Wood Stork Foraging Probability Index

(STORKI v. 1.0)

User's Guide

(photograph by William Perry, Everglades National Park)

Alicia Lo Galbo*, Leonard Pearlstine, Janice Lynch, Mario Alvarado, Robert Fennema

South Florida Natural Resources Center, National Park Service, Everglades National Park, 950 North Krome Avenue, Homestead, FL 33030, USA

**Corresponding author. Telephone: 305-224-4243*

E-mail addresses: Alicia_Logalbo@nps.gov, Leonard_Pearlstine@nps.gov, Janice_Lynch@nps.gov

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Table of Contents

Model Description

Everglades Wood Stork Foraging Probability Index (STORKI v. 2.4.2) is a wood stork foraging probability model that can be used to assess potential effects of Everglades' restoration scenarios on habitat foraging suitability for the wood stork (*Mycteria americana*).

Key objectives of this project include the following:

- develop a spatially-explicit wood stork foraging model whose spatial domain will include the freshwater marshes within the Florida Everglades Water Conservation Areas and Everglades National Park;
- develop the model in collaboration with other scientists and facilitate code sharing to encourage the long-term development and use of the model;
- develop a model that can be used to readily evaluate Everglades restoration scenarios from hydrologic input provided by models such as the Regional System Model (RSM) and the South Florida Water Management Model (SFWMM);
- generate coding spatio-temporal output that meets international NETCDF NetCDF program coding file formatting standards; and
- develop a flexible modeling framework so that existing model parameters can be readily modified and new model parameters can be incorporated.

This document describes how to install and use STORKI v. 1.0. Please refer to the Ecological and Design Documentation for the STORKI v. 1.0 model rationale and methodology.

Software Requirements

Java JRE 1.5 or greater is required to run STORKI.

Installation

There is no installer for STORKI. Simply unzip the directory to the desired location.

If you are editing and compiling the Java source code, then you must also download the DiSC HPCC framework from simGlades.org. The DiSC documentation describes how to add the DiSC libraries to your project.

Inputs

Input files Summary:

File	File Type	Description
Daily Water Depths	NetCDF	Raster temporal data of water depths typically at 400x400 or 500x500 meter resolution.
Wood Stork Colonies	Text	File containing the UTM coordinates of wood stork colony locations.
Parameters	Text	Contains the path and filenames of input and output files and all the user-modifiable parameters used in the simulation.

Daily Water Depths

Any daily water depths raster dataset can be used; however, for Everglades restoration planning, the input water depth files are 500m resolution orthogonal interpolations of the gridded South Florida Water Management Model (SFWMM, 2 mile native resolution) or the Regional Simulation Model (RSM, variable mesh resolution). Everglades research may also use Everglades Depth Estimation Network (EDEN) time series, the M3ENP hydrologic model (Florida International University / Everglades National Park) or the USGS TIME/BISECT. All of these models are the 400m resolution orthogonal grids.

Interpolations are generated using a Delaunay Triangulation approach with the **SpecificRSMconverter** application created by JEM (jem.gov). Although RSM is in the application's name, it can also be used for interpolating orthogonal datasets including the SFWMM. For more information about Delaunay Triangulation, see the reports at http://www.cloudacus.com/simglades/WaDER.php.

The extent of the wood stork output will be equal to the extent of the water depths file.

Wood Stork Colonies

A file listing wood stork colony locations must be located in the ./input folder and must be called "Wood_Stork_Colony_Locations.csv". The file contains a header in the first row, followed by the data in the subsequent rows. Each row has at least 3 columns that must contain the colony name, the colony's UTM y coordinate, and the colony's UTM x coordinate in that order. Additional columns will be ignored. All columns must be separated by commas.

Example Wood_Stork_Colony_Locations.csv file:

```
Colony,UTMy,UTMx
Lox NC-4,2934894.,572107.
Lox# 01083,2932193.,573709.
Jetport,2860524.,516157.
3B Mud East,2853782.,551125.
Jetport South,2854109.,515134.
Jetport new,2861143.,515668.
```

Parameters

User changeable parameters must be located in the ./input folder and must be called "parameters.txt".

There are 17 modeling parameters that are user-changeable, but there are only a few parameters that the user will change regularly. The other parameters will usually only be changed to experiment with the model's behavior. The defaults for these parameters are the values that should be used for Everglades restoration planning and should not be ordinarily changed.

Each of the 17 parameters must be listed with a value in the parameters.txt file. The parameter name must be at the start of a line followed by a greater-than sign (">") used as a separator and then the value of the parameter. Double slashes at the beginning of the line can be used to include comments in the file. The order of the parameters in the file does not matter. See Figure 1 for an example parameters.txt file.

Parameters that will regularly be changed by the user:

Parameter Name	Values	Description
in_hydro		Path and file name of input NetCDF file containing daily water depths.
out_file		Path and file name of output files. Do not include the output file name extension. 2 output files are created: • a NetCDF file with a .nc extension that contains all the spatial layers (see outputs below). • a text file with a .txt extension that contains output variable values at the specific colony locations.
layer_name		Name of the layer in the in_hydro file that contains the water depth values.
units	'mm', 'cm', or 'ft'	Measure units used for recording water depth in the in_hydro file.
extent	'all' or 'colonies'	'all' produces cell and neighborhood spatial output layers. 'colonies' only produces cell spatial variable output layers. 'all' & 'colonies' both produce a text file of colony variables. See Output section for more information.
start_year	yyyy	Year to start the simulation. Start_year should be >= the starting year of the in_hydro file time series.
end_year	yyyy	Year to end the simulation. End_year should be <= the ending year of the in_hydro file time series.

Parameters that are not ordinarily changed by the user. Output with parameters that are changed from this section may change model behavior and should be carefully documented.

Parameter Name	Default Values	Description
forage_radius	23.4	Forage radius is in kilometers
skip	3	The sampling rate within the forage radius when "all" is selected for extent.
colony_skip	1	The sampling rate within the forage radius when "colonies" is selected for extent.
top_percent	23	Average of top_percent of values in forage_radius
begin_season	Dec-01	Starting month & day for breeding season
end_season	Jul-15	Ending month & day for breeding season
location	13	Foraging response to water depths is modeled as a skewed normal distribution. Location, Shape, Scale, and Max are parameters used to describe the skewed normal distribution.
shape	3.66	See description for the location parameter
scale	14	See description for the location parameter
max	0.66	See description for the location parameter

```
//Document    : Parameters.txt
//Created on : Febuary 29, 2012, 2:00 PM
// Author     : l pearlstine
// Description:
//    Parameters for Woodstork_v4.1 foraging suitability index model

// lines starting with "//" and blank lines are ignored.

//LAYERS
    //in_hydro units must be "mm", "cm", or "ft"
    in_hydro      > C:/Documents/Projects/EDEN/version2/1991-2011_Depth_mm.nc
    //out_file filename is given without an extension
    out_file      > C://Projects/Woodstork/output_v2_4_2/TEST_ALL_2000-2010-skew8_0_21
    layer_name    > depth
    units         > mm

//SIMULATION PARAMETERS
    //two options for extent are "colonies" or "all"
    extent        > all
    //forage radius units are km
    forage_radius > 23.4
    //skip is the sampling rate within the forage radius when "all" is selected for extent
    //colony_skip is the sampling rate within the forage radius when "colonies" is selected for extent
    skip          > 3
    colony_skip   > 1
    top_percent   > 23
    //begin_season & end_season defaults are Dec-01 & Jul-15
    begin_season  > Dec-01
    end_season    > Jul-15
    start_year    > 2000
    end_year      > 2010

//SKEW NORMAL
    // current default (2/26/12) is location: 13, shape: 3.66, scale: 14, ,max: 0.66
    location      > 8
    shape         > 0
    scale         > 21
    max           > 0.4
```

Figure 1. Example parameters.txt file.

Outputs

Output		File type	Description
GIS Raster with 3 or 7 data layers*		NetCDF	
1.	Proportional depth change		Proportional change in water depth from 7 days prior to the present.
2.	Cell forage probability		Probability index at each grid cell that wood stork will forage at that cell.
3.	Cell suitability index		Index at each grid cell of cell forage probability modified by proportional depth change over the previous week.
4.	Neighborhood forage probability*		Average forage probability in user defined radius around each grid cell (Default = 23.5km).
5.	Neighborhood suitability index*		Average suitability index in user defined radius around each grid cell (Default = 23.5km).
6	Neighborhood top forage probability*		Average of top user defined % of forage probability values in user defined radius around each grid cell (Defaults = 23% & 23.5km).
7.	Neighborhood top suitability index*		Average of top user defined % of suitability index values in user defined radius around each grid cell (Defaults = 23% & 23.5km).
Foraging probability indices at colonies		Text (tab-delimited)	Each of the above output variables at specific colony locations.

* Neighborhood raster GIS output is only created if the user choses the option of treating each grid cell in the input domain as a potential colony (extent = all). If the user only wants output at specific colony locations (extent = colony), then this output is not produced. The raster output for proportional depth change, cell forage probability, cell suitability, and the text file of indices (including neighborhood indices) at colonies is produced regardless of the user's choice.

Running STORKI

Edit the parameters.txt file as needed and save in the Woodstork_v2_4_2/inputs directory.

Option 1. In Windows: go to the Woodstork_v2_4_2 directory and double click on run.bat

Option 2. In a Windows or Linux command window and change directory to Woodstork_v2_4_2. Enter the command "java -jar dist/Woodstork_v2_4_2.jar".