WILLIAM K. NUTTLE

11 Craig Street, Ottawa, Ontario, Canada K1S 4B6

4 April 2018

Honorable Mayor Carlos Giménez, and
Miami-Dade County Board of County Commissioners
Stephen P. Clark Center
111 NW 1st St., Suite 320
Miami, FL 33128

Dear Mayor and Commissioners,

I am writing to provide my insights into how continued operation of the cooling canals at FPL's Turkey Point power plant will affect the remediation of the hypersaline groundwater plume caused by past operations. I am a hydrologist with 25 years of experience working in South Florida. Currently, I am a consultant to the Southern Alliance for Clean Energy. My CV is attached.

The cooling canal system (CCS) at Turkey Point is, first and foremost, an industrial facility. FPL depends on the cooling canals to remove waste heat from its two nuclear power plants, Units 3 and 4. Cooling is needed for the generation of electrical power and the safe operation of the nuclear reactors. For this purpose, the Florida DEP provides FPL with a permit to operate the cooling canals as an industrial waste disposal facility.

Between 2009 and 2015 I was hired to advise the team at the South Florida Water Management District tasked with reviewing monitoring by FPL to characterize conditions in and around the cooling canals. The results of this monitoring provide a picture of how water moves out of and into the cooling canals, including how seepage connects the cooling canals with the Biscayne aquifer.

Interaction between the Cooling Canals and the Aquifer

The water budget reveals how the cooling canals interact with their surroundings. Major components of the water budget are shown in the attached figure. FPL's annual monitoring reports compile estimates of the size of each component of the water budget. I have reviewed results reported for the period September 2010 through November 2016.

Evaporation - 40 MGD (Million Gallons Per Day) The process of cooling the power plants causes high evaporation from the cooling canals. Evaporation is about 50 percent higher than what would occur from the same area of mangrove wetland under natural conditions. The high rate of evaporation causes problems with water quality in the canals, such as the accumulation of salt leading to high values for salinity.

Rainfall - 20 MGD On average, rainfall provides enough water to replace only about half of the water removed by evaporation. On days when rain is heavy, rainfall can add over half a billion gallons of water to the canals. This greatly exceeds evaporation, causing water levels to rise.

Net Seepage Input from Biscayne Bay – 8 MGD Water flows both into and out of the cooling canals on a daily basis via seepage between the canals and the underlying aquifer. Water moves freely through the porous limestone that separates the canals from Biscayne Bay. The net seepage of salty water from Biscayne Bay provides about 8 mgd of water input to the cooling canals.

Other Inputs of Water - 20 MGD Other inputs of water into the cooling canals include "blowdown" water discharged from the power plants, and water pumped from the interceptor ditch and discharged into the canals. New sources of water were added in 2014. These include fresh water pumped from the L-31E canal, water from shallow saline wells, and brackish water pumped from the Floridan aquifer.

For the first 40 years of operation, water lost from the canals through evaporation was replaced by rainfall, seepage into the canals from the aquifer and from Biscayne Bay, water pumped from the interceptor ditch, and smaller amounts of water from other sources within FPL's facilities. Since 2014, following the uprate of the nuclear power plants, FPL finds it necessary to add more water from additional new sources to counteract deteriorating water quality in the canals.

Discharge into the Aquifer – 9 MGD Seepage into the aquifer from the cooling canals averages about 9 mgd. At this rate the entire contents of the canals empty into the aquifer every 18 months. Over the approximately 45 years that the cooling canals have been in operation, seepage has fed the development of a large plume of hypersaline water in the Biscayne aquifer, underneath the cooling canals and extending to the west.

FPL's Remediation Plan

FPL wants to assure residents of Monroe and Miami-Dade Counties that it is making progress on cleaning up the groundwater plume created by the cooling canals. However, the claims the utility is making don't add up.

As described in an article in the Miami New Times last year (http://www.miaminewtimes.com/news/state-approves-fpls-pollution-fix-but-activists-say-plan-could-suck-water-from-everglades-9192954), FPL's plan is to pump contaminated water out of the aquifer and draw the plume back towards the cooling canals through a system of recovery wells. Peter Robbins, spokesman for FPL, promised that "the majority of the plume will be retracted in the first five years, but complete retraction will take longer." Initially, the plan is to pump the wells for ten years.

Three numbers are essential to understanding how FPL's plan will actually work. And, these numbers tell a different story.

The first number is 5.4 billion gallons per year. That's the maximum rate at which FPL is permitted to pump contaminated water out of the aquifer, reducing the plume's volume.

The second number is 3.3 billion gallons per year. That's the rate at which seepage from the cooling canals adds new water to the plume, fueling its growth. The seepage number is based on detailed water budget calculations by FPL using data that it has been collecting in and around the cooling canals since 2010.

The third number is 140 billion gallons. That is the volume of water now in the aquifer that originally came from the cooling canals, identified based on its chemical composition. The team at the water management district estimated this to be 123 billion gallons based on a map of the plume made in 2013. Add to that roughly 17 billion gallons from five years of seepage.

Pumping the recovery wells for ten years will remove 54 billion gallons from the plume, but over the same time seepage from the canals will add 33 billion gallons into the aquifer. The net result is that the plume's volume will decrease by 21 billion gallons.

That's a decrease of only 15% over ten years - not even close to the claim FPL made a year ago to sell their remediation plan.

If FPL makes no changes, it will take well over 60 years to fully recover the plume. But, if FPL and the County follow through on the proposal to add treated wastewater to the canals, as proposed, the rate of seepage from the canals into the aquifer will increase, further delaying remediation of the groundwater plume.

Assuring Remediation's Success

Moving forward, what can FPL do to speed up remediation of the groundwater plume?

Some might say that nothing more needs to be done, because mixing and dilution will solve the problem. Over time, the water in the plume mixes with other water in the aquifer, and this gradually reduces the level of contamination through dilution.

However, this leaves the contamination in the aquifer where it will continue to threaten water supply wells. Mixing reduces the level of contamination, but it increases the amount of water in the aquifer that is contaminated. Remediation by dilution is not the plan that FPL promised to deliver.

FPL cannot increase pumping by the recovery wells to speed remediation, because that would risk harming nearby wetlands and other users of the aquifer. FPL's water use permit for the operation of the recovery wells sets the upper limit on the rate of pumping.

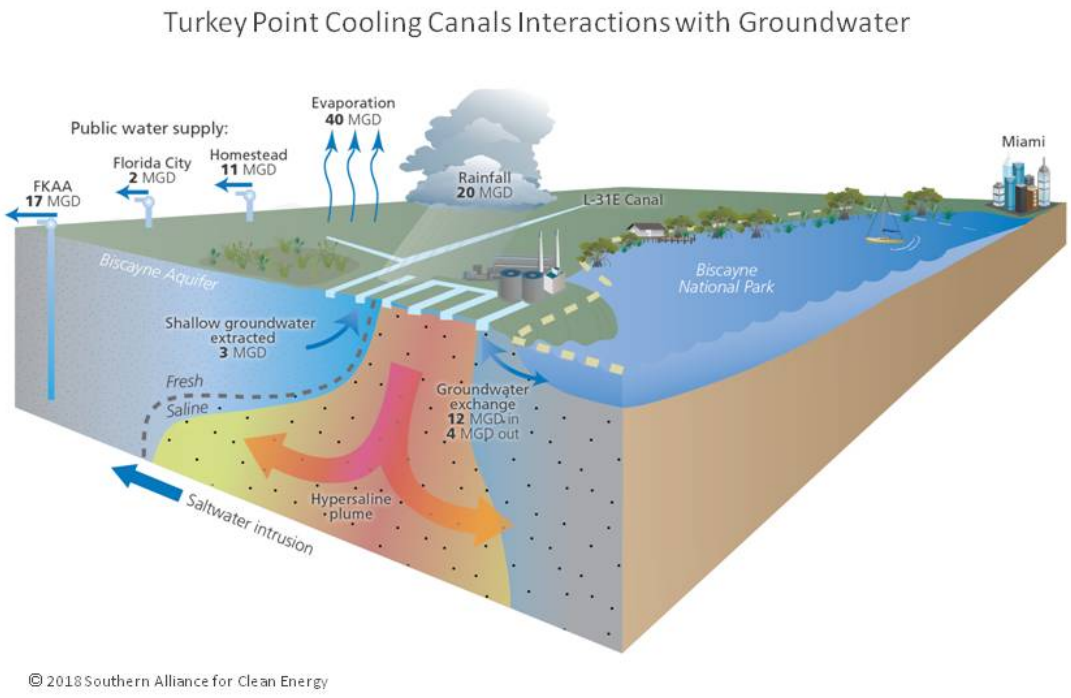
If FPL is really serious about assuring the success of its remediation plan, it will look at discontinuing the operation of the cooling canals. Eliminating the seepage that continues to feed the plume would increase the effectiveness of the recovery wells. Instead of recovering a net amount of 21 billion gallons in 10 years, the wells could reduce the volume of the plume by the full 54 billion gallons pumped, more than doubling their effectiveness.

This is why the plaintiffs in the Clean Water Act law suit are pushing for FPL to replace the canals with cooling towers as soon as possible. As long as the cooling canals remain in operation, high evaporation creates problems with water quality in the canals, and continued seepage out of the canals works against efforts to protect the region's freshwater supply and stop the pollution of Biscayne Bay.

Sincerely,

William K. Nuttle, PhD, PE

Turkey Point cooling canals interacts with regional groundwater –
Water moves freely between the cooling canals and the underlying Biscayne aquifer, driven by constantly changing water levels in the cooling canals, in Biscayne Bay, and in the surrounding wetlands. The process of cooling the power plants causes high evaporation from the cooling canals. Rainfall replaces about half the evaporative loss. Groundwater seepage and water from other sources makes up the rest. Pumping from the interceptor ditch, which is intended to intercept seepage from the cooling canals toward the L31-E canal, extracts about 3 million gallons per day (mgd) of shallow freshwater from the aquifer, more than Florida City's wellfield uses. Exchange between the canals and Biscayne Bay results in an average inflow of 12 mgd into the canals and 4 mgd average discharge from the cooling canals toward Biscayne Bay. Over the long-term, seepage out of the canals into the aquifer averages 9 mgd.



Curriculum Vitae

William K. Nuttle, Ph.D, P.Eng

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Profile

William K. Nuttle has 25 years of experience working with water managers, engineers, Earth scientists and ecologists in planning eco-hydrology research and to applying the results of this research to ecosystem restoration and management of natural resources. Prior to joining the University of Maryland he coordinated ecosystem research programs directed at supporting large-scale ecosystem restoration activities and resource management in South Florida and Louisiana. He was director of Everglades Department for the South Florida Water Management District in 2000-2001, and prior to that he served as Executive Officer for the Florida Bay Science Program. Dr. Nuttle received his M.S. and Ph.D. (1986) degrees in civil engineering from the Massachusetts Institute of Technology and his BSCE from the University of Maryland.

Recent and Ongoing Projects

2016 -	Everglades Report Card, Jacksonville District, U.S. Army Corps of Engineers
2016-	Expert testimony, Southern Alliance for Clean Energy
2015	Expert testimony, Lewis Longman, and Walker, West Palm Beach, FL
2014 - 2015	Long Island Sound Environmental Report Cards, Long Island Sound Futures Fund
2013 - 2015	Mississippi River Watershed Report Card, America's Watershed Initiative
2013 - 2015	Technical Committee, Changing Course Competition, Environmental Defense Fund
2013 - 2014	Upgrade and Calibration of FATHOM model, Jacksonville District, U.S. Army Corps of Engineers
2010 - 2013	Mississippi River Delta Science and Engineering Special Team, National Audubon Society
2009 – 2015	Expert assistance to the South Florida Water Management District on the water and salt budgets for the Turkey Point Power Plant cooling canals
2009 - 2012	South Florida MARES Project, NOAA/CSCOR

Education

1986	PhD, Civil Engineering, Massachusetts Institute of Technology, 1986
1982	MS, Civil Engineering, Massachusetts Institute of Technology, 1982
1980	BS, Civil Engineering, University of Maryland, 1980

Career Summary

1986 - Consultant in Environmental Science, Hydrology, and Water Resources
2013 - Science Integrator, Integration and Application Network, Center for Environmental Science, University of Maryland
2009 - 2012 Executive Officer, South Florida MARES Project
2000 - 2001 Director, Everglades Department, Division of Watershed Research and Planning, South Florida Water Management District
1998 - 2000 Executive Officer, Science Program for Florida Bay and Adjacent Marine Systems
1997 Lecturer, Environmental Science Program, Carleton University, Ottawa, Ontario
1991 - 1993 Associate, Rawson Academy of Aquatic Science, Ottawa, Ontario
1990 - 1991 Assistant Professor (Research), Memorial University of Newfoundland
1986 - 1989 Assistant Professor, University of Virginia

Scientific Publications

2014 J.S. Ault, S.G. Smith, J.A. Browder, W. Nuttle, E.C. Franklin, J. Luo, G.T. DiNardo, J.A. Bohnsack, Indicators for assessing the ecological dynamics and sustainability of southern Florida's coral reef and coastal fisheries, Ecological Indicators, Volume 44, September 2014, Pages 164-172, ISSN 1470-160X, http://dx.doi.org/10.1016/j.ecolind.2014.04.013. (http://www.sciencedirect.com/science/article/pii/S1470160X14001435)

2014 Pamela J. Fletcher, Christopher R. Kelble, William K. Nuttle, Gregory A. Kiker, Using the integrated ecosystem assessment framework to build consensus and transfer information to managers, Ecological Indicators, Volume 44, September 2014, Pages 11-25, ISSN 1470-160X, http://dx.doi.org/10.1016/j.ecolind.2014.03.024. (http://www.sciencedirect.com/science/article/pii/S1470160X14001265)

2014 Grace Johns, Donna J. Lee, Vernon (Bob) Leeworthy, Joseph Boyer, William Nuttle, Developing economic indices to assess the human dimensions of the South Florida coastal marine ecosystem services, Ecological Indicators, Volume 44, September 2014, Pages 69-80, ISSN 1470-160X, http://dx.doi.org/10.1016/j.ecolind.2014.04.014. (http://www.sciencedirect.com/science/article/pii/S1470160X14001447)

2013 Kelble CR, Loomis DK, Lovelace S, Nuttle WK, Ortner PB, Fletcher P, Cook GS, Lorenz JJ, Boyer JN. The EBM-DPSER Conceptual Model: Integrating Ecosystem Services into the DPSIR Framework. PLOS One 8 (8):e70766. doi:10.1371/journal.pone.0070766

2010 Lookingbill, T., T.J.B. Carruthers, J.M. Testa, W.K. Nuttle, and G. Shenk. Chapter 9: Environmental Models, in: Longstaff, B.J. and others (eds), Integrating and Applying Science: A Practical Handbook for Effective Coastal Ecosystem Assessment. IAN Press, Cambridge, MD.

2008 Habib, E., B.F. Larson, W.K. Nuttle, V.H.Rivera-Monroy, B.R. Nelson, E.A. Meselhe, R.R. Twilley. Effect of rainfall spatial variability and sampling on salinity prediction in an estuarine system. Journal of Hydrology 350:56-67.

2007 Habib, E., W.K. Nuttle, V.H. Rivera-Monroy, S. Gautam, J. Wang, E. Meselhel, R. R. Twilley, 2007. Assessing effects of data limitations on salinity forecasting in Barataria Basin, Louisiana using a Bayesian analysis. Journal of Coastal Research 23:749-763.

2007 Hunt, J. and W. Nuttle, eds. Florida Bay Science Program: a Synthesis of Research on Florida Bay. Fish and Wildlife Research Institute Technical Report TR-11, p.i-148.

2007 Price, R.M, W.K. Nuttle, B.J. Cosby, and P.K. Swart. Variation and Uncertainty in Evaporation from a Subtropical Estuary: Florida Bay. Estuaries and Coasts 30:497–506.

2007 Kelble, C.R., E.M. Johns, W.K. Nuttle, T.N. Lee, R.H. Smith, P.B. Ortner. Salinity Patterns of Florida Bay. Coastal Estuarine and Shelf Science 71:318-334.

2006 Fahrig, L., and W. K. Nuttle. Population ecology in spatially heterogeneous environments. In G. M. Lovett, C. G. Jones, M. G. Turner, and K. C. Weathers, editors. Ecosystem function in heterogeneous landscapes. Springer-Verlag, New York, New York, USA.

2002 Nuttle, W.K. Is ecohydrology one idea or many? Hydrological Sciences Journal 47:805-807.

2002 Nuttle, W.K. Taking Stock of Water Resources. Eos 83:513.

2002 Nuttle, W.K. Eco-hydrology's Past and Future in Focus. Eos 83:205.

2001 Nuttle, W.K. Estuarine Science: A Synthetic Approach to Research and Practice (book review). Eos 82:4.

2000 Nuttle, W.K. Ecosystem managers can learn from past successes. Eos 81:278.

2000 Nuttle, W.K., J.W. Fourqurean, B.J. Cosby, J.C. Zieman, and M.B. Robblee. The influence of net freshwater supply on salinity in Florida Bay. Water Resources Research 36:1805-1822.

1999 Nuttle, W.K. Ecosystem Restoration a Challenge for Unified Hydrologic Science. Eos 80:469.

1997 The Working Group on Sea Level Rise and Wetland Systems, Conserving coastal wetlands despite sea level rise. Eos 78:257-262.

1997 Nuttle, W.K., Measurement of wetland hydroperiod using harmonic analysis. Wetlands 17:82-89.

1995 Nuttle, W.K. and J.W. Harvey, Fluxes of water and solute in a coastal wetland sediment. 1. The contribution of regional groundwater discharge. Journal of Hydrology 164:89-107.

1995 Harvey, J.W. and W.K. Nuttle, Fluxes of water and solute in a coastal wetland sediment. 2. Effect of macropores on solute exchange with surface water. Journal of Hydrology 164:109-125.

1994 Boesch, D.F., M.N. Josselyn, A.J. Mehta, J. T. Morris, W.K. Nuttle, C.A. Simestad, and D.J.P. Swift, Scientific assessment of coastal wetland loss, restoration and management in Louisiana. Journal of Coastal Research, Special Issue No. 20.

1993 Hoelscher, J.R., W.K. Nuttle, and J.W. Harvey, The calibration and use of pressure transducers in tensiometer systems. Hydrological Processes 7:205-211.

1993 Nuttle, W.K., The effect of rising sea level on the hydrology of coastal watersheds, in Proceedings of the World at Risk Conference, M.I.T., Cambridge, Mass. American Physics Institute Press.

1991 Nuttle, W.K. and J. Portnoy, Effect of rising sea level on runoff and groundwater discharge to coastal ecosystems. Estuarine Coastal and Shelf Science 34:203-212.

1991 Nuttle, W.K. Comment on "Tidal dynamics of the water table in beaches" by P. Neilsen, 1990. Water Resources Research 27:1781-1782.

1991 Nuttle, W.K., J.S. Wroblewski, and J. Sarmiento, Advances in modeling ocean primary production and its role in the global carbon cycle. Advances in Space Research 11:(3)67-(3)76.

1990 Nuttle, W.K., H.F. Hemond and K.D. Stolzenbach. Mechanisms of water storage in salt marsh sediments: The importance of dilation. Hydrological Processes 4:1-14.

1989 Nuttle, W.K. Comment on "A model for wetland surface water dynamics" by D.E. Hammer and R.H. Kadlec, Water Resources Research 25:1060-1062.

1988 Nuttle, W.K. The interpretation of transient pore pressures in salt marsh sediment. Soil Science 146:391-402.

1988 Nuttle, W.K. The extent of lateral water movement in the sediments of a New England salt marsh. Water Resources Research 24:2077-2085.

Technical Reports

2015 Nuttle W., America's Watershed Initiative Report Card for the Mississippi River Methods: report on data sources, calculations, additional discussion. [online: http://americaswater.wpengine.com/wp-content/uploads/2015/12/Mississippi-River-Report-Card-Methods-v10.1.pdf; accessed 1 May 2017]

2015 Nuttle, W.K. Review of CCS Water and Salt Budgets Reported in the 2014 FPL Turkey Point Pre-Uprate Report and Supporting Data. Prepared for the South Florida Water Management District, 8 June 2015.

2013 Nuttle, W.K., and P.J. Fletcher (eds.). Integrated conceptual ecosystem model development for the Florida Keys/Dry Tortugas coastal marine ecosystem. NOAA Technical Memorandum, OAR-AOML-101 and NOS-NCCOS-161. Miami, Florida. 92 pp.

2013 Nuttle, W.K., and P.J. Fletcher (eds.). Integrated conceptual ecosystem model development for the Southwest Florida Shelf coastal marine ecosystem. NOAA Technical Memorandum, OAR-AOML-102 and NOS-NCCOS-162. Miami, Florida. 108 pp.

2013 Nuttle, W.K., and P.J. Fletcher (eds.). Integrated conceptual ecosystem model development for the Southeast Florida Coast coastal marine ecosystem. NOAA Technical Memorandum, OAR-AOML-103 and NOS-NCCOS-163. Miami, Florida. 125 pp.

2013 Nuttle, W.K. Review of CCS Water and Salt Budgets Reported in the 2012 FPL Turkey Point Pre-Uprate Report and Supporting Data. Prepared for the South Florida Water Management District, 5 April 2013.

2012 Day, J. and others. Answering 10 Fundamental Questions About the Mississippi River Delta. Mississippi River Delta Science and Engineering Special Team, National Audubon Society.

2010 Marshall, F., and W. Nuttle. Development of Nutrient Load Estimates and Implementation of the Biscayne Bay Nutrient Box Model. Final Report prepared by Cetacean Logic Foundation, Inc. for Florida International University Subcontract No. 205500521-01.

2008 Marshall, F., W. Nuttle, and B. Cosby, 2008. Biscayne Bay Freshwater Budget and the Relationship of Inflow to Salinity. Project report submitted to South Florida Water Management District by Environmental Consulting and Technology, Inc., New Smyrna Beach, FL.

2008 Nuttle, W.K, F.H. Sklar, A.B. Owens, M. D. Justic, W. Kim, E. Melancon, J. Pahl, D. Reed, K. Rose, M. Schexnayder, G. Steyer, J. Visser and R. Twilley. 2008. Conceptual Ecological Model for River Diversions into Barataria Basin, Louisiana, Chapter 7. In, R.R. Twilley (ed.), Coastal Louisiana Ecosystem Assessment & Restoration (CLEAR) Program: A tool to support coastal restoration. Volume IV. Final Report to Department of Natural Resources, Coastal Restoration Division, Baton Rouge, LA.

2008 Habib,E., W.K. Nuttle, V.H. Rivera-Monroy, and N. Nasrollahi. An Uncertainty Analysis framework for the CLEAR Ecosystem Model: Using Subprovince 1 as Test Domain and Skill assessment, Chapter 12. In, R.R. Twilley (ed.), Coastal Louisiana Ecosystem Assessment & Restoration (CLEAR) Program: A tool to support coastal restoration. Volume IV. Final Report to Department of Natural Resources, Coastal Restoration Division, Baton Rouge, LA.

2007 Nuttle, W., and E. Habib. Response of Salinity in Barataria Basin to Alternative 3 Freshwater Diversions. Final Report Submitted to the CLEAR Program, Louisiana State University Contract 4296, March 2007.

2007 Dennison, W., W. Nuttle, and C. Wicks. Assessment of Coastal Management and Science Needs in South Florida. Final report to National Oceanic and Atmospheric Administration Center for Sponsored Coastal Ocean Research (CSCOR), February 2007.

2007 Hunt, J. and W. Nuttle, eds. Florida Bay Science Program: a Synthesis of Research on Florida Bay. Fish and Wildlife Research Institute Technical Report TR-11, p.i-148.

2006 Marshall, F.E., D. Smith, and W. Nuttle. Simulating and Forecasting Salinity in Florida Bay: A Review of Models. Task report for a Critical Ecosystems Initiative (CESI) project (Cooperative Agreement Number CA H5284-05-0006) submitted to Everglades National Park, November 30, 2006.

2005 Cosby, B., W. Nuttle, and F. Marshall. FATHOM Enhancements and Implementation to Support Development of MFL for Florida Bay. Final Report on Contract C-C-15975-WO05-05 for the South Florida Water Management District. Environmental Consulting & Technology, Inc. New Smyrna Beach, Florida.

2005 Biscayne Bay Coastal Wetland Project Planning Tool Phase I:Hydrology and Salinity Calculations. Project report for Everglades National Park, January 2005.

2004 Nuttle, W.K. Wetland Hydrology and Estuarine Salinity Related to SFWMM Scenarios (Models Version 1.1). Final report submitted to Everglades National Park on GSA Order Number D5284020058. The Cadmus Group, Inc. Watertown, MA 02472. January 2004.

2004 Bartell, S.M., J. Lorenz, W.K. Nuttle. Roseate Spoonbill Habitat Suitability Index Model. Progress report submitted to Everglades National Park on GSA Order Number D5284020058. The Cadmus Group, Inc. Watertown, MA 02472. January 2004.

2003 Florida Bay Science Program. A Synthesis of Research on Florida Bay. Florida Marine Research Institute.

2003 Bartell, S.M., W.K. Nuttle, S.K. Nair, J. Lorenz. A Decision Making Framework for Ecosystem Restoration in Everglades National Park. Progress report submitted to Everglades National Park on GSA Order Number D5284020058. The Cadmus Group, Inc. Watertown, MA 02472. October 2003.

2002 Report #1: Review and Evaluation of Hydrologic Modeling Tools for the Coastal Mangroves and Florida Bay. Project report for Everglades National Park, April 2002.

2002 Version 1.0: Wetland Hydrology and Estuarine Salinity Models for the Taylor Slough/C111 Area. Project report for Everglades National Park, December 2002.

2000 Science Information Needs in the Southern Coastal Areas: Progress and Update. draft of report by joint committee of the PMC and the Science Coordination Team, August 2000.

2000 Meeting on Salinity Performance Measures in Florida Bay. Report on the workshop held July 2000.

2000 Synthesis of Florida Bay Research for Ecosystem Restoration. Report to the Interagency Working Group by the PMC, May 2000.

2000 Standard Data Set for Florida Bay. Report on the workshop held May 2000

2000 Florida Bay Models Coordination Meeting. Report of the meeting held May 2000.

2000 Hydrologic Linkages from Upland into Southern Coastal Areas, Background paper submitted to the Florida Bay PMC March 2000.

2000 Salinity Models for Florida Bay – Status and Recommendations. Results of a workshop on salinity modeling held August 1999.

1999 Draft Implementation Plan. Executive Officer's Report to the Science Program for Florida Bay and Adjacent Marine Systems, May 1999.

1999 Predictive Models for Florida Bay, Florida Keys and Southwest Coast. Program Assessment and Status, February 1999.

1997 Salinity Transfer Functions for Florida Bay and West Coast Estuaries. Final report of project for Everglades National Park and South Florida Water Management District.

1997 Compilation and Analysis of Estuarine Hydrology Data. Final report to South Florida Water Management District (PC P705317).

1995 Intra-Annual and Multi-Year Variation in the Hydrology of Shark Slough. Technical report prepared for the Global Climate Change Research Program, South Florida Biogeographical Region.

1995 Assembled Historical Data Sets. Technical report prepared for the Global Climate Change Research Program, South Florida Biogeographical Region.

1995 GCC Hydrological Monitoring Stations: Operation and Maintenance Manual. Draft technical report in preparation for the Global Climate Change Research Program, South Florida Biogeographical Region (with G. Anderson).

1993 Coupled Surface Water / Groundwater Hydrology Model Version 1.0. Technical report prepared for the Global Climate Change Research Program, South Florida Biogeographical Region.

1993 Adaptation to Climate Change and Variability in Canadian Water Resources. Occasional Paper No. 7, Rawson Academy of Aquatic Science, Ottawa, Ontario.

1993 Adaptation to Climate Change and Variability in Canadian Water Resources. Climate Change Digest 93-02, Atmospheric Environment Service, Environment Canada.

1993 Forecasting Emerging Environmental Issues. for Eco-Health Branch, Environment Canada, Hull, Quebec.

1992 The Experimental Lakes Area Business Plan. for Freshwater Institute, Department of Fisheries and Oceans, Winnipeg, Manitoba.

1991 A Review of the Environmental Impact Assessment of the Swan Hills Expansion. for the Swan Hills Environmental Review Coalition, Edmonton, Alberta.

1990 Extreme Values of Discharge for Mill Creek and Options to Control Flooding from the Herring River. for the Cape Cod National Seashore, South Wellfleet, Massachusetts.

1989 Technical Manual for Hydrometeorological Stations. for Virginia Coast Reserve LTER Program, University of Virginia, Charlottesville, Virginia.

1980 Codell, R. and W.K. Nuttle. Analysis of Ultimate Heat Sink Cooling Ponds. U.S. Nuclear Regulatory Commission NUREG 0693, Washington, D.C.