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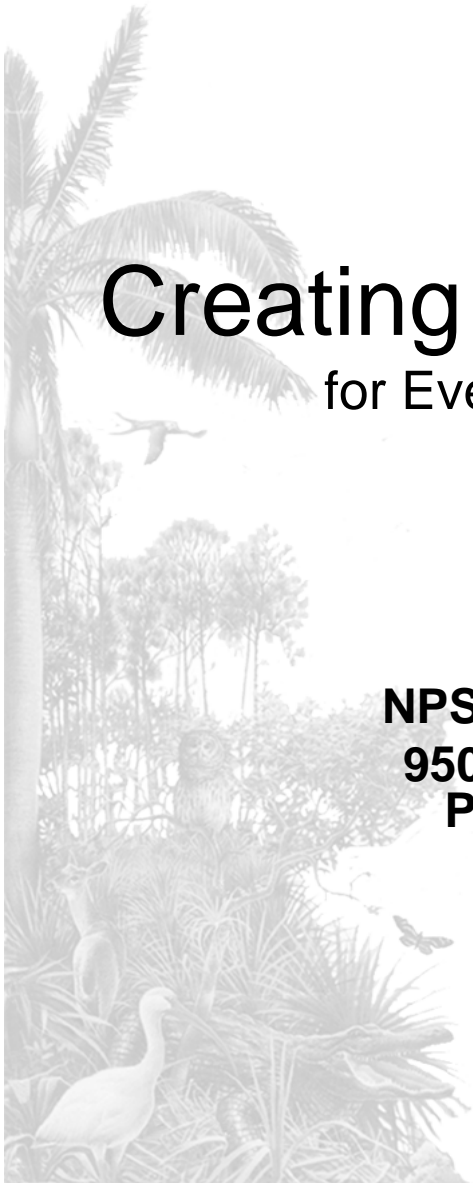


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Creating High Resolution Hydrology for Everglades Restoration Ecological Models

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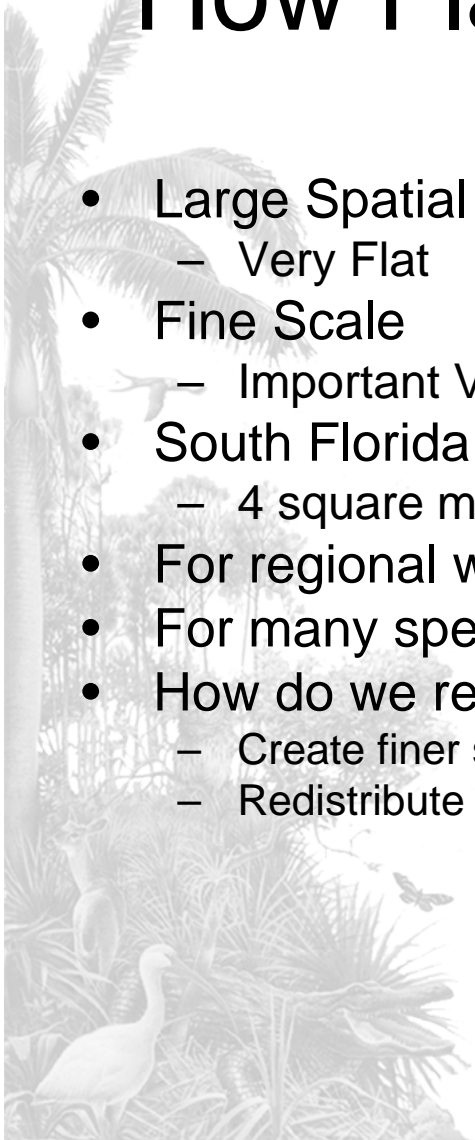




How Flat is the Everglades?

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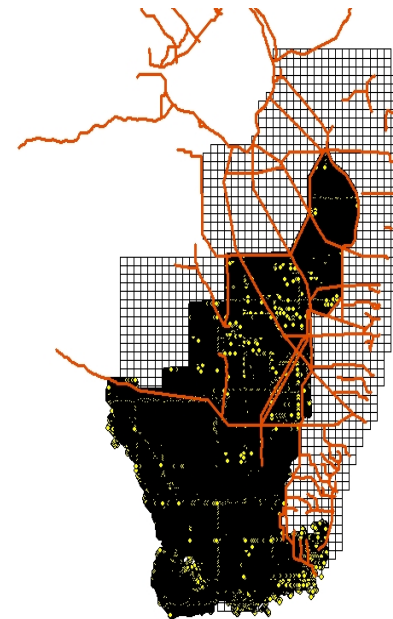
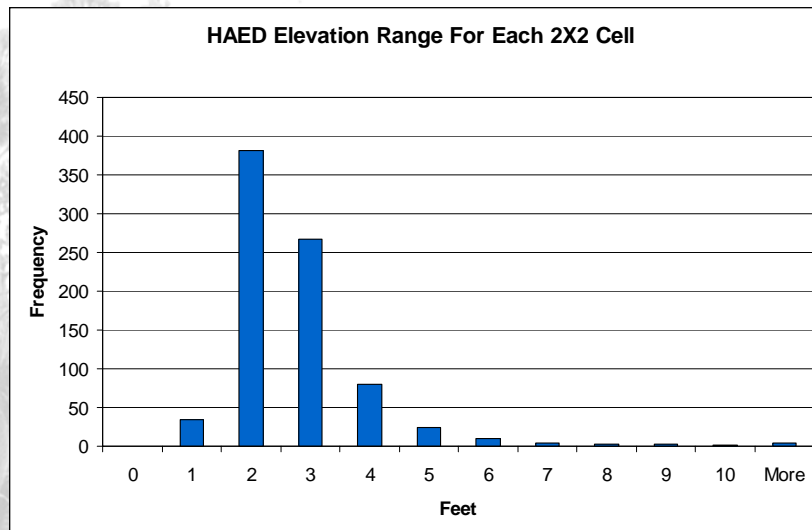
- Large Spatial Scale
 - Very Flat
- Fine Scale
 - Important Variation
- South Florida Water Management Model (2X2)
 - 4 square miles is flat
- For regional water resource planning this may be fine
- For many species, fine scale variation is important
- How do we reclaim that variation?
 - Create finer scale topography
 - Redistribute water





Map Creation-Source Data

- HAED covers most of the “Natural Areas” at a resolution of 400m.



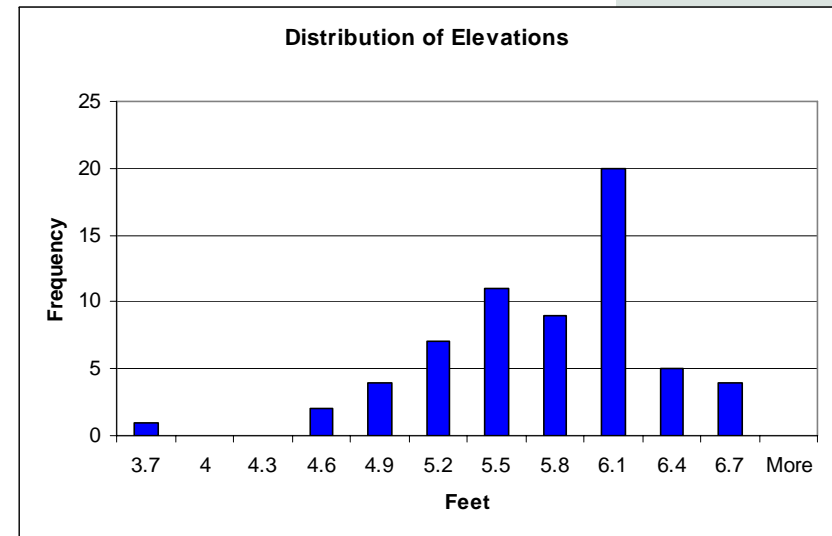
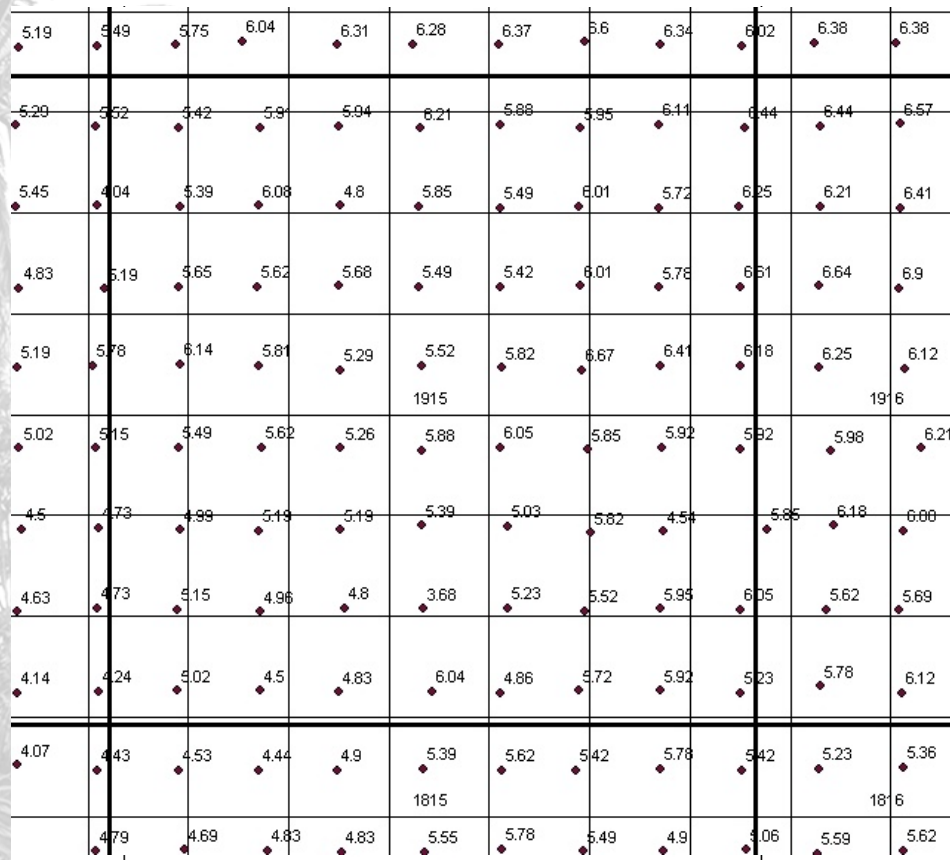
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We Use HAED to Add Back the Variation

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Why 500m Grid?

- The original HRH was developed at The Institute of Ecological Modeling, University of Tennessee, Knoxville prior to HAED so there was no predefined (400m) scale.
- As of now there are many models/performance measures that use a 500 meter grid including:
 - RECOVER Wet Prairie Performance Measure
 - 7 ATLSS SESI Models
 - CSSS Hydrologic Impact Evaluator
 - American Alligator Population model
- 400m Resolution in the future?
 - Perhaps...

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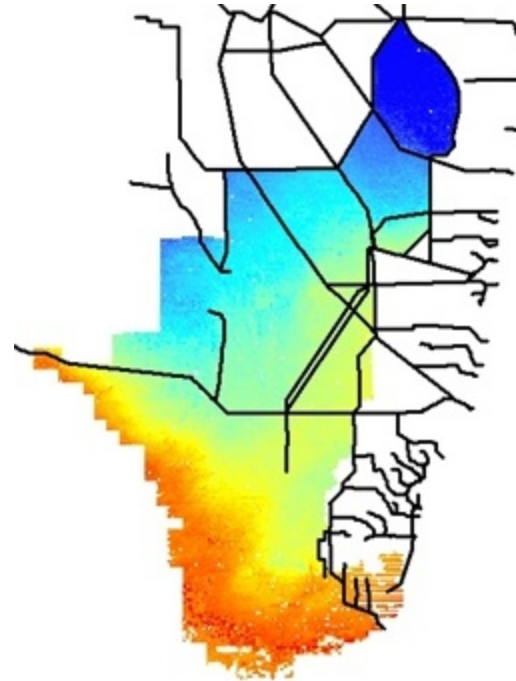
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Final 500 meter Elevation Map

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- Grid 500m Resolution
- Dimensions 419X264
- Bounds the 2X2 domain
- Where is no HAED, 2X2 elevations are substituted
- Elevation Range
 - 17 feet-> -4 feet





Adjusting Water Depths

- The Prime Directive: Don't change volume of 2X2.
- Water depths are calculated on a daily basis.
- Each 2X2 cell is treated separately and is static.
- 500m Depths are calculated relative to overall stage using combination of the 500m elevation and the soil porosity.
 - The stage may have to be adjusted to maintain the same volume as will be described in the next two slides.
- Output is binary file of short integers with units in mm. (about 2.8 GB in size.)

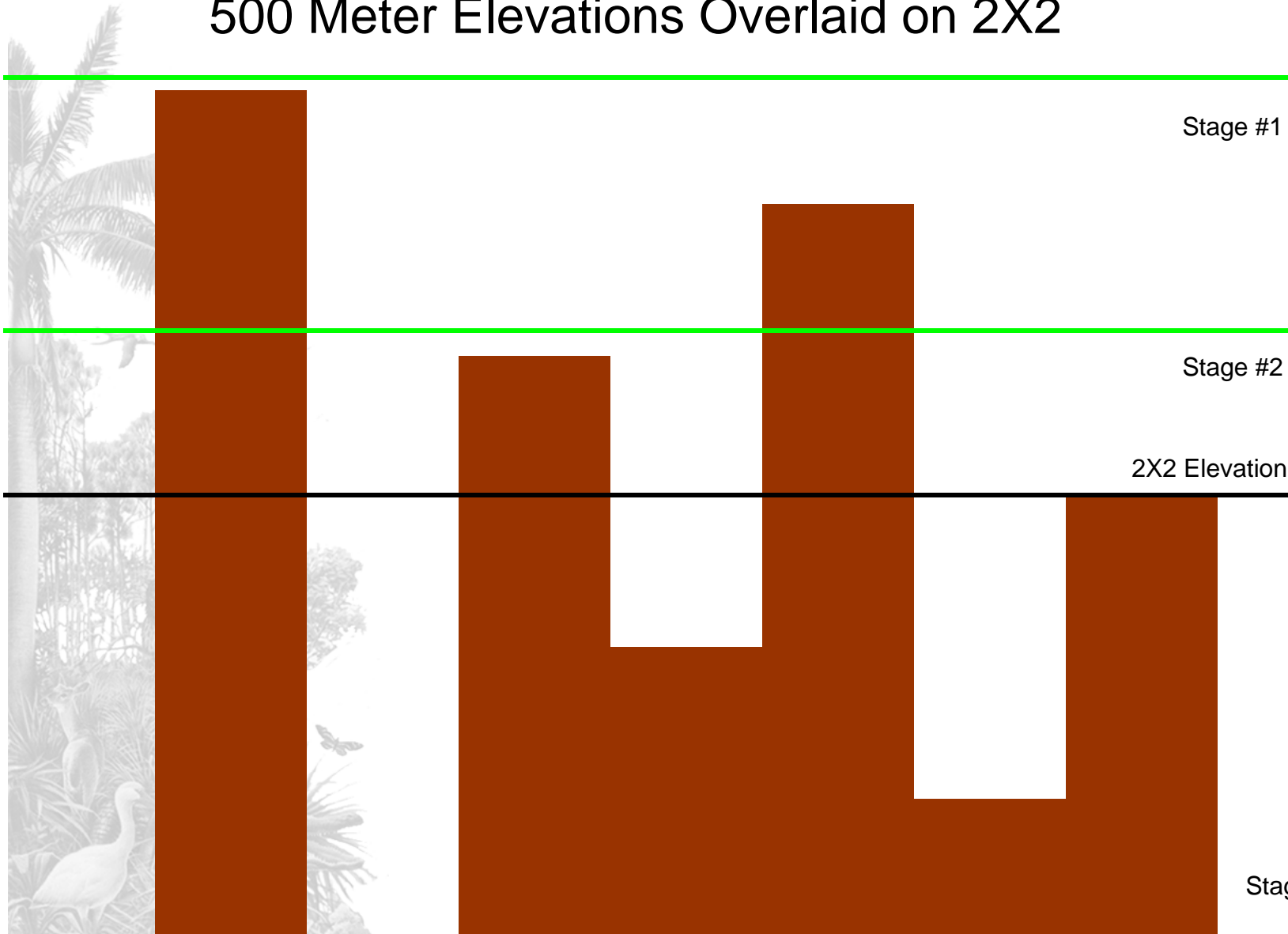
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500 Meter Elevations Overlaid on 2X2

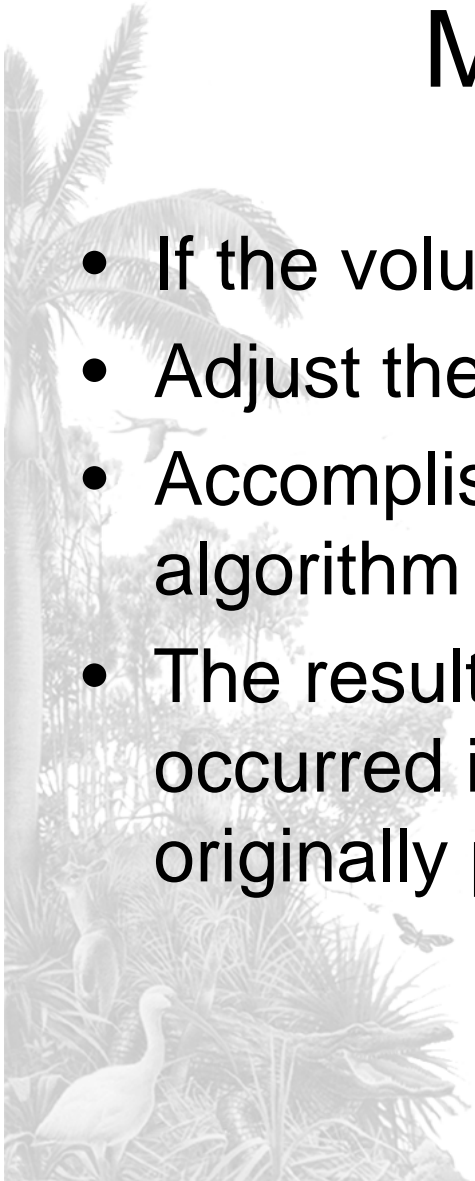
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Matching Volumes

- If the volumes don't match:
- Adjust the stage up or down until they do
- Accomplished using a simple convergence algorithm
- The result is the stage that would have occurred if the 500m elevations were originally present.



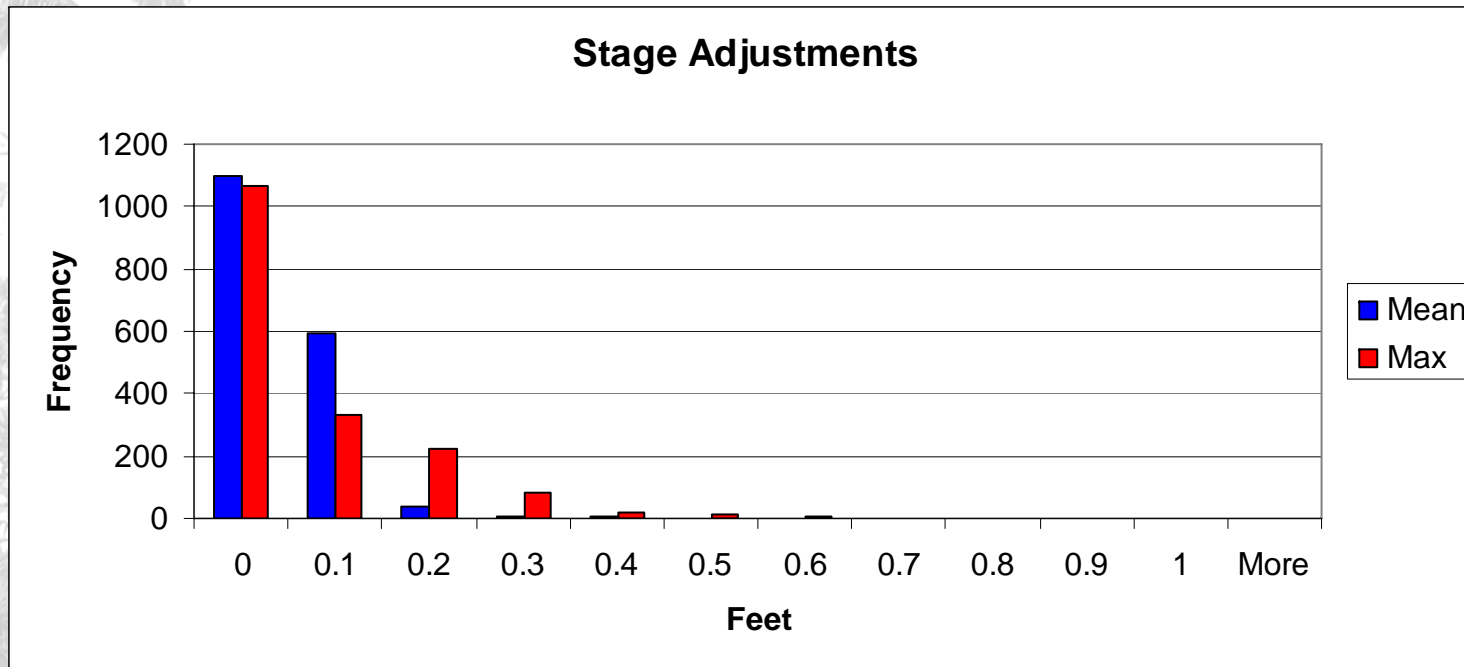
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What is the Magnitude of the Stage Modification?





Gauge Testing

- Compare gauge readings to model predictions (both 2X2 and 500m).
- 14 Gauges chosen
 - Location
 - Data Available
- Stage used as a comparison
 - Elevations not available for all gauges
 - Made “apples to apples” comparison easier
- Basic metric compares mean absolute deviation between the gauge and simulated time series

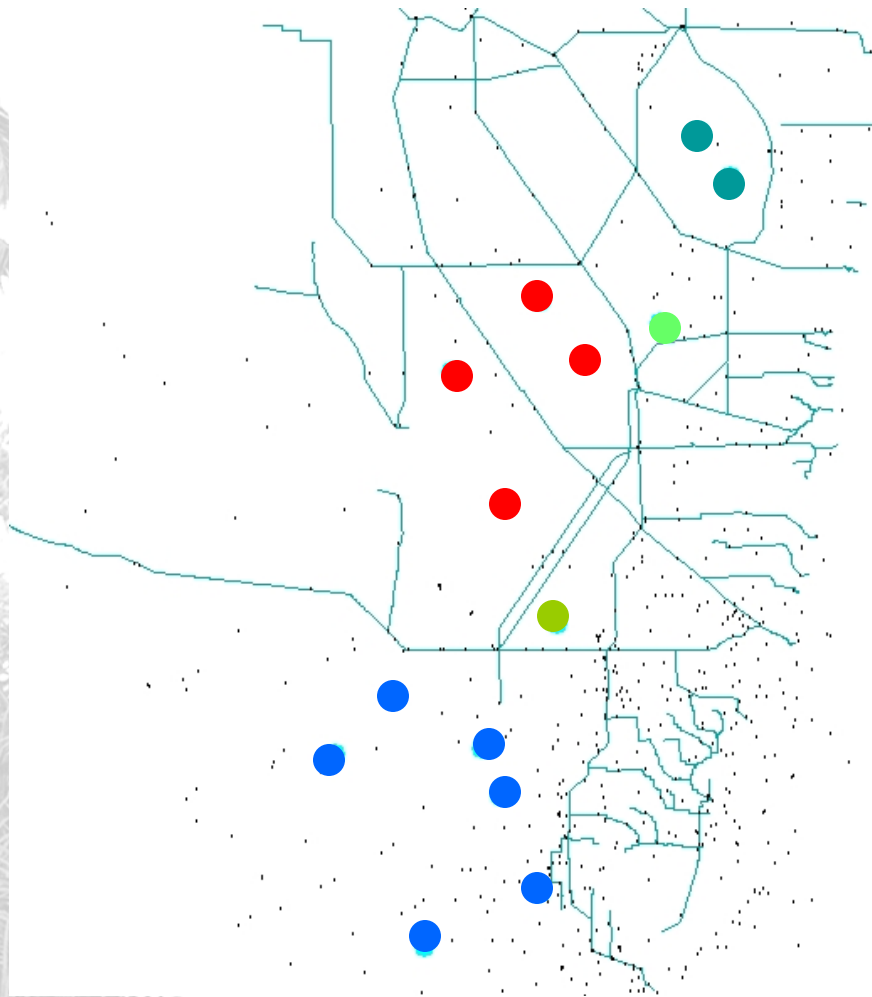
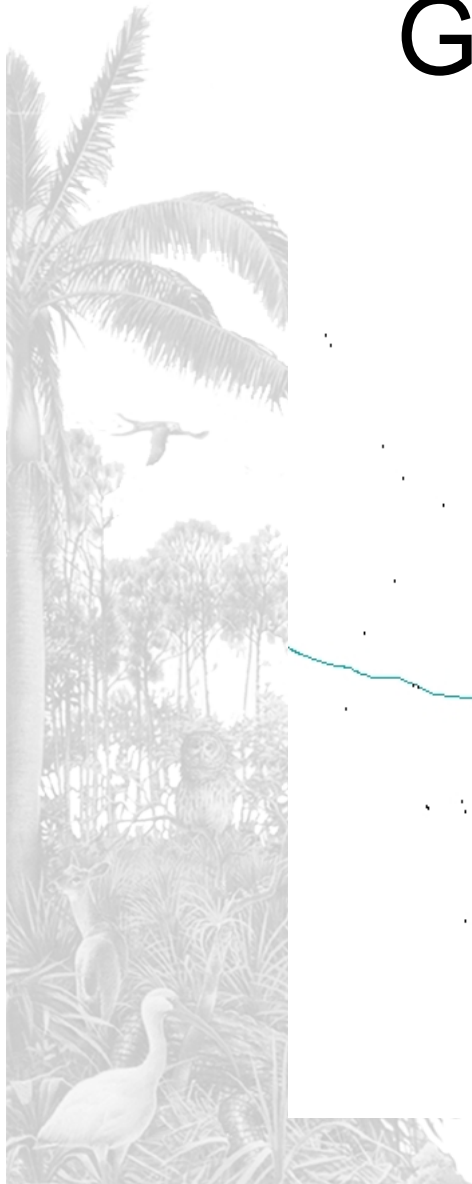
$$Score = \frac{1}{N} \sum_{i=1}^N | predicted_i - measured_i |$$

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Gauge Locations



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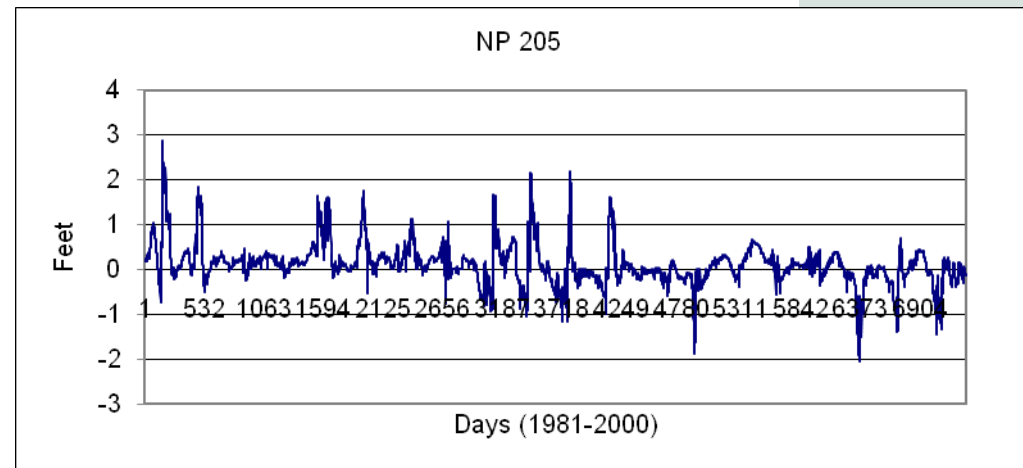
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Gauge Results

Gauge	500m	2X2
P33	0.23	0.24
NP46	0.36	0.35
P34	0.38	0.31
TSB	0.69	0.82
NP206	0.34	0.42
NP205	0.32	0.36
3ANE	0.50	0.50
3A4	0.27	0.26
3A3	0.36	0.69
3A2	0.33	0.33
SRS1	0.26	0.26
2A300	0.50	0.45
1X7	0.31	0.30
1X9	0.29	0.29
Mean	0.37	0.40

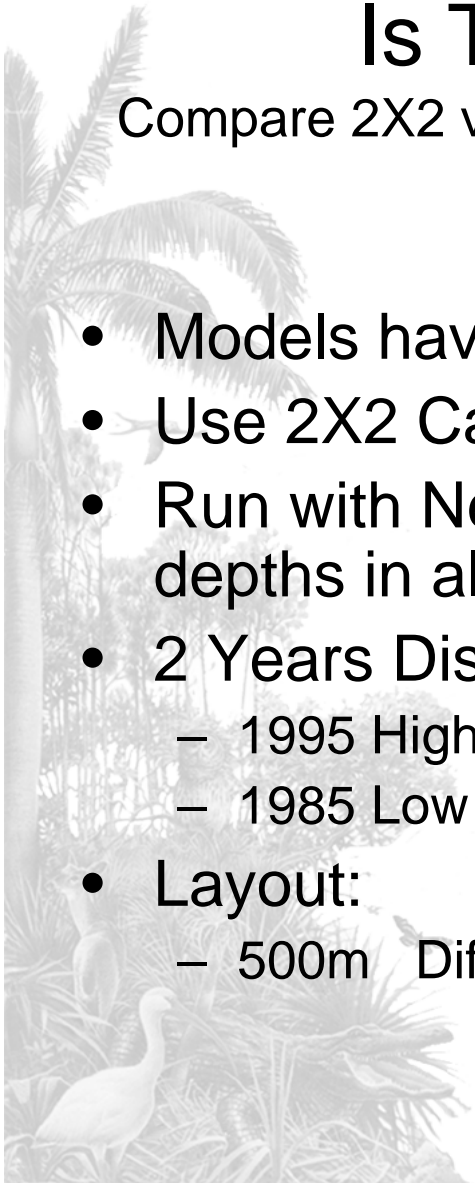




Is This Really Worth It?

Compare 2X2 vs. 500 meter For SESI Wading Bird Model

- Models have varying sensitivities to water depths
- Use 2X2 Cal/Ver run
- Run with New High Resolution Map and with 2X2 depths in all cells
- 2 Years Displayed
 - 1995 High Rainfall
 - 1985 Low Rainfall
- Layout:
 - 500m Difference 2X2



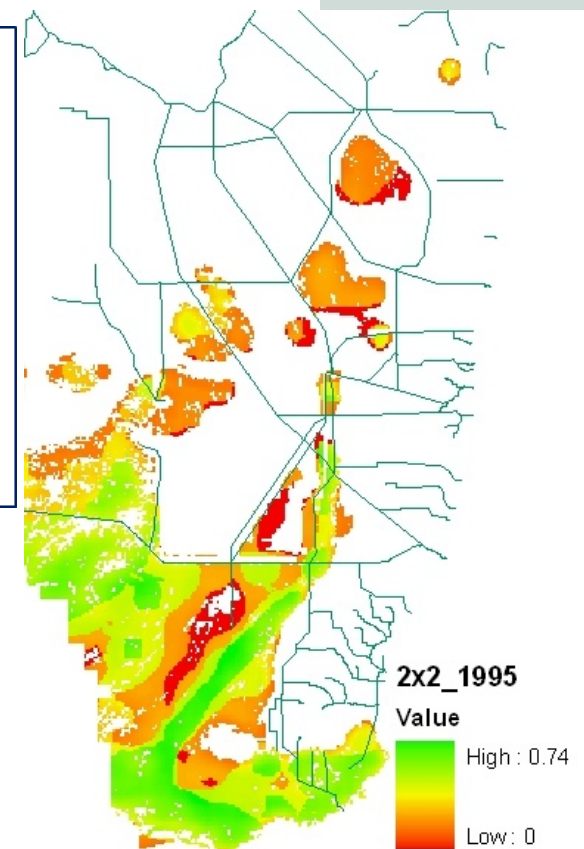
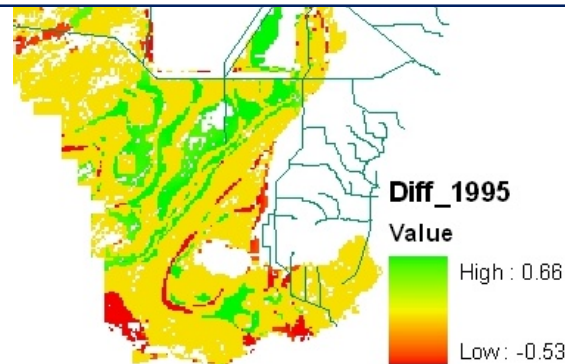
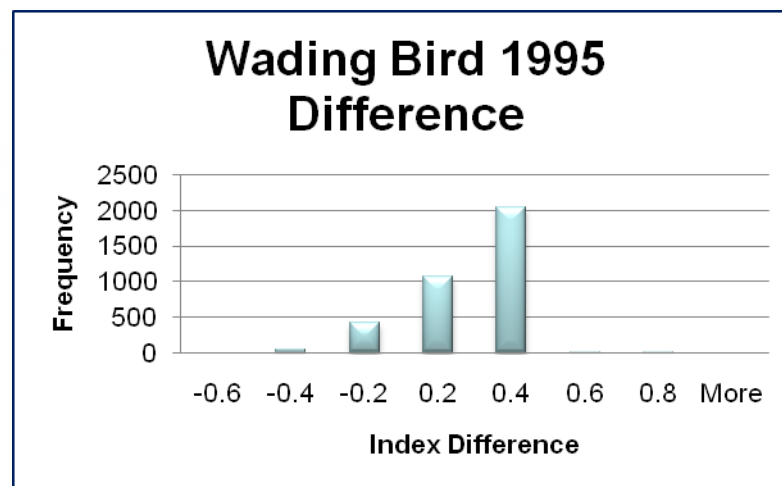
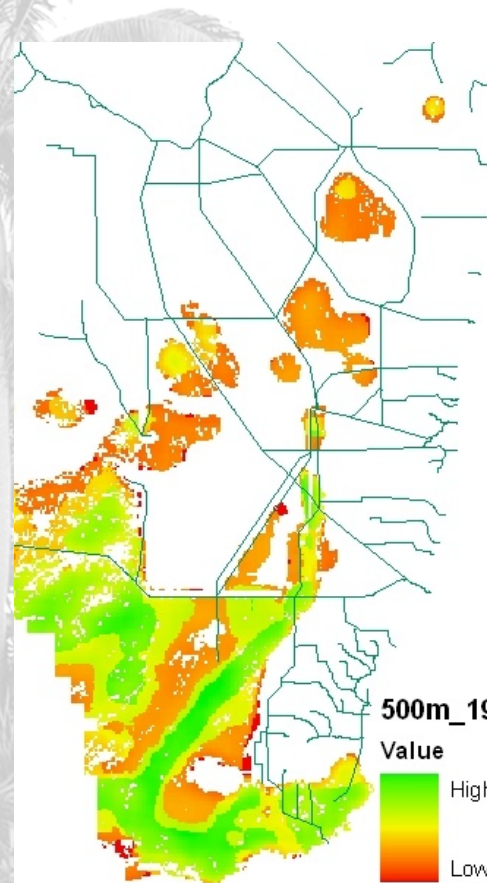
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SESI Wading Bird Model 1995 High Rainfall Year

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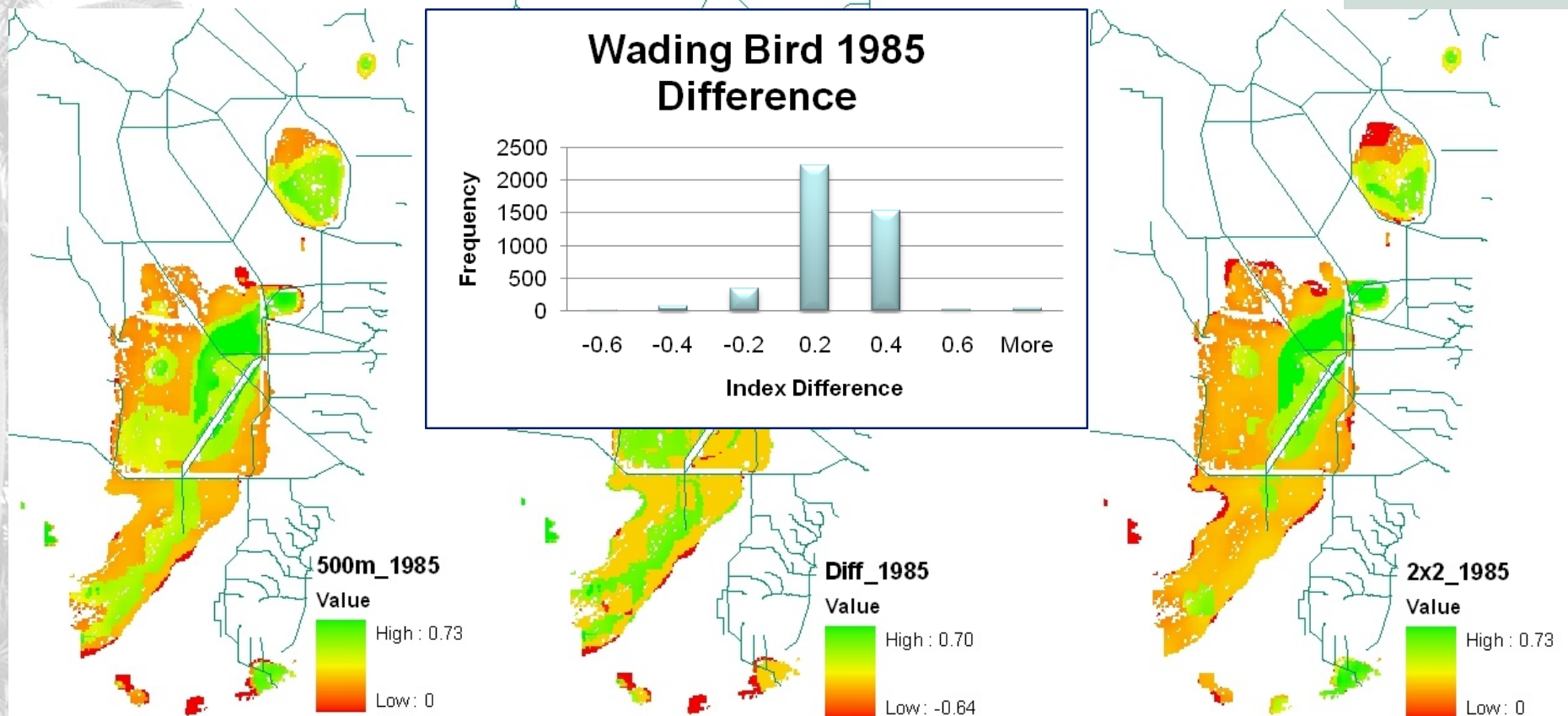
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SESI Wading Bird Model 1985 Low Rainfall Year

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Acknowledgements

- 4DHRH uses the concept of High Resolution Water developed by The Institute of Ecological Modeling (TIEM) at the University of Tennessee at Knoxville.
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