

# Background and Context for Interpreting the “Compilation of Benefits and Costs of STA and Reservoir Projects in the South Florida Water Management District” for the Northern Everglades Payment for Environmental Services Program



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Northern Everglades Payment for Environmental Services Program**

**A Report Prepared by**

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## **Introduction**

This report is a companion to the report “Compilation of Benefits and Costs of STA and Reservoir Projects in the South Florida Water Management District” prepared by Hazen and Sawyer and provides background and context useful to the interpretation of those results. It also includes a discussion of the considerations that should be kept in mind when comparing the estimates of costs and benefits contained in the report to those of on-ranch water management alternatives (WMAs) secured by the solicitation process of the NE-PES program.

The compilation of costs and benefits report was prepared at the request of the Florida Ranchlands Environmental Services Project (FRESP) partners. The terms of reference for the benefit and cost analysis was developed by FRESP project directors and SFWMD staff, and the compilation of benefits and costs were conducted by Dr. Grace Johns of Hazen and Sawyer. The projects included in the report were selected by the SFWMD with a focus on projects located in the Northern Everglades. The results are provided in the complete Hazen and Sawyer report “Compilation of Benefits and Costs of STA and Reservoir Projects in the South Florida Water Management District” available at [www.fresp.org/resources](http://www.fresp.org/resources).

The full Hazen and Sawyer report is based on available data for 5 regional water management projects that together include four stormwater treatment areas (STA) and two reservoirs. Data about each project was provided by those having project management responsibility within the SFWMD from the data included in planning and design documents. The five projects are in different stages of design, construction and operation and will be implemented by the US Army Corps of Engineers (ACOE) and/ or the South Florida Water Management District (SFWMD).

The five projects include:

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1. Taylor Creed Stormwater Treatment Area (STA) -- completed
2. Nubbin Slough Stormwater Treatment Area (STA) – completed, but repairs needed before operational
3. Lakeside Ranch Stormwater Treatment Area (STA) – construction started with expected completion in 2012
4. Caloosahatchee (C-43) West Basin Storage Reservoir – design completed
5. St. Lucie Canal (C-44) Reservoir and Stormwater Treatment Area – construction to start in 2011

## Background

The 2011 Hazen and Sawyer report is a follow on to a January 2005 Hazen and Sawyer report to the Everglades Friendly Beef Steering Committee (precursor group to FRESP). That report was entitled “Estimates of Average and Marginal Costs Per Pound of Phosphorus Removed Using RASTAs in the Lake Okeechobee Watershed and Marginal Costs of Water Storage” and is available at [www.fresp.org/resources](http://www.fresp.org/resources). The estimated costs were for building and operating the *next added* regional project to secure each service. Thus, in the 2005 Hazen and Sawyer report the cost of regional projects that had been, or were expected to be, built were used as a basis for predicting what the “next” acre foot of storage or pound of P removed would cost. The same approach is followed in the 2011 report.

The 2005 Hazen and Sawyer report was an input to “Assessing On-Ranch Provision of Water Management Environmental Services” July 2005, available at [www.fresp.org/resources](http://www.fresp.org/resources). That report assessed, at a conceptual level, the potential for providing water storage and phosphorus (P) load reduction from ranchland water management alternatives<sup>2</sup> (WMAs) and the costs per unit of service. In that report the water control service was calculated as storage not retention, and P load retention was estimated for all WMAs and not just those that took off site water. The costs for on-ranch water services were based on a) estimates of the annualized cost for design, construction and operation of on ranch WMAs, plus b) a simulated annual payment that rancher’s might expect to receive for allocating some part of their ranch to provision of water management services.

The results from that study suggested that there was a potential cost-effectiveness of securing water management services on-ranch as a complement to regional projects. This encouraging

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<sup>2</sup> Water management alternative (WMA) refers to the combinations of construction and management practices selected and implemented by the landowner within a defined drainage basin of the ranch in order to produce the water management services.

result led to the creation of the FRESP collaboration which raised funds from federal, state and private foundation sources to launch a “payment for environmental services” (PES) pilot project (2005-2011) with on-the-ground projects on volunteer ranches to ground truth this potential. The demonstrated success of the 8 FRESP pilot projects and the field testing of program design elements resulted in the launch of the SFWMD’s new Northern Everglades Payment for Environmental Services (NE-PES) Program.

## **Context and interpretation of 2011 Report Results**

The cost analysis in the 2011 Hazen and Sawyer report uses data from the 5 regional projects to calculate the present value of costs for acquiring water management services from regional STAs and reservoirs. The annual projects costs were estimated or incurred at different times; these costs included both initial investment costs and projections of future costs over a 50 year useful life of the projects. In order to put all costs, with the exception of land prices, on a common basis before computing their present value, they were converted to 2011 dollars using standard inflation adjustment procedures. In the base run of their analysis Hazen and Sawyer used a 4.125% discount rate. The results of this analysis are found in Chapters 2-6 of the full report. Hazen and Sawyer also conducted a sensitivity analysis using land prices adjusted to 2010 levels derived from data from UFL-IFAS to provide estimates of land prices as they might be incurred at the current time. Putting these costs on a current cost basis means that the costs reflect what the next regional project would cost if it were in place in 2010. They also assumed the 3.25% discount rate being used by the SFWMD in the NE-PES program solicitation process to calculate the regional projects annualized costs and benefits over a 50 year time horizon. Results of the sensitivity analysis are found in table 7.3 of Chapter 7 of the full report.

### **Comparing costs and benefits of regional projects with on ranch WMAs.**

Any interpretation of the benefit and cost analysis of regional projects, when making a comparison with the costs of on-ranch WMAs, should recognize and accommodate key differences between the regional and on-ranch water management projects.

***Uncertainty of costs and service flows:*** Over a 50 year project life circumstances change and predictions of service levels and annual and recurring costs for operations, repair and rehabilitation made at the time of planning may prove to be in error. With regard to costs, annual costs *in real dollars* were assumed to be constant each year for the five regional projects and there were no costs explicitly identified for major repair and rehabilitation. For NE-PES WMAs the costs are highly certain for the 10 year contract. For service levels, both WMA and regional project service levels are model estimates. However, the longer the time horizon, as in the regional projects, the greater is the uncertainty of the estimates.

For example, comparing cost and service estimates of the Taylor Creek STA between the 2005 and 2011 Hazen and Sawyer report show that the service estimate declined by 33% (from 6,890 lbs per yr in 2005 to 4586 lbs per yr in 2011) and total capital costs increased by 44% (from \$4.3 mil in 2005 to \$6.1 mil in 2011).

For all these reasons, it should be understood that the cost per unit of service estimates may be higher or lower than what is reported, especially for regional projects with a longer service life. However, the inevitable uncertainty in the calculation of annualized costs or service levels is not reflected in the reported cost per unit estimates. Because of this uncertainty any single cost per unit estimate should not be treated as a precise number.

***Project Life Used in Cost Analysis:*** The project life for regional projects cost analysis was 50 years. This long time horizon correctly allocates capital costs over the expected life of the project, so the longer the project life the more opportunity to spread costs over many years. The WMA contracts are for 10 years even though the useful life of some of the capital investments will last beyond 10 years and contracts can be renewed if buyer and seller agree. The 10 year limit does not allow for the amortization of initial investment costs over the useful life of the investment. Therefore, this should be recognized if a comparison is made between the estimated costs of regional projects and the costs of WMAs, as submitted under the NE-PES.

***On ranch water retention projects provide different services than regional water storage.***<sup>3</sup> Water retention provided by NE-PES WMAs does not yield the same services as water storage provided by reservoirs. Water retention is estimated by the Potential Water Retention Model (PWRM) and is defined as the amount of water in acre feet that is lost to evaporation, transpiration or seepage each day. Said differently, retention is the acre feet of water that because of the WMA no longer drains off the WMA site as surface flow. The service as estimated by the PWRM is the acre feet of water retained each day over the last 10 year (3650 days) period of record, divided by 10 years. This is average annual water retention.

As a result of on-ranch water retention the amount of water flowing to the lake and the estuaries during high rainfall events is reduced or moderated. Of course this effect on the Lake and estuaries would be realized only if there are many thousands of acre feet of retention across the Northern Everglades landscape reflecting many contracts with individual landowners.

The measurement of the service from regional projects is the volume of water that a reservoir could hold when it is held at a certain design level. The best way to think of this service is to imagine the reservoir as a large bucket and the storage is the volume of water it can hold at some

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<sup>3</sup> ***P Load Reduction Measurement for taking off ranch water:*** The P load reduction service from regional projects is measured in the same way as for nutrient removal WMAs that take off ranch water. Whether a regional project or a nutrient removal WMA, P load is measured as the water enters and exits the site and the difference is the P load reduction service.

surface water level inside the reservoir. This volume is measured in acre feet but is not the same service as acre feet of retention. The service of the reservoir comes with the ability of the reservoir operator to hold and release water in ways that meet the immediate operational goals of the water management district.

The only way to relate storage to retention is to include both kinds of projects in a large system model for the whole region and have the model estimate how the presence of water retention WMAs can affect the required size and operation of the storage reservoirs needed to meet the targets for Lake Okeechobee stages for freshwater flows to the estuaries. This modeling has not been done. As a result there is no way to compare storage to retention, despite the representation of both in “acre feet”.

Water retention WMAs secured through the NE-PES program also provide desired nutrient retention, so two services are provided by a single on-ranch investment in water retention. The dual services provided by water retention WMAs was recognized both in the 2005 Hazen and Sawyer report that was used to justify the launch of FRESP and the FRESP pilot projects in advocating for what eventually became the NE-PES program. For example, the average annual pounds of P retention from the 7 water retention FRESP projects were estimated at roughly 5000 lbs/yr.

In principle then, the costs for a WMA should be allocated to the different services of water and nutrient retention. After the costs are divided between the services, a comparison, however rough, between the costs for water retention at a WMA and regional water storage would be made. However, allocation of joint costs is a complicated analytical process and was not completed for the NE-PES or for this report. Nonetheless, any comparison of annualized costs for regional water storage to on-ranch water retention must recognize the differences in services provided; that is storage is not retention and on ranch WMAs simultaneously provides the services of water retentions and expected, but not quantified, nutrient reduction benefits.

***Administrative Practicality:*** The costs of administering a program – implementation, monitoring and enforcement – and how these functions fit into implementing agency’s existing structure are different for on-ranch WMAs under the NE-PES program from those of regional projects. The differences in administrative costs have not been evaluated.

***Immediacy and Scale:*** This refers to the time it takes to make a project operational and includes the design, land purchase (regional projects), permitting, construction, and implementation of a project. As demonstrated by the FRESP pilot a WMA can come on line quickly. Regional projects have longer lead times from conception to operation. The costs for the “next” project (beyond the 5 used for current cost estimation) as estimated are in 2010 dollars, but costs may change by the time the next proposed project becomes operational. However, the level of total

services from a single regional project can be significant and it may take several WMAs to be in place to have a hydrologic impact. Thus it may take several years before the needed WMAs are on line to equal the regional project.

***Permanence:*** Permanence is the expected duration over which a project will be operational or available for providing services. NE-PES contracts are for 10 years but the water retention services of WMAs can operate indefinitely as long as contracts are renewed and if needed infrastructure is replaced at the end of its useful life. The operational life of the P removal WMAs is not certain. While the land is owned in permanence, the regional STAs may require significant rehabilitation over time to maintain P load reduction, but that need is uncertain.

***Habitat and Recreation:*** Both regional projects and WMAs provide, to some degree, site and landscape level hydrologic restoration and wildlife habitat. The annual payment associated with the NE-PES approach will help keep ranches profitable and, in so doing, maintain preservation of open space that protects and maintains wildlife habitat and potentially could contribute to wildlife corridors. Recreational services such as boating, public viewing and picnic areas are available at some regional projects but are not part of a NE-PES contract.

***Economic activity:*** Regional projects take land off the tax rolls, although payments in lieu of taxes may be made. However, second round economic activity effects attributable to working ranch land will be lost and may not be replaced by the activities associated with the regional projects.

***Reversibility:*** Reversibility refers to the ability to alter or exit from project operation if a project or the program does not prove viable over time. Two key factors that influence reversibility are the amount of capital investment costs and the expected project life. In general the higher the capital investment costs and longer the project life the lower the reversibility, hence WMAs are more reversible. On the other hand, changes to regional project operations can be made that will expand or maintain service levels, although any costs that might be required to make such adjustments if that becomes necessary are not part of the cost analysis reported here.

### **Reflections on the NE-PES contribution to water management in the Northern Everglades**

The Hazen and Sawyer report provides a summary of the benefits and costs associated with the five reservoir and /or STA projects using different assumptions about land values and discount rates. The estimates (actual and predicted) of costs for the next added regional projects per acre foot of storage and per pound of nutrient retention generated in this study are an update to the 2005 analysis. They were developed to assist the buyers and sellers of WMA services in understanding the costs, advantages and disadvantages of WMAs dispersed over the landscape as

compared to regional projects. However, there are limits to the ability to make direct comparisons between regional and WMA projects.

In the end there is no expectation that WMAs even at a large program scale would completely displace regional projects. Instead the WMAs have always been described by the FRESP team as a complement to regional projects. In the future, as the Dispersed Water Management program is taken to full scale it could result in a reconfiguration of the plan for regional project numbers, location, size and type that would be determined through an adaptive management Northern Everglades' restoration planning process.

Buyers and sellers can use the results of this report as a guide for better appreciating the alternative approaches for securing water management services. In the end the buyer will need to ask itself what is the maximum they are willing to pay given this information, for services from WMAs; and sellers should be focused on determining the minimum amount they would require to be a seller in the program. If buyer and sellers use the information contained herein in this way then the opportunities for buyer and sellers to come together on a payment that is acceptable to both will be advanced.