Paying for Environmental Services: Comparing Progress in Costa Rica and Florida

By

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A thesis submitted in partial fulfillment
of the requirements of the
University Honors Program
University of South Florida, St. Petersburg
April 23rd, 2018

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University Honors Program
University of South Florida
St. Petersburg, Florida

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Honors Thesis

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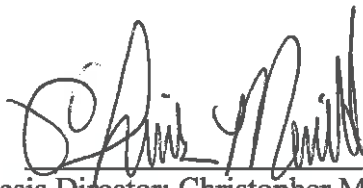

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Thesis II

Introduction:

With the world facing an uncertain environmental future, many governments are deploying alternative conservation strategies to mitigate the worst effects of environmental degradation. Particularly important to human survival is the conservation of land and water resources. Efficient use of land and water can provide people the resources they need for survival while reducing the loss of biodiversity, pollution, human health risks, and carbon emissions that could accelerate climate change. Traditional conservation strategies include buying and preserving land by public or private organizations, establishment of flora and fauna rehabilitation facilities, and the rationing of natural goods. With environmental crises becoming increasingly common, different kinds of conservation models are necessary. Payment for environmental service (PES) programs are voluntary incentives that pay landowners in exchange for conserving, maintaining, or producing an ecosystem service. PES programs are renowned for their potential effectiveness as a conservation and remediation measure, but few countries have implemented these programs on a large scale (Wunder, 2008). Despite its status as a developing country, Costa Rica is regarded as having the most successful PES example (Pagiola, 2008). On the other hand, Florida, the third most populated state in one of the richest countries in the world, struggles to implement both state and federal programs. This paper aims to compare Costa Rica and Florida's environmental service payment programs and discuss the factors leading to each. Expected results are that Costa Rica's past environmental crises, international standing, favorable political structure and internalization of climate change directly allow for the program's success, while Florida's governance, real estate industry, and market-based hurdles prevent a statewide program from taking hold.

Florida's History and Environment

Florida possesses a unique ecology, with more than 80 distinct ecosystems including swamps, freshwater marshlands, mangrove forests, scrublands, sandhills, and flatlands (University of Florida IFAS Extension, 2015). In 2016, the North American Coastal Plain was declared an ecological hot spot, or a highly biodiverse area at risk of destruction, with the areas that intersect Florida considered the richest areas in terms of species diversity (Kotala, 2016). Like Costa Rica, Florida is highly valued for its natural capital and ecosystem services. For example, in 1979, the United National Educational, Scientific, and Cultural Organization (UNESCO) declared the Everglades, one of Florida's most notable natural regions, a wetland of major importance (UNESCO, 2018).

Florida is the fourth largest economy in the United States with a GDP of 840 billion USD and a state government budget of 83 billion USD (Walton, 2016). When discussing GDP, Florida's economy can be broken up into six major sectors: agriculture, biomedical production, merchandising exports, aviation, financial services, and most notably, tourism. Florida received 122.8 million visitors in 2016, adding more than 51 billion USD to the state GDP (University of West Florida, 2018). Despite the breadth of ecological diversity, tourists to Florida often prioritize beaches and theme parks, and around 1 out of every 9 employed Floridians work within the tourist industry (University of West Florida, 2018).

Costa Rica's History and Environment

Costa Rica is a neotropical country located on the Central American isthmus and is considered an ecological hotspot. According to Costa Rica's National Institute of Biodiversity (2015) the country has one of the greatest species densities in the world, comprising nearly 4%

of all the world's species. Costa Rica is known for its rainforests, which contain the bulk of its biodiversity, but it also possesses a range of biomes: montane forests, cloud forests and their watersheds, dry pacific forests, alpine tundra, mangrove forests, and coral reefs (National Institute of Biodiversity, 2015). The variable ecology of Costa Rica makes the country a valuable asset both financially and environmentally, due to the ecological and atmospheric contribution of its rainforests, such as emission control and biodiversity

Costa Rica is transitioning from an agriculture-based economy to a more diversified economy. Foods like bananas, coffee, and beef remain important exports, but an increasing number of Costa Ricans find work in the growing medical and electrical manufacturing industries (U.S. Central Intelligence Agency, 2017). Tourism represents the largest source of foreign exchange and makes up 12.5% of the country's gross domestic product (GDP) (Flores Groves, 2017). In 2013, Costa Rica reported a per capita GDP of 16,100 US dollars (USD). Despite its relative stability, Costa Rica has a high poverty rate, which has remained at almost one-quarter of the population since the 1990s (U.S. Central Intelligence Agency, 2017).

In the 1970s and 1980s, Costa Rica underwent rapid deforestation, largely driven by the demand for cattle and agriculture. The rate of deforestation was one of the highest in the world at the time: forest cover decreased from 76.54% in 1943 to 41.71% in 1977, averaging a rate of 52,000 hectares lost per year (Keogh, 1984). While deforestation drove down costs of timber and in many areas increased economic activity, the loss in natural capital from forest-based ecosystem services and wildlife populations is estimated to be 4.1 billion dollars USD (Solorzano et al., 1991).

Methods:

This paper reviews existing literature pertaining to the history, ecology, environmental economics, and conservation strategies of both Florida and Costa Rica. Peer reviewed literature accessed from the Elton B. Stephens Co. (EBSCO) database through the University of South Florida library, and Google Scholar is the primary source of literature. Non-peer reviewed literature, including government documents and newspaper articles, is also heavily consulted. The inclusion criteria is lenient, as the topic requires a broad timespan and background. Articles and abstracts published in English or rudimentary Spanish were screened for relevancy and quality. No documents were excluded based on the date of publication, but sources addressing time-relevant subjects such as census or economic data were kept as up to date as possible. I also incorporated personal observations and images from an academic trip to Costa Rica in Summer 2017. These observations consisted of personal interviews and cultural immersion and were especially relevant to the Environmental Education section.

PES Programs and Ecosystem Services:

PES programs aim to reimburse landowners for ecosystem services, which refer to ecological processes or functions that benefit humanity. This includes natural pest control, protection from ultraviolet rays, and moderation of temperature extremes (Ruhl et al., 2007). Both local and international organizations have compiled lists and values of ecosystem services for management purposes. Most notably, the United Nation's Millennium Ecosystem Assessment (2003) grouped ecosystem functions into four main categories: provisional services (providing food and natural materials), regulatory services (regulating air and water quality), cultural services (aesthetic and social wellbeing), and support services (reducing carbon emissions).

Similar to the Millennium Ecosystem Assessment, standard PES programs typically utilize a variation of the four categories of service: producing and provisioning food and natural materials, carbon sequestration and storage, regulating air and soil quality, and maintaining natural areas for their aesthetic value and ecotourism potential (Wunder 2008). In order for a program to be successful, the goals for the project must be well-defined and measurable. This can be a difficult endeavor, as ecosystem processes are complex by nature and trying to simplify them into a specific, improvable benefit can lead to conflict. For example, using aesthetic values as a program metric is challenging, as beauty is not a hard, measurable quality like water or air pollution. Therefore, each PES program typically requires its own personalized metric, including goals that align with the sponsoring agency's desires (Wunder 2008).

For many international policy bodies, PES programs offer a broad solution to several challenging development issues (Wunder 2008). The appeal of PES programs lies in their directness. Rather than enact conservation measures through far-reaching regulations, money is provided to locals after the assigned service is provided. Monetization of conservation methods may incentivize communities to reduce their environmental impact without necessarily compromising development goals, especially in areas where environmental protection rules are either weak or not enforced. This exchange model also garners attention as a potential poverty reduction strategy. Research conducted in Thailand and Costa Rica suggests that populations that live near protected areas and having access to high quality ecosystem services fare better economically than populations with similar poverty rates in urban areas (Andam et al., 2010). PES programs are not usually designed to address poverty, but well-designed programs that are integrated into an accepting community may improve living standards. However, adverse effects, such as increasing the rate of poverty and issues surrounding land ownership have been

identified as potential drawbacks (Pagiola et al., 2005). If these problems are navigated successfully, some models predict that by the year 2030, market programs for biodiversity conservation could benefit 10-15 million low-income households, watershed protection 80-100 million households, and aesthetic and recreation protection 5-8 million households worldwide through service payments. (Milder, Scherr, & Bracer, 2010).

Costa Rica and Environmental Services:

Costa Rica's PSA (Pago por Servicios Ambientales) program is considered one of the most successful PES programs in the developing world, if not worldwide (Pagiola, 2008). When it was introduced in 1997, it was the first PES program ever to be instituted on a national level at the time, and it continues to serve as a model for PES program structure. The PSA program, coupled with the country's significant energy initiatives fosters Costa Rica's reputation as one of the world's greenest countries (Seager, 2009). The success of Costa Rica's green initiative is an additional benefit to the rectification of environmental crises. To address the rapid loss of habitat in the 1970s, in 1980 Costa Rica passed its first forestry law establishing a tax rebate system for sustainable forest practices, a stricter logging permitting process, and the Costa Rican Forestry Department (Radka, 2011). After these reforms, Costa Rican officials ultimately created the PSA program, which began its official operations in 1997 (Porras and Neves, 2016).

The program, titled Forest Law No. 7575, addressed the four main environmental service groups now common with PES programs: emission control, water resource services, biodiversity conservation, and preserving aesthetics and ecotourism (Radka, 2011). The program is regulated by the governing board FONAFIFO (Fondo de Financiamento Forestal de Costa Rica). The FONAFIFO board includes a representative from the Ministry of Environment, Ministry of Agriculture, and the National Banking System, as well as two representatives from private

forestry companies (Pagiola, 2008). Applications to the PSA program must be conducted and approved through FONAFIFO. Program structure differs from contract to contract, and amount and timing of payments vary based on target services. As of 2010, some suggested compensation rates for program categories are as follows: reforestation (980 USD), forest protection (320 USD), and agroforestry (1.30 USD per tree) (Porras and Neves, 2006).

Costa Rica's PSA model differs from traditional PES programs due to its handling of finances. In an ideal scenario, users of the target ecosystem services would pay for services used, and that money would be used to cover most of the program costs (Wunder, 2008). In Costa Rica, the PSA program costs are financed mainly from taxes on gasoline. Costa Rica devotes 3.5% of its fossil fuel tax revenue to support PSA projects, approximately 3.5 million USD each year. (Radka, 2011).

While the program is considered a success due to its maturity, the model in practice deviates heavily from the ideal market-powered program, where environmental services are funded via the payments of users for material services such as water. Efforts have been made to close the gap between consumer payments and program payouts. The amount paid into the program by potential users is far less than the amount needed to sustain the program, leading to heavy governmental subsidies (Porras, 2010). However, as with quantifying environmental progress in general, the difficulty lies in putting a dollar amount on certain services. Quantifying water services, despite the current lack of legal requirements, is the most straightforward approach, with the ideal program charging water users based on quality and quantity of water used. Certificates of conservation for water users, where users pay the program for continued use, are negotiated independently through FONAFIFO and make up the bulk of user payments directly into the program (Radka, 2011).

The contribution of fossil fuel tax can arguably be considered a system of carbon payments, meeting the emission control goal of the program. However, because the tax is not directly linked to PSA, alternative sources of revenue are being investigated. FONAFIFO has developed a Certifiable Tradable Offset (CTO) carbon credit, which represents a one ton net reduction in emissions (Radka, 2011). CTOs are often traded internationally to governments seeking to lower their impact, as in the case of Norway, who has previously purchased 200,000 credits for 2 million USD. These carbon credits are primarily based on reducing deforestation rather than the Kyoto-approved methods of reforestation and afforestation, which severely reduces the ability for these credits to be traded. Credits that are in keeping with the Kyoto guidelines are currently in development (Radka, 2011). Due to their lack of intrinsic financial value, biodiversity and aesthetic payments have the least development and security. FONAFIFO has attempted to secure compensation from the tourism industry with little to no success (Radka, 2011). Visitors to the country already pay a higher rate to visit protected areas, but these funds go back to park maintenance rather than PSA. However, Costa Rica's comprehensive ecotourism evaluations and payments to participating companies means that these factors are still a solid focus within the program despite classification issues.

The benefits of the PSA program can be difficult to formally quantify. Overall, the annual rate of deforestation plummeted from 52,000 hectares per year in the 1970s to 4,737 hectares in 2005. The percentage forest cover for the country even increased, from 41.71% in 1977 to 46.8% in 2006 (Pagiola, 2008). A FONAFIFO- sponsored econometric model estimated that the PSA program contributed to preserving 10% of primary forest cover nationwide from the years 1996 to 2000, and that 38% of all FONAFIFO-issued landowner contracts resulted in avoided deforestation (Pagiola, 2008). Due to the majority of the program being forest-based, the

effects on water resources are less studied. However, the prevailing belief among Costa Rican environmental officials is that high quality forests improves water quality, so an improvement in one makes for an improvement in the other (Pagiola, 2008). This could indeed be the case for Costa Rica, as forests can theoretically improve the quality of watersheds and reduce natural hazard risks such as floods. However, there is little data to quantify this belief (Porras & Neves, 2016).

Regarding biodiversity and aesthetic improvements, there is even less information. However, the intents and effects of the PSA program are compatible with the powerful, growing ecotourism sector, which would see the most obvious economic change from aesthetic impacts. Like improvements in water quality, no direct correlation has been formally established. The number of tourists to CR each year continues to grow, reaching a record 2.9 million in 2016. The 26% of the country designated as protected areas and national parks have become a prominent economic asset (Flores Groves, 2017). In a study conducted in international airports throughout Costa Rica, respondents overwhelmingly chose nature-based tourism as among their top reasons for visiting Costa Rica, and most tourists went on to visit at least one nature preserve or national park (Costa Rica Tourism Board, 2007). As initiatives like the PSA program institutionalize environmentalism and give more economic value to tourism, the impact of the PSA program may become more widely accepted.

A study on Costa Rica's PSA program between the years of 2007 to 2009 concluded that overall, the PSA program had an insignificant effect on Costa Rica's poverty problem (Robalino et al., 2014). While the PSA program has minimal impact on poverty in areas with a lower deforestation threat, it can also inadvertently increase poverty in areas with a higher deforestation

threat due to reduction of economic activity. Poverty reduction would be ideal, but it is not automatic.

Despite a lack of hard data on certain benefits, the presence of the PSA program is increasing. Figure 1 shows the total allocation of program contracts and payouts from 1997-2008. The program suffered a decrease in funding after its first three years, but was funded at relatively high levels from 2002-2008 due to increasing interest and international support.The number of contracts with program participants also increased after 2002, presumably because the program had more funding to work with. FONAFIFO (2018) reports 1,000 new or renewed contracts currently active for 2018 at the time of this writing. As contracts are accepted on a rolling basis, the amount is likely to increase save for funding interruption.

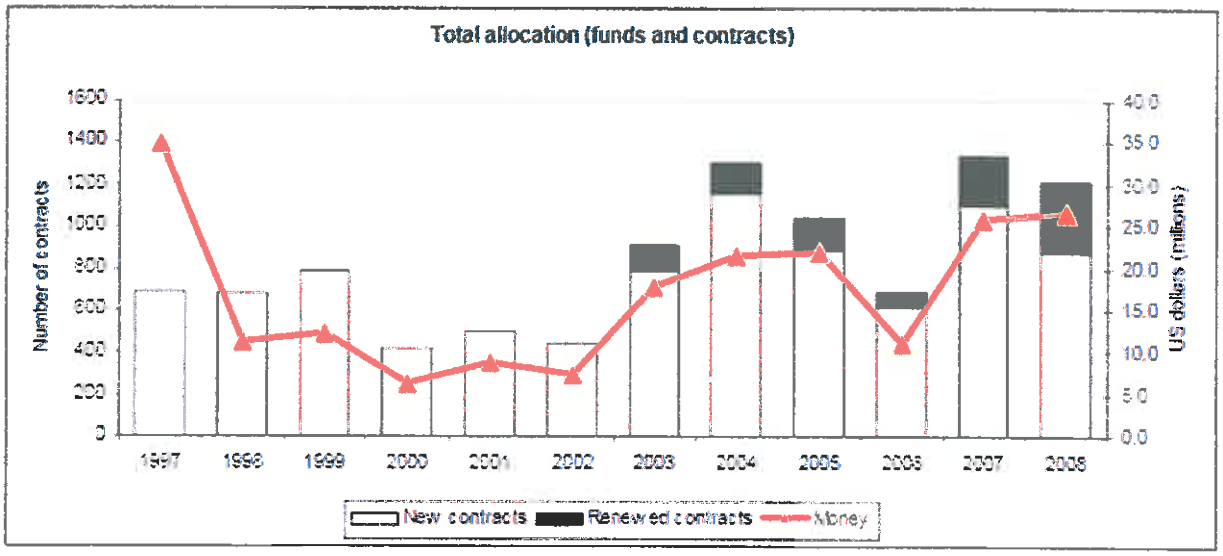

Figure 1. Both PSA funding and the number of contracts have increased since the program's inception in 1997. From "Green and fair? The social impacts of payments for environmental services in Costa Rica." By Porras, 2010.

Environmental Service Programs in the United States:

Comparing PES programs in the developing world to similar models in the developed world is difficult. PES programs are often designed to target lower-income areas with lighter

environmental regulations, so their equivalent in richer countries with stricter environmental regulations may take different formats than expected. It can also be difficult to locate information on program benefits: the Costa Rican model is studied worldwide and therefore has garnered ample scholarly attention, while PES models in the United States are less studied.

In the United States, PES programs exist primarily in the U.S. Department of Agriculture (USDA). Examples include the Conservation Reserve Program (CRP) and Environmental Quality Incentives Program (EQIP), enacted by the 1985 and 1996 farm bills, respectively (Womach, 2005). The Conservation Reserve Program, under the USDA's Farm Service Agency (FSA), is a rewilding cost-share program for agricultural landowners. Under a 10 to 15 year contract, farmers in the program receive an annual rental fee to take qualifying land out of agricultural production (Womach, 2005). The CRP's priorities include decreasing soil erosion, increasing soil and water quality, and protecting wildlife habitation (USDA, 2017). This can be considered a PES program because it can add environmental services such as improved water quality due to no pesticides, increased water quantity due to no irrigation, and increased wildlife habitat.

EQIP, administered by the USDA's Natural Resources Conservation Service (NRCS), is a related program. Like the CRP, EQIP offers financial assistance to American farmers, but instead of rental fees for unused land, EQIP subsidizes "conservation practices" consisting of a wide variety of techniques and treatments with the goal of helping farmers conserve natural resources while also improving technical operations (Womach, 2004). For example, an EQIP applicant could request a subsidy for improved fertilizer, with the goal of decreasing nutrient runoff. Program priorities vary from state to state based on resource needs. NRCS Florida (2018) currently targets farmers with degraded water and soil quality, insufficient water quantity, poor

plant and animal health, and insufficient habitat for wildlife. This can be considered an environmental service program as it is designed to ultimately result in the improvement of ecosystem services.

Federal Programs and Florida:

While federal programs are a potentially attractive option for national conservation efforts, there are equity and program spatial distribution concerns, especially in Florida. Making a direct comparison to the Costa Rican model is difficult, as data on program benefits specific to Florida is sparse. However, like Figure 1 above, program activity can show the relative significance of the program in Florida. Managerial issues in other states can also be a good indicator of potential problems with Florida programming, as in the case of EQIP below.

CRP enrollments and payments have been declining nationally since 2007, a trend that is attributed to increasing crop prices creating increased land use and budgetary limitations. In Florida, CRP funding has steadily declined since 1998 (Figure 2), with a total payout of 64,242,537 USD. Participation reached its lowest in 2015, with only 895 recipients despite 2,212 qualifying in the inaugural year (Environmental Working Group, 2018). In 2014, only 48,492 acres were covered by CRP, despite a 2015 census of state agriculture estimated 9,410,000 acres currently in agricultural production (Hodges et al., 2015). Figure 3 is a geographic visual of this trend, showing CRP enrollment heavily emphasized among midwestern states, with Florida having minimal enrollment activity in comparison.

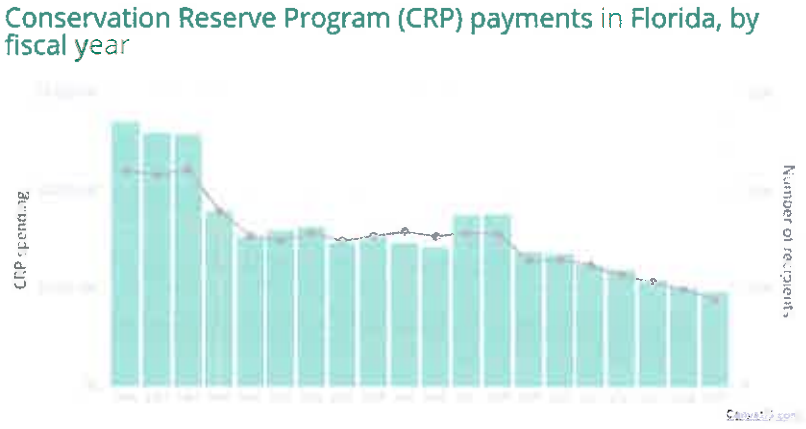

Figure 2. Conservation Reserve Programs spending and number of recipients decrease from 1996-2015. In *EWG Conservation Database.* Retrieved from https://conservation.ewg.org/

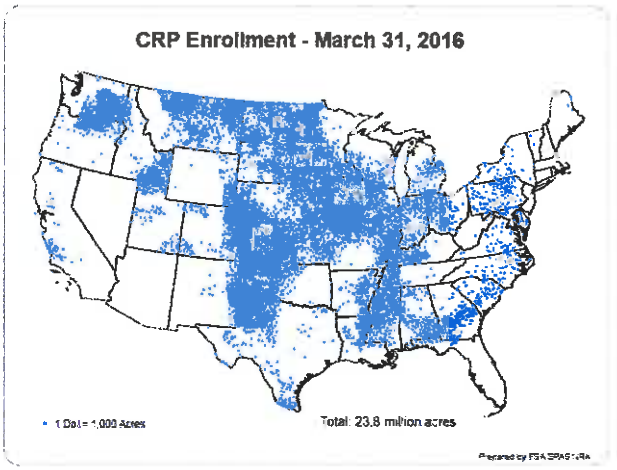

Figure 3. Dot-Density map of nationwide CRP enrollment shows a high concentration of participants in the Midwest, but virtually none in Florida. March 2016. In *USDA FSA: Conservation Reserve Programs Reports and Statistics*. Retrieved from https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/Conservation/

From the years 1998-2015, EQIP has paid 6,550 Florida enrollees a total of $152,425,711. Nearly one-third of all program payments helped support new irrigation systems (Figure 4). Additional funding fostered improved crop management, which primarily includes techniques to reduce erosion and implement cover crops, and grazing management, such as improved fencing and land mechanical treatment. (Environmental Working Group, 2018)

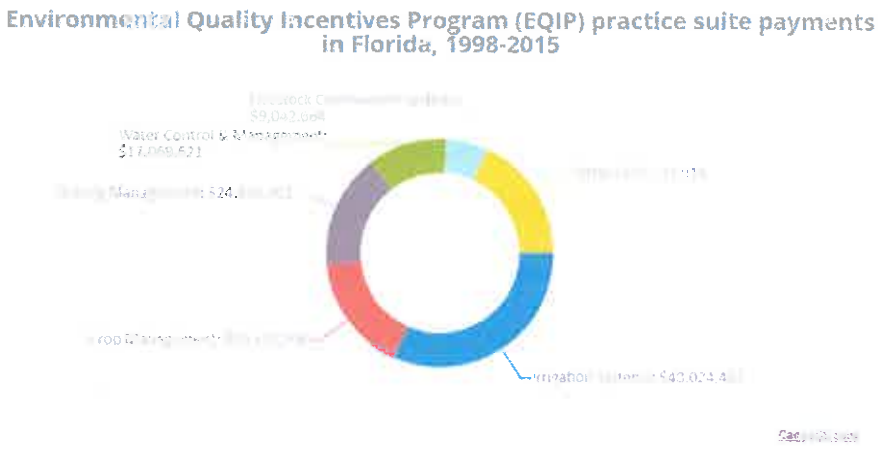

Figure 4. The division in EQIP payments from 1998 to 2015 shows that sustainable irrigation systems were the plurality of payments in Florida. In *EWG Conservation Database*. Retrieved from https://conservation.ewg.org/

EQIP's emphasis on irrigation in Florida is a source of concern because farmers in the program may opt to increase rather than reduce their use of water resources with the new irrigation technologies. This trend has been observed in studies in the Midwest, specifically in high funding states Colorado and Texas. Overall evaluations of the program have drawn the conclusion that EQIP's net efforts may have no effect on water conservation nationwide (Wallander & Hand, 2011). Future studies may opt to assess the impact of EQIP on a state-by-state basis. Currently, there is no data that focuses solely on the efficacy of the program in Florida.

Environmental Service Programs in Florida:

Florida has made modest use of PES as one method to address the challenges posited by human development on local ecosystems. Originally proposed in 2005, as the Florida Ranchlands Environmental Services Project (FRESP) in 2011, the South Florida Water Management District (SFWMD) adopted the Northern Everglades-Payment for Environmental Services (NE-PES) program (Shabman, 2013).

The NE-PES program would compensate ranchers who stored nutrient-rich stormwater on their land in order to prevent this water from flowing into Lake Okeechobee, the second largest lake entirely within the United States. Because lake levels are kept relatively low (in order to prevent failure of an aging dike), lake water is often flushed to coastal estuaries in southeast and southwest Florida. The sudden addition of nutrient-filled lake water on the coasts causes algae blooms that reduce the available oxygen for other parts of the marine ecosystem. The federal and state government initially approached the problem with expensive strategies such as reservoirs or water treatment plants, but these became delayed due to budget constraints and available land. There is also the additional challenge of determining how to measure the environmental services provided and then setting appropriate compensation for landowners. Several ranchers proposed water and nutrient removal systems by diverting excess water through natural wetlands on their properties, which were approved by SWFMD on a contract basis. Ranchers were paid monthly, beginning in March 2012 according to average rainfall as long as they built structurally sound water storage facilities. Authorities used rain gauges and stream stage recorders to measure fluctuation of water to determine which sites held water, as contracts were based off of computed 10-year estimates. The revised NE-PES program, using the basic design of FRESP, accepted new proposals from ranchers during May 2011 after the contract period for FRESP ended that January (Shabman, 2013).

Private Programs in Costa Rica and Florida:

It is important to note the role that private conservation interests play in PES program success. Nature-focused organizations, such as Audubon or the Sierra Club, Private enterprises can be crucial to conservation efforts, as they can support programs when public funds become limited. Furthermore, private enterprises add an important voice regarding conservation strategy.

In Florida, many conservation efforts are supplemented by nonprofits and non-governmental organizations. Private / non-governmental organizations (NGOs) have long supported a more established conservation structure: land trusts. Land trusts are a privately funded, well-established conservation structure and can be considered a form of a PES program. Land owners donate or are paid upfront for complete or partial control of the land, and the trust sets similar conservation goals and timelines. Similarly, conservation easements allow landowners to relinquish development rights to organizations while still living on their property. Objectives of land trusts and easements often include remediation, endangered species habitation conservation, and restoration (Brewer, 2003). Brewer (2003) considers land trusts to be the most effective product of the environmental movement. While some observers might disagree with this assessment, it underlines the staying power of land trusts that PES programs have yet to achieve in the United States.

While development of land trusts avoids the pitfalls of policy changes and lack of public funding, they cannot completely compensate for the absence of public programs. Despite often reimbursing owners for the cost of land, land trusts and easements ultimately remove a level of agency from participants that is not feasible at all scales. For example, smaller farmers that depend on agriculture for income could not reasonably divest themselves of their property or rights for the environment's sake, and supplemental income over a longer period of time may be a better incentive for changing behavior than a single payment.

The independent nature of land trusts allows them to flourish, but Florida's tax landscape may reduce or prevent other PES-like programs from taking hold. Tax credits, or lack thereof, can significantly aid or impede environmental programs by incentivizing or failing to provide incentives for participants. While The Nature Conservancy, a major worldwide land trust

organization, has been established in Florida since 1961 (Brewer, 2003), Florida House Bill 7157, which exempts land kept in easements in perpetuity from property taxes, was only passed in 2010 (Demers and Carter, 2015). This is a major missed incentive, as pre-2010 participants would be paying taxes on essentially unusable land for their entire lives. Similar issues with the tax code may help to explain the lack of footing of both public and private voluntary environmental programs in Florida.

In comparison, in Costa Rica, the Costa Rican Network of Private Reserves incorporates 213 nature reserves and 82,045 hectares of land (Kahler, 2015). However, when compared to the nearly 1.1 million acres protected by the federal government, (26% of the country's land area) the private conservation sector has a relatively small impact on land conservation programs. Government funded land conservation programs are still very important.

Sociopolitical Factors of Public Success:

Although PES programs in both countries suffer from a lack of concrete conclusions about their efficacy and benefits, the Costa Rican reputation is known worldwide, while Florida has not made much progress in establishing lasting PES programs. That said, despite the Florida legislature's recent intransigence, the Sunshine State and its water management districts have been very successful in buying land for conservation for the past 30 years. While a correlation between social and economic factors and political success or failure can only be assumed and not directly proven, research supports the link between certain variables like education and ensuing changes in economic willingness among the public. The following section elaborates on possible factors that may influence implementation of environmental policies in both Florida and Costa Rica.

Impact of Environmental Programs- Developed World versus Developing World:

One particularly interesting aspect of the Costa Rica and Florida comparison comes from the disparity of wealth. Worldwide, the impacts of voluntary environmental programs such as PES varies between developing and developed countries. Economic growth often leads to environmental impacts and environmentalists often point out that developing nations bear more than their share of pollution and other environmental damage due to widespread poverty, resource extraction, and unregulated manufacturing and waste disposal (Smith, 2011). Wealthy countries often devote more resources to environmental protection but lack of funding for environmental initiatives in less developed countries often lets these problems go unchecked.

Despite the wealth gap, evaluations of environmental programs in both developed and developing countries show a difference in priorities. A U.S. based analysis of industry enrollees to voluntary environmental programs, which refer to any incentive-based conservation programs such as PES or land trusts, found that some of the stronger motivators for enrollment included high visibility, competition, and brand image (DeLeon and Rivera, 2010). Highly-polluting companies joined in order to pre-emptively forestall expensive regulations and to have a visible, attractive label in exchange for their efforts. In developed countries, where environmental regulation is comprehensive, enrollees to voluntary environmental programs do so in order to obtain esteem and standing.

In developing countries, there is often little or inconsequential environmental regulation. Therefore, the motivation to get ahead of government inspections and to achieve environmental cleanliness as a status symbol does not exist in the way it does in the developed countries (DeLeon & Rivera, 2010). Therefore, when voluntary environmental programs exist, participants are not seeking status in the same way as companies in developed countries. Instead, enrollees

seek out programs for specific, tangible benefits and aid. For example, a voluntary program aimed to reduce poverty in the developing world would have more impact than a similar program in the developed world because the rate of poverty is much higher and pre-existing social programs much weaker. The same is true for environmental programs, which may connect increasing enrollment to increased impact in Costa Rica. While the idea that environmental reputation is less important to Costa Rica now is patently untrue, it may have helped with early establishment of the PSA voluntary conservation model.

There is also the issue of international aid. Crucial to the financial viability of Costa Rica's PSA program has been a series of international donations and interventions. The World Bank credits its Structural Adjustment Programs (SAPs) in the 1980s as well as Costa Rica's early Forest Laws for this central American nation's environmental renaissance. The World Bank contends that the SAPs reduce the profitability of agriculture and cattle ranching as paving the way for stronger deforestation policies (de Camino et al., 2000). However, the fact that the World Bank had imposed structural adjustment on many other developing countries that have not had such an environmental renaissance suggests that other factors are significant. Regardless of their individual contribution, the World Bank's 1993 Forest Sector Review concluded that because the benefits of healthy Costa Rican forests are felt worldwide, the country should be compensated on behalf of the global community (de Camino et al., 2000). Other international donations include a loan to further national resource conservation in 1989 from the United States Agency for International Development (de Camino et al., 2000). While Florida is considered internationally valuable for its ecosystems like the Everglades, it is unlikely that it will ever receive aid for conservation purposes on the same level as Costa Rica due to the wealth gap.

Education and Resource Conservation:

While quantifying the impact of a nation's moral values and education on its treatment of resources is difficult at best, case studies of the public's increasing willingness to pay (WTP) for environmental services have recently emerged. Willingness to pay studies are helpful because they estimate the price a consumer is willing to pay for an environmental service. This can quantify how public-based behavioral strategies and economic impacts affect a consumer's evaluation of worth. For example, in a 2003 study of Nigeria's Do-Ambra River, farmers were informed that the river basin authority would collect an annual fee to support repair of the region's degraded soil and water quality. A survey done before and after an environmental education class on soil and water showed a 62% increase in WTP, suggesting that increased participation in environmental education could address resource devaluation and welfare tradeoffs from pollution (Urama and Hodge, 2006).

Another example of the relationship between public education and resource conservation is the study of community-based conservation in the Colombian Caribbean. Researchers found that people directly involved in community development programs (defined by conservation awareness and economic incentives) are more willing to contribute to conservation (Vargas and Dias, 2014). However, this study also showed that WTP decreased as price of services increased, an effect that may be combated by governmental support.

While many WTP studies focus on education gaps in developing countries, one study of opinions on worldwide tropical deforestation among respondents in Switzerland shows much of the same trend. Much of the surveyed population already had a positive opinion on the value of forests due to their utility as carbon sinks and biodiversity hubs, and as knowledge of these benefits increased, so did WTP. Also consistent with previous findings is the preference for

government funded conservation efforts over personal funding contributions such as donations, service payments, or income reduction (Baranzini, 2010). This has positive implications for the effect of environmental education on WTP in developed as well as developing countries.

Costa Rican Environmental Education:

In Costa Rica, education is valued highly in general, with 30% of the country's national budget going towards primary and secondary education, producing a literacy rate of 95%, one of the highest in Central America (Blum, 2008). Moreover, it is evident that most Costa Ricans consider environmental education a priority. With Costa Rica's status as an environmental leader, and the country nearly avoiding ecosystem collapse several decades ago, the importance of environmental responsibility is never far from the public eye. During my visit to Costa Rica in summer 2017, I found that TV news stations regularly played advertisements showcasing local and national issues of importance, and the major newspaper *La Nacion* reported on environmental issues almost daily.

Figure 4. An example of publicly-supported climate change education efforts. In English, the sign reads: "Municipality of Santo Domingo, Environmental Management. Climate change affects us all. We pay for use of rainwater." Photo by author.

In a 2013 study of public perception of climate change, 91.6% of Costa Rican participants responded that humans were responsible for climate change (Vignola, et al., 2013).

While scientific awareness of specific details ranked low (45.8% of Costa Ricans also responded that earthquakes affect the Earth's temperature), concern for the planet's climate was significantly higher than similar global studies, with 85% of Costa Rican respondents indicating that they were "concerned" or "very concerned" about climate change.

While concern about climate change does not necessarily result in environmental protection, this poll directly relates Costa Rican environmental anxieties to public support of resource conservation policy. Indeed, Costa Ricans expressed strong support for tax reallocation for environmental programs. Use of tax dollars to plant trees (91.8 % in favor), protect forests (96.2 % in favor) and support environmentally friendly agriculture (97.2 % in favor) were among the most popular issues in the poll. This is in line with a higher national recognition of deforestation as a contributor to climate change as compared to North American and European respondents.

However, the largest concern for respondents in this poll also had the least supported policy measure. 61% of Costa Rican respondents reported that water quality was the most important factor at risk of degradation due to climate change, but only 52.5 percent of respondents supported increasing the cost of water for conservation purposes. Although WTP studies appear to indicate Costa Ricans support paying more taxes to support environmental protection, this response suggests that the government might find more support for indirect taxes, such as the gasoline tax, to pay for environmental service programs.

Florida Environmental Education:

Polls similar to the Vignola et al. (2013) survey done in the United States show different results. Since the United States is a huge and politically variable country, it is worthwhile to examine opinions on a state-by-state basis. The 2016 Climate Opinion Map (Marlon et al., 2016)

produced by researchers at Yale University shows 70% of Americans believe global climate change is happening. In the state of Florida, 70% of the population believe it is happening, with 53% responding that it is caused mostly by human activities. Statewide, 57% of Floridians are worried about the effects of climate change, a percentage that increases in more southern counties, peaking in hyper-vulnerable Miami-Dade County at 65%.

A notable difference between Florida and Costa Rica is apparent in the Yale poll: Florida residents are not exposed to environmental issues on the same scale. When asked about climate communication, only 32% of Floridians responded that they discussed climate "at least occasionally" and only 24% responded that they heard about climate change in the media at least once a week (Marlon et al., 2017). This suggests that increasing the amount of consistent, reliable information about resource degradation risks due to climate change may increase Floridian's willingness to pay for environmental programs.

Aside from the general issue of environmental education is a potential lack of understanding about the benefits of specific environmental protection programs. For example, a survey of cattle ranchers in Alabama, Florida, Georgia and Mississippi showed that although ranchers in these states generally value wildlife for intrinsic purposes, cattle rancher interest in conservation assistance programs is often overestimated by state and federal agency personnel (Willcox & Giuliano, 2011). Rancher's willingness to accept (WTA, not the same thing as WTP, or willingness to pay) government funding for wildlife protection is reported to be partially contingent upon both past participation in a program and their knowledge of, and exposure to, positive opinions about the program. While the authors advise personnel that social networking and program growth will help to overcome rancher disinterest, the low enrollment trends in Florida pose a significant barrier to word-of-mouth education.

Another issue that may affect implementation of environmental programs is the perception of tax burden. As established above, willingness to pay for environmental services drastically decreases when respondents are asked to pay for these directly, rather than allocated from a pre-existing revenue source. Florida has a long-standing reputation as a tax haven because residents and business owners pay a lower amount in taxes than the rest of the country (Franklin, 2005). The lack of income tax is made up for by sales taxes from non-essential purchases, which is greatly supplemented by more than 100 million visitors annually. While Costa Ricans view tax allocation for environmental programs as necessary and beneficial, as seen in the Vignola et al. (2013) survey, the appeal of lower taxes could be potentially used as leverage against these policies.

Disaster and Willingness to Pay:

The high WTP of Costa Ricans for national forest programs and their support for national environmental education may be attributed to the deforestation crisis of the 1970s and 1980s. Similar to the correlation between WTP and exposure to the benefits of resource conservation, current research suggests that WTP for disaster prevention increases through education and personal experience. An evaluation of WTP among Florida homeowners for a pre-disaster mitigation fund, which could finance measures such as showed that over half of participants both experienced hurricane damage in the past and were concerned about future hurricane damage in the next 10 years (Mozumder, 2010). This results in a high overall WTP for disaster mitigation programs: however, less than 26% of homeowners surveyed would support the implementation of a new program if they were expected to pay additional taxes.

Florida is no stranger to disaster. Many of the costliest hurricanes in American history severely impacted Florida's economy and infrastructure. The frequency of devastating hurricanes

is expected to worsen in a warming world. Pre-hurricane mitigation strategies have been suggested as strategies to avoid "natural disaster syndrome", or the draining of state budgets post-crisis due to underinvestment in protection (Mozumder, 2010). In comparison, because Costa Rica's deforestation crisis became manifest just a handful of decades ago, and many Costa Ricans' livelihoods were directly or indirectly impacted, it is likely that the WTP for economic environmental policy programs comes from personal experience. Although the 1970's deforestation was an anthropogenic crisis, PES programs and the paradigm shifts in Costa Rican economic evaluations is similar to natural disaster syndrome: a costly environmental event that paved the way for a mitigation strategy.

Crucial to this connection is the broadening of the definition of "disaster". Although Florida Governor Rick Scott addressed hurricane damage in 2017 relatively quickly, this is not the same thing as passing proactive legislation, and the state legislature continues to ignore climate change and refuse to support funding for sea level rise mitigation projects (Dennis, 2017). This shows that on a fundamental level, Florida's top elected officials do not consider environmental degradation and climate change as a disaster on the same level as a hurricane, although its eventual damage will have similar effects. This line of thinking may be a unfortunate barrier to the implementation of environmental economic programs.

Ecotourism:

Another major difference that may account for environmental service payment programs in Costa Rica and their virtual absence in Florida is the branding of ecotourism. Ecotourism refers to ethical, less environmentally damaging, recreational travel to natural areas, and can be a popular option for visitors (Fennell et al., 2001). While Costa Rica has achieved international

renown for its ecotourism industry despite its developing nation status, lack of ecotourism standards and the strength of theme parks in Florida's tourism industry may prevent more investment into environmental protection programs. The following section compares the establishment of ecotourism in Costa Rica and identifies areas of improvement in Florida.

Costa Rica and Ecotourism:

Costa Rica's ecotourism legacy began in the 1980s, with increasing international interest in biodiversity and rainforests. Researchers studying rainforest conservation began a trend of "science tourism", which created a platform for ecologically-sensitive travel. Surveys of foreign tourism have shown that visitors spend approximately two-thirds of their time in natural, protected areas, and Costa Rica is consistently ranked one of the top ecotourism destinations in the world (Jones and Spadafora, 2017). Ecotourism in Costa Rica is regulated by the Costa Rican Tourism Board, which implements a program called Certification for Sustainable Tourism (CST). The CST program is considered as one of the first ecotourism standards, ranking participants on five levels based on biological, economic, and physical impacts such as energy use and emissions (United Nations, n.d.). The certification is endorsed by the United Nations and has been implemented throughout several other countries in Central America.

The Forestry Laws and PES programs have been an undeniable boon to Costa Rican ecotourism, and vice versa. Costa Rica passed its first Forestry Laws in 1969, which helped build a network of national parks; subsequent forestry laws raised national park entry prices for non-citizens and helped center ecotourism as a both a business priority and a political development strategy (Jones and Spadafora, 2017). Local involvement has been crucial to ecotourism's success. Increasing protected areas required nearby rural populations to change their evaluation

of the worth of forests, and PES programs helped make that change by providing direct economic stimuli. Rural community tourism is now the fourth largest segment of the tourism market, (Bien, 2010). Private nature enterprises have also been critical, and PES programs are currently the only government mechanism through which a private business can receive compensation for improved environmental quality through ecotourism (Porras and Neves, 2006). This relationship to a major market sector helps give environmental service programs significant staying power.

Ecotourism and Florida:

As a major American tourist destination, Florida offers a variety of recreation activities and destinations to attract travelers. This includes high visitation to many nature-based areas, most notably beaches and national parks like the Everglades. However, due to the highly variable nature of the tourism market in Florida, some tourism promoters have given ecotourism ~~has~~ a very broad definition. For example, in 1997, the Heritage Tourism Advisory Committee claimed that even high-impact, consumptive activities such as fishing and boating counted as ecotourism (Fennell et al., 2001). This means that most outdoor activities could be considered ecotourism if we followed the Heritage Tourism Advisory Committee.

As such, ecotourism in Florida does not have the same sustainable connotations and expectations as it does in Costa Rica, and therefore limited impetus for environmental policy. While there are various sustainability measurements in the United States and there have been some efforts to link environmentalism and ecotourism in Florida, impact has been limited. Certifications for ecotourism have been created, such as the Florida Department of Environmental Protection's (2017) Green Lodging Program, which evaluates operations in the

hospitality industry. Organizations like the Florida Society for Ethical Ecotourism (2018) have also developed criteria for service providers, but there are currently only 13 certified members.

A barrier to strict ecotourism regulation or certification in Florida may be the perception that stronger rules would restrict this type of tourism. However, the interest in undeveloped natural areas and less impactful activities in Florida is evident in a study done in the Apalachicola River region. Visitors who preferred minimal infrastructure when visiting natural areas had the highest willingness to pay and recreation demand, suggesting that increasing infrastructure in order to increase outdoor tourist spending may not be necessary (Shrestha, 2007). Therefore, although more primitive sites may not be designed for a heavy volume of visitors, ecotourists generally spend more, increasing their economic impact While this cannot overcome the market impact of theme parks, it suggests that landowners of natural areas may not need much to consider a recreational enterprise. This could support the implementation of further PES programs, as there would be a stronger incentive for programs to avoid developing or improving desirable landscapes.

A stronger, more rigorous ecotourism definition could also support environmental service programs due to their focus on supporting local economies. The International Ecotourism Society (1990) describes generating financial benefits via conservation to local communities as one of the founding pillars of ecotourism. Although Florida's rural communities do not experience the same level of poverty as Costa Rica, smaller business and local communities could still benefit. If sustainable requirements become stricter, this would create an impetus to compensate local communities for their environmental contributions. As Costa Rica shows, leveraging environmentalism as a brand can create a stronger market and a stronger connection to progressive conservation policies.

Real Estate:

Costa Rica's reliance on tourism as a major economic activity highlights the disparity in land use priority between the two areas, a paradigm that may change if Costa Rican markets shift. Interest in Costa Rican real estate is growing both domestically and internationally, with many North American retirees seeking investment abroad. This has seen the rise of the luxury estate market: gated communities, condos, and upscale hotels (Viva Tropical, 2016). This is at odds with the country's commitment to environmental consciousness, as luxury real estate is usually synonymous with high-impact construction and behaviors. In addition, Costa Rica's service sector now accounts for 76% GDP in 2016, making it even more like Florida (U.S. Central Intelligence Agency, 2017). Although luxury development is potentially unsustainable, ecotourism still accounts for 5.8% of GDP, so it is unlikely that land use changes will significantly affect natural areas designation and forestry laws. However, if real estate becomes more of a profitable priority among the public, this connection to PES may falter.

Florida is clearly vulnerable to climate change and yet its population continues to grow (Cushman and Wakefield, 2016). The real estate industry in Florida has been a major economic driver for the state, a trend that is set to increase despite the threat of sea level rise. South Florida, especially the Miami region, is particularly vulnerable and yet remains a hot spot for development. As with the rest of the state, Miami is reliant on property taxes to fund city government and encourages real estate growth despite the risks of climate change (Meyer, 2014).

This creates a difficult paradox. As in Costa Rica, there is ample opportunity to pay landowners to maintain or remove operations from conservable land, or implement other services based on interest and need. However, to continue programs like FRESP in high-risk areas of

South Florida, a strong tax base is needed for funding purposes. However, the reliance on real estate is often inherently at odds with the goals of payment for environmental service programs, as both require radical differences in land use.

The current strategy in Miami is to fan the flames of growth and development in order to generate more tax revenue to help pay for climate change adaptation—before they are forced to retreat (Meyer, 2014) While much of this income is being routed into high-visibility mitigation projects such as 400 million dollars in storm water drainage improvements (Meyer, 2014), investment into PES programs could potentially represent a small portion of that. While the example enrollment is low, ten years of EQIP in Florida cost the federal government $152,425,711, and more localized programs could potentially cost even less. However, until alternative funding methods are considered and factors addressed, mitigation strategies will remain the forefront of investments, with conservation strategies lagging behind. Although Miami is a built-out city, simple incentive programs could go a long way towards prolonging the quality of life in the area, such as water conservation programs via payouts for non-use.

Conclusion:

Although there is an emerging consensus as to the efficacy of payment for environmental service programs, their implementation has been far more successful in Costa Rica than in Florida. In Costa Rica, PES programs were used as a market mechanism to address a previous deforestation crisis; they persist because Costa Ricans value ecotourism, they are concerned about climate change, and several companies want to develop an international reputation.

Despite pilot programs and modest limited federal intervention, Florida has barely begun to develop PES programs. Programs like CRP and EQIP, aimed at improving agricultural

operations, have suffered from decreasing enrollment among Florida farmers; and NE-PES, while successful on a small scale, has not been renewed. It is likely that Florida's status as a wealthy state and lack of environmental anxiety among the public will reduce the likelihood that policymakers will fully develop PES programs

Examining sociopolitical factors in Florida and Costa Rica shows that perception of environmental threats and natural disasters and differences in tourism and real estate markets may be significant factors to help (in Costa Rica's case) or hinder (in Florida's case) the establishment of PES programs.

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