Appendix E: Comparison of Future With and Without Rain-Driven Operations

Prior to anthropogenic intervention, water was delivered to the Greater Everglades ecosystem by rainfall and by sheetflow that spilled over the banks of Lake Okeechobee and flowed southward. Today, water is delivered to the Everglades via the regional water management system of canals, pumps, levees and other structures. Operational schedules unite the system's structural features, controlling and coordinating water flow and levels in different parts of the Everglades and in the urban and agricultural environments.

Current operations use calendar-based regulation schedules for delivery of water to the WCAs. Such schedules, also referred to as rule curves or flood control schedules, specify rules for release of water to a WCA based on the water level at one or more key gauges. These schedules do not typically contain rules for importing water from upstream sources, nor do they allow for inter-annual variability in water delivery. In other words, the schedules are identical from year to year.

A rain-driven operations concept is a fundamental shift away from the current regulation schedule concept. Everglades rain-driven operations include rules for importing and exporting water from the WCAs in order to mimic desired target stage hydrographs at key locations within the Everglades system. These stage hydrographs indicate target water levels, throughout a year or period of years, which best approximate scientific estimates of the pre-drainage water levels in response to rainfall over the same period.

Rain-driven operations have long been recognized to offer important advantages over schedule-driven operations. In fact, the 1998 Interim Plan for Lower East Coast Water Supply included a rain-driven operations component, which was included as a part of the future without-project assumptions for the Restudy. The rain-driven opetations component included in the Restudy future without-project conditions, as described in the 1998 Interim Plan, however, was not expected to fully achieve natural system targets.

The Restudy's recommended plan, known as "D13R," included an operational Everglades rain-driven operations component that went beyond the rain-driven plan included in the future without-project condition assumptions.

The May 2000 Lower East Coast Water Supply Plan (LEC Plan) included a discussion of and recommendations for many projects and operational components to be addressed by CERP projects that would help achieve water supply and environmental planning objectives for southeast Florida. One such component was Everglades rain-driven operations. It, along with other CERP components expected to be implemented by 2020 (the end of the LEC Plan planning period), was included in hydrologic model simulations to demonstrate its effectiveness in achieving LEC Plan objectives. Among the LEC Plan recommendations was the recommendation to the CERP process to transform Everglades

rain-driven operations concepts, as modeled for the LEC Plan, to specific rainfall formulas to be applied to the C&SF system.

Everglades rain-driven operations as envisioned in LEC Plan modeling depends upon storage and conveyance features of the CERP. Ecological benefits provided by CERP projects are dependent, in part, on project operations. Since Everglades rain-driven operations is an operational component of CERP, ecological benefits attributable to Everglades rain-driven operations should be quantified and calculated in the future with-project condition for system-wide evaluations, rather than incorporated into the future without-project condition. Finally, it was recognized that Everglades rain-driven operations concepts applied to LEC Plan modeling cannot be fully implemented without Federal consultation and authorization, since this would require changes in the officially approved regulation schedules for the C&SF project. For these reasons, CERP program managers decided in May, 2005 not to include Everglades rain-driven operations in the future without project condition assumptions for the ICU or for individual CERP projects.

ICU Planners and RECOVER scientists were uncertain, however, how much difference removal of Everglades rain-driven operations from the 2050B3 run would make in Plan performance. The Planning and Evaluation Teams therefore decided to evaluate system-wide performance measures for the future without project condition both with (50B3S4) and without (2050B3) Everglades rain-driven operations.

Below is a summary table, by region, of the evaluated differences in performance between the two runs.

Region	2050B3 (no RDO)	50B3S4 (with RDO)	Summary Comments
Lake Okeechobee			Removal of RDO has little effect on Lake stage
Caloosahatchee Estuary		Slightly better performance in all criteria	
Lake Worth Lagoon		Slightly greater number of short and long periods of no flow	
St. Lucie Estuary			Only slight differences in performance between the two runs
Lake Okeechobee Service Area		Duration and severity of water shortages worse;	No difference in number of years with water restrictions;
Loxahatchee NWR		Slightly reduced hydroperiods (moving away from targets)	Little difference in inundation pattern of wetlands; no

			substantial difference in extreme highs and lows;
Holey Land WMA		Slightly fewer inundation periods of long duration	Slight difference in inundation patterns, but both over target hydroperiod; results similar for extreme high and low events
Rotenberger WMA		Slightly fewer inundation periods of long duration	Inundation percent over POR same, but slight difference in pattern of events; frequency and duration of extreme events almost identical
Corbett WMA		No results available	RDO was never intended to be used in this area.
WCA 2		Longer hydroperiods in 2A and 2B (than no RDO); fewer extreme low water events in northern 2A	In 2A—50B3S4 inundation values about the same as CERPA. In 2B—50B3S4 inundation values substantially closer to targets than CERPA.
Northern WCA 3		Shorter hydroperiods in northeastern WCA-3A; about the same in northwestern WCA-3A; slightly less extreme high water and slightly more extreme low water in northeastern 3A; slightly less high and low water in northwestern 3A; slightly better suitability for tree islands in high water and low water	Similar in northeastern 3A and similar in northwestern 3A; slight difference in hydrologic suitability for tree islands
Eastern WCA 3		Shorter hydroperiods; less extreme high water and more	Performance poor for high and low water events in both runs

		extreme low water; better suitability for tree islands in high water , worse in low water	
Central and Southern WCA 3		Slightly shorter hydroperiods in central 3A; substantially shorter hydroperiods in southern 3A; Moves hydroperiods further from restoration goals in most indicator regions; Less extreme high water and more extreme low water in southern 3A	Similar performance for extreme high and low events in central 3A; Part of CERPA improvement in high water conditions suitability for tree islands appears to be due to RDO.
WCA 3B and Pennsuco	Fewer number of high water weeks	Slightly shorter hydroperiods in Central 3B an slightly longer hydrperiods in Pennsuco; Moves hydroperiods further from restoration goals in most indicator regions; substantial increase in extreme high water events;	Substantial difference in extreme high water events in 3B and Pennsuco; Extreme low water events are similar between the runs; little difference in suitability for tree islands at low water
Big Cypress			Little difference in inundation pattern between runs;
Model Lands Marl Marsh		Significantly shorter inundation events; hydroperiods are significantly drier than the target envelope.	No difference in extreme high and low water events
Shark River Slough	Inundation pattern further from target envelope than 50B3S4;	Slightly fewer dry down events and shorter durations in some indicator regions; Increased percent period of record inundated and increase in average	Little difference in dry down events overall; number of dry down events is greater than the target envelope for both runs; little difference in extreme high and low events;

		inundation duration	both runs show gr;eater number of extreme low events than target; hydrologic suitability for tree islands similar for both runs
Taylor Slough		Fewer extreme low events	Little difference in inundation patterns; no difference in extreme high events; slight difference in number of extreme low events
Marl Prairies/Rocky Glades		Significantly higher average duration inundation duration in some indicator regions	Little difference in number or duration of inundation events or the % period of record inundated; average inundation durations higher than targets for both runs; slight differences in extreme high and low events
Lower East Coast Water Supply		Consistently higher stages than 2050B3 for south Miami-Dade agricultural lands	Slight differences between runs in duration of water restrictions; no violations of saltwater intrusion or of MFLs for Biscayne aquifer
Florida Bay		Slightly lower salinities in most embayments	Very little difference in high and low salinities;
Whitewater Bay		Slightly lower salinities	Slight difference in salinities between the runs
Biscayne Bay	Approximates targets for northern Biscayne Bay;	Freshwater flows slightly greater from Miami River; delivers slightly less water to Manatee Bay and Barnes Sound; slightly greater discharge to South Biscayne Bay; slightly greater discharge to	Slight differences in stage and salinity variations in Manatee Bay and Barnes Sound; Both runs fall short of discharge targets to south and central Biscayne Bay;

		northern Biscayne Bay in the dry season; slightly more discharge to central Biscayne Bay; slightly more discharge to northern Biscayne Bay through Snake Creek in dry season	
Snail Kit Foraging Habitat Suitability		Reduced occurrence of suitable snail kit foraging habitat	
Water Quality		Substantially less STA bypass volume; significantly lower flows to the EPA (surrogate for TP loading); exacerbates predicted STA overloading problem	Little difference in hydrologic surrogates for TP concentration in surface water;

1
2