

Article

What Is Behind Land Claims? Downsizing of a Conservation Area in Southeastern Ecuador

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Received: 5 August 2017; Accepted: 25 August 2017; Published: 26 August 2017

Abstract: While an increase in the size and number of conservation areas is expected as part of global environmental commitments, at the same time, Protected Area Downgrading, Downsizing, and Degazettement, or PADDD, is becoming more frequent worldwide. This paper analyzes the causal relationships between land claims and human settlements on the one hand and the downsizing process of a protective forest in southeastern Ecuador on the other. Industrial-scale commodity production, extraction, infrastructure development, and local land claims or existence of human settlements constitute the main drivers, but a deeper understanding of PADDD causality requires detailed documentation of the history of PA growth and loss. We analyzed official documents, conducted qualitative research through semi-structured interviews with stakeholders, and carried out a thematic analysis. We found that institutional and legal changes at the national level drive downsizing, and that local demands to land titles are a proximate cause. Our analysis demonstrates how driver and cause operate in an intertwined, multi-scalar relationship, and concludes that there is a need for more detailed understanding of PADDD causality, either to prevent such events or to define alternative tools, which can replace the idea of having areas with fixed borders to promote conservation, especially in inhabited zones.

Keywords: Ecuador; conservation areas; downsizing; land claims

1. Introduction

Site conservation and natural protected areas are fundamental means and tools of biodiversity conservation [1]. At a planetary scale, an increase in the size and number of conservation areas is expected as part of global commitments for biodiversity protection and climate change mitigation, e.g., Aichi Biodiversity Targets 2011–2020 [2]; hence, countries are increasingly protecting forested areas, with a strong upward trend in the tropics from 12% in 1990 to 26.3% in 2015 [3]. However, legal and technical procedures that modify size or conservation status of protected areas (PAs), although scattered, are becoming frequent and getting attention of both scholars and conservation agencies [4–6]. Instances of PADDD, or Protected Area Downgrading, Downsizing, and Degazettement, refer first to a decrease in legal restrictions on the amount, scale, or extent of human activities within a PA (e.g., by lowering the category of its legal protection status); second, to a decrease in the size of the PA through the excision of a land or sea area or a legal boundary change; and third, to a complete loss of the legal protection status of a PA [4]. Other reported procedures are: reclassification, i.e., a change in PA category while maintaining protection status, or upgrading: higher legal restrictions on human intervention [7]. These phenomena challenge the prevailing paradigm that protected areas are permanent zones of conservation [4,8].

This dynamic affects conservation areas with different protection statuses and is occurring worldwide. Mascia et al. [9] reported 543 PADDD cases between 1962 and 2009 in 57 countries in Africa, Asia, Latin America, and the Caribbean, affecting 50,359,100 ha. The extent of PADDD varied considerably in each country, ranging from 140 cases in Kenya to singular cases in 14 other countries. According to this study, downsizing was the most common phenomenon, taking place in 60.8% of the cases. In Brazil, 7.3 million ha of land have been affected by PADDD between 1982 and 2012; of these, in 5.2 million, downsizing and degazettement occurred, and mostly in conservation areas for sustainable use [7]. Until now, scholarly literature has focused on the occurrence of PADDD, considering coverage and temporal patterns [5,7,9], and on its impacts on biodiversity [10] or on deforestation and carbon emissions [8].

Overall, three main drivers have been identified for PADDD: (1) industrial-scale commodity production and/or extraction; (2) infrastructure development; and (3) local land claims and existence of human settlements [4]. However, these drivers have different impacts in each country or region and their incidence changes over time. In Brazil, Bernard et al. [7] reported stability in PA limits and categories between 1981 and 2000, with a notable increase of reclassifications in 2001 after normative changes in the national conservation area registration system. Until 2007, more downsizing took place as a result of agribusiness development, and after 2008, downsizing and degazettement were more frequent due to electricity infrastructure development. In Ecuador and Peru, land claims and human settlements have been reported as drivers of PADDD. Here, local communities were not consulted before certain areas were declared as PA, although the impact on citizens' livelihoods was strongly felt years later when prohibitions on resource use in the PA were reinforced through laws [11]. In these and other countries, restrictions on resources use, displacements, and evictions were reported as sources of tenure claim conflicts, which also resulted in border changes of PAs [4,11].

As shown, although academic attention to these processes has increased, their scope, patterns, trends, and causes are not widely recognized and poorly understood [4,8,9], partly as a result of a lack of publicly available information. Research on PADDD causality will require detailed documentation of the history of PA growth and loss [4], which is currently unavailable. To tackle this research deficit, we analyze the case of the downsizing of the Protective Forest Corazón de Oro (PFCO) in southeastern Ecuador, with a specific focus on 'land claims and human settlements', one of the recognized drivers of PADDD.

In this article, we first document the entire history of the downsizing process, from the declaration up to the excision and boundary change of the PFCO. Secondly, we identify the causes of downsizing at two levels: at the proximate-local level we focus on land claims of settler communities, and at the national level we scrutinize policy and other institutional aspects. Our findings indicate that the causal relationship between downsizing and land claims, as with PADDD in general, involves an entwined multi-scalar relation between PA design and planning, institutional and legal contexts, and local demands associated with specific land values. We conclude that there is a need for a detailed understanding of such PADDD causality, either to prevent conflict or to define alternatives to fixed borders for conservation purposes, especially in inhabited areas.

2. Case Study and Methods

Ecuador is one of the most biodiverse countries in the world [12,13]. The importance of this species richness and the dangers of habitat loss were recognized by Ecuadorian authorities through the creation of a high number of conservation areas. The first national park, Galápagos, was created as early as 1936, while the first state conservation area in continental Ecuador, Cotacachi-Cayapas, was founded in 1968. Since 1996, conservation areas have been under the jurisdiction of the Ministry of the Environment (MAE). In 2010, they covered about 55 percent of the country's total public land [14]. Conservation units include (a) the state reserve network of protected areas created in 1976 [15]; (b) the national forest heritage; and (c) the public network of protective forests (*Áreas de Bosque y Vegetación Protectora*, ABVP) [16,17]. Since 2007, the state reserve network entails (a) state protected

areas (*Patrimonio de Áreas Naturales del Estado*, PANE); and (b) conservation areas or reserves that are administered by local governments, indigenous/peasant communities, or private owners; several of these are protective forests (PFs). The areas can consist of any form of natural vegetation cover that helps to conserve natural resources (e.g., forest, soil, biodiversity, water) or support protective functions (e.g., prevention of soil erosion or landslides) [16]. De facto, PFs act as conservation corridors between PAs [15]. Although PFs allow human uses and settlements, intensive agriculture is prohibited within them. Furthermore, permits from the MAE are required to conduct tourism, scientific research, and sustainable forestry, while activities that lead to deforestation are illegal [16]. Only protected areas under PANE officially correspond to protection categories of the International Union for the Conservation of Nature (IUCN), receive yearly funding from the state, and have their own personnel. In 2015, 51 protected areas totaling 4,611,849.22 ha were integrated into the PANE [18]. In 2014, a total of 172 PFs were registered in the public network of protective forests of the MAE, covering 2,309,988 ha [19] (Supplementary Materials Figure S1). State PFs do not receive financial support from the state.

Southeastern Ecuador, which includes the eastern side of Loja province and the entire Zamora Chinchipe province, is located between approximately 78° and 79° W and 3.4° and 5° S. A part of the Tropical Andes hotspot, this region is one of the country's main biodiversity centers [20]. This was officially recognized in 1982 through the creation of the Podocarpus National Park (PNP), which is one of the most important areas of endemism in the Andes as 211 endemic plant species registered in Ecuador were found there, with 70 of those restricted to its borders [21]. In 2007, the PNP became the core zone of the new UNESCO Biosphere Reserve Podocarpus-El Cónдор (Figure 1). The existing protective forests served as buffer zones. Subsequently, two of these were given a higher conservation status and developed into new core areas of the Biosphere Reserve. The first concerned the protective forest Colambo Yacuri. Almost 43,091 ha of its 73,000 ha turned into the Yacuri National Park in 2009, while the rest remained protective forest [22]. Similarly, in 2010, part of the protective forest Alto Nangaritzza was declared Biological Reserve (Cerro Plateado) and was integrated into the PANE system [23].

2.1. The Study Area

In contrast to this trend, where processes of downsizing were combined with upgrading, the Protective Forest Corazón de Oro-PFCO lost a large portion of its area in 2012 as a result of land claims. The PFCO was declared in 2000 with 53,300 ha [24]. It is located in the buffer zone of the Biosphere Reserve Podocarpus-El Cónдор (north of the Podocarpus National Park). The elevation ranges between 1360 meters above sea level (m.a.s.l.) in the La Fragancia sector and 3400 m.a.s.l. at the Tambo Blanco peak. The average temperature oscillates between a minimum of 14 °C at this peak and a maximum of 23 °C in areas of lower elevation. Average rainfall varies between a minimum of 1000 mm and a maximum of 2600 mm per year [25]. According to Homeier et al. [26], the PFCO hosts five vegetation types: evergreen pre-montane rainforest, evergreen lower montane forest, evergreen upper montane forest, evergreen elfin forest, and shrub and dwarf bamboo *páramos* grasslands. Yet, in many areas the original vegetation has changed; the landscape now consists mainly of pastures, small fields, home gardens, and forest patches [27]. The protective forest hosts 52 endemic plant species and mammals, such as the spectacled bear (*Tremarctos ornatus*), the puma (*Puma concolor*), and rare bird species such as the grey breasted mountain toucan (*Andigena hypoglaucha*) [25].

An intense process of colonization has taken place inside the original limits of the PFCO since the mid-20th century, led by groups of small-scale farmers from Loja province in the Andes [28]. Cattle ranching has become the main economic activity of local communities; however, particularly in mestizo households, off-farm employment and emigration are modifying livelihood strategies. Several dispersed settlements developed in the area, most of them in the Amazonian province of Zamora Chinchipe. Interviews were carried out in the sites of El Tibio and Los Guabos, located in Imbana parish. The inhabitants of these sites are former colonists that migrated from the high Andes. El Tibio

was established during the 1950s by approximately 10 colonist families of the Saraguro indigenous group, while the mestizo settlers of Los Guabos arrived at the beginning of the 20th century as a labor force for the area's large agrarian holdings. The road connecting these frontier settlements with major cities was finished in 2005, and there are basic communal facilities (e.g., a church, a primary school, and medical care). Electricity arrived in 1999, telephone connections in 2003, and mobile phone coverage in 2009. Forest remnants and secondary vegetation, pastures, small fields, and other open areas dominate the landscape [29]. In 2008, Los Guabos had 85 inhabitants while El Tibio had 152 inhabitants [27].

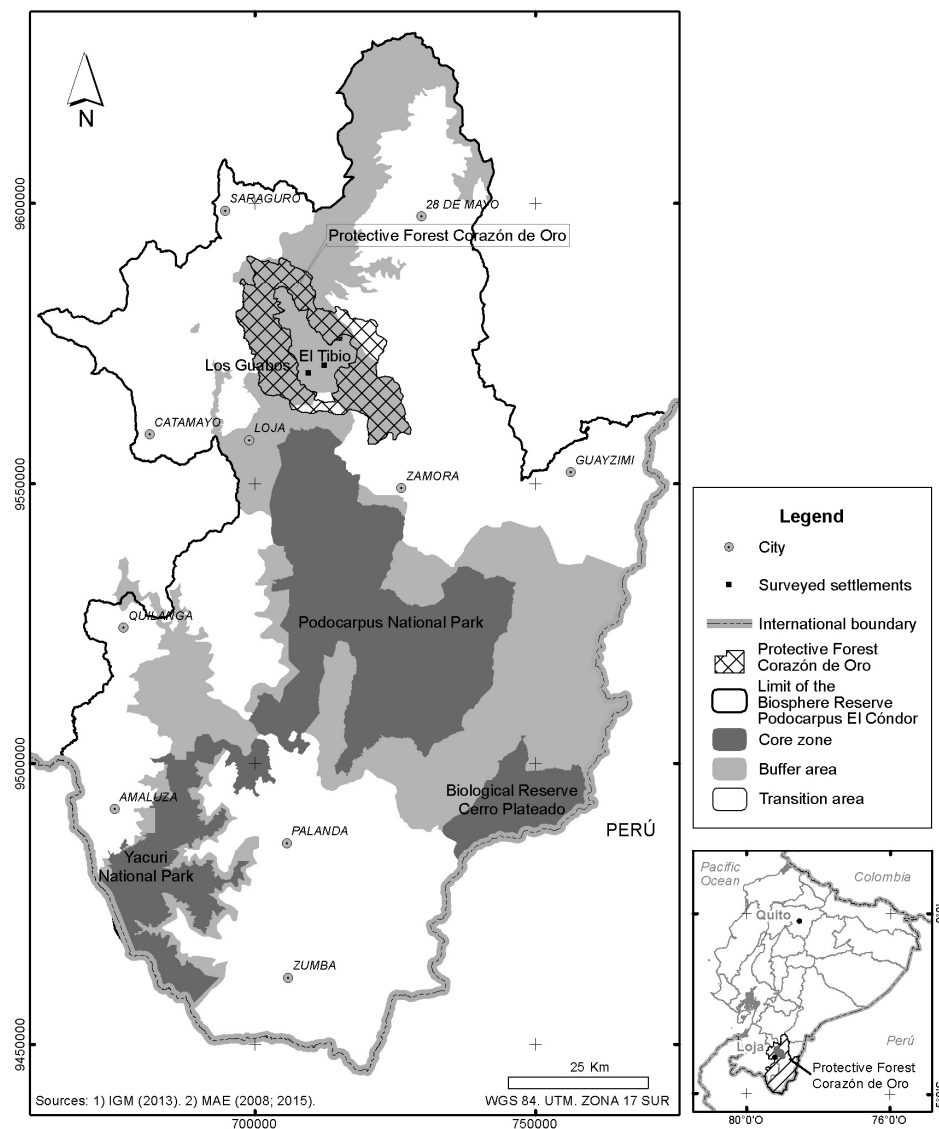


Figure 1. Protective Forest Corazón de Oro (PFCO) within the Podocarpus-El Cónдор Biosphere Reserve. Surveyed settlements, El Tibio and Los Guabos. Sources [19,30,31].

2.2. Methods

We have been conducting research in the study area since 2004 within the frameworks of the Research Groups 402 (Functionality in a Tropical Mountain Rainforest: Diversity, Dynamic Processes and Utilization Potentials under Ecosystem Perspectives) and 816 (Biodiversity and Sustainable Management of a Megadiverse Mountain Ecosystem in South Ecuador) of the German Research Foundation. Our main topics of research were ethnoecology, ethnobotany, and local land use, including

issues such as local livelihood strategies, environmental perception, land tenure, and local institutions of resource use [27–29,32]. Our long research experience in the area, which included several months of participant observation and informal conversations, enabled quick access to local people and community leaders, and also led us to define a new research topic as we found that local residents were concerned about how their land claims were possibly conflicting with conservation objectives of the protective forest.

Research was conducted in two phases between 2009 and 2015. This allowed us to integrally document the history of downsizing, from the declaration of the PF up to the excision of land. First, between 2009 and 2010, we acquired the history of land colonization and the establishment of protected areas through informal conversations, semi-structured interviews, and participant observation. Additionally, we reviewed PFCO documents from the Ministry of Environment (MAE), such as the diagnosis carried out previous to its implementation and the legal declaration register of the MAE. We also evaluated land adjudication registries of the Subsecretary of Land and Agrarian Reform, STRA (previously the National Institute for Agrarian Development, INDA), and the MAE's protective forests database. The results of this first analysis helped to identify three groups of stakeholders involved in land claims inside the PFCO: local leaders and settlers, government officials, and employees of local Non-Governmental Organizations (NGOs). In the second phase, two additional field visits were made in 2011 and 2015 to conduct semi-structured interviews with the last two groups of stakeholders. This information was complemented with a review of other institutional documents, such as the record of the downsizing process, the second legal declaration register after downsizing, and the current management plan.

Thematic analysis [33] (pp. 318–320) was used to examine qualitative data gathered in the field through a total of 21 interviews. We identified, analyzed, and described thematic domains and categories that explained the causality of downsizing. We assigned codes to those domains while organizing and synthesizing other narrative information to provide deeper understanding for code and category. The selection of informants in each stakeholder group was based on specific criteria which are detailed below, together with the number of cases in each group and the central themes of the interviews. The guiding questions of the interviews can be found in Supplement Materials Document S1.

- Local leaders and settlers ($N = 15$). Interviews were conducted with seven inhabitants of the settlements of El Tibio (indigenous Saraguro people) and eight inhabitants of Los Guabos (mestizo peasants). Irrespective of their gender, informants were selected according to two criteria: 'personal experience in land titling' and 'experience as a communal leader'. Through the first criterion, eleven informants between 35 and 42 years old (five of them women) were selected. Seven had tried to get land titles between 2002 and 2011, two had received titles before 2002, and two had not attempted to legalize land ownership. According to the second criterion, four informants were selected: one primary school teacher, the two current community presidents, and a former community president. They were interviewed about the history of settlement and colonization in the area, the relationship of local people with the protected areas (Podocarpus National Park and Protective Forest Corazón de Oro), and the problems related to land tenure.
- Government officials ($N = 4$). Informants of this group of stakeholders were responsible for the technical and legal processes related to downsizing. Informants were selected because of their direct and personal involvement in these processes. Two officials of the MAE, one of the STRA-INDA and one of the cadaster registry of the municipality of Zamora, explained the various steps in the process of declaring the protective forest, the legal procedures of land regularization in the area, and the process of the 2012 land excision in the PFCO.
- Employees of local environmental NGOs ($N = 2$). Although environmental NGOs were not directly involved in the process of downsizing, Nature and Culture International (NCI), a US-based conservation organization, facilitated communication between government officials and local communities. We conducted an expert interview with NCI's legal advisor about the historical,

institutional, and legal context in which downsizing of the PFCO took place, as well as about the origins of local land claims. The second interview was with NCI's cartography expert, who analysed the spatial outcomes of the land excision.

Despite the limited number of interviews, the informants' narratives provide relevant data on the causality of downsizing in the case of PFCO. Data triangulation was performed with information gathered from institutional documents and reports.

3. Results

3.1. History of Colonization, Protected Areas, and Downsizing

The PFCO was declared in 2000; at that time, about 1000 [34] people were living within its borders. According to our informants, the first settlers arrived from the high Andean valleys at the beginning of the 20th century in a scattered way. The settlement structure and economic activities of the local population evolved through an intense colonization process starting in the mid-20th century, motivated by strong state policies for colonization and land re-distribution [28]. Since the 1950s (Figure 2—1950), settlements developed close to the rivers. Basic communal posts, like schools and churches, were established, while pioneer fronts continued to higher locations, close to inhabited valleys. Road construction improved connections between Loja in the Andean region, the origin of most colonists, and Zamora in the Amazonian lowland. The economic needs of the colonists and the legal demands of colonization policies led to high rates of deforestation in order to demonstrate possession of land [29]. Land regularization became possible through the Agrarian Reform and Colonization Laws of 1964 and 1973. The latter created the first national agency for land titling, the Ecuadorian Institute for Agrarian Reform and Colonization (IERAC, from 1973 to 1994). It was later replaced by the National Institute of Agrarian Development (INDA, from 1994 to 2010), and in 2010 by the STRA [33].

During the 1970s (Figure 2—1970) the colonists, who initially settled in small villages along the valleys, gradually extended their pastures and timber extraction to more remote sites. Census data indicate that colonization was intense until the mid-1980s [34]. By the end of the 1980s, the cultural landscape in the study area showed evidence of a strong colonization process, with high deforestation rates [35], scarcity of valuable timber species [27], ongoing land titling through colonization claims, and the establishment of scattered dwellings with pasture expansion [29].

Since the creation of the PNP in 1982 (Figure 2—1990), southern Ecuador became attractive for conservation projects and donors. In 1997 the Podocarpus Program, with the support of the Dutch government, boosted the creation of local environmental NGOs in the city of Loja, and of private and public protected forests around the PNP. One of these was the PFCO with 54,143 ha, declared in 2000 [36]. Planning and design of the PFCO was carried out by one of the newly created NGOs, which disappeared after the establishment of the PFCO. Other than a few communal leaders, the local population was not informed of the process, and by the time of declaration, between 40 to 50 percent of the area was under use, particularly pastures; and around 15 settlements were located inside the PF [25]. In 2007 the Podocarpus-El Cóndor Biosphere Reserve was created with little to no participation of local residents. In this context, up to 2010 (Figure 2—2010), conservation efforts limited the availability of land for pioneer agriculture, in an area with a long-standing colonization history.

Between 2009 and 2012, protests arose in the area against the titling offices of INDA and the MAE. Although local communities were familiar with long land titling procedures, records for land regularization had not been processed since 2002. The problems resulting from the difficulties in acquiring land titles have been most evident since 2006, when titles became an eligibility requirement for subsidies, credits, and participation in social programs. Local communities demanded that the offices of INDA further examine their cases; however, INDA could not process these cases as they were located in a conservation area. The MAE also ignored these claims. Protests continued at the offices of the two ministries until 2011, when the settlers demanded the removal of land containing settlements

and agrarian uses from the PFCO. In November 2012, a total of 12,644.72 ha [36] was excised from the protective forest. This re-demarcation process indicates that this conservation area had not achieved the expected conservation outcomes. On the one hand, natural resources continued to be exploited after the PA declaration (e.g., through increased deforestation) [29,37,38], while on the other hand, the local population had to confront severe constraints to legalize land. This re-demarcation referred to as '*desmembración*', or dismembering, became a response to both social and environmental conflicts, and modified the shape of the PFCO in notable ways (Figure 2—2015).

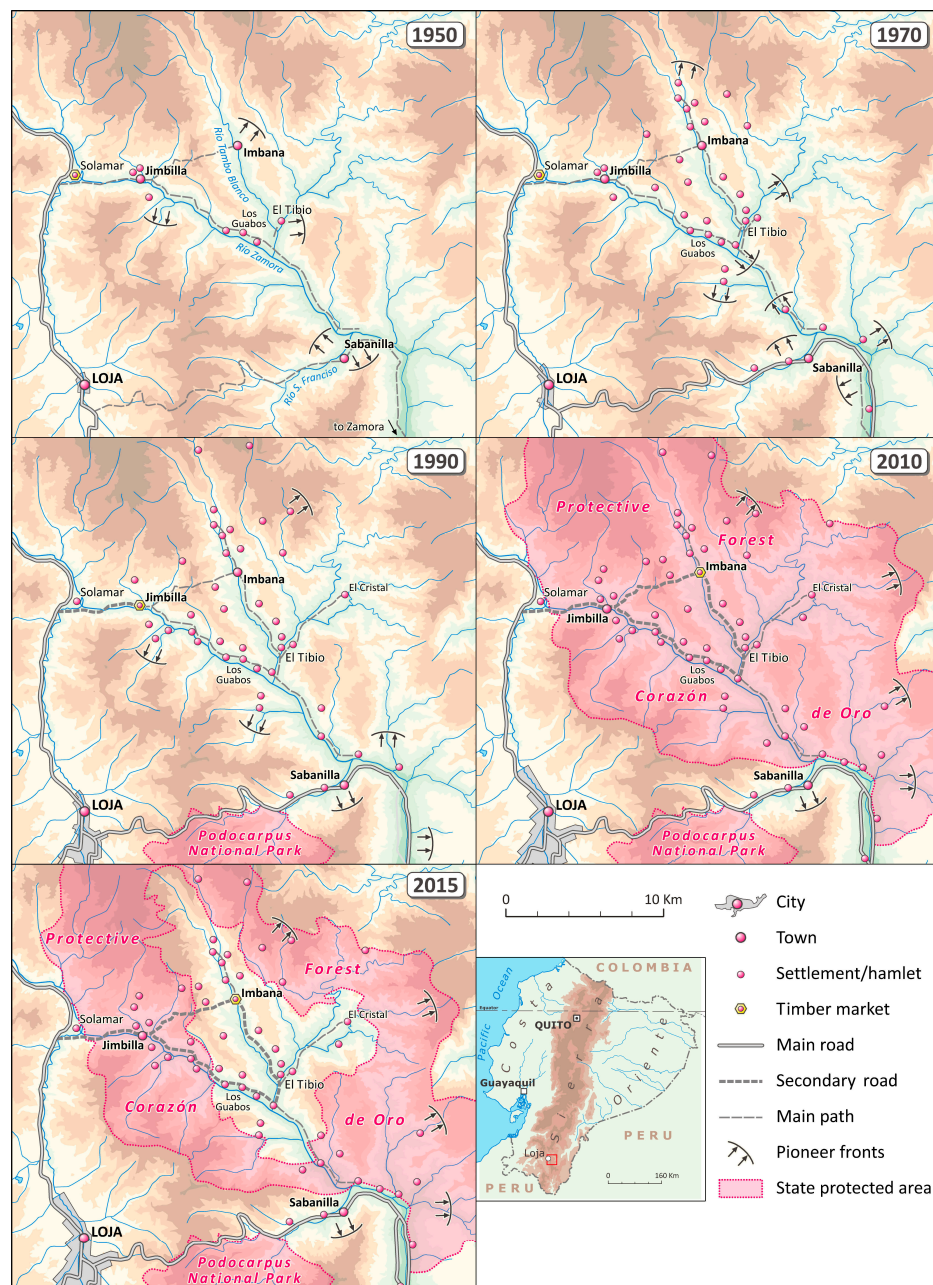


Figure 2. History of colonization and conservation areas in the study site. In 1950: first colonist settlements and pioneer fronts; 1970: settlements, expansion of pioneer fronts and road construction; 1990: location of the PNP; 2010: location of PNP and PFCO; 2015: PFCO after downsizing. Sources: ([19,30,31], field work 2009); conception and design: María Fernanda López Sandoval; Andrés Gerique, 2016.

3.2. Causes and Drivers of Downsizing

From the analysis of our semi-structured interviews, we identified two main thematic domains, one as a driver and the other as a proximate cause for the downsizing of the PFCO (the first at a national scale, the second at a local scale (Table 1)). First, we defined the thematic domain ‘driver’, and then we assigned the code ‘institutional and legal constraints’. This driver was repeatedly mentioned by government officials and NGO employees as being a major cause of land tenure conflicts in conservation areas in general. Specifically in the study area, this driver was evident in what we categorize as issues of (a) ‘inter-ministerial conflicts’; (b) ‘legal void’; and (c) ‘complex land regularization procedures and conditionalities’. Second, we identified the thematic domain ‘proximate cause’ and assigned the code ‘impediments for land regularization’. The two categories ‘necessity of land titles’ and ‘resistance to conservation areas’ were used for further explanations of this proximate cause at the local level.

Table 1. Scale of drivers/causes and their effects in the downsizing process in the PFCO.

Driver/Cause	Scale	Categories
Institutional and legal constraints	National	<ul style="list-style-type: none"> • Inter-ministerial conflicts, • legal void for land titling in conservation areas, • complex procedures for land regularization and conditionalities.
Impediments for land regularization	Local	<ul style="list-style-type: none"> • Necessity of land titles, • Resistance to conservation areas.

3.2.1. Institutional and Legal Constraints

Inter-ministerial conflicts. According to informants in the two stakeholder groups, ‘government officials’ and ‘employees of local NGO’, a major factor that led to downsizing was the conflicts between the MAE and the land titling agency INDA. The origins of this struggle date back to the historical and simultaneous implementation of contested land policies, promoting contradictory land uses for agrarian development and conservation. On the one hand, between the 1950s and the mid-1990s, strong national land policies encouraged colonization and agrarian development in forested zones. Various laws and land titling agencies (IERAC, INDA) allowed land redistribution and settlement of vacant public lands. On the other hand, since 1996, legal bodies for the management and planning of conservation areas were consolidated through the creation of the MAE. Until that time, the state reserve network was administered by the Ministry of Agriculture (MAGAP). Since the mid-1990s, the implementation of land policies for rural areas has been hosted in two separate legal bodies: either for conservation or for agrarian development. The MAE became the national authority for the administration of conservation lands, while the land titling agencies and the MAGAP administer vacant lands that are suitable for colonization.

Legal void for land regularization in conservation areas. Until 2007, neither ministry charged with rural land administration considered land titling in protected areas. While MAE administered conservation areas, it was not legally empowered to solve tenure conflicts or to provide land titles inside any form of conservation area. The legal advisor of the local NGO identified this as a legal void between 1996 and 2007, in that neither the INDA agency nor the MAE had legal means to provide land titles in conservation areas. This legal void severely affected the possibility of solving land tenure conflicts in Ecuador’s conservation areas [14]. However, in 2007, a legal amendment empowered the MAE to grant land titles and regulate land conflicts in all categories of the country’s conservation areas, including PFs.

Complex procedures for land regularization and conditionalities. Although land regularization in the PFCO became legally possible in 2007, MAE’s requirements were complex and, according to the informants, unfavorable for local communities. In conservation areas, land titles can be granted to settlers, but the properties remain as part of the conservation area, and therefore, land uses are

subjected to a certain degree of control by the MAE. In vacant public land designated for colonization, titling requirements include completion of a petition form, as well as valid identification documents, declaration of possession of the plot for at least five years, and a legal planimetric survey of the plot. In addition to the aforementioned requirements, in conservation areas a management plan for every plot is needed, independent of its size, and conditions associated with conservation must be accepted. PFs conditions include restrictions to intensive land use, to timber extraction, and to changes in land use beyond those authorized in the management plan. The violation of these conditionalities or the failure to execute the management plan can lead to the withdrawal of property rights [39]. Also, the division of plots for mortgage, sale, or inheritance requires an authorization of the Ministry of Environment [16].

These institutional and legal constraints led to specific events at the local level that influenced land claims of PFCO residents. Between 1996 and 1999, land titling offices were closed in the area. Between 2000 and 2002, the titling agency INDA received applications for titles inside the PFCO, but did not process these, shifting responsibility to the MAE. However due to the legal void on land titling, MAE could not intervene. After 2007, when land titling in conservation areas became possible, local residents perceived the titling process as complex, time consuming, and expensive. The technical report [36], prior to re-demarcation, demonstrated effects of the institutional and legal constraints to land claims: out of a total of 448 processes registered by INDA-STRA or MAE, only 196 were completed, and all were concluded prior to the declaration of the PFCO. Another 125 cases corresponded to the initiated processes, which could not be completed due to the declaration of the protective forest; the remaining 127 cases were from tenants who have claimed possession for the past 30 years, but whose petitions were not processed in any form [36].

3.2.2. Impediments for Land Regularization

Necessity of land titles. Informants of the ‘local leaders and settlers’ group agreed that the desire among settlers to acquire property titles has increased since 2006. Land titles became critical assets in order to access state benefits and credits, especially subsidies and public services. Very few informants regarded titles as a means to enhance tenure security or to improve land prices because unofficial forms of tenure agreements had always sufficed. Three informants of the Saraguro settlers specifically addressed title acquisition with regards to facilitating their inheritance. Although not all informants stated that they had attempted to acquire property titles, most knew that difficulties associated with acquiring titles were linked to the existence of the protective forest. However, no informants adequately understood the information provided by MAE and INDA. Conflicts around land titles exploded in 2010 as the staff of the housing subsidy program arrived in the area and residents could not complete applications due to a lack of titles. Although land titling would theoretically have been possible in the MAE, settlers rejected this possibility because of the conservation conditionalities attached to land title acquisition in the area. Additionally, these cases would have been treated individually, with higher costs and greater time investment. Local communities demanded a common solution, simple and fair, as compensation for the unfair conditions connected to the declaration of the protected forest. Hence, excision of land with settlements/agrarian use or degazettement of the PFCO became an alternative option and a possible solution to the land titling conflict.

Mistrust toward conservation. A major consequence of the titling conflicts in the PFCO was local communities’ mistrust towards protected areas and conservation. The interviews revealed that people knew about the existence of protected areas in the regions (the PNP and PFCO), but did not know that they themselves were located within the boundaries of these areas. Although some informants mentioned restrictions to forest use (e.g., the use of fire, illegal timber extraction), the only actual regulation they had experienced until the problems associated with land titling was police controls on timber transportation. It was through the titling conflict that people became aware of the fact that they were living inside a protective forest. In the discussions that took place between staff of the MAE, residents, the local parish, and municipal officials to solve the conflict, residents expressed

their disagreement with the declaration of the PFCO. Although most people did not perceive a risk of losing land rights after PFCO declaration, they argued that (a) local communities had not adequately participated in the process of PF declaration; (b) the planners of the protective forest had not considered the existence of settlements and human activities; and (c) current land uses were not suitable for conservation management. They perceived notions of protection and conservation as contradictory to their livelihoods and needs.

After four years of struggle and once the decision was made in the MAE, downsizing was conducted rapidly, in approximately eight months and with notable participation from local communities. The process started with group discussions and explanations about the downsizing procedure. Afterward the causes, actions taken, and thematic cartography of the PF were documented in a technical report [36] that served as a legal basis for the land excision. Finally, the legal amendment consisting of the new borders of the PFCO was included in a ministerial agreement. According to the officer of the register, this solution to the land claim conflict was the easiest and most inexpensive, while still maintaining some degree of protection for water conservation in the higher zones of natural vegetation. The maintenance of the PFCO was necessary for the zonation of the Biosphere Reserve Pocarcus El Cóndor. All stakeholders perceived the downsizing as a positive result for local communities. Nevertheless, some informants, particularly those from NGOs and MAE, were concerned about the effects of the resulting size and shape of the PFCO on the outcomes of biodiversity conservation.

4. Discussion

Among cases of PADDD, downsizing is one of the most frequent processes to result in changing PA boundaries and surface reduction [7,9]. Downsizing has been reported as an instrument to divide land within protected areas to allow large scale projects of resource use [7,11]; however, this case study shows that the excision of land inside a protective forest was identified as the best technical and legal solution to separate settlements and land under agricultural use from natural vegetation that has to be protected. In this case, downsizing was also perceived as legal and social compensation for an improper PA declaration process. The analysis of the causality behind this process reveals an entwined multi-scalar relationship between failures in the planning phase of the protective forest, which considered neither institutional nor legal constraints for the future integrity of the conservation area, nor the views of and values placed upon land by local colonist communities.

The study identified institutional and legal constraints contextualized in national policy frameworks as important drivers of PADDD. These constraints included the threats derived from inconsistent policy and/or legal bodies for conservation management, which may impose restrictions on the permanency of a specific protected area or even a certain category of protected areas. For instance, Bernard et al. [7] referred to modifications of the classification system of conservation units in Brazil as a form of 'regulatory change' that influenced modifications of existing PAs. This case study demonstrates how, since the mid-1990s, the division of legal bodies and institutions for the administration of rural lands, according to objectives of either conservation or agrarian development, became a threat for the integrity of conservation areas. The legal void related to land titling procedures that resulted from these reforms impacted conservation areas in all of Ecuador. In 2010, land tenure conflicts existed in at least 50 percent of the public land administered by the MAE [14]. Such conflicts were related to: (a) legal titles acquired prior to the declaration of the protected area; (b) ancestral territories that cannot be legalized; (c) possessions of settlers and colonists prior to the declaration [40]. This institutional division of rural land administration responsibilities has prevented the intervention of land regularization programs in conservation areas in Ecuador since 2002 [41,42]. Scattered interventions to solve land claims in conservation areas addressed specific protected areas of the state reserve network in categories I or II (e.g., biological reserves and national parks) or conflicts between indigenous territories and PAs. NGOs and development agencies financed by international donors have conducted interventions to solve land conflicts [42]. Solutions to land tenure conflicts

in other conservation areas (not included in the national reserve network) have not been prioritized by state or non-governmental offices; only dispersed cases, in which conflicts escalated, have been mediated [23].

This division of legal bodies for rural land administration in Ecuador shows the need to conceive environmental policy in an integrated way, e.g., beyond sectoral policy design, in order to achieve sustainable development [43]. This is particularly true for sectoral policies with diverse objectives that spatially overlap. Not only directives and laws for policy integration, but also specific tools for integration practices, in this case for conservation and sustainable use, are needed (e.g., endangered species legislation, conservation easements, private PAs, payments for ecosystems services programs, or commodity certification regimes) [9]. These tools are currently being discussed and developed in conservation science. The challenge is to find mechanisms to connect them to those policy frameworks, which strongly depend on specific national legislation bodies. In this regard, social scientific knowledge is fundamental for achieving both the integration of environmental policy integration and successful conservation efforts [44].

This study also analyzed specific concerns about land titles in former colonist communities within a protective forest. The need to clarify land tenure in protected areas is often mentioned as a basic pre-condition to achieve conservation. However, land tenure is often still overlooked when designing conservation areas or evaluating their performance. For example, in the recent study of López Rodríguez and Rosado [17] on the effectiveness of PAs in southern Ecuador, none of the indicators considered land tenure as a factor for analysis. Particularly in cases of mixed-use conservation areas, such as the Ecuadorian protective forests, successful conservation outcomes are often predicated on strong local support [45]. In buffer zones of protected areas this support is crucial for the overall success of conservation outcomes [46]. Hence, clear land tenure frameworks can positively influence attitudes toward such actions [47,48]. For example, the effectiveness assessment framework of the IUCN establishes that recognition and protection of traditional rights, and the development of mechanisms to resolve land tenure disputes, are fundamental in the design phase of a protected area [49].

Although the conflict between land rights and protected areas has been discussed in relation to indigenous peoples and communal property [50], this case study specifically shows that land values in former frontier zones are related to individual tenure and to the use of land as a collateral asset, whereby land titles are critical for individuals' livelihoods and welfare. Conservation planning and management agencies must be aware of the fact that the creation of a conservation area alters existing land-use rights [51] by transferring certain decisions about land to the state in order to achieve public benefits. In this context, land claims of individual tenants are not only related to risks in tenure security, but also to the conservation conditions attached to land titling. A careful review of the consequences of PA creation requires knowledge of specific land values [48], which emerge and change with political and historical contexts [52].

In this light, downsizing appears as a technical and legal response to (and compensation for) foregone actions (e.g., information, diagnosis of tenure status, inclusion, and participation), but also wider policy and legal contexts in which the PA declaration process takes place. However, such a technical and legal procedure endangers other expected conservation outcomes, such as when the resulting size and/or shape of a downsized conservation area does not allow for ecological processes to occur or when people living in or close to these areas are fully disassociated from possible conservation actions.

5. Conclusions

Protected areas still are a major tool for in-situ conservation, and their relevance for biodiversity protection and climate change mitigation will increase globally [7]. The question of their permanence involves serious challenges and contradictions. On the one hand, international agreements demand an increase in conservation area coverage; on the other hand, it is expected that PADD will continue and accelerate in the face of increasing global commodity demands [53,54], local land pressures,

and demographic growth [55]. Policy changes at the national level signal changes in economic and development models. In the case discussed here, the rural development model that promoted colonization and agrarian land use changed to a model that incorporated conservation objectives. However, until now, a solid policy or effective institutional structure to support this model for an integrated rural land administration has not been achieved. Consequently, institutional and legal constraints anchored in national policy frameworks can become a driver for PADDD when they directly or indirectly affect the use or tenure of forests or other natural resources.

We also conclude that a deeper and more systemic understanding of the causal relations between national policy frameworks as an underlying driver on the one hand, and proximate causes of PADDD on the other, is imperative. More awareness about the different stakeholder perceptions of envisioned protected areas is required [56]. First, this understanding might help to prevent PADDD by identifying, already in the planning phase, bottlenecks in national legislation or local specific values which have the potential to become threats to PA permanency or conservation goals. Second, particularly in inhabited conservation areas or in buffer zones, this understanding is crucial to plan innovative and well-designed alternative conservation tools, which constructively address relationships between local people and conservation.

Supplementary Materials: The following figures are available online at www.mdpi.com/2071-1050/9/9/1519/s1, Figure S1: Distribution of protective forests in Ecuador, 2014 Sources: [19]; Design. Marcela. Alvarado, 2016. Document S1: Interviews' guideline.

Acknowledgments: This research was supported by the project “Human ecological dimensions in sustainable utilization and conservation of tropical mountain forest”, within the Research Unit 816, “Biodiversity and Sustainable Management of a Mega-diverse Mountain Ecosystem in Southern Ecuador” of the German Research Foundation (DFG). We thank Vicente Medina, Mónica Burbano, Tatiana Ramon, Carla Velez and Alex Quizhpe for their assistance in the field work and in the interview transcription. Also to Stephan Adler and Marcela Alvarado for the cartographic work. We received funds from DFG for covering the costs to publish in open access. We are grateful to two anonymous reviews for comments that improved the manuscript. The authors retain full responsibility for any errors that remain.

Author Contributions: M.F.L.S., A.G., and P.P. designed research; M.F.L.S., A.G., and P.P. conducted field work and analysis; M.F.L.S. and A.G. wrote the paper.

Conflicts of Interest: The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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