CASE STUDY # 3

EVOLUTION OF WATER DELIVERIES TO EVERGLADES NATIONAL PARK

The evolution of water deliveries to Everglades National Park (ENP) is an example of how water management strategies have been altered over time to preserve a large and pristine ecosystem in south Florida, while also providing flood protection and water supply for a growing human population. The focus of this case study is during 1985 – 1997, when three Federal and State agencies were required by Congressional action to enter into an agreement to conduct an experimental program of water deliveries to improve natural conditions within the Park. While much was accomplished during implementation of this program, problems and conflict also occurred. At times, the three participating agencies found it difficult to reach consensus on interpretation of monitoring data and development of operating criteria for new test iterations.

Background and Chronology

Disagreement during the early 1960s over who was responsible for water deliveries and how much water should be delivered to ENP (including events when no water was delivered to ENP) was partially resolved in 1970 by Congressional action. A quota system of monthly allocations, consistent with the seasonality of South Florida rainfall, was established to protect ENP under drought conditions by requiring minimum deliveries to three key areas within the Park: Shark River Slough, Taylor Slough, and the C-111/Eastern Panhandle areas. The volumes were said to reflect minimum flow characteristics of the 1940s and 1950s. This legislation provided minimum deliveries through a dry period in the 1970s.

However, unusually heavy rains associated with an El Niño weather system in January and February 1983 required undesirable and off-season regulatory releases to ENP according to the existing regulatory schedule. By March, an environmental emergency was declared in the Park which offered the '7-point plan' to avert future crises of a similar nature. These circumstances led Congress to authorize the Experimental Water Deliveries Program (Experimental Program) to find more natural ways of delivering average and peak flows by modifying the Water Conservation Area 3A (WCA-3A) regulation schedule. The Minimum Deliveries requirements were suspended while the Experimental Program was active. Under the Experimental Program, the U.S. Army Corps of Engineers (Corps), South Florida Water Management District (SFWMD), and the National Park Service (NPS) were directed to explore ways to restore historic flow patterns to the Park by way of a three-party agreement.

The premise of the Experimental Program was to deliver water to the Park in a more natural regime tied to rainfall and natural variability of precipitation. The program consisted of a series of iterative tests providing a mechanism to field test water delivery and to assess potential impacts on the authorized Central and Southern Florida (C&SF)

Project for flood control and other purposes. The framework of the Experimental Program consisted of changes in the operation of water management facilities to restore a more natural flow of water through the Everglades and continued in one form or another from 1983 to 2000.

In 1985, the Corps completed an Environmental Assessment (EA) and filed a Finding of No Significant Impact (FONSI) for the first test of the Experimental Program. On July 24, 1985, a Letter of Agreement (LOA) was signed between the Corps, SFWMD, and the NPS for the testing program to begin. Addendum 1 presented the operational procedures used in a 2-year test of the "rain-driven" plan for water deliveries to ENP. Based on this plan, water allocations to Shark River Slough were determined as a function of rainfall, evaporation, water level in WCA-3A and the previous week's discharge. The rainfall plan was deemed successful in improving the linkage between precipitation and overland flow, a vital part of the slough system that feeds ENP. These operations were continued in one form or another from Tests 1 through 5 with minimal changes from test iteration to test iteration, indicating the difficulty the three parties had in using the program to experiment with operations.

In 1993, the Corps completed an EA and filed a FONSI for the sixth test of the Experimental Program, called the Taylor Slough Iteration. Test 6, which was implemented in 1995, incorporated the Taylor Slough area into the Experimental Program and was responding to the scientific information that flood protection benefits had over-compensated for the changes in water deliveries to ENP. Test 6 involved operating practices for the existing structural features of the C&SF Project that affected water deliveries to, and hydrologic conditions in, Shark River Slough and Taylor Slough within the boundaries of the ENP. The test objectives of the Taylor Slough Iteration were to evaluate methods to restore a more natural hydroperiod to ecosystems within ENP, including Northeast Shark River Slough and Taylor Slough. Additional objectives included reduction of large, freshwater discharges through the S-197 structure into Manatee Bay and Barnes Sound and the provision of flood protection at a level satisfying mitigation for changes in water deliveries to ENP. Monitoring of physical, chemical, and biological parameters was conducted to determine the environmental effects of the proposed test. Test 7 involved refinements to Test 6 and included implementation of water delivery to ENP via the L-31W Canal based on a rainfall/canal-stage relationship developed by the NPS for water deliveries to Taylor Slough.

The various alternatives for implementing the experimental program were effectively analyzed by staff at the Corps, SFWMD, and the NPS. These three agencies assembled a hydrologic modeling group to share in the development and conceptualization of the modifications of operations to structures for the various tests. In order to verify model output and make final determination on alternatives, evaluations were made of actual data from monitoring wells located within the basin, and field trips were made to locations shown by the model to be of question. Through an exchange of information between the agencies and other interested parties alternative operating scenarios were formulated.

During the early to mid-90s, the Experimental Program was guided by the objective of hydrological restoration because hydrology is the primary ecological force in the ENP, and a hydrologic model that simulated historical water flow was available to use for plan formulation. However, even under this "experimental" state, agencies were constrained by key issues, obstacles, and institutional barriers. This in turn constrained the range of alternatives considered, due to the associated risks of testing major modifications to operational schemes – which some viewed as the required step necessary to significantly improve system operations and water delivery to ENP.

Key Issues

- *Competing Interests and Demand for Water Deliveries to the ENP* – This case study is centered around competing water management "demands" in south Florida, flood protection for agricultural interests, water supply for expanding urban areas, and water delivered in the right amount at the right time to the Park. Challenges to these competing demands, interests, expectations, and agency missions are described in more detail below.

- *Agricultural and Flood Protection* – Agricultural interests were concerned about being provided with ideal growing conditions to meet market demands, especially for tomatoes in the mid to late 1980s. For example, in south Dade County, the Corps often encountered long standing conflicts over lower canal levels to provide flood damage reduction for farmers and homeowners east of L-31, versus higher canal levels to provide desirable hydroperiods for the environment west of L-31. On July 12, 1985, the first of a series of agreements was reached between SFWMD and agricultural interests farming an area between Canal 111 (C-111) and the Levee 31W (L-31W) known as Frog Pond in response to the *Kendall et al. v Marsh, et al.* lawsuit. These agreements permitted the Experimental Program to continue for 3 years without further litigation by the farmers in exchange for lower L-31W levels to increase groundwater drainage during the wet season. It was recognized that flood damages in the C-111 area were being caused by depth and duration of flooding, with duration of stages affecting the root zone of crops being the critical parameter. The longer the duration of flooding the greater the resulting crop damages. A February 7, 1995 "order of taking" between the SFWMD and the South Dade Land Corporation provided for acquisition and possession of the entire Frog Pond area by June 1, 1995.

- *Threatened and Endangered Species (T&E)* – The Experimental Program was at times superseded by other operational criteria prompted by ecological concerns involving endangered species (e.g., the Cape Sable Seaside Sparrow and Florida Panther). For example, during the period of November 1997 through March 1998, when the C&SF Project Area would normally be expected to receive a "dry season" rainfall of approximately 11 inches, the area received over 24 inches of rain, one of the largest rain events in Florida history. These unprecedented events not only impacted sparrow habitat, but also placed significant stresses on the C&SF Flood Control System. New information on the status of the Cape Sable

Seaside Sparrow indicated that the western subpopulation was in danger and that immediate action was required to reduce adverse effects on both the sparrow and its habitat. The implemented action required a balancing of natural resource options, as there was no single alternative that did not have a potentially negative impact on some component of the ENP ecosystem.

- *Monitoring Program* – Perhaps one of the more contentious issues associated with the Experimental Program was implementation of the environmental monitoring program, particularly evaluation of monitoring data. A ecological and hydrologic monitoring program was developed by the Corps, NPS, and SFWMD for Test 7, as specified in the 1995 Concurrency Agreement. The plan was intended to assess ecological responses during the period of Test 7, and to establish a baseline for future iterations of the Experimental Program. While good intentions were behind the development of the monitoring plan, implementation of the Plan was not a united theme of participants. Each agency functioned independently, submitting reports on different schedules and interpreting data differently, which frequently promoted traditional agency values. Consensus often could not be reached on the conclusions of annual reports and not all assigned agency personnel participated equally in the compilation and analysis of data and preparation of the annual reports.

Obstacles

- *Agency Mission* – The mission of the three agencies involved in implementing the Experimental Program is fundamentally different and creates opportunities for conflict. For example, the Everglades National Park Act requires the NPS "to preserve intact the unique flora and fauna and to protect the essential primitive natural conditions that prevailed when the Park was established." On the other hand, the Corps is required to deliver water to the ENP according to applicable laws and regulations and cannot deviate without Congressional approval and preparation of  PA documentation.

- *Stakeholders* – The Experimental Program was created by Federal law that specified that Corps, NPS, and SFWMD sign the implementing agreement; a vehicle allowing stakeholder involvement was not provided. The earliest opportunity for formal stakeholder participation was when an EA (NEPA documentation) was prepared. Because of the delay in getting stakeholders involved, agricultural interests filed a lawsuit to ensure that flood protection was provided to private lands devoted to agricultural production.

- *NEPA Documentation* – The Corps was confronted with the difficult task of preparing adequate NEPA documentation for new iterations of the Experimental Program without impeding timely execution. This was accommodated by preparation of a series of environmental assessments with FONSIs. The complexity of alternatives dictated the appropriate type of NEPA documentation required – alternatives that appraised as a FONSI could be analyzed by an

environmental assessment versus more complex alternatives requiring an environmental impact statement. In some instances, if more extreme actions were required, an exemption to the normal NEPA process had to be obtained from the Council of Environmental Quality. The exemption allowed emergency action without more extensive documentation because of the urgency of the problem with regard to resource management in the Park. However, NEPA documents do establish constraints upon which the proposed action must be implemented. These constraints cannot be exceeded without preparation of additional NEPA documentation.

- *Interpretation of Scientific Results* – The Corps solicited input from the staff of other Federal and State agencies to draw upon their expertise in the implementation of the Experimental Program. To accomplish the test iterations and document progress, the Corps developed an objective process for reporting monitoring data and developing solutions and alternative operating scenarios. However, staff from participating agencies frequently interpreted results of hydrologic and ecological monitoring data differently (particularly for Tests 6 and 7), making it difficult to reach consensus on monitoring results. Differences in data interpretation were generally along agency or individual value systems.

- *Accountability* – From the three participating agencies, not all staff provided input to monitoring reports in a timely manner, and in some cases input was not provided at all. As the reporting agency, the Corps had to rely upon whatever data was made available, and then compile the submitted data and present this information in annual reports.

- *Clinging to Core Agency Values During Negotiations* – During development of operating criteria for specific components of the Experimental Program, technical staff frequently found it difficult to negotiate in a collaborative process, but rather negotiated under a zero-sum scenario.

- *Management Agreement with Monitoring Results* – Management and agency technical staff at different levels within participating agencies did not always agree with the interpretation of monitoring results developed by technical staff directly involved in the project. On some occasions results that had been previously agreed upon had to be changed and reworked. Senior technical staff and managers served as a "reality check," to get inconsistencies and inadequacies addressed or resolved by field-level scientific and technical staff.

Science-Policy Linkages

- *Experimental Feedback via Monitoring Results* – Success of the various components of the Experimental Program depended upon results of environmental monitoring, yet interpretation of results varied among participating agencies. Technical staff presentations and interpretations at times were geared to preconceived agendas. In some cases, agency managers at different levels within an agency were not aligned on how results should be interpreted and did not

always agree or support the interpretations reached by technical staff. At times, agency managers' interpretations of monitoring data were along traditional agency value systems.

- *Series of NEPA Documents* - Significant changes or adjustments to water deliveries to the Park required the Corps to prepare additional NEPA documentation. During preparation of the EA, the proposed action was clearly defined, alternatives evaluated and consequences of the proposed action described. These actions were defended with scientific data and policy established through the NEPA process.

- *Operating Criteria* – The Experimental Program generally consisted of providing water to the Park under varied operating scenarios (e.g., operating pumps for specified time periods and pumpage rates, maintaining water levels in canals at specified stages, etc). Operating criteria for each test were negotiated during meetings that at times became contentious as agency staff aggressively defended their positions, sometimes over criteria involving less than a 0.1 ft change in stage elevation.

- *Test Iterations* - Participants agreed upon incremental changes to experimental tests thru a series of addendums to the original Letter of Agreement driven by new information and climatic conditions. Revised testing approaches were based upon best available technical information.

Lessons Learned

- ***Stakeholders*** – Need to maintain open communication with stakeholders throughout life of a project; stakeholders need to be brought into the decision making process as early as possible to avoid conflict and future litigation.
- ***Accountability*** **–** Agency personnel need to be held accountable for scheduled submittals to maintain trust among participating agencies and staff; accountability needs to extend to the highest levels of management within each agency; often it is a not a lack of will but the lack of time, money and resources which prevent schedules from being met.
- ***Collaboration*** –Often agency staff have treated conflict as a "zero-sum game" (one player can come out ahead only if another player loses) thus, creating the need for a collaborative approach to reach consensus. A paradigm shift is required to switch from agency negotiation strategies used in the past, primarily using zero-sum approaches, to a more collegial atmosphere needed to create "win-win" scenarios.
- ***Competing Missions*** **–** Differing demands and expectations are a reality, each must be given the opportunity to be heard and dealt with during the decision making process before an issue can be brought to closure.
- ***Core Values*** - Values differ depending on organization, position within an organization, and role within the organization (e.g., decision maker vs. scientific

researcher). These differing values can act as institutional barriers to conflict resolution if not included and properly managed.

- ***Natural Systems Fluctuations*** **–** Recognition that natural systems are dynamic and change is inevitable; outside factors can influence project performance (e.g., El Niño event). Consequently, operational flexibility needs to be built into the planning of a project and the selection of the preferred alternative.
- ***Entrenched Interests*** – Entrenched interests outside the boundaries of applicable laws and regulations on the part of a single agency staff member can lead to a conflict stalemate if not properly managed and a process established to address such situations.
- ***Proper Use of Science*** – Science cannot drive the policy making process; rather an objective appraisal of data guided by requirements of law and an agreed upon process to reach consensus is needed to successfully negotiate competing interests, demands and expectations.
- ***Potential Failure*** - Because the occasional failure is unavoidable, experimental risks should be designed in such a way that the consequences of failure lead to learning rather than crisis.
- ***Operational Adjustments*** - Need for adjustments to system operations as monitoring feedback is made available and properly evaluated; finding the ultimate solution can be an iterative process requiring continuous monitoring and analysis.
- ***Balancing of Tradeoffs*** **–** Different agency missions, natural variability, uncertainty, and competing interests require that tradeoffs be balanced by participating decision makers.

Adaptive Management Strategy Development
Workshop #1
Appendix 3: Discussion Questions for Case Study 3

Evolution of Water Deliveries to Everglades National Park Case Study

Challenges posed by the number and complexity of entities, institutional players, and stakeholders. Values differ depending on organization, position within the organization, and role within the organization. These differing values, expectations, and demands can act as institutional barriers if not addressed and properly managed.

- How can the adaptive management strategy encourage collective accountability for restoration performance? What happens if/when CERP project or system-level monitoring identifies a failure to meet performance expectations, or that performance for a critical system component is declining? How will this scenario translate into operational/project change? Who will make recommendations? How can a process be designed that is able to work with, around, and through individual, personal, agency, or political agendas and "agency hats"? How does communication happen between project managers/engineers, policy makers, and CERP decision makers? What role should stakeholders play in the adaptive management process at the stage where science is

linked with policy decision making; how best to incorporate stakeholder input and feedback?

When assumptions change. Throughout the history of water deliveries to the park, major assumptions designed to improve "natural" conditions in the park turned out to be flawed, and may have even "caused harm."

- How can adaptive science and management processes be designed rigorously so as to be explicit about assumptions, hypotheses, and targets, to monitor effectively, to test and identify problems with the operational performance of restoration components, as well as with the assumptions underlying them? What are the lessons for CERP?

Changing goals and objectives. The delivery of water to the park has been marked by changing goals and objectives over time, both as a result of changing external demands and drivers, as well as failure and unintended consequences of water management itself.

- What are the lessons for CERP, as a large ecosystem restoration program? How will CERP address changes in social values and drivers of the human environment over the fifty-year life of the restoration effort??

Integrating operational flexibility into preliminary design. Projects are often built to design specifications based on preliminary targets with considerable uncertainty and/or the need to contain cost. When the need for operational change is identified, it often turns out that it may have been more cost effective if operational flexibility was designed into the original plans, rather than retrofitting an existing project.

- How can the adaptive management process work to ensure that options are not foreclosed through design? How can operational flexibility be incorporated into project designs?