

1.0 Performance Measure Title

WS-2 Frequency, Severity and Duration of Water Restrictions for the Lower East Coast Service Area

Last Date Revised: March 14, 2005

2.0 Justification

The expectation for water supply and flood protection is to help meet the second goal of the Restudy: enhance economic values and social well being; and two of its objectives: increase availability of fresh water (agricultural/municipal and industrial) and reduce flood damage (agricultural/urban) (USACE and SFWMD 1999). In addition, since these two purposes of the C&SF Project are integral to sustaining the human population, federal and state laws provide additional guidance on their expectations.

Both federal and state laws specifically address levels of service for flood protection and water supply for the CERP. Meeting these social and economic objectives and laws must be in the context of meeting the natural resource restoration goals and objectives. CERP goals and objectives include restoration, preservation and protection of the South Florida ecosystems while providing for other water related needs of the region. This overarching goal was further established in Florida law, which specifies that for water supply plans, "the level-of-certainty planning goal associated with identifying the water supply needs of existing and future reasonable-beneficial uses shall be based upon meeting those needs for a 1-in-10-year drought event." (Chapter 373.0361(2)(a)(1), Florida Statutes [F.S.]).

In the Lower East Coast Service Areas (LECSAs), water restrictions primarily affect water utility customers, landscape water users such as golf courses, and agricultural water users. Economic losses associated with water shortages depend not only on the number of water shortages, but also on the severity and duration of the water restrictions. The longer the restrictions are in place and the more severe the cutbacks the greater the effect on utility customers, landscapes and crops; the greater the financial impacts on utilities and businesses; and the greater the expenses that are required by users to comply with the water shortage restrictions.

3.0 Source of Performance Measure

Section 373.0361(2)(a)(1), F.S.

C&SF Project Restudy (USACE and SFWMD 1999)

4.0 Restoration Expectation

Decrease seepage losses and harmful releases of excess water for the natural system while providing at least a 1-in-10-year level of service for the Lake Okeechobee and Lower East Coast Service Areas through regional water deliveries and seepage from Lake Okeechobee, the Water Conservation Areas and Everglades National Park.

4.1 Predictive Metric and Target

Provide at least a 1-in-10 level of service as indicated three or less water years simulated with regionally significant water shortages in the 36-year evaluation period

4.2 Assessment Parameter and Target

The evaluation target is to minimize the severity and duration of any water restrictions over and above those that might be expected when drought levels exceed a 1-in-10 severity. The minimum duration for shortages is typically one month. The target for the frequency of water restrictions is that there will be three or fewer years in the simulation period with regionally significant water restrictions. Water restrictions are considered regionally significant only if they last three months or longer.

Experience in the Restudy (USACE and SFWMD 1999) indicates that as the number of water years with restrictions is reduced most years with only locally caused shortages drop out and those remaining have only a few months

during which water shortages are in effect. The years when there are water shortages due to supply-side conditions in Lake Okeechobee also are reduced, but the remaining years continue to have durations of about 7 months, primarily because they start early in the dry season. In total about 18 months with water restrictions remain when conditions indicative of meeting all demands in a 1-in-10 year drought have been achieved. The LECSA evaluation target for duration is that there be no more than 18 months with water shortages during the simulation period.

To minimize severity it is desired that the cutback volumes during the restriction period in any year would be unlikely to cause significant economic losses. The minimum severity for water shortages is the Phase I "Moderate" Water Shortage in which the overall reduction of use is up to 15%. Reductions of this magnitude coupled with the high willingness to pay for municipal and industrial water use indicate that even the Phase I restrictions are likely to cause significant economic losses. Experience in the Restudy also indicates that only Phase 1 restrictions can be expected when frequencies of water shortages approximate the 1-in-10 level of service. For these reasons the evaluation target for severity in the LECSAs is that all water shortages be Phase 1.

5.0 Evaluation Application

5.1 Evaluation Protocol

Frequency

The South Florida Water Management Model (SFWMM) is the evaluation tool. It will simulate a 36-year period, 1965 to 2000, and the implementation of the South Florida Water Management District's Lake Okeechobee Supply-Side Management Policy and Water Shortage Plan. The results are presented in the "Frequency of Water Restrictions" graphic, which is a table indicating the months (rows) within each year (column) when water shortages are simulated. Years are "water years", October to September, to correspond to the break between the wet and dry seasons. Shortages occur in the Lower East Coast Service Area either because Supply-Side Management Policy or the Water Shortage Policy has been implemented. This graphic tracks the implementation of both policies. Since some of these shortages are due to local conditions beyond the reach of the regional water system, water restrictions that last two months or less will not be considered a regionally significant water shortage.

Additional detail on where the water shortage plan has been triggered because groundwater stages have fallen below their criteria can be found on the "Frequency & Severity of Water Restriction Triggers" graphic. This graphic can also be utilized to evaluate the severity of cutbacks.

Separate evaluations are completed for each of the four Lower East Coast Service Areas: Northern Palm Beach County, Service Area 1, Service Area 2 and Service Area 3.

Duration

The South Florida Water Management Model (SFWMM) results are used in the evaluation. The SFWMM will simulate a 36-year period, 1965 to 2000, and the implementation of the South Florida Water Management District's (SFWMD's) Lake Okeechobee Supply-Side Management Policy and Water Shortage Plan. The results used to evaluate duration of water restrictions are presented in the "Frequency of Water Restrictions" graphic, which is a table indicating the months (rows) within each year (column) when water shortages are simulated. Years are "water years", October to September, to correspond to the break between the wet and dry seasons. There are four graphics, one for each of the LECSAs. Shortages occur in the LECSAs either because the Supply-Side Management Policy or the Water Shortage Policy has been implemented. This graphic tracks the implementation of both policies. It also tracks months when water shortages would be declared because once the SFWMD has placed an area under water restrictions and it is fairly late in the dry season, the water restrictions are continued till the start of the wet season. The metric for the duration of water shortages is taken from this graphic for each service area and is the sum of months of water shortages from all causes during the evaluation period. If the total number of months is less than or equal to the target of 18 the duration performance will be considered to be acceptable. If the total number of months with shortages exceeds the target of 18, then a measure of performance deficiency can be calculated as the total months of shortages less the target of 18.

Severity

Data on the severity of the LECSA restrictions are also provided in the "Frequency & Severity of Water Restrictions" graphic. The Phase of water shortage for each month is indicated by a phase number (1, 2, 3 or 4). The "L" and "D" designations correspond to a Phase 1. Because the impact of the water shortages will increase as the phase increases a severity score for each phase was developed as follows:

Water Shortage Phase	Percent Reduction in Overall Demand	Severity Score
Phase I - Moderate	Less than 15%	1
Phase II -	Less than 30%	2
Phase III -	Less than 45%	3
Phase IV -	Less than 60%	4

The final severity score is the sum of the severity scores for each month with water restrictions over the evaluation period.

Since the evaluation target for water shortage severity was to have all shortages at the Phase 1 level, the target score for severity is that it be less than or equal to 18, the same as the target score for duration. Thus, if the total severity score is less than or equal to the target of 18 the severity performance will be considered to be acceptable. If the total severity score exceeds the target of 18, then a measure of performance deficiency can be calculated as the total severity score less the target of 18.

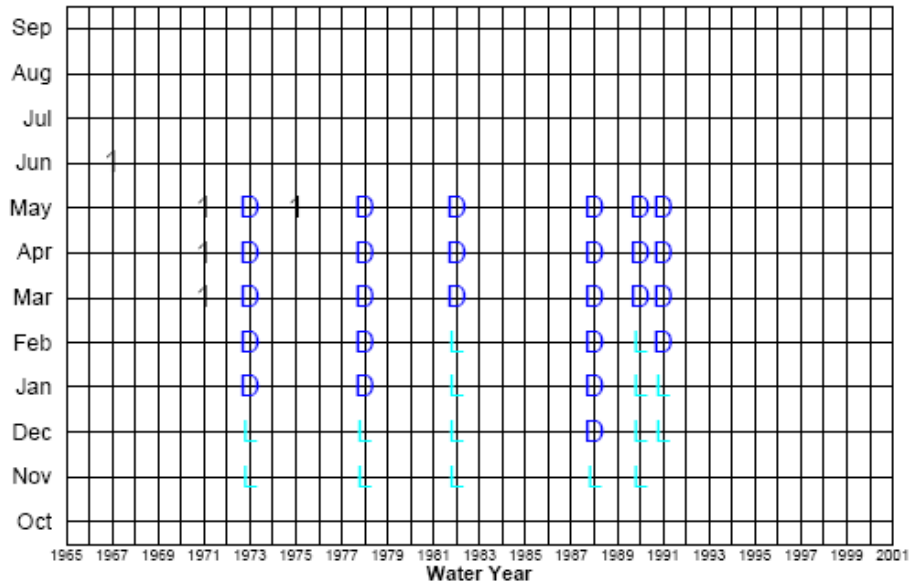
Separate evaluations are completed for each of the four Lower East Coast Service Areas: Northern Palm Beach County, Service Area 1, Service Area 2 and Service Area 3.

5.2 Normalized Performance Output

5.3 Model Output (example attached)

Frequency of Water Restrictions for the 1965 – 2000 Simulation Period

Service Area 1 – 2000B3



Total number of water years with 3 or more consecutive months with restrictions= 7
 Target number of water years with 3 or more consecutive months with restrictions= 3

Note: Water year 1981 starts Oct/1980 and ends Sep/1981

For Planning Purposes Only
 Run date: 06/07/05 11:43:33
 SFWMM V5.4.3
 Script used: freq_water_restr.scr, V1.11
 Filename: leo_sa_1_freq_restr.2000B3.fig

5.4 Uncertainty

6.0 Monitoring and Assessment Approach

See *CERP Monitoring and Assessment Plan: Part 1 Monitoring and Supporting Research - South Florida Hydrology Monitoring Network Module* section 3.5.3.5 (RECOVER 2004a)

7.0 Future Tool Development Needed to Support Performance Measure

7.1 Evaluation Tools Needed

7.2 Assessment Tools Needed

8.0 Notes

9.0 Working Group Members	
Linda McCarthy, FDACS Brenda Mills, SFWMD Carl Woehlcke, SFWMD	
10.0 Acceptance Status	
WS Working Group	March 14, 2005
ET	
AT	
Public Review	
Final Acceptance Date	
11.0 References	
<p>Apogee Research. 1990 and 1991. Water Shortage Economic Impact Model. Apogee Research are Planning and Management Consultants at the Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida. Report in three phases, see especially Phase I report Section III, "Agricultural Uses Economic Impact Model" and Section IV, "Urban Uses Economic Impact Model".</p> <p>RECOVER. 2004a. CERP Monitoring and Assessment Plan: Part 1 Monitoring and Supporting Research. Restoration Coordination and Verification Program, c/o United States Army Corps of Engineers, Jacksonville District, Jacksonville, Florida, and South Florida Water Management District, West Palm Beach, Florida.</p> <p>USACE and SFWMD. 1999. Central and Southern Florida Project Comprehensive Review Study Final Integrated Feasibility Report and Programmatic Environmental Impact Statement. United States Army Corps of Engineers, Jacksonville District, Jacksonville, Florida, and South Florida Water Management District, West Palm Beach, Florida.</p>	