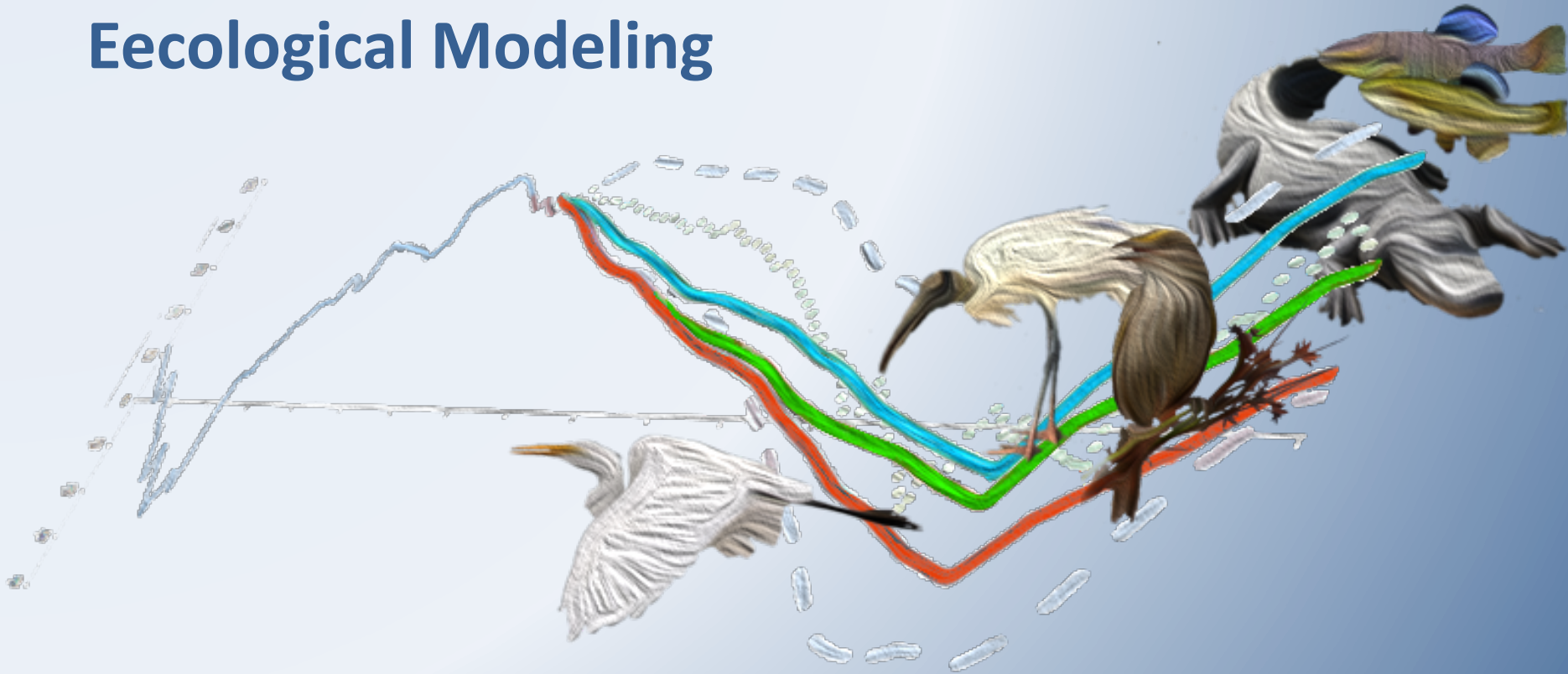


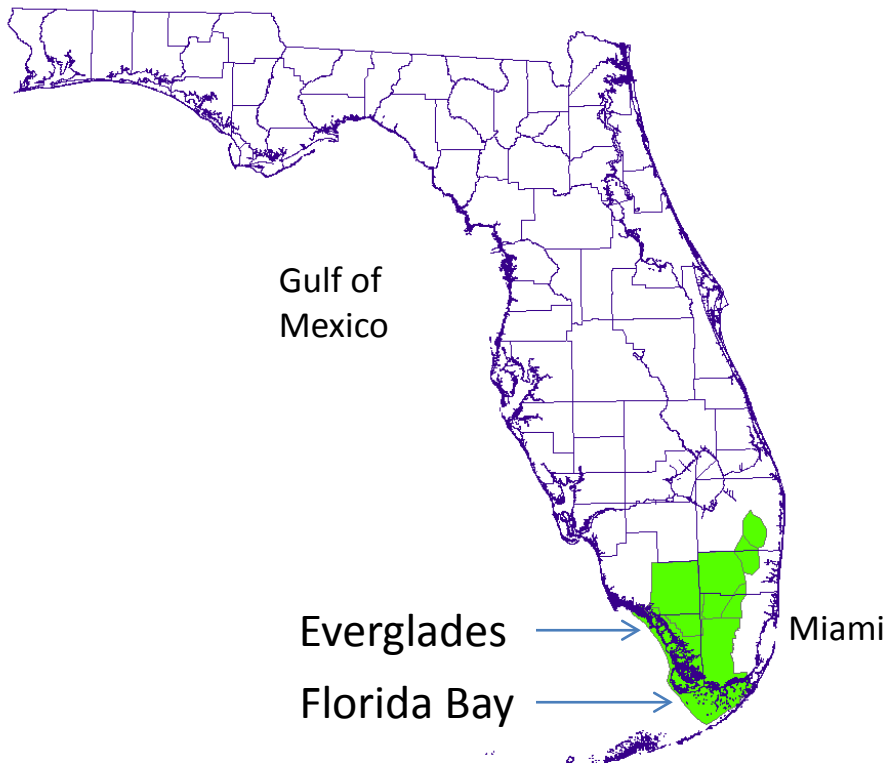
# Everglades Spatially-Explicit Hydrological Near-Term Forecasts for Ecological Modeling



Leonard Pearlstine<sup>1</sup>, James Beerens<sup>2</sup>, Gregg Reynolds<sup>1</sup>, Kevin Suir<sup>2</sup>, Mark McKelvy<sup>2</sup>

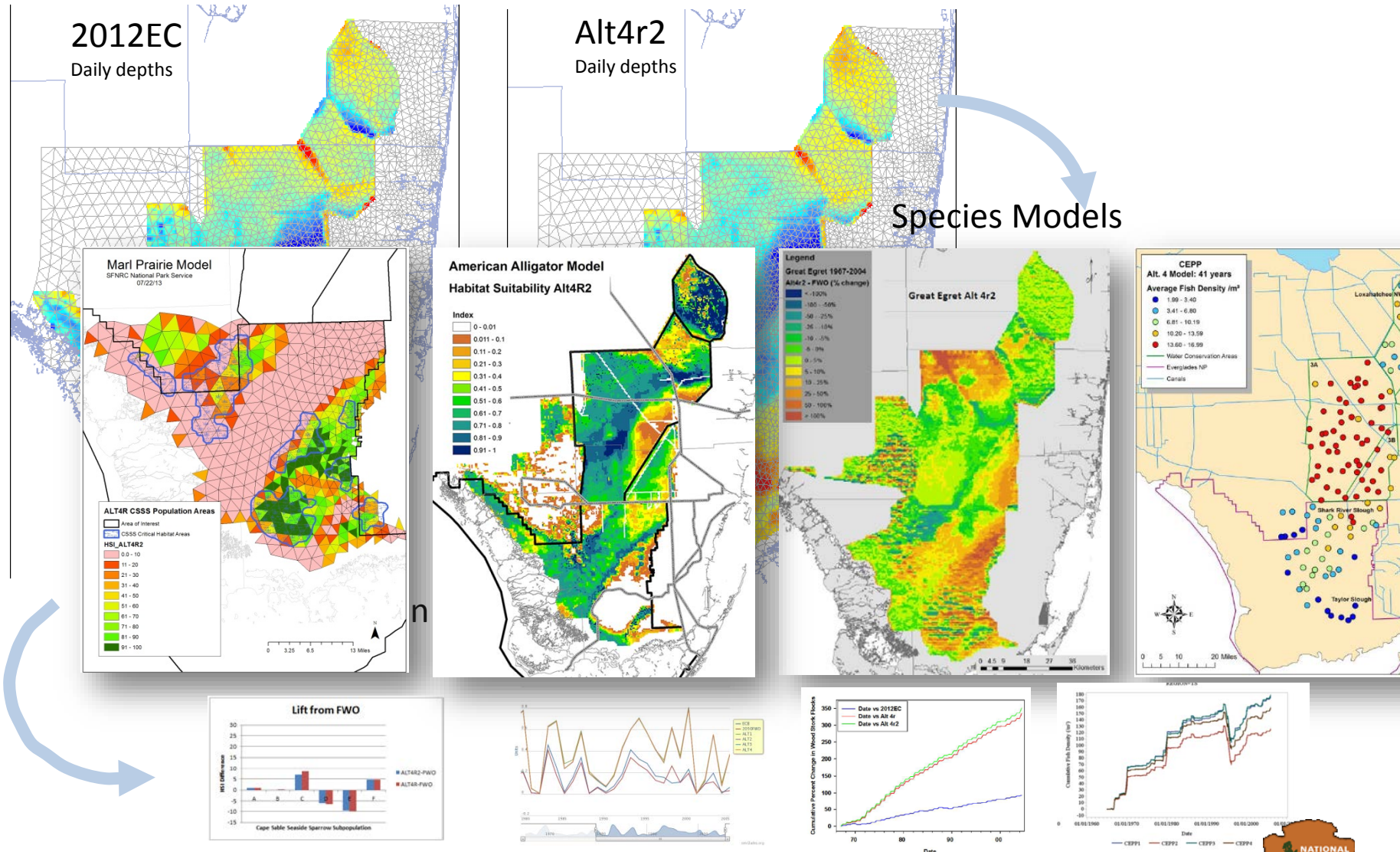
<sup>1</sup> National Park Service, <sup>2</sup>U.S. Geological Survey

# Objectives



- Develop spatially-explicit framework to rank species landscape responses to near-future hydrologic simulations
- Improve integration between water management operators and natural resource managers

# CEPP Ecological planning tools

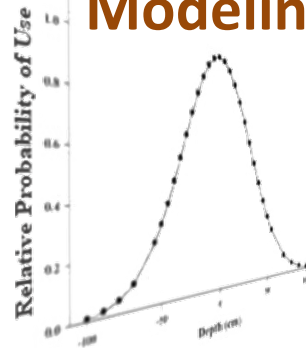


# Near Real-time Automated Modeling

External  
Data Acquisition



Evaluation  
Modeling



Open Web Access  
Spatio-temporal  
Results and Reports

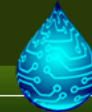


## Decision support in Everglades water management and restoration

**Multi-agency:** local, state, regional, and federal scientists, technical staff, and decision-makers.

**Regular review** of compliance with water release regulations and impacts on ecological, agricultural, urban and cultural priorities.

**Flexibility** within regulation schedules and structural capacities for modification of water delivery timing and spatial distribution.



EcoModeling Home

SNRC Home

ENP Home

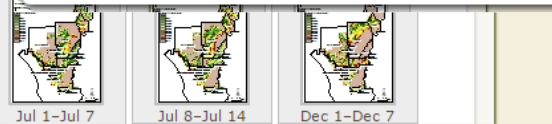
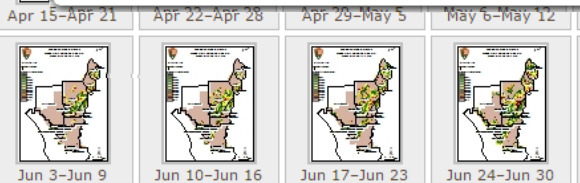
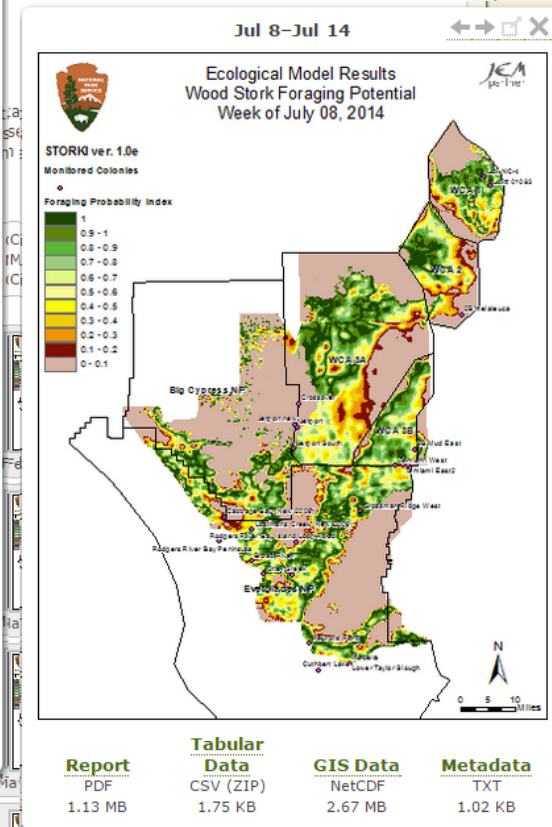
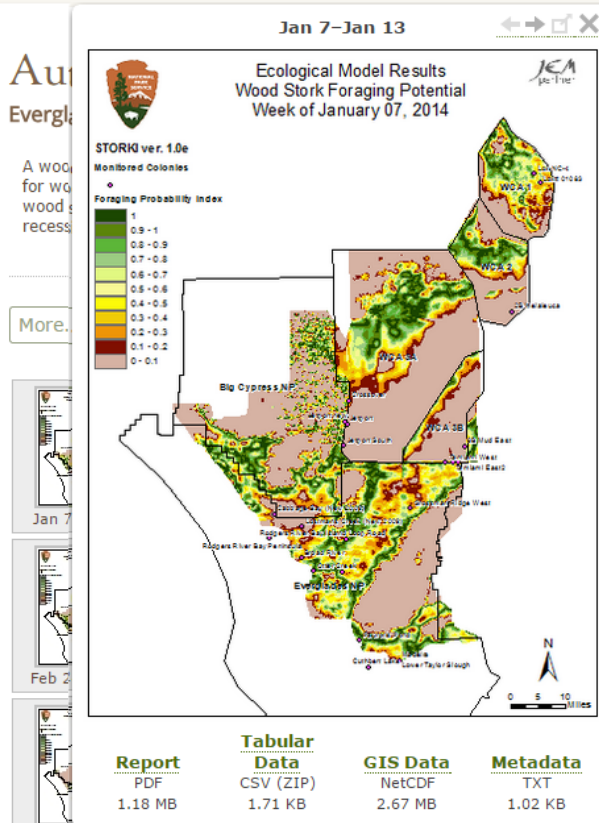
JEM Home

Applications

Near Real-Time Models

CEPP

Contact Us



# Ecological Position Analysis

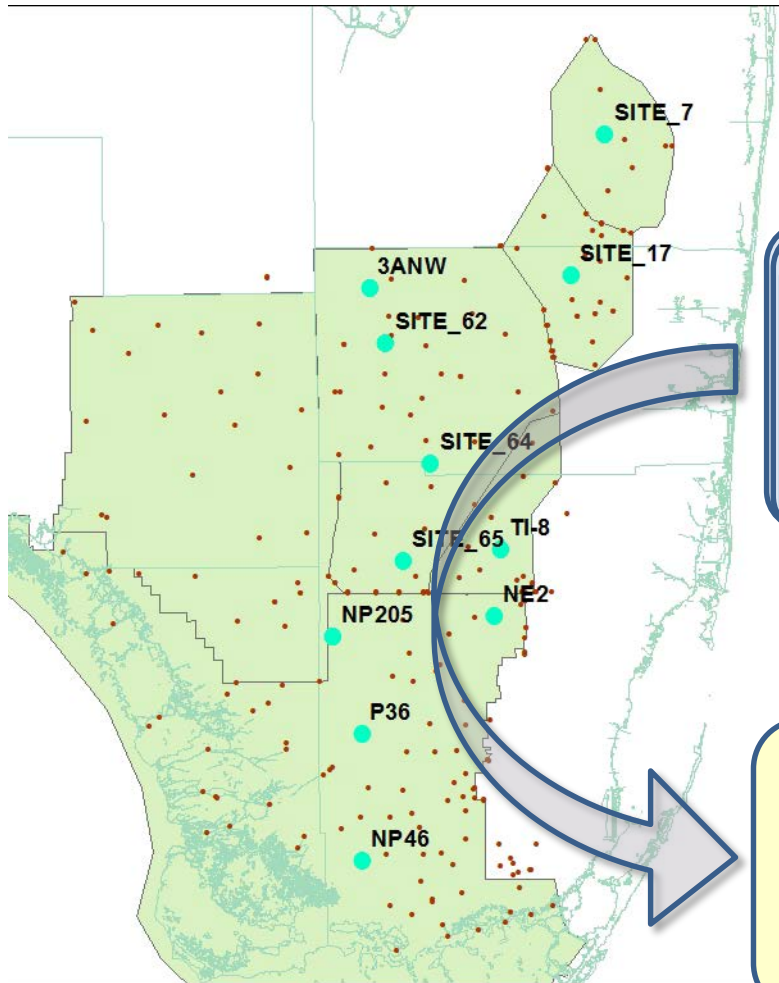
Near real time eco-modeling facilitates integrated understanding of hydrologic conditions and ecological responses.

BUT, it is not enough.

We've shown where we are now, but managers still are left to speculate on likely ecological trends into the near future.

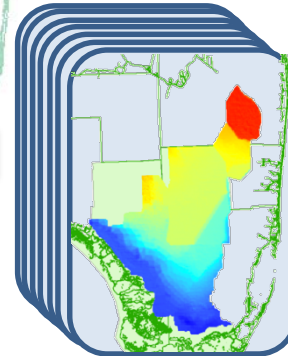
# Ecological Position Analysis

For each forecast month:

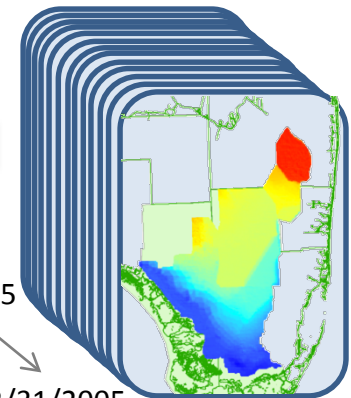


RMSE match  
to gauge  
values

RSM 2012EC  
**Water Stage**  
(or Alt4r2  
or ModWaters or ...)



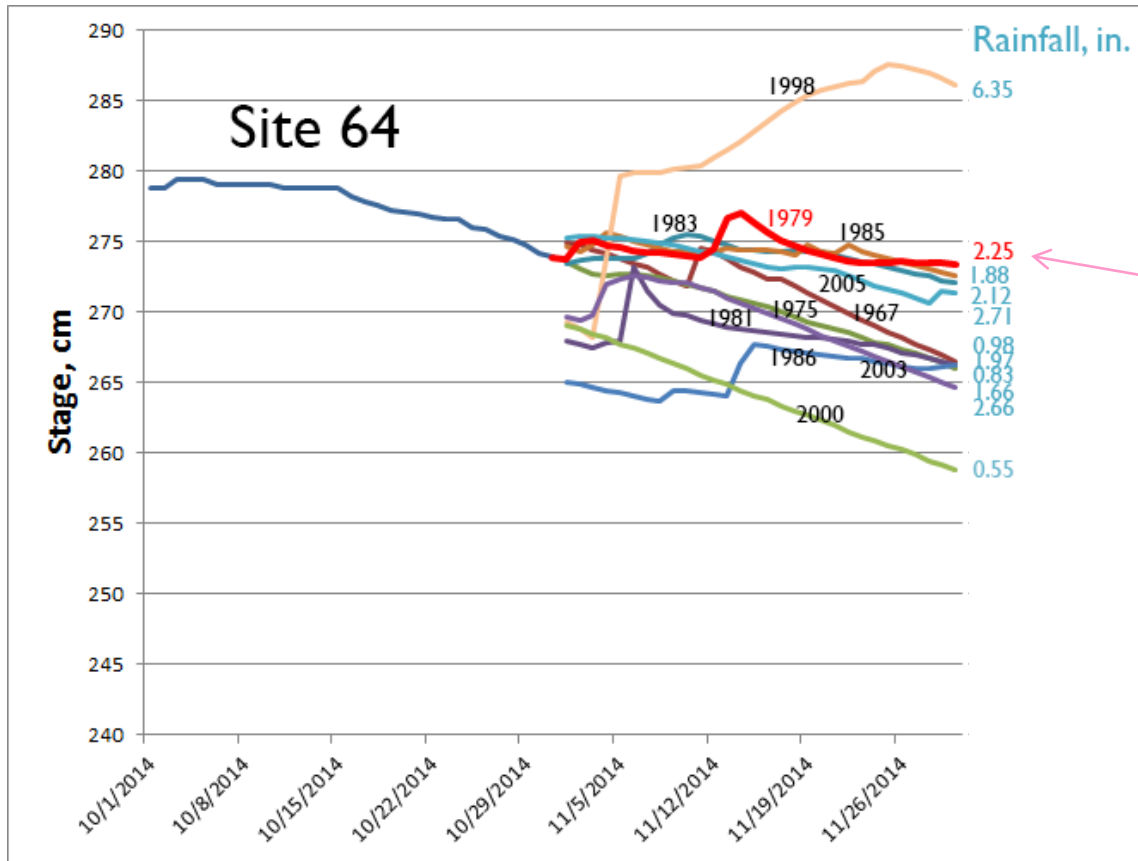
Subset



Closest Match from each  
stage-similar year to NMME  
& precipitation forecasts

Plot  
shifted  
analog  
month

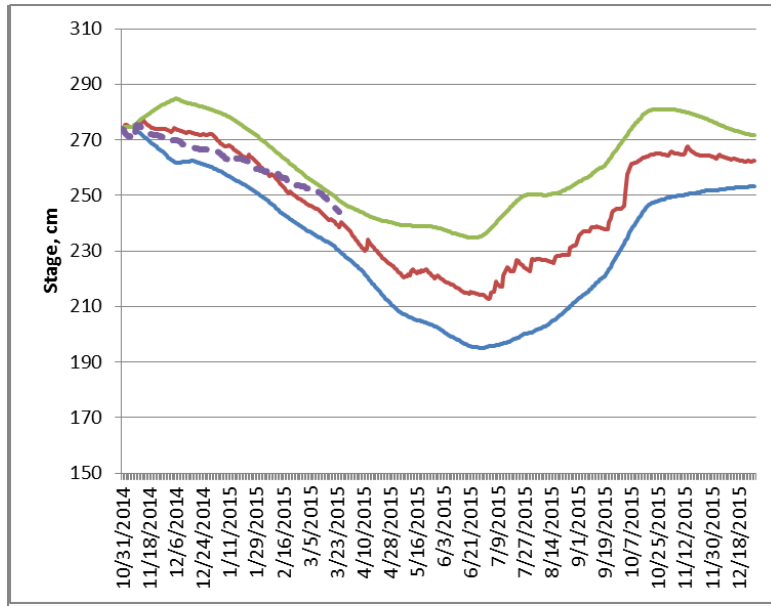
# Select Analog Month



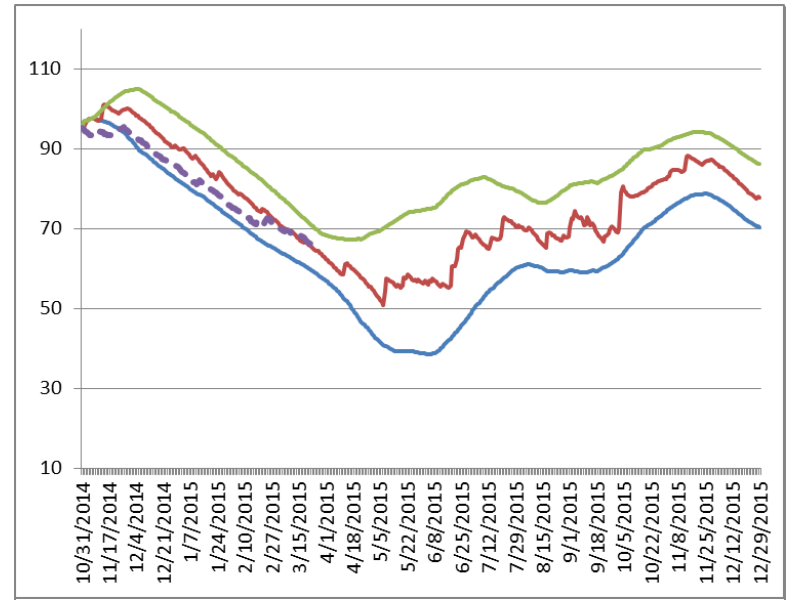
NMME to RSM Composite Forecast (in.)	
Nov	2.18
Dec	1.66
Jan	1.95
Feb	1.99
Mar	2.60
Apr	1.97
May	3.99
Jun	8.22
Jul	6.78
Aug	7.16
Sep	6.83
Oct	3.91
Nov	2.18
Dec	1.66



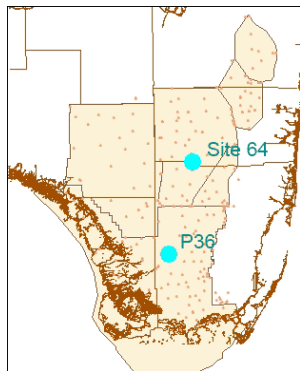
# Forecast Stage for the Upcoming Year



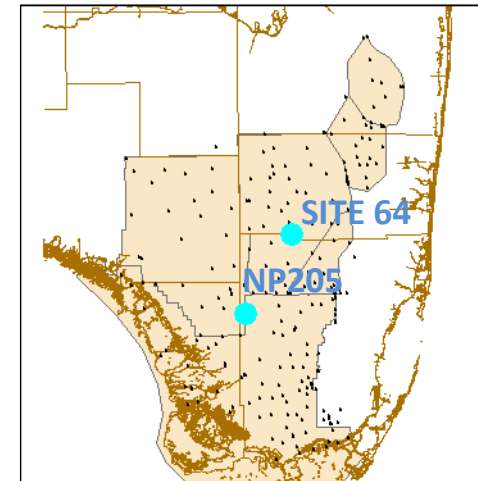
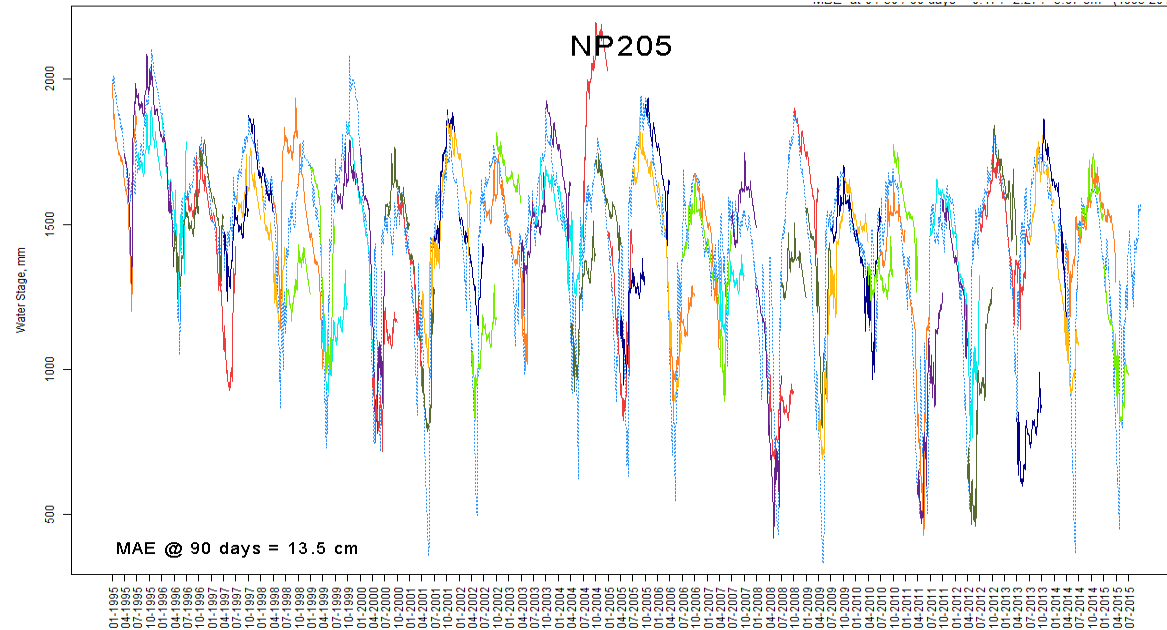
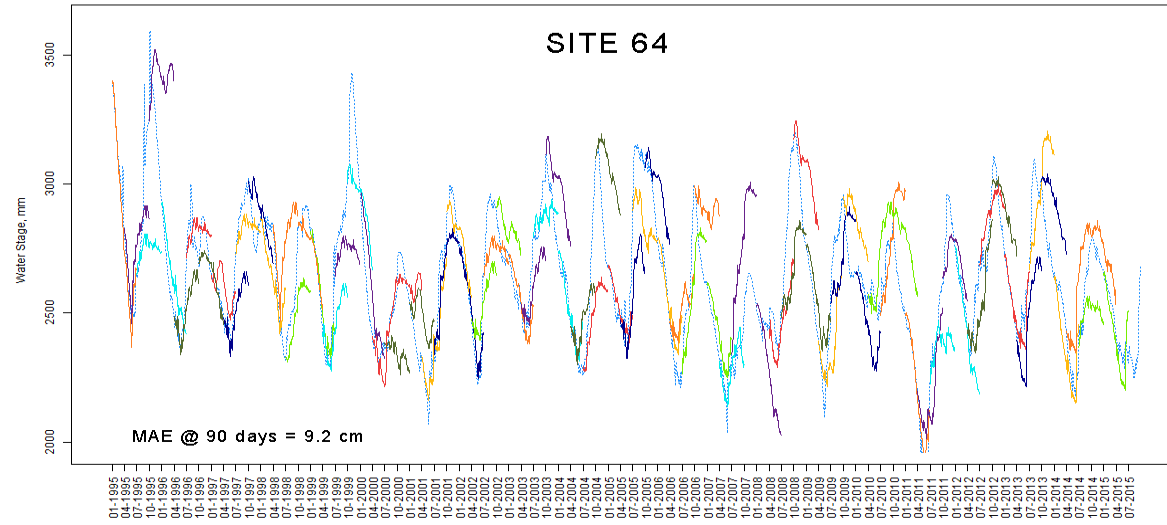
Site 64



P 36

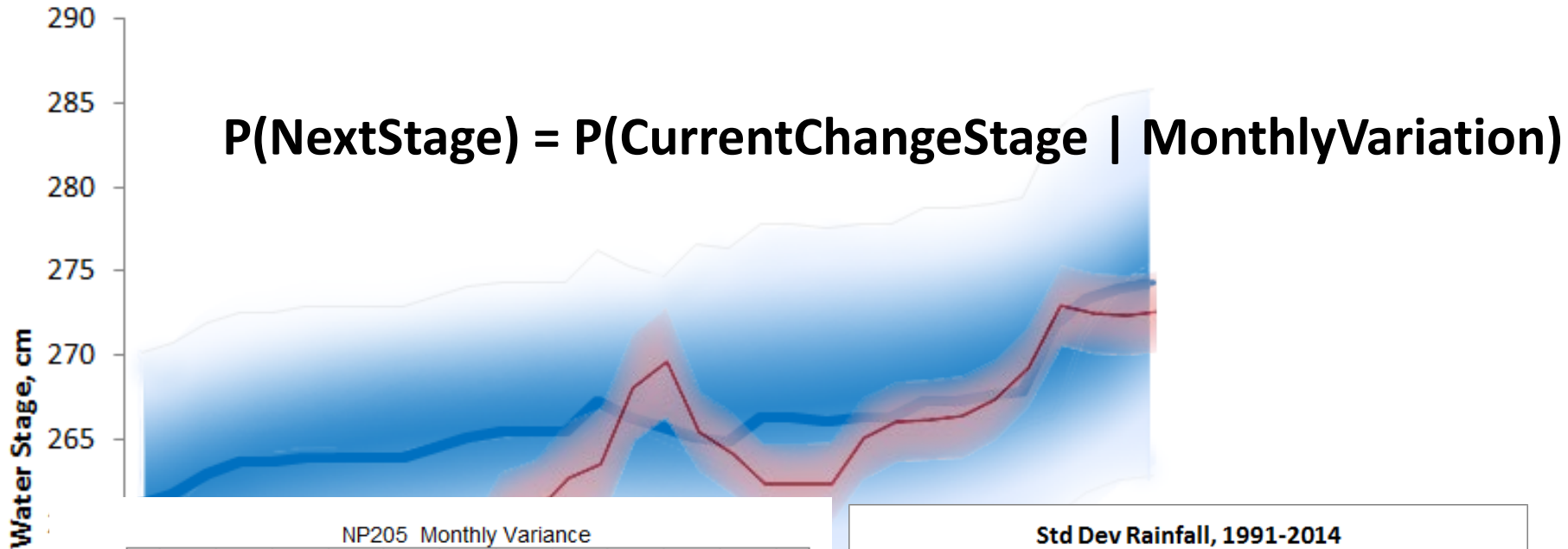


# Validations

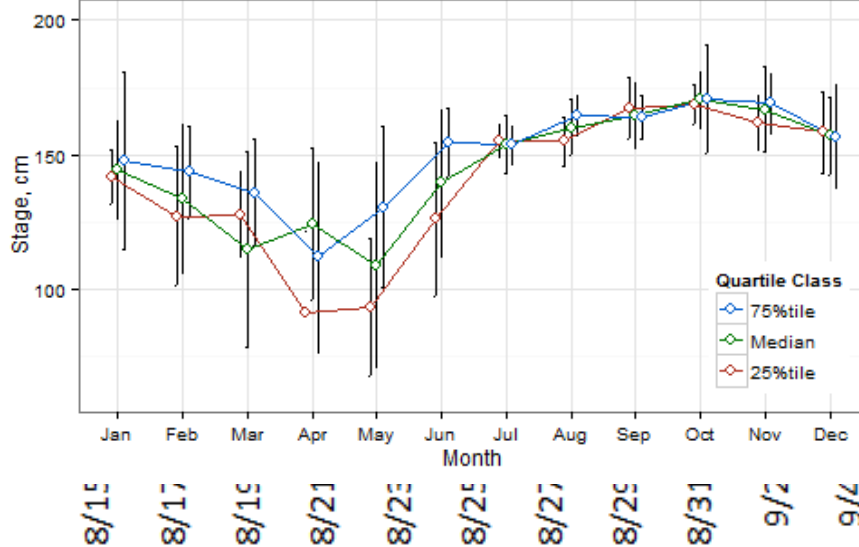


# Monte Carlo Simulations about a Central Tendency

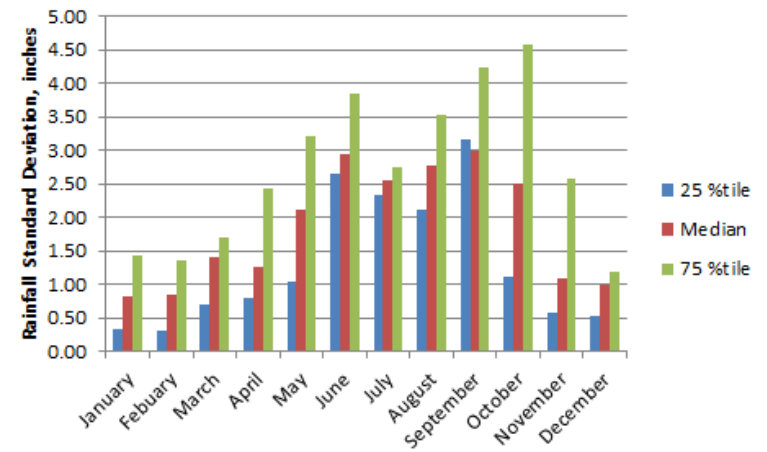
$$P(\text{NextStage}) = P(\text{CurrentChangeStage} \mid \text{MonthlyVariation})$$



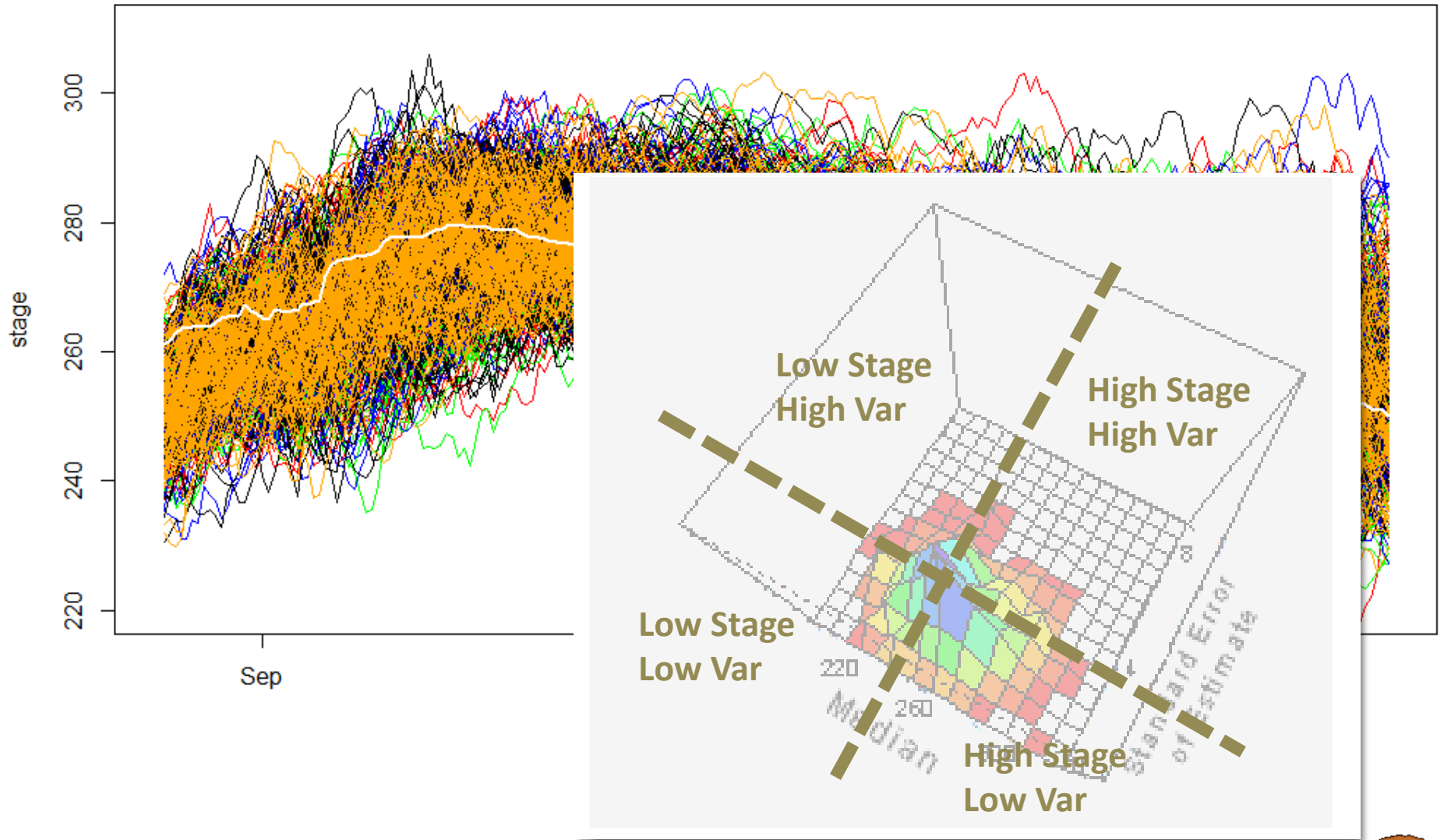
NP205 Monthly Variance



Std Dev Rainfall, 1991-2014

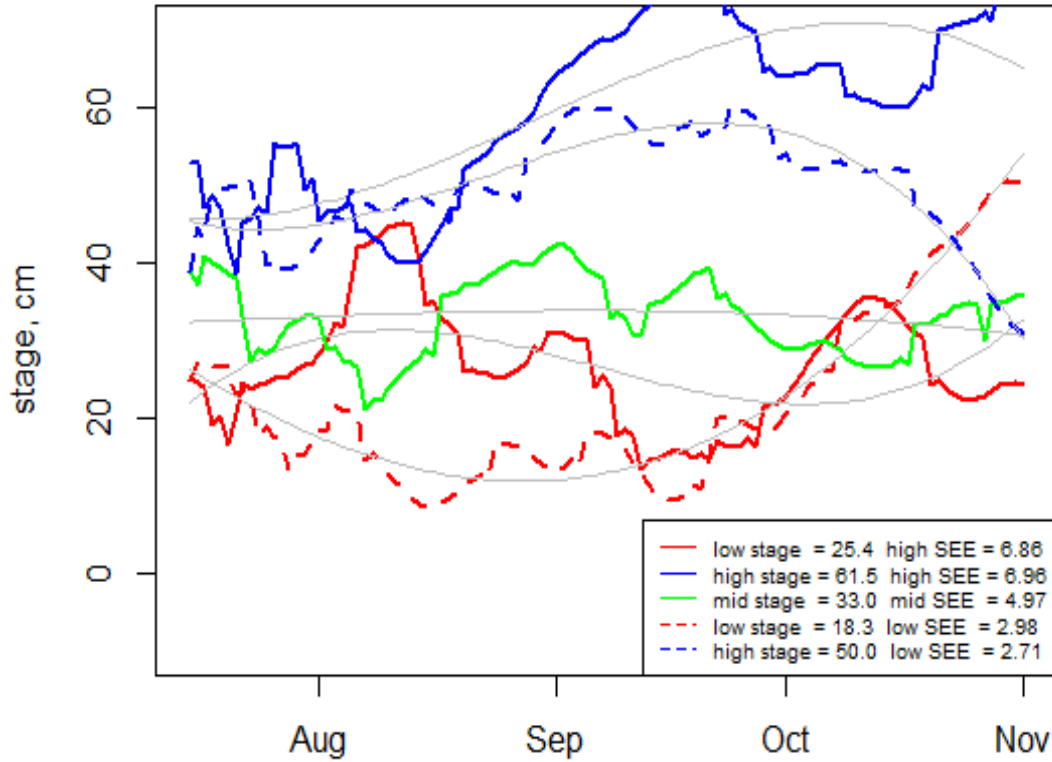


# Monte Carlo Simulations about a Central Tendency

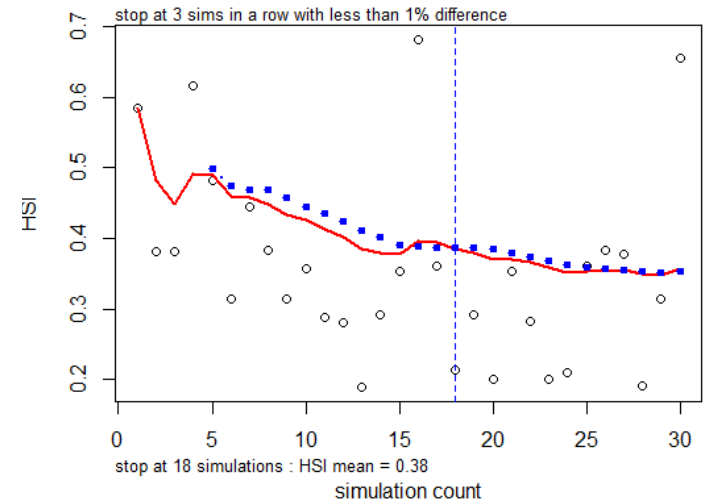


# Monte Carlo Simulations about a Central Tendency

## Sampled Simulations



## PseudoStork mean HSI when low stage and low IQR



# Summary Features

- Quantitative Monte Carlo forecasts of water depth changes based on hydrologic modeled depth distributions and historic variability
- Incorporates precipitation forecast to restrain the projections to likely near-term shifts in regional wetness/dryness
- Increased focus on ecosystem spatial conditions to maximize system-wide benefits
- Improved integration between water management operators and natural resource managers