

Picayune Strand Restoration Project (PSRP) Water Quality Projections

Background

PSRP is a Comprehensive Everglades Restoration Plan (CERP) project. The objective of the project is to restore the hydrological and ecological function of nearly 55,000 acres of a previously drained wetland. This project will increase discharges to Outstanding Florida Waters within Collier-Seminole State Park and the Cape Romano – Ten Thousand Islands Aquatic Preserve (Fig 1). Additionally, the Ten Thousand Islands regions have been assigned estuary specific Numeric Nutrient Criteria (NNC) by the Florida Department of Environmental Protection. Given the importance of the State Park and Aquatic Preserve water resources, this assessment was performed utilizing a hydrologic model produced by the Army Corps of Engineers (USACE) and water quality data collected by the South Florida Water Management District (SFWMD) and Collier County and provides an estimate of the changes in nutrient concentration and loads to downstream areas and waterbodies upon completion of this project.

Methods

Flows used in this analysis were taken from the USACE's PSRP model results, which was run for the period from 2003 to 2013 for conditions *Without* the project (approximating current conditions) and *With* the project (future conditions). The model output for both conditions included daily average flows at several culverts and bridges under Highway 41 (Tamiami Trail). The daily average flows for sites BR36, New Out, and BR37 (Figure 1) were summarized into mean monthly flows. The available Total Phosphorus (TP) and Total Nitrogen (TN) data collected by the SFWMD and Collier County at each site (BR36, BR37) were statistically analyzed to provide a single monthly nutrient concentration value, which was then applied to the monthly mean flows to calculate nutrient loads and flow-weighted mean (FWM) concentrations for the *Without* conditions. The *With* project additional flow nutrient concentrations were similarly aggregated into monthly data and water quality data from the SFWMD FAKA site (which currently receives discharges from the PSRP) was used to simulate expected changes in concentrations for BR37 and New Out.

Results

Modeled flow results showed an increase of over two times the current flow being delivered by the project (Table 1 and Figure 2). It is expected that this increase in restored flow will limit discharges from the agricultural area (west of the PSRP Protection Levee) through the Tomato Road culvert to the project area. In addition, the water quality expected to be delivered by additional project flows as simulated by the FAKA site nutrient levels, has much lower nutrient concentrations than those measured at BR36 and BR37. These two outcomes result in reduced nutrient concentrations of both TN and TP for the waters being discharged across the three structures evaluated (Table 1 and Figure 2). More specifically, expected long-term average TP concentrations were reduced by 84% (from 0.320mg/L to 0.051mg/L), and the average annual load decreased by 65% (from 756kg to 262kg). For TN, the long-term average concentration decreased by 52% (from 1.34mg/L to 0.64mg/L), but due to the increased flow there is a slight 4% increase of the average annual load (from 3,164kg to 3,287kg).

Additionally, in consideration of the estuaries that will receive the PSRP waters, the downstream and adjacent Numeric Nutrient Regions (Blackwater River, Rookery Bay/Marco Island, and Gulf Islands) were evaluated for water quality compliance in the most recent ten water years (2009 - 2019) using data collected by the SFWMD. The annual geometric mean (AGM) for TN, TP, and Chlorophyll *a* for this period was compared to the estuarine specific criteria for each region listed in F.A.C. 62-302.532. Further, two

stations positioned at the mouth of the tidal tributaries receiving project waters (through Blackwater Creek and Mud Bay/Palm Bay) were evaluated for TN and TP. All three regions have been exceeding the TN criterion, but are meeting the TP and Chlorophyll *a* criterion. The two stations in the tidal tributaries showed that both TP and TN are above the criteria for most years.

Conclusion

Based on the nutrient concentration reductions for the *With* project model results, it is expected the discharges to Collier-Seminole State Park will be of improved water quality for both TP and TN. It is also expected that TP concentrations in the tidal tributaries and within the Ten Thousand Islands nutrient region will improve overall, while TN concentrations will likely improve or remain approximately at current levels. Therefore, water quality degradation is not expected with the increased discharges to the areas downstream of the PSRP project associated with the construction of the Western PSRP Protection Levee.

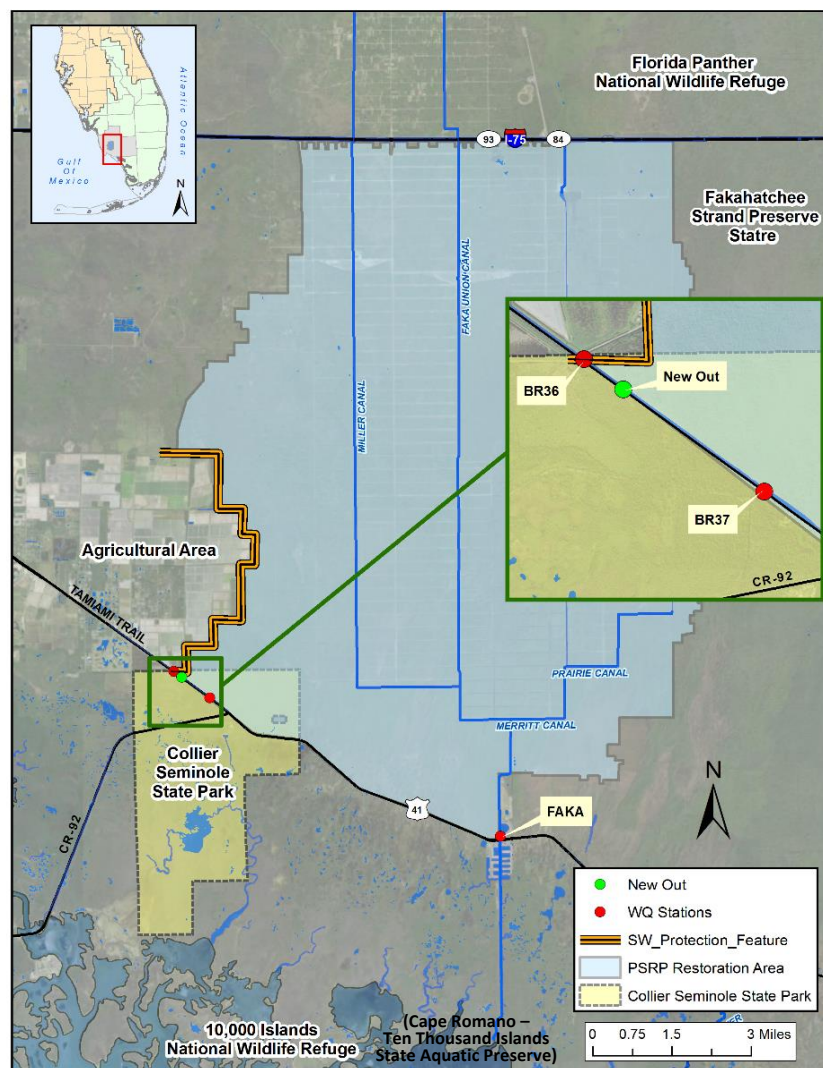


Figure 1. Map showing PSRP, flow and water quality monitoring locations, and State of Florida OFWs.

Table 1. Summary of flow, nutrient loads, and flow-weighted means (FWM) for *Without* and *With* project model period (November 2003 to October 2013) averages.

<i>Without</i> Project (Period Average)				<i>With</i> Project (Period Average)				<i>With</i> Project Percent Change		
Locations	BR36	BR37	Total	BR36	BR37	New Outlet	Total	BR36	BR37	Total
Flow (ac-ft)	494	1,423	1,917	395	2,572	1,227	4,194	-20%	81%	119%
Total Phosphorus										
FWM (mg/L)	0.382	0.298	0.320	0.403	0.014	0.014	0.051	6%	-95%	-84%
Load (kg)	233	523	756	196	45	21	262	-16%	-91%	-65%
Total Nitrogen										
FWM (mg/L)	1.77	1.19	1.34	1.80	0.52	0.51	0.64	2%	-56%	-53%
Load (kg)	1,079	2,085	3,164	877	1,645	765	3,287	-19%	-21%	4%

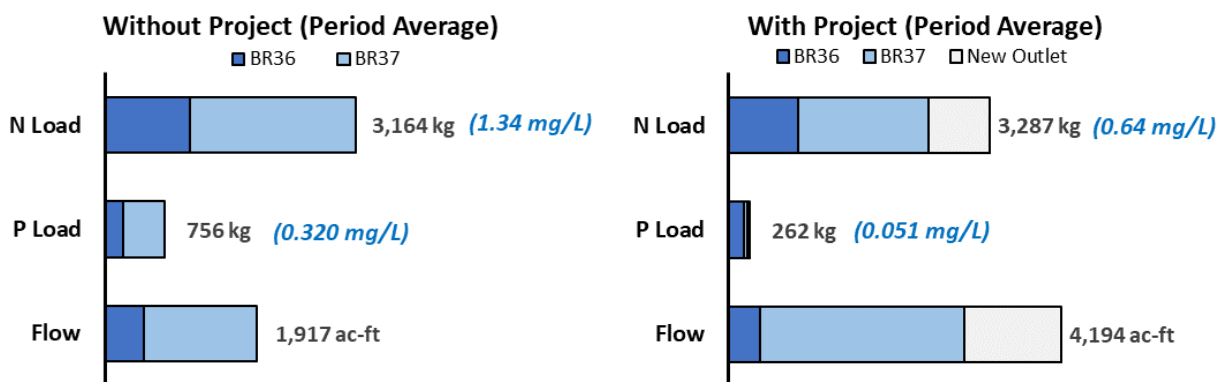


Figure 2. Comparison of nutrient (N and P) loads (kg), flow (ac-ft), and flow-weighted mean (FWM) concentrations (mg/L) in parenthesis for the model period (November 2003 to October 2013) showing the *Without* Project and *With* Project results.