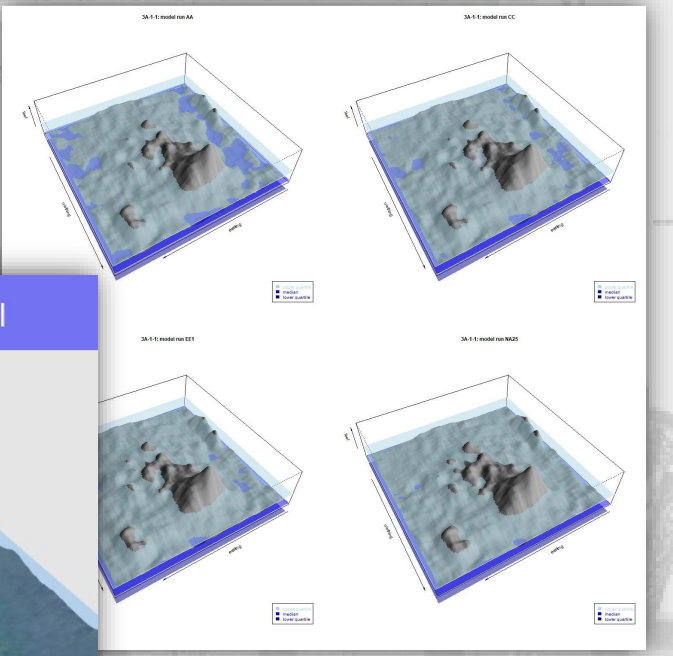
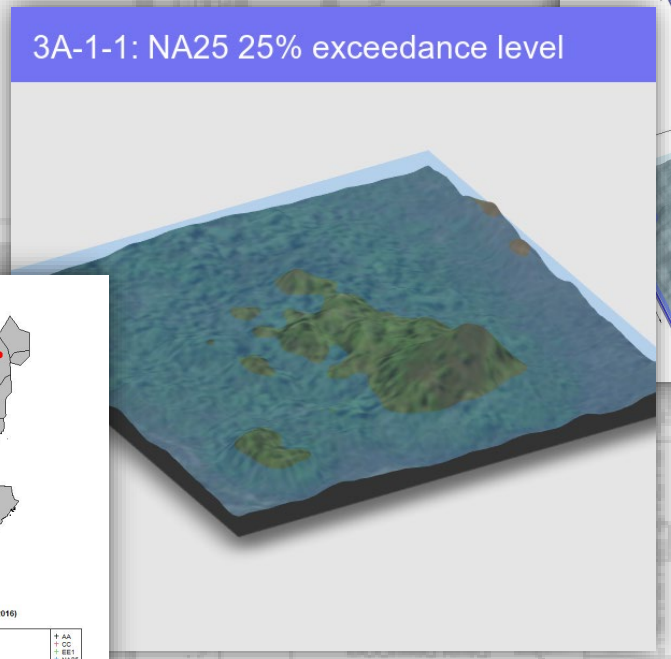
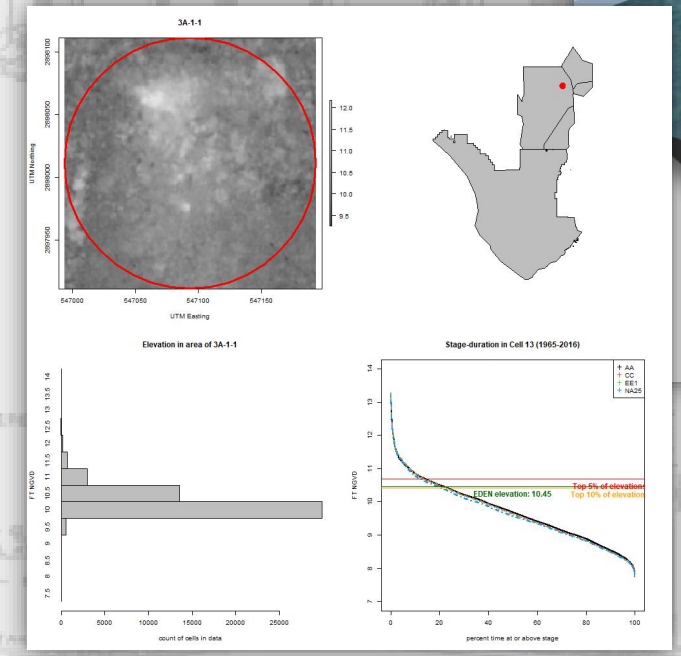
Regional Simulation Model Tree Island Tool







September 21, 2023

Chris Altes

Planning and Policy Division, Environmental Branch, Cultural Resources Section

U.S. ARMY

US Army Corps of Engineers

SETTING THE PACE
JACKSONVILLE DISTRICT

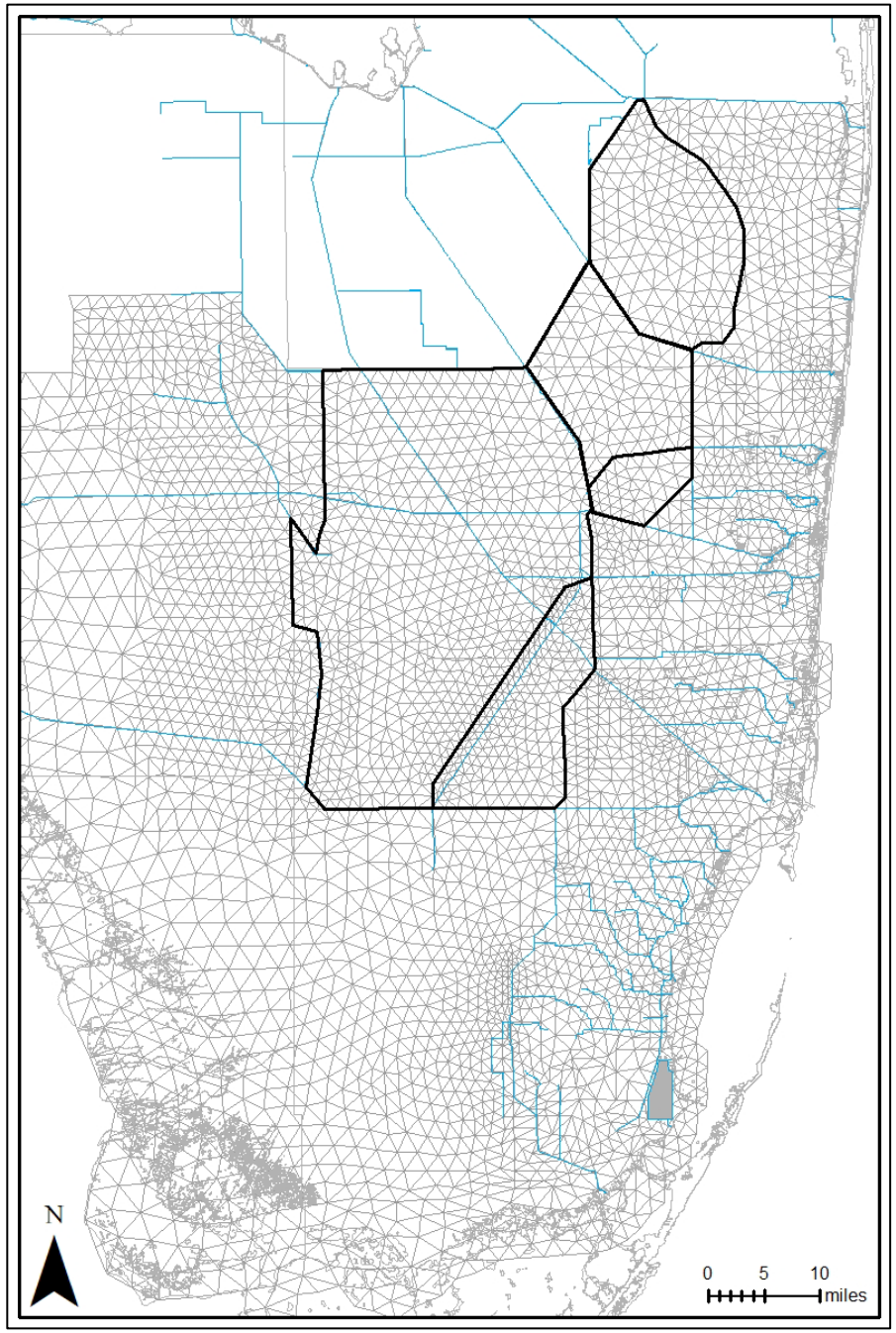
Questions driven by cultural resources concerns in analyzing modeling

- How do the modeled scenarios change water levels at this location?
- What are meaningful elevations at tree islands?
- Do the changes in modeled scenarios produce changes at meaningful elevations?
- How can we expand our inventory of sampled locations?
- What did it look like before C&SF (though not necessarily before major drainage)?
- How can we translate difficult-to-access RSM-GL netcdf files into interpretable and site-specific data?

RSM-GL

Regional **S**imulation **M**odel **- G**lades and **L**ower East Coast Service Area

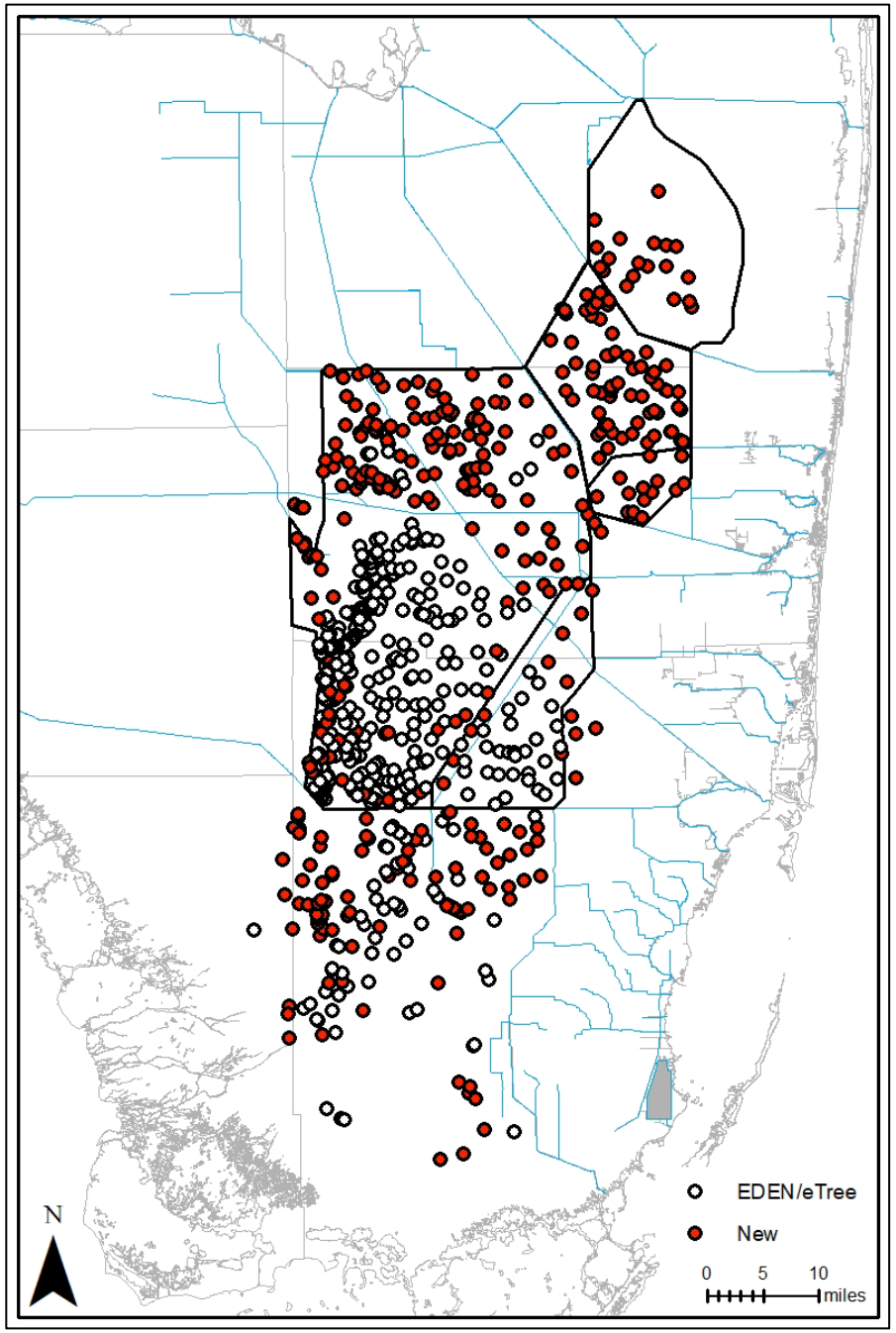
- Used by Interagency Modeling Center to simulate changes in operations
- Regional model incorporating constructed features, terrain, rainfall, and operations
- Extends from the boundary of the EAA to Florida Bay
- Irregular triangular cells
- 18993 days (1965-2016) and 7076 cells (currently)
- Output file includes daily flow vectors and stage for each cell



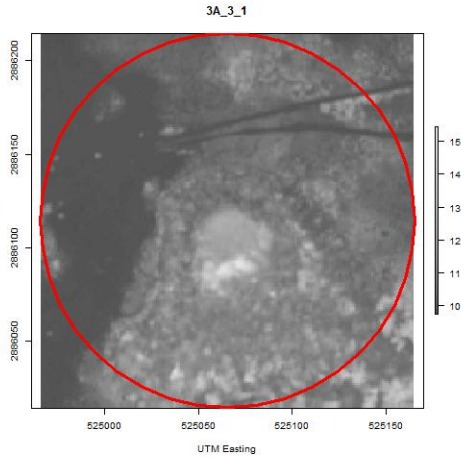
Sample Locations

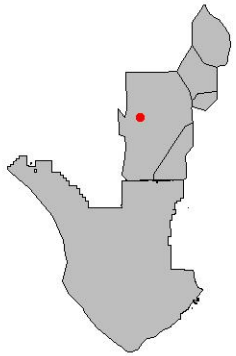
- White Points: EDEN points (400)
  - Have documented elevations
  - Part of prior analyses
  - Limited geographic area

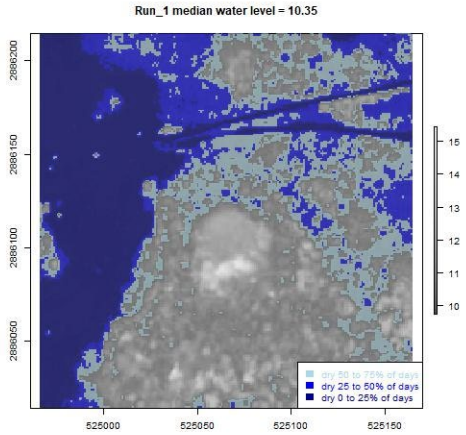
- Red Points: draft Additional Points (380)
  - Does not included surveyed elevations
  - Includes WCA 2A, WCA 2B, northeastern and northwestern ENP
  - Includes locations outside of the compartments and where there may be unintentional effects

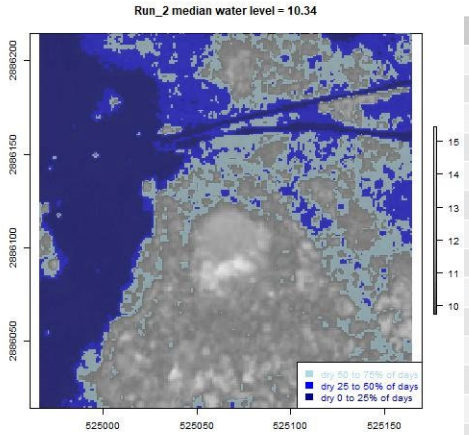


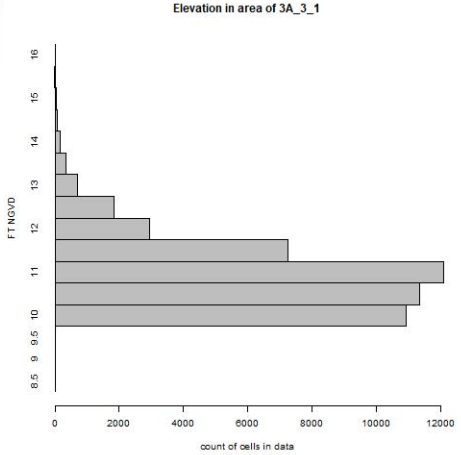
EXAMPLE OUTPUT

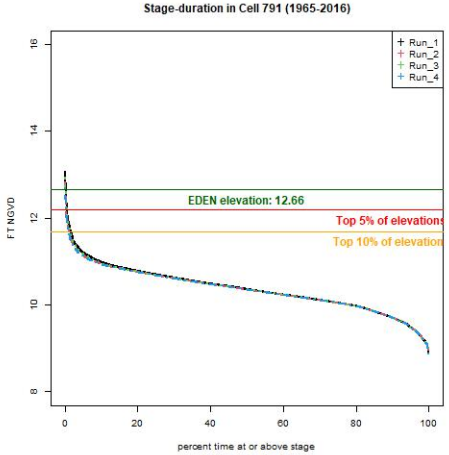


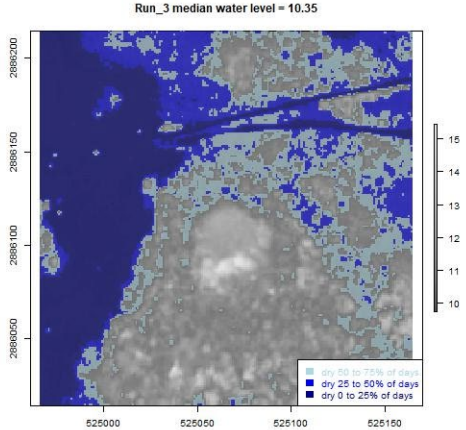


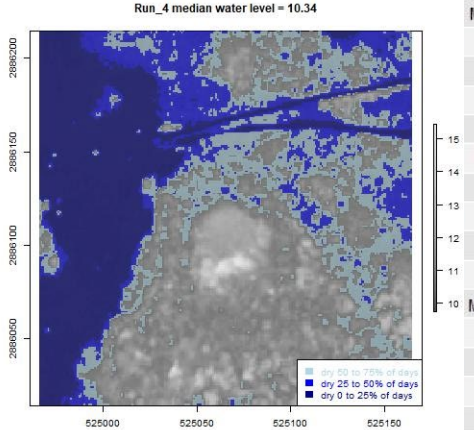






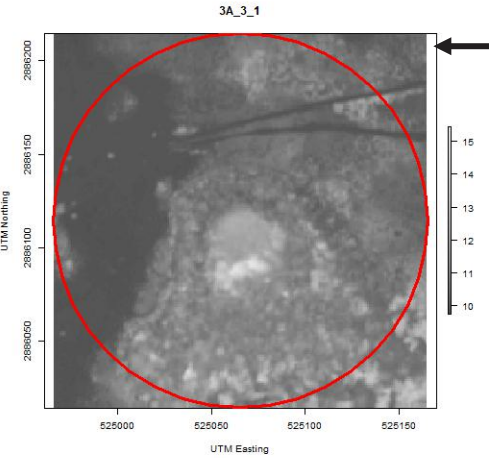


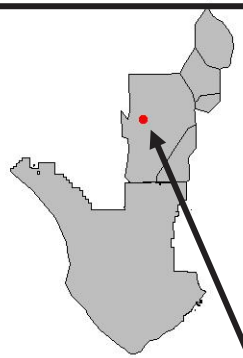




Tree Island 3A_3_1 derived stats	Run_1	Run_2	Run_3	Run_4
Maximum yearly count of days exceeded				
EDEN	52	24	42	6
EDEN minus 40 cm	186	170	172	160
Top 10% of area	158	131	146	116
Top 5% of area	89	79	81	70
Median yearly count of days exceeded				
EDEN	0	0	0	0
EDEN minus 40 cm	0	0	0	0
Top 10% of area	0	0	0	0
Top 5% of area	0	0	0	0
Minumum yearly count of days exceeded				
EDEN	0	0	0	0
EDEN minus 40 cm	0	0	0	0
Top 10% of area	0	0	0	0
Top 5% of area	0	0	0	0
Maximum yearly count of days contiguous exceeded				
EDEN	52	23	29	6
EDEN minus 40 cm	186	170	172	160
Top 10% of area	116	103	104	89
Top 5% of area	89	79	81	70
Median yearly count of days contiguous exceeded				
EDEN	0	0	0	0
EDEN minus 40 cm	0	0	0	0
Top 10% of area	0	0	0	0
Top 5% of area	0	0	0	0
Minumum yearly count of contiguous days exceeded				
EDEN	0	0	0	0
EDEN minus 40 cm	0	0	0	0
Top 10% of area	0	0	0	0
Top 5% of area	0	0	0	0

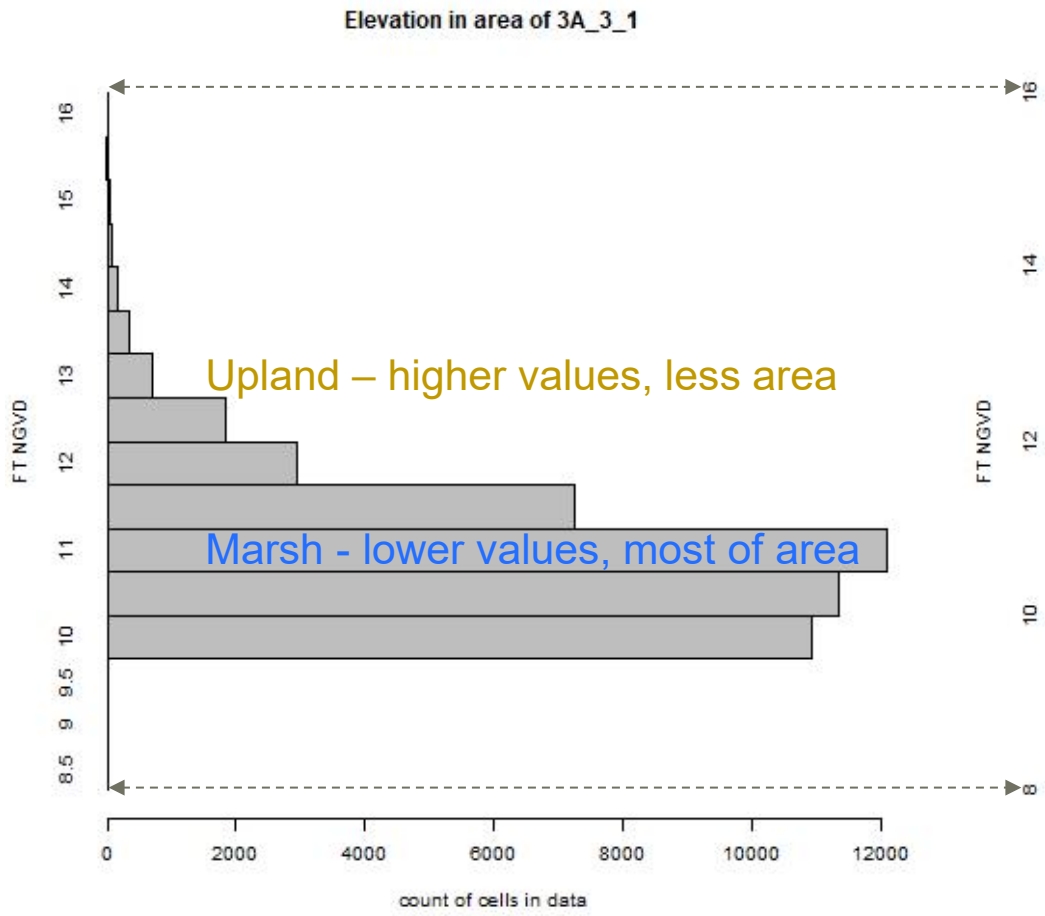
BASE INFORMATION

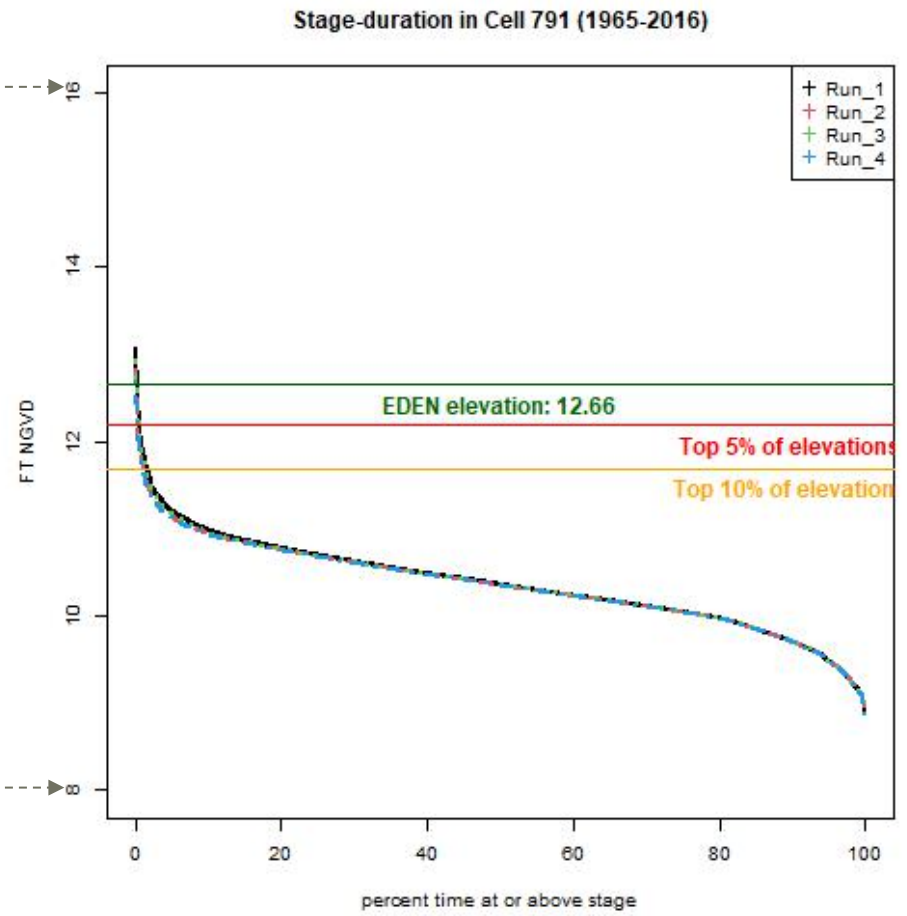




- DTM of 200-x-200m area around the EDEN single point for the tree island visualized with a contrast stretch between the local maximum and minimum values in the sample area. The white area are the highest elevations, the black are the lowest elevations.
- Sample location (red dot)

TOPOGRAPHY AND WATER LEVELS



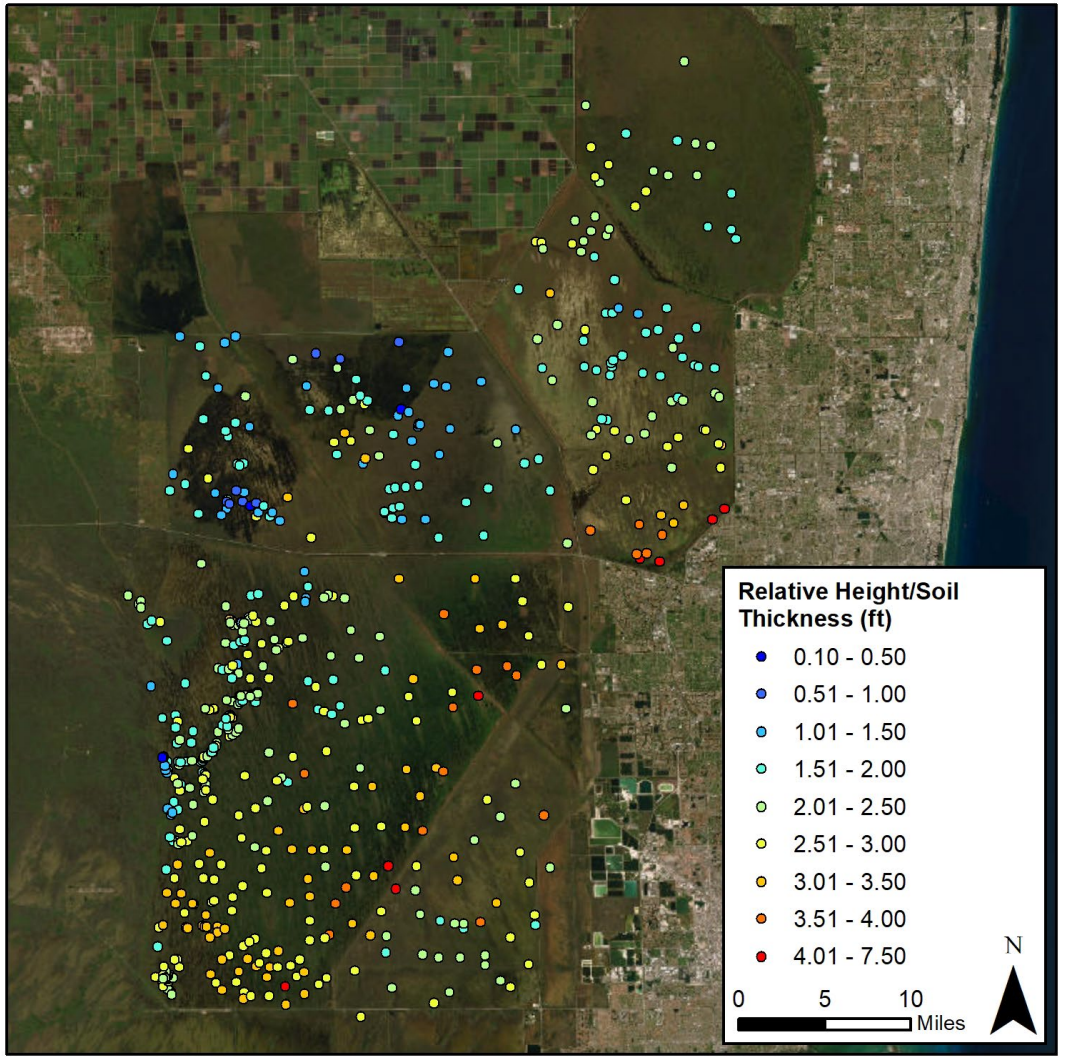


- Histogram of all elevation values in 200-x-200m sample area – including surrounding marsh – at the same vertical scale as the stage-duration curve. The Y axis is elevation, the X axis is amount of area within the 200-x-200m sample (the count is by raster cell)
- Stage-duration curves of the RSM-GL model runs (color-coded) shown with EDEN elevation (green, if available) and the top 5% (red) and top 10% (orange) of DTM elevations in the sample area as horizontal lines on top of the curves

DERIVED METRICS

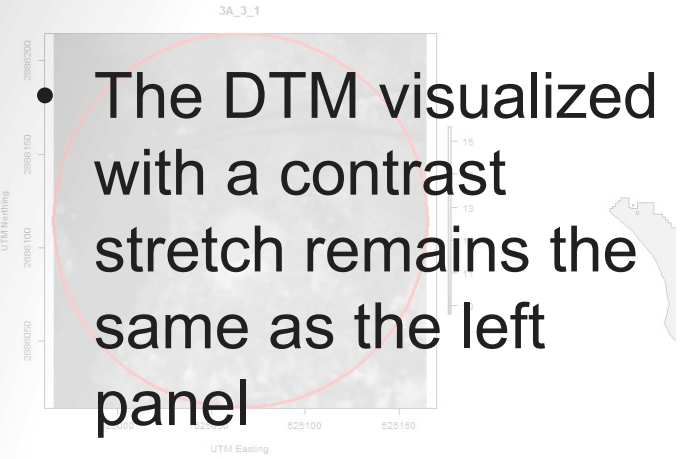
- Comparing the generated heights to the HAED measurements of slough bottoms, an approximation of soil thickness can be generated

- Difference from height of island and local median provides a relative height

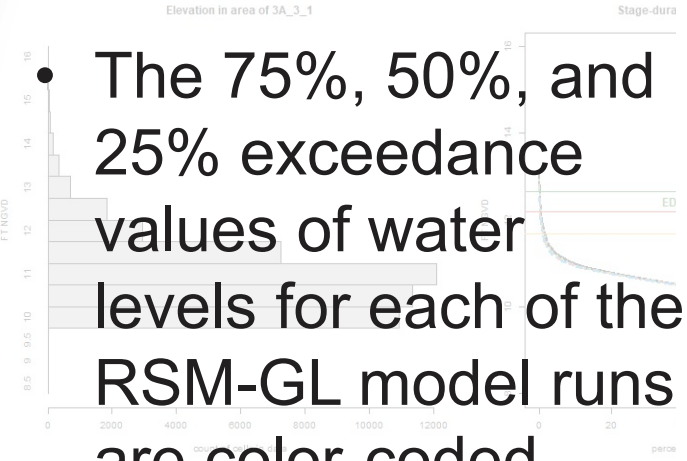


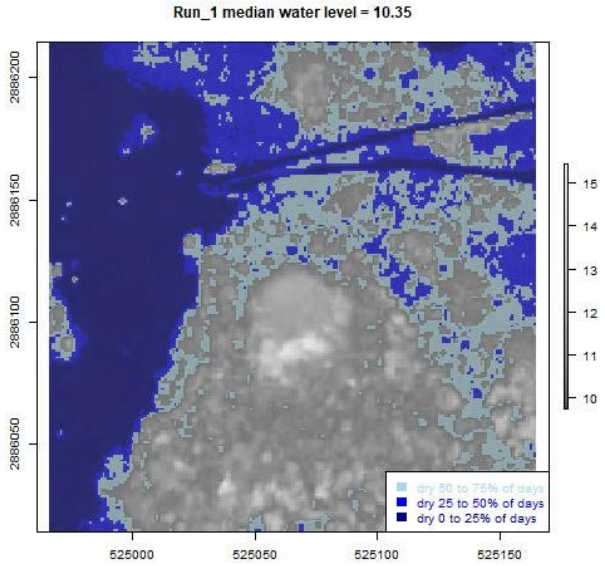
DIFFERENCES IN SCENARIOS

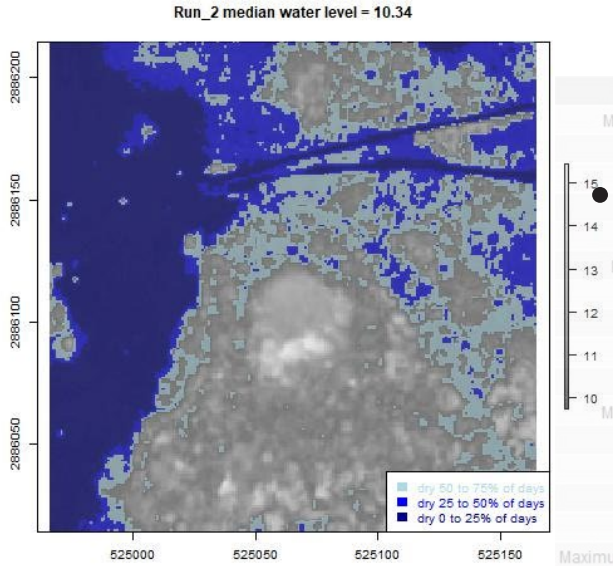
- The DTM visualized with a contrast stretch remains the same as the left panel

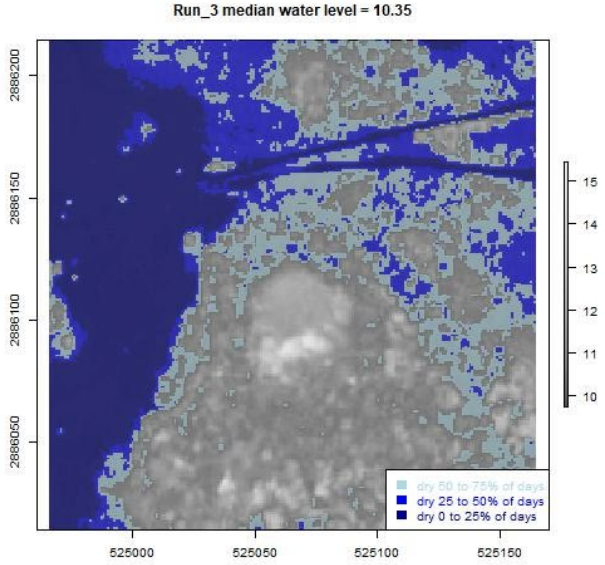


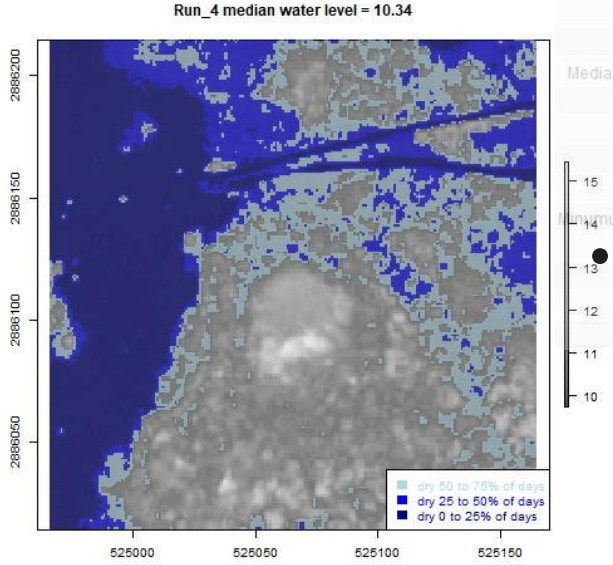
- The 75%, 50%, and 25% exceedance values of water levels for each of the RSM-GL model runs are color-coded





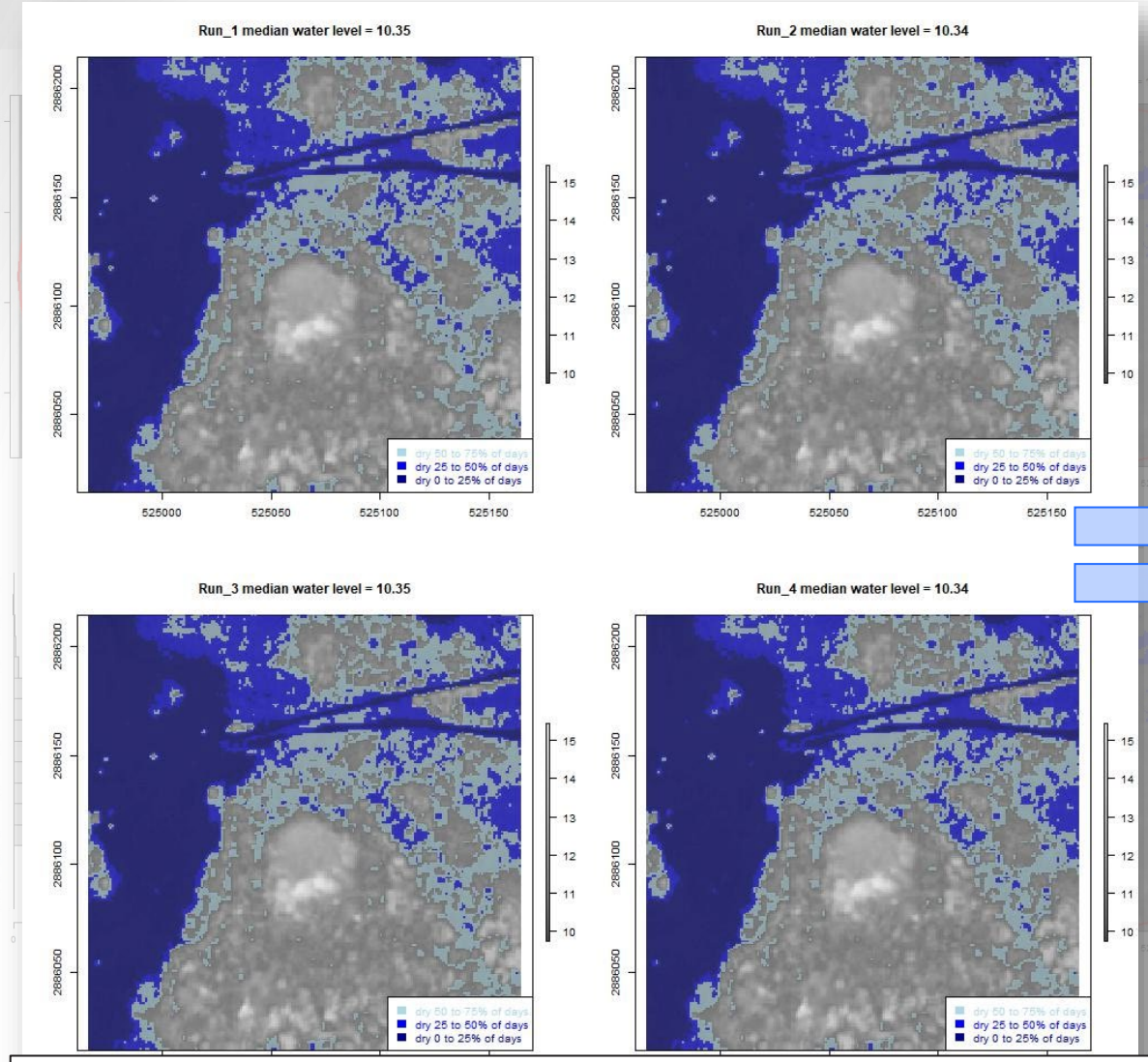




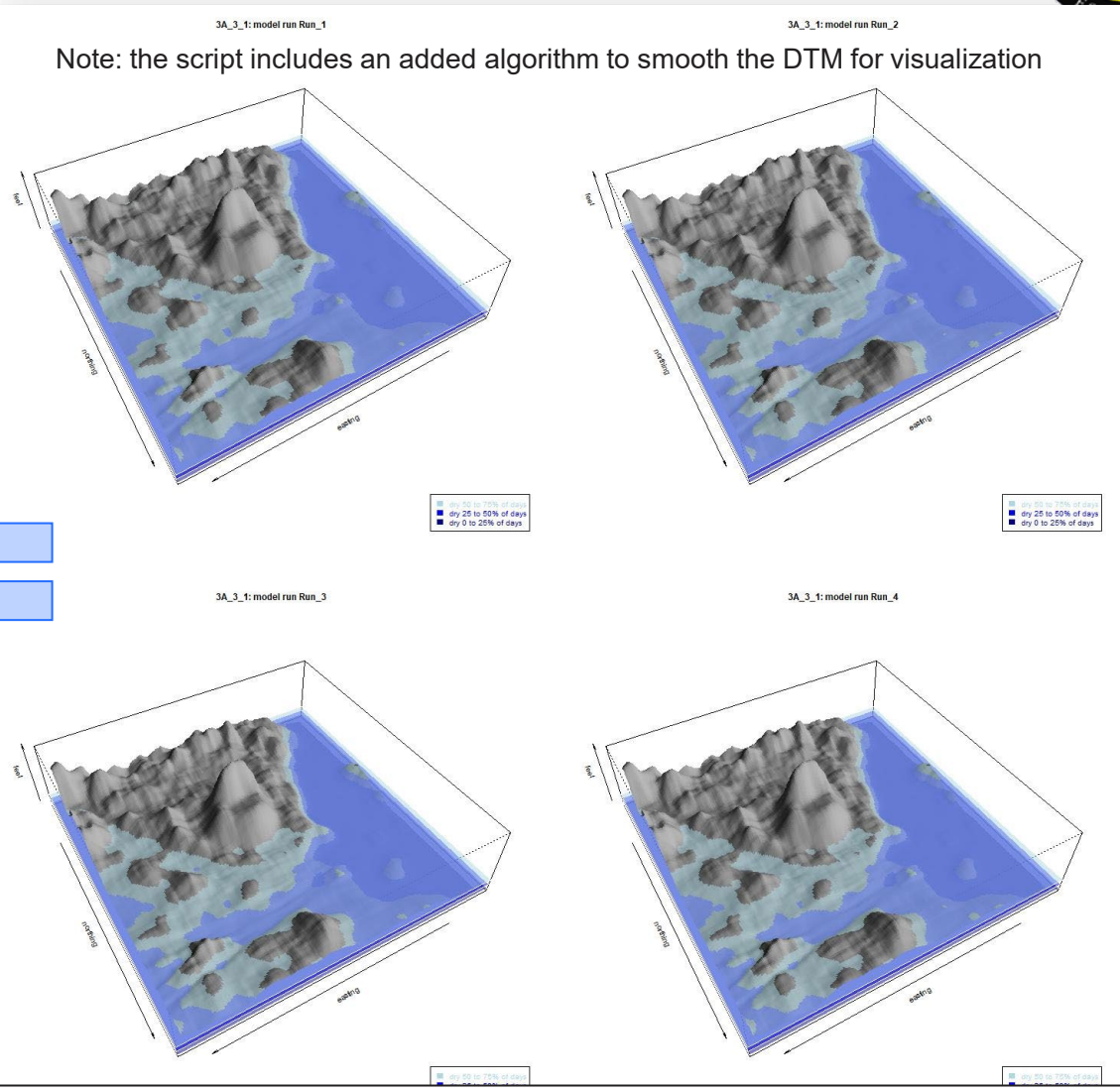


- The coloring is intended to show what is covered by water up to three-quarters, one-half, and one-quarter of the time in the RSM-GL model run
- DTM is <u>not</u> vegetation-corrected

EXAMPLE OUTPUT VARIATIONS



Note: the script includes an added algorithm to smooth the DTM for visualization



The lightest blue is the 25-50% exceedance (mostly dry), the middle blue is the 50-75% exceedance water level, and the darkest blue is the 75% exceedance (mostly wet) from the stage-duration curves previously shown. The two images show the same information. If a color is not present, it means that point is not about the ground surface in the sample window at that point in the stage-duration curve (drawn below ground on the right).

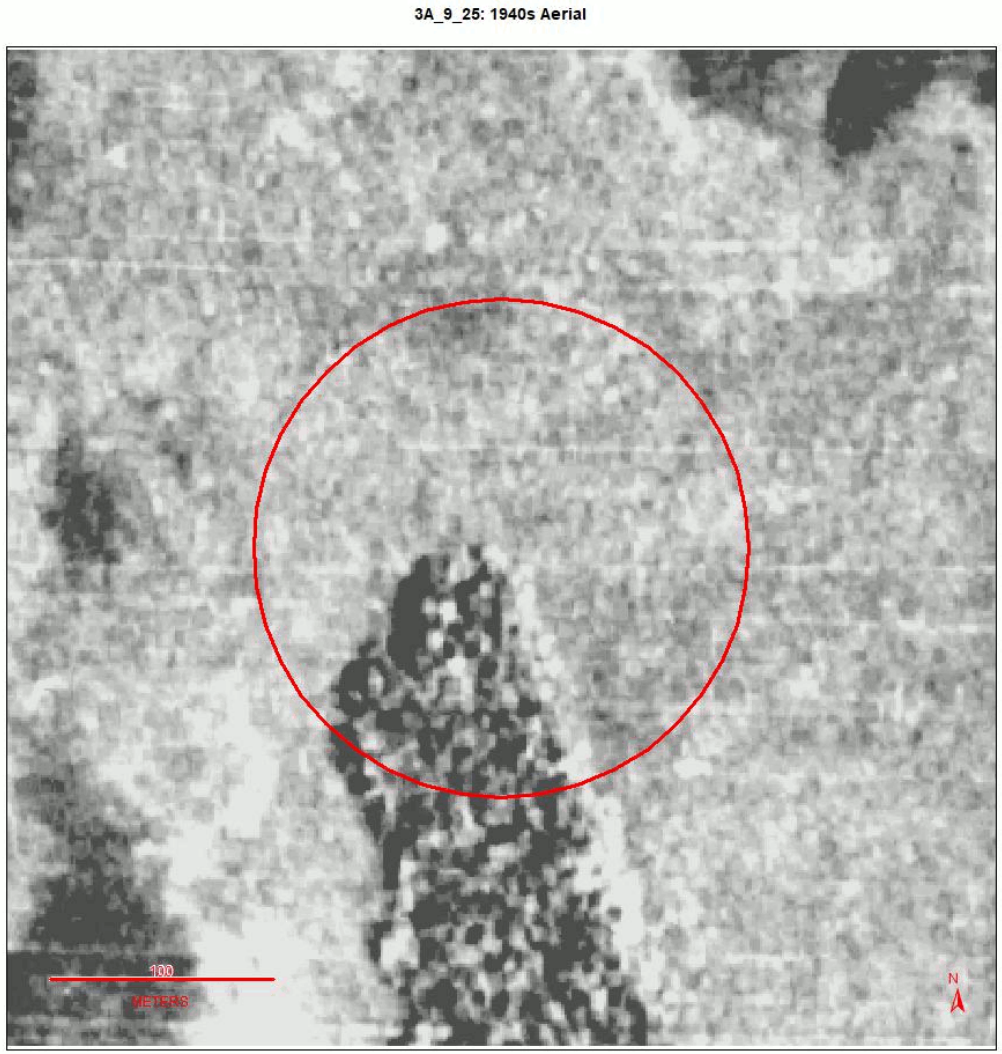
EXAMPLE STATISTICS

- Summary statistics on counts of days with exceeded values by water year (May 1 Year 1 through April 30 Year 2). This is presented in maximum, median, and minimum counts in days by water year
- Includes EDEN elevation, EDEN elevation minus 40 cm (a hardwood rootzone proxy), the top 10% of elevation values in the DTM, and the top 5% of the elevation values in the DTM
- Separately summarizes continuous exceedances in count of days. This is how many days in a row the threshold values are exceeded.

Tree Island 3A_3_1 derived stats	Run_1	Run_2	Run_3	Run_4
Maximum yearly count of days exceeded				
EDEN	52	24	42	6
EDEN minus 40 cm	186	170	172	160
Top 10% of area	158	131	146	116
Top 5% of area	89	79	81	70
Median yearly count of days exceeded				
EDEN	0	0	0	0
EDEN minus 40 cm	0	0	0	0
Top 10% of area	0	0	0	0
Top 5% of area	0	0	0	0
Minumum yearly count of days exceeded				
EDEN	0	0	0	0
EDEN minus 40 cm	0	0	0	0
Top 10% of area	0	0	0	0
Top 5% of area	0	0	0	0
Maximum yearly count of days contiguous exceeded				
EDEN	52	23	29	6
EDEN minus 40 cm	186	170	172	160
Top 10% of area	116	103	104	89
Top 5% of area	89	79	81	70
Median yearly count of days contiguous exceeded				
EDEN	0	0	0	0
EDEN minus 40 cm	0	0	0	0
Top 10% of area	0	0	0	0
Top 5% of area	0	0	0	0
Minumum yearly count of contiguous days exceeded				
EDEN	0	0	0	0
EDEN minus 40 cm	0	0	0	0
Top 10% of area	0	0	0	0
Top 5% of area	0	0	0	0

HISTORIC IMAGERY

- For comparison to pre-C&SF
- Georeferencing of historic aerials is not always precise, so wider extents are used – the view is from farther out than preceding graphics
- Script modifies the colors to make things “pop:” it makes “dark” areas darker and “bright” areas brighter. The originals are often very gray

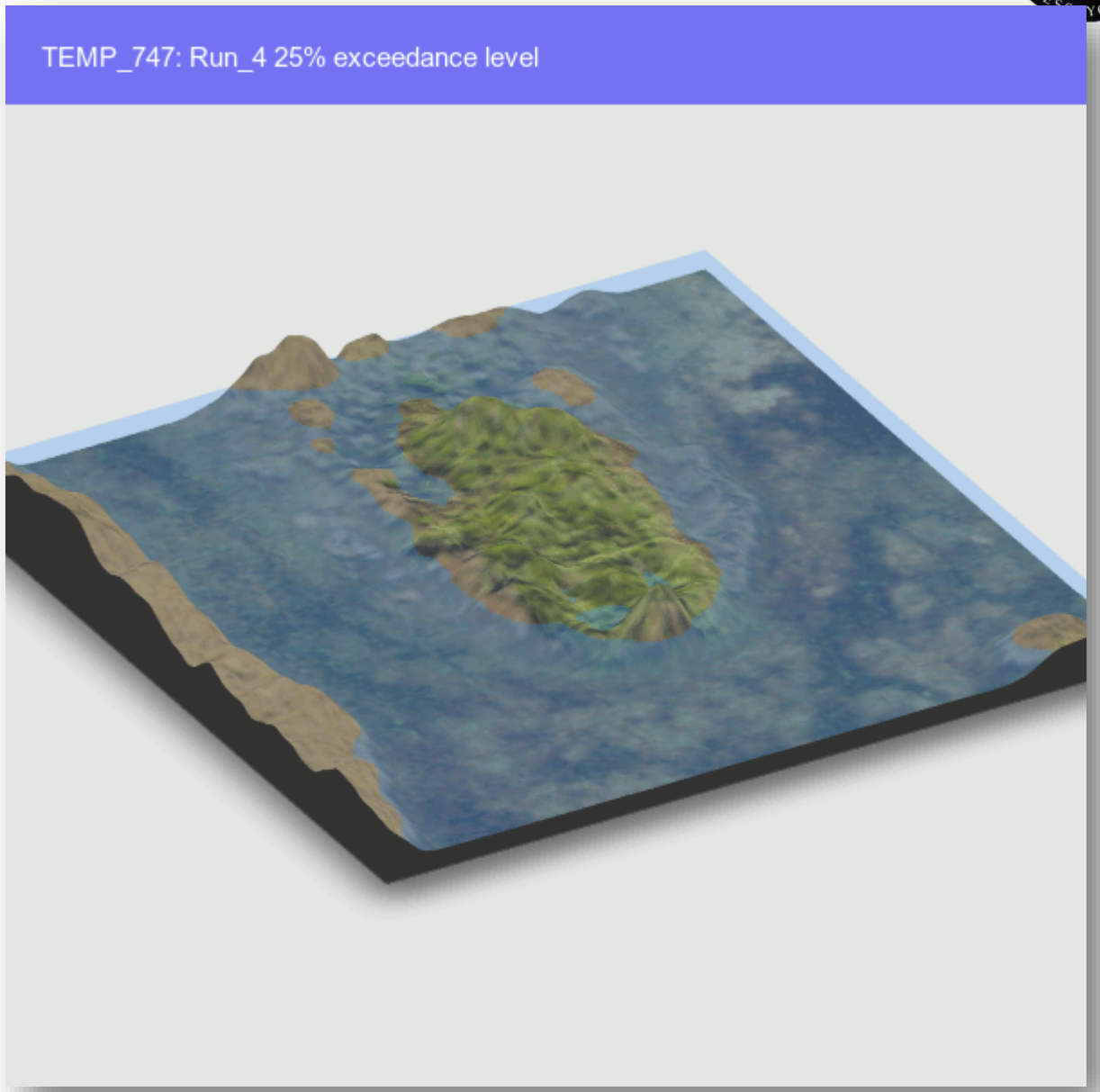


REFERENCE IMAGERY

- National Agricultural Imagery Program Plus (NAIP Plus) accessed and exported
- Server-based data from the U.S. Department of Agriculture
- Resolution is generally 1 meter
- Uses the same extent as the 1940s aerial for visualization quantitative change

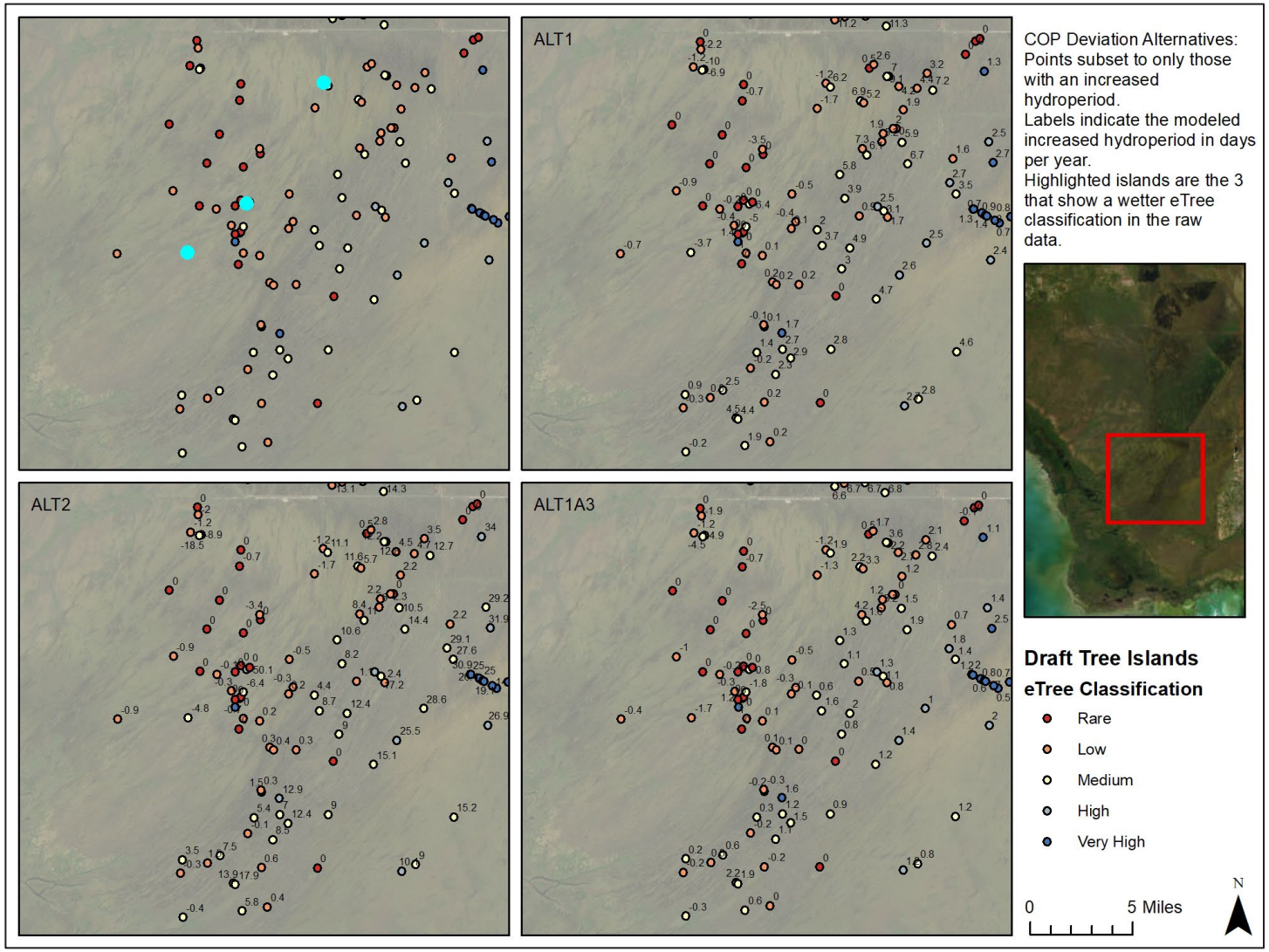
SHOWING MODELED CONDITIONS

- Three-dimensional model made from the DTM with “texture” from the NAIP Plus aerial photograph
- Water level from the RSM-GL modeling
- Vertical heights are exaggerated, but not as much as previous slide



ETREE INCORPORATION

- Apply the tree island hydroperiod categories from eTree to more locations
- Using DTM-derived elevations
- Compare modeled scenarios from RSM-GL to see if and where there is meaningful change in tree island hydroperiods: is it a potential change in character and use?



ADDITIONAL TOOLS AND NEXT STEPS

Updates:

- Deriving heights and statistics from regional 2025 Monte Carlo DTM
- Integrated targets provided by MTI
- Began implementing canopy mapping to refine target areas

In the future:

- As available, add vegetation data with threshold elevations
- Incorporate additional locations
- Add scripts to calculate any RECOVER metrics as they become available