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**NATURAL RESOURCE MANAGEMENT IN A
COSTA RICAN WATERSHED**

VOLUME I

By

Delanie Kellon

A THESIS

**Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of**

MASTER OF SCIENCE

Resource Development

2006

The study explored
in the Caribbean
whether trees
beneficial for
food security
could be used
to reveal a
shared natural
heritage, and
revealed benefits
dimensions of

ABSTRACT

NATURAL RESOURCE MANAGEMENT IN A COSTA RICAN WATERSHED

By

Delanie Kellon

This study explores human dimensions of watershed management in a small watershed on the Caribbean side of Costa Rica. Using a multiple method, qualitative approach, the researcher tried to develop an understanding of local residents' perspectives regarding their natural resource management, concerns, problems, and potential solutions, and hoped to identify support among the watershed communities for implementing alternative natural resource management and sustainable development initiatives. The reported results reveal a high degree of stakeholder knowledge and understanding about their shared natural resources, the identification of important resource management and use conflicts, and suggestions about how to improve these situations. The research also revealed benefits of using multiple methods for understanding and measuring human dimensions of watershed management.

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ACKNOWLEDGEMENTS

While more people than I could ever list here have helped me over the course of research, data analysis and interpretation, reporting findings, and writing and rewriting the chapters of this thesis, the support offered by the following people has been absolutely critical to the completion of this project. First and foremost, I would like to thank the community members of the Dos Novillos Watershed for taking the time to share their thoughts and ideas with me. Without their willingness to let me into their communities, meeting halls and homes, and spend their precious time with me, this research project would not have advanced at all. Interacting with the people of these communities made the challenging task of conducting focus groups and in-depth interviews in the field an absolute pleasure in addition to being an incredibly rich learning experience.

The collaboration and support of EARTH University's administrators, professors, and staff was critical to this research. Dr. Carlos Hernández asked my advisor, Dr. Michael Kaplowitz, to apply for NOAA funding, and it was this grant that ultimately helped to fund the research project. EARTH's president, Dr. José Zaglul, was completely supportive of my efforts. Dr. Carlos Hernández, Dr. Pedro Bidegaray, Dr. Jane Yoemans, and Dr. Julio Tejada, among others, provided valuable information and input. Dr. Daniel Sherrard and his family gave me a place to call home and Dr. Jim French lent me his office. Eduardo Ruiz, Luis Diego Chacon and Arnoldo Quirós provided me with transportation and logistical support at all hours. Special thanks to my good friends and former co-workers, Marta Escoto and Larissa Blanco for making my time spent at the

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office a pleasure and for always lending a helping hand. Gina Reyes and Larissa worked incredibly hard to transcribe all of the focus group sessions and individual interviews. Their excruciating attention to detail and personalized notes to be about the meaning of acronyms and local slang made my analysis that much richer. Thanks also to Georgina and Helen for taking the time to do anything you could to help me out, and to Katia Yoemans and Gary Cooke for helping with the focus group sessions.

Edmundo Castro, the director of the Research Center for the Study of Ecological Economics (CRESEE) generously provided input on this research, as well as a wealth of information about natural resource and agricultural issues and previous research in the study area.

In addition to applying for and receiving the funding used to carry out this project, my advisor, Dr. Michael Kaplowitz, also provided around the clock guidance and insight into the entire research process. His uncompromisingly high standards were always a goal and an incentive for me to do the highest quality research possible. My committee members, Dr. Jeff Riedinger and Dr. Scott Whiteford, were always willing to meet with me to talk about the project and to share their invaluable experience, perspectives and insights.

Professors and colleagues with the Department of Resource Development (RD) provided an exceptionally supportive and positive atmosphere for learning and developing critical thinking skills. While all of my classes in RD exposed me to new ideas and new ways of thinking about natural resource and community development issues, Dr. Kim Chung's

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class on qualitative research methods was invaluable to me as it prepared me to develop and conduct qualitative research, and to analyze qualitative data.

I have been fortunate to work for EARTH University Foundation throughout my master's program, and the support and understanding of the Foundation's president, Gian Rossi-Espagnet, and the entire EUF team has made it possible for me to continue my work for them during each stage of my program.

This research would not have been possible without the financial support of: a National Oceanographic and Atmospheric Administration (NOAA) 'White Water to Blue Water' Special Project Grant; a Water Security Grant from The William and Flora Hewlett Foundation; and a Research Fellowship from Michigan State University's Center for Latin American and Caribbean Studies (CLACS).

My family and friends have been steadfastly supportive of me during my entire master's program, and especially during the thesis writing process, despite the fact that they were not entirely sure what my research project was all about. My husband, best friend, and fellow master's student, Oscar Arreola, suffered the most during my master's program, but he remained an unwavering supporter of my efforts and my abilities, in addition to being an excellent sounding board for ideas, and provider of comments and critiques about my work and this research. He also kept me fed and reminded me to have fun and enjoy life. For everything he has done and for all he continues to do, I am extraordinarily thankful that we are in this together.

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LIST OF ABBREVIATIONS

AyA	Instituto Costarricense de Acueductos y Alcantarillados [Costa Rican Institute of Aqueducts and Drains]
CBNRM	Community-Based Natural Resource Management
CDP	Community Development Program
CRESEE	Centro Regional de Estudios en Economía Ecológica [Research Center for the Study of Ecological Economics]
EARTH	Escuela de Agricultura de la Región Tropical Húmeda [Agricultural University of the Humid Tropical Region]
ICAA	Instituto Costarricense de Acueductos y Alcantarillados [Costa Rican Institute of Aqueducts and Drains]
IDA	Instituto de Desarrollo Agraria [Institute for Agrarian Development]
JAPDEVA	Junta de Administración Portuaria y de Desarrollo de la Vertiente Atlántica [Port Administration and Development Board of the Atlantic Region]
MAG	Ministerio de Agricultura y Ganadería [Ministry of Agriculture and Cattle]
MINAE	Ministerio de Ambiente y Energía [Ministry of Environment and Energy]
MIRENEM	Ministerio de Recursos Naturales, Energía y Minas [Ministry of Natural Resources, Energy and Mines]
RA	Rural Aqueduct
RAC	Rural Aqueduct Committee
SINAC	Sistema Nacional de Áreas de Conservación [National System of Conservation Areas]

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CHAPTER 1

INTRODUCTION

The purpose of the study was to explore the human dimensions of watershed management in the Dos Novillos Watershed, a sub-watershed of the Reventazón-Parismina, which is located on the Caribbean side of Costa Rica (see Figure 1). This project aimed to utilize a multiple methods approach in order to understand local citizens' perspectives with respect to natural resource management problems and potential solutions, and to identify support among the watershed communities for implementing alternative natural resource management and sustainable development initiatives¹.

STUDY OBJECTIVES

The project's objectives were to: assess stakeholder knowledge, perceptions and understanding about natural resource management in a watershed context; provide watershed communities and EARTH University with information about natural resource management problems, contributing factors, potential solutions, and statements regarding community members' willingness to collaborate to help improve various aspects of natural resource management; and evaluate the effectiveness of a multiple methods approach for understanding and measuring human dimensions of watershed management in Costa Rica.

¹There were no specific initiatives proposed to research participants during the phases of the study reported here. Rather, questions about community members' willingness to participate in efforts to improve natural resource management referred to potential solutions that the community member(s) had suggested or referred to generalized efforts to improve the resource problems he/she (they) cited during focus group discussions and individual interviews.

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Figure 1: Costa Rica and Study Area



Sources: Arreaga and Bracamontes (2001)

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THEORETICAL FRAMEWORK

This section briefly reviews previous scholarly work touching on natural resource management in Costa Rica from global, national, and local perspectives, including watershed management approaches.

NATURAL RESOURCE MANAGEMENT IN COSTA RICA

In Central America, a region known for governmental instability and corruption, Costa Rica's government is notably stable and democratic, and its civil society is impressively literate and active in the political process (Skidmore and Smith 2005). Costa Rica is also notable for its dedication to natural resource conservation, which has resulted in the establishment of numerous environmental laws and 121 continental protected areas (Tejada and Castro 2000, DeShazo and Monestel 1997 in DeShazo 2001). However, despite Costa Rica's environmentally aware citizenry² (INCRE 2004) and proactive government, the country still faces a potentially severe environmental crisis. Some researchers attribute current natural resource management problems to poor water management (Espeleta 2001, Sherr et al. 1997 in Tejada and Castro 2000, Sanchez-Azofeifa et al. 2002, Pareja and Sosa 2001, Calvo 1990) and poor land use planning (Sanchez-Azofeifa et al. 2002, Carpenter et al. 2001, Pagiola 2002, Kaimowitz 2001, Panayotou 2001).

With respect to water, Costa Rica receives an average of 3,272mm of rainfall a year and, as a result, has one of the largest supplies of fresh water in the world (Espeleta 2001).

Espeleta (2001) believes that the country's abundant rainfall has led many Costa Ricans

² Environmental education is included in the country's national curriculum for grades 1-6 (INCRE 2004).

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Along these lines, Sanchez-Azofeifa et al. (2002) discuss the current conflicts surrounding water resource management in Costa Rica. They describe how competing pressures from agriculture, industry, hydropower generation and the demand for clean and plentiful drinking water is taking place in a context of unsustainable urban development, population growth and an expanding tourism industry. They conclude that uncontrolled land use and cover change is a very real threat to Costa Rica's ability to manage its water resources.

One of the most critical land use and cover change problems is deforestation and forest fragmentation. Despite the country's impressive protected areas system and conservation legislation that is intended to protect its forest resources, Costa Rica has experienced one of the world's highest rates of deforestation (Peuker 1992, FONAFIFO 2000, World Bank 2000 in Pagiola 2002). In the 1980s, Costa Rica actually had the highest

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deforestation rate in the world (Panayotou 2001). Between the late 1970s and the early 1990s, the country is estimated to have lost about 35-40 percent of its forest cover, driven primarily by conversion to agriculture and pasture. It is commonly believed that this deforestation negatively impacted water services in Costa Rica (Pagiola 2002, Kaimowitz 2001). Although Costa Rica's apparent lack of attention to deforestation may seem surprising considering its pro-conservation reputation, Panayotou (2001) reports that it took the devastation caused by Hurricane Mitch in Central America in 1998 for deforestation and land use policy to become the focus of the environment and development debate in Central America.

In addition to environmental consequences, there are also socio-economic impacts related to poor natural resource management. Carpenter et al. (2001) highlight the human dimension of deforestation's impact on soils. They state that deforestation and the ensuing soil erosion is especially detrimental in the humid tropics where rainfall is heavy and crops are often planted on steep slopes. They assert that the loss of productivity in tropical areas of the world, such as Costa Rica's Atlantic Region, is on a "collision course with increasing human population density and the demand for food."

Calvo (1990) adds that the environmental, agricultural and socioeconomic implications of erosion due to deforestation and poor agricultural management practices could "sacrifice future economic opportunities and may threaten not only the water resources development but also the national [Costa Rican] political and social stability." He contends that the viability of existing and potential hydropower plants (which Costa Rica

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In addition to threats to adequate food production and hydro-electric power generation, Espeleta (2001) argues that under the current natural resource management situation, Costa Rica is headed for a water quality crisis. Eleven years after Calvo (1990) concluded that Costa Rica, a small country with obvious natural resources limits, must develop long-term natural resource and environmental management plans in order to cope with its increasing population growth, Espeleta (2001) reiterated Calvo's warning by stating that Costa Rica must act quickly to address its water quality problem at the highest levels. Additionally, Calvo emphasized the urgent need to apply appropriate pricing to the water service in order to control consumption and avoid a crisis. More than 10 years later, Sanchez-Azofeifa (2002), Pareja and Sosa (2001), and Pagiola (2002) all echo Calvo's call to control water consumption by discussing the numerous competing users of watershed services: hydroelectricity generators; industry; small to large-scale agriculture (including banana, and ornamental plant plantations); municipal water supply systems; and populations in flood-prone areas.

While Costa Rica's past failure to adequately protect its forest and water resources raises concern about the country's ability to enforce seemingly sound natural resource management legislation, there does appear to be optimism about the future of natural resource management due to some researchers' view that throughout the 1990s, SINAC had a significantly positive impact on society's perception of biodiversity conservation.

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Castro (1993) in Tejada and Castro (2000) states that since the 1990s, SINAC has managed to more efficiently administer the country's biodiversity and that the institution has created a good environment for advancing natural resource management research and projects.

Additionally, researchers claim that due to tourism revenues, Costa Rican policy makers have come to see their country's natural resources as more valuable intact and protected, than exported or depleted (DeShazo 2001). Costa Rica, like many countries, uses ecotourism as a means to earn income needed to maintain conservation areas and protect biodiversity in addition to contributing to the overall economy (Panayotou 2001). Costa Rica may be particularly successful at this due to its stable and democratic government, its reputation as being "eco-friendly", and the wide variety of environments and activities available to tourists (Skidmore and Smith 2005, Panayotou 2001).

In addition to considerations about the Costa Rican government's capacity to manage natural resources, and the potential for cooperation with the tourism sector, other researchers have focused on the role that they feel citizens can and should play in the process. These researchers advocate for participatory natural resource management based on their experiences and an international literature that discusses the strengths and weaknesses of different kinds of community-based arrangements carried out in a wide variety of contexts. Indeed, it should be noted that scholar-practitioners that have contributed to the literature and practice of community-based natural resource management (CBNRM) make it clear that natural resources all around the world have

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been managed by diverse representations of communities both alone or in partnership with governments and/or private entities. This literature also shows that, as with any management method, there will always be context specific challenges to face, pitfalls to avoid, and lessons to learn (Ostrom 1990, Ostrom and Schlager 1996, Ostrom et al. 1994, McKean 1996, Jodha 1996, Baland and Platteau 1996).

WATERSHED MANAGEMENT APPROACH

While there are multiple definitions for the term, ‘watershed’, one straightforward interpretation is that a watershed delimits “the boundaries of a hydrologically independent area” (Sen et al. 1997). Knox and Gupta (2000) offer a more all-encompassing definition: “Watersheds connect land units through lateral flows of water, nutrients and sediment, linking farmers, fishers and urban dwellers in intricate cause and effect relationships.”

Regardless of the exact definition of ‘watershed’, it appears that watershed-based approaches have been suggested as appropriate methods for natural resource management planning for both hydrological and biological reasons. Kaimowitz (2001) states that the term ‘watershed management’ “implies that someone manages land use at a scale larger than a farm to achieve collective benefits.” Depending on the local situation, the collective benefits that can typically be the focus of watershed management projects are: flood control; greater dry season flow; landslide prevention; improved water quality; forest protection; and reduced sedimentation of reservoirs, waterways, and coastal zones. Rhoades (1998) points out that when a development or management goal is to “balance

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production and conservation at many scales over both short and long-term planning horizons...the watershed unit is ideal for these ends since it designates a layered natural and social phenomenon (multi-scale, diverse user, complex resource) which is also readily appreciated by lay persons, policy makers, and funders.”

COMMUNITY PARTICIPATION IN WATERSHED MANAGEMENT

As has been made apparent in the previous sections, it is not uncommon for researchers that are using a watershed management approach to stress the importance of the role of community members and other stakeholders. According to Sen et al. (1997), participatory, integrated watershed management is “a continuous and participatory effort at improving livelihoods and overall human development.” In this way, the intention of participatory watershed management is to help farmers and community members take charge of natural resource management in an effort to advance poverty alleviation and overall human development. The literature indicates that true participation requires project coordinators to partner with local community members in a way that has not often been done traditionally (Sen et al. 1997, Hinchcliffe et al. 1995, Farrington and Lobo 1997).

According to Hinchcliffe et al. (1995), in order for watershed management to be successful and sustained, a project must “see farmers as the solution rather than the problem, and so put local knowledge and skills at the core of programmes.” They explain that for almost a century, rural development policy and practice assumed that farmers could not or did not properly manage the soil and water. As a result of this belief, farmers

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Lessons Learned – Common Problems with the Approach

In addition to the cautionary advice given by Hinchcliffe et al. (1995), other researchers have also noted the approach’s shortcomings in an effort to improve both practice and outcome. Farrington and Lobo (1997) state that small, participatory, NGO sponsored watershed management projects are abundant, but typically must repeat the same time-consuming, expensive, in-depth techniques in each successive village, therefore, they expand very slowly. On the other hand, government-sponsored projects are known to expand rapidly, but they often do not count on the local ownership and stakeholder support that is needed to ensure sustainability. They explain that “approaches to watershed planning and implementation which are both participatory and easily replicable have remained elusive: most exhibit one or other of these characteristics, but not both.” They suggest that the experiences of existing, successful projects need to be analyzed by adapting variations for different conditions (increase or decrease in livestock numbers, crop diversification, different formal and informal institutional arrangements) in order to better prepare for proposed future projects. They contend that, unfortunately, the preconditions for scaling-up are often not identified and incorporated into the new

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PREVIOUS WORK IN THE STUDY AREA

Previous natural resource management work in the Dos Novillos Watershed has evaluated some of the socio-economic and biophysical aspects of the Watershed (Navarro and Reyes 1999, Cuesta 1999), as well as the sustainability of the productive systems (Guerrero 1996). However, these studies focused primarily on the middle section of the Dos Novillos Watershed and the community of La Argentina. Other preliminary work has been done to identify and prioritize, through a somewhat participatory method, natural resource management objectives and action areas for the Watershed (Tejada and Castro 2000, Tejada et al. 2000, Navarro and Reyes 1999). While some community members' perceptions seem to have been taken into account in these previous studies, there has not been a research effort targeting all of the communities located throughout the entire Dos Novillos Watershed concerning their perceptions about natural resource management. This research project addresses this lack of information and understanding.

RESEARCH QUESTIONS

This thesis addresses the need for perception-based research of community members with respect to natural resource management (Sen et al. 1997, James et al. 2002, Adegbiidi et al. 1999). The need for this kind of research is particularly urgent in the study area (discussed in Chapter 3) due to the socio-economic and environmental vulnerability that exists in the Watershed (Cuesta 1999, Guerrero 1996, Navarro and Reyes 1999, Pareja

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and Sosa 2001, Tejada and Castro 2000). Addressing these vulnerabilities in a viable manner requires collaborating with local communities, one aspect of which includes gaining a thorough understanding of the community members' perceptions regarding natural resource management issues and opportunities in their watershed. By collecting data concerning the perceptions of community members in the Dos Novillos Watershed this research specifically explores stakeholders' perceptions of:

- 1) how natural resources are currently being managed in the Dos Novillos Watershed (Espeleta 2001, Sanchez-Azofeifa et al. 2002, Calvo 1990, Tejada and Castro 2000, Guerrero 1998, Cuesta 1999, Navarro and Reyes 1999, Pareja and Sosa 2001);
- 2) how current resource management affects, and is impacted by, the socio-economic activities of the local communities (Calvo 1990, Chaves and Lobo 2000, Costanza 1998, Espeleta 2001, Tejada and Castro 2000, Sanchez-Azofeifa et al. 2002, Kaimowitz 2001, Carpenter et al. 2001, Farrington and Lobo 1997, Pagiola 2002, Rhoades 1998);
- 3) the alternatives that exist for possibly achieving more sustainable natural resource management and improved quality of life in the Watershed (Calvo 1990, Espeleta 2001, Sanchez-Azofeifa et al. 2002, Pagiola 2002, Tejada and Castro 2000, Panayotou 2001, Deshazo 2001, Girot et al. 1998);
- 4) the stated willingness of community members to participate in efforts to improve natural resource management using methods that they deem viable (Sen et al. 1997, Hinchcliffe et al. 1995, Rhoades 1998, Farrington and Lobo 1997, Swallow

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- 5) with respect to research methods, this project evaluates whether or not a qualitative, multiple method approach yields in-depth, salient and accurate information regarding community members' perceptions about natural resource issues in their watershed (Patton 2002, Kaplowitz 2000, Knodel et al. 1990, Morgan 1998, Strauss and Corbin 1998).

The project was designed to collect data that would allow the researcher to address these research questions, which are grounded in and linked to previous literature on: A) natural resource management in Costa Rica in global, regional, and national contexts; B) natural resources and environmental services; C) the watershed management approach; and D) the role of community participation in watershed management, the consideration of institutional arrangements, and common problems with the participatory watershed management approach. Additionally, the usefulness of the study's multiple methods approach was evaluated with respect to literature on E) qualitative multiple method research approaches.

METHODS AND PROCEEDURES

To accomplish the research goals and objectives, the project employed a multiple method approach designed to use successive phases of data collection to learn about topics of particular relevance to community members while being grounded in previous research

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RESEARCH SITE

The reported research took place in the Dos Novillos Watershed, which is a sub-watershed of the Reventazón-Parismina – the major watershed in this part of the country (Guerrero 1996).

Reventazón-Parismina Watershed

Guerrero (1996) states that the Reventazón-Parismina is one of Costa Rica's most important watersheds. It is located on the eastern side of the country and drains into the Caribbean Sea, thus it is essential to the well being of communities, farmers, fragile ecosystems, and biodiversity of the northern Caribbean lowlands and Tortuguero National Park, as well as other wetland and marine environments that are critical to the region's tropical ecology and the health of the Caribbean Basin.

Dos Novillos Sub-Watershed

The Dos Novillos, a sub-watershed within the Reventazón-Parismina, is home to approximately 7,000 people that live in a mix of rural communities and more populated small towns or settlements, which are referred to as the 'urban area' in this document (see Figure 11).

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According to Tejada and Castro (2000), the Dos Novillos Watershed is unique in that, from an ecosystem perspective, it is still intact enough to warrant preventative action as opposed to restoration. It is important that the prevention of further deterioration begins soon, however, because the Watershed is under pressure from extensive productive activities (cattle farming and banana, pineapple, and ornamental plant plantations) in the lower section, and deforestation in the middle and upper sections. “If allowed to continue under current management practices, these activities could seriously deteriorate the Watershed’s natural capital and thus, its ability to carry out important socio-ecological functions such as water capture, scenic beauty and biodiversity protection” (Tejada and Castro 2000). As Pareja and Sosa (2001) point out, the Dos Novillos River is also extremely important to the Watershed communities because it is their primary water source for agricultural and industrial activities.

METHODOLOGICAL FRAMEWORK

Data collection for this project was carried out using a multiple methods approach with the goal of understanding local citizens’ perspectives regarding natural resource management (including impacts, problems, and potential solutions) as thoroughly as possible, and identifying their willingness to support and participate in natural resource management initiatives. The project’s approach builds on literature that suggests the use of qualitative methods when in-depth data is sought (Patton 2002), and the use of more than one qualitative method to help investigators answer their research questions in a more thorough and accurate manner (Patton 2002, Strauss and Corbin 1998) and to compensate for possible bias caused by the unwillingness of some participants to disclose

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sensitive information during focus group sessions (Kaplowitz 2000, Knodel et al. 1990). To accomplish this, the research project was specifically designed to allow for preliminary, generalized issue scoping using multiple small-group discussions, followed by in-depth, private, individual discussions about key issues (Patton 2002, Strauss and Corbin 1998). By using this multiple methods approach, researchers hoped to gain a greater understanding of local community perceptions (than would be possible if using a survey questionnaire or just one qualitative method) regarding natural resource management issues directly influencing future sustainable development in the Watershed (Sen et al. 1997, James et al. 2000, Adegbidi et al. 1999, Hinchcliffe et al. 1995, Rhoades 1998). Toward these ends, Phase I (focus groups) was undertaken in June and July 2004 and Phase II (individual interviews) took place in July and August 2004.

Qualitative Research

While there are many different ways to undertake qualitative research, the term can be defined simply as "...any type of research that produces findings not arrived at by statistical procedures or other means of quantification" (Strauss and Corbin 1998, 10-11). Some researchers would modify this strict definition, however, by pointing out that quantitative analysis is often carried out on qualitative data as a supplement to the qualitative analysis (Patton 2002). In the social sciences, it is generally understood that qualitative research allows for an in-depth and detailed study of individuals' thoughts, feelings, perceptions and ideas (Patton 2002, Rubin and Rubin 1995, Strauss and Corbin 1998). This tradition, which accepts that different people and groups have diverse perceptions, views, value systems, and constructions of reality, and aims to collect data in

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the form of rich descriptions told in research participants' own words, is often set in contrast to the positivist tradition of carrying out research under the assumption that there is one reality that exists regardless of people's different perceptions (Holliday 2002, Rubin and Rubin 1995).

Grounded Theory

Qualitative researchers such as Strauss and Corbin (1998) and Patton (2002) discuss the typical problem in which researchers begin their study with such strong preconceptions and theories based on what they have read and heard, as well as their own experiences, that they are not able to truly hear or understand the people they are interviewing. Strauss and Corbin (1998, 12) contend that the researcher should instead "...allow the theory to emerge from the data". This 'grounded theory' approach is used to inductively generate theory that "...emerges from the researcher's observations and interviews out in the real world rather than in the laboratory or the academy" (Patton 2002, 11).

Multiple Methods

Research literature suggests that the use of more than one method can help investigators answer their research questions in a more thorough and accurate manner (Patton 2002, Strauss and Corbin 1998). This research uses two complementary qualitative methods to learn about people's perceptions regarding natural resource management in their communities. This multiple methods approach involves first carrying out generalized issue scoping (focus groups) and then conducting in-depth, individual discussions (individual interviews) about key issues that were highlighted during the focus groups.

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Focus Groups

A focus group is a qualitative data collection method used to generate a discussion among a small group of people (usually 6-10 participants and a trained moderator) about a particular issue, event or subject. Patton (2002) specifies that a series of focus group sessions are often held in order for a researcher to hear a number of different perspectives. Morgan (1998) points out that focus groups can be used alone or as a compliment to other qualitative and quantitative methods.

Individual Interviews

Another qualitative data collection method is the in-depth, open-ended individual interview. According to Schensul et al. (1999), open-ended interviewing is the most technically difficult, yet rewarding and exciting interview method. Patton (2002, 341) states that the purpose of interviewing individuals is to "...allow us to enter into the other person's perspective. Qualitative interviewing begins with the assumption that the perspective of others is meaningful, knowable, and able to be made explicit. We interview to find out what is in and on someone else's mind, to gather their stories."

POPULATION AND STUDY PARTICIPANTS

The Dos Novillos Watershed is about 5,100 hectares in size. Although a government census has not been completed in Guácimo County since 1995, EARTH University estimates that the Watershed has a total population of about 7,000, and there are approximately 1,750 households in the research area (Navarro and Reyes 1999 in Tejada and Castro 2000). The target population for phases I and II was adult residents from the

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distinct geographic areas (e.g. pre-mountain and lowland) and residential densities (e.g. rural village, large town (urban area), small to medium sized farm) in the Watershed.

INFORMED CONSENT

The researcher used an informed consent procedure approved by the University Committee on Research Involving Human Subjects (UCRIHS) of Michigan State University. Focus group and interview participants were advised verbally of their rights as research participants, including their right to confidentiality and their right to withdraw from the study at any time without prejudice (see Appendix 1). The researcher conducted the interviews, took written notes and also tape-recorded the sessions when consent was obtained from participants. All research participants' identities are confidential and each participant was given a code number for transcription and reporting purposes.

QUALITATIVE DATA - ANALYTICAL APPROACH

As discussed previously, the purpose of conducting qualitative, social science research is to achieve an in-depth, holistic understanding of certain aspects (depending on the research goals) of individuals, groups, organizations, communities or societies (Miles and Huberman 1994). The analysis of this kind of data requires the researcher to be able to make sense of large amounts of information gathered from interviews, observations, and document review (Patton 2002). Contributing to the daunting nature of the task is the fact that there is no standardized formula for carrying out qualitative analysis, leaving it up to the researcher to draw from the many qualitative research traditions and find the analytical approach that is most suitable to the study's purpose.

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Content Analysis

While Patton (2002) points out that there is no exact, agreed-upon way to describe how to carry-out qualitative analysis, he suggests that the term ‘content analysis’ can be used to generally describe “...any qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings” (Patton 2002, 453). He goes on to state that the content of interviews and observations is analyzed in order to find out what is significant given the research goals. Specifically, it “...involves identifying, coding, categorizing, classifying, and labeling the primary patterns in the data” (Patton 2002, 463).

One methodology for carrying out content analysis is ‘grounded theory’. Strauss and Corbin (1998) describe the process of using this methodology, which is based on iterative qualitative analysis using three coding techniques: open coding; axial coding; and selective (thematic) coding, in order to create and compare categories and subcategories, and then integrate them to form theories. The process begins with “Microanalysis: the detailed line-by-line analysis necessary at the beginning of a study to generate initial categories (with their properties and dimensions) and to suggest relationships among categories...” (Strauss and Corbin 1998, 57).

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Open Coding

Strauss and Corbin (1998, 101) define open coding as: “The analytic process through which concepts are identified and their properties and dimensions are discovered in data”. Rubin and Rubin (1995) describe the same process by explaining how Herbert Rubin reads through the transcriptions marking each concept or explanation of a concept with a code. Strauss and Corbin (1998) emphasize that open coding is used to develop categories and understand their properties. As the researcher is carrying out open coding, she should also be making axial coding notes that will be revisited in an ongoing and repeated process.

Axial Coding

“The process of relating categories to their subcategories, termed ‘axial’ because coding occurs around the axis of a category, linking categories at the level of properties and dimensions” (Strauss and Corbin 1998, 123). The term, ‘properties’ refers to the characteristics of a category (e.g. themes related to waste management problems) and ‘dimensions’ refers to the range of properties in a given category (e.g. wastewater, household waste, dead farm animals, recyclable materials, and the range of problems related to each one of these themes). Rubin and Rubin (1995) describe this process by explaining how Herbert Rubin examines the concepts he previously established (using open coding) by analyzing the themes and concepts within each category as well as among the different categories. After all of the categories have been analyzed and compared, the

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Thematic Coding

Strauss and Corbin (1998, 143) describe this coding procedure as “...the process of integrating and refining theory”. Once the themes and concepts (based on open and axial coding) have been placed into a smaller number of overarching thematic categories (selective codes), Strauss and Corbin (1998) say that the emerging findings can become theory. Rubin and Rubin (1995, 251) describe this process as the “final stage of analysis” and explain how after going through the first two stages (described above under open and axial coding), they aim to “build toward overarching themes” (1995, 251) that “tie the individual pieces together” (1995, 255) and allow the researchers to report their results.

SAMPLE SELECTION PROCESS

Focus group participants were invited to participate in the focus group sessions by community leaders. While this sample selection procedure was efficient in terms of the amount of time the researcher invested in inviting community members to participate in the focus groups, it was not ideal due to the invitation bias of the community leaders, and the self-selection bias inherent in the focus groups’ membership.

The researcher used a purposeful sampling technique to recruit individual interview participants. Specifically, the researcher purposefully sought to interview male and

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female adult residents living in the north, south, east, west and center of each urban community (see Figure 13). An attempt was made to interview adults working in the public and private sectors, as well as people who identify themselves as homemakers, unemployed, or retired. Throughout the upper, middle and lower section of the rural community (which is situated on the slope of a mountain), the researcher sought out small to medium-scale producers of a variety of agricultural products, as well as landowners offering agro-ecotourism activities, and landowners who are employed off-farm (see Figure 12). This sampling procedure was not intended to provide a sample representative of the population distribution in the Dos Novillos Watershed, rather, the researcher aimed to obtain a sample representative of the heterogeneity of residential areas (geographical), land uses, and socio-economic classes represented by Watershed residents.

IMPLEMENTATION AND RESULTS

Potential focus group participants were told that the discussion would take about one hour and that there would be light refreshments. Potential individual interview participants were told that the interview would take about 30 minutes. While participants were respectfully thanked for their time and collaboration, they were not given any compensation for participating in the research project, as it is not customary to do so in the study area.

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FOCUS GROUPS

Altogether, six focus group sessions were conducted (see Figure 9), with three in the rural area (upper, middle and lower La Argentina) and three in the urban area (Pocora, Pocora Sur, Las Mercedes). Each group was made up of six or seven participants with a total of 21 men and 18 women participating in the discussions. Each focus group session was carried out using the same discussion guide. Informed consent procedures were conducted without any objections, and some participants volunteered that they were not worried about others finding out what they thought. The sessions were audio taped and later transcribed. The focus group participants appeared to be interested in the research topic in general, as well as in the specific issues that were discussed.

The researcher's findings are organized and presented around the selective (thematic) codes that emerged from the iterative coding process. In the discussion of thematic areas, care is taken to distinguish between findings based on data collected in the rural and urban areas.

Figure 3 presents the open codes established during the first step of analyzing the focus group transcriptions and Figure 4 presents the thematic codes used to further analyze the data. The analysis includes representative quotes from the interviews as well as some basic quantitative analysis carried out using SPSS.

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INDIVIDUAL INTERVIEWS

Altogether, 27 individual interviews (see Figure 10) were conducted and each one was carried out using the same discussion guide. Everybody the researcher approached to interview appeared happy to collaborate. Informed consent procedures were conducted without any objections, and as in the focus groups, a number of respondents volunteered that they were not worried about people finding out what they thought. The interviews were audio taped and later transcribed. Respondents typically expressed an interest in, and asked more about, the purpose of the research project during the informed consent process. Although some respondents initially appeared shy or reserved, these people relaxed as the interview got underway and they answered the first couple of questions. Nobody told the researcher that they did not want to be interviewed, however, two respondents said that they did not want to be tape-recorded.

The researcher's findings are organized and presented around the selective (thematic) codes that emerged from the iterative coding process. Figures 5, 6, and 7 present the codes used to analyze the interview transcriptions. The analysis includes representative quotes from the interviews as well as some basic quantitative analysis carried out using SPSS.

FINDINGS AND CONCLUSIONS

The data collected from the focus groups and individual interviews show that there is greatest concern about:

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- Dos Novillos River contamination.

Numerous participants expressed their perception of the interconnected nature of the natural resource problems they cited. For example, some participants talked about deforestation with respect to decreasing river levels or flooding, river contamination from agro-chemical runoff, decreasing aquifer levels, and/or loss of wildlife habitat.

PHASE I AND PHASE II

As stated above, the two data sets yielded the same general findings, although the individual interviews revealed greater depth with respect to most of the concepts and themes that were discussed in both sessions, as well as more specific information about perceived problems with wastewater management and tap water provision.

The one area where data analysis of the two phases yielded slightly different findings was with respect to ‘Threats to Well-being’. Comparative analysis of this data from Phase I and Phase II reveals that natural resource-based threats to well-being were more often reported by respondents during the focus group sessions than during the individual interviews. Specifically, while four out of the six focus groups reported natural resource problems as the greatest threats to their well-being, the majority of both urban and rural individual interview respondents (65% and 70% respectively) cited socio-economic problems as representing the greatest threat to their well-being. This difference could be

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due to the fact that people felt more comfortable discussing possibly sensitive socio-economic problems in one-on-one interviews than in the group setting, and/or because some focus group participants did not feel comfortable disagreeing with other participants who they perceived as being more aware of, or more passionate about, natural resource problems (Kaplowitz 2000, Knodel et al. 1990). Additionally, although social problems (crime, drug addiction, unemployment) were not the focus of this research, the data make it clear that it is impossible to understand a community's reality without considering the natural resource issues together with the socio-economic situation (Hinchcliffe et al. 1995, Sen et al. 1997).

STRENGTHS AND WEAKNESSES OF APPROACH

STRENGTHS

The researcher found the project's inductive approach useful for understanding community members' perceptions about natural resource management in their watershed. Based on her experience, the researcher believes that carrying out consecutive data collections and using the analysis of data collected in a previous scoping phase to develop the instrument for the next issue clarification phase to be critical to gaining a better understanding of the community members' perceptions regarding a variety of natural resource issues.

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WEAKNESSES

Although the researcher found great value in using the qualitative, multiple method approach to carry out phases I and II of this project, it should be noted that the approach does have weaknesses if the project is to be conducted in a country foreign to the field researcher and if the PI is financially or logistically restricted to spending less than two months in the field carrying out research. Specifically, the researcher feels that due to the need to meticulously analyze one or more sets of data in the field before being able to develop a discussion guide and carry-out the in-depth, individual interviews, it would be extremely difficult for a researcher to use this approach successfully in this time period without being fluent in the local language and without having some experience living/working in the community, or at least, elsewhere in the region or in a similar culture.

Based on her experience, the researcher believes that using focus groups for scoping is ideal. However, being aware of the challenges of doing so, she contends that if a project is lacking sufficient time and/or resources to properly conduct focus groups in addition to one or two subsequent phases of research, informal scoping should be carried out instead, possibly by interviewing a cross-section of stakeholders. She asserts, however, that this would be a viable alternative as long as the qualitative or quantitative instrument that results from this scoping phase is pre-tested to ensure relevance, utility and understandability. Alternatively, a resource constrained researcher might choose to have a smaller overall sample and still use both methods.

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SUGGESTIONS FOR FUTURE WORK

The researcher suggests the completion of a survey questionnaire in order to take full advantage of the new knowledge about local perceptions regarding natural resource management gained through this project. Additional work to expand the scope of the research to include complementary areas of inquiry is also recommended. Doing so successfully would allow for the development and eventual implementation of viable initiatives with the goal of improving natural resource management in the Watershed, while simultaneously contributing to the long-term process of improving the quality of life of the Watershed's residents.

Next steps include working with project partners to draft manuscripts for publication in peer-reviewed journals. As part of this process, the researcher will take into consideration the history of the study area (resource management; land tenure; water rights and use; community conflicts and cooperation) and also compare the findings of this study with the results of other related research projects. This information will allow the researcher to develop more conceptual conclusions about the findings presented in this chapter, as well as their implications for future work in the study area. The results of this process will allow the researcher to develop realistic follow-up questions for future research.

Similarly, the project's findings will be made available to the residents of the Dos Novillos Watershed communities. This will be coordinated through EARTH University's Community Development Program (CDP). The CDP and the researcher should present

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the findings to community members and request their feedback. Since there is no project funding available for this, the CDP and the researcher will do this on their own. The CDP and/or the researcher should then follow-up on any comments and feedback made by community members and other stakeholders, and report on any additional findings.

After complementary socio-economic and bio-physical research (work in progress by EARTH University) has been completed and the findings of all three reports synthesized, a workshop could be held in which certain stakeholders (depending on the objective of the meeting) are invited to openly discuss the findings and their impact for the future of the Watershed. Among the stakeholders that could be invited to participate are:

- community members (recognizing existing community organizations and committees);
- government representatives: local and municipal officials, MINAE, AyA, Ministry of Health, and the congressional representative;
- agro-industry representatives with current and planned projects in the area;
- universities working in the area; and
- NGOs working in the area.

The initial workshop could be conducted with the goal of discussing the findings and asking community members and other stakeholders what they would like to do with this information. If stakeholders express an interest in collaborating to try to improve any/various aspects of the natural resource management situation, future workshops could be organized to discuss further action. Additionally, after receiving and responding

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to community, stakeholder and scholar-practitioner feedback on the findings, a proposal to carry out a scaled-up study in the Reventazón-Parismina Watershed should be drafted.

CONCLUSIONS

The findings derived from phases I and II of this pilot project have revealed a number of apparently serious natural resource management problems in the Dos Novillos Watershed, as well as contributing factors, potential solutions, and statements regarding community members' willingness to collaborate to help improve various aspects of natural resource management.

Subsequent research will help to determine how widespread and salient the phase I and II findings are among the Watershed population. The final, synthesized findings should give EARTH University useful input for its Research Program, which is oriented toward integrated watershed management of the Reventazón-Parismina Watershed. These findings could also help EARTH University's Community Development Program develop work plans and priority areas, and also seek funding and collaboration in order to address issues reported in the findings.

It is hoped that the findings could be used by the Watershed residents' Community Development Associations and other local groups to engage more residents in a dialogue about the natural resource problems that they say negatively affect their well-being and the natural environment. The findings could also help community groups develop work plans and designate priority issues. Other stakeholders could also benefit from the report.

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The wealth of information disclosed about community members' perceptions of the work being done by governmental representatives (local and municipal officials, MINAE, AyA, Ministry of Health) could help these representatives understand the residents' points of view. While residents and officials are bound to disagree on many issues, if this information is used in the spirit of finding viable solutions to problems, governmental representatives and other stakeholders (agro-industry representatives) could use the findings as a starting point to begin a process of communication and collaboration with the communities.

In addition to supporting EARTH University's Community Development and Research programs and serving as a case study for scholar-practitioners working on similar issues, other universities and NGOs working in the area could also benefit from the project's findings by eliminating the need for duplicative studies in the same sub-watershed (thus saving scarce resources), serving as an input for future, complimentary studies, and opening a forum to discuss the project's methodology, implementation, and results, with the goal of improving future work. While it is intended that various aspects of this research project be published in peer-reviewed journals, it is important to ensure that the findings are also distributed through other means in order to reach stakeholders and practitioners that may not have access to these publications.

In conclusion, this research appears to demonstrate that potential exists within the Dos Novillos Watershed communities for addressing a variety of the natural resource management concerns cited by community members due to: the existence of a relatively

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well informed citizenry that is concerned about a wide variety of natural resource management issues; community members' stated willingness to help address the natural resource management problems they cited; and a history of collaborative community development work with EARTH University's Community Development Program. However, it also appears that community members and service providers would benefit from a continuing dialogue about the cited natural resource management concerns in an effort to develop collaborative ways to address problems. Such a process might also motivate more people to be willing to collaborate individually and as communities. With respect to the research methods, this pilot project demonstrates the strengths of utilizing a multiple method qualitative approach to address natural resource management issues, and also highlights some weaknesses and possible alternatives. This said, the researcher acknowledges that input from stakeholders and further data analysis is needed in order to validate the researcher's perceptions, as well as future lines of research.

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CHAPTER 2

THEORETICAL FRAMEWORK

INTRODUCTION

This chapter presents the theoretical foundations for the thesis. A review of previous scholarly work that examines natural resource management in Costa Rica from global, national, and local perspectives, as well as watershed management approaches, provides a framework for the research questions addressed in this thesis.

NATURAL RESOURCE MANAGEMENT IN COSTA RICA

In Central America, a region known for governmental instability and corruption, Costa Rica's government is notably stable and democratic, and its civil society is impressively literate and active in the political process (Skidmore and Smith 2005). Costa Rica is also notable for its dedication to natural resource conservation, which has resulted in the establishment of numerous environmental laws and 121 continental protected areas (Tejada and Castro 2000, DeShazo and Monestel 1997 in DeShazo 2001). However, despite Costa Rica's environmentally aware citizenry³ (INCRE 2004) and proactive government, the country still faces a potentially severe environmental crises. Some researchers attribute current natural resource management problems to poor water management (Espeleta 2001, Sherr et al. 1997 in Tejada and Castro 2000, Sanchez-

³ Environmental education is included in the country's national curriculum for grades 1-6 (INCRE 2004).

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Azofeifa et al. 2002, Pareja and Sosa 2001, Calvo 1990) and poor land use planning (Sanchez-Azofeifa et al. 2002, Carpenter et al. 2001, Pagiola 2002, Kaimowitz 2001, Panayotou 2001).

With respect to water, Costa Rica receives an average of 3,272mm of rainfall a year and, as a result, has one of the largest supplies of fresh water in the world (Espeleta 2001). Espeleta (2001) believes that the country's abundant rainfall has led many Costa Ricans to think that water is an infinite, free resource that can be extracted at will. Furthermore, it has been suggested that poor water management has caused socioeconomic and environmental deterioration to take place in Costa Rica's watersheds, and that this has resulted in poverty, malnutrition, low family income, loss of water quality, prolonged droughts, natural disasters, erosion and changes in the local water cycle (Sherr et al. 1997 in Tejada and Castro 2000). In apparent recognition of the problems that are thought to be caused by poor water management, there have been calls for preventative action in watersheds where carrying out remedial activities and capitalizing on available resources and local capacity appear possible (Sherr et al. 1997 in Tejada and Castro 2000).

Along these lines, Sanchez-Azofeifa et al. (2002) discuss the current conflicts surrounding water resource management in Costa Rica. They describe how competing pressures from agriculture, industry, hydropower generation and the demand for clean and plentiful drinking water is taking place in a context of unsustainable urban development, population growth and an expanding tourism industry. They conclude that

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uncontrolled land use and cover change is a very real threat to Costa Rica's ability to manage its water resources.

One of the most critical land use and cover change problems is deforestation and forest fragmentation. Despite the country's impressive protected areas system and conservation legislation that is intended to protect its forest resources, Costa Rica has experienced one of the world's highest rates of deforestation (Peuker 1992, FONAFIFO 2000, World Bank 2000 in Pagiola 2002). In the 1980s, Costa Rica actually had the highest deforestation rate in the world (Panayotou 2001). Between the late 1970s and the early 1990s, the country is estimated to have lost about 35-40 percent of its forest cover, driven primarily by conversion to agriculture and pasture. It is commonly believed that this deforestation negatively impacted water services in Costa Rica (Pagiola 2002, Kaimowitz 2001). Although this apparent lack of attention to deforestation seems surprising given Costa Rica's pro-conservation reputation, Panayotou (2001) reports that it took the devastation caused by Hurricane Mitch in Central America in 1998 for deforestation and land use policy to become the focus of the environment and development debate in Central America.

From a regional perspective, Costa Rica (as well as the Central American region as a whole) is recognized as being both biologically rich, and environmentally degraded. While DeShazo (2001) states that Central America is known for its biodiversity and is home to 20,000 of the world's 250,000 species of flora, as well as 1,306 known species of mammals and 4,835 bird species, Sherr et al. (1997) and Garrett (1997) as cited in

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Tejada and Castro (2000) point out that environmental degradation in Mesoamerica (Central America and southern Mexico) throughout the last decades has caused serious soil erosion, water contamination, biodiversity loss, changes in annual precipitation, and climate alterations.

With respect to the availability of potable water, in 1995, Costa Rica ranked fourth among the Latin American and Caribbean countries for the provision of water for human consumption. By 1997, Costa Rica claimed to have supplied in-home access to water to 100 percent of the population. In the same year, 85 percent of Costa Ricans reportedly received water that was supervised and subject to quality control. Of this number, 68 percent was reported to be receiving potable water (Espeleta 2001).

It is important to point out, however, that in Costa Rica, underground sources provide 63 percent of the potable water for human consumption. At the time of writing (prior to 2001), Espeleta (2001) reported ICAA's (Costa Rican Institute of Aqueducts and Drains, commonly referred to as 'AyA') results showing that 52 percent of the country's 1,660 mostly spring fed rural aqueducts had fecal contamination problems (256 of these had been decontaminated by 2001). This degree of fecal contamination is not surprising given that most of Costa Rica's sewage goes untreated (Espeleta 2001).

COSTA RICAN CONTEXT

To put Costa Rica's global and regional natural resource management situation into perspective, one must consider the country's historical context. From the arrival of the

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Spanish through the early 1960s, government policy in Costa Rica promoted the deforestation of thousands of acres in order to clear land for crop and cattle production. As international trade increased, deforestation was dictated by foreign prices of cattle in the country's northern region, coffee in the central area, and bananas in the east, as well as sugar cane in various parts of the country. Falling output prices for these products resulted in a decrease in the pace of deforestation during the 1980s and 1990s (which, as stated previously, still represented a high rate in the global context). This decrease in agricultural expansion overlapped with an increase in economic benefits that landowners started to receive from forested land due to: the expansion of ecotourism since the early 1990s; the creation of a government sponsored payment for environmental services program in 1997; and the popularity of value added and eco-friendly certified products such as shade grown coffee (Pfaff and Sanchez-Azofeifa, 2004).

In response to the visible loss of forest area as a result of decades of agricultural expansion, Costa Rica created a significant protected areas system. Between 1974 and 1978, the protected areas grew from 3 to 12 percent of the country's total area, and the figure now stands at 25 percent. The country has also developed substantial forestry policy. There are currently three forestry laws (enacted in 1979, 1986, and 1996), and a legal definition of conservation that was included in the country's Biodiversity Law (1998). As the need for more efficient administration and enforcement became apparent, its agency structure evolved from a three-agency system (Forestry, Wildlife, and National Parks) into a consolidated National System of Conservation Areas (SINAC) created in 1995.

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Yet, as mentioned previously, despite the country's dedication to environmental conservation and natural resource management, its critical land use and cover change problems have continued to fuel deforestation and forest fragmentation. According to Sanchez-Azofeifa et al. (2002), the deforestation rate in Costa Rica between 1986 and 1992 was at 4 percent per year, and by the end of 1992, Costa Rica's forests were severely fragmented. By 1997, only 44 percent of the country was covered by forest despite the fact that 64 percent is considered to have forestry and forest conservation potential.

In addition to environmental consequences, socio-economic impacts related to poor natural resource management have also been documented. Carpenter et al. (2001) highlight the human dimension of deforestation's impact on soils. They state that deforestation and the ensuing soil erosion is especially detrimental in the humid tropics where rainfall is heavy and crops are often planted on steep slopes. They assert that the loss of productivity in tropical areas of the world, such as Costa Rica's Atlantic Region, is on a "collision course with increasing human population density and the demand for food."

Calvo (1990) adds that the environmental, agricultural and socioeconomic implications of erosion due to deforestation and poor agricultural management practices could "sacrifice future economic opportunities and may threaten not only the water resources development but also the national [Costa Rican] political and social stability." He

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In addition to threats to adequate food production and hydro-electric power generation, Espeleta (2001) argues that under the current natural resource management situation, Costa Rica is headed for a water quality crisis. Espeleta (2001) contends that the existence of abundant rainfall in Costa Rica has contributed to a false sense of water security, which has resulted in a lack of attention to the fact that water quality deterioration is a serious problem. She goes on to explain that, ironically, Costa Rica has in fact been including the protection and management of water in its policies for more than 100 years. The principles that govern the country's water policies are: all waters and catchments are public goods; water rights are granted temporarily through concessions; waters and waterways are inalienable properties over which the State may not lose control; the Ministry of Environment and Energy (MINA E) is the entity that administers this resource and has the authority to govern its management; all public and private users must obtain a concession to utilize water; conservation and usage are of public interest; and utilization for human consumption has priority over any other use and must take precedence in the event of any conflict about water usage.

Despite the creation of sound policy based on these principles, Espeleta (2001) argues that the country's basins are being contaminated rapidly (mostly from urban sources) for the following reasons: untreated domestic effluents; solid waste and degraded organic

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matter; urban run-off; and coffee and other food processing waste. Among agricultural contamination sources, the three major problems are: erosion; agrochemicals; and animal waste (cattle, pigs, chickens). She notes that half of the total amount of animal waste and fertilizer eventually ends up in the country's waterways.

Calvo (1990) adds to this concern by stating that this uncontrolled surface water pollution also impacts the ecology of the coastal ecosystems, including mangroves, coral reefs, beaches and commercial fishing areas, thus multiplying the negative effect on the country's natural resources. He also points out that because of the low costs associated with aquifer development, and the fact that this water generally does not require much treatment, aquifers represent Costa Rica's most significant water source for both human consumption and industrial use. He explains that, despite the existence of this relatively low-cost source, the water supply sector faces critical problems, including: uncontrolled urban development; inadequate water supply system maintenance; high treatment costs due to surface water pollution; lack of rural water quality monitoring; low water usage rates; and the absence of watershed and aquifer protection.

Eleven years after Calvo (1990) concluded that Costa Rica, a small country with obvious natural resources limits, must develop long-term natural resource and environmental management plans in order to cope with its increasing population growth, Espeleta (2001) reiterated Calvo's warning by stating that Costa Rica must act quickly to address its water quality problem at the highest levels. Additionally, Calvo emphasized the urgent need to apply appropriate pricing to the water service in order to control consumption and

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avoid a crisis. More than 10 years later, Sanchez-Azofeifa (2002), Pareja and Sosa (2001), and Pagiola (2002) all echo Calvo's call to control water consumption by discussing the numerous competing users of watershed services: hydroelectricity generators; industry; small to large-scale agriculture (including banana, and ornamental plant plantations); municipal water supply systems; and populations in flood-prone areas.

While these researchers argue that the Costa Rican government urgently needs to both develop long-range natural resource management plans, and enforce current environmental policy, others point out that there appears to be some movement in the right direction. According to Ballesteros (1998) as cited in Tejada and Castro (2000), "environmental policy in Costa Rica and the recognition of the social and environmental costs of inadequate natural resource management in watersheds has motivated conservation and sustainable use of natural capital." Tejada and Castro (2000) cite INBio (1998) as claiming that natural resource conservation improved during the 1990s thanks to the creation of the Ministry of Environment and Energy (MINAE) and the National System of Conservation Areas (SINAC). Tejada and Castro (2000) go on to state that MINAE is supported in its efforts by six Costa Rican laws (Environmental Law; Forestry Law; Water Law; Biodiversity Law; Wildlife Conservation Law; and Soil Use and Conservation Law). With this legislation, they contend that the country has a solid legal framework, as well as the support of SINAC's work to promote environmental protection and sustainable natural resource use.

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In terms of policy enforcement, Castro (1993) as cited in Tejada and Castro (2000) points out that throughout the 1990s, SINAC had a significantly positive impact on society's perception of biodiversity conservation. He goes on to say that SINAC has managed to more efficiently administer the country's biodiversity and that the institution has created a good environment for advancing natural resource management research and projects. Tejada and Castro (2000) cite information from a 1998 Ecological Economic Services for Development report which states that this process has brought about better recognition and identification of the environmental services that biodiversity conservation produces. They contend that this has allowed valuable water resource protection efforts to be carried out through the participation of producers and consumers in a watershed context, and they cite the Government's program to provide payment for the environmental services of forests as an example of these protection efforts. Tejada and Castro (2000) point out, however, that SINAC could be more effective in the long-term. They state that one of the System's challenges is to become self-financing since international funding for its work has been reduced. They suggest that for SINAC to function effectively, the public and private sectors need to become more involved in funding environmental protection. Alternatively, while Espeleta (2001) does not comment specifically on SINAC itself, it appears that she holds a different perception of governmental policy enforcement with respect to water resources. She contends that enforcement is lacking due to what she describes as the "disjointed, conflicting and sometimes obsolete nature of the legislation", as well as the fact that many public entities are responsible for water resources in some way, and all of these entities view management sectorally rather than integrally.

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While Costa Rica's past failure to adequately protect its forest and water resources raises concern about the country's ability to enforce seemingly sound natural resource management legislation, there does appear to be optimism that due to tourism revenues, Costa Rican policy makers have come to see their country's natural resources as more valuable intact and protected than exported or depleted as a consequence of other commercial ventures (DeShazo 2001). Costa Rica, like many countries, uses ecotourism as a means to earn income needed to maintain conservation areas and protect biodiversity in addition to contributing to the overall economy (Panayotou 2001). Costa Rica may be particularly successful at this due to its stable and democratic government, its reputation as being "eco-friendly", and the wide variety of environments and activities available to tourists (Skidmore and Smith 2005, Panayotou 2001). In citing a 2000 article in Costa Rica's newspaper, *La Nación*, Hearne and Salinas (2002) point out that Costa Rica has successfully promoted its ecotourism industry by offering both natural beauty and environmental sustainability, and that Costa Rica has become one of the most visited ecotourism destinations in the world. Tourism currently represents Costa Rica's most important source of foreign exchange, followed by top earning exports; coffee and bananas (Hearne and Salinas 2002, U.S. Department of State 2004, CIA 2005). Hearne and Salinas (2002) attribute Costa Rica's successful tourism industry, in large part, to a mutually beneficial relationship with the country's regional conservation areas and National Park System, and it is this kind of relationship that some conservationists think might be the country's best avenue for protecting its natural resources over the long-term.

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Others, however, are more conservative in their optimism that ecotourism represents the country's best option for long-term natural resource management. Conservationists and even ecotourism advocates worry about the negative environmental impacts of poorly managed ecotourism on the country's fragile natural areas, and they are working to find ways to make nature and cultural tourism a more ecologically sustainable development alternative (Panayotou 2001, DeShazo 2001). "Our overarching strategy is to integrate the tourism economy into the system of protected areas in a way that strengthens the fiscal and institutional capacity of natural and cultural resource managers" (DeShazo 2001, 233).

In addition to considerations about the Costa Rican government's capacity to manage natural resources, and the potential for cooperation with the tourism sector, other researchers have focused on the role that they feel citizens can and should play in the process. For example, Girot et al. (1998) discuss the collaborative arrangement for managing Cahuita National Park that has evolved between the Costa Rican Government and local community members. Solórzano (1997) as cited in Girot et al. (1998) states that the Government has been considering alternative, participatory approaches for managing the country's protected areas due both to its inability to effectively manage the country's extensive protected areas, and SINAC's view that local communities should benefit economically from the parks.

These researchers advocate for participatory natural resource management based on their experiences and an international literature that discusses the strengths and weaknesses of

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different kinds of community-based arrangements carried out in a wide variety of contexts. Indeed, it should be noted that although the Cahuita case is unique in Costa Rica because the area being cooperatively managed is a National Park, scholar-practitioners that have contributed to the literature and practice of community-based natural resource management (CBNRM) make it clear that natural resources all around the world have been managed by diverse representations of communities both alone or in partnership with governments and/or private entities. This literature also shows that, as with any management method, there will always be context specific challenges to face, pitfalls to avoid, and lessons to learn (Ostrom 1990, Ostrom and Schlager 1996, Ostrom et al. 1994, McKean 1996, Jodha 1996, Baland and Platteau 1996). Before reviewing the role of stakeholder participation in natural resource management, an overview of natural resources and environmental services is presented in the next section.

NATURAL RESOURCES AND SOCIETY

NATURAL RESOURCES AND ENVIRONMENTAL SERVICES

From a natural resource management perspective, the resources that are typically taken into account when evaluating a study area are: forests; soils; ground and surface water; flora and fauna (biodiversity); and air. A general review of the environmental services provided by a tropical watershed environment reveals that: rivers provide habitat for flora and fauna, food for humans and wildlife, scenic beauty, and recreation; groundwater and surface water also provide water which is used by industry, agriculture (irrigation, livestock), urban centers and rural communities (potable water), and hydroelectric power generation; soils produce crops and fodder for livestock; and forests capture moisture and

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provide water (although according to Kaimowitz 2001, Pagiola 2002, and Faris 2001), this is a debated service), timber and other food and fiber resources, habitat for wildlife, recreation, scenic beauty, carbon sequestration, medicinal extracts, flood control, and mudslide prevention, among other services; and biodiversity provides ecosystem stability and health (through genetic diversity) and scenic beauty (Costanza et al. 1998; Kaimowitz 2001; Panayotou 2001; Espeleta 2001; Pagiola 2002; and Sanchez-Azofeifa 2002).

According to Chaves and Lobo (2000), Costa Rican forests offer a wide range of goods and services to the local, national and global community. These many environmental goods (wood, fruit, meat, medicines, seeds, etc.) are sold on the market or consumed directly by the harvester. Pagiola (2002) lists the following specific water services that forests are thought to provide:

- Reducing sediment loads in waterways to prevent the sedimentation of reservoirs and the associated production and maintenance costs for irrigation systems, hydroelectric power plants, water supply systems, and fisheries;
- Regulating the timing of water-flows so as to reduce flood risk in the wet season and the likelihood of water shortages in the dry season;
- Increasing the volume of water, either year-round or specifically in the dry season; and
- Improving the quality of water for domestic use.

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According to Pagiola (2002), due to the high rate of deforestation in Central America and the general recognition of the many valued services provided by forests, deforestation and its negative impact on hydrological flows in the region are of serious concern. To address this problem, there has been an attempt to protect forest resources. Lutz et al. (1994) in Pagiola (2002) explains that the response to deforestation has traditionally been made up of a combination of three efforts: remedial measures (e.g. repairing flood damage); preventative measures (e.g. regulation of land use in fragile areas); and conservation measures (e.g. reforestation and agroforestry projects). According to Pagiola (2002), it has unfortunately become clear that none of these approaches have worked as well as intended.

While it is generally no surprise to find that the remediation projects are typically expensive, and the regulatory efforts are often difficult to enforce and may impose unfair costs on poor users, it has been surprising to many policy makers and development practitioners to find that the conservation measures often offer only temporary success, especially when subsidies allowed for their implementation in the first place. Lutz et al. (1994) in Pagiola (2002) found that as soon as the subsidies ended, “land users reverted back to their previous land uses, neglecting the conservation measures they had adopted or even actively destroying them.” This kind of experience shows that practitioners cannot assume that conservation activities are always carried out in the land users’ best interest. In fact, a review of conservation projects throughout Central America revealed that most farmers found that conservation measures were not profitable (Lutz et al. 1994 in Pagiola 2002).

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In addition to problems associated with conservation approaches, Pagiola (2002) states that while a variety of services are commonly thought to be provided by forests, there is really not a strong body of evidence to support this claim. Kaimowitz (2001) also cites a lack of data with respect to this perceived connection. Specifically, he points out a lack of data explaining the degree and kind of interconnections between forested land and the provision of water services. Pagiola (2002) continues to say that although there is a scarcity of precise information on the subject, it is clear that forests do have a role in providing water services and that a key hurdle to overcome with respect to managing the link between forests and water services is that the people who are receiving the service are typically located far from the forests that provide the services. Since the provision of these services represents a cost to the landowners/users in the service production zone by limiting their land use options, if they are not compensated for the services they are providing to others, they may well be forced to switch to a land use that generates a higher return for them – a situation that often leads to socially and environmentally unfavorable land use decisions. In an attempt to respond directly to this problem, and offer incentives to protect resources that produce services, the concept of ‘payment for environmental services’ was developed (Pagiola 2002).

With this potential solution, however, comes yet another problem: how to assign values to the services that are believed to be provided by natural resources in order to arrive at appropriate payments. Faris (2001) exemplifies the difficulty of assessing these values when he states, “The cost of deforestation is the lost services provided by forests. These

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services are numerous and diverse, and their composition depends on location, forest type, and perspective.” He, like Pagiola (2002) and Kaimowitz (2001), also points out the lack of empirical data needed to demonstrate a connection between forests and the production of water services. He states that, “Unfortunately, documentation of these costs remains largely at the anecdotal level. Careful studies establishing the links between land cover changes and the incidence of flooding and landslides are yet to be carried out.”

Costanza et al. (1998) tried to confront the dilemma of assigning values to ecosystem services by attempting to calculate the total value of the biosphere’s ecosystem services. They state that, “The services of ecological systems and the natural capital stocks that produce them are critical to the functioning of the Earth’s life-support system. They contribute to human welfare, both directly and indirectly, and therefore represent part of the total economic value of the planet.” The study that Costanza et al. carried out resulted in an estimation of the current economic value of 17 ecosystem services. They concluded that the value of the ecosystem services being carried out within the entire biosphere is between US \$16 and \$54 trillion per year. They insist, however, that because of lack of information about certain ecosystems and other research limitations, this calculation represents the minimum value of ecosystem services and should be used as a starting point for further analysis and policy discussion.

Costanza et al. (1998) contend that this kind of study is critical to the natural resource management decision-making process because going through the task of valuing the services provided by natural resources requires an understanding of the effect that natural

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resources have on people, and of the impact that even small changes in the ecosystem's ability to provide these services has on human welfare. Since most of these services do not appear in the market system, they are often not considered when economic development proposals are being reviewed. For example, Costanza et al. (1998) state that while forests provide timber (a well established good in the market), forests also capture moisture; hold soil in place; create microclimates; and provide scenic beauty, habitat for flora and fauna, and potential for recreation, among other generally non-marketed services. Often, people are not even conscious of the services provided by natural resources, much less of the market value that these services represent. This leads to a scenario in which development projects are approved based on calculations that ignore or underestimate the value of ecosystem services, therefore not taking into account the fact that the proposed project's negative social and environmental costs vastly overshadow any potential benefits.

Costanza et al. (1998) calculated that, "About 38 percent of the estimated value [of the biosphere's ecosystem services] comes from terrestrial systems, mainly from forests (US \$4.7 trillion per year) and wetlands (US \$4.9 trillion per year)." The ecosystem services that Costanza et al. (1998) studied which are represented by tropical forests such as those found in the Dos Novillos Watershed are: gas regulation (e.g. carbon sequestration), climate regulation (e.g. Greenhouse Gas regulation, affect on local cloud formation); disturbance regulation (e.g. flood control); water regulation (e.g. provision of water for domestic, agricultural and industrial uses); water supply (e.g. provision of water by watersheds, aquifers); erosion control and sediment retention (e.g. prevention of loss of

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soil by wind and runoff); soil formation (e.g. accumulation of organic matter); nutrient cycling (e.g. nitrogen fixation); waste treatment (e.g. detoxification through the recovery of mobile nutrients and removal or breakdown of excess xenic nutrients and compounds); pollination (e.g. provision of pollinators for plant reproduction); refugia (e.g. habitat for migratory and native species); food production (e.g. production of fish, game, crops, nuts, fruits); raw materials (e.g. production of lumber, fuel, fodder); genetic resources (e.g. production of genes for human medical research, agricultural research to find resistance to plant pathogens and crop pests, and ornamental species); recreation (e.g. eco-tourism, sport fishing, hiking, birdwatching); and cultural (e.g. aesthetic, artistic, educational, and spiritual values).

While the attempt by Costanza et al. (1998) to study the entire biosphere's ecosystem services represents an enormous and daunting undertaking, their research brings to light the importance of trying to understand what kinds of ecosystem services exist in different socio-economic and ecological contexts, and then as a next step, determining what values people in these different situations place on the services they perceive (both in anecdotal and monetary terms). To accomplish this, some researchers prefer to study the complex interactions between natural resources and the services they provide from a watershed perspective because, among other reasons, the unit is smaller, has more obvious boundaries, and is generally more manageable than an entire ecosystem. The following section addresses the 'watershed perspective'.

WATERSHED MANAGEMENT APPROACH

While there are multiple definitions for the term, 'watershed', one straightforward interpretation is that a watershed delimits "the boundaries of a hydrologically independent area" (Sen et al. 1997). Knox and Gupta (2000) offer a more all-encompassing definition: "Watersheds connect land units through lateral flows of water, nutrients and sediment, linking farmers, fishers and urban dwellers in intricate cause and effect relationships."

Regardless of the exact definition of 'watershed', it appears that watershed-based approaches have been suggested as appropriate methods for natural resource management planning for both hydrological and biological reasons. Simpson and Covel (2000) explain that watershed management is a land use planning process that "uses a topographical, rather than geo-political, framework for assessing, planning, implementing and reassessing activities on the landscape which result in a sustainable situation." Kaimowitz (2001) states that the term 'watershed management' "implies that someone manages land use at a scale larger than a farm to achieve collective benefits." Depending on the local situation, the collective benefits that can typically be the focus of watershed management projects are: flood control; greater dry season flow; landslide prevention; improved water quality; forest protection; and reduced sedimentation of reservoirs, waterways, and coastal zones. Rhoades (1998) points out that when a development or management goal is to "balance production and conservation at many scales over both short and long-term planning horizons...the watershed unit is ideal for these ends since it designates a layered natural and social phenomenon (multi-scale, diverse user, complex resource) which is

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also readily appreciated by lay persons, policy makers, and funders.” He supports Kaimowitz’s view that from a biophysical perspective, focusing on the hydrologically defined watershed is a good compromise between working at the scale of a farmer’s fields (small unit) and an ecoregion (large unit). Rhoades (1998) goes on to explain that,

“By studying interactions in the hydrological system instead of component research on crops or specific resources, watershed scientists and planners broaden the analytical framework to encompass cross-ecosystem linkages, including upstream and downstream dynamics. Since water and land use have reciprocal effects, they should not be treated as separate development issues. Land use is water-dependant and water quality and quantity are impacted by land use.”

Finally, Rhoades (1998) states that working within watershed boundaries allows scientists to clearly delimit the study area, which makes it easier to carry-out input-output studies, as well as simulation and decision-making models.

Integrated Watershed Management Approach

While some researchers naturally think of watershed management in holistic terms, it can not be assumed that any watershed management project will be carried out in an integrated, manner. For this reason, the term ‘integrated watershed management’ is used in order to be explicit about taking a holistic approach. According to Sen et al. (1997), integrated watershed management deals with “the utilization and conservation of land, water, and forest resources at and within farm, household and community levels.” They state that in the broadest sense, integrated watershed management could include both

human and non-human elements of a watershed's make-up. They stress, however, that in practice, the goal of integrated watershed management is focused on responding to the problems and needs of local people. The common issues that often motivate integrated watershed management work are: natural resource management; poverty alleviation through capital and income generation; and distributional equality with respect to gender, social groups, and classes.

The term, 'integrated watershed management' can be confused with 'integrated water resource management' (IWRM), when in fact, the former is just one kind of the later. Van Hofwegen and Jaspers (1999) describe IWRM as "decision making about the development and management of water resources for various uses [which takes] into account the needs and desires of different users and stakeholders." They contend that a consultative and participatory methodology is required to properly implement this approach.

Dzurik (2003) states that integrated water resource management is multidimensional and includes the following aspects when applied to watershed management:

- water resources have various physical aspects (e.g. surface, ground; quantity, quality);
- water is a system but it is also a component that interacts with other systems (e.g. interaction between land and water);
- interrelationships exist between water and social and economic development (e.g. role of water in hydropower, industry, urban growth);

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- rivers must be considered in terms of the biological resources that rely upon them in their natural state (e.g. fish and wildlife) in addition to the water itself;
- rivers must be considered from headwaters to estuary, and with respect to the entire range of potential uses over their length; and
- rivers and their uses must be considered from long and short-term perspectives.

As has been made apparent, it is not uncommon for researchers using a watershed management approach to stress the importance of the role of community members and other stakeholders in planning, implementing, and evaluating watershed management projects. The next section addresses stakeholder-researcher collaboration with respect to watershed management.

COMMUNITY PARTICIPATION IN WATERSHED MANAGEMENT

It is not uncommon for researchers that are using a watershed management approach to stress the importance of the role of community members and other stakeholders.

According to Sen et al. (1997), participatory, integrated watershed management is based on “a continuous and participatory effort at improving livelihoods and overall human development.” Specifically, the intention of participatory watershed management is to help farmers and community members take charge of natural resource management. They state that it is crucial that farmers become active leaders of the watershed management/development process because: farmers are the main stakeholders in watershed management; it empowers farmers and promotes self-reliance; and the

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participatory process forces governmental and non-governmental technical agents to be facilitators of the stakeholder-led process, instead of simply transferring technology.

According to Hinchcliffe et al. (1995), in order for watershed management to be successful and sustained, projects must “see farmers as the solution rather than the problem, and so put local knowledge and skills at the core of programmes.” They explain that for almost a century, rural development policy and practice assumed that farmers could not or did not properly manage the soil and water. As a result of this belief, farmers have been “advised, lectured at, paid and forced” to adopt new techniques. In some cases, the target communities benefited for a time, but it has been observed that financial and legal incentives often bring about short-term conservation improvements because farmers eventually reverted back to their original practices after incentives ended or lost their value. Other researchers support this assertion by stating that the reason for carrying out participatory approaches is to ensure that there is “full involvement of local populations in the identification of priority problems and potential solutions” (Blackburn and Holland 1998) and to “redress the sins of the top-down, heavily subsidized approaches of the past which alienated local populations and often contributed to further land and water degradation” (Rhoades 1998).

While stakeholder participation in watershed management projects has become a popular concept, it is not a concept that is universally implemented. Depending on research goals, project constraints, and researchers’ views on participation, even among participatory projects, stakeholders are engaged in varying degrees of participation. According to Sen

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et al. (1997), a watershed management approach is truly participatory when “farmers get a chance to express their views and opinions; to identify problems; and to share their ideas with researchers, extensionists, and [project] managers.”

Perception-Based Research

As Sen et al. (1997) point out, part of the process of eliciting true community participation is seeking out the opinion of community members in order to understand how they perceive the watershed and the issues surrounding its management. James et al. (2002) promote perception-based research as part of what they call a participatory rural assessment (PRA) methodology for watershed projects by saying that “The methodology offers a flexible and practical tool to enable projects to undertake regular, multi-stakeholder PRA-based community assessments of villager perceptions on a variety of issues. This can help to clear misunderstandings, make clarifications, explain project approaches and give villagers regular opportunities to air their grievances.”

As an example of using this approach to clear-up the misperceptions of researchers and other outsiders, Adegbidi et al. (1999) carried out an evaluation of farmers’ perceptions with respect to soil fertility decline in Benin. The study yielded important results because researchers found that farmers were, in fact, very well aware of the problems, and they also knew about farming techniques that could help maintain soil fertility. However, as researchers learned, lack of time and money, not ignorance or unwillingness, kept many farmers from applying these practices. This perception-based research was carried out in order to ensure that decisions made about environmental policies would be appropriate

and based on the local reality according to the people who live in the study area.

Adegbidi et al. (1999) explain that the research examined “how farmers themselves perceive their situation and the consequences of their actions. We therefore focus on farmers’ own opinions about soil degradation, its causes and required responses. This approach will provide a better understanding of the rationality of farmers’ behavior and, in turn, the basis for formulating appropriate policies to improve the situation.”

Although this thesis was limited to the collection and analysis of perception-based research in the Dos Novillos Watershed, it is not enough to simply elicit opinions and perceptions from stakeholders when the aim is to conduct a truly participatory watershed/natural resource management project. Farrington and Lobo (1997) stress that implementing participatory watershed management projects also requires a serious commitment to collaborative planning in order to incorporate local knowledge and opinions into a technically realistic plan. They state that to do this, the planning process must strive to involve all registered owners of land in each watershed in order to develop detailed action plans. Only then can technical teams and participating partners such as universities and NGOs conduct detailed surveys and carry out land use planning in collaboration with local community members.

Another valuable aspect of watershed management that community stakeholders can help researchers understand is the variety, effectiveness, and impact of the formal and informal institutional arrangements that are at play with respect to natural resource management in the watershed.

Institutional Arrangements

Knox and Gupta (2000) make it clear that taking institutions into account helps researchers and stakeholders better understand a watershed from a holistic point of view that includes the combination of socio-economic and bio-physical interactions. They state that, “Externalities between people who share a watershed depend upon both the biophysical attributes of the watershed and the institutions that shape people’s interactions within the watershed.”

According to Heathcote (1998), an institutional arrangement can be thought of as “a system of written or unwritten rules that state the boundaries of acceptable behavior within the society and specify sanctions, the penalties that will be imposed on those who violate the rules that prevail in their society.” North (1994) as cited in Schmid (2004, 7), defines institutions simply as the “formal rules (constitutions, statute and common law, regulations, etc.), the informal constraints (norms of behavior, conventions, and internally imposed rule of conduct), and the enforcement characteristics of each.” Schmid (2004, 6) adds that institutions are not simply the rules of the game, but that they also enable individuals to do as part of a group what they cannot do alone. He states that, “Institutions are sets (networks) of ordered relationships (connections) among people that define their rights, their exposure to the rights of others, their privileges and their responsibilities.” One institutional arrangement that is often studied with respect to its role in natural resource management is ‘collective action’.

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Collective Action

Knox and Gupta (2000) use Marshall's (1998) definition of collective action when they state that it is "action taken by a group, either directly or on its behalf through an organization, in pursuit of members' perceived shared interests." Swallow et al. (2001) define it simply as "people working together toward some common goal." Knox and Gupta (2000) clarify that this kind of action is voluntary and thus distinctive from group activities carried out by paid workers. They contend that natural resource management situations that are spatially complex (forestry, fisheries, watershed management) benefit from collective action, and that the existence of a common threat can actually inspire collective action. In this kind of situation, the solution, which might be prohibitively expensive for individuals (e.g. building a fence to keep cattle from contaminating a water source) can be carried out efficiently by the group. The fundamental aspect of collective action solutions is that they will only work if there is collective agreement and subsequent action to support the new rules.

Based on their work in Kenya and the Philippines, Swallow et al. (2001) have determined that collective action for watershed management is "likely to be successful when it appeals to the self-motivation of farmers to improve their fields and the welfare of their families" (Shaxson 2000 in Swallow et al. 2001). These findings focused on the importance that farmers placed on the individual benefits that they received from greater investment in their land. In their study, farmers' motivations for adopting soil and water conservation techniques were characterized as: reduced risk; increased crop production; and penalty avoidance (Tiffen and Gichuki 2000 in Swallow et al. 2001).

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White and Runge (1995) examined collective action in small watersheds in the Maissade region of Haiti. Like Swallow et al. (2001), their research also focused on learning why individuals decided to participate or not, and why the cooperative groups formed in only some of the watersheds. They found that “the basic rational driving voluntary collective action is that individuals or groups are interdependent, and that their welfare – however defined by the individual actors – can somehow be improved with cooperation.” They concluded that “individual choice to cooperate in collective actions that yield public goods is conditional, and best predicted by: prior membership in reciprocating social organizations; practical knowledge of potential gains from cooperation; and some potential to gain from that action.” They add that on a very basic level, individuals are more likely to participate in collective action if they think others will also participate as well, and that contrary to popular assumptions, non-cooperative free-riding or defection did not occur often at all.

Based on their findings, White and Runge (1995) make the case that their research supports the concept of outside organizations voluntarily providing communities with technical conservation support, and subsequently encouraging communities to form voluntary collective action groups in order to manage watersheds. They stress, however, the importance of working with local, existing or self-organized voluntary organizations instead of imposing outside arrangements on the local community. Working with established organizations, even if they are transformed as is often the case in order to respond to the new task at hand, helps ensure that the collective action process is in line

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with local norms and logic systems. In addition to the importance of working with locally formed organizations, White and Runge (1995) point out that it is necessary for researchers and consultants to take into consideration factors that they claim have a very real effect on individuals' motivation to participate: "moral claims, cultural ideology, long-term social interdependence, external relations, and political leadership."

Lessons Learned – Common Problems with the Participatory Watershed Management Approach

In addition to the cautionary advice given by Hinchcliffe et al. (1995) regarding the importance of valuing local knowledge, other researchers have also noted the approach's shortcomings in an effort to improve both practice and outcome. While researchers that use the participatory watershed management approach attest to numerous reasons why this approach is valuable to natural resource management efforts, some researchers also caution that the approach does have its flaws and advise that practitioners take these problems into consideration when planning and carrying out the approach.

By way of sharing their experiences, Farrington and Lobo (1997) state that small, participatory, NGO sponsored watershed management projects are abundant, but typically must repeat the same slow, expensive, in-depth techniques in each successive village, therefore, they expand very slowly. On the other hand, government-sponsored projects are known to expand rapidly, but they often do not count on the local ownership and stakeholder support that is needed to ensure sustainability. They explain that "approaches to watershed planning and implementation which are both participatory and easily replicable have remained elusive: most exhibit one or other of these characteristics,

but not both.” They suggest that the experiences of existing, successful projects need to be analyzed by adapting variations for different conditions (increase or decrease in livestock numbers, crop diversification, different formal and informal institutional arrangements) in order to better prepare for proposed future projects. They contend that, unfortunately, the preconditions for scaling-up are often not identified and incorporated into the new project’s design, thus decreasing the chance of implementing an efficient and sustainable project.

Rhoades (1998) points out that while the participatory watershed management approach is encouraged by funding agencies, actually carrying out such projects in the real world has proven to be difficult. He contends that practitioners face a gap between the project idea and the reality in the field, and some observers of this situation have proposed that the participatory approach has so far not been successful and should be re-evaluated.

Rhoades (1998) warns that, “A few critics of bottom-up development are starting to argue wistfully that the participatory rhetoric, like communism, was a noble dream but not very practical due to a naiveté about human nature.”

He states that often, participatory projects are not planned realistically, and end up being carried out as traditional land use or hydrology studies despite the written commitment to participation. Rhoades (1998) goes on to ask the following question about participatory watershed development: “But does it work any better than the top-down approach at the watershed and other multi-scale levels?” Since the implementation of participatory watershed projects is still a fairly recent occurrence, there has not been much opportunity

to assess the outcomes of existing projects. This means that any evidence about successes or failures at this point is mostly anecdotal.

Swallow et al. (2001) add to this view by pointing out that another challenge in watershed management is working across political boundaries. They suggest that due in part to this limitation of the watershed management approach, it is becoming more accepted to begin by working within the smallest possible political areas within a watershed and gradually work up to the watershed-level (Johnson et al. forthcoming in Swallow et al. 2001).

Swallow et al. (2001) cite other authors that support their opinion and have worked successfully at the sub-village level with groups made up of fewer than 40 people, or in a single local government area where the group members are neighbors and thus know each other well (Tiffen and Gichuki 2000 in Swallow et al. 2001).

Due to the apparent difficulty of carrying out the participatory watershed management approach well, it appears that instead of planning a fully participatory approach based simply on its ideological value, researchers should strive toward the level of participation that is both appropriate to, and necessary for, their specific project, as well as one that is realistically feasible given the project's constraints. A more realistic implementation of the approach should allow for more useful analysis of outcomes and the effectiveness of the approach itself.

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PREVIOUS WORK IN THE STUDY AREA

Previous natural resource management work in the Dos Novillos Watershed has evaluated some of the socio-economic and biophysical aspects of the Watershed (Navarro and Reyes 1999, Cuesta 1999), as well as the sustainability of the productive systems (Guerrero 1996). However, these studies focused primarily on the middle section of the Dos Novillos Watershed and the community of La Argentina. Other preliminary work has been done to identify and prioritize, through a somewhat participatory method, natural resource management objectives and action areas for the Watershed (Tejada and Castro 2000, Tejada et al. 2000, Navarro and Reyes 1999). While some community members' perceptions seem to have been taken into account in these previous studies, there has not been a research effort targeting all of the communities located throughout the entire Dos Novillos Watershed concerning their perceptions about natural resource management. This research project addresses this lack of information and understanding.

CONCLUSION

This project will focus on addressing the need for perception-based research of community members with respect to natural resource management (Sen et al. 1997, James et al. 2002, Adegbedi et al. 1999). The need for this kind of research is particularly urgent in the study area (discussed in Chapter 3) due to the Watershed's socio-economic and environmental vulnerability (Cuesta 1999, Guerrero 1996, Navarro and Reyes 1999, Pareja and Sosa 2001, Tejada and Castro 2000). Addressing these vulnerabilities in a viable manner requires collaborating with local communities, one aspect of which

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includes gaining a thorough understanding of the community members' perceptions regarding natural resource management issues and opportunities in their watershed.

Specifically, this project was designed to collect data that would allow the researcher to:

1) assess stakeholder knowledge, perception and understanding about natural resource management in a watershed context; 2) provide watershed communities and EARTH University with information about natural resource management problems, contributing factors, potential solutions, and statements regarding community members' willingness to collaborate to help improve various aspects of natural resource management; and 3) evaluate the effectiveness of a multiple methods approach for understanding and measuring human dimensions of watershed management in Costa Rica.

Research questions developed to address these objectives are grounded in and linked to previous literature on: A) natural resource management in Costa Rica in global, regional, and national contexts; B) natural resources and environmental services; C) the watershed management approach; D) the role of community participation in watershed management (including perception-based research and the consideration of institutional arrangements), and common problems with the participatory watershed management approach.

Additionally, the usefulness of the study's multiple methods approach was evaluated with respect to literature on E) qualitative multiple method research approaches.

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CHAPTER 3

METHODS AND PROCEEDURES

INTRODUCTION

This thesis project examines human dimensions of natural resource management in a watershed context. The research was carried out in the Dos Novillos Watershed, located in Guácimo County, Costa Rica (see Figure 1).

The project's purpose is to understand the perspectives of community members living in the Dos Novillos Watershed of eastern Costa Rica with respect to problems and potential solutions regarding natural resource management, and to identify support among the watershed communities for implementing alternative natural resource management and sustainable development initiatives⁴. To accomplish this, the project employed a multiple method approach designed to collect a variety of social science data using qualitative methods.

The research was undertaken through a collaboration by faculty and staff of the Agricultural University of the Humid Tropics (EARTH University) in Guácimo County, Costa Rica, and Michigan State University (MSU) as part of an effort to improve natural resource management in this and other watersheds.

⁴ There were no specific initiatives proposed to research participants during the phases of the study reported here. Rather, questions about community members' willingness to participate in efforts to improve natural resource management referred to potential solutions that the community member(s) had suggested or referred to generalized efforts to improve the resource problems he/she (they) cited during focus group discussions and individual interviews.

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REVENTAZÓN-PARISMINA WATERSHED

Guerrero (1996) states that the Reventazón-Parismina is one of Costa Rica's most important watersheds. It is located on the eastern side of the country and drains into the Caribbean Sea, thus it is essential to the well-being of communities, farmers, fragile ecosystems, and biodiversity of the northern Caribbean lowlands and Tortuguero National Park, as well as other wetland and marine environments that are critical to the region's tropical ecology and the health of the Caribbean Basin.

DOS NOVILLOS SUB-WATERSHED

The Dos Novillos, a sub-watershed within the Reventazón-Parismina, is home to approximately 7,000 people that live in a mix of rural farming communities and more populated rural towns or settlements (referred to as the 'urban area' in this document).

In 1997, Mérida (cited in Tejada et al. 2000) estimated that the Watershed contained aquifers that could supply potable water to more than 10,000 people. Despite the apparently sufficient quantity of groundwater in the Watershed, water use throughout the Dos Novillos is still a concern since it is believed that local people have the impression that the resource is unlimited, and for this reason, water conservation practices are virtually non-existent. The quality of the water is also of great concern due to sedimentation, and contamination by sewage and agricultural contaminants (Tejada et al. 2000).

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According to Tejada and Castro (2000), the Dos Novillos Watershed is unique in that, from an ecosystem perspective, it is still intact enough to warrant preventative action as opposed to restoration. It is important that the prevention of further deterioration begins soon, however, because the Watershed is under pressure from extensive productive activities (cattle farming and banana, pineapple, and ornamental plant plantations) in the lower section, and deforestation in the middle and upper sections. "If allowed to continue under current management practices, these activities could seriously deteriorate the watershed's natural capital and thus, its ability to carry out important socio-ecological functions such as water capture, scenic beauty and biodiversity protection" (Tejada and Castro 2000). The situation is particularly urgent because one spring located in the upper watershed currently provides potable water to approximately 1,600 households, and as Pareja and Sosa (2001) point out, the Dos Novillos River is also extremely important to the Watershed communities because it is their primary water source for agricultural and industrial activities.

Additionally, Cuesta (1999) reports that there is an increasing need for natural resource management strategies to protect water quality and quantity in the Dos Novillos Watershed due to:

- population growth (Leitón 2001 cited in Pareja and Sosa 2001 attributes the country's population growth to immigration by foreigners), especially in the urban areas, which puts pressure on both quantity (demand) and quality (treatment of potable water and disposal of wastewater);

- growing conflict over the maintenance, capacity and administration of the Rural Aqueduct that serves the communities of La Argentina, Pocora Sur, El Carmen Sur y Norte, and parts of Pocora Norte;
- and land use conflicts that threaten the quality of water in the urban and rural areas (deforestation, shifting to pesticide and fertilizer intensive crops, urbanization).

DOS NOVILLOS WATERSHED – GEOGRAPHIC FEATURES

The Dos Novillos Watershed is located between the vertical coordinates 5.66 and 5.83 and the horizontal coordinates 2.24 and 2.47 on the Costa Rican National Institute of Geography map sheets Bonilla and Guácimo.

According to Tosi's map of ecological life zones of Costa Rica (Tosi 1969 cited in Guerrero 1996), the Watershed is located within the following zones: Premontane Rainforest (upper section); Premontane Transition Zone and Very Humid Tropical Forest (middle section); Very Humid Tropical Forest (upper part of lower section); Very Humid Premontane Forest and Transition Zone to Lowlands (lower section); and Humid Tropical Forest (lowest elevation in lower section).

According to Guerrero (1996), the Watershed is made up of 5,100 hectares of land in the foothills of the Turrialba Volcano and is divided into three areas defined by altitude. Land between 600 and 2,530 meters above sea level (masl) is considered to be in the upper watershed and is made up of steep, irregular terrain and mountain slopes that are

mostly forested with some pastures and regenerating deforested land, and is within the jurisdiction of a forest reserve (Reserva Forestal de la Cordillera Volcánica Central). The middle section of the Watershed is found between 200 and 600 masl. Its rolling hills and slopes are covered by forests, regenerating deforested land, pastures and annual crops. Finally, land in the lower Watershed lies between an elevation of 30 and 200 masl and is characterized by fairly flat land covered mostly by crops and pasture and an urban area. The major population center is located around 100 masl., and the middle and lower sections of the Watershed are part of the Tortuguero Conservation Area. Landsat images analyzed by González and Pérez (1995) cited in Guerrero (1996) show that primary forest cover makes up the largest land use in the Watershed, followed by crop and livestock areas. These forested areas are located mostly on the steep slopes and riverbanks, however, the images show evidence of deforestation. Agricultural activity fades out as the elevation increases, giving way to regenerating deforested land. Although the researcher did not have access to more recent Landsat images, anecdotal and first-hand visual evidence confirm that expanded agricultural production in the lower and middle sections of the Watershed has resulted in more deforestation.

Data from the Costa Rican Ministry of Agriculture and Cattle (MAG) and the Inter-American Institute for Cooperation on Agriculture (IICA 1994 cited in Guerrero 1996) shows that the Watershed's climate is characteristic of the country's Atlantic zone: year-round high temperatures and abundant precipitation. Average rainfall in the middle section of the Watershed is 4,432.7 mm/year distributed throughout the year with minimum rainfall recorded in February, March and September, and peaks of maximum

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rainfall recorded in May, October and November. The lower section receives an average annual rainfall of 3,464 mm/year with two yearly peaks of greater rainfall from June-August and November-December. March, the driest month, receives about 124 mm. Data from MAG and IICA (1991 cited in Guerrero 1996) report that the temperature varies between 18.5 C and 29.7 C (24.13 C average) throughout the year with a relative humidity between 85 and 95 percent.

Using U.S. Department of Agriculture (USDA) soil type classifications, Sancho et al. (1989 cited in Guerrero 1996) found the following soil types in the Dos Novillos Watershed: upper section: IV and V; middle section (where the farming community of La Argentina is located): III and IV; and lower section (where the farming community of La Argentina and the urban area are located): II, III, IV and V. Generally speaking, classes I, II, and III are appropriate for cultivation with an increasing requirement for soil conservation practices. Class IV is only productive for occasional crops or permanent vegetation cover, and class V is only useful for permanent vegetation cover).

According to Navarro and Reyes (1999 cited in Tejada and Castro 2000), in the upper section of the Watershed, the forest plays the important role of water capture, and for this reason, this watershed has also been considered for its potentially high capacity for hydroelectric generation. Extensive cattle farming is also carried out in the area. Land uses in the middle section of the Watershed are mostly made up of traditional agricultural and livestock activities carried out by small, medium and large-scale farmers. The producers' soil and water management techniques in this area have led to erosion and, as

a result, loss of productivity. Land in the lower section is used mostly by banana and ornamental plant plantations, as well as for cattle production and some short-cycle crops with little economic importance such as corn, yuca and tubers (Navarro and Reyes 1999 and Guerrero 1996 cited in Tejada and Castro 2000). First-hand observation by the researcher supports anecdotal evidence that large-scale pineapple production has increased in the Watershed's lower and lower-mid sections during the past few years.

DOS NOVILLOS WATERSHED – NATURAL RESOURCES

The Dos Novillos Watershed, as well as the other tropical and subtropical regions of Costa Rica, makes up part of the Mesoamerican Hotspot as defined by Conservation International (Mittermeier et al. 2000). According to the work on global hotspots by Norman Meyers and Conservation International, the Mesoamerican Hotspot, which extends from the Panama Canal west and north through parts of southern and central Mexico, ranks at the top of the list of 25 global hotspots - along with Tropical Andes and Sundaland - in terms of total biodiversity. Although some species are very rare, a number of key fauna species from this hotspot are found in the Dos Novillos Watershed, including: spider and howler monkeys; jaguar; tapir; wild boar; and large macaws (Personal Observation 2000-2003, Community Members of La Argentina, Personal Communications June 2004, INBio 2005).

According to Costa Rica's National Biodiversity Institute (INBio), the tropical area of the Neotropical Americas, where Costa Rica is located, is home to the greatest diversity of species and ecosystems in comparison to the other tropical zones around the world. The

Institute also states that Costa Rica is considered to be one of the 20 most biologically diverse countries in the world, while making up only .03 percent of the Earth's surface (INBio 2004). The Nature Conservancy makes a similar statement on its website where it claims that while Costa Rica constitutes just .01 percent of the planet's landmass, it is believed be home to approximately five percent of its biodiversity (The Nature Conservancy 2004).

Mérida (1997) and Navarro and Reyes (1999) cited in Tejada and Castro (2000), state that large amounts of natural forest exists in the Dos Novillos Watershed (about 10 percent of the Watershed, which equals approximately 500 ha), but that this resource could be partially altered or severely deforested in the next few years if the current natural resource use patterns continue. The National Research Council (1993) and Navarro and Reyes (1999) cited in Tejada et al. (2000) state that the loss of forests in the upper reaches of the Dos Novillos Watershed is especially concerning since this region is essential for supplying the water that supports the area's fragile ecosystem. Furthermore, these sources contend that water from this region is used and consumed by the growing communities in the middle section of the Watershed (including the rural communities and parts of the urban communities). Therefore, it appears that the range of environmental services provided by the forest ecosystem in the Dos Novillos Watershed is critical to sustaining both the natural resources (e.g. ground water, Dos Novillos River, soils, carbon recycling, biodiversity) and the rural and urban communities that depend on these resources (e.g. aquifers for potable water; Dos Novillos River for recreation, livestock, irrigation, and fishing; soils for agriculture; biodiversity for ecological balance).

Although the upper section of the Watershed is located within the boundaries of the Cordillera Central Forest Reserve, it is still threatened by illegal logging practices. As mentioned above, deforesting the upper section of the Watershed is predicted to have devastating effects on the natural resources and the people who depend on them. Loss of biodiversity is also a problem in this area as intensive hunting is suspected to have greatly reduced the wild boar population, causing jaguars to come down from their habitat in the mountains to hunt livestock (E. Chinchilla, Personal Communication June 2004).

DOS NOVILLOS WATERSHED – COMMUNITIES

An estimated 7,000 people live the Dos Novillos Watershed (Navarro and Reyes 1999 in Tejada and Castro 2000). Approximately 1,000 live in the rural, farming community of La Argentina, and about 6,000 live in the more urbanized area made up of the towns of Pocora, Pocora Sur, El Carmen, El Carmen Sur, and Las Mercedes. Generally speaking, the people that live in the rural areas are dedicated to small to medium scale agricultural production. The urban population works on agricultural plantations or in the local public and private sectors, and some people own cattle and grazing land located in the rural agricultural area (Navarro and Reyes 1999).

According to a recent study by UNIMER Research International (UNIMER 2003), Guácimo County, where the Dos Novillos Watershed is located, is ranked 72 out of the 83 counties in Costa Rica on development and vulnerability indices (the 83rd county being the most vulnerable). Ninety-six percent of the families in Guácimo are categorized

as low income, with 20 percent of households lacking two or more basic needs (e.g. housing, basic hygiene, nutrition, education). Pugh and Sarmiento (2004) have found that people who are unable to meet their basic needs will be pushed to exploit natural resources for short-term survival and are less likely to be able to make short-term sacrifices in order to receive long-term gains.

According to Yglesias et al. 1996 in Navarro and Reyes (1999) and UNIMER (2003), the main problems that people in the Dos Novillos Watershed's rural areas face are: poverty; poor road quality; lack of information regarding the commercialization of their agricultural products; lack of medical services; poor access to credit; and a lack of reforestation programs. In the urban areas, main problems appear to include: drug addiction; unemployment; violence and crime; low salaries; lack of affordable housing; and poverty (UNIMER 2003).

According to Guerrero (1996) and Navarro and Reyes (1999), the community in the middle section of the Watershed (La Argentina, which marks the southernmost boundary of this study area) is comprised mostly of small to medium sized farms (1.5 to 45 ha farms with an average of 9.7 ha). Farmers in this area typically rely extensively on cattle production. Coffee, heart of palm, cacao, and roots and tubers are also grown at the small or medium scale. Data from the National Research Council (1993) cited in Navarro and Reyes (1999) shows that farmers in this region are using lands primarily comprised of deforested, tropical soils which are no longer adequately protected from the erosive effects of rainfall. If this land is not properly managed, its utility may be greatly reduced

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and farmers may ultimately be forced to abandon crop and pasture land in search of new areas to farm.

An expanding agricultural frontier as well as the accompanying devastation on tropical forests is a worldwide phenomena and the Atlantic region of Costa Rica is especially vulnerable in this regard due to its high rate of poverty and its predominantly agricultural economic focus (both subsistence and commercial). Clay (2004) states that evidence suggests that the greatest amount of environmental damage in both developing and developed countries may result from small-scale farmers' use of poor soils and their lack of information about, and access to, sustainable farming methods and technologies.

Adding to this concern, Navarro and Reyes (1999) say that the growing population in the lower, urban areas of the Watershed (6,000 people) is putting ever greater pressure on local natural resources by: an increased demand on the water supply; the unplanned expansion of urban areas onto potential agricultural land; the increased contamination of streams due to a lack of sewage treatment; an increase in impervious surface runoff; and inefficient waste management techniques. Pugh and Sarmiento (2004) state that just as the rural poor are more likely to resort to resource exploitation in order to meet their survival needs, the urban poor are less likely to take a proactive stance to limit natural resource degradation, especially if it would require them to make financial sacrifices.

METHODOLOGICAL FRAMEWORK

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Data collection for this project was carried out using a multiple methods approach with the goal of thoroughly understanding local citizens' perspectives regarding natural resource management (including impacts, problems, and potential solutions) and identifying their willingness to support and participate in natural resource management initiatives. Researchers propose that this multiple methods approach will allow them to more fully understand community members' perspectives about natural resource issues than would be possible using only a survey questionnaire or just one qualitative method. The project's approach builds on literature that suggests the use of qualitative methods when in-depth data is sought (Patton 2002), and the use of more than one qualitative method to help investigators answer their research questions in a more thorough and accurate manner (Patton 2002, Strauss and Corbin 1998) and to compensate for possible bias caused by the unwillingness of some participants to disclose sensitive information during focus group sessions (Kaplowitz 2000, Knodel et al. 1990). To accomplish this, the research project is specifically designed to allow for preliminary, generalized issue scoping via multiple small-group discussions, followed by in-depth, private, individual discussions about key issues (Patton 2002, Strauss and Corbin 1998). Researchers intend that achieving a greater understanding of local community perceptions regarding natural resource management issues will directly influence the effectiveness of future sustainable development initiatives in the Watershed (Sen et al. 1997, James et al. 2000, Adegbedi et al. 1999, Hinchcliffe et al. 1995, Rhoades 1998). Toward these ends, Phase I (focus groups) was undertaken in June and July 2004 and Phase II (individual interviews) took place in July and August 2004.

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QUALITATIVE RESEARCH

While there are many different ways to practice qualitative research, the term can be defined simply as "...any type of research that produces findings not arrived at by statistical procedures or other means of quantification" (Strauss and Corbin 1998, 10-11). Some researchers would modify this strict definition, however, by pointing out that quantitative analysis is often carried out on qualitative data as a supplement to the qualitative analysis (Patton 2002).

In the social sciences, it is generally understood that qualitative research allows for an in-depth and detailed study of individuals' thoughts, feelings, perceptions and ideas (Patton 2002, Rubin and Rubin 1995, Strauss and Corbin 1998). This tradition, which accepts that different people and groups have diverse perceptions, views, value systems, and constructions of reality, and aims to collect data in the form of rich descriptions told in research participants' own words, is often set in contrast to the positivist tradition of carrying out research under the assumption that there is one reality that exists regardless of people's different perceptions (Holliday 2002, Rubin and Rubin 1995).

Patton (2002) describes three kinds of qualitative data that researchers use to try to understand their research participants' reality: interviews; observations; and document review. Regardless of the kind or combination of data gathered, these methods will allow the researcher to gain a level of understanding that is not possible through quantitative methods alone. Patton (2002) points out that the level of detail gained through qualitative research also has the potential to effect political change in a way that quantitative data

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often cannot do on its own. He states that decision-makers may simply dismiss unfavorable questionnaire results as inaccurate and biased, but cannot so easily ignore the points of view, emotions, real life situations, problems, and concerns revealed by people's own words. While researchers do not plan to take the results of this study directly to public officials, researchers do intend for the findings to be useful to Watershed communities and EARTH's Community Development Program in their efforts to develop watershed management plans. Therefore, the level of detail associated with qualitative methods would be important to this planning process.

While quantitative data collections are systematic, succinct, and relatively straightforward to analyze, qualitative data is typically voluminous, hard to summarize, and difficult to analyze. Despite the difficulties of working with qualitative data, "...the open-ended responses permit one to understand the world as seen by the respondents. The purpose of gathering responses to open-ended questions is to enable the researcher to understand and capture the points of view of other people without predetermining those points of view through prior selection of questionnaire categories" (Patton 2002, 20-21).

In order to achieve these goals, qualitative research usually involves working with small sample sizes (even a single case can constitute the sample) that are selected purposefully. Purposeful sampling is done in an attempt to gain the most in-depth accounts and the most pertinent information possible from each research participant. This is in contrast to quantitative research sampling procedures, which are typically carried out by randomly selecting large sample sizes (N=30 being the minimum number required to qualify as a

large sample) in order to achieve statistically significant (generalizable) findings (Patton 2002).

Grounded Theory

Qualitative researchers such as Strauss and Corbin (1998) and Patton (2002) discuss the typical problem in which researchers begin their study with such strong preconceptions and theories based on what they have read and heard, as well as their own experiences, that they are not able to truly hear or understand the people they are interviewing. Strauss and Corbin (1998, 12) contend that the researcher should instead "...allow the theory to emerge from the data".

This 'grounded theory' approach is used to inductively generate theory that "...emerges from the researcher's observations and interviews out in the real world rather than in the laboratory or the academy" (Patton 2002, 11).

"Flexibility and openness are linked with having learned to sustain a fair amount of ambiguity. It is not that the researchers do not want to pin things down analytically, but the urge to avoid uncertainty and to get quick closure on one's research is tempered with the realization that phenomena are complex and their meanings are not easily fathomed or just taken for granted....In doing the research, they enjoy the flow of ideas, but not merely the substantive ones, as they have learned that theoretical ideas have their own precious value. Yet, they are skeptical of established theories, however enticing they might seem, unless these

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eventually are grounded through active interplay with the data” (Strauss and Corbin 1998, 6).

MULTIPLE METHODS

Research literature suggests that the use of more than one method can help investigators answer their research questions in a more thorough and accurate manner (Patton 2002, Strauss and Corbin 1998). This research uses two complementary qualitative methods to learn about people’s perceptions regarding natural resource management in their communities. This multiple methods approach involves first carrying out generalized issue scoping (focus groups) and then conducting in-depth, individual discussions (individual interviews) about key issues that were highlighted during the scoping process.

Data collection for this project was carried out using a mixed methods approach with the goal of thoroughly understanding local citizens’ perspectives regarding natural resource management (including impacts, problems, and potential solutions) and identifying their willingness to support and participate in natural resource management initiatives. It was proposed that a mixed methods approach would allow for a full understanding of community members’ perspectives about natural resource issues. The approach was designed to allow for preliminary, generalized scoping via multiple small-group discussions to be followed by in-depth, private, individual discussions about key issues (Patton 2002, Strauss and Corbin 1998).

Triangulation

It is widely accepted that using multiple methods strengthens a study through triangulation (Patton 2002). The term, 'triangulation' originates from land surveying and is used in research in order to increase validity by employing methods that have, "...non-overlapping weaknesses in addition to their differing strengths" (Brewer and Hunter 1989 in Patton 2002, 248).

Patton (2002, 247) lists the following four kinds of triangulation that were identified by Denzin (1978): 1) data triangulation; 2) investigator triangulation; 3) theory triangulation; and 4) methodological triangulation (e.g. mixed methods). While employing some form of triangulation is ideal, it can also be expensive and time consuming, therefore it is critical for researchers to use the kind of triangulation that is most feasible as well as appropriate for their particular research.

FOCUS GROUPS

A focus group is a qualitative data collection method used to generate a discussion among a small group of people (usually 6-10 participants and a trained moderator) about a particular issue, event or subject. Patton (2002) specifies that a series of focus group sessions are often held in order for a researcher to hear a number of different perspectives. Morgan (1998) points out that focus groups can be used alone or as a compliment to other qualitative and quantitative methods.

Knodel et al. (1990) emphasize the distinction between 'focus group discussions' and 'group interviews'. While a group interview is conducted using a closed-ended

questionnaire with the goal of obtaining factual information (a group of people are interviewed together in case one person cannot provide the information requested), a focus group discussion is conducted using open-ended topical guidelines or questions with the goal of stimulating conversation among the participants in order to bring out perceptions, opinions and in-depth stories about the subject of interest.

It is commonly believed that focus group discussions offer the researcher the opportunity to go beyond simply learning from individuals' knowledge, and to benefit from insights that are arrived at through the group discussion (Brown, Collins, and Duguid 1989 cited in Patton 2002, 40).

While some researchers have found that people divulge more detail in the group setting than they are willing to share during individual interviews due to feelings of embarrassment or vulnerability (Patton 2002), Kaplowitz (2000) cited in Patton (2002) found that sensitive topics were more likely to be discussed in individual interviews than in focus groups. The fact that it is difficult for a researcher to determine whether or not research participants are being forthcoming during focus group discussions is yet another reason to triangulate (by using mixed methods) in order to reduce bias. Similarly, Knodel et al. (1990) discussed the potential bias that can arise during focus group discussions due to social pressures that may prevent participants from disclosing their true opinions. Recognizing the limitations of focus group discussions, Krueger (1994) cited in Patton (2002, 387) says, "The focus group is beneficial for the identification of major themes, but not so much for the micro-analysis of subtle differences."

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INDIVIDUAL INTERVIEWS

Another qualitative data collection method is the in-depth, open-ended individual interview. According to Schensul et al. (1999), open-ended interviewing is the most technically difficult, yet rewarding and exciting interview method. Patton (2002, 341) states that the purpose of interviewing individuals is to “...allow us to enter into the other person’s perspective. Qualitative interviewing begins with the assumption that the perspective of others is meaningful, knowable, and able to be made explicit. We interview to find out what is in and on someone else’s mind, to gather their stories.”

When administered well, open-ended individual interview questions result in extremely detailed responses about people’s perceptions, experiences and opinions. Ideally, the actual data is in the form of verbatim transcriptions, and when this is not possible, the interviewer or an assistant takes detailed notes during the interview. The transcriptions and notes are then organized by themes, interpreted and analyzed through content analysis, and findings are illustrated using representative quotes (Le Compte and Schensul 1999, Patton 2002).

Patton (2002, 342) describes three different approaches to conducting open-ended, individual interviews: 1) the informal conversational interview; 2) the general interview guide approach; and 3) the standardized, open-ended interview. While the informal approach is totally spontaneous and the general interview guide approach employs a list of general topics for discussion, the standardized, open-ended approach involves using a carefully worded interview guide so that the same questions can be asked in the same

way to all of the respondents. In addition to limiting bias potentially caused by varying the question language, this approach also helps the interviewer to use time efficiently by focusing the interview and making it easier to stay on track. Bernard (1995) makes the distinction that despite being called 'standardized' and helping to reduce variation among the interviews, this approach does not, however, limit the researcher's flexibility to follow new lines of questioning that might arise during an interview. He classifies this type of interview as 'semi-structured' and says, "The interviewer still maintains discretion to follow leads, but the interview guide is a set of clear instructions..." (Bernard 1995, 210).

RESEARCH DESIGN

This project was designed to combine qualitative data collections. The qualitative data collections were carried out by conducting document review, focus groups, and individual interviews. With this approach, each data collection was used, together with the literature, as a basis for the development of the next phase.

In this case, exploratory focus groups were conducted first in order to gain a general idea about the natural resource issues concerning watershed residents. Findings from these focus groups were used to develop the discussion guide for another round of focus groups that were carried out in order to better understand the issues, problems, concerns, attitudes, and perceptions of adult residents. The second round of focus groups represents Phase I of this study.

Phase I data was then analyzed in order to develop the individual interview guide for Phase II. In this issue clarification phase, key issues that came up during the focus group sessions were investigated in greater detail in order to find out if purposefully selected residents had the same or different kinds of concerns as the focus group participants. Phases I and II were completed in August 2004.

POPULATION AND STUDY PARTICIPANTS

The Dos Novillos Watershed is about 5,100 hectares in size. Although a government census has not been completed in Guácimo County since 1995, EARTH University estimates that the principal communities in the Watershed have a total population of about 7,000, therefore there are fewer than approximately 1,750 households in the research area (Navarro and Reyes 1999 in Tejada and Castro 2000). The target population for Phase I and Phase II was adult residents from the middle and lower sections of the distinct geographic areas (e.g. pre-mountain and lowland) and representative residential densities (e.g. rural village, large town [called an urban area in this thesis], small-medium sized farm) in the Watershed.

In Phase I, participants were initially contacted via community leaders who were recommended to the researcher by EARTH University representatives. Six to seven residents participated in each focus group and a total of 39 participants took part in six completed sessions. In Phase II, participants were selected by the researcher through purposeful sampling (Patton 2002). A total of 27 adult residents completed in-depth interviews.

INFORMED CONSENT

The researcher used an informed consent procedure approved by the University Committee on Research Involving Human Subjects (UCRIHS) of Michigan State University. Focus group and interview participants were advised verbally of their rights as research participants, including their right to confidentiality and their right to withdraw from the study at any time without prejudice (see Appendix 1). The researcher conducted the interviews, took written notes and also tape-recorded the sessions when consent was obtained from participants. All research participants' identities are confidential and each participant was given a code number for transcription and reporting purposes.

PHASE I – FOCUS GROUPS

Upon arrival to the research site, the researcher spent 10 days better orienting herself with the Dos Novillos Watershed, meeting with people who have conducted previous research and project work in the research area, reviewing maps and reports, and organizing the focus groups. She did this for two reasons.

First, before being able to organize the focus groups, the researcher needed to confirm exactly which communities and rural farms lie within the Watershed. It took longer than expected to confirm this information because many of the people that she spoke with (faculty members of EARTH University, community members, government officials) and sources that she reviewed (maps, previous research conducted in the Dos Novillos Watershed) used different definitions for a watershed, and/or had conflicting perceptions regarding the Dos Novillos Watershed's boundaries, regardless of the definition used.

After this initial investigation, the researcher confirmed that the communities that lie within the Dos Novillos Watershed are: La Argentina, Pocora Sur, Pocora (including a cluster of houses located outside the apparent northern town limit known as Mascota), and Las Mercedes. She also confirmed that these communities receive their potable water from two different sources, one of which is located in the Dos Novillos Watershed, while the other is located outside the Watershed's boundaries.

Second, in order to be able to select a sample population that is as representative as possible of the land uses and economic activities being carried out in the Watershed, the researcher wanted to familiarize herself with the rural and urban areas in order to understand the land use pattern and see first-hand what kinds of employment activities exist. Related to this second reason, the researcher also visited the water source for the rural aqueduct that she was told provides water to La Argentina and Pocora Sur – a feature of the watershed that she assumed would be discussed during data collection. Despite this effort to orient herself before starting data collection, the researcher continued to receive conflicting information regarding the boundaries of the Watershed and the communities within the research area, which prompted her to continue to consult individuals, documents and literature in an attempt to confirm the appropriate boundaries considering the research goals.

While in the process of conducting the second focus group session, she learned that the community of El Carmen (which is split into north and south sections by the road between San José and Limón) also receives its drinking water from the source inside the

Dos Novillos Watershed (in addition to La Argentina and Pocora Sur). Although this community is located on the edge of the Destierro River and would normally be considered to be outside the Dos Novillos Watershed boundaries, the researcher decided to include this community in the study since it receives its water from a source within the Watershed and thus has an impact on how the source is managed.

Discussion Guide Design

Based on a review of the pertinent literature (See Chapter 2), the results of exploratory focus groups that were carried out in the study area by Dr. Michael Kaplowitz from March-April 2004, and the researcher's general knowledge about the area's local natural resource management situation (e.g. two potable water sources administered by different entities, expansion of plantation agriculture into forested land, history of community conflict due to illegal deforestation) and institutional arrangements (e.g. Rural Aqueduct Committee, Community Development Committees), the researcher developed a draft focus group discussion guide that was submitted to UCRIHS in May 2004 and approved on July 7, 2004.

After spending 10 days confirming information at the research site and setting up the focus groups, the researcher made some small edits to the focus group discussion guide and sent the updated guide with justifications for edits to her advisor for approval. The final focus group discussion guide was approved (see Appendix 2) for use in the field.

Sample Selection Process

During this initial phase of orientation and observation of the study site, the researcher met with a staff member of EARTH University's Community Development Program who has direct, first hand knowledge of the Watershed and its rural communities. This staff member gave the researcher the names of community leaders that could help organize focus groups in La Argentina. Other EARTH staff members gave the researcher the names of community leaders in Pocora Sur, Pocora and Las Mercedes that could do the same in their communities.

The researcher contacted seven people (because of the extended area encompassed by the community of La Argentina, she decided to conduct three focus groups there – one in each of the upper, middle and lower regions of the community) by phone when possible, or in person to introduce herself and ask if she could meet with them to talk about the project in more detail. From July 9-11, she met with the community leaders in the following order: upper La Argentina, lower La Argentina, Pocora, Las Mercedes, and Pocora Sur. One of the community leaders in middle-La Argentina was out of town and another was unable to be reached at his home during that week, so the researcher met with one of these leaders the following week in order to schedule the focus group in that community.

In each case, the community leaders said they felt that the research project was important and that they would help organize a focus group in their community. The researcher explained that it would be important to organize a group of 6-8 people that was made up

of men and women representing diverse economic activities in order to be able to hear from members of the community that represent different opinions. She specifically asked that they not invite too many EARTH employees, simply because she wanted to hear from people that work in a variety of sectors. Also, since EARTH University's mission is built around sustainable natural resource management techniques, the researcher suspected that University employees might be more aware of natural resource management issues and problems than community members who do not work there, and she wanted to limit the bias that exceptionally well informed people could have on the data.

During each of these conversations, the community leader picked a date, time and location that he/she thought would work best for most people, taking into account the other community activities being organized for that week. These logistical decisions had to be changed, and invitations redone, on two occasions (middle La Argentina and Pocora Sur) when it was discovered that there was a conflict with the proposed date. In each case, the community leaders asked the researcher to print out 16-20 half-page invitations that they could distribute to members of their community (see Appendix 3). The community leaders said they needed to invite 12-16 individuals in order to ensure that 6-8 would attend and they said they needed to hand out the invitations 7-10 days before the proposed meeting in order to give people enough time to plan ahead and be able to attend. By July 15, the focus group schedule had been arranged and invitations had been distributed, except in the case of middle-La Argentina, which was scheduled the following week once the community leader had returned from a trip. While this focus

group sample selection procedure was efficient in terms of the amount of time the researcher invested in inviting community members to participate in the focus groups, it was not ideal due to the invitation bias of the community leaders, and the self-selection bias inherent in the focus groups' membership.

Focus Group Sessions

The focus groups were moderated by the researcher, who is fluent in Spanish and has received training in qualitative research methods as part of her graduate studies. She used a standardized, open-ended discussion guide (Patton 2002) to steer the conversation but was careful to use only non-directive prompts in order to guide the discussion and ask for clarification or more detail. Two of the sessions were held in outdoor, open-air structures on a participant's farm, three were held inside elementary schools, and one took place in a community center. Each group allowed the sessions to be recorded, and the sessions lasted 1.5-2 hours.

The researcher carried out the focus groups with the assistance of two EARTH University interns who helped the researcher set up refreshments and organize the seating while the researcher greeted and talked to people before the sessions began. They also helped the research take notes during the meeting.

After the first focus group session, the researcher made some slight adjustments (word choice, word order) to the interview guide in order to make the questions easier to

understand and to make them flow more naturally. The researcher also made these kinds of slight wording adjustments after the second and third focus group sessions.

Four of the six focus groups took place without any problems. The session in upper La Argentina had to be cancelled and reorganized for the following week because two unexpected community events taking place at the same time as the focus group prevented people from attending. The session held in Pocora Sur was interrupted when the researcher's car was broken into during the discussion. That focus group had to be rescheduled twice due to conflicting schedules and a national holiday and was completed two weeks after it was originally planned. The delay in completing this focus group session made it impossible to organize and conduct a focus group in El Carmen due to time constraints.

PHASE II – INDIVIDUAL INTERVIEWS

After analyzing the Phase I data, the researcher carried out Phase II in order to learn more about the issues participants had raised as important to their livelihood and natural resource management in the area. Specifically, the researcher wanted to find out if the concerns raised in the focus groups were actually widespread and salient throughout the Watershed. Researchers also wanted residents to discuss potential solutions to the problems they discussed.

Interview Guide Design

The researcher developed the Phase II individual interview guide based on the Phase I findings in conjunction with the pertinent literature (see Appendix 4). The researcher drafted the proposed questions and probes along with justifications for asking these questions. After receiving comments from a local co-PI on the project, she edited the interview guide and sent it to her advisor for review. After multiple iterations of some questions, the final standardized, open ended, in-depth interview guide was approved. The Phase II questions were consistent with the general themes that emerged during the focus group sessions, and they were oriented toward understanding these general themes in greater detail and finding out if there were other key themes that were not identified in the focus group sessions.

Sample Selection Process

The goal for Phase II was to complete 40 individual interviews with a diverse group of male and female heads of household throughout the study area, with a greater number of interviews in the more densely populated urban area.

In the urban area, the researcher purposefully sought male and female participants in the north, south, east, west and center of each community (see Figure 13). An attempt was made to interview adults working in the public and private sectors, as well as people who identify themselves as homemakers, unemployed, or retired.

Throughout the upper, middle and lower section of the rural community (which is situated on the slope of a mountain), the researcher sought out small to medium-scale producers of a variety of agricultural products, as well as landowners offering agro-ecotourism activities, and landowners who are employed off-farm (see Figure 12). Poor roads, long distances between farms, and lengthier than planned interviews all increased the time it took to conduct the interviews. As a result, there was not enough time to interview the desired number and diversity of respondents.

The researcher planned to conduct the 40 interviews with the following distribution: in the Urban Area - Las Mercedes: 4; Pocora: 7; Pocora Sur: 7; El Carmen: 4; El Carmen Sur: 4; Mascota: 2; and in the Rural Area - La Argentina: 12. This sample distribution was not intended to be representative of the population distribution between the rural and urban areas (which would have called for only six interviews in the rural area and 34 in the urban area). Rather, due to the perceived heterogeneity of the rural community because of its varied degree and type of interaction with the Dos Novillos Watershed as a result of the community members' distribution over a large geographical area and participation in a variety of different farm and off-farm economic activities, the researcher decided to interview four people in each of the three geographic regions of the community (upper, middle, lower).

Individual Interviews

In this phase of the project, the researcher interviewed 27 purposefully selected adults from different sectors of each of the communities. The interviews took 1-2 hours, and as

with the focus groups, the researcher used a standardized, open-ended interview guide (Patton 2002) and non-directive prompts to guide the conversation. All but two people allowed their interviews to be tape-recorded.

On August 7 and 8, before the researcher located someone to accompany her, she used the approved interview guide to conduct interviews in Pocora, El Carmen Sur and Las Mercedes. As mentioned previously, she selected participants in the urban area by trying to interview someone living in the north, south, east, west and center of town. By using this approach, the researcher aimed to interview people that live near the Dos Novillos River (except in the case of El Carmen since this community does not boarder the Dos Novillos), and people that live farther from it. She also aimed to interview people employed in the public and private sectors and a relatively equal number of men and women.

On August 8, the researcher located a person that was willing to accompany her on her trips and watch the vehicle while she conducted interviews. On August 9, she conducted interviews in Pocora. On August 10, she conducted interviews in Pocora Sur and Las Mercedes. After conducting 15 interviews in the urban area of the Watershed, the researcher calculated that she was running out of time to reach the total (urban and rural) sampling goal because each of the interviews was taking longer than expected. Due to the need to conduct interviews in the rural area, and because she found that she was receiving similar responses from residents in the urban area, she began to conduct interviews in the rural, farming community of La Argentina.

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The researcher selected participants in the rural area by using a hand-drawn map of the community that she had also used to divide the community into the upper, middle, and lower sections during Phase I. Within each of these sections, she asked permission to interview farmers that appeared to be carrying out different types of agricultural production (e.g. cattle, swine, plantains, coffee) or economic activities in general (e.g. agriculture, forestry, ecotourism), and of differing sizes. She successfully completed 10 interviews in La Argentina. One interview in the lower section of the community was interrupted and never completed because the research participant had to leave to attend to a family issue.

The researcher then returned to the urban area to conduct two interviews in the sector of Pocora called Mascota because watershed residents had told her that Nicaraguan immigrants live there, and she wanted to know if they had different perceptions than their Costa Rican neighbors. She also attempted to conduct an interview with a business owner in El Carmen, but that interview was interrupted when a client came to the research participant's office. The researcher concluded Phase II on August 18 with a total of 27 completed individual interviews, and left the research area on August 19.

RESEARCH CONSTRAINTS

Problems that the researcher encountered were primarily related to the logistics of conducting interviews in difficult to access rural areas and in high-crime urban areas. Due to poor telephone service and bad road conditions in the rural area, it was extremely

difficult to make multiple attempts to interview a particular person. As a result, some intended research participants could not be successfully contacted in time to include them in the study. Also, by investing a lot of time in finding and coordinating with the potential participants, the researcher had limited time to conduct interviews.

The high incidence of theft and increasing occurrence of violent crime in the urban area made it necessary for the researcher to take a local chaperon with her when she interviewed participants. This caused some delays, as it was difficult to contact this chaperon when research plans had to be adjusted because she does not have a telephone. Also, because it was considered too dangerous for the researcher and chaperon to conduct interviews in the urban area after dark, the number of interviews that could be conducted, especially with men that work outside the home until late in the evening, was limited. Having a longer time-frame in which to complete the research would have allowed for more weekend visits, and thus, a better opportunity to interview male heads of household during the day.

QUALITATIVE DATA - ANALYTICAL APPROACH

As discussed previously, the purpose of conducting qualitative, social-science research is to achieve an in-depth, holistic understanding of certain aspects (depending on the research goals) of individuals, groups, organizations, communities or societies (Miles and Huberman 1994). This requires the researcher to be able to make sense of large amounts of data typically gathered from interviews, observations, and document review (Patton 2002). Contributing to the daunting nature of the task is the fact that there is no

standardized formula for carrying out qualitative research, leaving it up to the researcher to draw from the many qualitative research traditions and find the analytical approach that is most suitable to the study's purpose.

CONTENT ANALYSIS

While Patton (2002) points out that there is no exact, agreed-upon way to describe how to carry-out qualitative analysis, he suggests that the term 'content analysis' can be used to generally describe "...any qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings" (Patton 2002, 453). He goes on to state that the content of interviews and observations is analyzed in order to find out what is significant given the research goals. Specifically, it "...involves identifying, coding, categorizing, classifying, and labeling the primary patterns in the data" (Patton 2002, 463).

One methodology for carrying out content analysis is 'grounded theory'. Strauss and Corbin (1998) describe the process of using this methodology, which is based on iterative qualitative analysis using three coding techniques: open coding; axial coding; and selective (thematic) coding, in order to create and compare categories and subcategories, and then integrate them to form theories. The process begins with "Microanalysis: the detailed line-by-line analysis necessary at the beginning of a study to generate initial categories (with their properties and dimensions) and to suggest relationships among categories..." (Strauss and Corbin 1998, 57).

Open Coding

Strauss and Corbin (1998, 101) define open coding as: “The analytic process through which concepts are identified and their properties and dimensions are discovered in data”. Rubin and Rubin (1995) describe the same process by explaining how Herbert Rubin reads through the transcriptions marking each concept or explanation of a concept with a code. Strauss and Corbin (1998) emphasize that open coding is used to develop categories and understand their properties. As the researcher is carrying out open coding, she should also be making axial coding notes that will be revisited in an ongoing and repeated process.

Axial Coding

“The process of relating categories to their subcategories, termed ‘axial’ because coding occurs around the axis of a category, linking categories at the level of properties and dimensions” (Strauss and Corbin 1998, 123). The term, ‘properties’ refers to the characteristics of a category (e.g. themes related to waste management problems) and ‘dimensions’ refers to the range of properties in a given category (e.g. wastewater, household waste, dead farm animals, recyclable materials, and the range of problems related to each one of these themes). Rubin and Rubin (1995) describe this process by explaining how Herbert Rubin examines the concepts he previously established (using open coding) by analyzing

the themes and concepts within each category as well as among the different categories. After all of the categories have been analyzed and compared, the researcher selects a final set of overall themes through selective (thematic) coding.

Thematic Coding

Strauss and Corbin (1998, 143) describe this coding procedure as, "...the process of integrating and refining theory". Once the themes and concepts (based on open and axial coding) have been placed into a smaller number of overarching thematic categories (selective codes), they contend that the emerging findings can become theory. Rubin and Rubin describe this process as the "final stage of analysis" (1995, 251) and explain how after going through the first two stages (described above under open and axial coding), they aim to "build toward overarching themes" (1995, 251) that "tie the individual pieces together" (1995, 255) and allow the researchers to report their results.

Without citing a specific methodology, Rubin and Rubin (1995) describe an analytic process similar to that of Strauss and Corbin (1998): "Our approach to analyzing data parallels Spradley's (1979) and Strauss's (1987) systems but accommodates the particular type of research we do. We each read and reread the interviews to note core ideas and concepts, recognize emotive stories, and find themes. We code the material to group similar ideas together and figure out how the themes relate to each other. To reflect the

distinct nature of the material we collect, each of us uses different coding techniques that vary in detail from Spradley's and Strauss's approaches" (Rubin and Rubin 1995, 229).

Miles and Huberman (1994) also describe using three types of coding techniques in order to break the data down into meaningful and manageable pieces: "descriptive codes", "interpretive" and "pattern codes" (Miles and Huberman 1994, 57). They give special emphasis to pattern coding because, "Just naming or classifying what is out there is usually not enough. We need to understand the patterns, the recurrences, the plausible whys" (1994, 69). To do this, they recommend first summarizing pieces of data and then placing these summarized pieces into groups or themes. They relate this qualitative technique to the quantitative technique of statistical cluster analysis.

While the literature makes it clear that the research project's purpose and the researcher's epistemology and theoretical perspective will determine exactly how content analysis will be carried out, Patton's (2002) explanation of inductive and deductive qualitative analysis helps to clarify the purpose and usefulness of these two approaches to analysis. Simply put, in inductive analysis, "...findings emerge out of the data...in contrast to deductive analysis where the data are analyzed according to an existing framework" (Patton 2002, 453). Although different types of analysis are typically labeled either inductive or deductive, Patton (2002), Strauss and Corbin (1998), and Natasi (1999) point out that qualitative analysis often combines the two. They explain that researchers that aim, "...to define the phenomenon of interest purely from the perspective of those being studied..." (Natasi 1999, 29) begin the coding process inductively by letting the coding categories

develop or evolve out of the data (e.g. open coding as defined by Strauss and Corbin 1998). After the themes and categories are established, the analysis can then become deductive as the researcher compares what she has found with the literature, her hypothesis and/or contradictory data from the same research project. This approach is often used to generate theory (e.g. the purpose of grounded theory) or findings. This inductive-to-deductive approach could be reversed by someone conducting “analytic induction” (Patton 2002, 454). In this case, the goal of the research would be to verify a theory, and the approach is to look at the data, “in terms of theory-derived sensitizing concepts or applying a theoretical framework developed by someone else” (Patton 2002, 454). Either at the same time, or after the deductive analysis is complete, the researcher would then try to find new and different understandings in the data by analyzing it inductively.

Regarding when to begin analysis, Rubin and Rubin (1995), Strauss and Corbin (1998), Miles and Huberman (1994), and others advise that unlike quantitative analysis, qualitative analysis should begin in the field, while data collection is ongoing. They point out that researchers should pay attention to the themes and patterns that seem to be taking shape during data collection, however, they should not do so to the point that they will be distracted from data collection tasks. Paying attention to the emerging themes during data collection allows researchers to learn about important issues that they were not aware of, or it could reveal that a theme thought to be key is really not as important to the study as originally believed (or visa versa). Depending on the research design and purpose, it may

be necessary for a researcher to modify her data collection instrument or methods based on the results of in-field analysis.

After fieldwork has been completed because the sampling goal has been met, research themes have become “saturated” (Strauss and Corbin 1998, 136), or simply because research constraints impede further data collection, Patton (2002) advises that before attempting to begin post-fieldwork analysis, field notes should be reviewed for completeness and re-typed, and recorded interviews listened to and transcribed verbatim.

Since there are strengths and weaknesses to every qualitative analysis approach, researchers must use the approach and techniques that are most appropriate for the purpose of their study. Miles and Huberman emphasize that what is important is that researchers be explicit about the methods they use and that these methods must be, “...credible, dependable, and replicable in qualitative terms” (Miles and Huberman 1994, 2).

QUALITATIVE DATA ANALYSIS

The researcher analyzed Phase I data by carrying out the following steps: 1) Review of field notes and tape recordings of the focus group discussions; 2) Transcription of focus group recordings into MS Word © files; and 3) Print out and iterative, hand coding of transcriptions. Phase II data was analyzed in the same way, and also included: 4) Entry and analysis of individual transcriptions using Ethnograph © qualitative analysis software.

While the researcher used the same iterative, analytical framework (Strauss and Corbin 1998, Rubin and Rubin 1995) to analyze the focus group and individual interview data, due to the different nature of each data collection, the processes used to analyze each set of data varied slightly.

PHASE I - FOCUS GROUPS

The goal of this phase of analysis was to learn from the community members about their environmental realities vis-à-vis their perceptions regarding watershed and natural resource management in their community. By doing so, the researcher aimed to be able to find out what themes should be discussed in greater detail in the next phase of research (individual interviews).

After completing each focus group, the researcher reviewed her notes and the recorded discussion. This was done immediately after the focus group sessions in order to ensure that her notes were understandable and complete and that the recording was audible. In the event that the recording was not audible, she would have expanded her notes while the discussion was still fresh in her memory. This pre-transcription review of the data allowed the researcher to note the themes and concepts that were emerging from the data as it was collected (Miles and Huberman 1994).

The researcher hired two Costa Rican, native Spanish speakers to transcribe each of the completed focus group sessions verbatim. As she received the transcriptions, the researcher carried out microanalysis (Strauss and Corbin 1998) by reviewing the

document and then conducting what Strauss and Corbin (1998) describe as open and axial coding by hand.

Due to a number of delays in completing the focus group sessions, and the slower than expected transcription-time (due to inconsistent sound quality), the researcher had to begin selective (thematic) coding on each completed transcription before having received all six focus group transcriptions.

Coding Procedure

Although the purpose of the Dos Novillos research project was not to develop theory (the main emphasis of Strauss and Corbin's 'grounded theory' approach), the researcher found the iterative and comparative technique to be helpful in trying to gain an in-depth understanding of community members' perceptions about natural resources and natural resource management in their watershed.

The researcher began the coding process by carrying out microanalysis (Strauss and Corbin 1998, 57) on focus group transcriptions by carefully considering each line of data and conducting open and axial coding. "It is through careful scrutiny of data, line by line, that researchers are able to uncover new concepts and novel relationships and to systematically develop categories in terms of their properties and dimensions" (Strauss and Corbin 1998, 71).

Open and Axial Codes

The researcher developed the open and axial codes by carefully reading through the focus group transcriptions and using a code to mark the words, phrases or larger sections of texts (one or more paragraphs) that related to the study questions or seemed important to the respondent/s because the concept was repeated or emphasized and/or because it seemed particularly out of place to the researcher, indicating that she might be missing something crucial and should look into this concept further (Strauss and Corbin 1998, Rubin and Rubin 1995).

The initial plan was to open code all of the transcriptions before carrying out axial and then thematic coding, however, after the researcher conducted open coding on the first transcription, there was considerable lag-time between receiving the next focus group transcription. Due to a time constraint for analyzing the focus group data, the researcher decided to conduct open and axial coding sequentially on each transcription as it was received. For example, instead of coding each different concept first, then going back through the transcriptions and grouping them into the subcategories as a separate, second step, as the researcher coded each transcription, she compared and contrasted all of the different properties and characteristics of the categories (e.g. different threats to well-being in urban/rural area) and grouped the individual concepts into the subcategories (e.g. Threats to Well-Being in the Rural Area) in one step. As she received each transcription, she repeated the process again using the same list of open codes established and added to during the analysis of each subsequent transcription. When new codes were used, they were added to the list and the previously coded transcriptions were reviewed again to

code for the new concepts. Please refer to Figure 2 for an example of open and axial coding.

Thematic Codes

After reviewing, coding and re-coding all of the focus group transcriptions, a total of 140 open/axial codes were established (see Figure 3). Although another set of codes was not explicitly developed as part of a second step (as explained previously), after identifying, coding, and cross-referencing all of the concepts raised during the focus group sessions, the researcher then grouped the concepts together using 10 focus group discussion question topics as the headings, and placed the concepts under the subcategories, urban or rural, so that she could compare and contrast them in order to gain a more in-depth understanding of their significance to the research questions (Rubin and Rubin 1995). Because of the interconnected nature of the concepts, using the discussion guide questions to organize the concepts by topic was critical to the researcher's ability to then place the concepts into subcategories and continue to compare and contrast the data. Using these thematic areas simplified the process of analyzing the respondents' perceptions regarding each of the issues mentioned or discussed in-depth during the focus group sessions. This stage of analysis made it possible for the researcher to understand which issues seemed to be most important for further investigation in Phase II. Please refer to Figure 4 to see a list of the thematic codes used and Figure 2 for an example of thematic coding.

As the researcher analyzed the thematic data related to each of the 10 overarching themes, she wrote up summary sheets for each theme and described similarities and differences found in the urban and rural areas. The researcher used these summary sheets to generate findings and determine what to ask community members during the individual interviews.

PHASE II - INDIVIDUAL INTERVIEWS

The goal of this phase of analysis was to learn more about the key issues that were discovered through the analysis of the focus group data and find out if these issues and concerns were widespread and salient. The researcher also wanted residents to tell her about potential solutions to the problems they raised and indicate whether or not they were willing to support initiatives like the ones they mentioned.

Since the individual interviews were conducted at a much faster pace than the focus group sessions, there was not time for the researcher to completely review her notes or the audio recording immediately after each interview. Rather, the researcher reviewed her notes and the recordings in the evenings, after the day's data collection was complete. This gave her the opportunity to review her notes, but did not allow her time to listen to all of the recorded interviews (given that there were six or more hours of interviews taped on most days). The researcher did skim the recording of each interview, mostly in order to test for audibility, but this also gave her the opportunity to replay each of the day's interviews in her head and helped her start forming a list of themes and concepts as they emerged from each interview (Miles and Huberman 1994).

The researcher hired the same two people who had transcribed the focus group discussions to transcribe the individual interviews. Due to poor sound quality on some of the recordings, the transcriptions were completed slowly and the researcher had received only a quarter of the transcriptions before completing data collection and leaving the research site. After the recorded interviews were transcribed and the transcriptions reviewed, the tapes were destroyed.

As required by UCRIHS, the researcher took her interview recordings with her when she left. Upon returning to Michigan, the researcher converted the audio recordings to digital files and sent them via DHL to EARTH University, where the transcribers each took half of them and continued to transcribe. The transcribers emailed the researcher each transcription as soon as it was completed and the researcher ultimately received a total of 357 single-spaced pages of transcriptions (two of the 27 respondents did not allow their interview to be recorded).

As the researcher received transcriptions by email, she carried out the same microanalysis process described previously (Phase I - Focus Groups) by reviewing the document and then conducting open and axial coding by hand (Strauss and Corbin 1998, Rubin and Rubin 1995). Again, due to the delay in receiving all of the transcriptions, the researcher began selective (thematic) coding (Strauss and Corbin 1998) on the completed transcriptions before having received all of the individual interview transcriptions. As she

received the remaining transcriptions, she reviewed them, carried out open and axial coding on them and then incorporated them into the selective (thematic) coding process.

Coding Procedure

As she had done previously with the focus group data, the researcher conducted microanalysis (Strauss and Corbin 1998, 57) on the individual interview transcriptions by carrying out open and axial coding.

Open and Axial Codes

The researcher developed the open and axial codes by carefully reading through the individual interview transcriptions and using a code to mark the words, phrases and sections of texts that stood out because of their relation to the research questions or because the researcher thought she should consider a concept in greater depth (Strauss and Corbin 1998, Rubin and Rubin 1995). While many of the open/axial codes the researcher used in this phase of coding were the same as codes she developed when she coded the focus group transcriptions, the researcher did not use the list of focus group codes as a basis for coding the individual interviews. Since she wanted to let the transcriptions speak for themselves instead of running the risk of unconsciously forcing the individual interview concepts and themes to match the focus group concepts and themes, the researcher inductively coded the individual interviews. Also, the researcher decided to code the individual interviews in Spanish (the language of the transcriptions) because she had found it difficult to code the Spanish-language focus group transcriptions

in English. For this reason, the actual individual interview codes (see Figure 5) are derived from Spanish words and thus do not seem to match their corresponding English (translated) meanings.

Since the researcher received most of the individual interview transcriptions one-at-a-time, and she was under a time constraint for analyzing the data, the researcher decided to repeat the process she had used to code the focus group transcriptions. She, therefore, conducted open and axial coding sequentially on each transcription as she received it. Whenever new codes were used, they were added to the list and the previously coded transcriptions were reviewed again to code for the new concepts. Please see Figure 8 for an example of open/axial coding.

Thematic Codes

After reviewing, coding and re-coding all of the focus group transcriptions, a total of 56 open/axial codes were established (see Figure 5). Since there was such a great deal of information and so much overlap among the concepts and themes, the researcher then used the interview guide as a basis for dividing up and recoding the already coded chunks of data into 38 (often overlapping) subcategory thematic codes (see Figure 6). After cross-referencing and re-coding all of the concepts and themes that came out of the individual interviews, the researcher then grouped the concepts together using nine overarching thematic codes (see Figure 7) that were based on the broad, overarching thematic sections of the individual interview guide. Please see Figure 8 for an example of thematic coding.

As was the case with the focus group data, the researcher found that using the interview guide questions to organize the coded concepts by topic was critical to her ability to understand the data as best she could. Using this two-stage thematic coding process made it easier to analyze the respondent's stated perceptions and suggestions regarding natural resource management in the Dos Novillos Watershed. This stage of analysis made it possible for the researcher to select the issues that appeared to require further investigation.

The researcher used the qualitative data analysis software, Ethnograph, to analyze the thematic data related to each of the 38 subcategory themes and nine overarching themes by loading the transcriptions and codes into the program and using it to generate memos for each of the 38 subcategory themes. The researcher used these summary sheets to compare and contrast the perceptions of each respondent, and to gain a more holistic understanding of the nine overarching themes in general.

ANALYSIS CONSTRAINTS

The initial coding plan for Phase I data was to open code all of the transcriptions before carrying out axial and then thematic coding, however, after the researcher conducted open coding on the first transcription, there was considerable lag-time between receiving the next focus group transcription.

Due to the inconsistent sound quality of most of the recordings, it took the transcribers longer than expected to complete each transcription. The sound quality varied throughout each recording depending on the location of the meetings. When sessions were held outside, the sounds of cicadas, frogs and chickens were sometimes deafening and when sessions were held in schools, the sounds of nearby activities sometimes interfered with the audibility of the group discussion (due to the hot, humid climate, there is no way to completely close a room, even if the door is shut). In addition to location-specific noise interference, many focus group participants were eager to share their views and the researcher had to work hard to keep them from talking all at once. Despite her best efforts, she could not always keep participants from talking at the same time and this also made it difficult for transcribers to interpret the audiotapes.

Again, with respect to Phase II data analysis, the transcription process proved to be much slower than anticipated, however, due to the high quality of the transcriptions she had received, the researcher decided that the transcribers were doing their best, and that inconsistent sound quality and the transcribers' professional schedules interfered with the timely completion of transcriptions. The researcher had selected the two people that she knew would do the best job possible, and as it turned out, she could not find anyone else that she thought could do the same quality work at a faster pace. The slow return of transcriptions meant that the researcher had only received a quarter of the transcriptions before completing data collection and leaving the research site. The recorded interviews that were yet to be transcribed presented a different problem.

As required by UCRIHS, the researcher took her interview recordings with her when she returned to Michigan. She had tried to have the recordings copied before she left so that she could leave the transcribers with a copy of the tapes that they would then return to her by mail after completing the transcriptions. Unfortunately, no device could be found at or near EARTH University that could copy a micro-cassette. Upon returning to Michigan, the researcher intended to copy the micro-cassettes and send them to the transcribers by courier. She encountered further delays when it became apparent that not even audiovisual stores in Lansing, Michigan had equipment for copying micro-cassettes. The researcher spent a great amount of time trying to copy the cassettes using a variety of methods, and ultimately found a software program that allowed her to transfer the recordings from the micro-cassettes into digital format.

This process was time-consuming and delicate because the researcher had to be present during the entire recording process in order to monitor the progress of the recording transfer. The software worked well, but the tape recorder had to be situated in a certain position in order to eliminate background noise (from the recorder playing) and when the sound level increased above a certain point, the researcher had to turn the volume down or the software would not pick up any of the recording at all. The researcher was frustrated by this process because of the time she invested in making the recordings and also because she then found that the files, even when converted to MP3 documents, were too large to send to the transcribers by email. The researcher saved the digital files onto labeled CDs and sent them via DHL to EARTH University, where the transcribers each took half of them and continued to transcribe. It should be noted that upon returning to

Michigan, the researcher considered paying a local person/people to transcribe the interview recordings, however, she realized that she needed to have native Spanish speakers familiar with Costa Rican slang and local colloquialisms transcribing the interviews. Additionally, the transcription budget was set at Costa Rican prices, and additional funds would have to have been allocated to transcription if the researcher hired a transcriber in Michigan. Since there was still another phase of fieldwork to be completed, the researcher was hesitant to use more project funds for transcription.

As with the focus group recordings, the individual interview recordings (although cleaned by the digitizing software) ranged in quality, mostly due to ambient noise. For example, in one case, someone was using a motor saw to cut down trees across the river from the respondent. Again, due to the delay in receiving all of the transcriptions, the researcher had to begin selective (thematic) coding (Strauss and Corbin 1998) on the completed transcriptions before having received all of the individual interview transcriptions.

The researcher's methodological and analytical implementation techniques and the results of data analysis are presented in the next chapter.

**NATURAL RESOURCE MANAGEMENT IN A
COSTA RICAN WATERSHED**

VOLUME II

By

Delanie Kellon

A THESIS

**Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of**

MASTER OF SCIENCE

Resource Development

2006

CHAPTER 4

IMPLEMENTATION AND RESULTS

INTRODUCTION

To learn about Dos Novillos community members' perceptions regarding natural resources and natural resource management in their community, focus group and individual interview data were analyzed (Rubin and Rubin 1995, Strauss and Corbin 1998). An iterative coding procedure (described by Patton 2003 as content analysis) similar to those described by Rubin and Rubin (1995), Strauss and Corbin (1998) and Miles and Huberman (1994) was used to identify key themes, consider these themes in relation and in comparison to each other, and to recognize patterns. This analytical process resulted in the research findings discussed below.

This chapter presents demographic information about the respondents, researcher observations on the implementation and conduct of the focus group sessions and the individual interviews, and the results of the data analyses. Representative quotes of themes as well as interesting points are presented as well. First, the participant demographics are presented for each phase of the research (focus groups and individual interviews), followed by a separate presentation of the focus group and individual interview analysis.

PARTICIPANT DEMOGRAPHICS

Data and analysis regarding participant demographics is presented here. First, there is a discussion of the demographic data collected from Focus Group participants (Tables 1-3). Next, there is a discussion of the demographic data collected from Individual Interview respondents (see Tables 4-8).

FOCUS GROUPS

Origin

Understanding where respondents are from can help investigators understand local land use practices, as well as attitudes and perceptions about natural resource management (Wang 2001). To this end, respondents were asked about their origin at the beginning of the interview.

Most focus group participants have moved to the study area from another location. As Table 1 shows, 85% of both the female and male respondents are migrants to the Dos Novillos Watershed. Of the total respondents, 33 (85%) are migrants to the study area, five (13%) were born and raised there and one (3%) is from unknown origin.

Of the 33 non-native respondents, half of them migrated from towns in Costa Rica's Atlantic region (Turrialba, Guacimo, Guapiles, Pocora, and Iroquois). A total of 41% came from the country's Atlantic region, with 21% from the Central Valley (San Jose,

Alajuela, Heredia), 21% from the Pacific region (Quepos and Guanacaste) and 1% from Southern Region (Perez Zeledon).

Residential Zone

The focus group participants were evenly distributed between rural and urban residents.

A total of 19 (49%) respondents were from the rural area and 20 (52%) were from the urban area. Four (80%) of the native respondents live in the urban area with one (20%) in the rural area.

Gender

The focus group participants were almost equally distributed with respect to gender. The data show that 18 (46%) of the respondents were female and 21 (54%) were male.

Table 1
Focus Group Respondents' Origin, Residential Zone and Gender

	Residential Zone				Total
	Urban		Rural		
	Male	Female	Male	Female	
Native	1	3		1	5
Migrant					
Alajuela		1			1
Guacimo		2	1		3
Guanacaste	2		1	3	6
Guapiles	1			1	2
Heredia	1				1
Iroquois		1			1
Perez Zeledon			1		1
Pocora	2				2
Quepos	1	1			2
San Jose	2		3	1	6
Turrialba		1	4	3	8
Unknown Origin	1				1
Total	11	9	10	9	39
Percentage	28%	23%	26%	23%	100%

Respondents' Years of Residency

The focus group participants varied in the length of their residency in the Dos Novillos area. As Table 2 illustrates, while 77% have lived in the study area for more than 10 years, this applies to more urban respondents (63%) than rural respondents (37%).

The respondents' average years of residency was 17, with an average of 29.2 in the urban area and 13.7 in the rural area.

Table 2
Focus Group Respondents' Years of Residency

		Years of Residency						Total
		1-10	11-20	21-30	31-40	41-50	51-60	
Urban	Male	1	4	2	3		1	11
	Female		2	4	1	1	1	9
	Group Total	1	6	6	4	1	2	20
		5.0%	30.0%	30.0%	20.0%	5.0%	10.0%	100.0%
Rural	Male	4	3	3				10
	Female	4	2	3				9
	Group Total	8	5	6				19
		42.1%	26.3%	31.6%				100.0%
Table Total		9	11	12	4	1	2	39
		23.1%	28.2%	30.8%	10.3%	2.6%	5.1%	100.0%

Respondents' Employment Type

It is evident from the literature that land use has a major impact on natural resource management (Sanchez-Azofeifa et al. 2002, Wang 2001). The literature also suggests that people will perceive their impact on their environment based on their practical experience as well as their level of formal or informal education about the subject (Soderqvist 2003). Therefore, asking respondents about the way they earn a living should help investigators interpret respondents' answers by considering how they interact with natural resources on a daily basis through their employment activities.

Responses were divided into four general categories: private sector; public sector; retired; and homemaker. The private sector has been further divided into the following specific

categories: employed non-farm; and farmer. Homemakers who are also employed outside the home are not included in the 'homemaker' category.

As Table 3 shows, most respondents were employed in the private sector. A total of 83% of respondents are employed in some kind of job outside of the home (80% in the private sector and 3% in the public sector), while 10% are homemakers and 8% are retired.

A total of 36% of all respondents are farmers, 44% are employed (non-farm) in the private sector, and 3% are employed in the public sector. Looking at the private sector alone, a total of 45% are farmers and 55% are employed (non-farm).

Most of the urban workers are employed in a private sector activity other than farming (75%), while 10% are retired, 5% are employed in the public sector, 5% are farmers, and another 5% are homemakers.

In the rural area, 68% of the respondents are farmers, while 16% are homemakers, 11% are employed in the private sector (non-farm), and 5% are retired.

Most female respondents work in the private sector with an equal percentage in both farming (33%) and non-farm employment (33%). A total of 22% of females are homemakers, 6% work in the public sector and another 6% are retired.

Most male respondents (52%) have non-farm private sector jobs, 38% are farmers, and 10% are retired.

Table 3
Focus Group Respondents' Employment Type

	Residential Zone				Total %
	Urban		Rural		
	Male	Female	Male	Female	
Farmer	1		7	6	14 35.9%
Private Sector (non-farmer)	9	6	2		17 43.6%
Public Sector		1			1 2.6%
Homemaker		1		3	4 10.3%
Retired	1	1	1		3 7.7%
Total	11	9	10	9	39 100.0%

Types of Agricultural Production

The importance of evaluating land use patterns to evaluate natural resource management practices, threats and opportunities (Sanchez-Azofeifa et al. 2002, Wang 2001) led investigators to ask respondents about their agricultural production activities.

Respondents in the rural area of the Dos Novillos Watershed described a variety of agricultural activities.

Of the 14 farmers, five (36%) grow heart of palm, four (29%) raise beef cattle, three (21%) raise tilapia, and three (21%) also grow coffee.

Tubers and fruit (rambutan, banana) are each grown by two (14%) farmers, and one farmer (7%) reported raising dairy cattle, pigs, and chickens, and growing each of the following: sugar cane; citrus; pejibaye; and medicinal plants.

All but two of the 14 farmers reported selling their products locally. The two exceptions were a beef farmer that sells his cattle at the livestock auction in Guapiles, and a fruit and vegetable grower that sells his citrus in Heredia and the rest of his fruit in San Jose. Three producers that sell their products locally added that they earn money from agrotourism or ecotourism carried out on their farms.

INDIVIDUAL INTERVIEWS

Origin

Most respondents have moved to the study area from another location. As Table 4 shows, **63%** of both the female and male respondents are migrants to the Dos Novillos **Watershed**. Of the total respondents, (63%) are migrants to the study area, (30%) were **born** and raised there and (7%) are from unknown origin.

Of the 17 non-native respondents, most of them migrated from towns in Costa Rica's **Atlantic** region (Turrialba, Guapiles, Iroquois, La Alegria Limon and Siquirres). A total of **53%** came from the country's Atlantic region, with 29% from the Central Valley

(Alajuela, Cartago, Heredia, and San Jose), 12% from the Pacific region (Parrita and Puntarenas) and 6% from Nicaragua.

Residential Zone

A total of 10 (37%) respondents were from the rural area and 17 (63%) were from the more populated urban area. As with the focus groups, all but one of the native respondents lives in the urban area. A total of 87.5% of the native respondents live in the urban area with 12.5% in the rural area.

Table 4
Individual Respondents' Origin, Residential Zone and Gender

		Urban			Rural			Total
		Male	Female	Total (Urban)	Male	Female	Total (Rural)	
Native	Native	3	4	7		1	1	8
	Total (Native)	3	4	7		1	1	8
Migrant	Alajuela					1	1	1
	Cartago				1		1	1
	Guapiles		1	1				1
	Heredia					1	1	1
	Iroquois		1	1				1
	La Alegria		1	1				1
	Limon				1		1	1
	Nicaragua		1	1				1
	Parrita					1	1	1
	Puntarenas		1	1				1
	San Jose		1	1	1		1	2
	Siquirres					1	1	1
	Turrialba	1	2	3	1		1	4
	Total (Migrant)	1	8	9	4	4	8	17
Unknown Origin			1	1		1	1	2
Total		4	13	17	4	6	10	27
Percentage Total		15%	48%	63%	15%	22%	37%	

Gender

The data show that 70% of the individual interview respondents were female. The researcher attributes this over sample of female community members to the time of day that she conducted interviews. While focus groups were conducted in the evenings (and received an almost equal number of male and female participants), individual interviews

were conducted during the day (when men tend to be at work outside the home) due to concerns of EARTH University security staff about the researcher's safety conducting individual interviews in the study area at night.

Respondents' Years of Residency

The individual interviews revealed that respondents varied in the length of their residency in the Dos Novillos area. As Table 5 illustrates, while more than half of the respondents (63%) have lived in the study area for more than 10 years, this applies to more urban respondents (71%) than rural respondents (50%).

Male respondents from the urban area have lived in the study area for a longer time than **those** in the rural area. In the urban area, all of the male respondents have lived in the **study** area for more than 30 years (24% of urban respondents), while no respondents from **the** rural area have live in the study area for more than 30 years. As discussed previously, **fact** that urban respondents have lived in the study area for a longer period of time than **rural** respondents could be explained by the IDA land distribution program and the **apparent** prevalence of migrants to the rural area.

In **both** the urban and rural areas, more female than male respondents have lived in the **study** area for more than 10 years. In the urban area, female respondents that have lived in the **study** area for more than 10 years represented 47% of respondents while male respondents represented 24% of respondents. Of the total rural respondents, 40% of **female** respondents and 10% of male respondents have lived in the study area for more than 10 **years**.

Some respondents that have lived in the area for more than 10 years show a more in-depth understanding of changes in the watershed's natural resource base. For example, long-time residents tended to be able to comment with greater detail about changes in river flow, water quality, groundwater quality, the amount of fish in the river, and the amount of forest cover.

The respondents' average years of residency was 23.5, with an average of 29.4 in the urban area and 13.4 in the rural area.

Table 5
Individual Respondents' Years of Residency

	Years of Residency							Total
	1-10	11-20	21-30	31-40	41-50	51-60	61-70	
Urban								
Male				1	1	2		4
Female	5	2	2	2		1	1	13
Total (Urban)	5	2	2	3	1	3	1	17
	29.4%	11.8%	11.8%	17.6%	5.9%	17.6%	5.9%	100.0%
Rural								
Male	3	1						4
Female	2	1	3					6
Total (Rural)	5	2	3					10
	50.0%	20.0%	30.0%					100.0%
Total	10	4	5	3	1	3	1	27
	37%	14.8%	18.5%	11.1%	3.7%	11.1%	3.7%	100.0%

Respondents' Employment Type

Responses were divided into four general categories: private sector; public sector; retired; and homemaker. The private sector has been further divided into the following specific categories: employed (non-farm); self-employed (non-farm); and farmer. Even though farmers are effectively self-employed, the distinction between “farmers” and “self-employed” is made in order to distinguish between the different relationships with, and impacts on, natural resources of these very different economic activities. Homemakers who are also employed outside the home are not included in the “homemaker” category.

As Table 6 shows, most respondents were employed in the private sector. A total of 67% of respondents are employed in some kind of job outside of the home (63% in the private sector and 4% in the public sector), while 30% are homemakers and 4% are retired. A total of 26% of all respondents are farmers, 19% are self-employed (non-farm), and 19% are employed in an activity other than farming. Looking at the private sector alone, a total of 41% are farmers, 29% are self-employed, and 29% are employed by someone else. Most of the private sector urban workers are self-employed in an activity other than farming (71%), and 29% are employed by someone else.

In the rural area, all of the respondents classified themselves as farmers or employees of other people. Most of the rural respondents (70%) are farmers, while 30% are employees of someone else. Most female respondents are homemakers. A total of 42% of females are homemakers, 21% are farmers, 16% are self-employed, 16% are employed by someone else, and 5% work in the public sector. Of the public and private sector

occupations that female respondents said that they work in, most are farmers.

Specifically, 36% are farmers, 27% are self-employed, 27% are employed by someone else, and 9% work in the public sector. Most male respondents (38%) are farmers, 25% are self-employed, 25% are employed by someone else and 13% are retired.

Table 6
Individual Respondents' Employment Type

		Urban			Rural				
		Male	Female	Total Urban	Male	Female	Total Rural	Total	
Private Sector	Employed (not farmer)	1	1	2	1	2	3	5	18.5%
	Self Employed (not farmer)	2	3	5				5	18.5%
	Farmer				3	4	7	7	25.9%
	Total (Private)	3	4	7	4	6	10	17	63.0%
Public Sector	Public Sector		1	1				1	3.7%
	Total (Public)		1	1				1	3.7%
Retired	Retired	1		1				1	3.7%
	Total (Retired)	1		1				1	3.7%
Home-maker	Homemaker		8	8				8	29.6%
	Total (Home-maker)		8	8				8	29.6%
Total		4	13	17	4	6	10	27	100.0%

Types of Agricultural Production

While seven out of the 10 rural respondents described themselves as farmers, the other three rural respondents are either farm caretakers (2) or a housekeeper (1). Although the

housekeeper did not describe herself as a farmer, she does participate in small scale agricultural production, the products of which she sells in the community. The agricultural production activities of all 10 rural respondents are included below.

As Table 7 shows, most of the 10 rural respondents (70%) raise beef cattle to some extent. The total number of beef cattle that respondents reported owning ranges from 5 to 34 heads. Respondents reported selling beef cattle either at the livestock auction in Guapiles or to Coope Montecillos R.L.

Dairy cattle are raised by 30% of the rural respondents. One of the farms' owners takes **the** cheese produced on site outside of the community to sell it. Another family uses the **milk** for family consumption and no market data was collected for the third farm.

Swine are raised by 20% of the rural respondents. Both people reported selling the pigs **locally** within the La Argentina as well as using them for family consumption.

Two of the rural respondents (20%) reported taking part in a new tilapia-breeding project **being** promoted by the Port Administration and Development Board of the Atlantic **Region** (JAPDEVA). Both projects are in the early stages and both respondents reported **that the** goal of the project is to sell the tilapia on the national market.

Chickens are also being sold by 20% of the rural respondents. In one case, a buyer comes to the farm to buy the chickens, which a retailer re-sells in Pocora, and in the other case, the chickens are sold directly to neighbors in La Argentina.

Two (20%) of rural respondents grow heart of palm. In one case, a buyer comes to the farm to purchase the crop, and the other farmer produces it for family consumption.

The other agricultural products are being grown or raised by just one of the rural respondents. Data shows that all of these products are sold or consumed locally in La Argentina. No market data was collected regarding coconut, maize, and papaya.

Table 7
Individual Respondents' Types of Agricultural Production

Type of Agriculture	Farmers Producing each Type of Agriculture	Markets
Beef Cattle	70.0%	Auction in Guapiles; Cooperativa Montecillos
Dairy Cattle	30.0%	Makes cheese to sell outside the community; Family consumption; No data
Swine	20.0%	Local sales in Argentina; Family consumption
Tilapia	20.0%	Goal is to sell in national market (not selling yet)
Chickens	20.0%	Buyer comes to farm; Local sales in La Argentina
Heart of Palm	20.0%	Buyer comes to farm; Family consumption
Banana	10.0%	Family consumption
Citrus	10.0%	Family consumption/Local sales in La Argentina
Coconut	10.0%	No Data
Coffee	10.0%	Local sale to local cooperative in La Argentina
Ducks	10.0%	Local sales in La Argentina
Guanábana	10.0%	Family consumption/Local sales in La Argentina
Maize	10.0%	No Data
Papaya	10.0%	No Data
Yuca	10.0%	Family consumption

FOCUS GROUPS

The focus group session data analysis is presented here. First, there is a review of the researcher's observations about the focus group sessions. Next, the focus group data analysis is presented, including representative quotes.

GENERAL OBSERVATIONS

Altogether, six focus group sessions were conducted (see Figure 9), with three in the rural area (La Argentina) and three in the urban area (Pocora, Pocora Sur, Las Mercedes). Each session was made up of six or seven participants with a total of 21 men and 18 women participating in the discussions. Each focus group session was carried out using the same discussion guide. Informed consent procedures were conducted without any problems, and some participants volunteered that they did not care if anyone knew what they thought. The majority of focus group participants appeared to be interested in the research topic in general, as well as in the specific issues that were discussed.

In four of the six sessions, there were one or two participants that did not appear to feel as comfortable engaging in the discussion as the others, as well as participants that would tend to dominate the discussion if the researcher did not intervene and ask others what they thought or if they had anything to share. In an attempt to compensate for passionate tones used by some speakers, and to ensure that each participant had the opportunity to contribute to the discussion, the researcher specifically asked the less vocal participants to share their opinions.

FG-1 was made up of two men and four women from the lower section of La Argentina, which is adjacent to the southern boundary of Pocora Sur. Their responses show that they represented a range of ages (from 20's to 70's) as well as a range of economic activities (carpenter, farm owner and agro-ecotourism operator, private forestry operation for timber production, and homemakers that maintain different levels of sustenance agriculture).

It appeared that the participants in this group were interested in the discussion topics and that they were responding sincerely. One member of the group did not participate as much as the others so the researcher intervened numerous times to ask him what he thought. After a couple attempts to encourage him to participate, he replied that he was not talking much because the others were expressing what he felt, so he did not need to interject. After saying that, he did however interject more often. One elderly participant that had lived in the community since it was originally granted to colonists by the Institute for Agrarian Development (IDA) told rich stories to exemplify statements that she and others made. While rich and entertaining, these stories were often long. The researcher used non-directive prompts to urge her to stay on track without deterring her from participating in the discussion in her own way.

FG-2 consisted of five men and one woman from Pocora. The participants in this session were less diverse in terms of age (40's to 70's), but equally as diverse in term of economic activities (banana plantation worker, EARTH employee, retired homemaker, retired plantation worker.)

Again, based on the participants' enthusiasm during the discussion, it appeared that they were interested in the discussion topics and that they were speaking sincerely. In this session, there were two participants that did not contribute as much to the conversation as the others. Again, the researcher spoke directly to these people to encourage them to join in the conversation. When spoken to directly, these participants generally responded by sharing their perceptions about the topic being discussed.

FG-3 was made up of one man and six women from Las Mercedes, and the participants ranged in age from 30's to 50's. While four of the seven participants are employed by EARTH University, the group still represented a diverse range of economic activities (two EARTH employees, two women employed on campus by EARTH residents, a local elementary school teacher, and two retired women). It should be noted that it is not surprising that four of the seven focus group participants in Las Mercedes would be employed by EARTH University since the community is located literally on the edge of campus and many community members are employed by EARTH.

Although this group was similar to the others in that the participants appeared to be enthusiastic about the subject, this group was different in that there was no reserved member of the group. All of the participants were eager to share their opinion, often at the same time. Despite the researcher's repeated attempts to encourage the participants to speak one at a time, there were numerous occasions in which two people were so eager to interject that they tried to do so by speaking louder than the other participant.

In FG-4, three men and three women from the middle section of La Argentina participated in the group discussion. The participants ranged in age from 20's to 60's. Two participants are caretakers of a farm and the other four own farms and practice a variety of agricultural activities on them. The four participants that own their own farm (or live on their family's farm in the case of the young woman in her 20's) all said that they practice agro-ecotourism on their farms.

As observed in previous focus group sessions, the participants appeared to be interested in the discussion topic, and responded as though they were speaking sincerely. This focus group session was different, however, due to the presence of one very well informed community member (the community leader), as well as another community member that appeared to have an agenda (came prepared with written notes and gave a speech before the session actually started). These two participants were often long-winded, making it necessary for the researcher to interrupt them in order to make sure other participants had ample opportunity to join in the discussion. In addition to these two dominating participants, there were two participants who appeared shy and needed encouragement from the researcher or from other participants to interject. The two more reserved participants (one man and one woman) explained that they were just learning about natural resources and did not feel that they could contribute much. When the researcher reminded them that there were no correct or incorrect answers and that she simply wanted to hear their opinion, these two people responded that they had not

thought about the subject long enough to have a strong opinion, but that they agreed with the current situation as stated by the other participants.

FG-5 was made up of five men and two women from Pocora Sur. This group ranged in age from late 20's to 60's and held a range of occupations (local elementary school teacher, secretary, agrochemical technician, local committee representative, retired, an EARTH employee).

Again, these participants appeared to be interested in the focus group discussion topic and responded as though they were speaking sincerely. In contrast to FG-3, the participants in this session spoke one at a time, despite having strong feelings about many issues, and as with FG-3, this group was made up of people who all participated equally. There was no dominating or passive participant in the group.

In FG-6, five men and two women from the upper section of La Argentina participated in the session. The participants' ages ranged between 20's and 60's. All of the participants were farm owners that engage in a range of agricultural production (beef cattle, tilapia, fruit and vegetable crops).

As with the other focus group sessions, the participants in FG-6 appeared interested in the discussion topic and responded as though they were being sincere. As was the case with FG-4, this group included one very well informed community member (the community

leader) and there was also one relatively quiet participant that needed encouragement from the researcher or other focus group participants in order to contribute.

FOCUS GROUP ANALYSIS

The researcher's findings are organized and presented around the selective (thematic) codes that emerged from the iterative coding process. In the discussion of thematic areas, care is taken to distinguish between findings based on data collected in the rural and urban areas.

Figure 3 presents the open codes established during the first step of analyzing the interview transcriptions and Figure 4 presents the thematic codes used to further analyze the data. The analysis includes representative quotes from the interviews as well as some basic quantitative analysis carried out using SPSS.

Open and Axial Codes

The open and axial codes that the researcher used to analyze the focus group transcriptions range from extremely specific perceptions (e.g. lack of understanding of natural resources) to broader themes that the researcher thought of as her axial codes. These broader codes contain multiple properties and dimensions (e.g. contamination). Because of this, many concepts and themes are connected to more than one code. Please refer to Figure 2 for an example of open and axial coding.

Thematic Codes

The following 10 thematic areas are broad enough that they allowed the researcher to include data about the different kinds of natural resource issues that focus group participants discussed (e.g. relating to forests, the river, the water source, agricultural land), and specific enough that she was able to conduct detailed analysis on different aspects of these issues (e.g. natural resource management problems, potential improvements, and impediments to implementing these improvements). Please refer to Figure 2 for an example of thematic coding. Each of the thematic areas is discussed below:

Threat to Well-Being – TWB

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

A Threat to Well-Being was perceived by the researcher as any social, economic, natural resource or other issue, situation or problem that community members identified as a threat to the well-being of themselves or their family (e.g. drinking water contamination).

Since the researcher wanted to understand how respondents perceive and value the natural resources in the Dos Novillos Watershed, she asked focus group participants what they consider to be the greatest threat to their well-being in order to find out if respondents felt that any natural resource problems represent the greatest threat to their

well-being (Rhoades 1998, Farrington and Lobo 1997). This question was asked before any discussion about natural resources, and was deliberately phrased without using the term, “natural resource” in order to avoid leading the participants to talk about natural resource issues, and also to eliminate bias against respondents that were unfamiliar with the term.

All of the coded text that had to do with something that the focus group participants said represented a threat to their well-being was also coded TWB since it fell under this thematic, overarching category.

Examples of TWB (Threat to Well-Being)

- “The biggest problem is lack of money.” “Yes, being poor. That’s the main problem.” FG-1 [p. 5]
- “Basically, I think the biggest threat is contamination.” “In the river.” “Agrochemicals.” “Fumigations.” “Fumigations from the banana plantations. Fumigations on ornamental plants too.” FG-2 [p. 9]
- “Now there’s a big one [threat to well-being] here, which is the expansion of pineapple plantations, which is getting very close to us and is going to affect the watersheds where our water comes from. Yeah, in order to plant pineapple, they completely deforest, totally, it ends up totally clear, you can’t see a single tree.” FG-3 [p. 2]

Rural Area

Participants from two rural groups responded that lack of money due to lack of markets for their agricultural products is the main problem. People from one of these two groups specified lack of employment opportunities as another facet of this problem. Participants from the third rural group responded that deforestation represents the biggest threat to their well-being.

People from both rural groups that did not mention a natural resource issue as the biggest threat to their well-being mentioned deforestation as the greatest, or one of the greatest, natural resource problems in response to other questions. Members of these two rural groups also revealed that they are concerned about river and tap water quantity and quality. Participants in the rural group that stated that deforestation is the biggest threat to their well-being linked their concern about deforestation to both water quantity in the Dos Novillos River, and tap water scarcity.

Urban Area

Participants in all three of the urban groups mentioned the following natural resource issues as top threats to their well-being: river contamination; deforestation; expansion of pineapple plantations; and water scarcity. Members of the urban group that cited deforestation as a top threat also mentioned drug addiction, theft and lack of recreation as the biggest threats.

No participants from the other two of the three urban groups mentioned social problems in response to this question, people in one of these groups said that the community's

social problems (delinquency, crime, lack of police proactivity) keep it from being able to organize and address the natural resource problems. Participants in the other urban group that did not mention social problems in response to this question said that their community does not have the same problems of drug addiction as the watershed's other communities. The responses of people from all three urban groups were linked to their concerns about the quantity and/or quality of their drinking water supply.

Summary

Participants in four out of the six focus groups responded that a natural resource problem represents the greatest threat to their well-being. Concern about water quantity and quality was common among all six focus groups, even for the two groups that did not cite a natural resource problem as the greatest threat to participants' well-being.

Interaction with Natural Resources – INR

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

An Interaction with Natural Resources was perceived by the researcher as any activity mentioned, or feeling expressed, that gives insight into the way the community members interact with and/or value natural resources (e.g. hunting for sustenance or sport).

The researcher asked focus group participants to describe their interaction with natural resources in order to understand what natural resources are important to them (Heathcote 1998, Hinchcliffe 1995).

All of the coded text that had to do with something that the focus group participants said represented the way they interact with or relate to natural resources was also coded INR since it fell under this thematic, overarching category.

Examples of INR (Interaction with Natural Resources)

- “I have a farm that is adjacent to both the Dos Novillos River and the Quebrada Honda River on this side, and within this area, there are many other rivers and streams. I’ve been taking care of these areas since 1984, 1985...Almost every day I visit these places, all over the area, which, although small, are of great value.”
FG-4 [p. 2]
- “Since EARTH came, we’ve learned a little more about how we should value nature, protect it, that we should plant trees, that we shouldn’t use poison [chemicals and agro-chemicals]. Because before we – well, me and my father used to poison the river to catch fish, and [hunt] animals... ” FG-3 [p. 9]
- “I go to the river, like on a Sunday outing, um, I like to see all that water. In that part [pointing to a part of the river], there’s lots of fish because there’s so much water. It’s beautiful!” FG-6

Rural and Urban Areas

In general, responses by participants from the rural and urban areas were very similar.

Focus group participants from both areas gave numerous examples of activities that they carry out in the watershed. These activities can be grouped into two overall categories: protection and recreation. By groups explained “protection” by giving the example of planting trees in order to protect the river. People in one group of rural respondents also mentioned protecting animals, while respondents from an urban group mentioned classifying trash (recycling) and not leaving the water running. According to focus group participants, outdoor recreation appears to be important to people in both rural and urban areas, with fishing and swimming in the river being the most mentioned activities among participants. Finally, participants from the rural area also placed importance on the aesthetic value of nature, while the urban participants did not mention aesthetic values.

Summary

The focus group participants from the rural and urban areas appeared to relate to the natural environment through efforts to protect natural resource from harm and through recreational activities. Rural participants also expressed aesthetic appreciation for the natural environment.

With respect to protection, rural and urban participants gave examples of activities that suggest concern about forests, rivers, tap water, waste management, and wildlife. The most often mentioned recreational activities by rural and urban participants rely on the river.

Natural Resource Management Meaning – NRMM

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

A Natural Resource Management Meaning was perceived by the researcher as any way that community members described what the term means to them (e.g. to take care of the soil so it will produce crops).

In order to find out how the focus group participants understand the term, “Natural Resource Management”, respondents were asked what the term means to them (Heathcote 1998, Farrington and Lobo 1997, Hinchcliffe et al. 1995).

All of the coded text that had to do with the way the focus group participants defined or described natural resource management was also coded NRMM since it fell under this thematic, overarching category.

Examples of NRMM (Natural Resource Management Meaning)

- “Well, that we try to protect the animals, watch out for deforestation, river contamination... .” FG-1 [p. 11]
- “Here, we’ve tried to collect trash and maybe recycle it, but money is needed to do this. Maybe here in the center of Pocora where the trash is collected, everyone could recycle...but we haven’t been able to do this because of the resources [that

are needed]. I'm interested in doing it, but I don't have the economic resources to do it." FG-2 [p. 17]

- "Conserve." "Know how to classify trash. We can use peels and all that [organic kitchen waste] to fertilize the soil. All the organic waste...food." FG-3 [p. 9]

Rural Area

Participants in the rural areas responded with similar explanations of their interpretation of what "natural resource management" means. The following examples of natural resource management were given by focus group participants in two of the three rural groups: protect forests; don't contaminate rivers; recycle; make organic compost; and don't use agrochemicals too much (or at all). Some rural respondents also mentioned: plant native tree species and use a biodigester.

Participants in one of the three rural groups did not name specific resources in response to this question, but said that natural resource management means to: protect; maintain; not contaminate; and respect the natural resources.

Urban Area

Urban respondents mentioned: not littering; not cutting trees; protecting animal habitat; reforestation; managing waste properly; making organic compost; and conservation.

Summary

Although there were differences in the examples given among the groups, participants from both rural and urban focus groups appeared to understand “natural resource management” in the same protection-oriented way. Based on participants’ responses, it appears that protecting forests, rivers, and sustainably managing waste are important “natural resource management” issues for both rural and urban participants.

Natural Resource Management Aspects – NRMA

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Natural Resource Management Aspects were perceived by the researcher as anything that community members identified as positive or negative aspects of natural resource management in the Dos Novillos Watershed (e.g. expanding pineapple plantations).

The researcher asked focus group participants if they had any comments or concerns about the way natural resources are being managed in the watershed (Rhoades 1998, Farrington and Lobo 1997, Sen et al. 1997). This question was included first and foremost to find out if people/groups that did not cite a natural resource issue as the greatest threat to their well-being had any opinions about natural resource management in their community. Participants that had already cited one or more natural resource issue as the biggest threat to their well-being, were asked the question as well in order to find out if there were other natural resource issues of interest or concerned to them.

All of the coded text that related to aspects of natural resource management (positive or negative) in the Dos Novillos Watershed also coded NRMA since it fell under this thematic, overarching category.

Examples of NRMA (Natural Resource Management Aspects)

- “A danger for this watershed, here around La Argentina, is that some people that own a farm on the other side of the river, are cutting trees without mercy, deforesting.” FG-4 [p. 3]
- “Well, José mentioned deforestation, and this can cause, or is causing, damage to the rivers and our springs – deforestation hurts us in so many ways.” FG-5 [p. 3]
- “The watershed isn’t just this side of the river, it’s on the other side of the river too, over there by Las Mercedes, where the Arayas live and their farm is big. I think we’re going to have a problem with the 600 hectares of pineapple. The spring that gives life to Pocora, Pocora’s aqueduct, is at risk of running out of water.” FG-6 [p.3]

Rural Area

Participants in all three rural groups identified deforestation as the most urgent natural resource management problem. Participants from all three groups agree that the people doing most of the deforesting are cutting the wood for timber sales. They said that a lot of the deforestation is taking place in the upper watershed (above La Argentina).

Participants from two of the three rural groups (the two groups that represent the lower 2/3 of the community) mention river contamination by trash and also by poison (for fishing). People in the group from the lower section (closest to the urban area) said that the people contaminating the river with trash are community members (mostly newcomers) and tourists from San José. People who poison the river to fish are both locals and visitors.

Participants in the group from the middle section said that community members are doing all of the river contamination. People in the groups from the middle and upper sections of the rural area mentioned the expansion of pineapple farming as a threat to forests and the water supply. They said that wealthy landowners with lots of land are creating these pineapple plantations.

Other natural resource concerns cited by participants in rural focus groups were: poor waste management techniques (by newcomers and other local people, however, the worst waste management practices are thought to be practiced by people in urban areas); agrochemical use by small-scale (subsistence) farmers, homeowners (herbicides), and large farm owners (plantation crops); wasting water (by everyone in the watershed, but large-quantity users take advantage of the situation the most); environmentally unfriendly cattle farming (for local or national sale); and illegal hunting (by local people who do it for sport, not because they need the food).

The researcher also asked focus group participants to give examples of any positive natural resource management practices being carried out in the Dos Novillos Watershed. People in all three rural groups responded that agro-ecotourism is an option that some members of the community have taken up in order to earn money and be able to protect the natural resources on their land. People from all three groups also mentioned: voluntary reforestation by some landowners; and organic production by some landowners. Participants from one group (the upper section of La Argentina) mentioned that they reforest with fruit trees in order to be able to harvest something that they can eat or sell in the community, although one participant sells fruit at the market in Herédia as well), as well as simply reforesting.

Urban Area

Participants from all three urban groups responded that deforestation, poor waste management, and pineapple production are the biggest natural resource management problems. Participants attributed deforestation to people who own land (that are not long-time community members) in the upper part of the watershed that sell trees to harvesters, as well as to the expansion of large-scale pineapple production (a mix of local, long-time owner/s of large properties and corporate farms).

Participants in all three groups expressed concern about deforestation's impact on the water supply, as well as on the wildlife (although water was more of a concern). Similarly, concern over pineapple production was related to deforestation and its effect on water quantity, as well as chemical contamination and its effect on water quality.

With respect to waste management, participants from one urban group highlighted the lack of sewage treatment and the subsequent river contamination (people are building right along the river, and businesses are also taking advantage of the river to dump their waste). People from this same group mentioned that there is no recycling program. Participants from the other urban group highlighted trash burning as a major problem. People in another urban group also mentioned illegal hunting as a problem (local hunters who kill deer and wild boar for sport, not for food).

The urban participants did not identify any positive natural resource management activities taking place in the urban area. Some people did mention that a number of things they have tried to do (planting trees, better waste management) have been thwarted by thieves who steal trees and trash cans.

Summary

While there was little overlap regarding the positive natural resource management aspects mentioned by rural and urban groups (only reforestation was mentioned by people in both areas), participants did discuss many of the same management problems. Specifically, focus group participants from the rural and urban areas appear to be concerned about: deforestation; poor waste management; river contamination; poor tap water management (quality and quantity); agrochemical use; the effects of large-scale pineapple production; and illegal hunting.

Natural Resource Management Problems: Contributing Factors – NRMP

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Natural Resource Management Problems - Contributing Factors were perceived by the researcher as anything cited by community members as contributing to problems in managing the watershed's natural resources (e.g. lack of environmental awareness).

In order to better understand the perceived underlying, contributing factors that allow poor natural resource management to occur, the researcher asked focus group participants to explain what factors they perceive of as contributing to the situation that allows the natural resource management problems that they mentioned to exist (Rhoades 1998, Farrington and Lobo 1997, Sen et al. 1997).

All of the coded text that related to situations that cause or contribute to problems for natural resource management in the Dos Novillos Watershed was coded NRMP since it fell under this thematic, overarching category.

Examples of NRMP (Natural Resource Management Problems - Contributing Factors)

- “The authorities don’t do their job [to stop people from using poison to kill fish in the river]. Filing a complaint doesn’t do any good. FG-1 [p. 14]

- “One of the biggest struggles is to organize the community, so that the community develops social consciousness.” “All the help that Bremen, the Rojas and Mamita Yunai [United Fruit Company] gave us is the reason why we can’t do anything today. Because now everyone’s waiting for them to give us a hand.” FG-2 [p. 18-19]
- “And the agro-chemicals that they spray on the pineapple! Yeah, imagine how they spray at night and all the drainage ditches go right to the river...so all the species [in the river] are dying.” FG-3 [p. 3]

Rural Area

Participants in the rural focus groups stated the following issues cause or contribute to natural resource management problems: lack of environmental/natural resource awareness; lack of an understanding about the impact that people have on the environment/natural resources; and lack of understanding/training for farmers regarding how to manage resources in a sustainable way that will still allow them to earn a living. Also, participants from all three groups mentioned that government agencies are not doing a good job managing natural resources with lack of enforcement of regulations cited as a specific management problem. Someone in the group from the upper part of the rural area said that a lack of sustainable, revenue generating options keeps people from being able to do more to protect natural resources.

Urban Area

People from the urban communities said that lack of understanding about the impact that a person's activities has on the environment/natural resources is at the root of many natural resource management problems. People in one group added that private companies are trying to maximize profits by putting workers and natural resources at risk. People in another group feel that there is a conflict of interest with respect to the people in power and the concepts they have regarding natural resource management and their own business interests. People in this group also talked about corruption being a problem, especially with respect to the enforcement of natural resource management regulations.

Summary

It should be noted that depending on the problem being discussed, text coded NRMP can simultaneously be a natural resource management problem itself (using pesticides), and a contributing factor of another natural resource management problem (river contamination).

Participants in both urban and rural focus groups said that the main obstacles to good natural resource management in their communities are: a lack of environmental/natural resource awareness/understanding about the impact that people have on the environment/natural resources; and a lack of law enforcement by government representatives regarding natural resource management issues. Lack of enforcement was sometimes described further as a corruption problem.

In addition to these shared perceptions, some rural participants also emphasized a lack of training and sustainable, revenue generating options for farmers in particular, while some urban participants discussed the perceived power of the private sector (agribusiness pineapple plantations were given as an example) to maximize profits at the detriment of workers and natural resources.

Natural Resource Management Improvements - NRMS

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Natural Resource Management Improvements were perceived by the researcher as anything cited by community members as potential ways to improve natural resource management in the watershed (e.g. law enforcement).

In order to better understand what community members perceive as potential solutions, the researcher asked focus group participants to talk about anything that they think could help address the natural resource management problems they have identified (Rhoades 1998, Farrington and Lobo 1997, Sen et al. 1997, Hinchcliffe et al. 1995).

All of the coded text that related to ways to improve natural resource management in the Dos Novillos Watershed was coded NRMS since it fell under this thematic, overarching category.

Examples of NRMS (Natural Resource Management Improvements)

- “The government or the governmental organizations [need to] train farmers, train them, so that they have the knowledge and understand what’s going on and what can happen if we keep cutting trees down with no control.” FG-4 [p. 6]
- “Unfortunately there’s no adequate government program [to deal with deforestation], but yes, we need a lot of training, a lot of education...with respect to small farmers, there needs to be more education to make people conscious about this subject – about deforestation and using agrochemicals and all this stuff.” FG-5 [p. 5]
- “I think that we need to find a way to earn a living ecologically, so that, well, the earnings are ecological.” “You’re talking about generating [income] and protecting the water [at the same time].” FG-6 [p. 10]

Rural Area

Focus group participants from the rural area suggested numerous potential solutions to deal with these problems. People in one group suggested: explaining the natural resource situation to neighbors and visitors and putting up signs that explain why people should not throw their trash on the ground/in the river; organizing meetings about different issues and having previous participants invite new people to subsequent meetings. Participants in another group said that it would help to: have NGO and or government sponsored training programs for farmers; file complaints against MINAE and other governmental entities; and pass legislation that makes decisions about forest management

a communal process. The third group of focus participants suggested: establishing a system of paying landowners to protect the forest in the upper watershed; and starting environmentally sustainable enterprises in order to create ecologically sound sources of employment.

Urban Area

Participants from all three urban groups said that their communities need to organize and focus on education and training to make citizens (in the urban and rural areas) aware of the impact that their actions (and others') have on natural resources. People from one group said that they should get organized in order to clean trash and plant trees. People in another group said that the community should try to work closer with the Solidarity Triangle (government sponsored initiative); work to create its own local solidarity movement; focus more on educating their children to value communal work; and try to collaborate with businesses and the government to improve natural resource protection.

Summary

Participants from urban and rural groups suggested strengthening community organization and said that increasing the community members' awareness about natural resource issues and more sustainable farming techniques would help to address the problem. Rural communities also suggested alternative institutional arrangements (payment for environmental services, co-management) and entrepreneurial activities that could help them manage the resources better, as well as filing complaints against governmental entities responsible for natural resource management, while the urban

groups' other solutions focused more on improving community organization/unity and members' commitment to community work, as well as having a dialogue with businesses and government representatives about ways to improve natural resource management.

Natural Resource Management Impediments - NRMI

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Natural Resource Management Impediments were perceived by the researcher as anything cited by community members as reasons that past/future attempts to improve natural resource management in the watershed have not been/might not be as successful as planned (e.g. lack of funding).

In order to learn from community members about the perceived flaws of past/future potential solutions, the researcher asked focus group participants to talk about possible impediments to successfully improving natural resource management situations Rhoades 1998, Farrington and Lobo 1997, Sen et al. 1997, Hinchcliffe et al. 1995).

All of the coded text that related to impediments to improving the way natural resources are managed in the Dos Novillos Watershed was coded NRMI since it fell under this thematic, overarching category.

Examples of NRMI (Natural Resource Management Impediments)

- “Because they’re people who really don’t know anything about harming the environment and the problems they cause [through poor resource management].” FG-1 [p. 15]
- “Now, the young people don’t want to do anything [to help the community], not even in their own home, and if it’s a solidarity movement [organizing the community], it has to start at home, and they [young people] don’t carry the solidarity movement with them [from home].” FG-2 [p. 19]
- “Money.” “Money moves everything in this life.” “It sounds like a lie, but in order to organize, to be able to speak, for transportation, without this [money]...[you can’t do these things].” FG-3 [p. 6]

Rural Area

Participants from the rural groups responded that community members are passive when there is an effort to deal with these problems and that they often do not want to participate in meetings. They also have the impression that government officials do not feel that they have to respond to citizens’ complaints about their lack of enforcement or poor natural resource management practices, and some participants specified that corruption among governmental representatives inhibits enforcement. Additionally, some people in the group from the upper section of the rural area also said that people in the urban area (that receive the water produced in the upper watershed) are not willing to pay for the environmental services they receive. This group also talked about the lack of financial resources (loans) for farmers to be able to start-up businesses. Other participants

said that they lack the money necessary to carry out conservation and waste management projects and training programs.

Urban Area

Urban participants said that one problem is that the government and businesses do not listen to them (individuals) because they are poor. People from another group said that a lack of government enforcement makes it difficult to address problems such as river contamination (municipality allows houses to be built on the river banks and the sewage drains directly into the river).

People from two groups said that a major problem is that the community members are paternalistic, lack community solidarity and do not participate in these kinds of meetings (to discuss improving the environment or communal infrastructure). Participants said that many people talk, but do not act, and that people do not want to commit to anything because often, if a community activity is carried out and something goes wrong, the organizers get blamed for stealing or wasting the money. Participants said that this situation makes people shy away from organizing and participating in community activities. They said that another problem is that projects and training programs are expensive and the communities do not have the money to implement them.

One group said that people also become discouraged because often, when a project has been initiated (plantings, waste management activity), thieves have stolen the trees or the trash cans. They also said that the high rates of crime, drug addiction, and theft (in Pocora

and Pocora Sur) combine to inhibit community action. With respect to impediments to curbing deforestation, participants in one group said that some people deforest out of necessity, and not because they are trying to get rich.

Summary

It should be noted that depending on the impediment being discussed, text coded NRMI can appear in this section as an impediment as cited by one context and/or group of participants, and appear in a previous section as a natural resource management problem as cited in a different context and/or group of participants (lack of government enforcement).

People from both urban and rural groups shared the following perceptions: many community members lack community solidarity and do not want to go to meetings about environmental/community issues; government representatives act as though they do not feel like they have to listen/respond to members of the communities in this watershed nor enforce laws; and communities do not have the money needed to implement natural resource management projects. In addition to these three impediments, focus group participants in the rural area also said that urban residents are not willing to pay for the environmental services that upstream, rural landowners provide. Urban area focus group participants also cited social problems as impediments.

Willingness to Improve Natural Resource Management - WILL

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Willingness to Improve Natural Resource Management was perceived by the researcher as any indication of the community members' perception about their communities' willingness to collaborate in improving the way natural resources are managed in the Dos Novillos Watershed (e.g. people are too lazy to help).

The researcher asked focus group participants about their fellow community members' willingness to collaborate in order to improve natural resource management in the watershed. This question was intended to help the researcher learn about the communities' potential willingness to try to improve the natural resource management situation (Jonsson 2004, White and Runge 1995).

All of the coded text that related to focus group participants' perceptions about the willingness of the members of their community to help improve natural resource management in the Dos Novillos Watershed was coded WILL since it fell under this thematic, overarching category.

Examples of WILL (Willingness to Improve Natural Resource Management)

- “Well, I don’t know, the people are not at all interested in participating. There are some people organized in agro-eco-tourism, but we’re a minority, there would have to be some proselytizing to motivate people to come to a meeting and ask them what they think, find out what their position is.” FG-4 [p. 11]
- “I think there will always be interested people. What has to be done is motivate them and make them understand the importance of these things, I mean, all of us – or most of us – have children and as Juan said, if not for ourselves, we have to do it for our kids. I think that although it’s difficult, sometimes it’s hard to get a small group together for a meeting, but by motivating people, making them understand the importance, I think it can be done.” FG-5 [p. 10-11]
- “Yes [there is willingness] because consciousness is growing. At least, that’s how I see it. The people here [in the focus group session], if we have another meeting, people will come. And that way, little by little consciousness grows and others join in, and others, and others, and it keeps going like that. ” FG-2 [p. 20]

Rural Area

Participants said that despite problems getting community members to participate, people in the watershed can be motivated to manage natural resources better. Participants said that people will participate and change the way they interact with the environment/natural resources, but that they need to see the good practices (e.g. biodigestor) first-hand so that they will be motivated to try to use them on their own.

Urban Area

Participants in two groups said that community members would be willing to do a better job protecting and managing natural resources, but that they need to understand the problems first. People in another group were not sure about the community members' disposition. They said that community members would have to be invited to find out how to manage natural resources better, and then it could be determined whether or not people are "asleep" or ready to "act". Participants in two groups specified that motivating community members is the key. One group said that someone has to be able to motivate the young people in order to get them to care about doing anything for the community.

Summary

Participants in five of the six focus groups said that they felt their fellow community members would be willing to help improve natural resource management. Participants in one urban group said that they were not sure if the people would be willing to join an effort.

Both rural and urban participants said that community collaboration would depend on individuals being motivated to do so (one urban group specified that young people need to be motivated), and on seeing good practices first hand/learning about better natural resource management practices. Participants in two urban groups specified that community members would have to understand the problems before they could be motivated to collaborate.

Perceived Changes in the Dos Novillos Watershed – CDNW

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Perceived Changes in the Dos Novillos Watershed were perceived by the researcher as any statement about any kind of change that community members have noticed during the time that they have lived in the Dos Novillos Watershed (e.g. there is less forested land now than there was when I moved here).

The researcher asked focus group participants how they would describe any changes in the watershed over the time that they have lived there. This question was intended to help the researcher learn about perceived natural resource management and land use changes in the watershed, and their perceived impacts (Sanchez-Azofeifa et al. 2002, Kaimowitz 2001, Wang 2001).

All of the coded text that related to focus group participants' perceptions about how the Dos Novillos Watershed has changed over the years was coded CDNW since it fell under this thematic, overarching category.

Examples of CDNW (Changes in the Dos Novillos Watershed)

- “Well, I can draw some conclusions, for instance, like what you [talking to another participant] said, that there used to be more water - that the river has

gotten drier.” “Yes, lots of deforestation.” “And the water used to be so cold - like she said - before, when you crossed the river it was so cold...” FG-1 [p. 22]

- “When I came here, the Dos Novillos was a river that had [a lot of water]. Now, it isn’t. After just two or three summer days and we can see that it’s nothing more than a trickle, so this has had an affect.” “It used to have rapids [even in the summer] and the water was clean.” FG-2 [p. 21]
- “There’s a lot of overpopulation. The population has grown a lot.” “Up there [in La Argentina], there was no electricity...there was no road...just trails.”
“Prostitution, theft. Before you could walk - there was no lighting, public lighting – and you could come and go late to Pocora. Now you can’t even go there, because they’ll get you! In broad daylight! It makes people afraid.” FG-3 [p. 13]

Rural Area

The first comment made by participants in two rural groups was that the Dos Novillos River has become drier. The second response was: “lots of deforestation”. Participants from one of these two groups also said that MINAE used to do a better job protecting the forests. Other comments by rural participants were: “lots of trash”; “the river is warmer than it used to be”; “there used to be more fauna in the river and on land”; and “now there’s a road” (from Pocora through La Argentina).

Urban Area

Participants from one of the urban groups responded that everything has deteriorated. Specifically, they cited: tap water problem; less fish in the rivers; the river used to be

clean; people are living right on the banks of the river now; the river is drier; and deforestation. People in another urban group mentioned both positive and negative aspects of change. They said that the area has gotten over populated (regarding population growth, they said that there are a lot of Nicaraguan immigrants that come to work on plantations) and that there is now a road to La Argentina, as well as electricity higher up in the watershed now. People in this group also mentioned social problems that exist now (theft, prostitution). Although this group did not mention natural resource changes, these participants did mention that deforestation is one of the greatest natural resource management problems in the watershed in response to another question. This group (Las Mercedes) was the only one in which nobody said that they think the river has been getting dryer. Participants in the third urban group said that the climate has become more erratic and there is more flooding (one person said that the flooding is a result of deforestation), the river is drier and also contaminated now (trash, livestock waste, agrochemicals from pineapple plantations) so people are worried about swimming in it, there is more deforestation and more pineapple plantations.

Summary

While participants from the rural and urban areas mentioned many different changes, five out of six groups talked mostly about deteriorations in natural resources, while one group talked exclusively about services and social problems. With respect to the five groups that discussed natural resource changes, participants from the rural and urban areas most often stated that, “the river has become dryer”. The next most often cited response among

rural and urban groups was, “deforestation”. Participants from both areas also said that there are less fish in the river now than in the past.

Impact of Population on the Dos Novillos Watershed - IPOP

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Impact of Population on the Dos Novillos Watershed was perceived by the researcher as any reference to changes in the human population in the watershed, as well as the perceived impacts of the stated changes (e.g. population growth is causing job shortages).

If no focus group participants brought up population changes during the discussion about changes in the Dos Novillos Watershed, the researcher asked focus group participants to comment on any changes that they have perceived with respect to the watershed’s population. This question was also intended to help investigators learn about perceived land use changes in the watershed and their perceived impacts (Sanchez-Azofeifa et al. 2002, Kaimowitz 2001, Wang 2001).

All of the coded text that related to focus group participants’ perceptions about population changes in the Dos Novillos Watershed was coded IPOP since it fell under this thematic, overarching category.

Examples of IPOP (Impact of Population in the Dos Novillos Watershed)

- “The population is growing...all over the watershed, and this is putting pressure on the forests.” FG-4 [p.]
- “In reality, if you all analyze the situation here, there’s been a huge growth in the population south from the road. I’ll tell you, when we built the Argentina rural aqueduct there were 366 parcels in Pocora [Sur], with 116 houses – I’m talking from the road south, and I’m not including El Carmen or the other side, just here, and today there are 700 people, eh, 700 houses in the same area.” “So, let me see, we are currently counting on the rural aqueduct for 30 years at the most [at the current calculation of 4-5 people per household].” FG-5 [p. 17]
- “Let’s talk about the squatters...there were 316 parcels, and now there are more than 500 because they divided them. [The population is growing] between 114 and 900 meters above sea level.” “People who come here, I think they adjust to the environment and the system that we live by here, because you can’t move here and disrupt what is already organized.” FG-6 [p. 16]

Rural Area

Participants from all three rural groups feel that the population in the watershed has grown although they gave differing comments regarding where the growth is occurring. Some participants responded that a lot of people from San José have bought properties in the rural area that they use as vacation/weekend homes. Others commented that many people have moved into the urban area in order to work on pineapple and banana plantations. These people feel that the river in the urban area is suffering because of all of

the wastewater that is generated by this growing population. One participant from the group in the middle section of the rural area commented that more people are needed in the rural area in order to have a greater strength [strength in numbers – a more effective community].

Urban Area

Participants from the urban groups responded that the population is growing in the urban area and they relate this growth to increased crime, theft and other social problems (prostitution, flashers), as well as to a deterioration in water quality due to river contamination, and locating homes on the river banks. These urban participants mentioned that there is also population growth in the rural areas and people in one group said that this is causing problems with deforestation. Participants from another group said that the urban population is growing so rapidly because so many Nicaraguan immigrants have moved there to work on plantations, and many families share one house [so the impact is even greater]. People in this group stated that although they have nothing against the Nicaraguans, they feel negatively impacted by the large number of Nicaraguan immigrants because they are willing to work in terrible labor conditions for very low pay (conditions that Costa Ricans know are illegal and refuse to accept), so Costa Ricans are having a hard time finding work in the area. Participants in the other urban group described a huge population increase south of the main road and they discussed the negative impact that this could have on their tap water supply.

Summary

Participants from each of the focus groups said that they feel that the communities in the watershed are growing, although there was not a uniform response with respect to where participants perceive that the growth is occurring. Although a variety of perceived impacts were cited, most participants from both the urban and rural areas appear to feel negatively impacted by at least some aspect of this growth. Only one group (a rural group) mentioned a positive impact of population growth (strength in numbers).

While rural participants cited the wastewater management problem, urban participants cited wastewater problems, as well as deforestation, social and economic problems.

INDIVIDUAL INTERVIEWS

The individual interview implementation and data analysis is presented here. First, there is a review of the researcher's observations about the individual interviews. Next, the individual interview data analysis is presented, including representative quotes.

GENERAL OBSERVATIONS

Altogether, 27 individual interviews (see Figure 10) were conducted and each one was carried out using the same discussion guide. While most of the interviews were conducted in private, four were conducted in which a family member were present. Specifically, a male spouse was present during one interview and teenage children were present during three others. Although male spouse answered the researcher's questions together with his wife and may have influenced some of her responses, the teenage children sat quietly and did not appear to influence their parents' responses. Everybody

the researcher approached to interview appeared happy to collaborate. Informed consent procedures were conducted without any problems, and a number of respondents volunteered that they were not worried about people finding out what they thought. Respondents typically expressed an interest in, and asked more about, the purpose of the research project during the informed consent process. Although some respondents initially appeared shy or reserved, these people relaxed as the interview got underway and they answered the first couple of questions. Nobody told the researcher that they did not want to be interviewed, however, two respondents said that they did not want the interview to be recorded.

Most of the individual interviews took much longer to complete than anticipated. This occurred when the respondent was very concerned about one or more issues and/or when the respondent had a lot of information about, or experience with, one or more issues. Many respondents had a great deal to say about various subjects, and were enthusiastic about sharing their thoughts. Due to the respondents' willingness to share their opinions, the researcher gained in-depth information during the interviews. Aside from using non-directive prompts to keep the respondents on track, she did not try to hurry the respondents along or end the interview before having the opportunity to explore all of the relevant questions with the respondent. The researcher was, however, very sensitive to the respondents' time constraints and only extended the interviews as long as the respondents made it clear that they wanted to continue.

As with the focus group sessions, the individuals appeared to be interested in the research topic and to respond honestly throughout the interview. People appeared to engage in frank discussions with the researcher and did not appear to be embarrassed to ask her what she meant by something or to say that they did not know about an issue. While they were happy to report what they considered to be positive aspects, they also did not appear to regret discussing negative issues that they saw as affecting, or being caused by themselves and their family, neighbors, community, and government. In fact, it appeared to the researcher that there was more discussion of intra and inter-community problems during the individual interviews than there was during the focus group sessions (Patton 2002, Kaplowitz 2000).

INDIVIDUAL INTERVIEW ANALYSIS

The researcher's findings are organized and presented around the selective (thematic) codes that emerged from the iterative coding process. Figures 10 and 11 present the specific, subcategory thematic codes and overarching thematic areas used to analyze the interview transcriptions. The analysis includes representative quotes from the interviews as well as some basic quantitative analysis carried out using SPSS.

Open and Axial Codes

As with the focus group coding process, the open and axial codes (Figure 5) that the researcher used to analyze the individual interview transcriptions range from specific perceptions (e.g. municipality needs to have a recycling program) to broader themes that the researcher thought of as her axial codes (e.g. waste management). These broader

codes contain multiple properties and dimensions. The fact that many concepts and themes are not mutually exclusive means that many coded sections of the transcriptions are coded with more than one code. Please refer to Figure 8 for examples of open and axial coding.

Thematic Codes

The following 38 subcategory thematic codes (Figure 6) are specific enough that they allowed the researcher to conduct detailed analysis on each aspect of natural resource management that she asked the respondents about (e.g. tap water administration, tap water quality, tap water quantity). Additionally, when the researcher considered all of the subcategory data for each of the nine overarching themes (Figure 7), she found the information to be complete enough to gain a broad understanding of the many issues surrounding each overarching theme (e.g. contamination). Each of the subcategory thematic codes is discussed below. Please refer to Figure 8 for examples of thematic coding.

Threats to Well-Being (Code 3A)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Threats to Well-Being were perceived by the researcher as any social, economic, natural resource or other issue, situation or problem that

respondents identified as a threat to the well-being of themselves or their family (e.g. drinking water contamination).

The literature shows that well-intentioned watershed/natural resource management projects are often unsuccessful in reaching their goals due to a fundamental disconnect in the way community members and project promoters perceive the local natural resource base (Rhoades 1998, Farrington and Lobo 1997). For this reason, the researcher aimed to understand how respondents perceive and value the natural resources in the Dos Novillos Watershed. As was done during the focus group sessions, this first question (see below) was deliberately asked in order to find out if respondents felt that any natural resource problems were perceived as representing the greatest threat to their well-being. The question was asked without using the term, 'natural resource' in order to eliminate bias against respondents that were unfamiliar or uncomfortable with the term.

Examples of 3A (Threats to Well-Being)

- “Young drug addicts, robbery, vandalism.” II-9: Homemaker, Pocora Sur
- “Environmental contamination....Well, for example, insecticides. There are a lot of irrational people that contaminate the rivers, the water...poisons [for fishing], agrochemicals.” II-3: Self-employed, Las Mercedes
- “What worries me now is that the cost of living is going up a lot, everything is more expensive, but what I produce doesn't go up as much [sale price]. The amount that the price I receive for beef cattle has gone up in the last nine years is

very little compared to how much the cost of living has increased.” II-24: Farmer, La Argentina

- “Deforestation. They cut a lot of trees here.” II-25: Employed, La Argentina
- “Apparently there are no jobs to be found. Like everyone says, people are going down [to the urban area] because there’s nothing to do up here... They say that because of the kind of soil, it isn’t worth it to plant crops because now you can’t even grow corn.” II-20: Farmer, La Argentina

Urban Area

More than half of the urban respondents (65%) cited one or more social problem as the greatest threat to their well-being (see Table 8). A total of 11 people responded that social problems represent the greatest threat to their well-being and six (35%) cited one or more natural resource problem as the greatest threat.

Rural Area

Similarly, more than half of the rural respondents (60%) cited one or more social problem as the greatest threat to their well-being (see Table 8). Six rural respondents said that social problems represent the greatest threat to their well-being and two (20%) cited one or more natural resource problem as the greatest threat. One person cited both a social problem and a natural resource problem, and another said that he could not think of any threats to his well-being.

Summary

When asked directly the open-ended question: *In your opinion, what are the greatest threats to your well-being?*, more than half of the respondents (63%) cited social problems (see full list of responses below, following Table 8). A total of 17 respondents named one or more social problem that they feel represent the greatest threat to their well-being, while eight (30%) of the respondents named one or more natural resource problem (see full list of responses below, following Table 8). One person named a social problem as well as a natural resource problem, and another responded that he does not have any concerns. (This person lives in the rural area where, in addition to his own agricultural activity, he works as a day laborer for neighbors and his adult children send him extra money.)

Overall, a higher percentage of urban respondents (35%) cited one or more natural resource problem as the greatest threat to their well-being than did rural respondents (20%, or 30% if taking into account the rural respondent that cited both a natural resource problem and a social problem). However, it should not be assumed from the answers to this question that rural respondents are unaware of or not concerned about natural resource problems. Questions about the state of specific natural resources (to be discussed) show that rural residents are also concerned about the way natural resources are being managed in the Dos Novillos Watershed.

Table 8
Individual Respondents' Perceived Threats to Well-Being

	Urban			Rural			Total	
	Male	Female	Total (Urban)	Male	Female	Total (Rural)		
Natural Resource Problem	2	4	6	1	1	2	8	29.6%
Social Problem	2	9	11	2	4	6	17	63.0%
Social and Natural Resource Problems					1	1	1	3.7%
No Problems				1		1	1	3.7%
Total	4	13	17	4	6	10	27	100.%

The list below shows what the respondents from each community cited as representing the greatest threat to their well-being.

Natural Resource Problems

Pocora = 1 Respondent

- River contamination, deforestation affecting river and potable water quantity (this person lives on the river bank).

Mascota = 2 Respondents

- Trash, rotting dead animals, wastewater and trash from medical clinic in the road, which floods frequently. Lots of mosquitoes from standing water.
- Her family doesn't have potable drinking water.
Well water contaminated by sewage.

Las Mercedes = 3 Respondents

- Environmental contamination, river contamination

- Pineapple plantations, deforestation, contamination
- Tall grass at the edge of EARTH's forest reserve [at the boarder of EARTH's property and Las Mercedes] clogs drainage ditches and is home to lots of poisonous snakes that come near and into houses.

La Argentina = 2 Respondents

- Deforestation and hunting
- Deforestation

Social Problems

El Carmen = 1 Respondent

- Delinquency, drugs, robbery

Pocora = 5 Respondents

- Drug addiction (3)
- No tranquility, drugs, robbery
- Lots of young thieves, lots of mafia. [In addition to drug addiction] there's lots of robbery because of the drug addiction.

Pocora Sur = 3 Respondents

- Youth drug addiction, robbery, vandalism
- Bad attention by the CCSS (national health care system), lots of drugs and thieves
- Drugs

Las Mercedes = 2 Respondents

- Unemployment

- Lack of community organization

La Argentina = 7 Respondents

- No jobs available
- Cattle theft
- Lack of economic resources, little money, no jobs
- No jobs, land doesn't produce [agriculture]
- Family security, children not being able to go to school, poverty
- Delinquency, theft, hunters
- Cost of living has risen a lot, but income from cattle sales has risen only slightly.

Proposed Solutions to Problems (Code 3B)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Proposed Solutions to Problems were perceived by the researcher as any solutions suggested by respondents regarding ways to help combat the problems they cite (e.g. improved law enforcement by responsible government agency).

After respondents said what they felt most worried about with respect to their well-being, they were asked what they thought could help to address these problems (Rhoades 1998, Farrington and Lobo 1997, Sen et al. 1997, Hinchcliffe et al. 1995).

Examples of 3B (Proposed Solutions to Problems)

- “They [government representatives] should support community members, especially in enforcement because citizens that turn in their neighbors for breaking the law make their neighbors mad and bring problems on themselves.”

II-3: Self-Employed, Pocora

- “People need to ask for what they need. The municipal Mayor is willing to help, but people don’t communicate what they need. I think they want everything to be done for them. If the community would organize and ask the Health Ministry and the Municipality for help in installing septic tanks, it could be done. But, people don’t want to do it.” II-25: Employed, La Argentina

- “Well, if the police enforced better, maybe. Look, so many drunks and all these people [delinquents], they should be made to clean the community and maybe they’d feel ashamed. If the law was stricter with these people, with these poor people who get into trouble [drug addicts], there should be a treatment center for them.” II-6: Employed, Pocora

Rural and Urban Areas

Respondents from both the rural and urban areas proposed a number of things that could be done to address the natural resource and social problems that they feel are threatening

their well-being. Although natural resource problems and social problems are often interrelated, this research project is focused on learning specifically about the natural resource issues in the Dos Novillos Watershed, therefore the following analysis will not address respondents' comments about social problems.

With respect to natural resource problems, respondents criticized the government and local community itself, and focused on three specific areas for improvement: education, enforcement, and citizen action.

With respect to the role of government, respondents' comments reflect a concern that government agencies are neither adequately monitoring natural resources nor enforcing existing laws meant to protect the resources. Community members also expressed frustration with government agencies for what they appear to perceive as a lack of proactivity in addressing natural resource problems (current and potential) and a lack of support for community members who are trying to do their part to protect natural resources.

Respondents also said that the government (or another entity) should offer environmental education/training in the communities. These respondents said that many people in their community do things that harm the environment because of ignorance and a lack of understanding about the environment.

With respect to the role of communities, respondents said that even though there are resources available to communities, community members/organizations do not ask for help. Similarly, the Development Committees were criticized for not being proactive, and for not coordinating activities with each other (with the Committees in other communities).

Summary

Respondents from the rural and urban areas appeared to share the perception that both the Costa Rican government and the local communities share the blame for the natural resource problems that are threatening the quality of life in the Dos Novillos Watershed.

Impediments to Improving the Situation (Code 3C)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Impediments to Improving the Situation were perceived by the researcher as any problems, issues or situations that have in the past or could in the future impede the success of these suggested solutions (e.g. government agency corruption).

Respondents were asked why they thought that the issue or issues they mentioned had not been successfully dealt with so far (Rhoades 1998, Farrington and Lobo 1997, Sen et al. 1997, Hinchcliffe et al. 1995). Respondents mentioned a number of things that currently

keep these (above) and other attempted solutions from being effective in trying to address natural resource problems.

Examples of 3C (Impediments to Improving the Situation)

- “They’ve [community members] lost their motivation...this community has an Association – the head of the community is supposed to be the Association. So, when people see that the Association only does things for themselves [Association members] and nothing for the community...people lose their motivation [to participate].” II-5: Homemaker, Pocora
- “What happens is that a lot of deals are made between the authorities and the people involved in cutting trees. So, say I file a complaint about illegal deforestation, what happens? Ministry people come, do a study and they tell the owner of the trees, ‘Give me so much and...’, [indicating a pay-off] and with that nothing happens with the complaint.” II-25: Employed, La Argentina
- “Things are very difficult here, things have gotten out of hand. I feel like it’s really difficult [to improve the situation] because there’s no law here, no authority.” II-15: Employed, Pocora Sur

Rural and Urban Areas

Respondents from the rural and urban areas offered a variety of perspectives with respect to the environmental education/training programs. One respondent insisted that outsiders (not a community member) needed to come in and motivate the community because people there did not trust their neighbors to be able to lead such a program. Another

person in a different community cited good work being done by a local teacher and said that more of that kind of work needed to be done. She said that the teacher was working very well with the children, but adults need training too. Some people said that in the past, it has been hard to get residents to attend environmental education/training sessions, but that the effort should continue even if just a few people come in the beginning. They said that over time, when others hear from their neighbors that the program is good and see that it is still operating, more people will attend.

Concerning the reason why communities are not more proactive/successful in addressing poor resource management, some respondents said that people are ignorant about environmental issues in general and lack an understanding about the impact of their actions on natural resources. Others said that the people who harm the environment simply do not care about natural resource problems. One respondent specified that while the people who do not care about the environment might benefit from environmental education, she thinks that the only thing that will really make them change their actions is to hold them legally responsible for the violations they commit. Others seemed to support this idea that ignorance was only part of the problem by stating that community members lacked motivation to change their practices, and that governmental agencies do not do a good job enforcing existing environmental regulations.

Some respondents said that there is a lack of local organization because people have gotten their hopes built up and then let down so often (based on past failed attempts to organize) that people do not even bother attending meetings now. Some complained that

the individuals on the Development Committee are not really concerned about helping the community. Others said that the Development Committee or other groups in the community could do good work but that the government does not help with law enforcement or financial assistance.

The concept of holding citizens legally responsible for illegal activities that negatively impact the environment appears to be related to the issue of government agencies being more proactive about monitoring natural resources and enforcing laws. In this case, corruption was cited as a factor that limits the Government's effectiveness in protecting natural resources, upholding the law and supporting citizens who are trying to help. One respondent also said that Nicaraguans can not file legal complains (in this case, about neighbors dumping wastewater into the river) because they are not legal residents of Costa Rica, so she believes that numerous violations do not even get reported.

Summary

Respondents from the rural and urban areas cited similar impediments to carrying out successful natural resource management programs in the Dos Novillos Watershed. With respect to the perceived failings of the Costa Rican Government, respondents specified that corruption keeps government agencies from effectively managing the watershed's natural resources. Regarding the local communities' role in managing natural resources, respondents cited a variety of problems that make community members and community organizations ineffective. Specifically, respondents cite the following impediments to implementing better practices: lack of understanding regarding human impact on natural

resources; lack of motivation to collaborate; lack of trust in local groups/organizations; lack of financial resources to carry-out activities; lack of legal enforcement of environmental laws.

Meaning of ‘Natural Resources’ (Code 4A)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Meaning of ‘Natural Resources’ was perceived by the researcher as any statement or description reflecting how the respondents define/understand the term, “natural resources”.

In order to find out how the term, ‘Natural Resources’ was understood by respondents, they were asked what the term means to them (Heathcote 1998, Farrington and Lobo 1997, Hinchcliffe et al. 1995). Although the term, ‘natural resources’ was used in the process of receiving informed consent, the researcher was careful not to define the term in any way in order to ensure that community members’ conceptions of the term would not be influenced.

The results of this question did not impact the respondents’ ability to participate in the rest of the interview. It was an exploratory question aimed at gaining insight into the respondents’ exposure to the term and their perception of its meaning. It was important for the researcher to see that respondents demonstrated a range of familiarity with the term.

Examples of 4A (Meaning of ‘Natural Resources’)

- “Well, ‘natural resources’ deals with protecting the river, right? So that there are, what, more fruit trees [along the river]?” II-6: Pocora, Homemaker
- “For me, the deforestation, the fauna, the rivers, water.” II-15: Pocora Sur, Employed
- “The truth is, I don’t know.” II-20: La Argentina, Farmer

Rural and Urban Areas

Some of the respondents who had cited a natural resource issue as the biggest threat to their well-being had already used the term themselves, however, others had not. All but three respondents replied by giving examples of what they believe to be natural resources (e.g. river, water, trees, forest, plants, animals, pasture, wood). Some of these respondents mixed in problems (e.g. contamination, deforestation) or solutions (e.g. reforestation) with the resources they named. Two respondents from the urban area and one from the rural area replied outright that they were not familiar with the term and did not offer any examples of what they thought it might mean.

Summary

While some respondents appeared to be confident in articulating their understanding of the term, others appeared to be unsure of the term’s exact meaning, or focused on just one or two examples.

It is important to note that just because a respondent was not able to give a clear definition of what the term, 'natural resources' means to him/her, it does not imply that he/she did not understand natural resource issues. For example, an urban respondent that gave an in-depth explanation of what he perceives as a serious river contamination problem was unsure about exactly what the term "natural resources" means.

Meaning of 'Natural Resource Management' (Code 4B)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Meaning of 'Natural Resource Management' was perceived by the researcher as any phrase or description reflecting how respondents define/understand the term, "natural resource management".

In order to find out how respondents understood the term, 'Natural Resource Management', respondents were asked what the term means to them (Heathcote 1998, Farrington and Lobo 1997, Hinchcliffe et al. 1995).

Examples of 4B (Meaning of 'Natural Resource Management')

- "That there should be people that are concerned about how the natural resources are managed." II-3: Self-Employed, Las Mercedes
- "'Natural resource management' is how natural resources are treated." II-9: Homemaker, Pocora Sur

- “‘Natural resource management’ means using the environment in the best way.”

II-10: Self-Employed, Pocora Sur

- “I’d like to have a place to attend tourists, keep the environment beautiful, have a plaza to play football, a spring.” II-23: Employed, La Argentina

Rural and Urban Areas

All of the people who had cited a natural resource issue as the biggest threat to their well-being had already talked about natural resource management issues (e.g. how forests should be protected or how wastewater should be disposed of) even though they had not used the term, ‘natural resource management’. These people often referred me to the conversation we had just had when I asked them this question (*Well, it means the same as what I was just describing.*). Others gave a variety of explanations of what the term means to them (see examples above). One respondent explained exactly how she would like to manage the natural resources on her property (see quote above). Three respondents from the urban area and one respondent from the rural area replied that they were not familiar with the term and did not offer any examples of what they thought it might mean. Two of these four people (one rural and one urban) had also responded that they did not know what the term, ‘natural resource’ means.

Summary

For the most part, rural and urban respondents understood ‘natural resource management’ in the same way: protecting and take care of the resources they identified (e.g. rivers, tap water, forests).

Regardless, as with the previous question, the results of this question did not impact the respondents' ability to participate in the rest of the interview. It was an exploratory question aimed at gaining insight into the respondents' exposure to the term and their perceptions of its meaning.

Dos Novillos River (Code 5A)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Dos Novillos River was perceived by the researcher as any responses regarding a description of the Dos Novillos River (e.g. it floods more now).

Respondents were asked to describe the Dos Novillos River in order to learn about their perceptions without prompting them to talk about river quality or quantity (Jonsson 2004, Sanchez-Azofeifa et al. 2002, Heathcote 1998).

Examples of 5A (Dos Novillos River)

- “It’s beautiful. I’ve never seen a river like this one, well, I don’t know how it is downstream. But here the water is so clear, fresh and clean.” II-16: Employed, La Argentina

- “Very contaminated. There’s trash, a lot of people throw trash in there because the truck [municipality] doesn’t come by here to collect it.” II-25: Employed, La Argentina
- “It’s really dirty. Before, you could go to the river and the water was clean, but now you can’t swim in it because the next day you break out with a rash or a fungus.” II-7: Self-Employed, Pocora
- “This river used to have a lot of water! It had $\frac{3}{4}$ more water back then [about 35 years ago].” II-1: Self-Employed, Pocora

Rural Area

All but one of the respondents from the rural area said that the section of the Dos Novillos River near them is clean. The person who said the river is contaminated lives in the lower section of La Argentina (close to the urban area) in a group of houses where she says the residents dump their wastewater directly into the river. Two rural respondents said that while the river is clean where they are, they do not know how clean or contaminated it is farther downstream.

Regarding perceptions of river quantity, all but two rural respondents said that they have noticed that the river seems drier than it has been in years past. The two people that said that the volume appears to be normal described natural fluctuations in water quantity. One respondent described flooding that caused the river to break its banks and form various smaller channels in the downstream area near the lower section of La Argentina.

She thinks that the river looks like it has less water because volume was dispersed from the main channel during this flood.

Urban Area

All but one of the respondents from the urban area said that the Dos Novillos River is contaminated. Similarly, all of the urban respondents said that the river is *drier* or *much drier* now than it was in years past.

Summary

While some respondents explained their perception that the section upstream of the urban area is clean, while the downstream section that passes through more populated areas is contaminated, respondents that just referred to the section where they live appear to be describing two different rivers. While most rural residents responded that the Dos Novillos River is clean, most urban residents responded that it is contaminated (one person in the rural area had no comment).

Regarding quantity, all but two rural respondents and all urban respondents said that the river is drier now (one person in each area did not have an opinion).

Impact River Quality (Code 5B)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Impact River Quality was perceived by the researcher as respondents' perceptions about what could negatively or positively affect the Dos Novillos River's quality (e.g. wastewater runoff from urbanizations).

In order to learn about respondents' perceptions regarding river management, respondents were also asked what they thought could affect the quality of water in the river (Jonsson 2004, Sanchez-Azofeifa et al. 2002, Heathcote 1998).

Examples of 5B (Impact River Quality)

- “The Arayas’ new pineapple plantation will do away with the Dos Novillos just like the pineapple plantations have done to the Destierro. Pineapple plantations require lots of fumigations and the machinery causes erosion, and this area receives a lot of rainfall...it all goes into the river. Heavy rainfall requires them to apply lots of fumigations.” II-8: Self-Employed, Pocora [He gave an example of this happening on the Destierro River and said that he gives the area 10 years before the pineapple production leaves the land totally barren. He gives the Dos Novillos River a year and a half before it’s destroyed because of the Arayas’ proposed pineapple project.]
- “The contamination that we put into the river, chemical residues, organic waste from cattle and swine, and so many things that people throw into the river. Plastic bags, plastic containers. Unfortunately, it happens here, not often, but it does.” II-24: Farmer, La Argentina

- “Oh, really contaminated [the Dos Novillos River], beginning with the trash that people throw in it, I think there are bathrooms that drain into the Dos Novillos River that runs from the drainage [ditch] here at the bridge, the bridge on the road. There’s a drain there where all the gross stuff gets dumped in, including the water from the Arayas’ garage – oils and gasoline and all that.” II-18: Employed, Las Mercedes

Rural Area

Respondents in the rural area said that sometimes people dump agrochemicals, wastewater, manure and trash into the river, but it does not happen often. Some said that there is a general lack of education about how to take care of the river.

Urban Area

Respondents in the urban area cited contamination by chemical runoff from current and proposed pineapple plantations, wastewater contamination from homes and businesses located next to the river (a number of people singled out a group of houses in lower La Argentina as a source of wastewater contamination), trash, dead animals and manure.

Summary

Although respondents from the rural and urban areas have differing perceptions about the quality of the river’s water, respondents from both areas offered basically the same ideas about how the river could be contaminated. Respondents from both areas cited:

agrochemicals, wastewater, trash and manure. Only urban residents mentioned “dead animals” as a source of contamination.

Impact River Quantity (Code 5C)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Impact River Quantity was perceived by the researcher as the respondents’ perceptions about what could negatively or positively change the quantity of water in the River (e.g. cutting trees in the catchment area).

In order to learn about respondents’ perceptions regarding river management, respondents were also asked what they thought could affect the quantity of water in the river (Jonsson 2004, Sanchez-Azofeifa et al. 2002, Heathcote 1998).

Examples of 5C (Impact River Quantity)

- “I think [the river is drier now] because of all the trees they cut, there are a lot of places that have been cut [along the river].” II-20: Farmer, La Argentina
- “The river isn’t like it was when we got here – it was summer and you could hear the river flowing! Not anymore. They’re deforesting a lot higher up. There use to be a waterfall, but not anymore, it dried up.” II-26: Homemaker, Mascota

- “Everyone blames the deforestation. Ever since they [IDA] gave away these properties [in La Argentina], everyone has been deforesting.” II-8: Self-Employed, Pocora

Rural and Urban Areas

In both the rural and urban areas, most respondents said that deforestation (for the purpose of selling timber or to clear land for pineapple plantations) is causing (or could cause) a reduction in the volume of water in the river. One urban respondent specifically blamed IDA for much of the watershed’s deforestation. He said that IDA’s land distribution program did not include any support/training for farmers and since they were poor, the first thing they did was sell the trees on their property. Another urban respondent said that dredging for rocks and sand in the river cuts the roots of trees and causes them to fall. Two urban respondents said that they did not know what would cause the river to become drier.

Summary

Both rural and urban respondents perceived a strong correlation between the presence or absence of forests and the volume of water in the river. Most blamed loss in river volume on deforestation.

Impact of Deforestation in the Watershed (Code 6A)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Impact of Deforestation in the Watershed was perceived by the researcher as the respondents' perceptions about the negative or positive effects of deforestation (e.g. loss of fauna).

In order to understand community members' perceptions of deforestation, respondents were asked about the impact that deforestation has had in the watershed. (Jonsson 2004, Pfaff and Sanchez-Azofeifa 2004, Kaimowitz 2001).

Examples of 6A (Impact of Deforestation in the Watershed)

- "It [deforestation] makes it warmer, drier, it hardly rains." II-23: Employed, La Argentina
- "What worries me [about tap water] is deforestation. That is going to affect us. And not just us, it will affect everyone." II-16: Employed, La Argentina
- "...I think that cutting trees will make the river dry-up...they shouldn't cut trees from the river banks..." II-2: Homemaker, El Carmen

Rural and Urban Areas

Most respondents in the rural and urban areas appeared to be sure about at least one negative impact of deforestation. Respondents said that deforestation affects the quantity of water in the river (causes droughts when it is not raining and floods when it rains). Many people were concerned that deforestation could affect their drinking water supply. Respondents were also concerned about deforestation's negative effect on wildlife

(habitat and food). Rural respondents also cited lack of wood for building, and a decrease in tourism.

Summary

Both rural and urban respondents had strong opinions about the perceived problems caused by deforestation. Negative affects on river volume and water supply were most often cited.

Deforestation Location, Purpose and Participants (Codes 6C, 6D)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Deforestation Location, Purpose and Participants were perceived by the researcher as respondents' perceptions about where deforestation is occurring (e.g. along the river), why it is occurring (e.g. to build fences and homes), and who is responsible (e.g. local settlers).

In order to better understand residents' perceptions of deforestation, the researcher asked to describe where it is taking place, why it is taking place and who was responsible (Jonsson 2004, Pfaff and Sanchez-Azofeifa 2004, Kaimowitz 2001).

Examples of 6C, 6D (Deforestation Location, Purpose and Participants)

- “They [pineapple producers] get people to sell their farms and move away. The Araya Family is buying a lot of land to produce pineapple.” II-1: Self-Employed, Pocora
- “Up here, people take care [of the forests], but sometimes you need a little wood and you cut a tree. There were a lot of trees here when I came here.” II-21: Farmer, La Argentina
- “I’m seeing that the pineapple plantation deforestation isn’t leaving any trees. What did CODELA do when it planted pineapple – cut all the huge, old Laurel trees, made a hole and buried them. Well, honestly, they’re a source of employment [pineapple plantations] for a lot of people, but the deforestation they do, they don’t leave anything [forests]. Up in La Argentina...here in Las Delicias.” II-18: Employed, Las Mercedes

Rural Area

There was not consensus among rural respondents as to where deforestation is occurring. Like the urban respondents, they said *all over the watershed*, but they also said, *near the source of the rural aqueduct, upper left fork of La Argentina, and pastureland (not along rivers as urban respondents said)*. As far as causes, in addition to citing timber sales and pineapple production, a few rural residents said that the timber is cut to use on the farm and not for sale. With respect to participants, respondents said that in addition to wood buyers who typically come from outside the community, local landowners also cut trees for farm use, while some large landowners are deforesting to make room for pineapple plantations on their properties.

Urban Area

Urban respondents cited a variety of places where deforestation is occurring. Responses ranged from *all over the watershed* and *middle to upper watershed* to *along the rivers*.

Regarding the causes, respondents said that timber sales and pineapple production are the main causes. They said that timber is sold to local and outside (of the community) buyers and that pineapple is produced by large landowners. One person said that she does not know how it is in the rural area, but that she deforested her property in Pocora Sur in order to make room in her yard to bury yard waste since the municipality will not collect it.

Summary

While there was some variation in the perceptions among rural and urban respondents with respect to where deforestation is occurring, overall, responses from rural and urban residents regarding where, why and by whom were similar.

Forest Administration (Code 6E, 6F)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Forest Administration was perceived by the researcher as respondents' perceptions about who is administering the forested land (e.g. MINAE),

and any perceptions respondents have about that administration (e.g. lacks funding).

In order to better understand residents' perceptions of forest management, the researcher asked about the administration of forests in the watershed (Pfaff and Sanchez-Azofeifa 2004, Kaimowitz 2001).

Examples of 6E, 6F (Forest Administration)

- “You don’t see MINAE around here. MINAE only comes when someone has asked for permission to cut. But they don’t come to check out the area and see what’s going on. Every day you hear saws around here, but they never come to inspect. I don’t think they’re working like they should.” II-24: Farmer, La Argentina
- “The community doesn’t take care of the trees, even me, because I had a bunch of trees and I cut them down. We deforest and we don’t treat natural resources like we should – we don’t value them like we should...” II-10: Self-Employed, Pocora
- “No, not that I’m aware of [nobody is in charge of protecting or administering the forests], nobody looks after anything here, everyone just protects their own property.” II-2: Homemaker, El Carmen

Rural and Urban Areas

When asked who/what entity is responsible for administering the forested areas, 17 respondents (63%) from the rural and urban areas said that the Ministry of Environment

and Energy (MINAE), which some referred to by its former acronym – MIRENEM, is responsible for protecting the forests and administering permits for cutting trees. Of the 17 respondents that named MINAE as responsible for managing the forests, 14 of them also said that MINAE either does not do its job well or that it does not do its job at all. The remaining three people said that they thought MINAE was doing a good job. A total of six respondents said that from what they could tell, nobody was responsible for managing the forests, and four people responded that they did not know.

Most respondents from the rural and urban areas said that forest management problems exist due to a lack of proactivity on the part of MINAE. One specific criticism is that instead of patrolling the area, MINAE only shows up if a violation is reported, however, one urban resident said that a major reason that MINAE does not do its job is because of a lack of financial and human resources. He said that the whole region has these same problems and MINAE can not be here [Dos Novillos] all the time because it has a large area to cover. Respondents also said that MINAE takes bribes from people carrying out illegal deforestation. Both rural and urban respondents said that the Costa Rican Government is not worried about this area (one person specified that this indifference is due to the area's low level of agricultural production), thus MINAE does not patrol there. Some respondents said that community members themselves do not protect the forest like they used to and that the lack of education/training programs about forest management adds to the area's forest administration problems.

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Just as more respondents (63%) identified MINAE (or MIRENEM) as being responsible for managing the forests, more also said that the entity is doing a poor job (52%). While more than half of the respondents blamed MINAE for poor forest management practices, some residents also blamed lack of support from local residents and budgetary constraints for the forest management problems. Although respondents did not identify landowners as the party responsible for managing the forests, it appears that many watershed residents feel that the landowners need to be regulated by MINAE because community members are generally reticent to gain enemies in these small communities by arguing with neighbors about their forest management practices. Some residents justify this reticence by stating that MINAE does not do enough to back-up citizens who risk social repercussions to file complaints, while other respondents criticize their fellow community members for not being proactive and not working together to put pressure on landowners who are violating forest management laws.

Forest Management Improvements (Code 6G)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Forest Management Improvements were perceived by the researcher as respondents' suggestions about ways to improve forest administration and forest protection (e.g. improve forestry law enforcement).

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In order to learn from community members about the things that they think could be done to improve forest management, the researcher asked respondents about potential solutions to the problems they cited (Pfaff and Sanchez-Azofeifa 2004, Kaimowitz 2001).

Examples of 6G (Forest Management Improvements)

- “I don’t have the right to tell someone to stop cutting down trees. If there was any support from MINAE, then I could say something. MINAE doesn’t come up here, but it’s their job to come up here and watch out for and protect the forest.” II-16: Employed, La Argentina
- “I see lots of trucks go by with felled trees, but I don’t know if they have permits or not. They harvest at night when it’s dark.” [When MINAE’s office is closed.] II-21: Farmer, La Argentina
- “People should take action instead of just talking. Here, everyone talks about what should be done but they don’t act.” II-5: Homemaker, Pocora

Rural and Urban Areas

Rural and urban respondents gave many examples of ways to help improve forest management. Their responses can be grouped into three categories: the Government’s role in general; MINAE’s specific role; and the community’s role.

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- Needs to hire people [at MINAE] who have the capacity to really protect the forests
- Needs to give MINAE a larger budget so it can be effective
- Needs to inform community members about how to protect natural resources (education/training programs)

MINAE's Role

- Needs to be more proactive and more dedicated
- Needs to patrol and inspect more often
- Needs to enforce Costa Rica's good forestry laws
- Needs to address its corruption problem and bring in independent or outside forest rangers to patrol

Community's Role

- Community members (and Development Committees) need to stop being passive and they need to work together and protest when they want to put a stop to a deforestation project
- Development Committee [La Argentina] should provide training on forestry protection and file reports of violations on behalf of the community so individuals do not have to
- Communities need to organize and communicate: communities need to talk and work together with business people, MINAE representatives, pineapple plantation representatives, and other stakeholders

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- Plant more shade trees
- Need someone from an outside organization to help organize and motivate the community

Summary

Rural and urban community members gave similar responses regarding ways to improve forest management. Their responses can be grouped into three categories: the Government's role in general; MINAE's specific role; and the community's role.

Respondents from the rural and urban areas suggest that: the government help MINAE be more effective by giving the ministry greater human and economic resources, and by giving the communities information and training; MINAE be more proactive, enforce the forestry laws and address its corruption problem; and community members be more proactive and organized with respect to collaborating as a community and with other sectors to protect the forests.

Willingness to Collaborate – Forest Management (Code 6H)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Willingness to Collaborate was perceived by the researcher as the respondents' stated disposition to collaborate with efforts to improve forest protection in their watershed (Jonsson 2004, White and Runge 1995).

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In order to learn from community members about their willingness to help improve natural resource management, the researcher asked the respondents about their own disposition to collaborate. While the researcher expected that the respondents' expression of their willingness to help would be overstated because of the lack of a cost (financial, social, etc.) associated with their help, the researcher chose to ask the question with the hope that some respondents would share their thoughts about the conditions under which they could/would or could/would not collaborate.

Examples of 6H (Willingness to Collaborate – Forest Management)

- “Oh, of course [I’d be willing to help]! Well, some people think it’s a good thing and some think it’s bad [pineapple plantations], but when the rivers start to dry up, we’re done, no matter how much work is available [at the pineapple plantations].” II-18: Employed, Las Mercedes
- “Well, yes, any way I can, yes.” II-15: Employed, Pocora Sur
- “Yes. In my case, I think that say, if someone is doing this [deforesting] I’ll report them. They say I’m a busybody but if I want to protect the trees it’ll report them.” [II-22: Homemaker, La Argentina]

Rural and Urban Areas

All but three respondents (89%) said that they would be willing to collaborate in any way that they could with an effort to protect the forests. The three people that said they could

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not collaborate live in the rural area. Two farmers said that they would like to participate in a forestry protection program by reforesting, but that they can not afford to reforest any of their land since that would reduce its carrying capacity. One of these farmers said that he is just barely earning a living with the number of cattle he currently owns. The third farmer said that she does not participate in anything anymore because of her illnesses and lack of time.

Two of the 24 respondents that said they would help, but limited their collaboration. One said that she did not have much time to spare and the other said that the program would have to be a serious one because people do not want to make enemies in their community by reporting illegal deforestation if it.

Summary

Most respondents said that they would be willing to collaborate in whatever way they could to improve forest protection. The three people that said they could not collaborate live in the rural area.

Tap Water Quality (Code 7A)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Tap Water Quality was perceived by the researcher as respondents' perceptions about the quality of their tap water (e.g. clean and fresh).

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In order to learn about the quality of tap water in the Dos Novillos Watershed, the researcher asked the respondents to describe their own tap water (Sanchez-Azofeifa et al. 2002, Espeleta 2001, Calvo 1990).

It should be noted that the researcher began her questions about tap water by asking the respondents where their water comes from (unless the respondent had already discussed the source previously. All but one respondent said that he/she knew the location of his/her tap water source.

Examples of 7A (Tap Water Quality)

- “They just started adding chlorine, but they add too much. My wife has to let the tap run for a while before making coffee because there’s too much chlorine. They began adding chlorine about 5 months ago because the water was very dirty. The quality has improved.” II-1: Self-Employed, Pocora
- “It’s natural water. It’s better than Alpina (bottled water). We have natural water. We have water that was approved by a microbiologist.” II-10: Self-Employed, Pocora Sur
- “I have to get water from my neighbors for drinking and cooking because my well water is so contaminated.” II-27: Homemaker, Mascota

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It should be noted that tap water service provision in the Dos Novillos Watershed does not adhere to the rural/urban distinction, therefore the discussion about tap water will be organized in terms of type of service.

AyA Service

When asked to describe their tap water quality, 10 of the 11 respondents that receive water from AyA (Costa Rican Institute of Aqueducts and Drains) said that their tap water quality is *good* or *great*. Four of these respondents mentioned that they have noticed that chlorine has been added to the water. While one person said that far too much has been added, they all said that they feel the water quality has improved since the chlorine has been added. One AyA user said that her water is *not very potable* and complained about debris in her water.

Rural Aqueduct Service

All 14 of the RA users reported having *very good*, *very clean*, or *excellent* water quality.

No Service

One respondent (urban area) that is not connected to either system said that she gets her water from a neighbor that is connected to the AyA system (it was not clear whether or not she pays her neighbor for the water). This respondent said that she cannot use her well water for drinking and cooking because it is contaminated by feces from her neighbor's pit latrine. The other respondent that is not connected to either service (rural area) has a spring on her property and says that the water is very good.

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Summary

Watershed residents receive their tap water from one of two sources (the AyA administrated service is located on a farm called Las Delicias and the source of the water for the Rural Aqueduct comes from a natural mountain spring located in the upper part of the watershed above La Argentina), or they are not connected to either system.

Both AyA and Rural Aqueduct users were positive about the quality of the tap water they receive. Of the two respondents that do not receive tap water from either service, one is content with the quality of her water and the other is extremely upset by the poor quality of her well water.

Tap Water Quantity (Code 7B)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Tap Water Quantity was perceived by the researcher as respondents' perceptions about the quantity of their tap water (e.g. inconsistent volume).

In order to learn about the quantity of tap water in the Dos Novillos Watershed, the researcher asked the respondents to describe their own tap water (Sanchez-Azofeifa et al. 2002, Espeleta 2001, Calvo 1990).

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Examples of 7B (Tap Water Quantity)

- “I don’t have water yet. You have to pay 32,000 colones, plus the form that they require which costs 10,000 to have the right [to connect to AyA’s system]. That’s why they don’t give me water yet, because I can’t pay.” II-26: Homemaker, Mascota
- “I’m without water every once in a while when a pipe breaks – sometimes due to high pressure, especially during storms. But somehow they fix it. I’m happy with the water here.” II-21: Farmer, La Argentina
- “I get a sufficient amount here, but there are a lot of houses that don’t [in Mercedes]. Yeah, there are a lot of households that have only one tap for four houses. II-14: Employed, Las Mercedes

AyA Service

When asked to describe their tap water quantity, 10 of the 11 respondents that receive water from AyA said that their water quantity is *good* and *more regular now*. One respondent complained that she receives *less volume now*.

Rural Aqueduct Service

All 14 of the RA users reported receiving *good*, *very good*, or *excellent* water quantity. The only exception to this occurs when water service is disrupted due to a broken pipe, however all but one person said that the pipes are always repaired as quickly as possible, so they are not upset about this problem.

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No Service

Two respondents (one in Mascota and one in La Argentina) do not have access to tap water.

Summary

Both AyA and Rural Aqueduct users were positive about the volume of tap water they receive. There are two respondents that do not receive water from either service.

Impact Tap Water Quality (Code 7F)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Impact Tap Water Quality was perceived by the researcher as respondents' perceptions about factors that could negatively or positively affect the quality of their tap water (e.g. infiltration of agro-chemicals).

In order to learn about respondents' perceptions regarding tap water management, respondents were also asked what they thought could affect the quality of their tap water (Sanchez-Azofeifa et al. 2002, Espeleta 2001, Calvo 1990).

Examples of 7F (Impact Tap Water Quality)

- “Over the years, when the area gets developed because of an increase in the population...due to contamination it won't be pure water anymore. By

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- "If the [water] pipes are in good condition, we won't have any problems...but if they keep cutting down trees we're going to have a lot of problems with the water [then referred to cutting trees to plant pineapple plantations]. II-15: Employed, Las Mercedes
- "The only think that I'd say [could affect the tap water quality] is if the plumbers or the people that work with the water do something incorrectly or do a bad job. But if they keep working like they are now, the water won't be affected. Because it's a spring up there. II-22: Homemaker, La Argentina

AyA and Rural Aqueduct Systems

When asked what could impact the quality of their tap water, respondents using the AyA and Rural Aqueduct systems said that: *contamination of the spring / source with human contamination and/or livestock manure*; and *poor system maintenance* (having dirty, old or broken tanks and pipes) were the biggest threats. Some Rural Aqueduct users added that agricultural expansion and deforestation around the source could impact their tap water quality.

Summary

Users of the AyA and Rural Aqueduct systems cited the same situations that could negatively impact their water quality.

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Impact Tap Water Quantity (Code 7G)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Impact Tap Water Quantity was perceived by the researcher as respondents' perceptions about factors that could negatively or positively affect the quantity/volume of the tap water they receive (e.g. more users).

In order to learn about respondents' perceptions regarding tap water management, respondents were also asked what they thought could affect the quantity of their tap water (Sanchez-Azofeifa et al. 2002, Espeleta 2001, Calvo 1990).

Examples of 7G (Impact Tap Water Quantity)

- “I think that as the community grows [population increases], there's less water [available].” II-2: Homemaker, El Carmen
- “It's a spring [the water source] that bubbles up and there's another one higher up, it's in layers of pure rock and there's a piece of intact forest up there and now they're planting pineapple everywhere. It might be intact [the forest], but if they start to cut around there the water will start to dry up there.” II-18: Employed, Las Mercedes
- “Let's say there's a huge storm and it rains too much, that would affect the water, and it would affect us for a long time, this happened to us before and

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AyA and Rural Aqueduct Services

When asked what could impact the quantity of their tap water, respondents that receive water from AyA and those that are connected to the Rural Aqueduct cited three main issues: *pipe size, connection and placement; deforestation; and increased demand from increasing population.*

Respondents that receive water from AyA also cited *people wasting water* (leaving it running, not reporting leaks) and *AyA wasting water* (not fixing leaks quickly).

Respondents that receive water from the Rural Aqueduct added that a natural disaster/big storm in the mountain could destroy access to the source, and that if the Rural Aqueduct Committee does not find an alternative source they will be left without water if the current source is depleted or made inaccessible.

Summary

For the most part, respondents that receive water from AyA and the Rural Aqueduct cited the same situations that could cause a reduction in the quantity of tap water they receive. Both groups did, however, also cite what appear to be location-specific concerns. Data suggests that AyA users, a group that does not include rural residents, see wasting water as more of a problem than do their rural neighbors. The data also suggests that the Rural

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Aqueduct users feel that their water source is more susceptible to being damaged by a natural disaster than do the AyA users. Only Rural Aqueduct users expressed concern that the entity responsible for administering their water has not located an alternative source.

Tap Water Administration (Code 7H)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Tap Water Administration was perceived by the researcher as the entity that respondents think administers their tap water (e.g. AyA).

In order to learn about respondents' perceptions regarding tap water administration, respondents were asked how they pay for their tap water (Sanchez-Azofeifa et al. 2002, Espeleta 2001, Calvo 1990).

Examples of 7H (Tap Water Administration)

- “Yes, the charge is fine [monthly fee isn’t too expensive]. My sister-in-law has a meter, and this house has a meter and it isn’t too expensive. The truth is that water is as valuable as gold!” II-6: Employed, Pocora
- “So, each month there’s a set monthly fee. It’s a little more than 1,000 colones...” II-14: Employed, Las Mercedes

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- “We used to pay 500 colones and now we pay 1,000 and I don’t think it will go up any more.” II-22: Homemaker, La Argentina

AyA Service

When asked how they pay for their tap water service, respondents that receive water from AyA said that they pay a one-time connection fee then a set monthly charge of 800-2,000 colones (amounts varied among respondents). These respondents reported not having a meter. One of these respondents said that she did have a meter in the past but that she had it removed because she was charged 7,000-8,000 colones a month with the meter.

Rural Aqueduct Service

Respondents that are connected to the Rural Aqueduct said that they pay a one-time connection fee then a set monthly charge of 1,000 colones. These respondents also reported not having a meter. They said that the monthly charge increases a little every year.

Summary

The data show that there is not one standard fee paid by AyA service users (even among those that do not use meters), whereas it appears that Rural Aqueduct users all pay the same monthly fee.

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Water Meter (Code 7I)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Water Meter was perceived by the researcher as respondents' perceptions of the use of water meters to generate water bills (e.g. in favor if they work well).

In order to learn about respondents' perceptions regarding tap water administration, respondents were asked what they thought of the use of water meters to determine tap water bills (Sanchez-Azofeifa et al. 2002, Espeleta 2001, Calvo 1990).

Examples of 7I (Water Meter)

- “My neighbors say that they worked hard to build the aqueduct and it is community property and nobody has the right to charge them. They worked hard to have ‘free’ water and they say they’d rather go to jail than use a meter.” II-23: Employed, La Argentina
- “See, if they had a meter, they wouldn’t be wasting water.” II-18: Employed, Las Mercedes
- “...people complain that there should not be tap meters here because we have abundant water, thank God, because of the rivers. There are springs everywhere.” II-6: Employed, Pocora

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AyA Service

Most (seven of nine) residents that use the AyA service feel that basing payment on water meters would result in higher bills and respondents worry that they would not be able to afford the higher charges. This concern was also revealed as a trust issue in some cases in which residents felt that AyA could use the meters to make them pay very high prices even if they did not use the amount of water they were charged for using (e.g. the meter readings could be easily manipulated), or that the meters simply do not work well and miscalculate the amount of water used. Concern about having to pay for water leaked out of pipes was also expressed. Alternatively, two AyA service users were in favor of using meters because they think they would make people conserve water. These two respondents also said that the monthly bill does not increase much when a meter is used.

Rural Aqueduct Service

Of the Rural Aqueduct users that discussed meters, more (five of eight) were in favor of using meters to calculate monthly water bills. While five users of the Rural Aqueduct said that basing payments on a meter would increase their monthly bill, two of these respondents are in favor of using meters because they feel the meter forces people to conserve water. Three other Rural Aqueduct users that are in favor of using meters contend that meters do not increase monthly bills, rather bills can decrease because one is only charged for what they use, and if they save water, they will benefit financially.

Perhaps the strongest anti-meter sentiment among the Rural Aqueduct users comes from respondents who helped to build the Rural Aqueduct, or know someone who helped to

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build it. One respondent said that her neighbor worked to build the Rural Aqueduct and that this person says that she worked so hard to build the system that she should have access to all the water she wants and should not have to pay for the volume she consumes.

Summary

A total of nine AyA users and eight Rural Aqueduct users discussed their feelings about using water meters. Respondents from both service areas revealed mixed feelings about the use of meters. Overall, more AyA users were opposed to using meters (78%) than Rural Aqueduct users (38%). While some respondents feel that using a meter would save them money, and it appears that people who have lived previously in a community where meters were used were in favor of using them again, other respondents thought that using meters would automatically increase their monthly water bills. Two respondents said that the people that helped to build the aqueduct felt that they deserved access to the water and would not accept the use of meters.

Respondents that were strongly opposed gave the following reasons:

- When the AyA installs meters, they charge higher prices even though you did not use a lot of water
- With a meter, you pay more [this person was not referring to AyA playing a role in this increase and admits that people waste water since they do not have a meter]

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Respondents that were in favor of using water meters gave the following reasons:

- Meters would make people conserve water
- People who do not use an excessive amount of water pay about the same if they use a meter or pay the current monthly fee
- You only pay what you use with a meter [one could actually pay less using a meter than paying the monthly fee]

Tap Water Service Problems (Code 7J)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Tap Water Service Problems were perceived by the researcher as respondents' perceptions about problems related to their tap water service (e.g. dirty pipes).

In order to learn about respondents' perceptions regarding their tap water service, respondents were asked what they thought of the tap water service that they receive from their provider (Sanchez-Azofeifa et al. 2002, Espeleta 2001, Calvo 1990).

Examples of 7J (Tap Water Service Problems)

- “As long as the water doesn’t get cut off, everything’s fine. But, a while ago we were without water for three or four days. It seems like the administration isn’t going well.” II-15: Employed, Pocora Sur
- “Well, no, there have never been any problems [with AyA’s service]. II-18: Employed, Las Mercedes
- “...a man came and told me that he’d come to cut off the water because Juan was two months behind [paying the bill]...and now they tell us that there are a bunch of people in El Carmen and Pocora Sur, that there are a ton of people that don’t pay their water bills and their water doesn’t get cut off!” II-20: Farmer, La Argentina

AyA Service

All but one of the AyA users said that they are happy with their water service, although when water meters were mentioned, seven of the AyA users expressed that they are upset at AyA for having attached meters to people’s homes without asking permission or explaining why they were doing it (see previous section: 7I). According to respondents, this incident occurred about two or three years ago and several respondents were still very upset about it. The one AyA user that complained about the service said that she is being charged an unfairly high monthly fee and AyA will not explain why or correct the problem. She would also like the water quality and quantity to improve since she feels that she is paying enough to receive good service.

Rural Aqueduct Service

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Similarly, although all 14 respondents that receive water from the Rural Aqueduct reported being happy with their water service, eight people complained about the administration. Specifically, these eight people said that members of the Rural Aqueduct Committee (RAC) are not well trained in administration and do not have professional-level experience in providing water service. One of these respondents also said that she would like to be involved in picking the members of the RAC. Two respondents said that they want the RAC to work together with AyA in general, and specifically, they would like the RAC to ask AyA for help in identifying an alternative source. One respondent said that the committee needs to be better organized and that they should have two representatives from the rural area (La Argentina). Another respondent said that the RAC only cuts service in the rural area and not in the urban area when bills are not paid. She said that the RAC is intimidated by the urban residents. Two respondents said that the committee should evaluate the pipes' placement and make changes to avoid the pipes being broken by vehicles and flooded rivers and to avoid contamination from the river and sewage ditches. One of these respondents is annoyed that the RAC has refused to consider her complaints and has not invited her to any meetings.

No Service

The two respondents that have neither AyA nor RA service have very different opinions about their lack of water service. While the respondent in the rural area is happy with the water quality and quantity she receives from a spring on her farm, the respondent in the urban area that only has access to a contaminated well is extremely frustrated. She said that most government agencies have not taken responsibility for helping them (the

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residents in her section of the community that do not have tap water service) connect to AyA's service, and the officials that have tried to help have been thwarted by interventions by EARTH's Banana Workers Association (the original owner of the property).

Summary

While all but one of the AyA users are also very pleased with AyA's administration (with the exception of the use of meters), more than half of the 14 RA users reported different problems with the RA's administration. While a number of AyA users were mistrustful of the AyA (because of the reportedly unannounced installation of meters) and one was very concerned about water quality and quantity, Rural Aqueduct users that had concerns were focused on the Rural Aqueduct Committee members' lack of administrative skills, their level of collaboration with AyA as a means to find an alternative source, and the placement and security of the pipes.

Solutions to Tap Water Problems (Code 7K)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Solutions to Tap Water Problems were perceived by the researcher as respondents' perceptions about potential ways to resolve their tap water problems (e.g. education about saving water).

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In order to learn from community members about possible ways to improve tap water service, respondents were asked what they thought could help to address the tap water problems they had cited (Sanchez Azofeifa et al. 2002, Espeleta 2001, Calvo 1990).

Examples of 7K (Solutions to Tap Water Problems)

- “Only that they [AyA] make sure the mountains aren’t deforested. That they protect the virgin forest around the water sources, don’t allow any more illegal deforestation so that the community isn’t threatened...” II-6: Employed, Pocora
- “There are so many things that can be done to protect the [tap] water...like protecting the environment, planting trees...form a group to work together.” II-22: Homemaker, La Argentina
- “I say that they should do the same as they do with us, make them [urban Rural Aqueduct water users] pay for their water too. It isn’t fair that the people who worked so much to have water pay, and those that didn’t work aren’t even charged.” II-20: Farmer, La Argentina

AyA and Rural Aqueduct Services

AyA and Rural Aqueduct users gave many examples of ways to help improve their tap water service. Their responses can be grouped into three categories: the Government’s role; the service provider’s role; and the community’s role.

AyA Service

Government’s Role

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- Government should inform community members about how to protect their water source
- Government should protect or buy land around the water source

Service Provider's Role

- AyA needs to communicate with the community about plans
- AyA needs to meet with community members and pineapple plantation owners to talk about the community's concerns

Community's Role

- Community members need to be more involved, attend meetings, and gain consciousness about water protection issues
- Community members need to cooperate with each other
- Community members need to report leaks faster
- Community members need to stop wasting water

Rural Aqueduct Service

Government's Role

- Authorities need to arrest people who manipulate the valves to divert water for personal projects

Service Provider's Role

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- RAC needs to organize information and training sessions so community members know how to better manage the water
- RAC needs professional members
- RAC needs support from AyA in promoting and enforcing good water management practices
- RAC needs to locate an alternative source
- RAC needs to inform users about plans and activities
- RAC needs to put locks on the tanks so water cannot be contaminated

Community's Role

- Community members need to be more involved, attend meetings, and gain consciousness about water protection issues
- Community members need to cooperate with each other
- Community members need to report leaks faster
- Community members need to stop wasting water

Summary

Respondents offered numerous solutions, all of which can be grouped into three categories: Government's role; service provider's role (AyA and RAC); and community's role. AyA users appear to want the Government to provide information, protection (of the resource) and legal enforcement, and they want the AyA to communicate better with community members and business interests that could impact the water supply. They also feel that community members should cooperate more to protect the resource.

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While Rural Aqueduct users want the Government to provide legal enforcement, they suggest an expanded role for the service provider compared to that suggested by the AyA users. RA users said that RAC should provide information, protection, enforcement and communication, and they also want a more highly skilled committee. Like the AyA users, RA users also feel that community members need to cooperate more to protect the tap water.

Willingness to Collaborate – Tap Water Service (Code 7L)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Willingness to Collaborate to Improve Tap Water Service was perceived by the researcher as respondents' stated disposition to collaborate to help maintain or improve the quality/quantity of their tap water (e.g. I would like to help).

In order to learn from community members about their willingness to help improve their tap water service, the researcher asked the respondents about their own disposition to collaborate (Jonsson 2004, White and Runge 1995). While the researcher expected that the respondents' expression of their willingness to help would be overstated because of the lack of a cost (financial, social, etc.) associated with their help, the researcher chose to ask the question with the hope

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that some respondents would share their thoughts about the conditions under which they could/would or could/would not collaborate.

Examples of 7L (Willingness to Collaborate – Tap Water Service)

- “Yes, yes, like if they were protecting the springs in the mountain that provide water to the community.” II-6: Employed, Pocora
- “Right, at least, the way I see it...if I have a problem with the faucet [leaking water], I turn it off and immediately look for someone to fix it. So, that way I wouldn’t be wasting water here.” II-22: Homemaker, La Argentina
- “Well, yes, because it’s something necessary. As long as I don’t have to go and protect it myself [she was joking about standing guard at the tank].” II-14: Employed, Las Mercedes

AyA Service

All but one AyA user said that they would be willing to collaborate to help improve and protect their tap water service. The respondent that said she was not willing to help said that she had been willing to help in the past, but that AyA’s attitude had discouraged her. She said that depending on how the program was working, she might be willing to collaborate again.

Rural Aqueduct Service

In the case of Rural Aqueduct users, all but two respondents said that they would be willing to help. These two respondents said that they did not have time to collaborate on such a program.

No Service

Of the two respondents that do not have a tap water provider, the one with a spring did not comment on this question, but the one using a contaminated well responded that she has become discouraged by the passive attitude of her neighbors who expect her to do all the work. She said that she has worked very hard in the past to try to achieve a safe water supply for the community only to receive no help from her neighbors, so she is not going to keep trying for the time being.

Summary

The vast majority of respondents said that they would be willing to collaborate in efforts to improve and protect tap water service (quality and quantity).

Willingness to Pay More for Tap Water (Code 70)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Willingness to Pay More for Tap Water was perceived by the researcher as respondents' stated willingness to pay more for tap water in order to

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protect their water quality and/or quantity (e.g. I won't pay more for water because I already pay too much).

In order to learn about community members' willingness to collaborate in projects to improve tap water management in the watershed, respondents in the lower region of the watershed were asked if they would be willing to pay more for their water service in order to be able to better protect the quality and quantity of the water they receive over the long-term (Jonsson 2004, Pagiola 2002, White and Runge 1995). While the researcher expected that the respondents' expression of their willingness to help would be overstated because of the lack of a realistic payment scenario associated with their proposed collaboration, the researcher chose to ask the question with the hope that some respondents would share their thoughts about the conditions under which they could/would or could/would not collaborate.

Examples of 7O (Willingness to Pay More for Tap Water)

- “Yes, I think so because it's something really important and it's important that when we receive it it's good, pure. I think that if we have to pay more to improve it, then we would support that.” II-2: Homemaker, El Carmen
- “Yes, as long as we see improvements, the work, the results. I wouldn't be right for them to ask for more money and they not do anything, right?” II-15: Employed, Pocora Sur

- “Well, as long as the water is protected and the cost doesn’t go up too much and as long as the cost is within my budget. Because there are people that can’t [pay much].” II-14: Employed, Las Mercedes

AyA Service

Six of the 10 AyA users said that they would be willing to pay more. These respondents qualified their statements by saying that they could do it if: *the water quality improved; the water quality and quantity really stays good; the increase is not too high; and meters are not used.*

Three of the four AyA users that were not willing to pay more for their tap water said that if the quality was bad, they would pay more to improve it, but that the quality is already good, so they do not want to pay more. One person said that all AyA does is increase the price without improving the service, so he is not willing to pay more.

Rural Aqueduct Service

Of the 11 RA users that answered this question, nine said that they would be willing to pay more. Like the AyA users, the RA users specified the conditions under which they would agree to pay more. They said that they would be willing to pay more for their tap water if: *the water quality improved; the water quality and quantity really stays good; the increase is not too high; they could afford the increase; and the service is good.*

Of the two respondents that said they would not be willing to pay more, one said that if the RAC administration was working like it should, the amount she currently pays should be enough to provide good quality water. The other person said that people in Pocora pay more, but they do not even have good service, so she thinks she pays enough for good service.

Summary

Overall, most respondents were receptive to the idea of paying more for tap water service in order to help ensure the improvement of poor service or the maintenance of good service. AyA and Rural Aqueduct users gave almost the exact same range of conditions on their willingness to pay more. In both cases, these conditions are based on their current perception of their water quality and quantity, and their personal budgetary constraints.

It appears that while some respondents that are content with their service might be willing to pay more to maintain that service, others might only pay more in order to improve poor service. Others who may or may not be content with the current service feel that the amount they are currently paying should be enough to provide good service, and they are not willing to pay more.

Willingness to Change Natural Resource Management Practices (Code 7P)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Willingness to Change Natural Resource Management Practices was perceived by the researcher as respondents' stated willingness to consider reforesting their land or changing some agricultural practices in exchange for payment with the goal of protecting the source, as well as downstream water quality and quantity (e.g. raise fewer head of cattle and reforest pasture).

In order to learn about community members' willingness to collaborate in projects to improve tap water management in the watershed, respondents in the upper region of the watershed (water capture zone) were asked if they would be willing to consider alternative production activities on their farms that would be aimed at protecting the water source in return for economic compensation (Jonsson 2004, Pagiola 2002, Kaimowitz 2001, White and Runge 1995). As with the previous willingness to collaborate question, while the researcher expected that the respondents' expression of their willingness to help would be overstated because of the lack of a realistic land use compensation scenario associated with their proposed collaboration, the researcher chose to ask the question with the hope that some respondents would share their thoughts about the conditions under which they could/would or could/would not collaborate.

Examples of 7P (Willingness to Change Natural Resource Management Practices)

- “That would be great and I would be willing and could collaborate with something good like that.” II-22: Homemaker, La Argentina



- “What I like is to have cattle, so if I take this little piece [of land], which is a really small piece of land, and I reforest it, then I wouldn’t be able to have cattle so that wouldn’t work...” II-18: Farmer, La Argentina
- “Yes, if there are funds [provided to fund the changes]. Most people have things planted [crops], but it would be like making an investment in the community. II-16: Employed, La Argentina

Rural Area

Of the six rural respondents located in the mid-upper section of La Argentina, three responded that they thought they could reforest if the activity was funded since the only reason they were not reforesting was for lack of money to buy trees and pay for the labor.

Of the three farmers that said they would not be able to agree to such a proposal, two (a cattle farmer and a coffee grower) said that they did not think they could spare any of their property to reforest but that if the payment was high enough, it might be worth it for them to reforest some or, in the case of the coffee grower, all of the property. Both farmers said that they would evaluate the financial costs and benefits of such a proposal. The cattle farmer said that the amount of money that MINAE currently pays for reforesting is far too little for him to justify doing it, so he could only consider a project that proposed to pay more than MINAE. The third farmer said that he would not be willing to reforest because he bought his land to raise cattle and he needs all his pasture-land for his cattle.

Summary

While three respondents were very receptive to the idea, two were cautiously receptive but said that they would have to carefully review the cost-benefit of changing their practices for compensation since other programs (e.g. MINAE's) do not offer sufficient compensation. One respondent was opposed to the idea of reforesting any of his land in exchange for financial compensation.

Waste Management Problems (Code 8C)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Waste Management Problems were perceived by the researcher as respondents' perceptions about the impact of waste disposal methods (e.g. household trash in the streets).

Waste management problems are known to have serious environmental and health impacts (Espeleta 2001). This, together with the fact that focus group participants discussed waste issues, led interviewers to ask more detailed questions about the impact of waste disposal methods in the Dos Novillos Watershed. Respondents were asked to talk about any impacts that result from the way in which community members dispose of their waste.

Examples of 8C (Waste Management Problems)



- “If the trash truck doesn’t come, people throw trash in the river. They throw in everything: tires; dead animals; containers. I was swimming once and a dead dog floated down the river.” II-5: Homemaker, Pocora
- “There are burns, lots of burns, of trash or grass when people want to plant something. Garage owners burn a lot of tires and this causes a lot of contamination.” II-15: Employed, Pocora Sur
- “People throw everything in that river [Dos Novillos]: trash, pieces of cars, washing machines, they throw anything they have in the river! Some people even have their toilets right on the river!” II-20: Farmer, La Argentina

Rural Area

Seven of the 10 rural respondents said that there are no waste management problems in their community. They explained how they take care of their waste in the rural area (burning and burying, septic tanks) and said that they felt their neighbors did a good job of keeping the community clean. The other three rural respondents cited river contamination as a major problem. They said that household trash (including discarded appliances), human wastewater, livestock manure and agrochemicals contaminate the Dos Novillos River. It should be noted that two of these three people live in the lower section of the rural area which is more populated and closest to the urban area. These three respondents also complained that there is no trash collection service in their community and that this leads to the trash disposal problems (dumping in river and sometimes, on the road).

Urban Area

Sixteen of the 17 urban respondents said that serious waste management problems in their communities cause river contamination. These 16 respondents cited the following sources of contamination (each cited more than one source): 11 respondents cited household trash; 10 cited human wastewater; seven cited agrochemicals (either in general or from a pineapple plantation), three cited dead animals/bones; two cited livestock manure; two cited medical waste from Pocora's clinic (bandages, syringes); two cited automotive waste from repair shops and gas stations (motor oil); and one cited poison used in rivers to kill and catch fish.

Twelve of these 17 urban respondents said that they are also concerned about the municipal trash collection service's irregular collection times and incomplete collection practices. Specifically, seven people complained that the municipal service does not regularly collect household trash, and does not collect yard waste and junk (e.g. discarded appliances, tires), which they have no room to burn or bury on their small lots. Aside from being visually unattractive, most of these people fear that having junk sitting in their yards will collect rainwater where Dengue Fever carrying mosquitoes will breed. Some of these respondents said that the municipality only collects junk after there has been an outbreak of Dengue, not before. Two other respondents said that they wished there was a recycling program in their community. Three urban respondents complained that despite living in an area where the municipality is expected to collect trash (for a fee), the municipality does not collect from their communities (El Carmen and Mascota). They said that this leads to trash being dumped in the river and in the street.

Two urban respondents from Mascota said that Pocora uses Mascota as a dump. They said that people from Pocora dump everything imaginable (e.g. trash, dead animals) into the field next to their small neighborhood and that trash and wastewater from households and the clinic fill the road that connects Mascota to Pocora every time there are heavy rains. They also said that many people in the neighborhood use pit latrines (instead of septic tanks) and that wastewater from these latrines and from Pocora filters into their wells (one section of the community is not connected to a tap water service).

Two other urban respondents also mentioned the problem of burning trash, tires and yard waste which they say results in air pollution. One of these people specifically said that this damages the ozone layer.

The one urban respondent that did not cite river contamination as a problem said that the only waste management problem she is aware of is that community members leave their trash bags where dogs can tear them up and the trash gets strewn all over the street.

Summary

While more than half of rural respondents said that there are no waste management problems in their communities, and all 17 urban respondents cited what they consider waste management problems, rural and urban respondents cited similar problems, most of which were linked to river contamination, while some problems also appear to contribute to town/street contamination. River contamination by trash and human wastewater were

most often cited (15 and 13 times respectively by the 27 respondents) as a serious waste management problem. Three urban respondents also cited a complete lack of municipal trash collection service and one urban resident said that human wastewater has contaminated her well (her only direct source of water).

Sources of contamination cited by rural and urban respondents can be divided into four general categories: household trash; yard waste/junk; wastewater (human and livestock); and toxic waste (agrochemicals, medical waste, motor oil).

Household Trash

- Trash and dead animals contaminate the river, the streets, and the land near Mascota.

Yard Waste/Junk

- The municipality will not collect yard waste, machinery, old appliances and tires. As a result, they end up sitting in peoples' yards, in open spaces or in the river.

Wastewater

- Human wastewater contaminates the river and groundwater.
- Livestock manure contaminates the river.

Toxic Waste

- Agrochemical runoff from pineapple plantations and, to a reportedly small degree, other agricultural activities, contaminate the river.
- Medical waste from the Pocora's medical clinic floats onto the road to Mascota when it rains and floods.



- Motor oil and other residues from an auto repair shop contaminate the river.

Causes of Waste Management Problems (Code 8D and 8E)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Causes of Waste Management Problems were perceived by the researcher as respondents' perceptions about reasons why waste management problems occur (e.g. people throw trash in the river); where they occur (e.g. in urban areas); and who is responsible (e.g. people who live on the river).

Understanding why waste management problems exist will help to ensure that actions taken to address the problem are developed based on the local reality (Heathcote 1998). For this reason, investigators aimed to understand community members' perceptions about the factors that contribute to existing waste management problems.

Examples of 8D, 8E (Causes of Waste Management Problems)

- "Well, because they're not educated, they don't know the impact that they have."
II-15: Employed, Pocora Sur
- "Because they don't understand the impact of what they're doing, they need to send a lot of information here." II-3: Self-Employed, Las Mercedes

- “Because they’re lazy. I think they do it because they’re lazy and because they’re disgusting people.” II-20: Farmer: La Argentina

Rural Area

Of the five rural residents that cited waste management problems, two said the problems exist because community members are not aware of the impact that their actions have on the environment. One of these two (this person cited a combination of factors) and two other respondents said that the people who contaminate know that what they are doing is wrong, but they do it anyway because they are lazy and they think it is easier to dump trash and wastewater in the river than dispose of it properly. One of these three respondents who said that people contaminate because they are lazy also said that the government (e.g. Municipality, Ministry of Health) should enforce laws so that people are forced to stop contaminating. The fifth rural respondent blamed the lack of services provided by the local government and said that there is nowhere for people in the rural area to put their trash and there is no recycling program, so people have to dispose of their trash somehow.

Urban Area

Of the 17 urban respondents that cited waste management problems, nine said that these problems exist because community members are not aware of the impact that their actions have on the environment. Six of these nine (these people cited a combination of factors) plus four other respondents said that the people who contaminate know that what they are doing is wrong, but they do it anyway because they are lazy, they do not care

about the negative impact they are causing, and they think it is easier to dump trash and wastewater in the river than dispose of it properly.

The remaining four urban respondents that had not cited lack of understanding nor laziness blamed the lack of services provided by the government and said that there is nowhere for people to put the trash that the municipality does not pick up, so people have to dispose of their trash somehow. Nine other urban respondents that cited other problems (laziness or lack of understanding) also said that the municipal government needed to do more to keep residents from polluting. Two people said that the government needs to install a sewage treatment facility. Others said that the municipal waste collection service needs to be expanded and improved and that there needs to be a recycling program. The two respondents from Mascota said that municipal and local government officials (e.g. Municipality, Ministry of Health, AyA, Mayor) need to extend trash collection service to their neighborhood, prevent people from Pocora from dumping trash next to their community, and keep waste from Pocora and its clinic from flooding into their road and community. Two urban respondents also said that the local Development Committees in their communities were not working well and were not helping to solve the communities' waste management problems.

Summary

Rural and urban respondents cited a variety of factors that they feel cause waste management problems in their communities. Of the 22 respondents that cited waste management problems, 15 gave more than one reason for the existence of these



problems. Urban respondents most often blamed problems on a lack of government services or support (14 references), followed by saying that individual polluters are lazy or do not care about the harm they cause (10 references) or that individuals do not understand the negative impact they cause (nine references). Rural residents' responses were slightly more evenly distributed among these three categories, making two, three, and two references respectively.

Waste Administration (Code 8F)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Waste Administration was perceived by the researcher as the entity that respondents think is responsible for handling and disposing of their waste (e.g. municipality).

In order to gain a better understanding of the waste management options available to watershed residents, the researcher asked respondents how they dispose of their waste (Heathcote 1998).

Examples of 8F (Waste Administration)

- “Here, everyone takes his or her bags of trash outside [for municipal collection]. Sometimes, we throw peels and organic waste in a pit in order to make organic fertilizer for the plants...” II-6: Employed, Pocora

- “I’m good at burning trash...they say it’s bad because it contaminates the environment. Now, I take all the peels [organic kitchen waste] and I put it on the plants so that it’ll decompose there.” II-20: Farmer, La Argentina
- “We have tons of trash. We have to burn all these bags of trash...cans, everything, because there is nowhere for us to throw away trash here. There isn’t anywhere left to bury it...everywhere you stick in a shovel, you find trash. It’s impossible! How can we live like this?” II-27: Homemaker, Mascota

Rural Area

Rural residents said that they do not have access to municipal trash collection. These respondents said that they burn flammable trash, use appropriate organic waste to make fertilizer, and bury the rest. Some rural respondents take what they can not dispose of to town for collection by the municipality. Two rural residents said that an organization (one person thinks it is CREA – a youth drug rehabilitation organization) passes through the communities about two or three times a year to collect recyclables in order to raise money. Rural residents say that they dispose of their wastewater in pits or septic tanks that they have built themselves.

Urban Area

Fourteen of the 17 urban respondents pay a monthly fee in order to have access to a municipal trash collection service that picks up trash every eight days in Las Mercedes, once a week in Pocora Sur, and twice a week in Pocora. Despite this service, some urban residents report burying the trash that the service does not collect (yard waste and junk).

The respondent that lives in El Carmen and the two respondents that live in Mascota said that the municipal trash truck does not collect any waste from their area, so they try to burn and bury their trash. Urban respondents say that there is no recycling program. They also report that there is no municipal sewage treatment facility and that each household has to build a septic tank to dispose of their wastewater. Some people, however, use a pit latrine or channel their waste into the river using a drainage ditch.

Summary

The data show that waste management is carried out differently in the rural and urban areas, and also in different parts of the urban area. All of the urban respondents, with the exception of the respondents from Mascota and El Carmen, said that the municipality is responsible for administering solid waste management in their community, while all of the rural respondents said that they are responsible for disposing of their solid waste. Both rural and urban respondents said that they are responsible for disposing of their own wastewater.

Waste Administration Problems (Code 8G)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Waste Administration Problems were perceived by the researcher as problems respondents perceive with respect to the way their waste is handled and disposed (e.g. trash truck does not always come).



In order to understand waste management problems from the community members' perspective, the researcher asked respondents about any problems that they perceive with their waste management system (Heathcote 1998).

Examples of 8G (Waste Administration Problems)

- “The Health Ministry used to be active and concerned when people contaminated the river, but now they don't do anything and the river is so contaminated you can't swim or fish.” II-5: Homemaker, Pocora
- “It's a terrible service that takes 15-22 days to come [and pick up trash] and all the dogs scatter the trash.” II-18: Employed, Las Mercedes
- “Yes, when they pick up the trash, they only pick up half of it, they don't collect it all [the municipality]. For example, two weeks ago they came on Wednesday, so everyone took their trash out on Tuesday [this week], and the truck never came and there were the dogs ripping up the bags.” II-14: Employed, Las Mercedes

Rural Area

One rural respondent said that with a small property, he is having trouble finding room to bury his trash. Others complained that a group of people that were allowed to build houses right next to the river dump their wastewater and trash into the river; and that there is no recycling program.

Urban Area

Thirteen of the 17 urban respondents said that wastewater is improperly disposed of in the river and two residents said that sewage left in pit latrines also contaminates groundwater. Urban respondents said that the municipal government allows people to build houses right next to the river, which adds to the problem of dumping wastewater and trash into the river. Respondents said that the municipal government does not help the communities properly manage their wastewater. They also cited the municipality's unreliable trash collection service (in terms of day and time) and the fact that it does not collect junk and yard waste; the lack of a recycling program; and the lack of wastewater treatment. In the case of three respondents, the municipal trash truck does not collect any waste from their area, so they try to burn and bury their trash, however they say that this is a major problem because they live in urban lots that are not big enough to bury and burn much waste. Urban respondents also said that community members do not keep the plaza clean; the Development Committee in Pocora does not do anything to help improve wastewater management; the municipal government does not provide information to community members about how to manage waste better; and the Health Ministry is not proactive in addressing waste management problems.

Summary

While urban respondents had more complaints about the way waste is managed than rural respondents, concerns among residents of both areas overlapped with respect to houses being built too close to the river contributing to wastewater and trash contamination of the river, and to a lesser degree, the lack of a trash collection service and a recycling program.

Waste Management Improvement (Code 8H)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Waste Management Improvement was perceived by the researcher as respondents' perceptions about potential ways to resolve these waste management problems (e.g. initiate a recycling program).

Researchers wanted to learn from community members about the things that they think could be done to improve waste management (Heathcote 1998).

Examples of 8H (Waste Management Improvement)

- “Some people need education, but others won’t stop contaminating unless they get fined for breaking the law.” II-25: Employed, La Argentina
- “If the municipality won’t do it, we should organize a truck to go around and pick up yard waste and other things that the municipality won’t collect, and take it somewhere. We should ask for help from EARTH, CODELA, Matas, la piñera, Siempre Verde.” II-5: Employed, Pocora
- “I think we need to learn what can be done with the waste, learn about this, because there are people who would be interested, it would be great if there was some training, a course to learn how to use waste.” II-6: Employed, Pocora

Rural and Urban Areas

Rural and urban respondents suggested very similar improvements. Of the suggestions listed below, only the first point under “Municipality’s Role” was given by respondents in just one of the two areas; in this case the urban area. The suggestions made by both rural and urban respondents can be grouped into the following three categories: government’s role; municipality’s role; and community’s role.

Government’s Role

- Needs to give community members (including school children) information and training on waste management (education efforts need to target the people living near the river)
- Needs to enforce the law that prohibits dumping wastewater into the river

Municipality’s Role

- Needs to collect more often and from all urban areas (including Mascota and El Carmen)
- Needs to collect yard waste, tires, appliances, etc. in addition to household trash
- Needs to implement a recycling program
- Needs to move the houses located right on the river back off the bank and not allow more to be built on the bank

Community’s Role

- Community members should be proactive (e.g. find alternatives to current poor practices, collaborate on contracting septic tank cleaners, and store waste where dogs can not rip open the bags)

Summary

Both rural and urban respondents suggested that: the government should provide information/education and legal enforcement; the municipality should expand its trash collection service and keep houses and business from being built on riverbanks; and community members should be more proactive and collaborative about managing their waste better.

Willingness to Collaborate to Improve Waste Management (Code 8I)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Willingness to Collaborate to Improve Waste Management was perceived by the researcher as respondents' stated disposition to collaborate on efforts to help improve their waste management situation (e.g. I don't have time to help).

In order to learn from community members about their willingness to help improve their waste management system, the researcher asked the respondents about their own disposition to collaborate (Jonsson 2004, White and Runge 1995).

While the researcher expected that the respondents' expression of their willingness to help would be overstated because of the lack of a cost (financial, social, etc.) associated with their proposed collaboration, the researcher chose to ask the question with the hope that some respondents would share their thoughts about the conditions under which they could/would or could/would not collaborate.

Examples of 8I (Willingness to Collaborate – Waste Management)

- “Yes, it would be wonderful if they would teach us to do these things [manage waste], that would be great. II-6: Employed, Pocora
- “I think so. And I’m sure other people would want to participate too. All this trash [here on the farm] is a bother.” II-21: Farmer, La Argentina
- “Yes, yes, of course. But I can only speak for myself [not for other community members].” II-26: Homemaker, Mascota

Rural and Urban Areas

All of the 15 urban respondents (of 17) and five rural respondents (of 10) that were asked this question responded that they would be willing to collaborate in an effort to improve waste management.

Summary

All rural and urban respondents that were questioned said that they would be willing to collaborate in efforts to improve waste management.

Natural Resource Issues of Concern (Code 9A)

In grouping the ideas and concepts presented by respondents into this theme, the following operational definition was used:

Natural Resource Issues of Concern were perceived by the researcher as respondents' perceptions about any natural resource concerns that were not discussed during the interview (e.g. disappearance of wildlife).

Even though the themes discussed in the individual interviews were selected based on the analysis of focus groups carried out in the Dos Novillos Watershed communities, the researcher wanted to find out what other natural resource issues are of concern to the respondents (Jonsson 2004, James et al. 2002, Rhoades 1998, Sen et al. 1997, Hinchcliffe et al. 1995).

Examples of 9A (Natural Resource Issues – Other Concerns)

- “Ah, I tell my son that before, it used to be more beautiful here. There were forests and fewer houses and there were more animals too.” II-14: Employed, Las Mercedes
- “...I don't like hunting. Other people think it's fine, but I don't.” II-21: Farmer, La Argentina

- “Now there are fewer animals, and you have to protect the iguanas now because there aren’t as many as before. Now you don’t see monkeys, we used to see them.” II-1: Self-Employed, Pocora

Rural Area

Six of eight rural respondents said that they have other natural resource management concerns. Five of the six rural respondents are concerned about diminishing numbers of wildlife. Three of these people are especially worried about hunting and a fourth states that the river has been over fished. One person concerned about the bird population fears that deforestation eliminates bird habitat and food. The sixth rural respondent cited concerns about negative health affects caused by agrochemicals used on agricultural products that she buys outside the community (she is not worried about agrochemical use in **La Argentina** because she says farmers there do not use much).

Urban Area

Nine of 16 urban respondents said that they have other natural resource management concerns. Three of these nine urban respondents are concerned about diminishing numbers of wildlife (including fish and birds). One of these people is especially worried about hunting. Five respondents said that tall grasses (abandoned lots or unmanaged grassy areas) concern them because they attract poisonous snakes or mosquitoes that carry **Dengue Fever**. One of these people said that open pit latrines act as a breeding ground for mosquitoes. Two people expressed concern that urban residents can no longer grow fruits or vegetables in their yards (this person said she does not have room because

she has to use her whole yard to bury trash that the municipality will not collect), or raise animals (this person said that the Ministry of Health will not allow people to raise chickens, ducks or pigs in their yards).

Summary

When asked if there were any other natural resource issues that concerned them, most respondents (15 of 24 respondents) cited something that had not been directly discussed during the interview. Two of eight rural respondents and seven of 16 urban respondents said that they did not have any other natural resource management concerns. Both rural and urban respondents cited decreasing wildlife (including birds and fish) in the watershed and at least one person from both areas cited hunting as a problem. Although there were no specific questions about any of the cited concerns in the interview guide, some factors perceived as contributing to these problems were discussed during the interviews (e.g. deforestation, river contamination, and waste management).


Figure 2: Focus Group Coding Example

FG-1 [p. 15]

Researcher: In what way to you think your neighbors in this area manage natural resources?

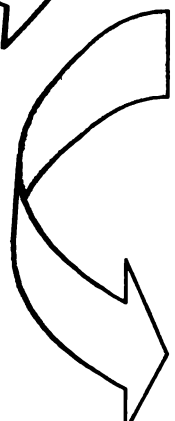
Respondent: {There's something regarding (the rivers) that seems important to me, and [everyone that sees it should (denounce the people doing it)]...they [put (poison) in (the rivers) to kill (the shrimp and fish)]. {And the reality is that this is leaving (the rivers) without any (animals), now there's no [(fishing)]}}.

Open Coding – (In parenthesis above)



RIV: "the rivers"
POI: "poison"
FAU: "(the shrimp and fish)"
FAU: "(animals)"
EN: "(denounce people)"
FISH: "(fishing)"

Axial Coding – (In brackets above)



NRM: "everyone that sees it should denounce the people doing it"
DP: "they put poison in the rivers to kill the shrimp and fish."
RQUAL: "they put poison in the rivers to kill the shrimp and fish."
REC: "fishing"

Thematic Coding – (In wavy parenthesis above)

NRMP: "they put poison in the rivers to kill the shrimp and fish. And the reality is that this is leaving the rivers without any animals, now there's no fishing."
NRMS: "There's something regarding the rivers that seems important to me, and everyone that sees it should denounce the people doing it...they put poison in the rivers to kill the shrimp and fish."
CDNW: "And the reality is that this is leaving the rivers without any animals, now there's no fishing."

Figure 3: Focus Group Open / Axial Codes

Meaning	Code	Meaning	Code
Agriculture Works for Corporations	AWC	Likes Rural Areas	LRA
Ag. Production	AGP	Local Benefit	LB
Agrochemicals	AC	Locals' Responsibility	LR
Apathy	AP	Lots of Trees	LT
AyA	AyA	Money	MON
BMPs	BMP	Motivation	MOT
Biting Insect	BI	Naïve	NAI
Bribery	BRI	Native	NAT
Bureaucracy	BUR	NR	NR
Climate	CLI	NR Management	NRM
		NR Management	NRME
Commitment	COM	Education	
Community Police	CP	Nicaraguan Workers	NW
Community Organization	CO	No Enforcement	NE
Conflict Interest	CI	No Markets	NM
Consciousness	CON	No Recreation	NREC
Contamination	CONT	Organic Markets	OM
Corruption	COR	Organize Coops.	OC
		Organize to Repair	ORR
Crops – Market	CM	Road	
		Outsiders' Responsibility	OR
Crops – Subsistence	CS	Own Land	OL
Deforestation	DEF	Participation	PART
Delinquency	DEL	Payment for	PES
		Environmental Services	
Desertification	DES	Pineapple Production	PP
Development Committee	DC		
Dialogue	DIAL	Plant Trees	PT
Direct Action	DA	Power	POD
Don't Protect	DP	Poison	POI
Drugs	DR	Poor Roads	PR
Ecology	ECO	Pop. Growth	PG
Employment	EMP	Poverty	POV
Enforcement	EN	Private Comp.	PC
Environmental Education	EE	Private Sector	PS
Environmental Services	ES	Prostitution	PROS
Expensive Inputs	EI	Protect	PRO
		Protect Water	PWS
Fauna	FAU	Source/River	
Fertile Land	FL	Public Sector	PBS
Fertilizer	FERT	Recreation	REC
		Recycling	RI
Fishing	FISH	Infrastructure	

Figure 3 (cont'd)

Meaning	Code	Meaning	Code
Flood	FLD	Reforest	REF
Food Safety Standards	FSS	Report	REP
Forestry	FOR Y	Retired	RET
Forests	FOR	Rivers	RIV
Frustration	FRU	River Quality	RQUAL
Gender Divide	GD	River Quantity	RQUAN
Government		Rural Aqueduct	RA
Management	GM		
Grassroots Movement	GMOV	Seek Markets	SM
		Sell Environmental	SES
Greedy	GRED	Services	
		Social/Environmental	SER
Health Probs.	HP	Response.	
Healthy Lifestyle	HL	Solidarity	SOL
		Sustainable Energy	SEP
Homemaker	HM	Production	
		Sustainable.	SD
Hunting	HUN	Development	
Immigrated Adult	IA	Tap Water	TAP
Immigrated Child	IC	Tap Water Quality	TWQUAL
Infrastructure	INF	Tap Water Quantity	TWQUANT
Institutional		Taxes	TX
Arrangement	IAR		
International		Theft	TH
Organization	IO		
International Quality		Threat Well-Being	TWB
Standards	IQS		
Invite People to		Time	TM
Participate	INV		
Kill Livestock	KLIV	Tourism	TOUR
Laborer	LAB	Training	TRAIN
Lack Employment	LEMP	Trash	TRSH
Lack Environmental		Understand NRM	UNRM
Education	LEE		
Lack Government		Values	VAL
Support	LGS		
Lack Information	LI	Values Ed.	VE
Lack Motivation	LMOT	Violation of Regulation	VR
Lack Recycle		Violence	VIO
Infrastructure	LRI		
Lack Support	LS	Waste Management	WM
Lack Transportation	LTRN	Wastewater	WW
Lack Understanding. of	LUNR	Water Temperature	WT
NR			
Land Use	LU	Worker Conditions	WC
Lazy	LZ	Years Resident	YR

Figure 4: Focus Group Thematic Codes

Meaning	Code
Threats to Well-Being	TWB
Interaction with Natural Resources	INR
Natural Resource Management Definition	NRMD
Natural Resource Management Aspects	NRMA
Natural Resource Management Problems	NRMP
Natural Resource Management Improvements	NRMS
Natural Resource Management Impediments	NRMI
Willingness to Improve Natural Resource Management	WILL
Perceived Changes in the Dos Novillos Watershed	CDNW
Impact of Population on the Dos Novillos Watershed	IPOP

Figure 5: Individual Interview Open / Axial Codes

Meaning	Code	Meaning	Code
Tap Water	AAT	Ignorance	I
Administration		Impediment	IMP
Forest Administration	AB	Immigration	MIGRA
Waste Administration	AD	Agrarian Development	IDA
Agrochemicals	AC	Institute	
Wastewater	AN	Place of Origin	LP
Air	A	Ministry of Environment and Energy	MINAE
Threats to Well-Being	ABIEN	Ministry of Health	MINS
Years of Residence	AR	Municipality	MUNI
Banana Companies	BAN	Nicaraguan	NIC
Trash	BAS	Community	
Biodiversity	BIO	Organization	OC
Hunting	CAC	Passive	PAS
Tap Water Quality	CALT	Perceived Definition of Natural Resources	PDRN
River Quality (Water and River)	CALR	Perception of Natural Resource Management	PMRN
Land Use Change	CUT	Pineapple (production, expansion)	P
Tap Water Quantity	CANTT	Population	POB
River Water Quantity	CANTR	Social Problems	PS
Development	CD	Agricultural Production	PA
Committee		Recreation	REC
Consciousness	CON	Natural Resources	RRNN
Contamination	CONTAM	Reforestation	REFOR
River Contamination	CR	Government's Role	RG
Convenience	CONVEN	Other Entity's Role	ROE
Community Cooperation	CC	Residents' Role	RR
Corruption	COR	Employment Sector	SE
Deforestation	D	Solutions	SOL
Unemployment	DE	Free Trade Agreement	TLC
Dialogue	DIAL	Tourism	TUR
Disposition to Collaborate	DCOL		
Education	ED		
Geography	GEO		

Figure 6: Individual Interview Subcategory Thematic Codes

Meaning	Code	Meaning	Code
Respondent's Origin	1A	Description of Tap Water Source	7A 7E
Years of Residence	1B	Affects Quality	7F
		Affects Quantity	7G
Employment Sector	2A	Administration (payment, meters)	7H
Type of Agricultural Production	2B	Administration Problems	7I
		Administration: How to Improve	7K
Threats to Well-Being	3A	Disposition to Collaborate	7L
Solutions to Threats	3B	Willingness to Pay	7O
Impediments to Solutions	3C	Willingness to be Paid to Reforest	7P
Natural Resource Definition	4A		
Natural Resource	4B	Waste Management Problems	8C
Management Definition		Why	8D
Description of Dos Novillos River	5A	Where / Who	8E
Affects River Quality	5B	Waste Administration	8F
Affects River Quantity	5C	Waste Administration Problems	8G
Deforestation: Impact	6A	Waste Administration: How to Improve	8H
Deforestation: Where/By Whom	6C	Disposition to Collaborate	8I
Deforestation: Why	6D		
Forest Administration	6E	Other Natural Resource Issues	9A
Forest Administration Problems	6F	Other Issues	9B
Forest Administration: How to Improve Protection	6G		
Disposition to Collaborate	6H		

Figure 7: Individual Interview Overarching Thematic Codes

Meaning	Code
Demographics	1
Employment or Agricultural Production	2
Threats to Well-Being	3
Natural Resources & Natural Resource Management	4
Dos Novillos River	5
Deforestation & Forest Management	6
Tap Water	7
Waste Management	8
Other Natural Resource Issues	9

Figure 8: Individual Interview Coding Example

II-3 [p. 1-2]

Researcher: In your opinion, what are the greatest threats to your well-being? Things that threaten you and your family...what kinds of things worry you the most?

Respondent: {[(Environmental contamination)]}.


Researcher: Can you give me some examples of environmental contamination that you notice?

Respondent: { Well, for example, (insecticides), { there are a lot of irrational people that [contaminate the (rivers)] } }.

Researcher: And how do they contaminate them, with what?


Respondent: [(Poisons and pesticides)].

Open Coding – (In parenthesis above)



CONTAM: "Environmental contamination."
AC: "insecticides"
RIV: "the rivers"
AC: "poisons and pesticides"

Axial Coding – (In brackets above)



ABIEN: "Environmental contamination."
CR: "contaminate the rivers"
CALR: "contaminate the rivers"
CR: "poisons and pesticides"
CALR: "poisons and pesticides"

Thematic Coding – (In wavy parenthesis above)

3A: "Environmental contamination."
3C: "there are a lot of irrational people that contaminate the rivers."
5B: "Well, for example, insecticides, there are a lot of irrational people that contaminate the rivers."

Figure 9: Focus Group Sessions and Locations

Session	Location
FG-1	La Argentina (lower section)
FG-2	Pocora
FG-3	Las Mercedes
FG-4	La Argentina (middle section)
FG-5	Pocora Sur
FG-6	La Argentina (upper section)

Figure 10: Individual Interview Locations

Session	Location	Session	Location
II-1	Pocora (West)	II-14	Las Mercedes (West)
II-2	El Carmen Sur (SE)	II-15	Pocora Sur (West)
II-3	Las Mercedes (SE)	II-16	La Argentina (Upper)
II-4	Pocora (Center)	II-17	La Argentina (Middle)
II-5	Pocora (East)	II-18	La Argentina (Middle)
II-6	Pocora (South)	II-19	La Argentina (Upper)
II-7	Pocora (North)	II-20	La Argentina (Middle)
II-8	Pocora (Center)	II-21	La Argentina (Upper)
II-9	Pocora Sur (East)	II-22	La Argentina (Middle)
II-10	Pocora Sur (Center)	II-23	La Argentina (Lower)
II-11	Las Mercedes (Center)	II-24	La Argentina (Upper)
II-12	Las Mercedes (East)	II-25	La Argentina (Lower)
II-13	Las Mercedes (North)	II-26	Pocora (North - Mascota)
		II-27	Pocora (North - Mascota)

Figure 11: Dos Novillos Watershed Communities

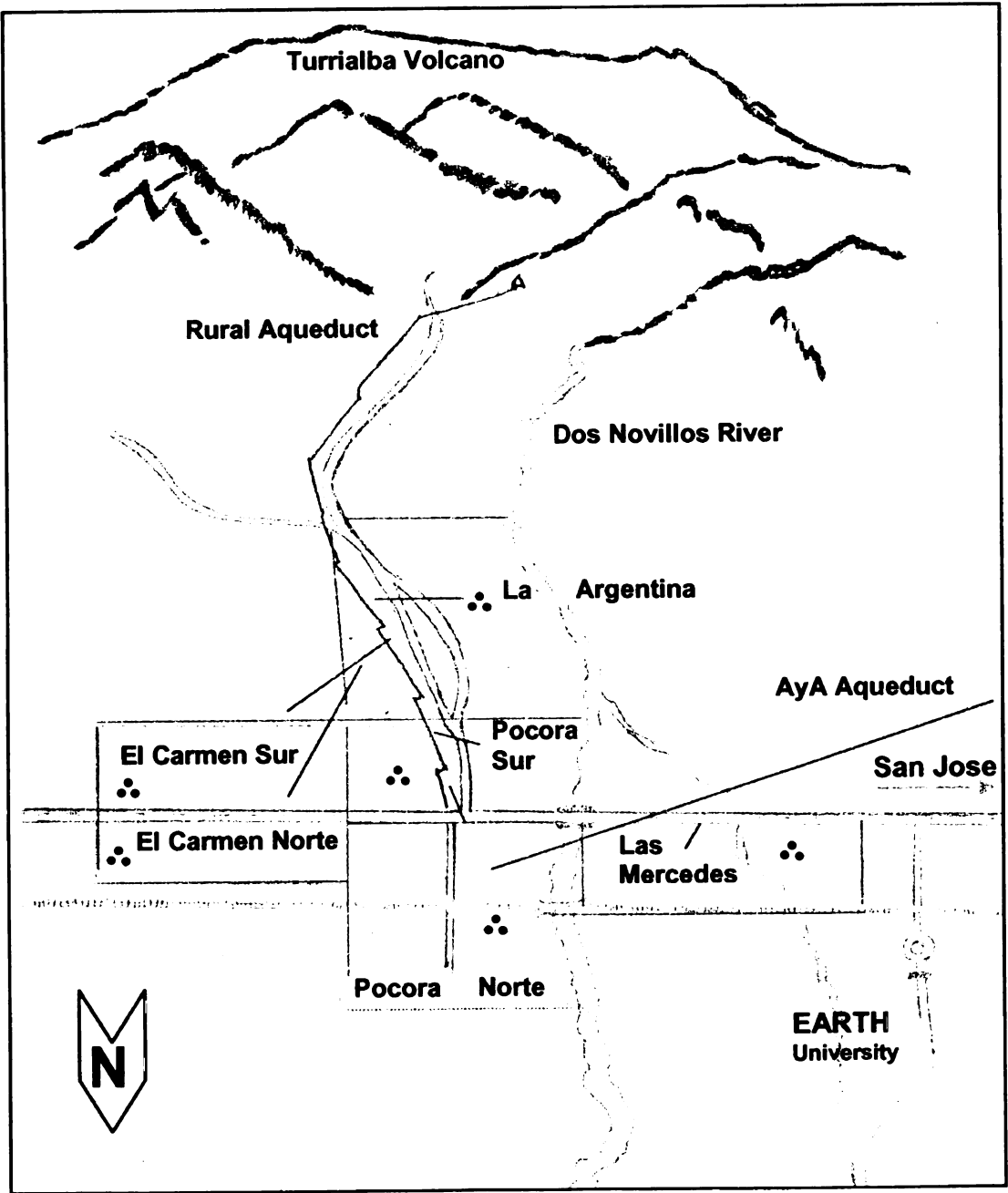
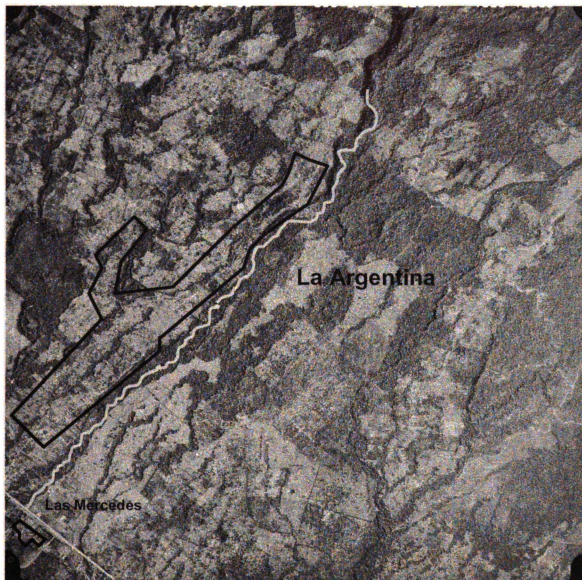


Figure 12: Upper Dos Novillos Watershed Community – Sampling Guide



Source: Aerial photo courtesy of Dr. Ricardo Russo, EARTH University

Figure 13: Lower Dos Novillos Watershed Communities – Sampling Guide



Source: Aerial photo courtesy of Dr. Ricardo Russo, EARTH University

CHAPTER 5

FINDINGS AND CONCLUSIONS

INTRODUCTION

This chapter presents the findings and conclusions drawn from the data. First, findings that correspond to the research goals are presented. Then, additional findings from each phase of research are presented, followed by a discussion of a comparison of responses from both phases; citizens living in the rural and urban areas; and users of the AyA and Rural Aqueduct (RA) water services. Finally, a review of the research project's strengths and weakness, suggestions for future work, and conclusions are presented.

RESEARCH QUESTIONS

The perception-based data collected from community members in the Dos Novillos Watershed met the project's objectives by addressing the project's five main research questions (please see Chapter 4 for more detail about the issues discussed below):

- 1) How are natural resources currently being managed in the Dos Novillos Watershed?

Research findings suggest that the natural resource management problems cited in literature about resources in Costa Rica and the study area (Espeleta 2001, Sanchez-Azofeifa et al. 2002, Calvo 1990, Tejada and Castro 2000, Guerrero 1998, Cuesta 1999, Navarro and Reyes 1999, Pareja and Sosa 2001) do exist in the Dos Novillos and appear to be worsening due a combination of factors including land use changes in the study area

and a lack of collaborative, proactive natural resource management efforts on behalf of the governmental service providers and the local community members.

In order to better understand community members' responses (James et al. 2002, Sen et al. 1997, Adegbidi et al. 1999), the researcher asked them to explain how they define 'natural resources' and 'natural resource management'. While some respondents appeared to be confident in articulating their understanding of the terms, while others appeared to be unsure how to define the term. In both cases, respondents gave examples of natural resources (e.g. forests, river, wildlife, tap water). For the most part, respondents said that 'managing' resources means 'protecting' and 'taking care of' resources.

It is important to note that just because a respondent was not able to give a clear definition of what the term, 'natural resources' means to him/her, does not imply that he/she did not understand natural resource issues. For example, an urban respondent that gave an in-depth explanation of what he perceives as a serious river contamination problem was unsure how to express exactly what the term "natural resources" means.

When asked specifically about natural resources, participants identified the following natural resource problems as the greatest causes of concern:

- the watershed's forests and deforestation;
- threats to their tap water supply and quality;
- waste management problems; and
- Dos Novillos River contamination.

With respect to forest management and deforestation, just as more than half of the respondents (63%) identified MINAE (or MIRENEM) as being responsible for managing the forests, more than half also said that the entity is doing a poor job (52%). While these respondents blamed MINAE for poor forest management practices (e.g. lack of proactivity, accepting bribes), some residents blamed lack of support and proactivity from local residents and MINAE's budgetary constraints for the forest management problems.

Although respondents did not identify landowners as the party responsible for managing the forests, it appears that many watershed residents feel that the landowners need to be regulated by MINAE because community members are generally reticent to gain enemies in these small communities by arguing with neighbors about their forest management practices. Some residents justify this reticence by stating that MINAE does not do enough to back-up citizens who risk social repercussions to file complaints, while other respondents criticize their fellow community members for not being proactive and not working together to put pressure on landowners who are violating forest management laws.

While there was some variation in the perceptions among rural and urban respondents with respect to where deforestation is occurring, overall, responses from rural and urban residents regarding where, why, and by whom were similar. As far as causes, in addition to citing timber sales and pineapple production, a few rural residents said that the timber

is cut to use on the farm and not for sale. With respect to who is deforesting, respondents said that in addition to wood buyers who typically come from outside the community, local landowners also cut trees for farm use, while some large landowners are deforesting to make room for pineapple plantations on their properties.

Regarding tap water, watershed residents receive their tap water services from one of two sources (the AyA administrated service is located on a farm called Las Delicias and the source of the water for the Rural Aqueduct comes from a mountain spring located in the upper part of the Watershed above La Argentina), or they are not connected to either system. The data show that there is not one standard fee paid by AyA service users (even among those that do not use meters), whereas it appears that Rural Aqueduct (RA) users are all charged the same monthly fee.

Both AyA and RA users were positive about the quality of the tap water they receive. Of the two respondents that do not receive tap water from either service, one is content with her water quality (rural user) and the other is extremely upset by the poor quality of the family's well water (urban user). Both AyA and Rural Aqueduct users were positive about the volume of tap water they receive.

A total of nine AyA users and eight Rural Aqueduct users discussed their feelings about using water meters. Respondents from both service areas revealed mixed feelings about the use of meters. Overall, more AyA users were opposed to using meters (78%) than Rural Aqueduct users (38%). While some respondents feel that using a meter would save

them money, and it appears that people who have lived previously in a community where meters were used were in favor of using them again, other respondents thought that using meters would automatically increase their monthly water bills. Two respondents said that the people that helped to build the Rural Aqueduct felt that they deserve access to the water and would not accept the use of meters.

While all but one of the AyA users are very pleased with AyA's administration of their tap water service (with the exception of the use of meters), more than half of the 14 Rural Aqueduct users reported different problems with the Rural Aqueduct's administration. While a number of AyA users were mistrustful of the AyA (because of the reportedly unannounced installation of meters) and one was very concerned about water quality and quantity, Rural Aqueduct users that had concerns were focused on the Rural Aqueduct Committee members' lack of administrative skills, their low level of collaboration with AyA as a means to find an alternative source, and the placement and security of the pipes.

The two respondents that have neither AyA nor Rural Aqueduct service have very different opinions about their lack of water service. While the respondent in the rural area is happy with the water quality and quantity she receives from a spring on her farm (and therefore has no complaints about her lack of service), the respondent in the urban area that only has access to a contaminated well is extremely frustrated. This respondent said that most government agencies have not taken responsibility for helping them (the residents in the section of the community that do not have tap water service) connect to AyA's service, and the officials that have tried to help have been thwarted by

interventions by EARTH's Banana Workers Association (the original owner of the property).

With respect to waste management, the data show that waste is disposed of differently in the rural and urban areas, and also in different parts of the urban area. All of the urban respondents, with the exception of those from Mascota and El Carmen, said that the Municipality is responsible for administering solid waste management in their community, while all of the rural respondents said that they are responsible for disposing of their solid waste. Both rural and urban community members said that they are responsible for disposing of their wastewater.

Rural and urban respondents cited a variety of factors that they feel cause waste management problems in their communities. Of the 22 people that cited waste management problems, 15 gave more than one reason for the existence of these problems. Urban respondents most often blamed problems on a lack of government services or support (14 references), followed by saying that individual polluters are lazy or do not care about the harm they cause (10 references) or that individuals do not understand the negative impact they cause (nine references). Rural residents' responses were similarly distributed among these three categories, making two, three, and two references respectively.

When asked if there were any other natural resource issues that concerned them, most respondents (15 of 24) cited something that had not been directly discussed during the

interview. Both rural and urban residents cited decreasing wildlife (including birds and fish) in the Watershed and at least one person from both areas cited hunting as a problem. Although there were no specific questions about any of these other concerns in the interview guide, some factors perceived by respondents as contributing to these problems were discussed during the interviews (e.g. deforestation, river contamination, and waste management). Two of eight rural residents and seven of 16 urban respondents said that they did not have any other natural resource management concerns.

2) How does this management impact the local communities?

Whereas authors of literature on environmental and socio-economic impacts of natural resource management in Costa Rica contend that urgent natural resource management problems exist, and call upon policymakers to address the problems (Calvo 1990, Costanza 1998, Espeleta 2001, Tejada and Castro 2000, Sanchez-Azofeifa et al. 2002, Carpenter et al. 2001, Pagiola 2002), data from this study shows that community members appear to be aware that their way of life (especially that of large landowners) directly impacts how natural resources are managed, and that this natural resource management also impacts their well-being in a wide variety of areas (e.g. health, economics, agriculture, aesthetics, recreation, free-time). The level of awareness and concern of respondents suggests that community members could play a more active role in improving natural resource management through a participatory watershed management approach.

Although more than half of the individuals interviewed (63%) responded that social problems represent the greatest threat to their well-being, both urban and rural respondents expressed concern about the way natural resources are managed (and 30% said that one or more natural resource management problems represented the greatest threat to their well-being).

With respect to the Dos Novillos River, although respondents from the rural and urban areas have differing perceptions about the quality of the river's water, respondents from both areas offered basically the same ideas about how the river could be contaminated. Respondents from both areas cited: agrochemicals, wastewater, trash, and manure. Only urban residents mentioned 'dead animals' as a source of contamination. Regarding river quantity, both rural and urban respondents perceive a strong correlation between the presence or absence of forests and the volume of water in the river. Specifically, respondents said that deforestation affects the quantity of water in the river by causing droughts when it is not raining and floods when it rains.

In addition to negative effects on river volume, both rural and urban respondents had strong opinions about other perceived problems caused by deforestation. Many people were concerned that deforestation could negatively impact their drinking water supply, wildlife (habitat and food), the amount of wood available for building, and tourism.

When asked what could impact the quality of their tap water, users of the AyA and Rural Aqueduct systems cited the same situations that could negatively impact their water

quality. Users of both systems cited: contamination of the spring or source with human contamination and/or livestock manure; and poor system maintenance (having dirty, old or broken tanks and pipes) as the biggest threats. Some Rural Aqueduct users added that agricultural expansion and deforestation around the source could impact their tap water quality.

For the most part, respondents that receive water from AyA and the RA also cited the same situations that could cause a reduction in the quantity of tap water they receive. Users of both services cited three main issues: pipe size, connection and placement; deforestation; and increased demand from a growing population. Both groups also cited what appear to be location-specific concerns. Data suggests that AyA users, a group that does not include rural residents, see wasting water as more of a problem than do their rural neighbors. The data also suggests that the Rural Aqueduct users feel that their water source is more susceptible to being damaged by a natural disaster than do the AyA users. Only Rural Aqueduct users expressed concern that the entity responsible for administering their water has not located an alternative source.

Regarding waste management, while more than half of rural respondents said that there are no waste management problems in their communities, and all 17 urban respondents cited what they consider waste management problems, overall, rural and urban residents cited similar problems. Most of the cited problems were linked to river contamination, while some problems also appear to contribute to town/street contamination. River contamination by trash and human wastewater were most often cited (15 and 13 times

respectively by the 27 respondents) as serious waste management problems. Residents of both areas specified that building houses too close to the river contributes to this problem. Three urban respondents also cited a complete lack of municipal trash collection service and one urban resident said that human wastewater has contaminated the family's well (the family's only direct source of water). The lack of a recycling program was also mentioned as a problem. Sources of contamination cited by rural and urban respondents can be divided into four general categories: household trash; yard waste/junk; wastewater (e.g. human and livestock); and toxic waste (e.g. agrochemicals from pineapple and ornamental plant plantations, medical waste from the clinic, motor oil from the gas station).

3) What alternatives exist for achieving more sustainable natural resource management and improved quality of life in the Watershed?

Just as respondents expressed awareness of a link between natural resource management and their well-being, they also provided suggestions about ways they felt management problems could be addressed, as well as explanations about impediments that have thwarted previous efforts. Again, although literature about natural resource management in Costa Rica appears to accurately identify management problems that exist in the Dos Novillos Watershed, these authors' calls for policymakers to address the problems (Calvo 1990, Costanza 1998, Espeleta 2001, Tejada and Castro 2000, Sanchez-Azofeifa et al. 2002, Carpenter et al. 2001) and potential solutions (Pagiola 2002, Panayotou 2001, Deshazo 2001) appear to neglect the potentially valuable role of local knowledge and

community participation in watershed management (Sen et al. 1997, Hinchcliffe et al. 1995, Farrington and Lobo 1997, Rhoades 1998, Swallow et al. 2001, Blackburn and Holland 1998, White and Runge 1995, Girot et al. 1998).

Respondents from the rural and urban areas appeared to share the perception that both the Costa Rican Government and the local communities share the blame for the natural resource problems that are threatening the quality of life of communities in the Dos Novillos Watershed. They discussed the role of the national government, the administrator/service provider (e.g. MINAE, AyA, Rural Aqueduct, Municipality), and the community and focused on three specific areas for improvement: enforcement; education; and citizen action. Specifically, with respect to the role of the government, respondents' comments reflect a concern that government agencies are neither adequately monitoring natural resources nor enforcing existing laws meant to protect the resources. Community members expressed frustration with government agencies for what they appear to perceive as a lack of proactivity in addressing current and potential natural resource problems and a lack of support for community members who are trying to do their part to help agencies protect natural resources. Respondents also said that the government (or another entity) should offer environmental education/training in the communities. These respondents said that many people in their community do things that harm the environment because of ignorance and a lack of understanding about the environment. Others seemed to feel that ignorance is only part of the problem. They state that, with respect to the role of communities, even though there are resources available to communities, community members/organizations are not motivated and do not ask for

help. Similarly, the Development Committees were criticized for not being proactive, and for not coordinating activities with each other (with the Committees in neighboring communities).

Specifically with respect to forest management, respondents from the rural and urban areas suggest that: the government help MINAE be more effective by giving the Ministry greater human and economic resources, and by giving the communities information and training; MINAE be more proactive, enforce the forestry laws and address its corruption problem; and community members be more proactive and organized with respect to collaborating as a community and with other sectors to protect the forests.

With respect to tap water provision, AyA users appear to want the government to provide information, resource protection and legal enforcement, and they want the AyA to communicate better with community members and business interests that could impact the water supply. They also feel that community members should cooperate more to protect the resource. While Rural Aqueduct users want the government to provide legal enforcement, they suggest an expanded role for the service provider compared to that suggested by the AyA users. Rural Aqueduct users said that Rural Aqueduct Committee should provide information, resource protection, legal enforcement, and communication, and they also want a more highly skilled committee. Like the AyA users, RA users also feel that community members need to cooperate more and do their part to protect their tap water.

Regarding waste management, rural and urban respondents suggested that: the government should provide information/education and legal enforcement; the municipality should expand its trash collection service and keep houses and businesses from being built on riverbanks; and community members should be more proactive and collaborative about managing their waste better.

In addition to suggesting potential solutions to existing problems, respondents from the rural and urban areas also cited similar impediments to implementing these solutions and carrying out successful natural resource management programs in the Dos Novillos Watershed. With respect to the perceived failings of the government, respondents specified that corruption keeps government agencies from effectively managing the Watershed's natural resources. Regarding the local communities' role in managing natural resources, respondents cited the following problems that make community members and community organizations ineffective: lack of understanding regarding human impact on natural resources; lack of motivation to collaborate; lack of trust in local groups/organizations; lack of financial resources to carry-out activities; lack of confidence in governmental agencies (due to the agencies' lack of legal enforcement of environmental laws).

- 4) Are community members willing to participate in efforts to improve natural resource management using methods that they deem viable?

While the researcher expected that the respondents' expression of their willingness to help would be overstated because of the lack of a cost (financial, social, etc.) associated with their help, the researcher chose to ask the question with the hope that some respondents would share their thoughts about the conditions under which they could/would or could/would not collaborate (Sen et al. 1997, Hinchcliffe et al. 1995, Rhoades 1998, Farrington and Lobo 1997, Swallow et al. 2001, White and Runge 1995, Blackburn and Holland 1998, Pagiola 2002). As was expected, most respondents said that they would be willing to collaborate in whatever way they could (although there were exceptions, and some conditions were specified - see Chapter 4) to improve forest protection; improve and protect tap water service (quality and quantity); and improve waste management.

Additionally, with respect to tap water provision, most respondents in the lower watershed were receptive to the idea of paying more for tap water service in order to help ensure the improvement of poor service or the maintenance of good service. AyA and Rural Aqueduct users gave almost the exact same range of conditions on their willingness to pay more. In both cases, these conditions are based on their current perception of their water quality and quantity, and their personal budgetary constraints. It appears that while some respondents that are content with their service might be willing to pay more to maintain that service, others might only pay more in order to improve poor service. Others who may or may not be content with the current service feel that the amount they are currently paying should be enough to provide good service, and they are not willing to pay more.

While three respondents in the upper watershed were very receptive to the idea of evaluating the possibility of changing their land uses in exchange for payment, two were cautiously receptive but said that they would have to carefully review the cost-benefit of changing their practices for compensation since other programs (e.g. MINAE's) do not offer sufficient compensation. One respondent said he would be opposed to the idea of reforesting any of his land in exchange for financial compensation.

- 5) Did the qualitative, multiple method approach used in this study yield in-depth, salient and accurate information regarding community members' perceptions about natural resource issues in their watershed?

The research revealed that using focus groups and individual interviews yielded in-depth and different, but complementary, results concerning stakeholders' perceptions of natural resources and their management (Patton 2002, Kaplowitz 2000, Knodel et al. 1990, Morgan 1998, Strauss and Corbin 1998). Based on this experience, the researcher believes that using focus groups for scoping is ideal at any scale. However, being aware of the challenges of using both qualitative methods (e.g. time intensive data collection and analysis), she contends that if a project is lacking sufficient time or other resources to properly conduct focus groups in addition to one or two subsequent phases of research, informal scoping should be carried out instead; possibly by interviewing a cross-section of stakeholders. She asserts, however, that this would be a viable alternative as long as the qualitative or quantitative instrument that results from this scoping phase is rigorously

pre-tested to ensure relevance, utility and understandability. Alternatively, a resource-constrained researcher might choose to have a smaller overall sample and still use both methods.

PHASE I (FOCUS GROUP) FINDINGS

The data collected from the focus groups suggests that many participants perceive a natural resource management problem to be the greatest threat to their well-being.

Groups of participants that did not cite a natural resource problem as the greatest threat to their well-being (two of the six groups), did express concern about the way one or more natural resources are being managed in the Dos Novillos Watershed. When discussing natural resources, participants raised a variety of concerns, but the researcher found that the following natural resource problems were identified as causing the greatest concern:

- deforestation;
- threats to tap water supply and quality;
- waste management problems; and
- Dos Novillos River contamination.

In each of the six focus groups, some participants expressed their perception of the interconnected nature of the natural resource problems that the group as a whole had cited. For example, some participants talked about deforestation with respect to decreasing river levels, river contamination (agro-chemical runoff), decreasing aquifer levels and/or loss of wildlife habitat. The researcher could not be sure, however, if these perceptions of interconnectedness were entirely shared by most participants due to the

presence of local environmental activists or obviously well-informed community members in each of the sessions (Knodel et al. 1990).

Among the numerous contributing factors mentioned, community members most often cited the following factors as reasons for the above natural resource problems:

- a lack of environmental/natural resource awareness in general and regarding the impact that people have on the environment/natural resources;
- a lack of natural resource management law enforcement by government representatives; and
- a lack of community cohesion and motivation needed to work together to learn about and address natural resource problems. With respect to this point, community members' lack of concern for their negative impact on natural resources, paternalism, a feeling that the government does not care about them because they are poor, and social problems (crime, drug addiction, prostitution) were also cited as reasons for lack of community support for managing natural resources better.

Although focus group participants suggested a wide range of ways to improve the situation, community members most often made the following suggestions about ways to address the natural resource management problems they identified:

- increase the community members' awareness and understanding about natural resource issues through formal and informal education (informal education being word of mouth among neighbors and friends);

- train farmers so that they can find out how to manage resources more sustainably and still make a living;
- promote collaboration and dialogue among community members, businesses and government representatives regarding ways to improve natural resource management; and
- work to improve community solidarity and motivate youth participation in community activities.

PHASE II (INDIVIDUAL INTERVIEW) FINDINGS

The individual interview findings mirrored the focus group findings in that the data suggest that a diverse group of Dos Novillos Watershed residents are most concerned about the same watershed and natural resource issues as the focus group participants. Again, even the respondents that did not cite a natural resource management problem as the greatest threat to their well-being, are concerned about:

- the watershed's forests;
- their tap water;
- trash and wastewater disposal; and
- the Dos Novillos River.

The individual interview data also revealed new aspects of wastewater management and tap water provision that were not discussed in great detail during the focus group sessions. The researcher considers it possible that topics related to perceived poor domestic wastewater management practices by some community members may not have

been discussed in detail during the focus group sessions due to their potentially sensitive nature (Kaplowitz 2000, Patton 2002), or simply due to the fact that focus group participants were not aware of localized problems.

The respondents discussed three main natural resource management problems that they feel represent a threat to these key resources (forests, tap water, Dos Novillos River). Since the following problems and their impacts on the above natural resources are not mutually exclusive, they do not each relate to only one of the stated natural resources:

- deforestation (primarily for timber and pineapple plantation expansion);
- lack of tap water quality/quantity assurance (in part due to problems with the water service provider's administration); and
- poor waste management.

While community members offered many different suggestions about ways to address each natural resource management problem they identified, their suggestions repeatedly included:

- communities need information/education/training on how to manage the resource better;
- the responsible agency needs to enforce laws protecting the resource and support citizens when they try to do their part to protect the resource; and
- community members/Community Development Associations need to be more proactive and collaborative in their efforts to manage the resource better.

COMPARISON FINDINGS

As multiple layers of data were analyzed during this research, various sets of findings were compared and contrasted in order to better understand individual layers of data.

First, there is a discussion of the similarities and differences between the findings drawn from the two phases of research (Phase I and Phase II). Next, there is a discussion of the similarities and differences between the findings derived from research in the urban and rural areas. Finally, there is a comparison of the findings regarding the two water service providers in the study area (AyA and Rural Aqueduct).

FOCUS GROUPS (PHASE I) AND INDIVIDUAL INTERVIEWS (PHASE II)

As stated above, the two data collections yielded the same general findings, although the individual interviews revealed greater depth with respect to most of the concepts and themes that were discussed in both sessions, as well as more specific information about perceived problems with wastewater management and tap water provision.

The one area where data analysis of the two phases yielded slightly different findings was with respect to 'Threats to Well-being'. Comparative analysis of this data from Phase I and Phase II reveals that natural resource-based threats to well-being were more often reported by respondents during the focus group sessions than during the individual interviews. Specifically, while four out of the six focus groups reported natural resource problems as the greatest threats to their well-being, the majority of both urban and rural individual interview respondents (65% and 70% respectively) cited socio-economic problems as representing the greatest threat to their well-being. This difference could be

due to the fact that people felt more comfortable discussing possibly sensitive socio-economic problems in one-on-one interviews than in the group setting, and/or because **some** focus group participants did not feel comfortable disagreeing with other **participants** who they perceived as being more aware of, or more passionate about, **natural** resource problems (Kaplowitz 2000, Knodel et al. 1990).

It was clear from both data collections that many of the natural resource management **issues** that community members talked about are not mutually exclusive. Almost all of **the** problems they raised and discussed during the focus groups and individual interviews **are** connected and interrelated in a way that makes it impossible to study one without **simultaneously** studying the others. For example, community members that said they **were** most concerned about river contamination due to the expansion of pineapple **plantations** (e.g. soil erosion and agro-chemical runoff into the river), may or may not **have** mentioned deforestation (e.g. to clear land to plant pineapple) as another grave **concern**. Similarly, people most concerned about deforestation by timber harvesters **because** of its perceived impact on water production (for drinking water and/or river **water**), may or may not have shared some community members' perception that forests in the **Watershed** are severely threatened due to the expansion of pineapple plantations. **Additionally**, although social problems (e.g. crime, drug addiction, unemployment) were **not the** focus of this research, the data make it clear that it is impossible to attempt to **understand** a community's reality without considering the natural resource issues together **with the** socio-economic situation (Hinchcliffe et al. 1995, Sen et al. 1997).

RURAL AND URBAN AREAS

The following comparative analysis of rural versus urban findings is presented first with respect to the focus group data, followed by the individual interview data.

Focus Groups

A comparison of responses from rural and urban focus group respondents reveals that rural and urban perceptions about many of the issues discussed during the focus group sessions appear to be remarkably similar. The data does, however, reveal some differences. Specifically, differences between rural and urban focus group participants' perceptions are notable with respect to the following themes:

Threats to Well-Being (TWB)

Although concern about water quantity and quality was common among participants in all six focus groups, only one of three rural focus groups cite a natural resource problem as the greatest threat to participants' well-being compared to all of the three urban groups. This could be attributed to the more easily identifiable contamination that residents live with in the densely populated, downstream urban area (e.g. trash, river contamination, traffic, dust, noise pollution), as opposed to the apparently cleaner, upstream, rural lifestyle characterized by abundant open space and vegetation in the rural area. Additionally, many urban respondents appear to be under the impression that their well-being depends on what happens in the rural areas (e.g. tap water quality and quantity), and their lack of control over these issues may make them seem even more

pressing. At the same time, since most residents in the rural area rely on farming for their livelihood, problems growing, transporting or selling their products, combined with a lack of off-farm employment opportunities could be most pressing to many people, despite their knowledge of, or concern about, natural resource problems.

Natural Resource Management Problems (NRMP)

Participants in both urban and rural focus groups said that the main obstacles to good natural resource management in their communities are: a lack of environmental/natural resource awareness/understanding about the impact that people have on the environment/natural resources; a lack of environmental law enforcement; and corruption by government representatives regarding natural resource management issues.

In addition to these shared perceptions, some rural participants also emphasized a lack of training and sustainable, revenue generating options for farmers, while some urban participants discussed the perceived power of the private agribusiness sector (e.g. pineapple plantations) to maximize profits at the expense of natural resources.

Natural Resource Management Improvements (NRMS)

While participants from both rural and urban groups suggested strengthening community organization and increasing the community members' awareness about natural resource issues, focus group participants from the rural and urban areas also gave seemingly area-specific suggestions. Specifically, rural communities also suggested alternative institutional arrangements such as payment for environmental services and co-

management, as well as entrepreneurial activities that could help farmers manage natural resources better. Respondents from the urban groups focused more on discussing ways to improve natural resource management with business and government representatives.

Natural Resource Management Impediments (NRMI)

While people from both rural and urban focus groups shared the following perceptions: many community members lack community solidarity and do not want to go to meetings about environmental/community issues; government representatives act as though they do not feel obligated to enforce laws or listen/respond to members of the communities in this watershed; and communities do not have the money needed to implement natural resource management projects, some perceived impediments were not shared by participants from both areas. While focus group participants in the rural area also said that urban residents are not willing to pay for the environmental services that upstream, rural landowners provide, urban area focus group participants also cited social problems as impediments.

Impact of Population (IPOP)

While participants from each of the focus groups said that they feel that the communities in the Watershed are growing, and most participants from both the rural and urban areas appear to feel negatively impacted by at least some aspect of this growth, one rural group mentioned a positive impact of population growth (strength in numbers). Another difference is that although rural participants appear to feel somewhat negatively

impacted, overall, rural participants appear to be less concerned about the perceived population growth than their urban neighbors. While rural and urban participants cited wastewater management impacts (e.g. river contamination), urban participants also cited deforestation, and social and economic impacts. Urban participants expanded to say that the immigrating plantation workers represent a threat to their community's employment opportunities because they feel that immigrants (identified as Nicaraguans) have lower employment standards than Costa Ricans.

Individual Interviews

As with the focus group analysis, a comparison of responses from individually interviewed rural and urban respondents reveals that rural and urban perceptions about many of the issues discussed during the individual interviews appear to be remarkably similar. The data does, however, reveal some important differences. Specifically, differences between rural and urban individual interview participants' perceptions are notable in the following themes:

Threats to Well-Being (3A)

Overall, a slightly higher percentage of urban respondents (35%) cited natural resource problems as the greatest threat to their well-being than did rural respondents (20%, or 30% if taking into account the rural respondent that cited both a natural resource problem and a social problem). Although the sample size of this phase of research is too small to draw generalizable conclusions, this apparently greater concern about natural resource

problems in the urban area could possibly be explained by the fact that the urban residents are downstream inhabitants of the Watershed and receive the impact of any poor natural resource management practices that occur upstream. This is not to say that the people in the rural area are responsible for the contamination, rather it is just to say that activities that occur upstream in the rural area (e.g. deforestation and pineapple production) and the upstream portion of the urban area (e.g. wastewater and trash disposal), all appear to have more noticeable negative impacts on the downstream urban residents that were interviewed.

Dos Novillos River (5A)

Rural and urban residents almost uniformly perceive that the Dos Novillos River is drier now than it used to be, however, rural and urban respondents cited different perceptions about the quality of the river's water. While most rural residents responded that the Dos Novillos River is clean, most urban residents responded that it is contaminated. The differences in opinion between rural and urban respondents with respect to the quality of the river water appears to be attributed to the perception that the river is very clean at the source and in its course down the mountain until it reaches the more populated rural/urban frontier area (lower La Argentina, southern Pocora Sur) where it becomes visually contaminated by trash, debris and wastewater.

Waste Management Problems (8C)

While rural and urban respondents cited similar problems, more than half of rural respondents said that there are no waste management problems in their communities, and all 17 urban respondents said that they have waste management problems. This apparently greater dissatisfaction with waste management practices in the urban area could be attributed to the fact that the impacts of poor waste management practices are more evident in a densely populated, downstream urban area than they are in the less populated, upstream rural area.

Waste Administration (8F)

While both rural and urban respondents said they are responsible for disposing of their wastewater, the data shows that solid waste management is carried out differently in the rural and urban areas, and also in different parts of the urban area. With the exception of respondents from Mascota and El Carmen, urban residents said that the Municipality is responsible for administering solid waste management in their communities. Urban residents from Mascota and El Carmen, as well as all of the rural respondents said they are responsible for disposing of their solid waste.

Waste Administration Problems (8G)

While concerns among residents from rural and urban areas overlapped, more urban respondents had complaints (76%) about the waste management administration than rural respondents (30%). This apparently greater dissatisfaction with the waste disposal system

in the urban area could be attributed to the fact that residents in the urban area expect good service from the Municipality since they are paying for trash collection service, or feel they should have access to the service since it is available throughout most of the urban area. Rural residents have no service to be disappointed in, and unless they have a particularly small property, they do not appear concerned about continuing to dispose of their trash.

Natural Resource Issues – Other Concerns (9A)

While both rural and urban respondents most often cited decreasing amounts of wildlife (e.g. mammals, birds, fish), more of the rural residents responded that they had natural resource concerns in addition to those discussed during the interview. Six of eight (75%) rural respondents compared to nine of 16 (56%) urban respondents said that they did have at least one other natural resource concern.

AyA AND RURAL AQUEDUCT SERVICES

Just as responses from the rural and urban residents were compared, responses from users of the AyA and RA tap water services were also compared. While the data reveals that the perceptions of users of both services appear to be similar in many instances, there are some exceptions in which apparent strong differences are evident. Differences between AyA and Rural Aqueduct users' perceptions are strongly notable with respect to the following themes:

Impact on Tap Water Quantity (7G)

For the most part, respondents that receive water from AyA and the Rural Aqueduct cited the same situations that could cause a reduction in the quantity of tap water they receive. Both groups did, however, also cite what could be source-specific concerns. The data suggests that AyA users, a group that does not include rural residents, see wasting water as more of a problem than do their rural neighbors. The data also suggests that the Rural Aqueduct users feel that their water source is more susceptible to being damaged by a natural disaster than do the AyA users. Only Rural Aqueduct users expressed concern that the entity responsible for administering their water has not located an alternative source.

Tap Water Administration (7H)

The data shows that there is not one standard fee paid by AyA service users (even among those that do not use meters), whereas it appears that Rural Aqueduct users are all charged the same monthly fee.

Water Meter (7I)

Respondents from both service areas revealed mixed feelings about the use of meters. Overall, more AyA users were opposed to using meters (78%) than were RA users (38%). It should be noted however that the Rural Aqueduct users that are opposed to the use of meters are very strongly opposed. This difference could be due to the fact that AyA users see the installation of water meters as a more likely possibility than RA users

do (since some have already been installed in the AyA service area), and therefore, more of an immediate threat.

Tap Water Service Problems (7J)

While all but one of the AyA users are very pleased with AyA's administration (with the exception of the use of meters), more than half of the RA users reported having problems with the Rural Aqueduct Committee's (RAC) administration. While a number of AyA users were mistrustful of the AyA (because of the reportedly unannounced installation of meters) and one was very concerned about water quality and quantity, RA users that had concerns were focused on the RAC members' lack of administrative skills, their lack of collaboration with AyA as a means to find an alternative source, and the placement and security of the water pipes.

Solutions to Tap Water Problems (7K)

Respondents offered numerous solutions, all of which can be grouped into three categories: national government's role; service provider's role (AyA and RAC); and community's role. AyA users appear to want the government to provide information, resource protection and legal enforcement, and they want the AyA to communicate better with community members and business interests that could impact the water supply. They also feel that community members should cooperate more to protect the resource.

While RA users also want the government to provide legal enforcement in order to protect the resource, they suggest an expanded role for the service provider compared to that suggested by the AyA users. RA users said that the RAC should provide information, protection, enforcement, and communication, and they also want a more highly skilled committee. Like the AyA users, RA users also feel that community members need to cooperate more to protect the tap water.

OTHER FINDINGS

DEMOGRAPHICS – GEOGRAPHICAL ZONE

In both the focus groups and individual interviews, all but one of the native respondents live in the urban area. The higher number of urban respondents that are native to the study area could reflect the fact that the Institute for Agrarian Development (IDA) distributed land in what is now La Argentina beginning in 1976. Current landowners have been migrating to the area since that time, thus residents that were born there would be relatively young (late 20's) and anecdotal evidence by some residents in the area suggests that many of the young people are moving away in search of employment.

DEMOGRAPHICS – GENDER

Forty-six percent (46%) of focus group participants were female, while 70% of the individual interview respondents were female. While the focus groups were held late in the evening or on the weekend when men were available to meet, the individual interviews were conducted between 8am and 6pm when most men in the community

appeared to be away from home at work. The researcher was restricted to this time-frame because of logistical constraints and concerns about her security.

FOCUS GROUP DYNAMIC

While the focus group session held in Las Mercedes (FG-3) was similar to the others in that the participants appeared to be enthusiastic about the subject, this group was different in that there was not one reserved member in the group. All of the participants were eager to share their opinions, often at the same time. Despite the researcher's repeated attempts to encourage the participants to speak one at a time, there were numerous occasions in which two people were so eager to interject that they tried to do so by speaking louder than the other participant.

The group dynamic observed during this session may reflect the fact that Las Mercedes is the smallest of the communities in the study area, therefore, community members probably know each other very well, and for that reason, they may not be as concerned about offending each other by talking over or contradicting each other. Also, the group was extremely concerned about the potential impact that a proposed pineapple plantation could have on the community's drinking water supply. The community had already been organizing to address the problem at the local, regional and national level. The degree of community-wide organization in Las Mercedes around the perceived impacts of a proposed pineapple plantation could explain why this group was so concerned, focused and conversant about natural resource concerns.

FG-4 (middle La Argentina) and FG-6 (upper La Argentina), both included one very well informed community member (the community leader) and one relatively quiet participant that needed encouragement from the researcher or other focus group participants in order to contribute. The self-confident tone used by the community leaders in FG-4 and FG-6 could have encouraged the other participants to give greater emphasis to the natural resource issues raised by these leaders or inhibited other participants from contradicting her/him (Knodel et al. 1990).

INDIVIDUAL RESPONDENT BEHAVIOR

Most of the individual interviews took much longer to complete than anticipated. This occurred when the respondent was very concerned about one or more issues and/or when the respondent had a lot of information about, or experience with, one or more issues. Many respondents had a great deal to say about various subjects, and were enthusiastic about sharing their thoughts. Their enthusiasm to talk with the researcher could be due to the respondents' concern about natural resource issues and/or a lack of opportunity to voice their opinions on these issues.

As with the focus group sessions, the individuals appeared to be interested in the research topic and to respond honestly throughout the interview. Respondents seemed to engage in frank discussions with the researcher and did not appear to be embarrassed to ask her what she meant by something or to say that they did not know about an issue. While they were happy to report what they considered to be positive aspects, they also did not appear to regret discussing negative issues that they saw as affecting, or being caused by

themselves and their family, neighbors, community, and government. It appeared to the researcher that there was more discussion of intra-community problems (with respect to neighbors or other residents, the Community Development Committees, and the Rural Aqueduct Committee) during the individual interviews than there was during the focus group sessions. While this could have occurred simply because residents had a longer time-period available to discuss their perceptions during the individual interviews, it could be that the group setting of the focus groups inhibited more frank discussions of sensitive topics (Kaplowitz 2000, Patton 2002).

RIVER VOLUME

Regarding volume, all but two rural respondents and all urban respondents that expressed an opinion said that the river is drier now than it was in the past (one person in each area did not have an opinion). It appears that the difference between respondents who replied that the river is drier and those that believe it is at its normal level could be due to the number of years that the respondents have lived in the area (longer-term residents perceive a greater change) and/or the respondents' proximity to the river or amount of time spent near the river (residents living near or spending more time by the river appear to perceive a greater change).

STRENGTHS AND WEAKNESSES OF APPROACH

The following section outlines some specific strengths and weaknesses inherent in this project's approach that may benefit others planning to conduct research using a similar approach.

STRENGTHS

The researcher found the project's inductive approach useful for understanding community members' perceptions about natural resource management in their watershed. Based on her experience, the researcher believes that carrying out consecutive data collections by relying on the analysis of data collected in a previous scoping phase to develop the instrument for the next issue clarification phase was critical to her being able to gain a broad understanding of the community members' perceptions regarding a variety of natural resource issues.

Specifically, conducting focus groups first allowed the researcher to make sure that she was on track with her line of inquiry. The researcher's experience corresponds to research literature, which states that using focus groups in a preliminary scoping phase allows researchers to gather a substantial amount of diverse information relatively quickly (when compared to seeking out and interviewing the same number of focus group participants on an individual basis). The literature contends that the key findings from this scoping phase can then be reevaluated for relevancy and investigated more profoundly through the implementation of in-depth, individual interviews (Morgan 1998).

However, the researcher's experience carrying out both focus groups and individual interviews supports the findings of Kaplowitz (2000) and Patton (2002) regarding the apparent unwillingness of some participants to disclose sensitive information during focus group sessions. Since it appears that the local context, the subject being discussed,

and issues of trust all have an impact on whether or not respondents will be willing to share sensitive information during focus group discussions or individual interviews, whenever possible, researchers should conduct both kinds of qualitative research (as well as other qualitative methods such as participant observation if warranted) in order to reduce the possibility that they are missing potentially crucial information that respondents did not feel comfortable disclosing.

Although a quantitative data collection may not always be possible or necessary (depending on the project's resources, time limitations, and objectives), the researcher feels that many projects, including this one, can benefit greatly from the implementation of a quantitative data collection. For example, the third, quantitative phase of this research should help to confirm how generalizable the Phase I and Phase II findings are, as well as generate new information and lines of research for future work.

In the case of this research, the multiple-method, inductive qualitative process made it possible for the researcher to develop a survey instrument that she was confident would be both understood by respondents in terms of language and content, and thought of as pertinent and important to the respondents. This was possible precisely because the researcher had carried out two phases of research (and also reviewed results of a previous, exploratory phase) with the goal of finding out what natural resource issues community members are concerned about, what potential solutions they suggest, and how willing they think their community is to help address the concerns they cite. This

information allowed her to frame the survey instrument's main themes, and to develop pertinent questions and response options.

With respect to the data analysis, the researcher feels that the advantage of having just one researcher carry-out all of the data collections, and conduct all of the coding and iterative analysis is that it can make the process of analysis and interpretation more reliable. While depending on one person to carry out the research and analysis eliminates the ability to triangulate coding and interpretation, the fact that the researcher conducted all of the data collections herself in the respondents' native language gave her a much better contextual understanding of what the respondents said, how they said it (e.g. sarcastic, joking, serious), and in some cases, why they said what they did (e.g. they visibly felt comfortable with the interviewer or group; they were angry with another participant). This level of knowledge about the data would not have been possible if the researcher had conducted only some of the data collections and then helped analyze the transcriptions of other interviews that someone else had conducted. A researcher who actually carries out each data collection also has the added advantage of being able to compare what each respondent said in each situation. By doing so, the researcher might be able to determine what the respondents may have left out, and why (e.g. in the case of sensitive information). This kind of interpretation lends itself to careful follow-up during the next phase of data collection that the researcher develops and implements.

Alternately, a second researcher would have made it possible to conduct more interviews in the given time period. This would also have allowed the researchers to triangulate the

coding procedure and check each other's interpretation of the data. While having more than one researcher carry-out the data collections and analysis would have eliminated the one-researcher/analyst strength described above, depending on the time restrictions and the minimum number of interviews to be collected, this could be an appropriate trade-off.

WEAKNESSES

Although the researcher found great value in using the qualitative, multiple method approach to carry out phases I and II of this project, it should be noted that the approach does have weaknesses if the project is to be conducted in a country foreign to the field researcher and if the PI is financially or logistically restricted to spending less than two months in the field carrying out research.

The researcher feels that due to the need to meticulously analyze one or more sets of data in the field before being able to develop and carry-out the in-depth, individual interviews, it would be extremely difficult for a researcher to use this approach successfully in this time period without being fluent in the local language and without having some experience living/working in the community, or at least, elsewhere in the region or in a similar culture. The researcher has based this on her own experience since she found that she was short on time despite the fact that she had lived in the research area for three years, knew her way around, was familiar with the local cultures, is fluent in Spanish, understands much of the local slang (thus, she needed no translators or translations), and did not need a guide to drive her around the research site and help her select and

approach respondents (she was accompanied into the field during the individual interview phase strictly for safety reasons).

As with most qualitative research, the focus group discussions and individual interviews were time consuming due to the interrelated and often emotional nature of the research questions, combined with the apparent lack of opportunities for many respondents to share their thoughts on the research subject. For this reason, not only should the researcher be fluent in the local language in order to be able to stay alert and follow the discussion for long periods of time, but the researcher should be an empathetic person, totally devoted to the project goals and to conducting high quality qualitative research. These qualifications will help the researcher remain patient and alert during repeated, long discussions about the same general topic, and then to meticulously pick through the voluminous amount of data that this type of data collection produces.

Based on her experience, the researcher believes that using focus groups for scoping is ideal. However, being aware of the challenges of doing so, she contends that if a project is lacking sufficient time and/or resources to properly conduct focus groups in addition to one or two subsequent phases of research, informal scoping should be carried out instead, possibly by interviewing a cross-section of stakeholders. She asserts, however, that this would be a viable alternative as long as the qualitative or quantitative instrument that results from this scoping phase is pre-tested to ensure relevance, utility, and understandability. Alternatively, a resource constrained researcher might choose to have a smaller overall sample and still use both methods.

SUGGESTIONS FOR FUTURE WORK

The researcher suggests the completion of a survey questionnaire in order to take full advantage of the new knowledge about local perceptions regarding natural resource management gained through this project. Additional work to expand the scope of the research to include complementary areas of inquiry is also suggested. Doing so successfully would allow for the development and eventual implementation of viable initiatives with the goal of improving natural resource management in the Watershed, while simultaneously contributing to the long-term process of improving the quality of life of the Watershed's residents.

Nest steps include working with project partners to draft manuscripts for publication in peer-reviewed journals. As part of this process, the researcher will take into consideration the history of the study area (resource management; land tenure; water rights and use; community conflicts and cooperation) and also compare the findings of this study with the results of other related research projects. This information will allow the researcher to develop more conceptual conclusions about the findings presented in this chapter, as well as their implications for future work in the study area. The results of this process will allow the researcher to develop realistic follow-up questions for future research.

Similarly, the project's findings will be made available to the residents of the Dos Novillos Watershed communities. This will be coordinated though EARTH University's Community Development Program (CDP). The CDP and the researcher should present

the findings to community members and request their feedback. Since there is no project funding available for this, the CDP and the researcher will do this on their own. The CDP and/or the researcher should then follow-up on any comments and feedback made by community members and other stakeholders, and report on any additional findings.

After receiving and responding to community, stakeholder and scholar-practitioner feedback on the findings, a proposal to carry out a scaled-up study in the Reventazón-Parismina Watershed should be drafted. The researcher's observations regarding strengths and weaknesses of the pilot project, other scholar-practitioner comments regarding the project's approach, and feedback regarding the findings should be considered when drafting the new proposal in order to correct weaknesses and ensure that strengths are taken advantage of to the fullest. Researchers may want to submit this scaled-up proposal for funding, or they may decide to wait for results of the socio-economic study (discussed below) in order to find out how they could better support this research by asking certain key questions not considered in this pilot study. Alternately, researchers may decide to carry-out both aspects of research (perceptions of natural resource management and socio-economic factors) in a more coordinated, overlapping fashion, instead of completing one project and then beginning the other.

Since socio-economic data is already being collected in the Reventazón-Parismina Watershed, the researcher suggests that while options for scaling-up the Dos Novillos pilot project are being considered, the socio-economic data should be reviewed and findings regarding factors affecting natural resource management in the Dos Novillos

Watershed should be considered as well. The data on socio-economic problems that was collected during the Dos Novillos pilot project should serve as inputs for the researchers studying the links between socio-economic factors and the natural resource management situation in the Watershed.

Again, while bio-physical data has already been collected in the Dos Novillos Watershed, and will continue to be collected in the Reventazón-Parismina Watershed, the researcher suggests that the bio-physical data collections follow-up on areas of particular concern (to be presented as pilot project findings) if they were not previously studied (e.g. domestic wastewater contamination levels in the Dos Novillos River).

After the socio-economic and bio-physical research has been completed and the findings of all three reports synthesized, a workshop could be held in which certain stakeholders (depending on the objective of the meeting) are invited to openly discuss the findings and their impact for the future of the Watershed. Among the stakeholders that could be invited to participate are:

- community members (recognizing existing community organizations and committees);
- government representatives: local and municipal officials, MINAE, AyA, Ministry of Health, and the congressional representative;
- agro-industry representatives with current and planned projects in the area;
- universities working in the area; and
- NGOs working in the area.

The initial workshop could be conducted with the goal of discussing the findings and asking community members and other stakeholders what they would like to do with this information. If stakeholders express an interest in collaborating to try to improve any/various aspects of the natural resource management situation, future workshops could be organized to discuss further action. For example, one option could involve establishing working groups to focus on each of the general areas targeted for improvement (e.g. forest management, potable water supply, river health, drug addiction, unemployment, lack of agricultural markets). Task forces could then be established to deal directly with specific issues (e.g. domestic wastewater management) and to coordinate with the other task forces working on related projects. Any such efforts should build upon existing local programs (e.g. EARTH's Community Development Program) in an effort to complement these activities and avoid disrupting or duplicating work already in progress.

Due to the interconnected nature of the problems to be addressed, it would be essential that the task forces share their ideas and proposals with each other and with the working groups so that partnerships can be established with other individuals and entities working nationally and internationally in these areas. This collaboration could help the project participants find creative ways to implement as many of their initiatives as possible by leveraging community, local, regional and national support, and to develop proposals to fund the implementation of more expensive initiatives (e.g. wastewater treatment) by

partnering with other institutions and taking advantage of international funding opportunities.

CONCLUSIONS

The findings derived from phases I and II of this pilot project revealed a number of apparently serious natural resource management problems in the Dos Novillos Watershed, as well as contributing factors, potential solutions, and statements regarding community members' willingness to collaborate to help improve various aspects of natural resource management. Subsequent research including a household questionnaire will help to determine how widespread and salient the phase I and II findings are among the Watershed population. The final, synthesized findings should give EARTH University useful input for its Research Program, which is oriented toward integrated watershed management of the Reventazón-Parismina Watershed. These findings should also help EARTH University's Community Development Program develop work plans and priority areas, and also seek funding and collaboration in order to address issues reported in the findings.

It is hoped that the findings could be used by the Watershed residents' Community Development Associations and other local groups to engage more residents in a dialogue about the natural resource problems that negatively affect their well-being and the natural environment. The findings could also help community groups develop work plans and designate priority issues. Other stakeholders could also benefit from the report. The wealth of information disclosed about community members' perceptions of the work

being done by governmental representatives (local and municipal officials, MINAE, AyA, Ministry of Health) could help these representatives understand the residents' points of view. While residents and officials are bound to disagree on many issues, if this information is used in the spirit of finding viable solutions to problems, governmental representatives and other stakeholders (agroindustry representatives) could use the findings as a starting point to begin a process of communication and collaboration with the communities.

In addition to EARTH University, other universities and NGOs working in the area could also benefit from the project's findings by eliminating the need for duplicative studies in the same sub-watershed (thus saving scarce resources), serving as an input for future, complimentary studies, and opening a forum to discuss the project's methodology, implementation, and results, with the goal of improving future work. While it is intended that various aspects of this research project be published in peer-reviewed journals, it is important to ensure that the findings are also distributed through other means in order to reach stakeholders and practitioners that may not have access to these publications.

In conclusion, this research appears to demonstrate that potential exists within the Dos Novillos Watershed communities for addressing a variety of the natural resource management concerns cited by community members due to: the existence of a relatively well informed citizenry that is concerned about a wide variety of natural resource management issues; community members' stated willingness to help address the natural resource management problems they cited; and a history of collaborative community

development work with EARTH University's Community Development Program.

However, it also appears that community members and service providers would benefit from a continuing dialogue about the cited natural resource management concerns in an effort to develop collaborative ways to address problems. Such a process might also motivate more people to be willing to collaborate individually and as communities. With respect to the research methods, this pilot project demonstrates the strengths of utilizing a multiple method qualitative approach to address natural resource management issues, and also highlights some weaknesses and possible alternatives. This said, the researcher acknowledges that input from stakeholders and further data analysis is needed in order to validate the researcher's perceptions, as well as future lines of research.

APPENDICES

Appendix A. Verbal Informed Consent Script

Acuerdo Verbal de Consentimiento

Como dije antes, me llamo: _____. Trabajo para un proyecto de investigación social de la Universidad Michigan State en Estados Unidos y la Universidad EARTH de acá de Guácimo.

La información que usted nos dé nos va permitir aprender de usted con respecto a cómo los miembros de la comunidad perciben y usan los recursos naturales en la cuenca del río Dos Novillos.

La conversación durará aproximadamente 30 minutos. No existen respuestas correctas, ni incorrectas. No tiene que contestar a ninguna pregunta que no le guste, y tiene la libertad de dejar la discusión en cualquier momento sin problemas o preocupaciones por haberlo hecho.

Le aseguro que su identidad y respuestas serán estrictamente confidenciales y que su privacidad será protegida al máximo, tanto como la ley nos lo permite. No utilizaremos su nombre, sino un código numérico para identificarle en nuestro cuestionario y en los análisis e informes. Seremos cuidadosos de no describir sus actividades en forma tal que permita que alguien pueda adivinar su identidad, y mantendremos nuestros datos siempre en un lugar seguro.

Quiero tomar nota cuidadosamente de todo lo que usted tenga o desee decir. Para ayudarme a hacer esto voy a tomar notas y si me permite, me gustaría grabar nuestra conversación.

Su participación en esta entrevista es voluntaria y sepa que usted no está bajo ninguna obligación de terminar la entrevista o a contestar alguna pregunta que no le guste. Esperamos que la información que recibamos de su parte y de otros miembros de su comunidad sirva para entender mejor cómo nosotros y los colegas en la Universidad EARTH podemos apoyar a personas como usted y a las comunidades en la cuenca del río Dos Novillos.

¿Tiene alguna pregunta?

Sí / No

Si en el futuro usted tuviera alguna pregunta con respecto a este estudio, por favor contacte directamente a cualquiera de las personas indicadas en esta hoja [entregar la hoja con información de contacto].

Si tiene alguna pregunta con respecto a sus derechos como participante de esta investigación, o está descontento en algún momento con este estudio, puede contactar al Dr. Peter Vasilenko, Encargado del Comité Universitario de Investigación que Involucra Sujetos Humanos (UCRIHS por sus siglas en inglés). Su información de contacto también está en esta hoja, pero siempre lo puede contactar por medio de los contactos de EARTH.

¿Basado en esta información, entiende usted sus derechos? Sí / No

¿Tiene alguna pregunta? Sí / No

¿Está de acuerdo en participar en la entrevista? Sí / No

Appendix B. Focus Group Discussion Guide

Guión de Discusión

Proyecto: El Manejo de Recursos Naturales en la Cuenca del Río Dos Novillos

Fecha: _____ **Hora:** _____

Lugar: _____

Participantes: (Usar códigos) _____

Metas de la Discusión

- Entender que significa, “manejo de recursos naturales” para la gente de la zona.
- Entender la opinión de los residentes de la cuenca respecto al impacto del manejo de RN en su calidad de vida.
- Identificar, con los residentes de la cuenca, los principales retos y oportunidades del manejo de RN en la zona.
- Identificar las soluciones y alternativas potenciales que los residentes creen que podrían ayudar a enfrentar los problemas identificados.

ANTES DE CONTINUAR:

1) LEER EL GUIÓN DEL ACUERDO DE CONSENTIMIENTO VERBAL A LOS ASISTENTES DE ENTREVISTA, Y

2) DISTRIBUIR LA INFORMACIÓN DE CONTACTO A LOS ASISTENTES DE ENTREVISTA

GRACIAS, CONTINUAREMOS

Los hemos invitado a estar aquí para que podamos tener una conversación grupal. Queremos conocer lo que ustedes opinan sobre los temas que les voy a mencionar ahora. Por favor, siéntanse con la confianza de hablar a los demás participantes en este grupo y de responder a los comentarios de cada uno y a no sentirse restringidos a contestar solamente a mis preguntas.

¿Tiene alguien alguna pregunta?

Preguntas

1. ¿Por cuanto tiempo ha vivido en (nombre de comunidad)?

Profundizar: Si no nació en _____, preguntar donde vivió antes.

2. ¿Cuénteme en que trabaja usted para ganarse la vida?

Profundizar: Si es un/una agricultor/a, preguntar qué produce.

Profundizar: Si la persona es dueño(a) de un terreno: cuénteme sobre este terreno - ¿tiene bosques, riachuelos, etc.?

Profundizar: Si es dueño/a de su propio negocio, o si es empleado en el sector público o privado, preguntar si él/ella se dedica a producir algún cultivo/ganado para consumo familiar o para vender.

3. En sus opiniones, ¿cuales son las amenazas más grandes a su bienestar – su calidad de vida?

Profundizar: ¿Que cree que podría solucionar estos problemas (tratar un problema a la vez)?

Profundizar: ¿Cuáles cree que son los impedimentos más importantes a la posibilidad de implementar o llevar a cabo estas soluciones (tratar un problema/una solución a la vez)?

4. ¿Cómo describen ustedes su interacción con los recursos naturales (la naturaleza) de la cuenca?

Profundizar: Entender si él/ella piensa que su bienestar depende en los recursos naturales, y si es así, ¿cómo?

5. ¿Qué significa para ustedes la frase: “manejo de los recursos naturales?”

Profundizar: Pedir ejemplos según los diferentes respuestas.

6. ¿Cómo describirían la manera en que los residentes manejan los recursos naturales por acá en _____? (Nombrar los recursos que él/ella ha mencionado como importantes.)

Profundizar: ¿Y en la cuenca en general?

Profundizar: Entender que son los problemas más graves con el manejo de los RN aquí en la cuenca? (Entender “quien” lo hace y “para el beneficio de quien”.)

Profundizar: Entender que son los mejores ejemplos del buen manejo de los RN en la cuenca? (Entender “quien” lo hace y “para el beneficio de quien”.)

7. ¿De los recursos que sufren de un mal manejo, que se podría hacer para mejorar este manejo? (Nombrar los recursos que él/ella ha mencionado.)

Profundizar: En su opinión, ¿qué son los impedimentos más importantes a la habilidad de manejar bien estos recursos (nombrar los recursos que él/ella ha mencionado)?

Profundizar: En su opinión, ¿qué podría ayudar a enfrentar estos impedimentos para asegurar que los recursos naturales (nombrar los recursos que él/ella ha mencionado) podrían ser manejados mejor?

Profundizar: Entender su opinión con respecto a la disposición de la gente de _____ de mejorar el manejo de RN. En la cuenca en general?

8. ¿Qué opinan ustedes sobre la manera en que la cuenca Dos Novillos ha cambiado a lo largo de los años? En términos del manejo de los RN?

Profundizar: Entender porque él/ella piensa que estos cambios (positivos y/o negativos) han ocurrido.

Profundizar: Entender cuales soluciones él/ella piensa que podrían ayudar a resolver los problemas.

Profundizar: Entender cuales impedimentos existen a la implementación de estas soluciones.

9. ¿Sienten ustedes que la población en la cuenca ha cambiado? ¿Cómo? ¿Dónde?

Profundizar: Si dicen que sí, ¿Cómo se sienten afectados por este cambio?

Bueno, muchísimas gracias. ¿Habría algo más que les gustaría agregar y que no tuvieron oportunidad de decir anteriormente?

Agradecemos mucho su voluntad a compartir con nosotros sus opiniones respecto a estos temas. ¿Sería posible contactarles en el futuro para clarificar o confirmar algún dato que nos han brindado hoy?

Por favor, no duden en contactarnos. Nuestra información de contacto está en la hoja que les entregamos al principio.

Appendix C. Focus Group Invitation

Sábado, 10 de julio de 2004

Señor(a) _____

Estimado(a) miembro de la comunidad:

Tengo el gusto de invitarlo a participar con nosotros en una corta reunión de una hora y media para conversar y aprender de usted sobre el manejo de los recursos naturales en la cuenca del Río Dos Novillos.

Esta reunión se llevará a cabo el próximo **sábado, 17 de julio a las 4pm** en la casa de don Eladio Chinchilla y contará con la participación de otros siete miembros de la comunidad de La Argentina, quienes han sido seleccionados para participar en este estudio. Este estudio tiene como propósito recoger información que servirá para que conjuntamente identifiquemos alternativas de manejo de recursos naturales que benefician a la comunidad. Por tal razón, consideramos que su participación es sumamente importante.

La información que se genere en esta reunión será tratada en forma anónima y cuidadosamente analizada. Al final del estudio los resultados serán compartidos con la comunidad para que puedan ser considerados en la toma de decisiones comunales.

Anticipadamente, agradecemos su colaboración con la Universidad EARTH y con mi persona en particular.

Estamos conscientes de su limitado tiempo y esperamos que esta hora sea conveniente para usted.

Esperando poder contar con su presencia para aprender de sus experiencias y conocimientos, mientras degustamos de un refrigerio. Por cualquier duda, por favor comuníquese directamente conmigo o con don Eladio Chinchilla.

Se despide cordialmente,

Delanie Kellon
Responsable del Estudio
Teléfono 713 - 00 - 00 Extensión 4100

Appendix D. Individual Interview Discussion Guide

Guión de Entrevista

Proyecto: El Manejo de Recursos Naturales en la Cuenca del Río Dos Novillos

Fecha: _____ **Hora:** _____

Lugar: _____

Descripción del Lugar: (Uso de la tierra) _____

Participante: (Usar código) _____

Metas de la Entrevista

- **Entender que significa, “recurso natural” y “manejo de recursos naturales” para la gente de la cuenca.**
- **Entender la opinión de los residentes de la cuenca con respecto al impacto de la deforestación, el servicio y la administración del agua y el manejo de desechos en su bienestar.**
- **Entender como funcionan (y como pueden ser mejorados) los arreglos institucionales que actualmente dirigen el manejo de los RN.**
- **Identificar, con los residentes de la cuenca, las principales oportunidades y soluciones potenciales para mejorar el manejo de los RN en la cuenca.**
- **Identificar la disposición de los participantes de participar activamente en la búsqueda de mejores formas de manejar los RN y las condiciones bajo cuales estarían dispuestos si actualmente no están.**

ANTES DE CONTINUAR:

1) LEER EL GUIÓN DEL ACUERDO DE CONSENTIMIENTO VERBAL AL PARTICIPANTE DE LA ENTREVISTA, Y

2) DISTRIBUIR LA INFORMACIÓN DE CONTACTO AL PARTICIPANTE DE LA ENTREVISTA

GRACIAS, CONTINUAREMOS

Preguntas

1. ¿Por cuanto tiempo ha vivido en _____?

Profundizar: Si no nació en _____, preguntar donde vivió antes.

2. ¿Cuénteme en que trabaja usted para ganarse la vida?

Profundizar: Si es un/una agricultor/a, preguntar qué produce.

Profundizar: Si la persona es dueño(a) de un terreno: cuénteme sobre este terreno – ¿tiene bosques, riachuelos, etc.?

Profundizar: Si es dueño/a de su propio negocio, o si es empleado en el sector público o privado, preguntar si él/ella se dedica a producir algún cultivo/ganado para consumo familiar o para vender.

3. En su opinión, ¿cuales son las amenazas más grandes para su bienestar – para su calidad de vida?

Profundizar: ¿Cómo cree que podría solucionar estos problemas (tratar un problema a la vez)?

Profundizar: ¿Cuáles cree que son los impedimentos más importantes para implementar o llevar a cabo estas soluciones (tratar un problema/una solución a la vez)?

4. ¿Me puede dar unos ejemplos de recursos naturales que son importantes para Usted? (Cosas del ambiente/la naturaleza que usemos en nuestras vidas.)

Profundizar: ¿Cuales recursos naturales son importantes para usted?

Profundizar: ¿Que significa para usted la frase: “manejo de los recursos naturales”?

5. ¿Cómo describe usted el Río Dos Novillos?

Profundizar: En su opinión, ¿Qué afecta la calidad del agua en el Río?

Profundizar: En su opinión, ¿Qué afecta la cantidad del agua en el Río?

6. ¿En su opinión, qué impacto tiene la deforestación que ocurre en esta cuenca?

Profundizar: ¿La deforestación impacta a usted, su familia o su comunidad? ¿Cómo?

Profundizar: ¿Dónde está ocurriendo esta deforestación y por quien?

Profundizar: ¿Por qué está ocurriendo la deforestación?

Profundizar: ¿Cómo se maneja/administra actualmente los bosques aquí en la cuenca del Río Dos Novillos?

Profundizar: ¿Qué problemas tiene este sistema?

Profundizar: ¿En su opinión, que se puede hacer para proteger mejor los bosques?

Profundizar: ¿Qué estaría dispuesto a hacer para ayudar a enfrentar el problema?

Profundizar: Si no está dispuesto a hacer algo, ¿por qué no?

Profundizar: Si está dispuesto, pero no puede ahora, ¿Qué tendría que ocurrir para que usted realmente haga un esfuerzo para ayudar a enfrentar el problema?

Profundizar: ¿Qué papel deben jugar las personas que viven en la cuenca del Río Dos Novillos en el manejo de los bosques?

Profundizar: ¿Qué papel deben jugar otros entes en el manejo de los bosques de la cuenca?

7. ¿Cómo describe usted el agua que recibe en su casa/negocio?

Profundizar: ¿Opina usted que la calidad y cantidad del agua que llega a su casa impacta a usted, su familia o su comunidad? ¿Cómo?

Profundizar: ¿De dónde viene el agua que llega a su casa/negocio?

Profundizar: En su opinión, ¿Qué afecta la calidad de su agua? ¿Quién lo hace y por qué?

Profundizar: En su opinión, ¿Qué afecta la cantidad que llega a su casa? ¿Quién lo hace y por qué?

Profundizar: ¿Cómo se administra el agua actualmente que usa esta comunidad?

Profundizar: ¿Qué problemas tiene el sistema de administración de su agua?

(Entender si paga por cantidad usada o solo para la conexión. ¿Cuanto es el cobro?)

Profundizar: ¿Qué soluciones sugeriría usted para mejorar el servicio (calidad y cantidad) y la administración del agua?

Profundizar: ¿Qué estaría dispuesto a hacer para ayudar a mejorar el servicio (calidad y cantidad) o la administración del agua?

Profundizar: Si no está dispuesto a hacer algo, ¿Por qué no?

Profundizar: Si está dispuesto pero no puede ahora, ¿Qué tendría que ocurrir para que usted realmente haga un esfuerzo para ayudar a mejorar el servicio?

Cuenca media/baja: Profundizar: ¿Estaría dispuesto a pagar algo adicional para asegurar la protección de su fuente de agua? ¿Bajo cuales circunstancias?

Cuenca alta: Profundizar: ¿A cambio de recibir financiamiento de parte de los usuarios del agua, estaría dispuesto a ajustar o cambiar sus prácticas agrícolas para poder proteger mejor la fuente del agua? ¿Qué estaría dispuesto a cambiar y qué no? ¿Bajo cuales circunstancias?

Profundizar: ¿Qué papel deben jugar las personas que viven en la cuenca del Río Dos Novillos en la protección de agua y la administración del servicio? ¿Por qué?

Profundizar: ¿Qué papel deben jugar otros entes en el manejo del agua en la cuenca? ¿Por qué?

8. ¿En su opinión, qué impacto tiene la manera en que los residentes (familias y agricultores, industrias, empresas privadas) de ésta cuenca desechan su basura, aguas residuales y desechos de producción – digamos, la forma en que se manejan los desechos?

Profundizar: ¿El manejo de desechos impacta a usted, su familia o su comunidad? ¿Cómo?

Profundizar: ¿Qué tipo de mal manejo de los desechos es más preocupante para usted?

Profundizar: ¿Por qué está ocurriendo este mal manejo? ¿Quién lo hace y por qué?

Profundizar: ¿Cómo se maneja actualmente los desechos aquí en la cuenca del Río Dos Novillos? (Tratamiento? Reciclaje? Colección?)

Profundizar: ¿Qué problemas tiene este sistema?

Profundizar: ¿En su opinión, que se puede hacer para mejorar el manejo de desechos?

Profundizar: ¿Qué estaría dispuesto a hacer para ayudar a enfrentar este problema?

Profundizar: Si no está dispuesto a hacer algo, ¿por qué no?

Profundizar: Si está dispuesto pero no puede ahora, ¿Qué tendría que ocurrir para que usted realmente haga un esfuerzo para ayudar a enfrentar el problema?

Profundizar: ¿Qué papel deben jugar las personas que viven en la cuenca del Río Dos Novillos en el manejo de sus desechos?

Profundizar: ¿Qué papel deben jugar otros entes en el manejo de los desechos en la cuenca?

9. ¿Hay algún otro RN que usted cree que debe ser manejado diferente aquí en la cuenca del Río Dos Novillos?

Bueno, muchísimas gracias. ¿Habrá algo más que le gustaría agregar y que no tuvo oportunidad de decir anteriormente?

Agradezco mucho su voluntad para compartir conmigo sus opiniones con respecto a estos temas.

Por favor, no dude en contactarme. Mi información de contacto está en la hoja que le entregue al principio.

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