



Restoration Coordination and Verification (RECOVER)  
Evaluation Team, Performance Measure Consistency Review Report  
**TRANSMITTAL LETTER**

July 3, 2007

re: Biscayne Bay Coastal Wetlands Project, Comprehensive Everglades Restoration Plan

Dear Project Team Managers and Planning Team,

RECOVER has completed the performance measure consistency review of the project level performance measures associated with Biscayne Bay Coastal Wetlands Project. Our final report is attached. RECOVER's evaluation of project goals, objectives, and performance measures fulfills the following requirements as prescribed by the Programmatic Regulations:

1. Ensure project is consistent with the CERP's goals and objectives;
2. Document consistency of the project performance measures with RECOVER's system-wide performance measures;
3. Suggest improvements to the project performance measures with the intent of improving target or evaluation methods to better evaluate project alternative plans that, if pursued, would contribute to selecting a tentative plan with the best performance by the project in achieving ecosystem restoration goals.

During RECOVER performance measures consistency reviews, RECOVER focuses on the following general questions:

- Are project-level goals and objectives consistent with CERP's system-wide goals and objectives?
- Are project-level performance measures consistent with RECOVER's system-wide performance measures?
- Are RECOVER system-wide performance measures included in the performance measure hierarchy? If not, are the reasons for excluding them documented?

RECOVER finds the project level goals and objectives to be generally consistent with the CERP goals and objectives. We have made some suggestions regarding the use, content, and targets for several of the performance measures that you may wish to include. Comments and suggestions can be found in the Final Report and Attachment A.

Best regards,  
Evaluation Team Chair  
(Steve Traxler)

*Biscayne Bay Coastal Wetlands (BBCW) Project*  
**RECOVER EVALUATION OF PROJECT-LEVEL PERFORMANCE**  
*MEASURES (Final 070307)*

Prepared by the Evaluation Team (ET)

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## **1.0 Introduction**

The role of the Restoration Coordination and Verification (RECOVER) team is to organize and apply scientific and technical information in ways that are most effective in supporting the objectives of the Comprehensive Everglades Restoration Plan (CERP). RECOVER links science and the tools of science to a set of system-wide planning, evaluation and assessment tasks. These links provide RECOVER with the scientific basis for meeting its overall objectives of evaluating and assessing Comprehensive Plan performance and refining and improving the plan during the implementation period. RECOVER fulfills this role by working with the project delivery teams (PDTs) to help them meet CERP's system-wide goals and objectives. Specifically, RECOVER reviews the performance measures (PMs) for project-level evaluation of alternatives for consistency with the system-wide evaluation performance measures developed by RECOVER.

The purpose of this PMs consistency review is: 1) to confirm that the project's goals and objectives are consistent with RECOVER system-wide goals and objectives; 2) to identify general compatibility of project-level PMs with applicable system-wide PMs; and 3) to provide information to project managers and others, as appropriate, regarding compatibility of project-level and system-wide PMs of the BBCW as submitted to RECOVER in June 2007. RECOVER recognizes and appreciates the time and effort that went into developing these PMs. The review comments below are intended to enhance the existing set of PMs. Comments on the specific project-level PM are presented in the attached table (Attachment A).

RECOVER previously reviewed the PMs for this project in June 2004. Due to modeling difficulties in the BBCW PDT, the PMs have changed from that review towards measures that are more focused on the review of measurable project components and GIS data that can be used to evaluate the differences between project alternatives through a scoring scheme. RECOVER began to review some of the concepts towards these PMs when they were requested to do a system-wide evaluation of the alternative plans being considered by the project team in April 2006.

The BBCW Project is part of the CERP as authorized by the Water Resources Development Act (WRDA) 2000 (U.S. Congress 2000). The goal of the BBCW Project is to restore or enhance freshwater wetlands, tidal wetlands, and nearshore bay habitat. The objectives of this project, as identified in the BBCW Feasibility Scoping Meeting Document (USACE and SFWMD 2004) are as follows:

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- Reestablish productive nursery habitat along the shoreline.
- Redistribute freshwater flow to minimize point source discharges to improve freshwater and estuarine habitat.
- Restore and improve quantity, quality, timing, and distribution of fresh water to the bay, including Biscayne National Park.
- Preserve and restore the spatial extent of natural coastal glades habitat.
- Reestablish connectivity between Biscayne coastal wetlands, C-111 Basin, Model Lands, and adjacent basins.

The following is an additional objective that was added to underline the importance of restoring the nearshore area.

- Restore nearshore salinity regimes.

The planning objectives developed for the BBCW Project are consistent with the objectives of the Comprehensive Plan (USACE and SFWMD 1999). The planning goal of this project is to restore or enhance freshwater wetlands, tidal wetlands, and nearshore bay habitat. It will primarily contribute to CERP environmental benefits to Biscayne Bay by improving the quantity, quality, timing and distribution of freshwater deliveries to the bay. The planning objectives for this project were developed using both the broad CERP goals and objectives and the more defined regional and site-specific restoration objectives. The six objectives developed for the BBCW Project presented below (Table 1) directly correspond to specific CERP objective(s) contained in the Central and Southern Florida Project Comprehensive Review Study Final Integrated Feasibility Report and Programmatic Environmental Impact Statement (USACE and SFWMD 1999).

**Table 1. Project and CERP objectives**

<b>Project Objective</b>	<b>Corresponding CERP Objective(s)</b>
Reestablish productive nursery habitat along the shoreline.	Improve habitat and functional quality. Improve native plant and animal species abundance and diversity.
Redistribute freshwater flow to minimize point source discharges to improve freshwater and estuarine habitat.	Improve habitat and functional quality. Improve native plant and animal species abundance and diversity.
Restore and improve quantity, quality, timing, and distribution of fresh water to the bay, including Biscayne National Park.	Improve habitat and functional quality. Improve native plant and animal species abundance and diversity.
Preserve and restore the spatial extent of natural coastal glades habitat.	Increase spatial extent.
Reestablish connectivity between Biscayne coastal wetlands, C-111 Basin, Model Lands, and adjacent basins.	Increase availability of fresh water. Improve habitat and functional quality. Increase spatial extent.
Restore nearshore salinity regimes.	Improve habitat and functional quality. Improve native plant and animal species abundance and diversity.

The project performance measures are described and reviewed in Appendix A.

## **2.0 General Comments**

The project performance measures presented to RECOVER June 2007 have replaced the performance measures evaluated by RECOVER in 2004. The BBCW PDT has changed their PMs due to significant delays in the completion of the project models. The hydrologic model was providing unrealistic output in many of the project areas. For example incorrect groundwater flows and the lack of water in the C-103 basin made the model difficult to accept. In addition, because the WASH hydrologic model was the western input for the TABS model, the team believed that TABS output was not realistic. Because of this modeling deficiency, the BBCW PDT has had to quickly develop additional PMs heavily relying on existing GIS data.

The only PM that relates to a RECOVER system-wide performance measure (Salinity performance measure for South Biscayne Bay) is VI.D (Ability to Establish Ecologically Desirable Salinity Ranges) which evaluates the ability of the project to develop a mesohaline zone in the nearshore area of the project within the dry season. Some of the PMs use project features and the extent of those features to evaluate the potential performance of the project alternatives in the freshwater and saltwater areas of the project. Whenever possible, project performance terms such as “maximize” should be replaced by numeric targets and then tied to ecological indicators. The following is a discussion of how these features may affect the overall performance of the project in meeting project and systemwide goals.

### **Spreader Canals**

The spreader canals are key features of the restoration provided by this project. The proposed spreader canals distribute water across flow paths, providing significant areas of inundation, which translates into restored or enhanced wetlands. The current alternatives provide flexibility and demonstrate a range of benefits by using spreader canals. The differences in spreader canal length amongst the alternatives provide variation in the flow path. There are, of course, potential water quality benefits associated with the spreader canals and the rehydration of natural areas. The length of spreader canals directly inputs into project PMs I.A and VI.C.

### **Rehydrating Natural Areas**

Increased spatial extent of natural areas by rehydrating inland marshes and estuarine habitats not only directly benefits biota by restoring previously degraded habitats, but also provides important water quality benefits. The ability to maintain more natural timing and distribution of water in the coastal wetlands allows periphyton and other native vegetation to flourish. Rehydration of the natural areas provides additional phosphorus uptake capacity beyond that of the proposed STAs. The hydration of wetlands is directly used in project performance measure II.C; however, it is also considered in II.A.

### **STAs and Reservoirs**

The current project alternatives provide for very little variation in STA design and operations that can maximize benefits for water quality or potential for restored or enhanced natural areas. STAs can be extremely efficient if designed and operated to promote emergent and submergent vegetation, as well as particulate settling. STAs and reservoirs are directly considered in project PM III.A. Considering the importance of STAs and reservoirs in the overall performance of the project, it is unfortunate that most of the project alternatives contain no reservoirs and greatly reduced STAs from the Yellow Book plan (approximately 6% of the area considered in the Yellow Book).

### **Spatial Extent and Habitat Connectivity**

Spatial extent is one of the defining characteristics of the Everglades ecosystem. Worldwide losses of wetlands to agriculture and other development have left behind poor water quality, loss of wetland species, loss of recreational and commercial opportunities, increased salinities, and lowered productivity in downstream estuaries and bays. In the Everglades ecosystem, half of the spatial extent of wetlands was lost by the time the USACE and the SFWMD began to take a second look at the C&SF Project impacts. In addition to a large spatial extent, the connectedness of Everglades wetlands is critical to the ability of the comparatively nutrient-poor system to support the tremendous abundance of biota it was naturally capable of supporting. Smaller, more isolated wetlands of various types, including short-hydroperiod wetlands, provide critical support for the Everglades from the sidelines by providing additional habitat for many Everglades species, particularly birds. Additionally, these habitats have been disproportionately impacted by development compared to remaining habitat types, ultimately degrading needed buffer zones.

During the Restudy, increasing the spatial extent and connectivity of wetlands was described as a “precursor” to restoring the Everglades ecosystem (USACE and SFWMD 1999). Wetland restoration adjacent to all projects was expected to increase the overall acreage of wetlands throughout the system. This would not only increase the amount of habitat available to wetland species, but provide free water storage and improve water quality. The Biscayne Bay coastal wetlands in particular are important for reconnecting overland flow with the marine ecosystem. If all the planned water is delivered to the area, a series of stable potentially year-long freshwater habitats will be created to provide nursery grounds for estuarine fish. The establishment of these stable freshwater environments is consistent with the CERP goal of increasing the spatial extent of natural habitat, increasing the connectivity, and improving species abundance and diversity. Many of the project PMs directly and indirectly address spatial extent and connectivity of the wetlands within the project area including project PMs II.A, II.B.1, II.B.2, II.B.3, IV.C, V.A, and V.B.

### **3.0 Consistency with RECOVER System-Wide Evaluation Performance Measures**

As indicated above, only one project PM relates to the salinity performance measure for South Biscayne Bay that RECOVER uses for systemwide evaluations. Project

performance measure VI.D (Ability to Establish Ecologically Desirable Salinity Ranges) evaluates the ability of the project to develop a mesohaline zone in the nearshore area of the project within the dry season using the project model, TABS-MDS, output. Current model output indicates that the existing condition achieves approximately 31% of the project target and the best project alternative only achieves 40% of the project target. The rest of the PMs are used to evaluate project features would not produce data comparable to the one BBCW CERP system-level PM that relates to ecological performance. The original set of BBCW PMs reviewed in 2004 where all consistent with the CERP BBCW System PM, but once again, due to modeling difficulties these PMs were never realized.

**Uncertainty and CERP Influences** – The current suite of project PMs have not been developed to compare the selected project alternative against the one BBCW system-level target. Several of the targets are normalized to the maximum, in particular targets pertaining to STAs and spreader canals and the Yellow Book alternative provides the maximum value, as opposed to targets based on system-level ecological restoration performance. This is due to not having good models to help set BBCW restoration targets.

**Consistency Among Projects and RECOVER** – Due to modeling difficulties, the current suite of project PMs are not similar to other project performance measures potentially used in the Florida Bay / Florida Keys Feasibility Study (FBFKFS) and C-111 Spreader Canal. FBFKFS and C-111 Spreader Canal PMs are based on ecological restoration targets derived from system-level PMs instead of project feature PMs. C-111 SC is having similar issues making their PMs work and FBFKFS will also likely experience the same issues due to the complexity and linkage issues of their models.

#### **4.0 Conclusions**

In general, the project PMs proposed for the BBCW project do evaluate project performance. They are designed, however, to evaluate the differences between project alternatives. The project PMs have been used in combination to create a Criterion Based Evaluation Method (C-BEEM) to evaluate the differences between the proposed project alternatives. The C-BEEM is effective in identifying differences between the project alternatives based upon the selected features. It is questionable whether the C-BEEM could be used to understand the performance of a single project over time, which is also the purpose of project PMs. RECOVER suggests that additional adaptive management PMs are developed for the BBCW area. With the current plan for all project and system level adaptive management monitoring being included in the MAP, then MAP BBCW monitoring will be the only active group to develop or finalize the project PMs or any additional PMs. These PMs will be critical for future project changes if adaptive management is to be successful.

#### **5.0 References**

USACE and SFWMD. 1999. Central and Southern Florida Project Comprehensive Review Study Final Integrated Feasibility Report and Programmatic Environmental Impact Statement. U.S. Army Corps of Engineers, Jacksonville District,

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Jacksonville, FL, and South Florida Water Management District, West Palm Beach, FL.

USACE and SFWMD. 2004. BBCW Project Feasibility Scoping Meeting Document. U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL, and South Florida Water Management District, West Palm Beach, FL.

U.S. Congress. 2000. Water Resources Development Act 2000. Public Law 106-541, 106<sup>th</sup> U.S. Congress, Washington, D.C.

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The following is a description of each of the performance measures being considered based upon how each performance measure and evaluation metric relates to the project objective, above, (i.e., how the metrics benefit habitat) and how the metrics are being proposed to be scored for evaluation of the project alternatives. The project is divided into four regions (or sub-regions depending on the document):

- Region 1 – Deering Estate;
- Region 2 – Cutler Wetlands and Black Point Wetlands;
- Region 3 – L031E Wetlands between C-1 and Florida City Canal; and
- Region 4 – the Model Lands.

<b>CERP Goal:</b> Enhance Ecologic Values
<b>Project Objective/Constraint:</b> I. Reestablish productive shoreline nursery habitat
<b>I.A. Linear extent of coastal spreaders (1 evaluation metric).</b>
<b>Target:</b> Maximum % of straight-line distance of the shoreline in each region (10.83 miles).
<b>Evaluation Method:</b> This performance measure relies upon the assumption that the ability to restore nearshore habitat to an appropriate salinity regime is a function of the capability to redistribute water along as much of the shoreline as possible (i.e., the longer the coastal spreaders, the more nearshore habitat will be restored). The target is the straight-line distance of the shoreline in each region. Spreader lengths and targets are measured using GIS tools and available maps. The metric is evaluated by dividing the length of the spreader in each region by the target. No additional credit is given to alternatives with spreaders longer than the target. This metric does not apply to Region 3 because no alternatives have spreaders in this region.
<b>Is this PM consistent with RECOVER PMs?</b> There is no corresponding RECOVER system-wide PM for comparison. However, the project PM would help measure the project plan alternative’s capability in reestablishing productive shoreline nursery habitat. This PM does have several constraints to how fully it measures the objective: <ul style="list-style-type: none"> <li>• It would not measure the capacity to redistribute water, which is a function of flow through the spreader canal and the number of diffuse points (weirs).</li> </ul> Also, please note that the AFB document in its current draft gives additional credit to spreader canals longer than the shoreline target for Region 2.

<b>CERP Goal:</b> Enhance Ecologic Values
<b>Project Objective/Constraint:</b> II. Redistribute freshwater flow to improve habitat.
<b>IIA. Performance measure: Reduce direct canal discharge (1 evaluation metric).</b>
<b>Target:</b> Average % water diverted into wetlands from canals in Regions 1, 2, and 3. The evaluation score is the percent of the water diverted from canals—the higher the percentage the better the score.
<b>Evaluation Method:</b> This performance measure is based on the premise that diverting water from canals into the wetlands results in the following ecological benefits: (1) reduction in harmful point source discharges to the nearshore areas, (2) rehydration of the wetlands (i.e., restoration of desired wetland hydropatterns) into which the water is diverted, and (3) improvement to the salinity regime in the nearshore and saltwater wetland areas by providing a more natural distribution to these areas. The volume of water diverted was calculated using empirical data from the District’s database to determine volumes available in canals (i.e., DBHydro observed flows through canal water control structures), and estimating the volume of the available water diverted as a function of the pump size and operating schedules specified in the alternatives. The evaluation score is the percent of the water diverted from canals—the higher the percentage the better the score.

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**Is this PM consistent with RECOVER PMs?**

There is no corresponding RECOVER system-wide PM for comparison. This project-level performance measure would provide a method to evaluate plan performance capability and capacity to redistribute freshwater flow to improve habitat conditions (nearshore submerged aquatic vegetation, mangrove, and water column, and freshwater wetlands). The PM documentation (doc) sheet should also note the percentage is averaged for all three regions and that the target is 100% diversion

**II.B. Performance Measure: Flexibility to move water (1 evaluation metrics).**

**Target** The ability to move water between basins is advantageous because excess water may be available in one basin that could be used improve ecological conditions (*i.e.*, the benefit) in another basin where water may be lacking. The flexibility to move water in the project area is assumed to be a function of the capability to transfer water between project sub-regions, which is the metric for this performance measure.

**Evaluation Method:** This metric is evaluated by qualitatively scoring, using best professional judgment, the transfer capability of an alternative based on its features (e.g., canals, pumps, etc.). Scoring is on a scale of 0 to 3 for each region (0 = no transfer capability, 1 = little transfer capability, 2 = moderate transfer capability, 3 = high transfer capability) for Regions 1 and 2. Region 3 scoring is limited to 0 to 1 because there are limited features or intent to move water from Region 3 to other regions. Alternatives that can pump water between regions through a dedicated feature (*i.e.*, canal or pipe) receive the maximum score of 3. Alternatives Q and O receive a score of 1 in Region 3 because of their possible capability to connect to the C-111 Spreader Canal Project.

**Is this PM consistent with RECOVER PMs?**

There is no corresponding RECOVER system-wide PM for comparison. The project PM doc sheet needs to explain how this measure applies to project/system-level benefits. The following recommended language would help convey this point: “This PM measures the project’s robustness to adapt to various environmental conditions and its ability to move varying quantities of water and to control the timing of distribution in order to reach desired nearshore salinity ranges.” The doc sheet should also refer to how the target of 7 was reached. This would best be explained by identifying the target for each separate evaluation metric, e.g., inter-region transfer capability 7 (region 1 = 3 + region 2 = 3, + region 3 = 1).

**CERP Goal:** Enhance Ecologic Values

**Project Objective/Constraint:** Restore and Improve Quality and Timing of Freshwater to the Bay

**II.C. Performance Measure — Hydrate freshwater wetlands (1 evaluation metric).**

**Target:** The target is the maximum straight-line distance spanning the freshwater wetlands in each region (13 miles).

**Evaluation Method:**

Metric 1: This metric is similar to I.A.1. This metric is similar to I.A. The performance measure relies upon the assumption that the ability to restore freshwater wetlands (*i.e.*, the benefit) is based at least partly on the capability to redistribute water into as much of the freshwater wetland habitat as possible (*i.e.*, the longer the freshwater spreaders, the more freshwater wetland habitat can be restored if there is sufficient water available). The target is the straight-line distance spanning the freshwater wetlands in each region. For Region 2 the target is the straight-line north-south distance between C-102 and Florida City Canal. For Region 3 the target is the linear extent of the Florida City Canal from the L-

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31 East Canal west to its intersection with Card Sound Road (7.25 miles). Only Alternatives O and Q have freshwater spreaders in Region 3. Spreader lengths and targets are measured using GIS and available maps. The length of the spreaders for each alternative is divided by the target to obtain the percent target achieved. No additional credit is given to alternatives with spreaders longer than the target. This metric does not apply to Region 1 because the major spreader features are coastal spreaders. The only freshwater spreader is the very short spreader (40 feet in length) affiliated with the Deering Estate and all alternatives address this component identically.

Metric 2: Evaluation metric – Potential freshwater wetland attenuation. This measure assumes that the ability to attenuate flows to the bay is a function of the spatial extent of the wetlands available in which to store water—the larger the wetlands, the more water can be stored and the greater the attenuation of flows to the bay. Attenuating flows to the bay improves the timing and distribution of freshwater entering the nearshore area, which results in improving the salinity regime. Each alternative is scored using GIS to determine the area of freshwater wetlands that is expected to be affected by the alternative based on best professional judgment. All alternatives have the same scores for Region 1. In Region 2, it is assumed that the freshwater spreaders associated with Alternatives O and M will affect the freshwater wetlands to the west of the spreaders a distance of 1500 feet from the spreaders. This does not apply to Alternative Q due to the levee associated with its spreader. The area of freshwater wetlands affected by each alternative in the Model Lands is shown on maps depicting alternative features (shown in green shading).

**Is this PM consistent with RECOVER PMs?**

There is no corresponding RECOVER system-wide PM for comparison. This metric captures the capability of the project having enough spreader canals to spread water to freshwater wetlands, and the amount of wetlands available to attenuate flow to the bay. However, it doesn't capture the actual capability to improve quality and timing of freshwater to the Bay. If model information is made available, this performance measure should be revised to better address how much water by month or season needs to be sent to the wetlands to hydrate them? Project monitoring of water amount and timing to the wetlands would then indicate whether the project is performing within the context of restoration benefits.

**CERP Goal:** Enhance Ecologic Values

**Project Objective/Constraint:** III. Restore and improve quantity, quality, timing, and distribution of freshwater to the Bay, including Biscayne National Park.

**III.A. Performance Measure – Reduce nutrient concentration (2 evaluation metrics)**

**Target:** Water quality is evaluated based on the spatial extent of STAs and wetlands, and on the volume of water diverted into those features.

**Evaluation Method:**

1. Evaluation Metric – Reduce nitrogen concentrations. This metric is scored by assigning an estimated removal rate for each flow path and then calculating the flow-weighted total nitrogen concentration for all surface water discharges. Water volumes diverted are the same as those used in II.A.1. Water volumes diverted are the same as those used in II.A.1. Note that there is a slight reduction in nitrogen in the Future Without Project alternative that is due to the anticipated land use transition from agriculture (which is a significant source of nitrate) to urban in the future.
2. Evaluation Metric – Reduce phosphorus concentrations. Reduction in phosphorus is calculated in a similar manner as performed for nitrogen.

**Is this PM consistent with RECOVER PMs?**

RECOVER PMs focus on water quality from an assessment PM perspective of maximum algal bloom and

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light attenuation. This metric focuses more on reduction of nutrient loads, which are often precursors to algal blooms. However, this metric does not clearly articulate how the target values of 0.05 mg/l and 0.005 µg/l relates to reduced nitrogen and phosphorus concentration, respectively. This measure in its current form does not help measure project performance with respect to restoration success in water quality.

**IV. Project Objective/Constraint:** Preserve and Restore Coastal Glades Habitat

**IV.A. Performance Measures – Reduction in Exotic Vegetation (1 evaluation metric).**

**Target:** The total number of acres of non-native vegetation in the USFWS vegetation map.

**Evaluation Method:** Eliminating non-native vegetation within the project footprint improves coastal glade habitat under the assumption that the non-natives removed will be replaced with native vegetation. The metric also relies upon the assumption that all non-native vegetation within the footprint of a given alternative will be controlled. Using the vegetation map created by the U.S. Fish and Wildlife Service in 2005 (Service 2005), the total area of non-native vegetation lying within the footprint of each alternative was determined. This map uses the preliminary project boundary specified in the Restudy, with the exception that it does not cover the area of the Model Lands south of SW360th Street—the majority of the Model Lands. Acres of non-native vegetation were normalized against the target. Note that any vegetation class that included non-natives as part of the mix (e.g., white mangrove/Brazilian pepper mix) was included as non-native vegetation coverage.

**Is this PM consistent with RECOVER PMs?**

There is no corresponding RECOVER system-wide PM for comparison.

**IV.C. Performance Measure – Spatial Extent of Existing Public Wetlands Restored (1 evaluation metric)**

**Target:** Acres of public wetlands restored west of L-31E in Region 2.

**Evaluation Method:** Performance Measure – Spatial Extent of Existing Public Wetlands Restored (1 evaluation metric). This metric assumes that the alternatives that restore lands already in public ownership should be credited above those that do not. Because all alternatives result in a certain level of restoration in the saltwater wetlands of Regions 1 and 2 (i.e., the Cutler and Black Creek wetlands, and the areas east of L-31E in Region 2), public lands in these areas are not considered. Also, because it is unclear how alternatives will restore Region 3, public parcels in this area are also not considered. Thus, only the lands west of L-31E in Region 2 are included in this analysis.

**Is this PM consistent with RECOVER PMs?**

There is no corresponding RECOVER system-wide PM for comparison.

**V. Project Objective/Constraint:** Reestablish Water Basin and Wetland Connectivity

**V.A. Performance Measure – Length of Obstructions Removed (1 evaluation metric).**

**Target:** Length of physical obstructions to wetland and basin connectivity removed.

**Evaluation Method:** This metric relies upon the assumption that removal of physical obstructions to surface flow, like roads and levees, will increase wetland connectivity within and between basins. Increasing wetland

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connectivity results in the following benefits: (1) establishing a more natural gradient in salinity across the wetlands, (2) restoring sheet flow across a broad front, and (3) providing broad corridors for wildlife movement between basins and wetlands. Reestablishing wetland and basin connectivity should result in a more natural water flow that will support more productive freshwater and estuarine systems than what is observed today. The analysis was limited to major features identified for removal, backfilling, or culverting in descriptions of alternatives. The target is based on features envisioned for removal by the Restudy and any project alternative, and include: Military Canal, North Canal, North Canal Drive, Palm Drive, Florida City Canal, Card Sound Road Canal, Tallahassee Road, SW 360<sup>th</sup> Street, and L-31E (from C-1 to Palm Drive and the Model Lands dogleg). Feature removal or filling receives the total score of feature length; features made hydrologically transparent by culverting receive scores of half the feature length. Analysis was conducted using GIS and project alternative descriptions.

**Is this PM consistent with RECOVER PMs?**

There is no corresponding RECOVER system-wide PM for comparison. This metric measures each plan alternative's total length of physical obstructions removed to reestablish water basin and wetland connectivity. This action will help ensure water can flow across the wetlands in the basin into the nearshore and improve habitat quantity and quality.

**V.B. Performance Measure –Increase Connection between Fresh and Salt Water Wetlands (1 evaluation metric).**

Target: Length of L-31E canal and levee removed or culverted.

**Evaluation Method:** This metric relies upon the assumption that removal of L-31E will increase the connectivity between salt and freshwater wetlands in all three regions. The benefits of this metric are the same as for V(A) above. The target does not include the segment of L-31E between the Florida City Canal and the eastern end of the L-31E dogleg in the Model Lands. Alternatives that remove the canal and levee are given full credit for length of L-31E removed; alternatives that include culverts in L-31E receive credit for half the length of the levee that is culverted. All alternatives, including the Future Without condition, are given half credit for the 2.5 miles of the L-31E section in the Model Lands that will be culverted as part of the Florida Power and Light's Everglades Mitigation Bank Phase II project. All alternatives, including Existing Condition, are credited with 0.01 miles of L-31E culverted by the SFWMD L-31E Pilot Project. Analysis was conducted using GIS and project alternative descriptions.

**Is this PM consistent with RECOVER PMs?**

There is no corresponding RECOVER system-wide PM for comparison. This PM should indicate that it is similar to V.A., but gives greater weight to the area affected by the L-31E canal removal because of its high importance.

**VI. Project Objective/Constraint: Restore Nearshore Salinity Regimes**

**VIA Performance Measure – Nearshore habitat restored as a function of the average daily volume of water (1 evaluation metric).**

**Target:** The salinity target equals 20 ppt in the nearshore area defined as the area between the shoreline out to 500m. The reported value is the acres of tidal wetlands that achieved a salinity target of less than 20 ppt; the metric is the percentage of the area that achieves the target.

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**Evaluation Method:** This metric relies upon the assumption that the more water that is or can be diverted from the major conveyance canals the more nearshore habitat will be restored. The metric uses Scenario 10 of the TABS Preliminary Scenario Runs (PSR) to predict the target flows needed to meet salinity targets for each of four geographic zones in the nearshore habitat of the study area. The daily flow required to meet the salinity target in each of four nearshore zones is shown in the table below:

<b>Nearshore Zone:</b>	<b>Average Daily Flow to Meet Salinity Target (ac-ft/day)</b>
Deering Estates	340
North Cutler	540
C-1 to Military Canal (includes South Cutler)	315
Military Canal to FI City Canal	210
<b>TOTAL</b>	<b>1405</b>

The volume of daily flows diverted into each of the four zones by each alternative is then calculated based on water available at the coastal water control structures of the major conveyance canals in the project area (S123, S21, S21A, and S20F), and pump sizes and operations defined by each alternative. The average daily diverted volume is then divided by the target volume to obtain a percent of the predicted target for each zone and alternative. These percentages are then multiplied by the total acres within each zone (calculated from the shoreline out to 500 m) to obtain habitat units. The final statistic is the average daily acreage of restored habitat in each of the four zones.

The delineation of the four geographic zones used in this metric is as follows: (1) Deering Estate to C-100, (2) C-100 to C-1, (3) C-1 to Military Canal, and (4) Military Canal to Convoy Point. Barnes Sound and Manatee Bay were not included in this analysis because the PSR run did not include this area. The period of record for the TABS run was August 1, 1997 to July 31, 1998.

Since neither Existing Condition (EC) and Future Without (FWO) scenarios include water diversion, the PSR model runs could not be used to estimate the acreage meeting the nearshore salinity criteria. In this case actual salinity records were used to estimate EC nearshore salinity habitat acreage. In the absence of a similar information to estimate FWO nearshore acreage, it was assumed that FWO acreage for this metric would be the same as for EC conditions. This is a reasonable assumption since, in total; the anticipated non-project related changes are thought to provide similar but somewhat less nearshore acreage than presently provided by the existing conditions. For the Existing Condition (EC) scenario, observed data were used from several sites to determine the percent of time during a 2-year period of record when salinity was 20 ppt or less. Observed data from salinity stations 64, 52, 30, and 16 were used to represent zones 1, 2, 3, and 4, respectively, for 2004. For Stations 64, 52, 30, and 16 the per cent of time salinity was 20 ppt or less was 8, 27, 42, and 30 percent, respectively. To obtain habitat units, these percentages were applied to the total acres in the respective zones. Note that 2004 was a dry year, which should be kept in mind when comparing to the TABS PSR run which simulated the average conditions period from August 1997 through July of 1998.

The Future-Without-Project Condition assumes flows increase by 50% in the C-100 basin and decrease by 50% in the C-103 basin from the Existing Condition calculations. Percentages used in the Existing Condition calculations were adjusted based on the above assumption.

**Is this PM consistent with RECOVER PMs?**

[This PM is comparable to the Southern Estuaries salinity PM. This PM provides a measure of the project](#)

**ATTACHMENT A – BBCW PROJECT PM CONSISTENCY REVIEW  
RECOVER COMMENTS – JULY 2007**

alternatives' potential contribution to system-level restoration of salinity in the nearshore ecological zone of Biscayne Bay.