1.0 Performance Measure Title

WS-1 Frequency and Severity of Water Restrictions for Lake Okeechobee 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's 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 Lake Okeechobee Service Area (LOSA) water restrictions primarily affect 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 more likely it is that crop yields will be reduced and the greater the expenses that are required by users to manage the water shortages (Apogee Research 1990 and 1991).

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 by simulations by the South Florida Water Management Model (SFWMM) in which three or less water years in the 36-year simulation period have water shortages in which significant supply-side management cutbacks are necessary.

Additionally, 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 target for the frequency of water shortages is that there be no more than three years with water restrictions in the simulation period. Experience in the Restudy (USACE and SFWMD 1999), indicates that as the number of water years with restrictions is reduced to three, many months of water restrictions drop out entirely or fall below the 18,000 acre feet (ac-ft) per month threshold. Total months of shortages dropped down to about 8. The evaluation target is that there be no more than 8 months with water shortages during the simulation period.

The evaluation target for severity is that the cutback volumes during the worst month of the water restriction period in any year would be unlikely to cause economic losses. This is considered as being achieved when supply-side

management cutback volumes in the worst month of a year with water restrictions are less than 18,000 ac-ft. Experience in the Restudy indicates that as the number of water years with restrictions is reduced to three, the severity of water restrictions is also reduced. However, severities continue to be much worse in the worst year than in the second worse year. To evaluate the severities, a scoring system was developed and used in the Restudy. It is proposed for use in this performance measure. The pattern from previous experience is that the sum of the severity scores for the worst three years drops down to about 7. The evaluation target is that the total of the severity scores across all years in the simulation be less than or equal to 7.

4.2 Assessment Parameter and Target

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 Service Area

5.0 Evaluation Application

5.1 Evaluation Protocol

Frequency

The SFWMM is used. The key 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 crop cycles and the break between the wet and dry seasons. Additional detail on demands-not-met are presented for the Lake Okeechobee Service Area in a "Supply-Side Management Report" that can be utilized to further evaluate the severity of cutbacks. Three criteria are used to determine if the water restrictions are significant. First, for a month to be counted there must be supply-side restrictions for seven or more days; second, the reductions in deliveries must be 10% or more; and third, the total reduction in deliveries during the month must exceed 18,000 acre feet. Any water year with one or more months meeting these criteria is counted as a year with significant supply-side restrictions.

Duration

The South Florida Water Management Model (SFWMM) results are used in the evaluation. The key results regarding duration are presented in the Frequency of Water Restrictions Graphic, which is a table indicating the months (rows) within each year (column) when significant cutbacks in water use due to declared water shortages is being simulated. Years are "water years" and are measured from October to September to correspond to crop cycles and the break between the wet and dry seasons. Three criteria are used to determine if the water restrictions are significant. First, for a month to be counted there must be supply-side restrictions for 7 or more days, second the reductions in deliveries must be 10% or more of the desired deliveries during the month and, third, the total reduction in deliveries during the month must exceed 18,000 ac-ft. The count of the total number of months in the 36-year evaluation period with significant restrictions as presented in the performance measure “Frequency of Water Restrictions for LOSA including EAA” (EAA is the Everglades Agricultural Area) is the duration performance metric. The performance is considered as meeting target if the total months are less than the 8 months established above. If the total months exceed 8, then a measure of performance deficiency can be calculated as the total months of shortages less 8.

Severity

Data on demands-not-met used for the evaluation of the severity of the LOSA restrictions are presented in the Graphic "Monthly Supply Side Management Results for LOSA including EAA". This report presents the amount of demands not met by month by water year. From this chart, for years with supply-side management, the month with the highest monthly cutbacks is selected and the associated monthly cutback is selected. A severity score for each year is then developed based on the following:

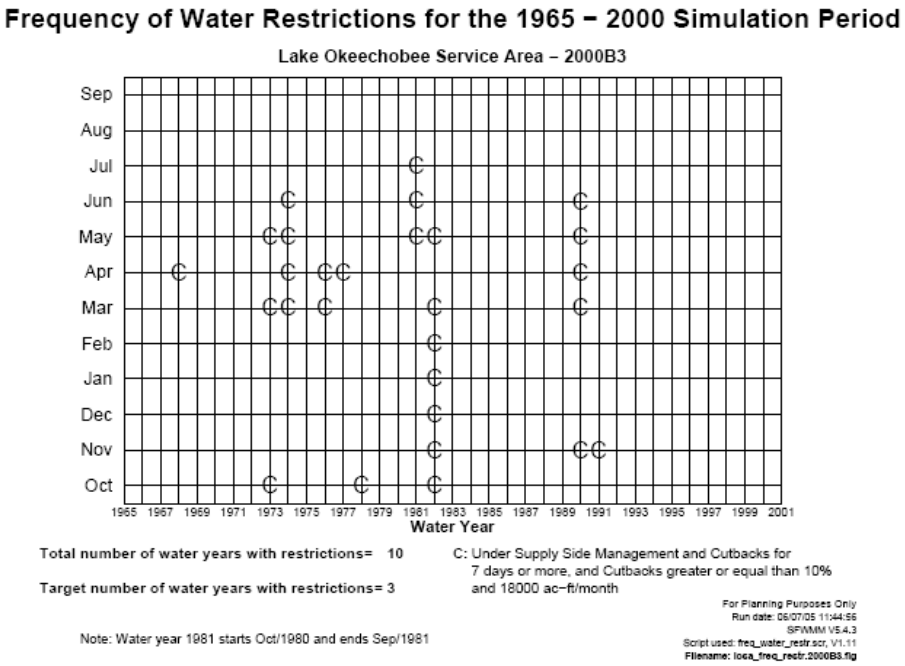
Size of Largest Monthly Cutback During Water Year	Severity Score

cutback < 18,000 ac-ft	0
18,000 ac-ft <= cutback < 50,000 ac-ft	1
50,000 ac-ft <= cutback < 100,000 ac-ft	2
100,000 ac-ft <= cutback < 150,000 ac-ft	3
cutback >= 150,000 ac-ft	4

The final severity score is the sum of the severity evaluations for each year over the evaluation period. The performance is considered as meeting the severity target if the total score for the simulation period is less than or equal to the 7 score established above. If the total score exceeds 7, then a measure of performance deficiency can be calculated as the total score less 7.

5.2 Normalized Performance Output

5.3 Model Output (example attached)



Monthly Supply Side Management Results
for the Lake Okeechobee Service Area
Report by Calendar Years
(Volumes in 1000 ac-ft)

Run:
SFWMM v5.4.3 - 2000B3

Note: SSM stands for Supply Side Management
SSMwC.B. stands for Supply Side Management with cutback

Year	Mon	# Days SSM	# Days SSMwC.B.	Supplem. Volume	SSM Cutback Volume	% SSM Cutback	Convey. Cutback Volume	% Cutback Convey.	Total Cutback	% Total Cutback
1965	1	0	0	57.85	0.00	0.00	0.00	0.00	0.00	0.00
1965	2	0	0	16.03	0.00	0.00	0.00	0.00	0.00	0.00
1965	3	0	0	44.35	0.00	0.00	0.00	0.00	0.00	0.00
1965	4	0	0	115.51	0.00	0.00	0.00	0.00	0.00	0.00
1965	5	0	0	252.98	0.00	0.00	1.62	0.64	1.62	0.64
1965	6	0	0	76.71	0.00	0.00	8.09	10.54	8.09	10.54
1965	7	0	0	20.48	0.00	0.00	0.00	0.00	0.00	0.00
1965	8	0	0	1.59	0.00	0.00	0.00	0.00	0.00	0.00
1965	9	0	0	0.17	0.00	0.00	0.00	0.00	0.00	0.00
1965	10	1	0	1.24	0.00	0.00	0.00	0.00	0.00	0.00
1965	11	0	0	56.89	0.00	0.00	0.00	0.00	0.00	0.00
1965	12	0	0	49.83	0.00	0.00	0.00	0.00	0.00	0.00

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

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10.0 Acceptance Status

WS Working Group	March 14, 2005
ET	
AT	
Public Review	
Final Acceptance Date	

11.0 References

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".

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.

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.