Farm of the Future

Buck Island Ranch and the Florida Ranchlands Environmental Services Project

Chris Horne

May 2011

Buck Island Ranch and the Florida Ranchlands Environmental Services Project

Chris Horne

Farm of the Future Project

Case Series Editors: Ariela Summit, Louise E. Buck, Sara J. Scherr

ecoagriculturepartners
landscapes for people, food and nature

Title: Buck Island Ranch and the Florida Ranchlands Environmental Services Project

Author: Chris Horne

Series: Farm of the Future Project

Case Series Editors: Ariela Summit, Louise E. Buck, Sara J. Scherr

May 2011

EcoAgriculture Partners
730 11th Street, NW #301
Washington, D.C. 20001 USA
www.ecoagriculture.org

Cover Photo: Buck Island Ranch

Table of Contents

Acknowledgments **3**

Introduction **4**

Agricultural, Ecological, and Regulatory Context **4**

From FRESP to PES **6**

Buck Island Ranch Profile **8**

Scaling-up: Challenges and Opportunities **13**

References **17**

Glossary of Acronyms **19**

Figures

Figure 1. Northern and Southern Everglades 5
Figure 2. Location of the Buck Island Ranch 9
Figure 3. BIR water management alternative design 10
Figure 4. BIR culvert and riser board system 11
Figure 5. Pre and post FRESP management 12

Images

Image 1. Image of culvert and riser board 11
Image 2. Image of stepped riser board system 11

Tables

Table 1. Characteristics of FRESP ranches 7
Table 2. BIR revenue summary, 2005-2009 13

ACKNOWLEDGMENTS

This case study would not have been possible without the support of Sarah Lynch, Director of the Florida Ranchlands Environmental Services Project (FRESP) at World Wildlife Fund, who provided extensive phone interviews about FRESP and Buck Island Ranch (BIR); and Patrick Bohlen, Director and Associate Research Biologist at MacArthur Agro-ecology Research Center (part of Buck Island Ranch), who devoted time in person and over the phone to discuss FRESP on BIR and broader PES issues. The in-person interviews with Gene Lollis, Manager at Buck Island Ranch, provided necessary information about ranch management under FRESP.

Tom MacVicar, President of MacVicar, Frederico, and Lamb Inc. engineering firm and former Deputy Executive Director of the South Florida Water Management District, supplied the background context of regional water management. Martha Musgrove, retired journalist at the Miami Herald and president of the Decision Makers Forum, interviewed by phone about conservation history in the greater Everglades.

I am grateful to EcoAgriculture Partners staff Ariela Summit, Louise E. Buck and Sara J. Scherr for their conceptual guidance and editorial support in initiating and completing this case, and to Sajal Sthapit, Rachel Friedman and Abigail Hart for their assistance in formatting and copy-editing. I also acknowledge the excellent professional design work of Wenceslao Almazán on the poster that accompanies the case study.

Finally, the author and EcoAgriculture Partners acknowledge the financial support provided to the Farm of the Future project by the USDA Office of Environmental Markets. Thanks especially to Alice Appleton, Ryan Atwell, Sally Collins, Elizabeth Larry, and Carl Lucero for their strategic and technical support.

.

Introduction

Buck Island Ranch (BIR) is one of eight participating ranches in the Florida Ranchlands for Environmental Services Project (FRESP), a project initiated in 2005 by World Wildlife Fund, ranchers, researchers, and state and federal agency partners. Driven by the desire to restore the ecosystems of the Florida Everglades and still retain Florida's vibrant agricultural industry, FRESP aimed to design a payment for ecosystem services (PES) program that fosters on-ranch water management practices that are both economically viable and compatible with ecosystem restoration.

Agricultural, Ecological, and Regulatory Context

Ecological restoration and agriculture are two of the most prominent issues in Florida. Agriculture is a major part of the state's economy, constituting 9.3 percent of its gross state product and 14.2 percent of reported employment (USDA-NASS 2007). About a quarter of the 12 million acres in the Greater Everglades Ecosystem are covered by farms. In the Northern Everglades, ranching is the dominant land use. Figure 1 shows the Greater Everglades divided into the North and South regions.

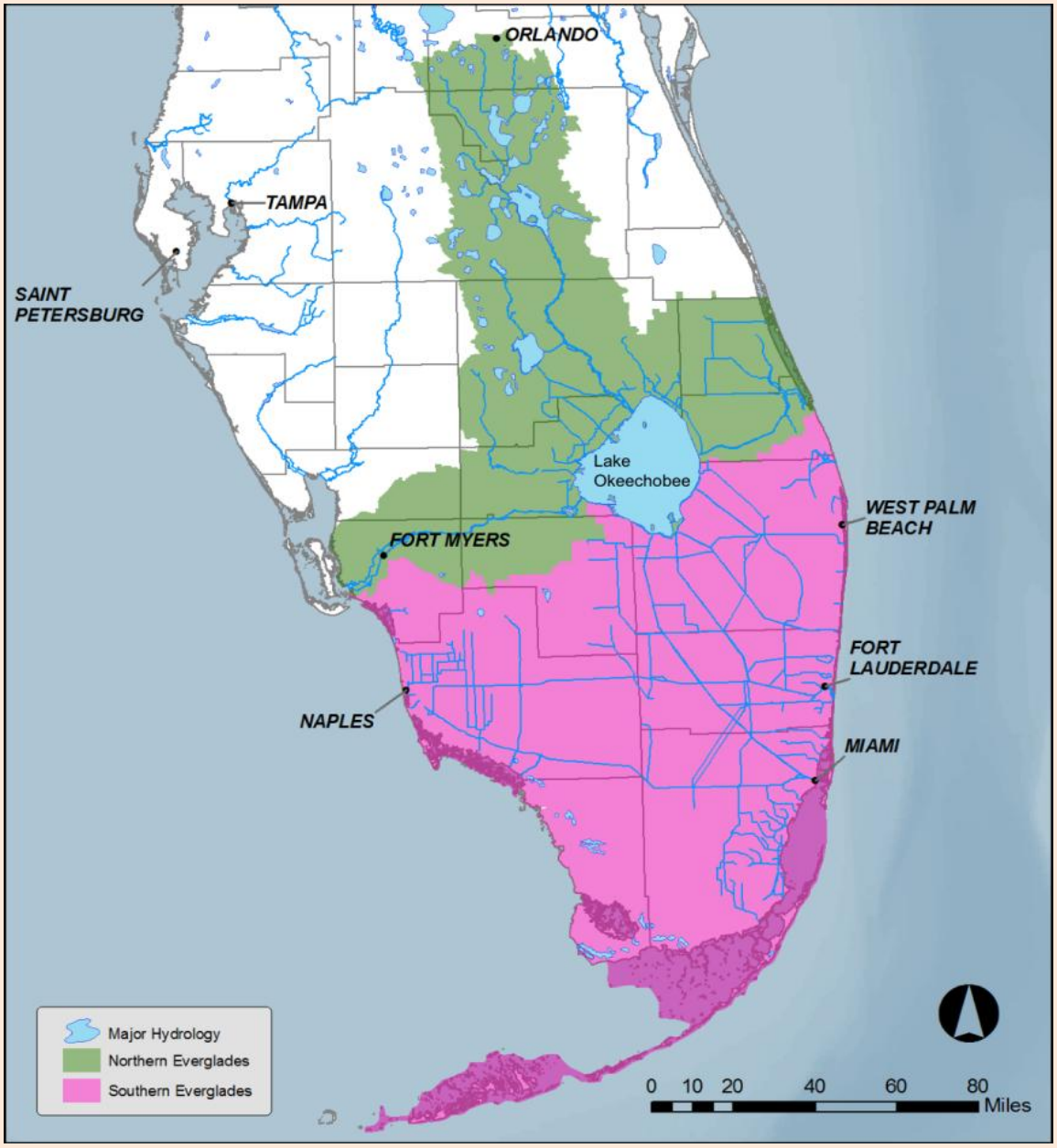
Over the past century, the Everglades have lost half of their wetlands by acreage, experienced a severe reduction in biodiversity, and suffered an array of hydrological problems driven by changes in land use and water management. These ecological problems have, in turn, created social and economic issues related to water quality, water supply, flood control, and tourism (Chimney and Goforth 2001; Dahm et al. 2006; Everglades Foundation 2008; Grunwald 2006; SFWMD 2010; USACE 1999).

In Florida and elsewhere, the interests of the agricultural community and environmentalists are often perceived as being in conflict (Grunwald 2006; Lemly, Kingsford, and Thompson 2000). However, one of the core tenets of FRESP is that ranching and Greater Everglades restoration can be mutually compatible. Ranchland already provides corridors for wildlife movement, critical areas for water recharge, and habitat for several endangered species, including the wood stork, indigo snake, crested caracara, Florida grasshopper sparrow, and Florida panther (Bohlen et al. 2009).

The particular ecological problem that FRESP aims to address is the quality, quantity, and timing of water flows in the Northern Everglades and more specifically, the Lake Okeechobee watershed. Under current management practices, excess water on farms, ranches, and developed areas is pumped into estuaries during the wet season, disrupting their salinity levels and overloading them with pollutants. During the dry season, water needed to sustain the Everglades ecosystem is diverted to serve the needs of residents in south Florida's developed areas (Lynch et al. 2005; SFWMD 2008; Steinman and Rosen 2000). With a new focus on Everglades restoration, there is a

generally recognized need for additional water retention and filtration capacity in natural areas to regulate flows and reduce nutrient loading (*ibid.*). FRESP addresses this need by developing a program in which ranchers are paid to retain and filter water flowing through their pastures.

Figure 1. Northern and Southern Everglades



Source: © Chris Home 2010

FRESP: THE PILOT PHASE

In 2005 the World Wildlife Fund, ranchers, researchers and state and federal agency partners initiated the Florida Ranchlands for Environmental Services Project (FRESP). Given recent regional interest in restoring the Florida everglades, this coalition of partners came together to launch a pilot project to design a payment for ecosystem services (PES) program to fund water management practices implemented on working ranches. The partners aimed to restore ecological function while simultaneously providing another funding stream to Florida ranchers. Funding for the five year pilot of FRESP comes from the U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) Conservation Innovation Grants, the Florida Department of Agriculture and Consumer Services (FDACS), the South Florida Water Management District (SFWMD), U.S. Environmental Protection Agency 319 funds, and the W.K. Kellogg Foundation.

The primary regulatory considerations driving FRESP relate to the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), and the Clean Water Act (CWA). To facilitate and streamline compliance by the ranchers with these and other regulations on creating new wetlands and maintaining water quality, the FRESP team is working with the U.S. Army Corps of Engineers to develop a General Permit for use in a PES program. NRCS and the U.S. Fish and Wildlife Service have developed a Consultation Matrix that will guide the design, construction, and operation of the WMA to address potential site-specific impacts on threatened and endangered species.

Eight ranches across the region signed on to participate in these early pilot phases. Under the pilot, ranchers receive payments for participating in the program and for implementing water management alternatives (WMAs) on their land to increase water retention and reduce nutrient runoff. Table 1 summarizes the characteristics of the eight FRESP pilot ranches and the environmental benefits achieved.

The WMAs are a combination of modified land management and low-tech water control infrastructure. There are no uniform or prescribed lists of management procedures; instead, the land manager is encouraged to use and modify any existing system to produce the desired services in the most efficient and effective way for her land. Typical practices that work on many ranches to manage water include culverts with flashboard risers, impoundments, berms, and pumps.

Table 1. Characteristics of FRESP ranches

Ranch	Total Size (acres)	Primary Service	WMA Size (acres)	% of Ranch Under WMA	Retention per WMA acre (acre-ft/acre)	Annual Estimated Phosphorous Reduction (lbs)
BIR	10,494	Retention	3,748	36%	0.45	3,342
2	783	Retention	367	47%	0.62	111
3	3,230	Retention	364	11%	0.64	154
4	5,074	Retention	1,624	32%	0.52	555
5	9,094	Retention	659	7%	0.46	132
6	3,062	Retention	2,197	72%	0.43	638
7	3,353	Retention	322	10%	0.43	30
8	342,247	Phosphorous reduction	2,368	1%	2.36	7,220

To document the provision of the desired watershed services, FRESP is developing two models, one for estimating potential water retention and the other for potential phosphorous reduction. Given various biophysical parameters of the ranch and the desired WMA, the model predicts the average annual amount of water retention or pounds of phosphorus retained over a given period of record for rainfall. It is understood that in any given year the amount of service provided may be above or below this estimate because of annual variation in rainfall.

Ecologically the WMAs on BIR and the other pilot ranches are achieving their core goals of water retention and/or phosphorus reduction (see Table 1). Other ecological impacts will be understood better upon completion of a recently initiated, three-year study of how changes in hydro-period and water management influence wetland plant communities and wildlife. The study considers four sites, all FRESP ranches, one of which is BIR. Although the impacts will be studied at the ranch scale, having a pool of data from multiple ranches across the landscape will provide some insight into the regional impacts of the FRESP WMAs. Anecdotally, based on limited, non-scientific observations, ranch staff members have reported an increase in wetland plants, frogs, wading birds, and ducks in response to higher water levels and longer hydro-periods associated with the project.

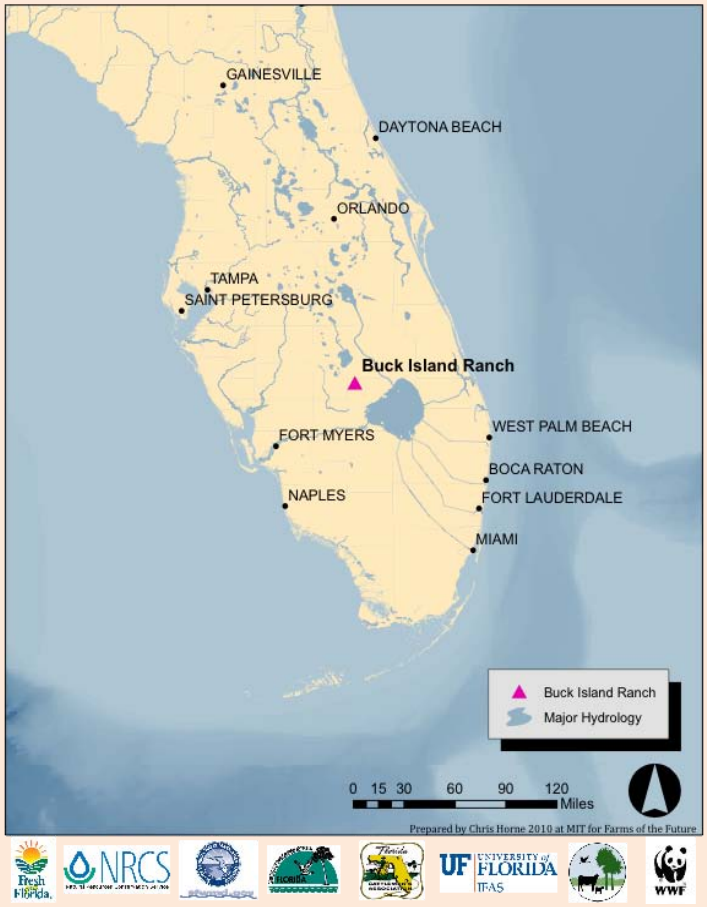
Buck Island Ranch Profile

Buck Island Ranch is one of the eight FRESP pilot ranches. From 1968 to 1988 it was the private ranch of philanthropist John D. MacArthur. It is now part of the MacArthur Agro-ecology Research Center (MAERC) in central Florida and currently is managed by the Archbold Biological Station under a long-term lease from the John D. and Catherine T. MacArthur Foundation. Although the ranch exists to support research, education, and environmental stewardship, it is managed as a full-scale commercial cow-calf operation. Net revenues are used to support research.[1] The map in Figure 2 locates BIR within the state.

With 3,000 head of cattle on 10,500 acres (4,250 ha), BIR is among the top twenty commercial cow-calf producers in Florida (FDACS 2010). Approximately half of the ranch is improved Bahia grass pasture, while the other half is semi-native, "unimproved" pasture. In addition to cattle sales, the ranch derives income from sod production, hunting leases, and cabbage palm harvesting. BIR was a logical FRESP partner because of its mission to understand and promote agricultural practices that are both environmentally sustainable and commercially viable. The long-term vision for BIR, which is guided by the MAERC research agenda, is to maintain its research and commercial operations without a major increase or decrease in scale or intensity.

[1] A more detailed discussion of BIR revenues and FRESP payments begins on page 12.

Figure 2. Location of the Buck Island Ranch

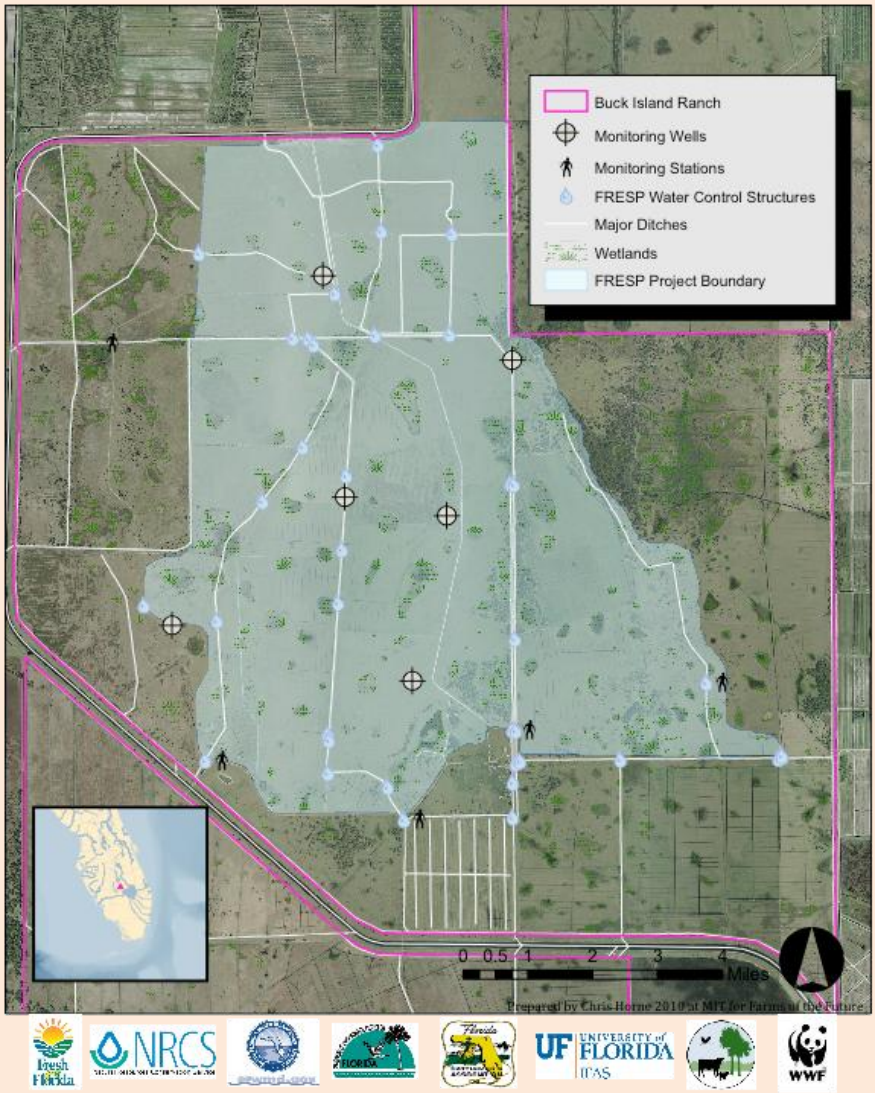


The ranch has won several environmental awards, including the 2006 Florida Cattlemen's Environmental Stewardship Award and the 2007 FDACS Agricultural-Environmental Leadership Award (FDACS 2010). It provides habitat for hundreds of plants and animals, including several threatened and endangered species. In 2005 BIR completed a Conservation Plan with USDA-NRCS and submitted a Notice of Intent to implement best management practices in order to be in compliance with state water quality laws for cow-calf operations. For the BIR ranchers, like all the participants of FRESP, profit is only part of their motivation to participate; they also value the opportunity to provide a public service and demonstrate that they are good stewards of the land.

From the beginning, BIR's participation in FRESP has been collaborative; it involves the ranchers, researchers, and Archbold Biological Station staff. From the FRESP team's point of view, partnering with BIR was critical for gaining credibility and access to the ranching community of central Florida.

BIR, like many other ranches in Florida, was using a culvert and riser board system to manage water long before FRESP came into existence. Changes to management undertaken in response to FRESP payment occurred on about 35 percent of the ranch (3,748 acres) and included expanding the culvert system and managing the boards at a higher level than before (see Figures 3, 4, and 5, and Images 1 and 2).

Figure 3. BIR water management alternative design



The purple outline is the boundary of the ranch property; the blue transparent polygon is the extent of the WMA. The water drop symbols are culverts with riser structures managed to reduce phosphorus runoff and retain water.

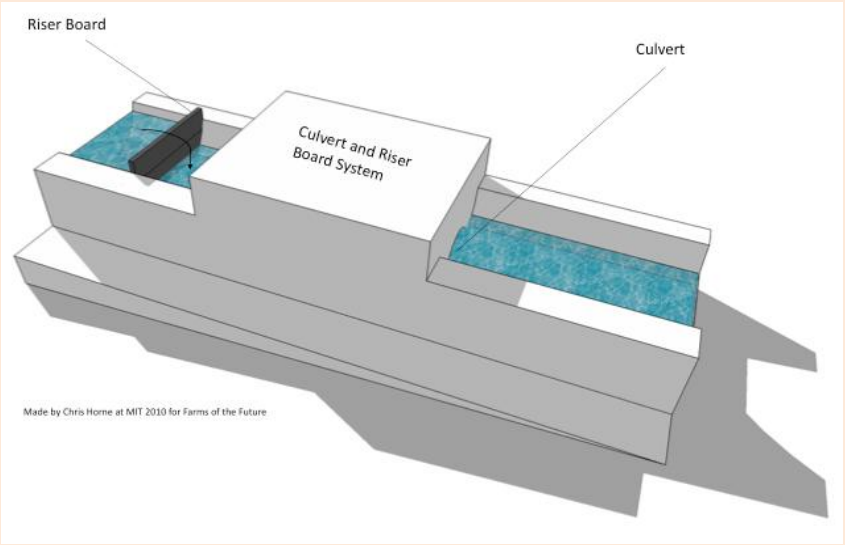
Image 1. Image of culvert and riser board

Riser board system currently being used on BIR.

Image 2. Image of stepped riser board system

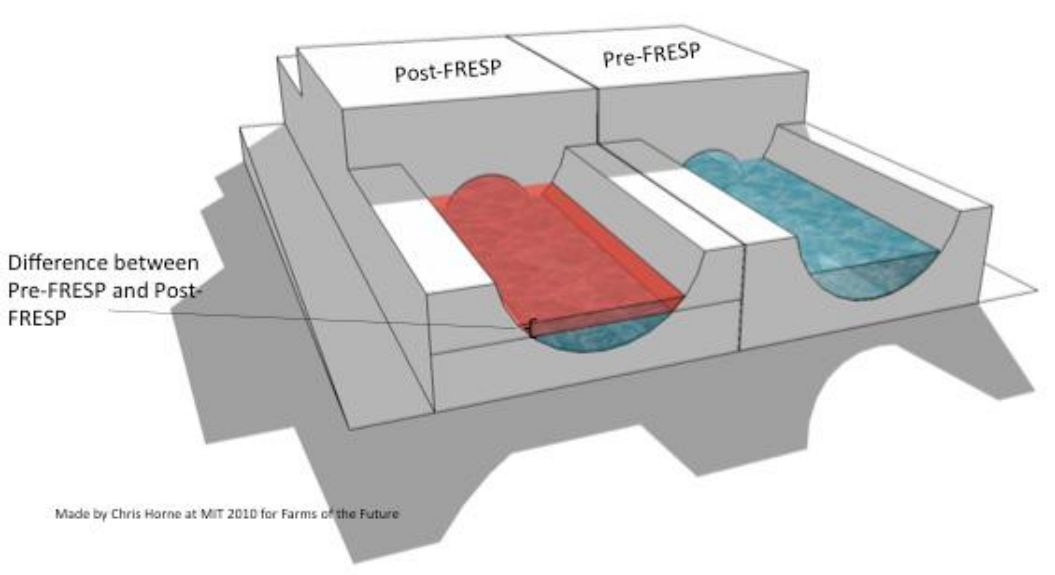
Three different stages of the stepped riser board system, one in the foreground, one in the middle ground, and a third in the background follow the natural drainage patterns of the landscape.

Figure 4. BIR culvert and riser board system



Water flows through a channel until it reaches the riser board, where flow is obstructed, and the water level in front of the board begins to rise. If the water level rises above the board, it will spill over into the next stage of the system and flow through the culvert. Some systems allow the board height to be adjusted, while others are fixed in place.

Figure 5. Pre and Post FRESP management



In a post-FRESP system, depicted on the left, the boards are maintained at a higher level than normal, causing water that would otherwise continue downstream to be retained up-stream. The red area on the left side shows the amount of water that is retained by the increased board height compared with the right side, which shows pre-FRESP management and a greater flow passing through the culvert.

In FRESP, BIR and the other participating ranches receive payment for land rental, forgone production, and program design. Therefore, the revenue numbers in Table 2 are not necessarily indicative of the level of payment in a full-scale PES program.

Participating ranches have achieved impressive results both in terms of water retention and phosphorus reduction. Retention on BIR for each WMA acre is now 0.45 acre feet. Phosphorus runoff has been reduced by an estimated 3,342 pounds each year.

Table 2. BIR revenue summary, 2005-2009

Source	Year 2009	2008	2007	2006	2005
Cattle Sales	$1,623,560 (88%)	$1,197,606 (85%)	$1,738,601 (93%)	$1,300,714 (86%)	$1,429,501 (81%)
Other Agricultural Revenue	$42,164 (2%)	$85,761 (6%)	$34,283 (2%)	$148,176 (10%)	$147,776 (8%)
Tours and Facilities Revenue	$90,164 (5%)	$28,449 (2%)	$50,985 (3%)	$38,637 (3%)	$40,350 (2%)
Hurricane Damage Insurance Reimbursement	$0 (0%)	$0 (0%)	$0 (0%)	$21,510 (1%)	$146,903 (8%)
FRESP	$93,333 (5%)	$93,333 (7%)	$53,889 (3%)	$0 (0%)	$0 (0%)
TOTAL	$1,849,221	$1,405,150	$1,877,758	$1,509,037	$1,764,530

The ranch began receiving FRESP payments in 2007. The numbers in parentheses are the percentages of annual income.

From FRESP to PES

The eight pilot ranches under FRESP have informed the design of a robust PES program, and SFWMD has agreed to purchase water retention and nutrient reduction services from area ranchers going forward. The FY 2011 budget of the SFWMD includes funds to enable the current pilot FRESP to transition into a full PES program. In the proposed PES program, WFWMD will be purchasing water management services and will issue a solicitation. (In principle, multiple agencies could become buyers.) Interested ranchers would propose water management alternatives (WMAs) on their land, and if the proposal matched the interests of the buyer, the two parties would negotiate a fixed-term contract. Payment will be determined in a reverse-auction system: ranchers will submit bids to the buyer based on the level of payment they would require in order to participate, and then

the buyer will select the bids that best suit its needs. Payments would vary from ranch to ranch reflecting the different capital, operations and maintenance and opportunity costs of each ranch WMA site and volume of services generated. As a result, there would not be a standard dollar per acre payment.

Ranchers would only contract a portion of their land to provide ecosystem services, while managing the rest for normal commercial operations. In some instances the portion of land set aside for PES would continue to provide commercial revenue. Even though most WMAs provide several water management services simultaneously (e.g. water retention, nutrient load reduction), each one would have a single primary service to guide design, contracting, and payment. Participation is voluntary, and a rancher may revert to pre-project conditions after the contract expires.

To document the provision of the desired watershed services, FRESP is developing two models, one for estimating potential water retention and the other for potential phosphorous reduction. These models will be used in the PES contracting process to establish the average amount of service the proposed site is predicted to generate. The use of the model provides a common metric for calculating the baseline for contract negotiations and annual program budgeting. The model will contribute to a streamlined administration process thereby helping to reduce transaction and monitoring costs. By using the model, monitors can simply verify that ranchers are managing the WMA in the agreed-upon fashion, without doing direct water measurements.

During contract negotiation, the buyer and seller would determine how to distribute the payments. Over the life of the contract, some ranchers might prefer an upfront payment to recoup investment costs, thereafter receiving smaller annual payments, while others might forego an upfront payment in order to have larger annual payments. During the operation of the WMA, verification of compliance and enforcement must be performed. Contracts will specify required performance documentation, exit clauses, penalties for non-compliance, mechanisms for contract renegotiation, emergency clauses and other terms and conditions.

One advantage of distributed management of the system across numerous small-capacity water retention sites, rather than a small number of large infrastructure projects, is that the WMAs can be designed, permitted, constructed, and made operational within one to two years. This compares favorably with large regional water infrastructure, which can take ten years or more to become operational (Lynch 2010; MacVicar 2010). Contract length is still under review but will be between five and twenty years. A contract of less than five years does not justify the capital investment, while twenty years is the outer limit of the infrastructure's physical durability.

SCALING-UP: CHALLENGES AND OPPORTUNITIES

The experiences thus far with alternative water management on BIR and the other FRESP pilot ranches indicate that the project has been a success. Preliminary analysis shows that the FRESP WMAs have the potential to make a significant contribution to regional water retention and phosphorus reduction needs. Furthermore, compared with regional water infrastructure, the WMAs are relatively rapid, easy to implement and have comparable, if not lower, lifetime costs.

In January 2011, the SFWMD launched a scaled-up Northern Everglades and Estuaries PES Program. Technical assistance is provided by the NRCS and FDACS. The goal is to build up 450,000 acre-feet of water retention. Ten-year contracts are being offered, using reverse auction bidding. The estimated obligation is $43 million over 10 years, including capital and annual service payments (Lynch 2011).

The feedback from the ranchers has also been positive. Two of the eight ranchers have placed portions of their land under permanent conservation easement through the Wetland Reserve Program. All of the remaining ranchers have expressed strong interest in continuing with the scaled-up PES program. In general, attitudes toward FRESP are positive among both the participating ranchers and the ranching community more broadly.

The initial focus area of the scaled-up PES program will be the Northern Everglades (see Figure 1). Although there has not yet been a formal study of the number of ranchers in the Northern Everglades who would be willing to participate in a scaled-up water management PES program, the results of the pilot project suggest that ranchers view participation as worthwhile. Based on this experience, it is plausible that a full-scale program would be generally attractive. Some landowners may choose not to participate, while others may be precluded from doing so because their properties are unsuitable.[2]

FRESP has also addressed many of the issues that caused past PES programs to fail. These include the identification of dedicated buyers and sellers with genuine incentives to participate, a streamlined process for regulatory compliance, technical feasibility of the WMAs, administrative feasibility, and

[2] Variables such as soil, slope, land cover, land tenure, spatial relationship with regional water infrastructure, and neighboring land uses all likely affect site suitability. A detailed suitability study that would incorporate these variables is pending from the FRESP team.

accepted procedures for service potential estimation. FRESP is further refining feasible processes for administration and monitoring. Some challenges do remain, such as establishing a cost-effective way to monitor service (Asquith, Vargas, and Wunder 2008; Bohlen et al. 2009; McDonald 2006; Pagiola et al. 2004; Wunder, Engel, and Pagiola 2008).

The project provides insight into the evolving relationship between agriculture and environmental protection. In FRESP, the ranchers are both food producers and water managers, able to make both a profit and a positive contribution to ecological restoration. As such, the farmer's overall role is one of a landscape manager and provider of ecological services and not solely a commodity producer. Society depends on both agriculture and ecosystem services for its survival, so it is imperative to manage both sustainably and synergistically.

REFERENCES

Asquith, N. M., M. T. Vargas, and S. Wunder. 2008. Selling Two Environmental Services: In-kind Payments for Bird Habitat and Watershed Protection in Los Negros, Bolivia. *Ecological Economics.* 65(4): 675-684.

Bohlen, P. J., S. Lynch, L. Shabman, M. Clark, S. Shukla, and H. Swain. 2009. Paying for Environmental Services From Agricultural Lands: an Example From the Northern Everglades. *Frontiers in Ecology and the Environment.* 7(1): 46-55.

Chimney, M. J. and G. Goforth. 2001. Environmental Impacts to the Everglades Ecosystem: a Historical Perspective and Restoration Strategies. *Water Science & Technology.* 44(11): 93-100.

Dahm, C. N., K. W. Cummins, H. M. Valett, and R. L. Coleman. 2006. An Ecosystem View of the Restoration of the Kissimmee River. *Restoration Ecology.* 3(3): 225-238.

Everglades Foundation. 2008. *The Essentials for Everglades and Estuary Restoration*. Palmetto Bay, Florida.

FDEP (Florida Department of Environmental Protection). 2001. *Total Maximum Daily Loads in the Southeast Florida District. Florida Administrative Code.*

FDACS (Florida Department of Agriculture and Consumer Services). 2010. Buck Island Ranch Overview. http://www.florida-agriculture.com/news/agen_buckisland.htm

Grunwald, M. 2006. *The Swamp: the Everglades, Florida, and the Politics of Paradise*. Simon & Schuster.

Lemly, A. D., R. T. Kingsford, and J. R. Thompson. 2000. Irrigated Agriculture and Wildlife Conservation: Conflict on a Global Scale. *Environmental Management.* 25(5): 485-512.

Lynch, S. 2011. Designing a Payment for Environmental Services Program on Working Ranchlands: Lessons Learned. WWF: Washington. http://www.farmfoundation.org/news/articlefiles/363-Sarah%20Lynch%20presentation.pdf

Lynch, S. 2010. Phone Interview. May 5..

MacVicar, T. 2010. Phone Interview. May 10.

McDonald, M. 2006. *Pre-Implementation Evaluation of Florida Ranchlands Environmental Services Project*. W.K. Kellog Foundation.

PSFWMD (South Florida Water Management District). 2008. *Lake Okeechobee Watershed Construction Project Phase II Technical Plan*. SFWMD, FDACS, and FDEP.

SFWMD. 2010. *South Florida Environmental Report.*

Steinman, A. D. and B. H. Rosen. 2000. Lotic–lentic Linkages Associated With Lake Okeechobee, Florida. *Journal of the North American Benthological Society.* 19(4): 733-741.

USACE (United States Army Corps of Engineers). 1999. *Central and South Florida Project Comprehensive Review Study. Final Integrated Feasibility Report and Programmatic Environmental Impact Statement, vols. 1–10.*

USDA-NASS (United States Department of Agriculture - National Agricultural Statistics Service). 2007. *US Census of Agriculture*.

Wunder, S., S. Engel, and S. Pagiola. 2008. Taking stock: A comparative analysis of payments for environmental services programs in developed and developing countries. *Ecological Economics*. 65(4): 834-852.

Glossary of Acronyms

BIR	Buck Island Ranch — one of eight ranches participating in the Florida Ranchlands Environmental Services Project and the featured case study of this report.
FDACS	Florida Department of Agriculture and Consumer Services — the Florida state agency that ensures the safety of food and consumer products throughout Florida, protects consumers from unfair business practices, and helps Florida's farmers produce and promote their products.
FRESP	Florida Ranchlands Environmental Services Project — a pilot project initiated by partners that included ranchers, World Wildlife Fund, FDACS, SFWMD, NRCS, and researchers with the goal of designing a program in which Florida state agencies purchase water retention and nutrient load reduction services from ranchers on a contract basis.
MAERC	MacArthur Agro-Ecology Research Center — the research center at Buck Island Ranch, part of the Archbold Biological Station. Its focus is on environmental stewardship on working farms and ranches.
NRCS	Natural Resources Conservation Service — part of the US Department of Agriculture, the NRCS provides technical assistance to farmers and landowners. Its mission is to improve, protect, and conserve natural resources on private lands through a cooperative partnership with local and state agencies. While its primary focus has been agricultural lands, it has made many technical contributions to soil surveying, classification and water quality improvement.
PES	Payment for Ecosystem Services — a model of environmental conservation in which private landowners are provided an incentive, often financial, to manage their land in a way that creates ecological benefits.
SFWMD	South Florida Water Management District — a state agency that covers a 16 county area stretching from the Florida Keys to Orlando. It is responsible for water quality, flood control, water supply, and environmental restoration.
USACE	United States Army Corps of Engineers — a federal agency that provides public engineering services. The Corps and the South Florida Water Management District are the primary entities responsible for water management in the Greater Everglades Ecosystem.
WMA	Water Management Alternative — the name used in the Florida Ranchlands Environmental Services Project to describe a combination of infrastructure and ranching management practices that provide ecosystem services.