

# Evaluating Methods for Determining Whether a Site Meets Wetland Hydrology Criteria

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# Objective

**Evaluate the accuracy and limitations of the Threshold Wetland Simulation (TWS) method for determining whether a site meets wetland criteria.**

# Procedures

- **Use water table data from 10 wells**  
4 to 5 years of data from each well
- **Calibrate DRAINMOD for each well**
- **Determine wetland status for each well**  
50 years of weather record (1951-2000)
- **Create Threshold Wetland Simulations**
- **Use TWS to evaluate each well for 1 yr**
- **Compare TWS evaluations to status**

# Site Locations

West Virginia

Virginia

Plymouth, NC

Raleigh

North Carolina

Aurora, NC

Charlotte

Plymouth, NC

1 well

February 1993

September 1996

Portsmouth sandy loam

Aurora, NC

9 wells

May 1999

April 2004

Roanoke silt loam

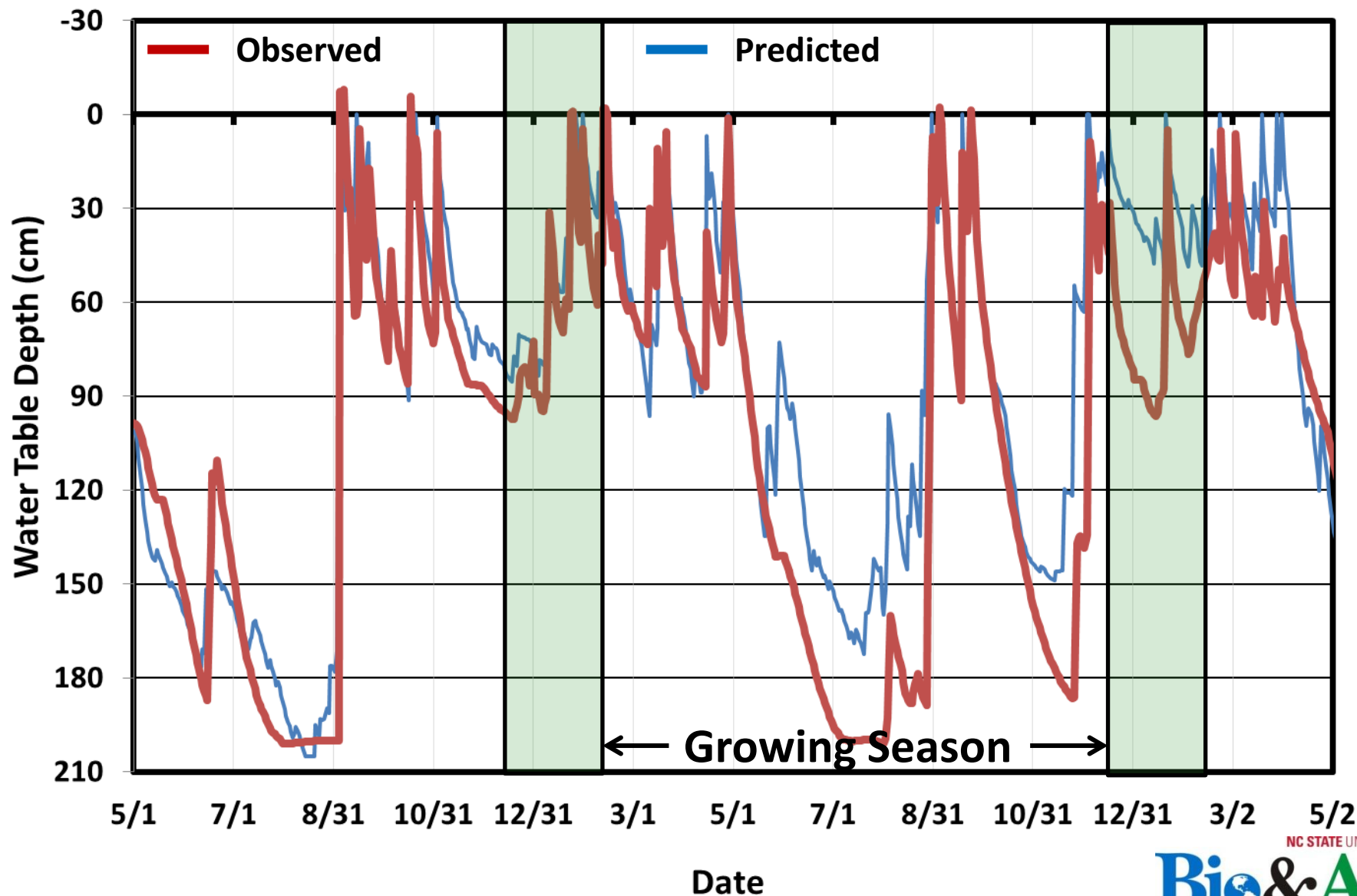
All were located in mixed  
pine and hardwood  
forests

# Calibration

- Use rainfall and temperature on site
- Compare predicted to observed WTD
- Adjust parameters to get best fit
  - drain depth and spacing
  - surface storage
  - soil porosity and upward flux
  - root depth
  - small adjustments to PET factors

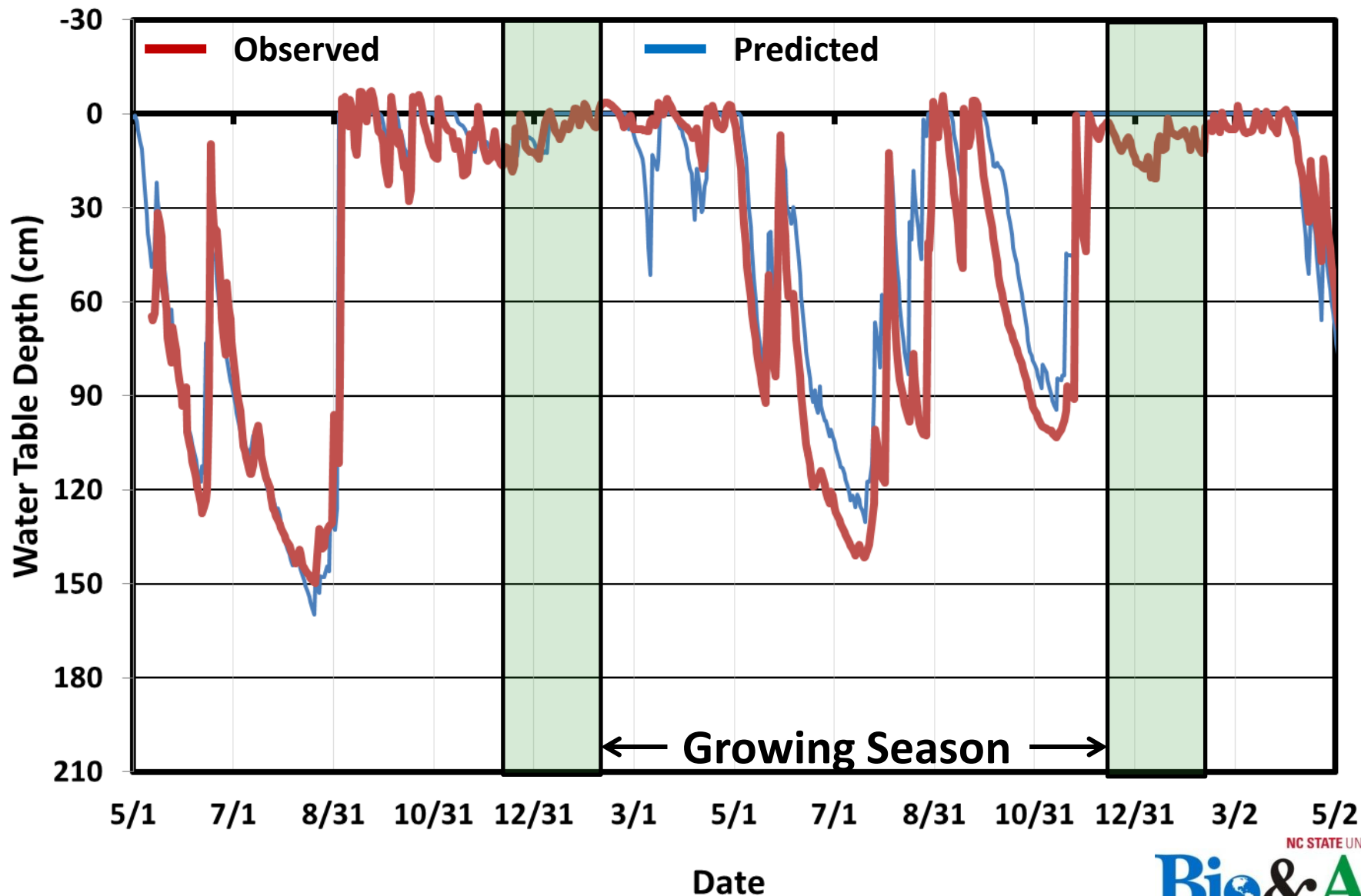
# Model Calibration

Aurora, NC Well H4W2



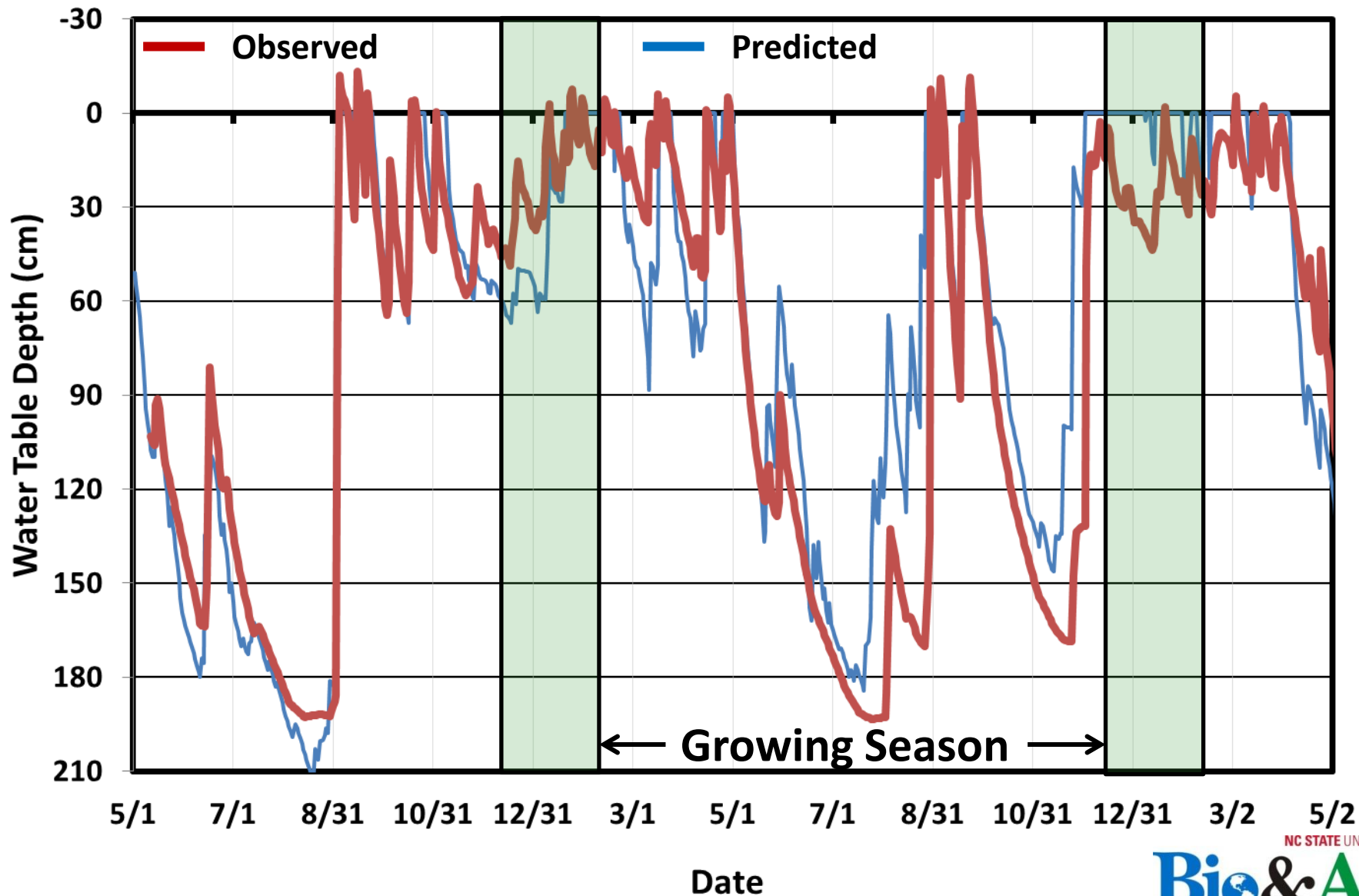
# Model Calibration

Aurora, NC Well H1W1



# Model Calibration

Aurora, NC Well H2W1





# Use long-term calibrated simulations to determine wetland status

- **DRAINMOD simulation for 50 yr period weather record from 1951 to 2000**
- **DRAINMOD predicts the number of years that criteria is met**

**Jurisdictional (WT<30 cm for 14 d)**

**Restoration (WT<30 for 12.5% of GS)**

# Wetland Status

## Jurisdictional

14 day

Number of years criteria is met

H1W1	H2W1	H2W2	H3W1	H3W2	H4W1	H4W2	J1HG	J2HG	PWET
47	45	46	23	43	46	12	38	36	49

8 of 10 sites are jurisdictional wetlands

## Restoration

12.5 % of growing season

H1W1	H2W1	H2W2	H3W1	H3W2	H4W1	H4W2	J1HG	J2HG	PWET
43	11	28	1	8	32	0	3	4	48

4 of 10 sites meet restored wetland criteria

# Create TWS

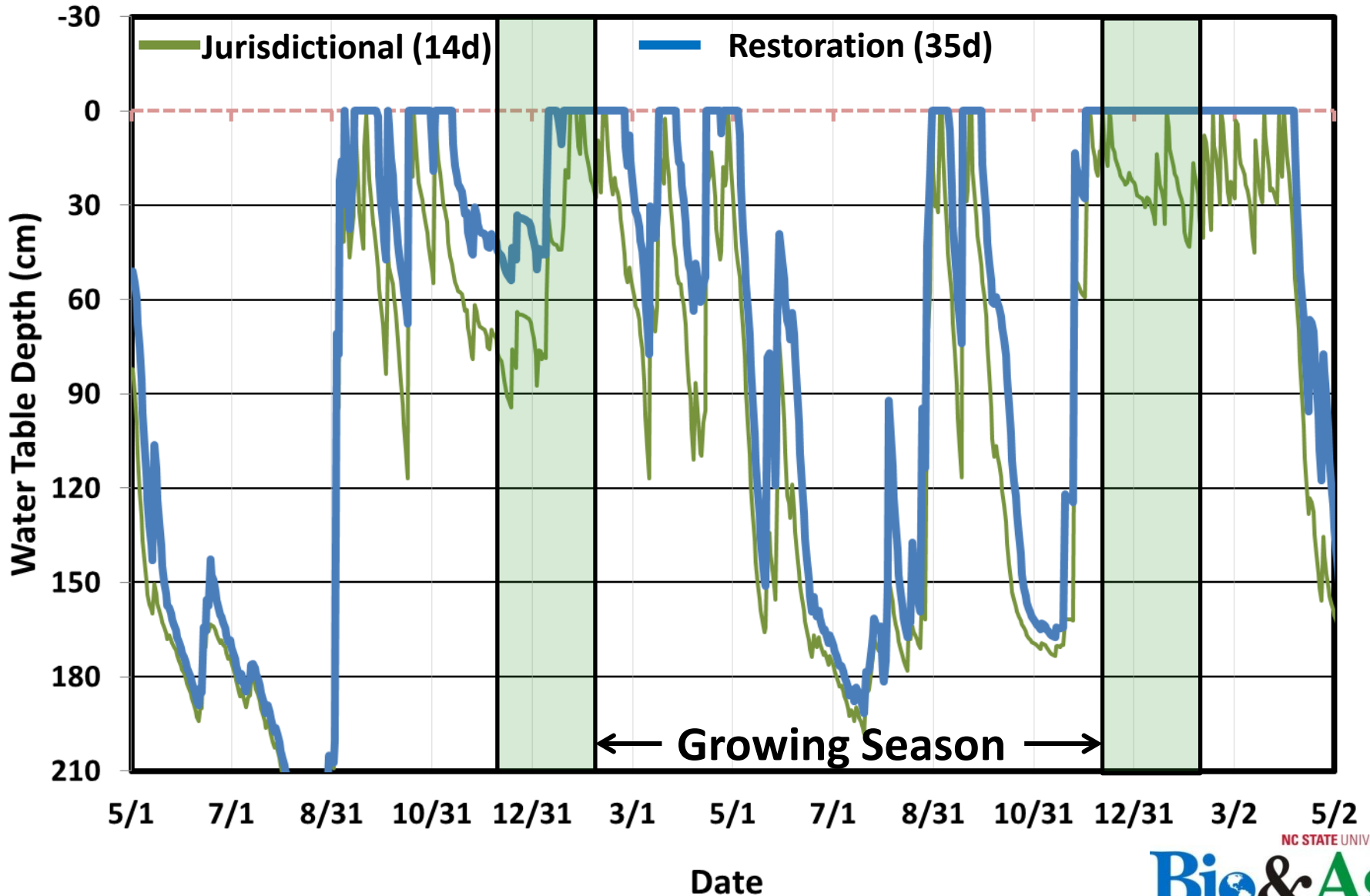
- **Select two calibrated data sets from Aurora and one calibrated data set from Plymouth**
  - H4W1 well for H series**
  - J1W1 well for J series**
  - PWET well for Plymouth**
- **Adjust drain spacing and surface storage in 50 year DRAINMOD simulations until wetland criteria are met in 25 of the 50 years.**

# Criteria and Weather

- **Aurora, NC**  
Aurora, NC weather 1951 to 2000  
Growing season Feb. 28 to Dec. 6  
Jurisdictional Criteria 14 days  
Restoration Criteria 35 days
- **Plymouth, NC**  
Plymouth, NC weather 1951 to 2000  
Growing season Mar. 21 to Nov. 15  
Jurisdictional Criteria 14 days  
Restoration Criteria 30 days

# Reference Wetland Simulations

## Aurora, NC

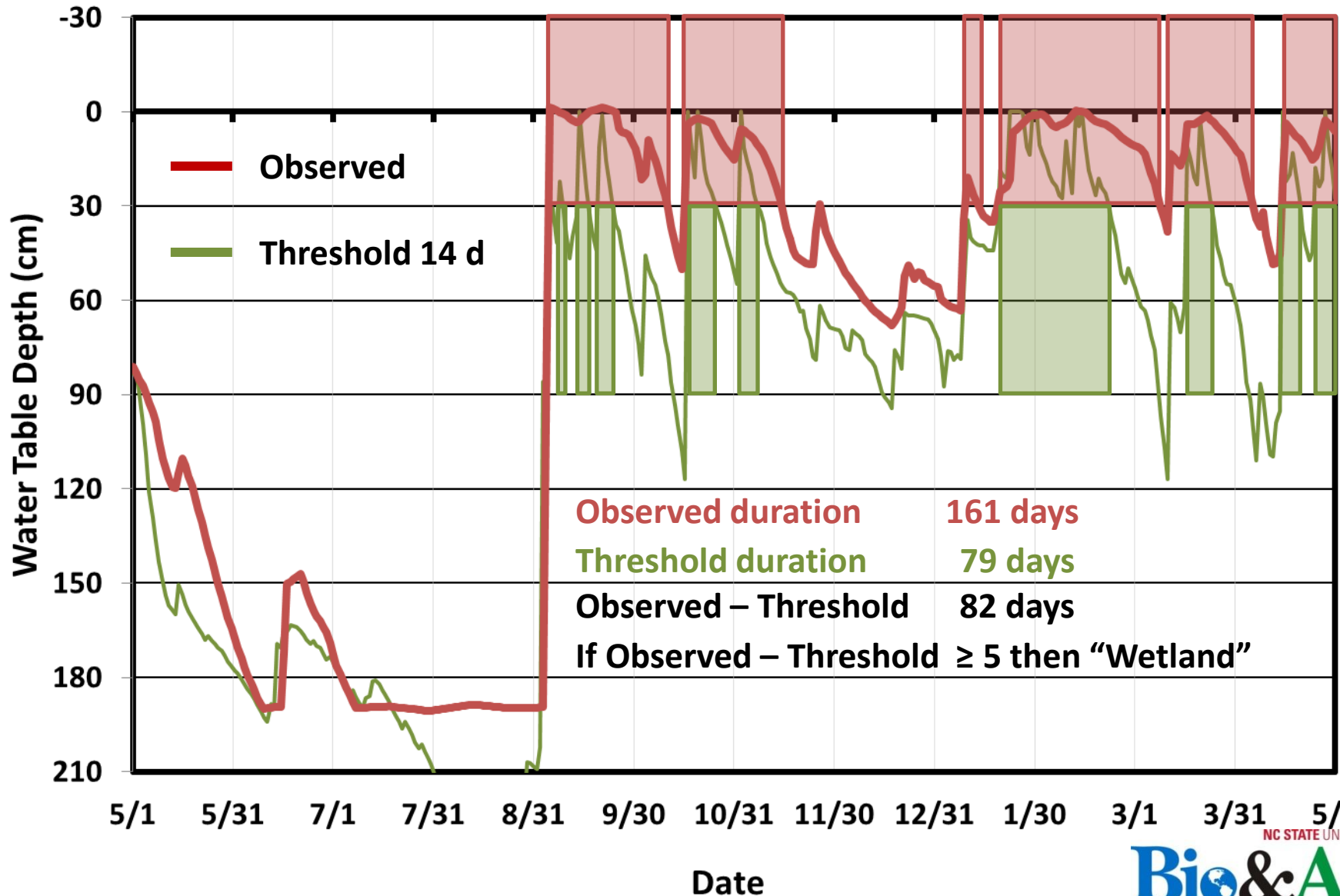


# Use TWS to determine wetland status

- Compare TWS to observed WT data
  - Compare for one year period
  - Compare total # of days  $WT < 30$  cm
  - If  $Obs - TWS \geq 5$  then “Wetland”
  - If  $Obs - TWS \leq -5$  then “Not Wetland”
  - If  $|Obs - TWS| < 5$  then “No Call”
- 98 site-years of comparisons
  - 9 wells X 5 yr + 1 well X 4 yr = 49
  - 49 X 2 criteria (14 d and 12.5%) = 98

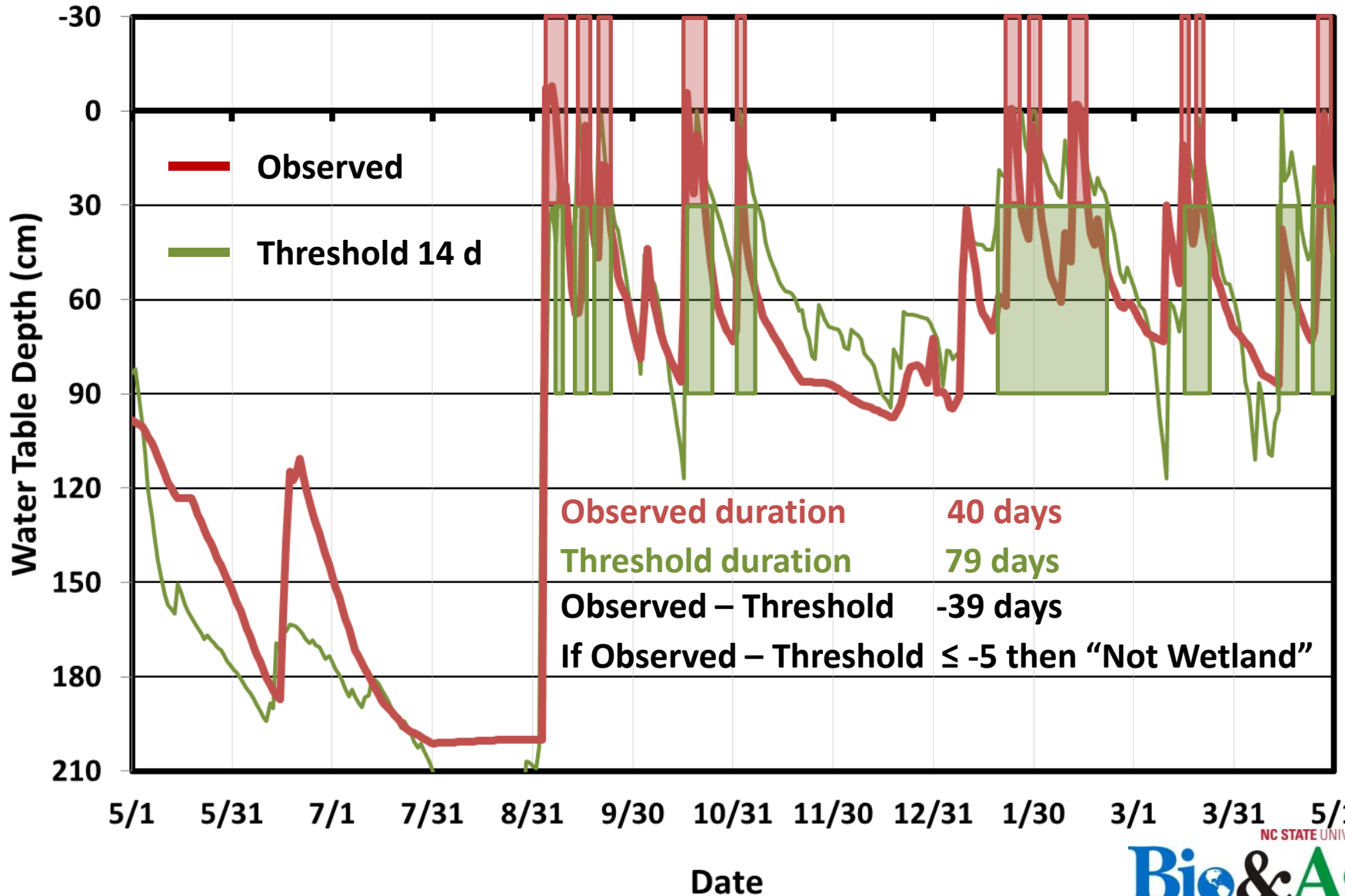
# Comparison of TWS to Observed WT

## Aurora, NC Well H2W2



# Comparison of TWS to Observed WT

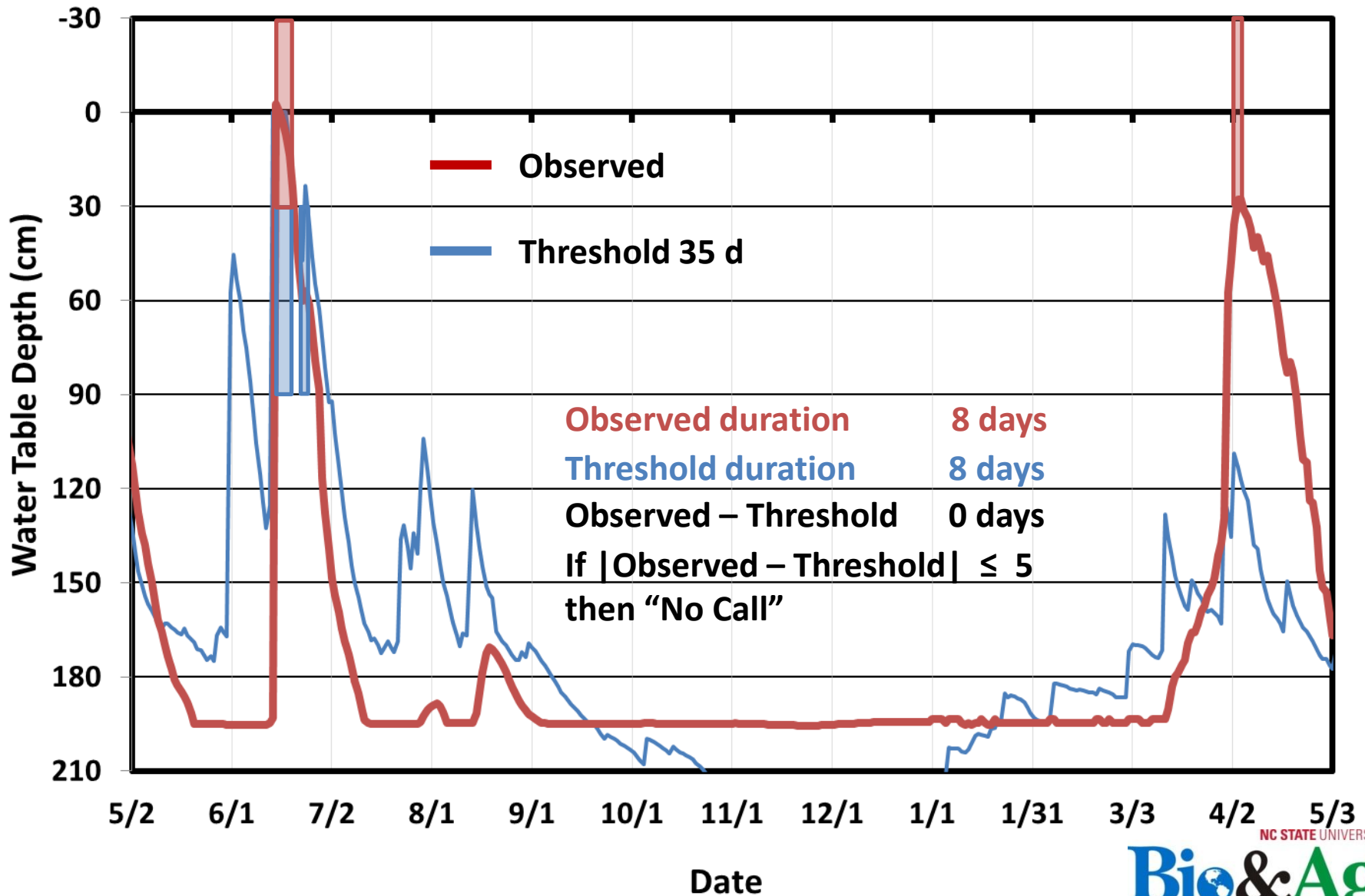
## Aurora, NC Well H4W2





# Comparison of TWS to Observed WT

## Aurora, NC Well H3W2



# TWS Wetland Calls

## Jurisdictional (14 day)

Observed duration – TWS duration (positive values are wetlands)

H1W1	H2W1	H2W2	H3W1	H3W2	H4W1	H4W2	J1HG	J2HG	PWET
162	67	82	-24	43	80	-39	39	56	42
63	7	25	-98	-18	-19	-91	46	44	57
69	37	9	7	5	2	6	50	40	177
47	23	-5	-28	1	9	2	18	12	90
166	140	167	-113	88	152	-36	10	86	

Wet	36
Not Wet	10
No call	3

# TWS Wetland Calls

## Jurisdictional (14 day)

Observed duration – TWS duration (positive values are wetlands)

H1W1	H2W1	H2W2	H3W1	H3W2	H4W1	H4W2	J1HG	J2HG	PWET
162	67	82	-24	43	80	-39	39	56	42
63	7	25	-98	-18	-19	-91	46	44	57
69	37	9	7	5	2	6	50	40	177
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H1W1	H2W1	H2W2	H3W1	H3W2	H4W1	H4W2	J1HG	J2HG	PWET
47	45	46	23	43	46	12	38	36	49

# Method Evaluation

## Jurisdictional (14 day)

Observed duration – TWS duration (positive values are wetlands)

H1W1	H2W1	H2W2	H3W1	H3W2	H4W1	H4W2	J1HG	J2HG	PWET
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47	23	-5	-28	1	9	2	18	12	90
166	140	167	-113	88	152	-36	10	86	
49	45	46	23	43	46	12	38	36	49

Correct	41	83.7%
Incorrect	5	10.2%
No call	3	6.1%

# TWS Wetland Calls

## Restoration (12.5% of growing season)

Observed duration – TWS duration (positive values are wetlands)

H1W1	H2W1	H2W2	H3W1	H3W2	H4W1	H4W2	J1HG	J2HG	PWET
91	-4	11	-95	-28	9	-110	-23	-6	30
14	-42	-24	-147	-67	-68	-140	-29	-31	43
64	32	4	2	0	-3	1	3	-7	140
22	-2	-30	-53	-24	-16	-16	-1	-7	51
32	6	33	-247	-46	18	-170	-114	-38	

Wet	15
Not Wet	25
No call	9

# TWS Wetland Calls

## Restoration (12.5% of growing season)

Observed duration – TWS duration (positive values are wetlands)

H1W1	H2W1	H2W2	H3W1	H3W2	H4W1	H4W2	J1HG	J2HG	PWET
91	-4	11	-95	-28	9	-110	-23	-6	30
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# Method Evaluation

## Restoration (12.5% of growing season)

Observed duration – TWS duration (positive values are wetlands)

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32	6	33	-247	-46	18	-170	-114	-38	
43	11	28	1	8	32	0	3	4	48

Correct	34	69.4%
Incorrect	6	12.2%
No call	9	18.4%

# Method Evaluation

## Summary

### Jurisdictional

Correct	41	83.7%
Incorrect	5	10.2%
No call	3	6.1%

### Restoration

Correct	34	69.4%
Incorrect	6	12.2%
No call	9	18.4%

### Total

Correct	75	76.5%
Incorrect	12	12.2%
No call	11	11.2%



# Conclusions

The TWS method did a good job determining whether or not a site was a wetland

Correct	76.5%
Incorrect	12.2%
No call	11.2%

The TWS method performed better for jurisdictional calls

Correct	83.7%
Incorrect	10.2%
No call	6.1%

The TWS method performed less well for restoration calls

Correct	69.4%
Incorrect	12.2%
No call	18.4%

# Future Work

More “incorrects” and “no calls” occurred doing a very dry year. More research is needed to characterize the performance of the TWS method during dry periods

The TWS method still needs to be evaluated in different wetland types and different climate conditions

Questions?



I'm outta here

