

Indian River Lagoon (IRL) Basin Management Action Plans (BMAPs)

Spatial Watershed Iterative Loading (SWIL) Model

April 30, 2024, via GoToWebinar

10:30 am – 11:13 am

Attendees

Becky Allenbach, EPA
Carolina Alvarez, Brevard County
Irene Arpayoglou, DEP
Jana Ash, RES
Taufiqul Aziz, DEP
Steven Baker, U.S. Space Force
Lisa Bally, ATM
Peter Barile, Citizen
Virginia Barker, Brevard County
Venetia Barnes, Fort Pierce
Connie Becker, DEP
Anthony Betts, SFWMD
Terri Breeden, Brevard County
Tiffany Busby, Wildwood Consulting
Timothy Carlisle, Cape Canaveral
Stacy Cecil, SJRWMD
Eric Charest, Indian River County
Taryn Chaya, University of Florida
Tessah Christian, Farm 2 Food
Carolin Ciarlariello, DEP
Anne Cox, Citizen
David Cox, Citizen
Derek Cox, SFWMD
Natalie Dahl, Intertek
Dean Dobberfuhr, SJRWMD
Christine Eastwick, U.S. Fish & Wildlife Service
James Einloth, Citizen
Jerry Elsberry, Advanced Biofermentation Services

Yesenia Escribano, FDACS
Julie Espy, SAS
Amanda Exposito-Ferree, Atkins Realis
Chris Fagerstrom, Pond & Company
Jake Fojtik, Florida Farm Bureau
Marcy Frick, Tetra Tech
Felicia Gordian, Sebastian
Raichel Gulde, RES
Samuel Hankinson, DEP
Kenny Hayman, DEP
Laila Hudda, EPA
Dana Hutchinson, Citizen
Danielle Ivey, Audubon
Kelly Jackson, Indian River Pioneer Farms
Chandy John, AECOM
Andrew Kamerosky, Applied Ecology
VJ Karycki, Rockledge
Lisa Krinsky, University of Florida
Tricia Kyzar, University of Florida
James Lappert, St. Lucie County
Ivette Leiva, FDOT
Jack Levy, AECOM
Nicholas Linehan, St. Lucie County
Esteban Lopez, RES
Jonathan Madden, SFWMD
Tom Mayton, SJRWMD
Michael McCabe, Melbourne Tillman WCD
Bach McClure, Brevard County
Mike McMunigal, SJRWMD
Melissa Meisenburg, Indian River County

Valentina Miele, Florida Oceanographic Society
Gabrielle Milch, St. Johns Riverkeeper
Abigail Morgan, Cocoa
Lori Morris, SJRWMD
Jessica Mostyn, DEP
Natalie Novak, Indian River County
Kevin O'Donnell, DEP
Stacey Ollis, SFWMD
Judy Orcutt, Citizen
Sara Ouly, SFWMD
Josh Papacek, SJRWMD
Ximena Pernet, RES
Jon Perry, ESA
Kimberly Peyton, Rockledge
Nicolas Pisarello, ATM
Elon Poole, Rockledge
Robert Potts, ATM
Erin Preston, SJRWMD
Allyson Reinert, DEP
Sandra Reller, Titusville
Samantha Russo, SJRWMD

Jerome Ryan, SWIG
Jimmy Sellers, Ecological Associates
Kevin Shropshire, Rockledge
Lorae Simpson, SJRWMD
Jennifer Spain, Volusia County
Anita Stine, DEP
Katie Sweetman, Brevard County
Rachel Tennant, Fort Pierce Utilities Authority
Lisa Van Houdt, DEP
Charlie Venuto, Citizen
Rachel Vitek, RES
Shreya Vuttaluru, Tampa Bay Times
Thomas Waite, Citizen
Jessica Wakefield, SFWMD
Michael Walther, Coastal Tech Corp
Benita Whalen, Dispersed Water LLC
Ragan Whitlock, Center for Biological Diversity
Terry Williamson, Brevard County
Laura Yonkers, Indian River County
Kelly Young, Volusia County

SWIL 5.0 Status

There were no questions during this agenda item.

Calibration Efforts & Model Performance

Q: Will a report of the SWIL model be public record associated with the BMAP? The report would help engineers and designers within the BMAP watershed.

A: Yes, this report will be posted, and the prior reports have been posted. The final report on the model will also be posted.

Q: Does the model include the large stormwater and wetland marsh treatments operated by St. Johns River Water Management District (SJRWMD) in the North Fork of the North Prong of the Sebastian River, which would modify flow?

A: The SWIL Model did not account for that. There are a number of water control structures such as the weir on Eau Gallie River. The SWIL estimated loading matched pretty well so those structures did not seem to have significant impact. Adding more information about the structures could be considered for future model development.

Q: How well do the event mean concentrations (EMCs) for subsurface flows in undeveloped land cover/land use match the groundwater well data?

A: When we reviewed the records, we were unable to find enough representative wells to calibrate every land use category. Most of the data were samples from the Upper and Lower Floridan Aquifer and not surficial groundwater samples. In the Brevard County surficial groundwater data, the natural land cover concentrations matched well with the SWIL output and had low nutrient concentrations. The SWIL Model estimates loading at the mouth of the lagoon, so the upland wells are expected to be representative of the nutrient concentrations at the lagoon. Where we had surficial groundwater samples from areas with natural land uses, the wells matched well with the calibrated data. However, there was a lot of variability in the Brevard County surficial well data associated with developed land uses. For example, some of the areas measured in Brevard County had septic systems and some had sewers. Some areas had wastewater effluent disposal with high nutrient concentrations and some areas had wastewater effluent with lower concentrations. Aggregating those concentrations in developed areas was expected to yield higher concentrations than the modeled concentrations for subsurface concentrations at the lagoon. The purpose of the SWIL Model is not to represent the surficial concentrations at every location in the basin but to capture what the concentration will be when it reaches the lagoon. To date, we haven't put the developed area surficial concentration numbers side-by-side to the subsurface flow concentrations predicted by the SWIL Model because there is attenuation of the loading expected between the developed areas and subsurface water that is discharged to the lagoon. The concentrations were higher than what we ended up as EMCs for subsurface flows into the lagoon. For natural areas, the subsurface concentrations were very close.

Q: What practical level of monitoring is warranted to improve reliability of the SWIL Model as a guide for public policy and total maximum daily loads (TMDLs)?

A: Part of what DEP is achieving with the IRL BMAP updates and the IRL Protection Program is reviewing the monitoring networks and looking at what additional data are needed. If you have feedback for DEP on data needs, please provide that information to Diana Turner. Data are always welcome by modelers when calibrating. However, when modelers use periodic samples (e.g., monthly samples), the data represent one point in time. We are counting on that measurement to represent the conditions for the entire sampling period (i.e., month). More continuous monitoring would be very welcome because then you get a better sense of the variability of the data and how much the periodic samples represent the average conditions. We know that there are spatial differences in the model too that are not always represented by the stations. The estimates are limited by the available data.

Q: The presenter stated golf courses are characterized as "light development." I'm just wondering how that is looked at from a development perspective as they have a high impact on our natural resources. There should be a push for requirements for them to reclaim/reuse their own water on site.

A: DEP can look into that suggestion as we work on the BMAP updates. We are unsure how those requirements would function in the development process. Note that in the SWIL Model, each land use cover has its own EMC, including golf courses. For golf courses, the EMCs for nitrogen and phosphorus are fairly high. The optimization process in the SWIL Model kept the subsurface concentrations of parks and golf courses linked together.

Q: Did you evaluate model calibration performance for total phosphorus (TP) and total nitrogen (TN) using metrics like root mean square error (RMSE), standard error, or other metrics?

A: Keeping in line with prior work by Harvey Harper, we looked at percent bias (PBIAS) to see if the error is within the range of plus or minus 25 percent. We also considered the Nash-Sutcliffe Efficiency (NSE) as described in the presentation. The model creates a month-to-month estimation of flows. More factors could be considered. However, in keeping with prior work, we focused on those two metrics.

Q: Is TP & TN speciation (speciation of pollutants) identified in any studies? Would this information be helpful to understand if biosolids are significant sources?

A: With previous work, we reviewed the literature for EMCs. There were too few studies that provided the details that we would need to speciate the nutrients. In a separate effort, we did a subset of the speciated models, and it was quite difficult. We need more water quality data and more monitoring of EMCs to do that effectively and to calibrate.

Next Steps

Q: Since FDEP is now also looking at loadings to the St. Johns River, is there any consideration to expanding SWIL to the St. Johns Basin?

A: We have not looked at expanding the SWIL Model to the St. Johns Basin, but we could consider that after the next BMAP update and see if that is something we want to do.