2002). Instead, natural resource management will be context

dependent, relying on a mixture of strategies that are best suited to addressing the socio-economic context of the conservation area. In order to illustrate the socio-economic context of the Llancahue watershed, semi-structured interview protocols for local and regional stakeholders were developed. This information was then used to evaluate the potential for the UACH to improve the management of this watershed through the creation of a public-private partnership. Through this research I demonstrate that the most effective management of Llancahue will be based on a mixture of populist and traditional conservation management approaches which supports Brechin and West's (1990) theory that effective conservation management will use both top-down and bottom-up approaches.

Multi-stakeholder collaboration may improve conservation management

A stakeholder analysis is a tool to improve conservation management because it increases our understanding of stakeholder interests (Grimble and Wellerd, 1997; Wondolleck and Yaffee, 2000; Sidaway, 2005). My stakeholder analysis focused on stakeholders at the regional and local level stakeholders as these are the most likely to implement the conservation management plan (Knight et al., 2006). Results from the stakeholder analysis suggest the Llancahue project has the interest of multiple actors from different sectors (i.e. University, Governmental, Non-governmental, Private, and the local campesino community). All stakeholders were in agreement that the Llancahue watershed

should be conserved and that the project will require the resources of multiple actors. The majority of stakeholders verbally consented to collaborating on this public-private partnership. They provided insights on how they believed stakeholders can work together to devise realistic solutions for improving the stewardship of the Llancahue watershed. In addition, they revealed their primary concerns with regards to the management plan, i.e. lack of resources for implementation and concern over the current unregulated use by the adjoining Lomas del Sol community. Finally, stakeholders expressed a need for the development of appropriate institutional designs that could facilitate concrete actions within this public-private partnership.

SFM has a role in achieving environmental sustainability

The stakeholder analysis revealed that the most immediate concerns were illegal harvesting and cattle grazing in the watershed by the Lomas del Sol community. In order to propose viable solutions to this problem, I conducted an economic and social analysis of the community to determine their current needs and gauge their interest in working with the UACH. Based on this analysis, the sustainable forest management plan proposed by the university appeared to be an appropriate solution. The sustainable forest management project can improve the conservation status of the Llancahue forests by addressing the socio-economic aspects of the project (i.e. generate revenue for watershed management

and jobs for the Lomas del Sol community) while insuring best management practices are used in forest management.

This case study demonstrates the importance of working with rural forest communities to achieve effective forest management; if local people's needs are ignored and they are harvesting illegally in the protected areas then it is difficult to implement international and national policies for forest conservation (McNeely et al., 1994; Borrini-Feyerabend 1996; Berkes, 2004, Elbers, 2008). In the case of Llancahue, the local people appear willing to participate in sustainable forest management, thus eliminating the problem of illegal logging within the watershed. After one-year, follow-up interviews with the local community, the University, and other regional stakeholders suggest the program has successfully reduced illegal logging in the watershed. These results suggest sustainable forest management can be an effective way to achieve conservation management goals in Llancahue because it is socially sustainable by improving the livelihoods of rural poor, economically sustainable by developing a tool for generating income, and environmentally sustainable by improving the management of the forests and streams in the Llancahue watershed.

Public-private partnerships require tools to facilitate collaboration

The stakeholder analysis also revealed that the greatest challenge was to develop appropriate institutional designs allowing stakeholders to work together through the public-

private partnership to achieve concrete actions. This pointed to appropriate extension tools for facilitating collaboration between stakeholders. According to Selin and Chavez's (1995) model, the Llancahue project is currently in between the problem and direction setting stages. A tool designed by Mehrizi et al. (2009) can help the university facilitate the public-private partnership by assigning specific actions to individual stakeholders for the purpose of achieving desired outcomes. This will help stakeholders understand the steps required to achieve progress and demonstrate which actions are doable in the short-term and which actions require further resources. The model also illustrates what resources can be provided by the various public and private actors for the project. The results provide evidence from the stakeholders that planning to facilitate the public-private partnerships amongst multiple levels of governance is an important step in any multi-stakeholder collaborative process (Wondolleck and Yaffee; 2000, Knight et al., 2006).

Conservation planning needs to occur at multiple levels

All levels of conservation planning must consider how actions will be sustainable over time (Costanza and Patton, 1995). Consequentially, approaches to conservation planning must be scale and context dependent (Knight et al., 2006). One of the greatest challenges in implementing conservation initiatives is integration across scales. Conservation professionals still differ in opinion as to how initiatives should be implemented, i.e. should they use top-down or bottom-up approaches or a mixture of both (Brown, 2002; Brechin

and West, 1990). History has shown the difficulty of implementing conservation policies and changing human behavior (Daniels and Walker, 2001; Dominici and Littlejohn, 2006), but there are many examples of conservation success stories (Varughese and Ostrom, 2001, Elbers, 2008; Laumonier et al., 2008). It is important to consider the partnership between international and national conservation policies, science and the local community (Humphreys, 2006).

Thus, as evidenced by the Llancahue case study, conservation planning must occur at multiple levels with multiple stakeholders. For the purpose of this study, we have focused on the implementation of conservation initiatives with both regional and local actors. This results in a mixed method approach to conservation management that relies heavily on populist and traditional approaches to conservation management. Regional actors, specifically the state and the UACH will have the ultimate authority on what activities are and are not permissible within the watershed. Yet, it is important to insure that these plans are adopted and implemented with the cooperation of the Lomas del Sol community since their activities directly impact the forest and water resources of Llancahue. This requires scaling down to understand and account for local people, and cooperating with local communities to improve resource stewardship through programs such as sustainable forest management in Llancahue.

Conclusion: Sustainability as a Moving Target

Sustainability science has been defined as a science where stakeholders and scientists interact to define important questions, study objectives, examine relevant evidence, and debate convincing forms of argument for improved resource management (Kates et al., 2001). Thus, in order to address global threats to environmental sustainability such as loss of biodiversity or global warming, we need to also consider how programs for improved sustainability can be implemented at the local and regional scales (Garcia-Frapolli et al., 2009). This requires understanding the context of the conservation problem, the interests of the stakeholders and the resources available to solving the problem (Wondolleck and Yaffee, 2000; Sidaway, 2005; Knight et al., 2006). The belief is that individual impacts are additive, thus improved conservation management at the local and regional level will create a more sustainable society (Hoekstra and Chapagain, 2007).

To date, there is no clear agreement at the international level on how forests and watersheds should be sustainably managed and who should be responsible for providing the resources required for management (Humphreys, 2006). Thus, additional research on approaches like sustainable forest management and public-private partnerships is needed to demonstrate how alternative conservation models can be implemented (Knight et al., 2006).

Sustainability is a concept that originated because people are concerned with anthropogenic impacts on the environment at local, regional, and national scales (Costanza

and Patton, 1995). With this in mind, society must determine how to implement appropriate solutions to our environmental problems in order to achieve economic, ecological, and social sustainability (Kates, 2001; Knight et al., 2006; Laumonier et al., 2008). Based on my research, I demonstrate how an understanding of local and regional actors allows for the prescription of sustainable conservation initiatives with a high likelihood of adoption.

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APPENDICIES

Appendix A: List of stakeholder on the management team, interviewed, and/or mentioned in the snowball sampling. Included are the number of times members from each group were interviewed or referenced. Organization type is also indicated.

Appendix B: Institutional interview

Appendix C: Campesino interview

Appendix D: Mission of each stakeholder organization and a summary of their interest in the Llancahue project.

Appendix A. Llancahue stakeholders

Codes for Organization type: 1=National Government, 2=Regional Government, 3=Municipal Government, 4=Multi-national Corporation, 5=Private Business, 6=Neighboring property holder, 7=International NGO, 8=National NGO, 9=National NGO, 10=Educational Group

Organization (*indicates a member of the management team)	# of times referenced in snowball sampling	Organization type	# of Interviews (# of additional participants in focus groups or stakeholder meetings)
CONAF*	15	1, 2	1
Local NGOs	3	8	8+ (1)
AIFBN*	8	8	3 (2)
Lomas del Sol*	3	5, 6	20 (16)
Bienes Nacionales*	3	1, 2	2 (2)
Neighboring forest companies	3	4, 6	2 (2)
Municipality*	11	3	2 (1)
INFOR	1	1, 2	2 (1)
Regional Government*	6	2	14+ (1)
UACH*	6	5, 10	14 (3)
CONAMA*	7	1, 2	1 (3)
Mineduc/ DAEM	4	3	1 (1)
TNC	2	7	1 (1)
Tourism Bureau	1	5	1 (1)
Amigos del bosque	3	8	0 (1)
GEF Siempreverde	2	7	0 (1)
Teachers	5	3, 5	2

World Wildlife Fund	4	7	2
CEA	4	8	2
SSS	2	1, 2	2
Other universities	1	4	2
SENCE	1	1, 2	2
Aguasdecima*	6	5, 6	1
INDAP*	5	1, 2	1
Agencia Los Rios	5	5	1
SERNATUR*	4	1, 2	1
CORFO	2	1, 2	1
Codeff	2	9	1
Forecos	2	8	1
Provincial Government	2	3	1
FOSIS	1	1, 2	1
Parques para Chile	1	8	1
Sercotec	1	1, 2	1
MOP	2	1, 2	0
SAG	2	1, 2	0
DGA	2	1, 2	0
Ministry of the economy	1	2	0
Miniagri	1	2	0
Servicio Pais	1	1, 2	0
Prodesal	1	1, 2	0
SERNAM	1	1, 2	0
Philanthropic organizations	1	7, 8, 9	0
Student	1	8	0

Organizations			
COCEL	1	1, 2	0
Ministry of the Environment	1	1	0

Appendix B. Campesino Semi-structured interview.

1. Tell me about a typical day.
2. What are your 3 most important economic activities during the year?
3. What are your 3 most important subsistence activities during the year?
4. Would you like alternatives?
5. Would you like alternatives for your children?
6. Do you work with people outside your family? Who?

If wood was identified as an important economic activity, then ask 7-13

7. Why do you collect wood?
8. How many trees do you harvest each year?
9. How many trees does your household need each year?
10. How do you choose which trees to harvest?
11. How far do you travel to harvest a tree?
12. Where do you prefer to harvest trees (show on map)?
13. Do you currently harvest wood in this area of Predio Llancahue?
14. Would you be willing to alter where you harvest trees (i.e. harvest trees from the secondary growth forests rather than the old growth forests)?

If cattle was identified as an important economic activity, then ask

15. How many cattle do you or your family own now?
16. Do you grow fodder?
17. If no, where do your cows graze (show on map)?
18. Do you currently graze cattle in el Predio Llancahue?
19. Would you be willing to follow rules regarding where you can and cannot graze cattle?
20. (If they graze in the forest) What would you do if cows were not permitted in el Predio Llancahue?
21. What other plants and animals do you use in your daily life?
22. In your lifetime, what are the biggest changes you've seen happen to the environment?
23. Do you believe plants and animals should be protected? Why or why not?
24. Should native forest be protected? Why or why not?
25. Are you aware that the Chilean government and the University Austral de Chile want to create a park in

predio Llancahue?

26. Should Predio Llancahue be a protected area?
27. Do you trust the university to manage predio Llancahue?
28. Please rank the following UACH management goals for Predio Llancahue in order of importance (1 = most important, 5 = least important)
 1. Sustainable forest management
 2. Develop ecotourism and recreation opportunities
 3. Create environmental education center
 4. Protect water quality
 5. Protect old growth forest
29. Would you want to work with the university as a partner in the management of Llancahue watershed?
30. Of the following management goals, which ones do you have an interest in working on (1 = most interested, 5 = least interested):
 - a. Sustainable forest management
 - b. Develop ecotourism and recreation opportunities
 - c. Create environmental education center
 - d. Protect water quality
 - e. Protect old growth forest
31. Do you want to work with the University to plan the park?
32. What incentives would motivate you to work with the University to protect the Llancahue watershed?
33. Would you want to work with the university to help them restore the forest? (plant trees)
34. Would you want to work with the university to help them manage the secondary growth forest? (Thin the forest)
35. Would you be interested in working in ecotourism activities such as guiding people in the Llancahue peri-urban park and teaching them about campesino life?
36. Would you be interested in selling food to people who visit the park?
37. What is the best way to inform you about opportunities to participate in the planning of the Llancahue protected area?
38. Can you provide me with contact information?

Demographic Information

of people living in household

Age

of years residing in Lomas del Sol Community

39. Did you have the opportunity to go to school?

40. Do your children have the opportunity to go to school?

41. I have finished the questions now. Before we end, is there anything else that you think it would be useful to know?

42. Would it be okay for me to contact you with further questions?

43. Would you be willing to let me accompany you on a workday?

Appendix C. Institutional Interview

We want to start by asking questions about your institutions views towards natural resource conservation.

1. What is your occupation?
2. What is the objective of your work?
3. For who do you work
4. What is the mission of your institution?
5. In your life, what is the largest environmental change you have noticed with regards to the environment?
6. Does your institution support the protection of biodiversity? How?
7. Does your institution support the protection of native forest? How?
8. How do you suggest that the Valdivian Temperate Rainforests can be protected?
9. Do you think the environmental laws of Chile are strong enough to protect the environment and native forests? Why?
10. Do you think the Llancahue watershed should be protected? Why?
11. What do you think is the biggest challenge with regards to the management of the Llancahue watershed?
12. Do you think Valdivia needs a park where they can have contact with nature? Why?
13. This is a map of the Llancahue watershed. Please identify any locations or resources that are important to your institution? You can draw on the map.
14. Please rank the following UACH management goals for Predio Llancahue in order of importance (1 = most important, 5 = least important)
 1. Sustainable forest management
 2. Develop ecotourism and recreation opportunities
 3. Create environmental education center
 4. Protect water quality
 5. Protect old growth forest
15. What interest, if any, does your institution have in predio Llancahue?
16. Do you have management goals or preferences for el predio Llancahue? If not, why?
17. What are your management goals for el predio llancahue?
18. Can you prioritize these management goals?
19. How will these goals achieved?
20. How will these goals funded?
21. Would you like to work with the UACH to protect predio Llancahue?
22. Can you name any other groups or institutions who should be key stakeholders in the creation of el predio Llancahue peri-urban park?
23. Have you had any interactions with these other stakeholders?
24. If yes, can you tell me about how you interact with these other institutions?

25. Would you like the university to contact you about future opportunities about participating in the design of the park and the management of el Predio Llancahue?
26. What is the best way to inform you about potential opportunities to participate?

- f. Phone
- g. Email
- h. Face-to-Face contact
- i. Mail
- j. Other

Demographic information:

27. Gender
28. How old are you?
29. What is your official occupation at this institution?
30. How many years have you worked for this institution?
31. What is your education level
32. Contact information
33. I have finished the questions now. Before we end, is there anything else that you think it would be useful to know?
34. Would it be okay for me to contact you with further questions?

Appendix D. Participating stakeholders missions and interests.

Stakeholder	View of Mission	Llancahue interest
Governmental organization		
Bienes Nacionales (National Assets)	<p>"Bienes Nacionales has the mission of administrating public patrimony, all the patrimony the state has, but it's also worried about small property ownership, that means, people getting their titles so they are the owners of their lands. This is one of the big works that this ministry does, but it's also important to develop a national system for coordinating territorial information, whose acronym is SNIT (Territorial information national system). This system's objective is that all the public agencies develop a territorial information network that is also useful for the community and the people who want to find out about properties, about where schools are at, etc.... and that it can be useful also for research. Today Bienes Nacionales Ministry has national commissions at all the regions to develop this system integrating all the public system actors that are involved (I17)."</p>	<p>"The first, to give this property, this area, to the Universidad Austral for what was established, this as a first fact, a public property is passed for this project is something good and the following role from us is to asses how the process advances and the development of the managements they want to implement there, because today, in fact, it is in the universities hands, but it doesn't mean that we can't help from public instances especially on themes about funding, helping convince others for obtaining funds, but our role today is watching how the project is developed, the grant is for 20 years (I17)."</p>

<p>CONAF, Corporación Nacional Forestal, National Forestry Cooperation</p>	<p>"CONAF has 4 basic missions that are separated by the four programs it has. There is a natural resources conservation and preservation program, developed through the administration of the national parks, this is the wild patrimony. A second mission is the cooperation or help for adequately managing native forest. This is a program for the administration of forest legislation that controls all the productive activities in native forests through the evaluation of management plans that all the owners must present to CONAF. The third general objective for CONAF is related to forestry protection and they have programs for fire fighting and controlling plagues. The fourth objective is the promotion of productive activities to support small landowners and to incorporate them into an economy that obtains profitability based on sustainable management of plantations. This is a direct assistance program done by an extension team in charge of directly work with small landowners to give them information and orientation respect to their productive activities related to forestry (I22)."</p>	<p>"We think we should participate in some way in the development of things happening at Llancahue, as an institution, I don't know, may be by being part of a directory, or a consulting board, being invited for the initiatives analysis and evaluation, things like that, even if we are not the ones who manage the predio, but we can be there for all the activities that could be developed, especially for forestry activities, CONAF has the obligation of reviewing that the plans for the activities are according to legislation and this is our responsibility. So, from the point of view of our institutional obligations and objectives, we should always be related to Llancahue. So, I think it would be good for the university if we work as partners and we have a common objective, so we don't have meetings just once a year each time they make a management plan to see its applicability, we should be more than that (I22)."</p>
<p>CONAMA, Comisión Nacional del Medio Ambiente , National Commision for the Environment</p>	<p>" It's a very big question. One of the CONAMA's main tasks is to coordinate the public agencies. Given it is not a ministry, it doesn't have a solid budget nor legal support to give orders to a ministry to do things, it just coordinates. CONAMA depends on the good will of other publics agencies, that's why the Environment Ministry is being created, to strengthen CONAMA (I2). "</p>	<p>"It is related with the departments that there are in CONAMA at Region de Los Ríos. Specifically, for my department, is to preserve native forest relicts, there are not many left near Valdivia, that's why it's being prioritized. In second place, because we are getting water for Valdivia from over there, if we don't preserve it, the city of Valdivia will lose only. And in third place I think that Education Department and Citizen Participation Department are interested, it could clearly be an important place for generating knowledge for the Valdivian society to know about how important the forests are (I2)."</p>

<p>Corfo, Corporación de Fomento de la Producción, Corporation for the Promotion of Productivity</p>	<p>" this is a government agency in charge of developing economies in different regions. We work to materialize projects and work with investors. We also have developed tools to do innovation and have tools related to creating networks between small companies in the same economic sector. We are one of the public sectors that has money for investing in development of new business and innovation, but we don't act like a bank. We did this in the past and lost a lot of money. Now we give money to banks to lend to small and middle sized businesses that has a special tax, but we don't assist big companies. We have offices in all of Chile (I33)."</p>	<p>"CORFO can't have a role in this. CONAF is really in charge of working there. If later on we talk about economic development and need some investors to work there, we can help. For example, a tourism company that wants to build a lodge. Also maybe we can provide some associative instruments to help people working in forests on missions to see how other people and companies are working in forest and making progress in that. Therefore, tourism development is the only major role that CORFO could have in this project. SENCE can help with building capacity in Llancahue - they are new in Valdivia and this is their job (I33)."</p>
<p>DAEM, Departamento Administrativo de Educación Municipal, The Administrative Department of Munciple Education</p>	<p>"Well DAEM's mission is to deliver a quality public education for all students from pre school age to adults in continuing education online so they can fit into society in a constructive and dynamic way (I41)."</p>	<p>" I think having the possibility of our students and our teachers that can make experiments or have the experience of "learning by doing", say by generating skills where students can have experiences regarding the topics related to the curriculum and generate them so that they may be able to go to work and make the topic not only from the theoretical but also from the practical perspicive (I41)."</p>
<p>Departamento de Salud, Department of the Health - Sanitary Action Service</p>	<p>"he mission is to protect public health. That's the mission, for which we have programs directed to people and also to the environment. The idea of the mission is to protect people's health and life and also provide environmental care and protection. This would be a summary of our activity, of our mission (I31)."</p>	<p>" I don't know what could be our role, in general for helping. I think if help is asked of us, we could do studies measuring source quality, we could do systematic sampling for a given period to determinate the variations existing between different seasons of the year, to see possible sources of contamination, because there might be, because we have presence of wild and domestic animals. So, I think that's the way.... maybe we could prohibit access to animals to the area sometime and to people that could eventually contaminate those water courses (I31)."</p>

<p>DGA, Direccion General de Agua, General directorate for water*</p>	<p>DGA is responsible for administering water rights which includes making analyses to determine the water resources of the country, assigning points of collection and the amount of water that can be extracted by an organization (Translated from website).</p>	
<p>Fosis, Fondo de Solidaridad e Inversión Social, (Fund for Solidarity and Social Investment)</p>	<p>"A non-profit organization started in 2005, affiliated with the Forestry Department at the University Austral. They are principally concerned with the development and promotion of research activities related to native forests and freshwater systems, with a focus on ecosystem services that provide for societies well being (I31)."</p>	<p>"Our role or commitment is about what I was telling you before, we can be involved in all the activities related to reaching a sustainable economic development with poor families, persons or communities linked to the project, we can help with investment, resources, work with those communities, fund projects, as long as they satisfy the criteria we have to be chosen as beneficiaries for our projects. We have the availability to work with all things according to these criteria at the region, because we are interested in associating and coordinating with public and private efforts to get over poverty, and if there are people qualified as poor, it means that there are people here who belong to our objective and we should associate with the project to offer our services for this project, but for the people, not for all the people involved in the project, but the people related to our institutional objective (I31)."</p>
<p>INDAP, El Instituto de Desarrollo Agropecuario, The Institute of Farming Development</p>	<p>"The strengthening of the productive small farmers, as well as their organizations, so our mission is to help family farms to enter rural markets, but through the market chains, through a series of technical services (I53)."</p>	<p>"Well I see that here INDAP might have a super important role, to see how we can intervene with an instrument with these families who are here who are in this forest, perhaps they have no chance, maybe they have no state help, and INDAP as an institution helps the small family farm. Agriculture is very feasible, we can deliver some sort of advice to this family, we can do this together even with the university (I53)."</p>

<p>INFOR, Instituto Forestal, Forestry Institute</p>	<p>" it is to develop research and development for the national productive sector, creating value for resources and forestry production (I52)"</p>	<p>"it may be a study of degraded forest management, we have projects to recover degraded native forest, watershed management, environmental services, to do a demonstration area of environmental services (I14)."</p>
<p>Municipality</p>	<p>"The municipality is a social institution that takes care of community development and can generate politics for environmental management (I18)."</p>	<p>"well, we..... This is actually a property in hands of Universidad Austral, so we as a municipality don't have responsibilities in respect to this area, we can help and support, in that way we can help them to get funds for developing the different programs that can be done at Llancahue Park (I18)."</p>
<p>Municiple Parks Department</p>	<p>" It is the maintenance, the generation of resource for projects, to give a value to each of the parks, to be able to maintain them, to highlight each of the parks, to achieve a maintenance of the landscape and to contain everything that is needed in urban parks. The mission is to develop these areas, like I was telling you when we started the process, but we have made progress, the community has the feeling that the parks generally are getting better (I10)."</p>	<p>"We as a municipality are the logistical support for these projects, We are the ones who have to be behind the scenes, you see, probably with university funds, surely national or international funds, I hope some people from the department of the environment in the municipality will participate at the table. They have been more closely involved in the project, so obviously our institution will be a part of the working group or supporting the project, and when it's time we will have to assume a role, I don't know that role today, the project will have to define what will be the role of the municipality. Once the project developed they will surely have different roles, the university is going to have a role, the municipality will have to assume a role, but I don't think they are clear now (I10)."</p>

Regional Government	<p>"The mission I said before, is to guide Valdivian neighbors to the various financing options for projects and help them to participate. We also have another line of action related to what is called "citizen action groups" that focus on different sectors through neighborhood groups, mainly we help establish these citizen action groups (17)."</p>	<p>"The provincial gubernator, Don Cristian Calluqueu, is a forest engineer so because of this he has a direct relation with the forest, and I know that Llancahue is one of his priorities, now for the institution this is a new thing that we are going to start right now. As I told you before, we have a lot of projects that we have to approach, and in this minute it is new. I was anxious about receiving the instruction to work on this theme, but I haven't had any prior notification for it. I know directly that he has been in the field and to visit the place and has been in contact with the CONAF, and with the corresponding organizations, it was not a small ordeal, the property transfer, it was necessary to start off with this (17)."</p>
SENCE, Servicio Nacional de Capacitación y Empleo, National Service for Capacity Training and Employment	<p>"Sence's mission is to contribute to the employability and create conditions for people to improve their employability (149)."</p>	<p>"We could identify training needs and depending on that, we could eventually create training for the beneficiaries that could be the role that we could do (149)."</p>

<p>SERCOTEC, El Servicio de Cooperación Técnica, The Service of Technical Cooperation</p>	<p>"SERCOTEC basically works with small companies or what we call formally established smaller size companies. I means, companies registered by the Tax agency, which controls and rules all things related with companies, where they pay their taxes. So, we work with companies already created, who pay their taxes, with the exception of a program we have for developing and creating, I don't know how you say enterprise (emprendimiento), when you have an idea for a business you want to start, but you don't have the support to do it, so we support this person who has an idea for a business in his mind, we define this person as an enterpriser, a person who search for new things to do (I35)."</p>	<p>"Support people from there for developing an activity, a business (I35)."</p>
<p>Sernatur, Servicio Nacional de Turismo Chile, Nacional Tourism Service of Chile</p>	<p>"The mission, let me search for it... here is the policy; maybe this may help, here is everything. The mission, do I read it? Or do you want to read it? It says: achieve coordinated and harmonious action of all actors involved in the development of the activities, taking advantage of the synergies that are generated by the public and private works in tourism, in order to consolidate the activities, stimulating the generation of new products, innovating development of new tourist market, improving the quality of tourism services, promoting growth, improving quality and quantity of tourism promotion and quality of supply, promoting investment, protecting cultural and natural heritage of the country and ensuring its sustainability (I28)."</p>	<p>"Now that I know about it there's an interest in if it should we be asked to support the creation of a management plan, there is support. I don't have a problem with working in that. In giving our experience and develop routes, trails and opportunities for the tourism (I28)."</p>
<p>SISS, Superintendencia de Servicios Sanitarios, Superintendence of Sanitary Services</p>	<p>"To control and verify the law enforcement [of Sanitary Services] (I38)."</p>	<p>" the water...We are concerned in this case that Aguas Decima comply with its obligations as a company of drinking water, in this case we take care that Aguas Decima captures water, sufficient flow is needed to supply the population. (I38)."</p>

**Non-governmental Organization
(NGO)**

<p>AIFBN, Agrupación de Ingenieros Forestales por el Bosque Nativo, The Association of Foresters for Native Forests</p>	<p>"Well, our mission, I don't know it literally, we have it at the office, I can give it to you if you want, but it has to do with how to promote models of development that allow compatibility between the production of goods and services out of the forest with ecosystems conservation. It's something like that (14)."</p>	<p>"The interest we have is basically that this place is conserved, the conservation of the ecosystems existing there and of course, that if we demonstrate with our experience, it could have a huge value for integrated watershed management. We see that Llancahue has all the conditions to be that, because is a well delimited watershed, the whole Cuenca is a public property, so we have a territorial unit and also a legal unit that allow us to work that way and because the existing neighbors provide a work force, we have a few families, a community that, even though it make an illegal use of the property, they are few families and it's quite easy to work with them and the rest of the neighbors are forest companies that don't get into Llancahue, that don't have an interest in Llancahue because they know it's a public property, that it is native forest and that they can't use it. So an integrated watershed management experience with local actors could be made and then get involved with external actors, I mean the Municipality, GORE (regional government), private companies, because finally it's a watershed that give benefits for all of us, so there should exist a readiness to generate an experience like that (16)."</p>
<p>CEA, Centro de Estudios Agrarios y Ambientales, Center for Environmental and Agricultural Studies</p>	<p>"Action, together with research, to establish working methods, hopefully with communities, based on natural resources, to achieve sustainability and at the same time the communities' economic development. That's how quite emblematic projects have been worked (112)."</p>	<p>"I'd love to, for several reasons. One is because I have a commitment, I did the zoning, the territorial optimization for this area. What we did at FORECOS and what I did later here at CEA, so I feel that I know the watershed I've walked in there almost everywhere, so I'd like to participate (112)."</p>

CODEFF, Comité pro Defensa de la Fauna y Flora, The Committee for the Defense of Flora and Fauna	"It is really trying to promote the sustainable management of native forests, but through preservation, conservation, and this term conservation, we understand the term to also include sustainable use. And we feel that the native forests have been neglected for the official policies for ever. And our position is to try to demonstrate the value of the native forest as a patrimony, but also as a resource that can be used and can provide work at the field level. I am talking mainly at little sites and small forests (126)."	"We can help as far as we don't have the costs. We can help with things because this is very much in line with things that we are looking for, because it is very much in line with our objectives. So we would be open to help in whatever we can do, but everything is going to depend - we cannot provide resources for example. We can provide some advice and we have a lot of work for a long time on environmental education, so this is another area where we can offer some expertise (126)."
Lagos sustentable (Sustainable Lakes)	" the mission... the truth is that we have never worked so hard on it, we do not have such an explicit mission, when the work started in 2003, which I believe I don't remember much, but I think it's what I remember, was a bit like what I told you it was an impact on public policy to incorporate the theme of citizenship, civic participation and sustainable development in the subject of quality of life for the people of the territories (132)."	" well, to participate in what we do. I think what we are interested in providing what has to do with the management with the community with a participatory planning and not purely academic. We can contribute with what they are communicating with companies on terms that we know how to do the job of getting the actors in the process. That is something which I believe we can contribute (132)."
Parques para Chile, Parks for Chile	"Support private conservation in southern Chile in particular, although we have no territorial restrictions, but we are focusing in the South, the Ninth to XI region (143)."	" I think that our interest is reflected in this proposal that we made together... since we are interested in anything that has to do with social value put on the area, helping to devise strategies to make visible the value of Llancahue, possibly as I was saying, implement systems to finance the mangement, I think that it is absolutely possible (143)."
TNC, The Nature Conservancy	"It's basically. I can't remember the exact phrase... but it's to protect the lands and waters in the planet, so the plants and animals in danger of extinction can survive. It's basically the protection of biodiversity (127)."	"Looking for the formula of funding for those activities that are priorities for the management of the unit, because with only good intensions it will not work. Although without having a super powerful team, you have no way to finance long term activities, it will not happen (127)."

WWF, World Wildlife Fund	"Lets see if I remember, it is basically to protect nature (I5)."	"We are not working in Llancahue, but the institutional value of Llancahue, is that it is a remnant forest of the central valley, "not the central zone of chile", of the "Central Valley" because we have a forest in the coastal range and in the Andes, but only remnants or fragments of forest in the central valley or "central depression" that is not the central zone, and in that sense Llancahue is a valuable forest. "That is the value", that there are few remaining forests of this type (I5)."
Private Business		
ADR, Agencia Regional de Desarrollo Productivo, Agency of Productive Regional Development	"Promote the improvement of the competitiveness in the region (I40.)"	"Well, one is to incorporate this project in a regional work agenda where the project can have an exemplifying character for other places in the region. Where there is also communities and possibilities to make a sustainable management like that. Also, I think that connecting with tourism, because we are with that philosophy about being able to interconnect different initiatives that have something interesting to show to the region and world. And being able to connect things as tourism with gastronomy or food industry. For example, it would be interesting for any project that is being done there, to make an audio visual documentary from the beginning and make a register so then there's a support and summary about the project (I40)".

<p>Aguasdecima, Private Sanitary Service company for Valdivia</p>	<p>"To be the best company of sanitary service in the region (I39)."</p>	<p>"It is another source of water for Valdivia, our interest in Llancahue is that is the historical source, since the beginning of the past century, Valdivia takes their water from Llancahue...We mostly want to see what kind of project it is, because like I said before we have tried to do thing there and always those projects have been dissolved and nothing happens so we have to see what kind of project it is. (I39)."</p>
<p>Camera de tourisma, Tourism Bureau</p>	<p>"A big objective of the bureau is to contribute to develop a local tourism and to make a tourism of excellence. This signifies that all the areas have to be competitive and it has to be integrative, so this implies a sustainable use of natural resources, the territorial management at a city level, and implies the articulation from the private and public sectors for public decisions, everything. So this is the very clear objective of the tourism bureau, because we are betting that we're creating this tourist destination of excellence known with the identity, in this case were talking about special interest tourism, and the forest is one of the elements that are we going to consider and give identity to it and all the attributes of the forest in the context of sustainable use."</p>	

<p>Forestal Valdivia, a subsidiary of Arauco, S.A.</p>	<p>"Establishing forests, manage them, and supplying industries associated with the company, at this time a sawmill and a pulp mill, that is the mission (I13)."</p>	<p>" I think that the provision of water dominates here, but obviously we must play all aspects of this. As a company, we are also interested that this is managed ok. It is also a risk for our sustainability. ie, we have a close site and we have another site here. We want to insure that when a problem comes out in neighboring sites we are not responsible, but the extent that this company has always said that we have some responsibility. We cut there, and for this we might muddy the water. In some cases we actually had some problems that we had to mitigate and that we have talked to the community. We tried but in other cases we have nothing to do and then, if this is strengthened and projects begin, we will welcome, we will welcome this project because it enables us to be sure that the rest do things well. We are getting involved in a good water supply, this will be the topic for the next few years, the water supply, which could turn into a weakness for the company and we do not want that (I13)."</p>
<p>Masissa, Division of Environmental Management and Social Forestry</p>	<p>"In our area, in the end, is to seek for the sustainable forestal management inside all of the forest operations of the heritage of MASISA and Forestal Tornagaleones. For this, we count on the certifications as tools of management, the ISO 14001, **OSA1800**, ISO9000 and also the certification FSC. In this way, and with these tools we are managing our impact, trying to mitigate, obviously, with all the rules of control of mitigation and also at the same time, working with everything that has to do with the ecosystem services: water, soil, biodiversity. Always with the concept of the sustainable forest management (I37)."</p>	<p>"Since we are neighbors and part of the basin, obviously it's like being part of the territory and that materializes the social and environmental management of the company. Obviously, we are interested in what happens to the rest of the territory and what may be done there with the University. That will always be interesting to know about it and get to be an actor in the problem, not to see it from the out side (I37)."</p>

Windsor School	"Train students with an ability to think they can play a role in society with the right tools and can be a contribution to humanity, have a good English language and also have a good understanding of the exams that we implement and also be one of the good schools in the region and in Chile (I42)."	" the science teachers and teachers of basic science education and basic education are very enthusiastic about projects that show the students things, which allows them to demonstrate things to students, I believe that is going to interest them (I42)."
University Institute		
CEAM, Centro Estudios Ambientales, Center of Environmental Studies at the UACH	" To make our contribution to the development of an environmental policy that promotes sustainable development (I36)."	"One is to use the experience of the people there in the forest faculty, for university teaching, for the course of honors program, or it can be used as an experience for a laboratory to visit, for how they can articulate and achieve goals of conservation and sustainable use, for students in field work, practical classes, and more. A second, investigation in two things: public-private cooperation for the conservation, because a public private experience in some aspects may be interesting to investigate and also the relationship with neighboring communities. And a third point of interest would be to capitalize on the experience to make it known as a proven experience, both to the government and the Valdivian community (I36)."
North Carolina State University		"So I guess for my own research interests. Also for the institution it has more to do with preserving biodiversity worldwide. And something to do with NC State creating a reputation as a global kind of research institute. And conservation institute (I1)."

UACH, Facultad de Ciencias Agrarias, School of Agricultural Science	"Well as a university we are committed to the excellence in education and in research and extension. In this school of agriculture, we are more specifically committed to....I can't remember. What is our mission, our mission in school? Ahh.. It's related to the education of professionals that are, I don't remember our mission, I read it this morning, but I can't remember what it says. But let's say we are committed to the education of young professionals that will be serving the area of agriculture and food processing and no doubt with a knowledge in science and technology and something like that. We do have a mission and strategic plan that you can read later. As a school I mean. We do have two strategic plans, one for the university and one for this particular school. You can read the mission better then I just said it (I3)."	
UACH, University Austral de Chile, Facultad de Forestal, Forestry School	"The mission is...I don't remember the, but in general, to be a relevant high education institution for southern Chile and hopefully with impacts throughout the world (I8)."	"The main one is to develop Llancahue as a periurban park or suburban park for the city of Valdivia, that was the mandate that we were given by the ministry in order to get Llancahue as a concession for 20 years, so that is the main one (I8)."
University Catholica y University of Chile	"Education and research (I50)."	"It is a forest of medium and low elevation and a refuge in plantations in the coastal range (I50)."

University de Magallanes,
concessionaire of the Omora
Ethnobotanical Park, another
University managed, public water
supply park in Chile

" the Omora park is dedicated to research, education and conservation and we achieve that through multiple ways including international courses, field courses, research and education programs from everywhere from the local school level up to the university level (147)."

" it would be nice to have some sort of contact or friends, like a friends network, like watershed friends. I don't know, maybe something a little more than just moral support, maybe a formal recognition that we are all sort of working on stuff that's similar. That could actually be something interesting for your thesis is to make a list of all the protected watersheds in Chile, like I said you are going to find several that are state protected areas like National Reserves, and there's going to be a few, well atleast two that are private, atleast public land concessioned to private parties. Well even just socializing or distributing that information lets everybody know, cause otherwise we wouldn't even know that they are doing it and they wouldn't know about us (147)."