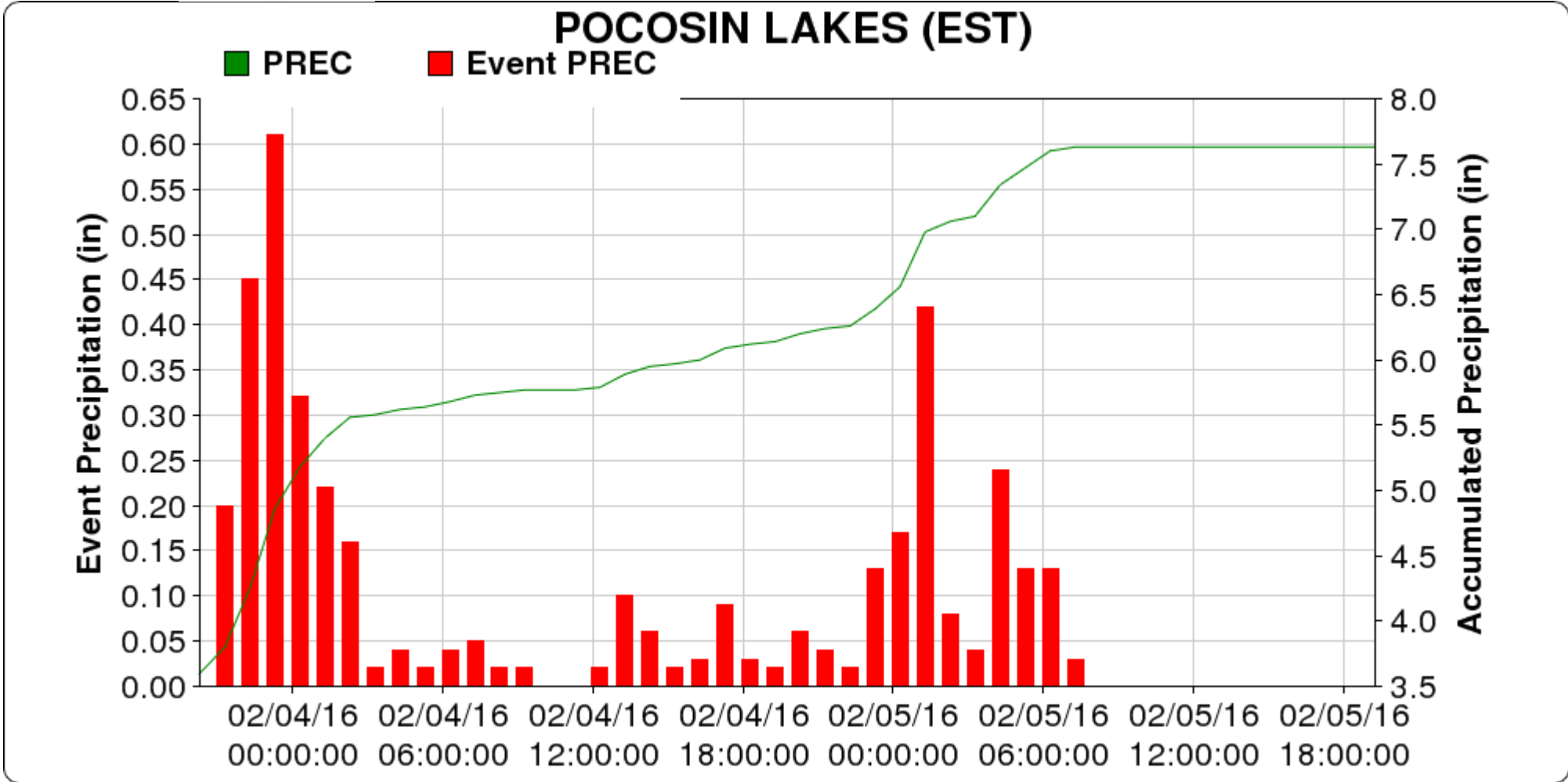


# Drainage Issues in the Blacklands A Washington County Perspective

Newland Road at C Canal



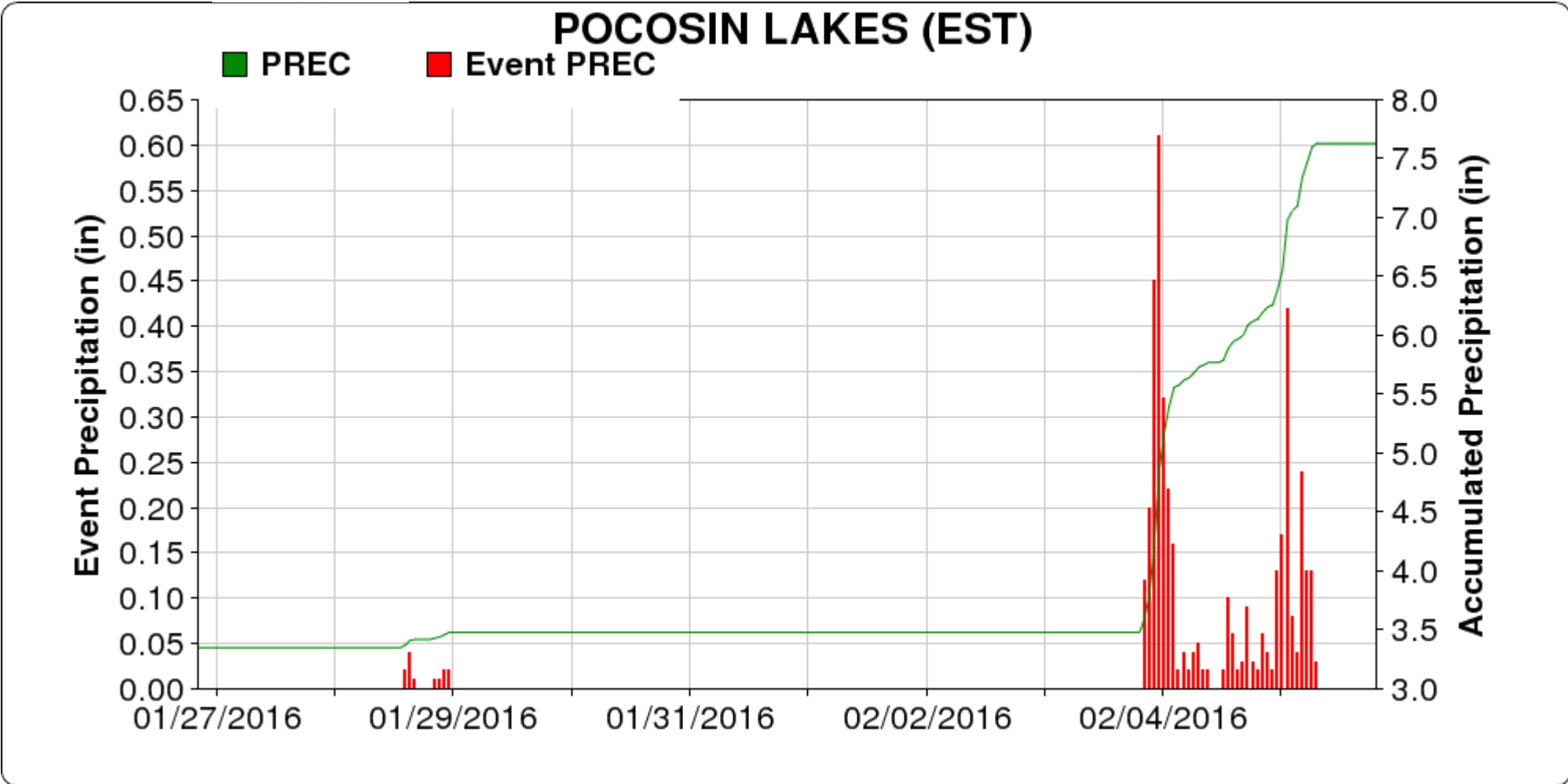
Interagency Remote Automatic Weather Stations



4" Rain Event in 36 Hours



## Interagency Remote Automatic Weather Stations



**RELATIVELY DRY OVER THE PAST 7 DAYS**



POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.456 (0.414-0.503)	0.530 (0.481-0.586)	0.601 (0.545-0.664)	0.686 (0.620-0.758)	0.774 (0.696-0.853)	0.851 (0.763-0.938)	0.922 (0.822-1.02)	0.993 (0.879-1.09)	1.08 (0.948-1.19)	1.16 (1.01-1.28)
10-min	0.728 (0.662-0.804)	0.848 (0.769-0.937)	0.962 (0.872-1.06)	1.10 (0.992-1.21)	1.23 (1.11-1.36)	1.36 (1.22-1.49)	1.47 (1.31-1.62)	1.57 (1.39-1.73)	1.71 (1.50-1.88)	1.83 (1.59-2.02)
15-min	0.910 (0.827-1.00)	1.07 (0.967-1.18)	1.22 (1.10-1.35)	1.39 (1.26-1.53)	1.56 (1.41-1.72)	1.72 (1.54-1.89)	1.85 (1.65-2.04)	1.99 (1.76-2.19)	2.15 (1.89-2.37)	2.30 (2.00-2.54)
30-min	1.25 (1.13-1.38)	1.47 (1.34-1.63)	1.73 (1.57-1.91)	2.01 (1.82-2.22)	2.32 (2.08-2.55)	2.59 (2.32-2.85)	2.84 (2.53-3.13)	3.09 (2.74-3.41)	3.42 (3.00-3.77)	3.72 (3.24-4.11)
60-min	1.56 (1.41-1.72)	1.85 (1.68-2.04)	2.22 (2.01-2.45)	2.62 (2.37-2.89)	3.08 (2.77-3.40)	3.50 (3.14-3.86)	3.91 (3.48-4.31)	4.34 (3.84-4.78)	4.90 (4.31-5.41)	5.43 (4.73-6.00)
2-hr	1.83 (1.66-2.04)	2.20 (1.98-2.44)	2.69 (2.41-2.99)	3.23 (2.90-3.59)	3.89 (3.47-4.30)	4.50 (4.00-4.98)	5.12 (4.52-5.66)	5.78 (5.07-6.39)	6.69 (5.82-7.40)	7.54 (6.50-8.36)
3-hr	1.98 (1.78-2.22)	2.37 (2.12-2.66)	2.90 (2.60-3.26)	3.52 (3.14-3.94)	4.28 (3.80-4.79)	5.02 (4.43-5.60)	5.77 (5.06-6.42)	6.59 (5.73-7.33)	7.74 (6.66-8.62)	8.85 (7.53-9.87)
6-hr	2.37 (2.13-2.67)	2.83 (2.54-3.19)	3.49 (3.12-3.92)	4.23 (3.77-4.75)	5.16 (4.58-5.78)	6.06 (5.35-6.78)	6.99 (6.12-7.80)	8.02 (6.96-8.93)	9.46 (8.10-10.5)	10.9 (9.19-12.1)
12-hr	2.79 (2.50-3.14)	3.33 (2.99-3.74)	4.11 (3.68-4.61)	5.02 (4.48-5.62)	6.17 (5.46-6.89)	7.30 (6.42-8.13)	8.46 (7.37-9.42)	9.77 (8.42-10.9)	11.6 (9.87-12.9)	13.5 (11.3-15.0)
24-hr	3.32 (3.08-3.59)	4.04 (3.74-4.37)	5.22 (4.83-5.64)	6.21 (5.73-6.70)	7.68 (7.02-8.27)	8.94 (8.10-9.62)	10.3 (9.26-11.1)	11.9 (10.5-12.8)	14.1 (12.3-15.3)	16.1 (13.8-17.5)
2-day	3.85 (3.57-4.20)	4.66 (4.32-5.09)	5.99 (5.53-6.53)	7.12 (6.56-7.75)	8.83 (8.07-9.60)	10.3 (9.34-11.2)	12.0 (10.7-13.0)	13.8 (12.2-15.1)	16.6 (14.4-18.2)	19.0 (16.2-21.0)
3-day	4.11 (3.82-4.46)	4.97 (4.62-5.40)	6.36 (5.89-6.90)	7.52 (6.95-8.16)	9.24 (8.47-10.0)	10.7 (9.74-11.6)	12.3 (11.1-13.4)	14.1 (12.5-15.4)	16.9 (14.7-18.5)	19.3 (16.5-21.3)
4-day	4.37 (4.07-4.72)	5.29 (4.93-5.72)	6.73 (6.25-7.28)	7.92 (7.33-8.56)	9.66 (8.87-10.4)	11.1 (10.1-12.0)	12.7 (11.5-13.8)	14.4 (12.9-15.7)	17.2 (15.0-18.7)	19.6 (16.9-21.5)
7-day	5.08 (4.75-5.48)	6.13 (5.73-6.60)	7.70 (7.18-8.29)	9.00 (8.37-9.67)	10.9 (10.0-11.7)	12.4 (11.4-13.4)	14.1 (12.8-15.2)	15.9 (14.3-17.2)	18.5 (16.4-20.1)	20.7 (18.0-22.6)
10-day	5.78 (5.43-6.19)	6.94 (6.52-7.42)	8.59 (8.05-9.20)	9.96 (9.31-10.6)	11.9 (11.1-12.7)	13.6 (12.5-14.5)	15.3 (14.0-16.4)	17.2 (15.5-18.4)	19.8 (17.7-21.5)	22.1 (19.4-24.0)
20-day	7.81 (7.35-8.32)	9.30 (8.77-9.92)	11.3 (10.6-12.1)	13.0 (12.2-13.8)	15.3 (14.3-16.3)	17.2 (16.0-18.3)	19.2 (17.7-20.5)	21.4 (19.5-22.9)	24.4 (21.9-26.3)	26.8 (23.8-29.1)
30-day	9.65 (9.09-10.3)	11.5 (10.8-12.2)	13.8 (13.0-14.7)	15.7 (14.7-16.6)	18.2 (17.1-19.4)	20.3 (18.9-21.6)	22.4 (20.8-23.9)	24.6 (22.6-26.3)	27.5 (25.1-29.6)	29.9 (27.0-32.2)

AT LEAST A 50% CHANCE OF AN EVENT THIS SIZE EACH YEAR



POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

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15-min	0.910 (0.827-1.00)	1.07 (0.967-1.18)	1.22 (1.10-1.35)	1.39 (1.26-1.53)	1.56 (1.41-1.72)	1.72 (1.54-1.89)	1.85 (1.65-2.04)	1.99 (1.76-2.19)	2.15 (1.89-2.37)	2.30 (2.00-2.54)
30-min	1.25 (1.13-1.38)	1.47 (1.34-1.63)	1.73 (1.57-1.91)	2.01 (1.82-2.22)	2.32 (2.08-2.55)	2.59 (2.32-2.85)	2.84 (2.53-3.13)	3.09 (2.74-3.41)	3.42 (3.00-3.77)	3.72 (3.24-4.11)
60-min	1.56 (1.41-1.72)	1.85 (1.68-2.04)	2.22 (2.01-2.45)	2.62 (2.37-2.89)	3.08 (2.77-3.40)	3.50 (3.14-3.86)	3.91 (3.48-4.31)	4.34 (3.84-4.78)	4.90 (4.31-5.41)	5.43 (4.73-6.00)
2-hr	1.83 (1.66-2.04)	2.20 (1.98-2.44)	2.69 (2.41-2.99)	3.23 (2.90-3.59)	3.89 (3.47-4.30)	4.50 (4.00-4.98)	5.12 (4.52-5.66)	5.78 (5.07-6.39)	6.69 (5.82-7.40)	7.54 (6.50-8.36)
3-hr	1.98 (1.78-2.22)	2.37 (2.12-2.66)	2.90 (2.60-3.26)	3.52 (3.14-3.94)	4.28 (3.80-4.79)	5.02 (4.43-5.60)	5.77 (5.06-6.42)	6.59 (5.73-7.33)	7.74 (6.66-8.62)	8.85 (7.53-9.87)
6-hr	2.37 (2.13-2.67)	2.83 (2.54-3.19)	3.49 (3.12-3.92)	4.23 (3.77-4.75)	5.16 (4.58-5.78)	6.06 (5.35-6.78)	6.99 (6.12-7.80)	8.02 (6.96-8.93)	9.46 (8.10-10.5)	10.9 (9.19-12.1)
12-hr	2.79 (2.50-3.14)	3.33 (2.99-3.74)	4.11 (3.68-4.61)	5.02 (4.48-5.62)	6.17 (5.46-6.89)	7.30 (6.42-8.13)	8.46 (7.37-9.42)	9.77 (8.42-10.9)	11.6 (9.87-12.9)	13.5 (11.3-15.0)
24-hr	3.32 (3.08-3.59)	4.04 (3.74-4.37)	5.22 (4.83-5.64)	6.21 (5.73-6.70)	7.68 (7.02-8.27)	8.94 (8.10-9.62)	10.3 (9.26-11.1)	11.9 (10.5-12.8)	14.1 (12.3-15.3)	16.1 (13.8-17.5)
2-day	3.85 (3.57-4.20)	4.66 (4.32-5.09)	5.99 (5.53-6.53)	7.12 (6.56-7.75)	8.83 (8.07-9.60)	10.3 (9.34-11.2)	12.0 (10.7-13.0)	13.8 (12.2-15.1)	16.6 (14.4-18.2)	19.0 (16.2-21.0)
3-day	4.11 (3.82-4.46)	4.97 (4.62-5.40)	6.36 (5.89-6.90)	7.52 (6.95-8.16)	9.24 (8.47-10.0)	10.7 (9.74-11.6)	12.3 (11.1-13.4)	14.1 (12.5-15.4)	16.9 (14.7-18.5)	19.3 (16.5-21.3)
4-day	4.37 (4.07-4.72)	5.29 (4.93-5.72)	6.73 (6.25-7.28)	7.92 (7.33-8.56)	9.66 (8.87-10.4)	11.1 (10.1-12.0)	12.7 (11.5-13.8)	14.4 (12.9-15.7)	17.2 (15.0-18.7)	19.6 (16.9-21.5)
7-day	5.08 (4.75-5.48)	6.13 (5.73-6.60)	7.70 (7.18-8.29)	9.00 (8.37-9.67)	10.9 (10.0-11.7)	12.4 (11.4-13.4)	14.1 (12.8-15.2)	15.9 (14.3-17.2)	18.5 (16.4-20.1)	20.7 (18.0-22.6)
10-day	5.78 (5.43-6.19)	6.94 (6.52-7.42)	8.59 (8.05-9.20)	9.96 (9.31-10.6)	11.9 (11.1-12.7)	13.6 (12.5-14.5)	15.3 (14.0-16.4)	17.2 (15.5-18.4)	19.8 (17.7-21.5)	22.1 (19.4-24.0)
20-day	7.81 (7.35-8.32)	9.30 (8.77-9.92)	11.3 (10.6-12.1)	13.0 (12.2-13.8)	15.3 (14.3-16.3)	17.2 (16.0-18.3)	19.2 (17.7-20.5)	21.4 (19.5-22.9)	24.4 (21.9-26.3)	26.8 (23.8-29.1)
30-day	9.65 (9.09-10.3)	11.5 (10.8-12.2)	13.8 (13.0-14.7)	15.7 (14.7-16.6)	18.2 (17.1-19.4)	20.3 (18.9-21.6)	22.4 (20.8-23.9)	24.6 (22.6-26.3)	27.5 (25.1-29.6)	29.9 (27.0-32.2)

10% CHANCE OF AN EVENT NEARLY TWICE THIS SIZE EACH YEAR

Greg Clayton's Wheat Field  
Tetterton Farm  
South of Highway 99



Larry Boyd's  
Gerald Allen Farm  
North of Highway 99



Mike Harris's  
East Side of Railroad Bed Road





# 3B Farms West of Shore Drive





**WHAT CAN WE DO?**

South Side of Highway 99



# 3 PRONGED APPROACH

South Side of Highway 99

A scenic view of a canal with a large, leafless tree in the center, surrounded by tall grasses and a road in the background. The water in the canal is calm, reflecting the sky and the surrounding landscape. The trees are mostly bare, suggesting a late autumn or winter setting. The overall scene is peaceful and natural.

# LOCAL EFFORT

Newland Road at B Canal



# BETTER MAINTANCE ON MAJOR CANALS

Newland Road at B Canal

# REMOVE SNAGS AND OBSTRUCTIONS





# STATE EFFORT

Cherry Road at Ambrose Road



Highway 99 at #12 Canal

**NC DOT  
CAN CLEAR HIGHWAY CROSSINGS**






Highway 99 at #12 Canal

**ELIMINATE DOUBLE CULVERTS  
WHERE POSSIBLE IN NEW CONSTRUCTION**



**THIS IS A SINGLE CULVERT  
ABOUT ¼ MILE UPSTREAM OF THE PREVIOUS SLIDE**



# PETTIGREW STATE PARK CAN BETTER MANAGE WATER LEVEL IN LAKE PHELPS

West side of Lake Phelps

WITH CURRENT MANAGEMENT STRATEGIES  
LAKE PHELPS  
FLOODS ADJOINING PROPERTY  
DURING RAIN EVENTS



Shore Drive west of Lake Phelps

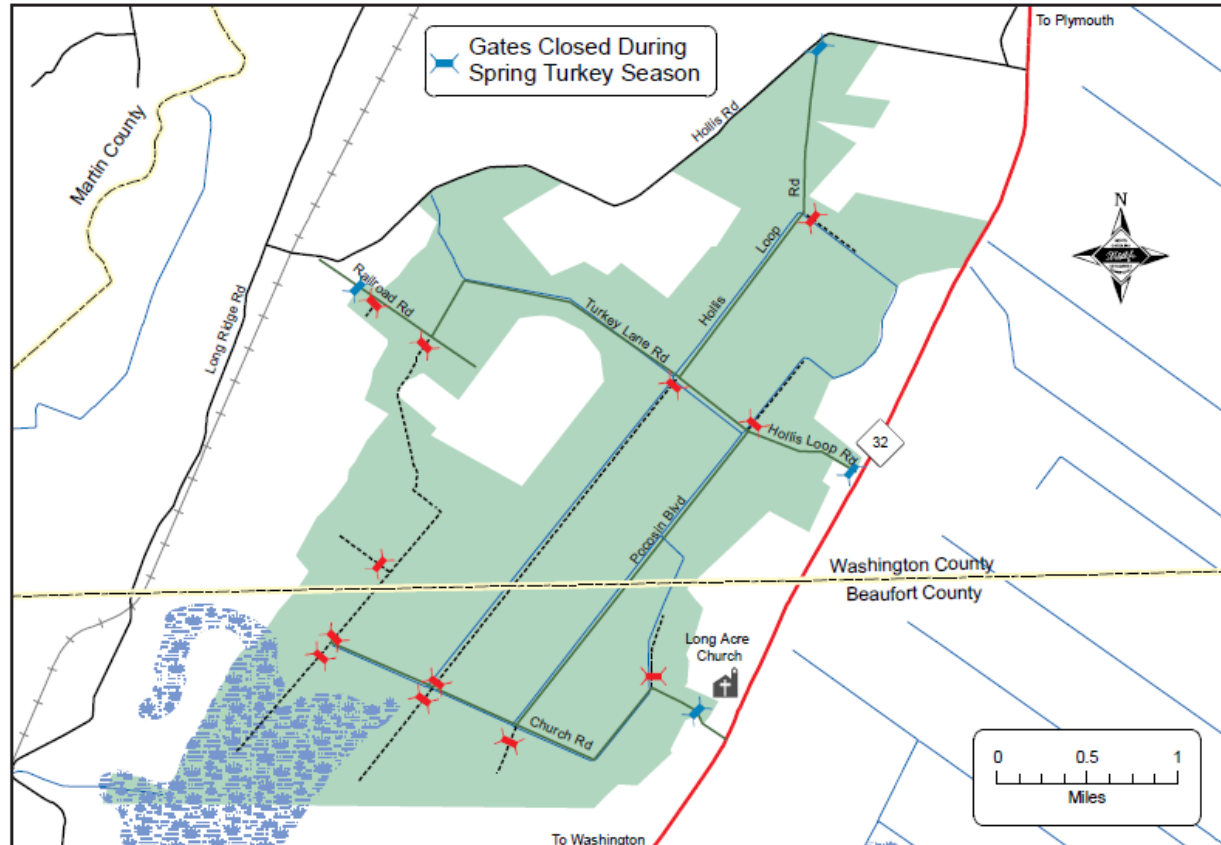
LAST SATURDAY (2/6/16) LAKE PHELPS WAS AT 11.9' (NAVD29)  
JURISDICTIONAL BOUNDARY IS AT 11.5'



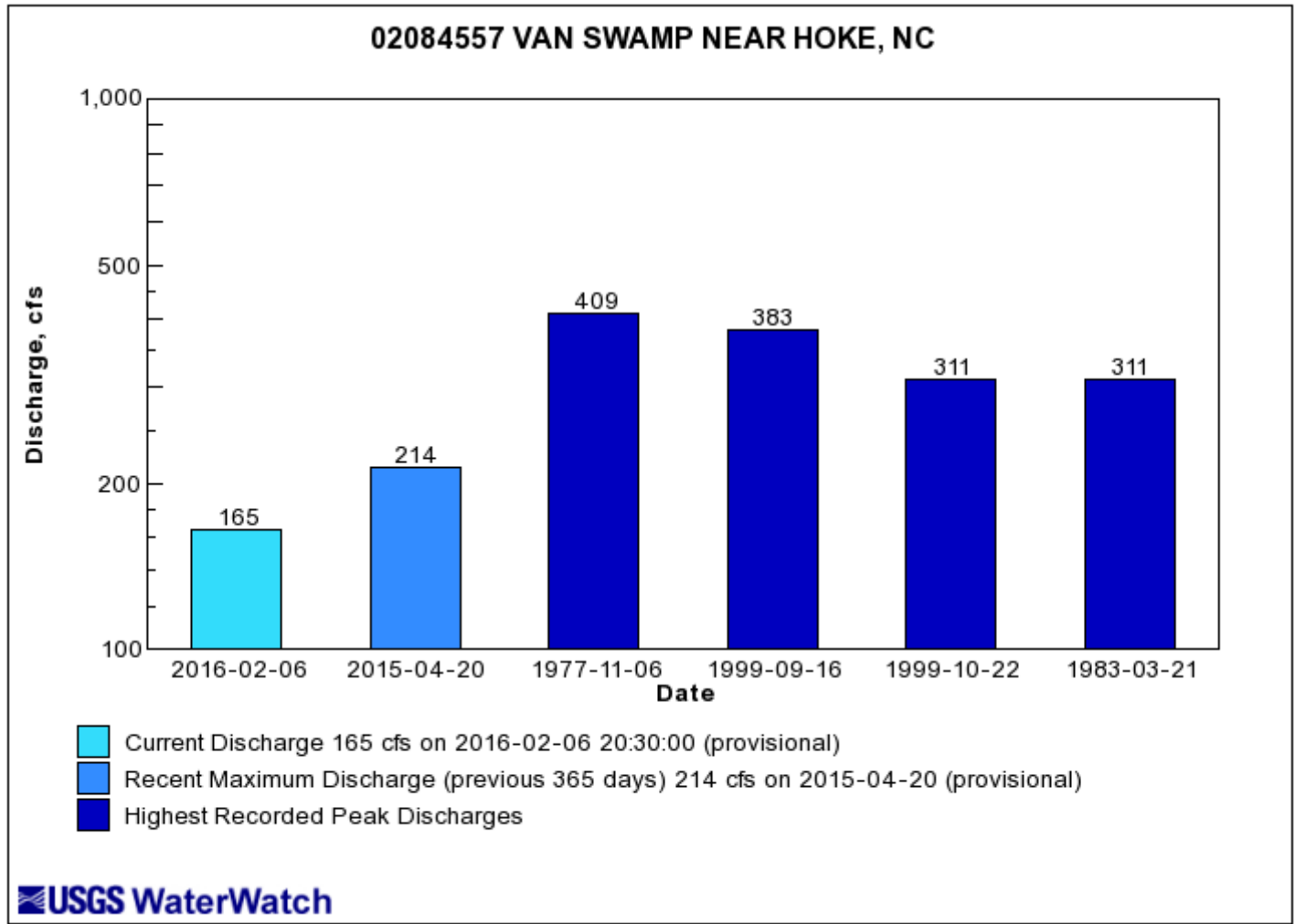
**PETTIGREW STATE PARK NEEDS TO REPLACE  
ANTIQUATED MANUAL DISCHARGE STRUCTURES  
WITH PROPERLY SIZED AUTOMATIC STRUCTURES**

## VAN SWAMP GAME LAND

N.C. Wildlife Resources Commission,  
Beaufort and Washington Counties (5,515 acres)



**VAN SWAMP GAME LAND  
DRAINS INTO ALBEMARLE DRAINAGE DISTRICT  
BUT PAYS NO DRAINAGE TAX**



VAN SWAMP GAME LAND  
IS ABOUT 37% OF THIS DRAINAGE

# FEDERAL EFFORT



Dehoog Road



A wide-angle photograph of a dirt road in a wetland area. The road is the central focus, leading from the foreground into the distance. A large, clear puddle on the left side of the road reflects the overcast sky. The surrounding landscape is a mix of green grasses, brown reeds, and scattered trees. The sky is filled with soft, grey clouds.

BETTER WATER MANAGEMENT

BY

POCOSIN LAKES

NATIONAL WILDLIFE REFUGE




POCOSIN LAKES NWR DUMPS AN ESTIMATED 25 CFS  
INTO THE EDDIE SMITH DRAINAGE DISTRICT THRU RISERS

F2 block beside Shore Drive

# POCOSIN LAKES NWR DRAINS AN UNDETRMINED AMOUNT OF ADDITIONAL WATER **ACROSS** ADJOINING TRACTS



A photograph of a creek with many trees and branches in the water, illustrating the need for clearing and snagging. The water is brown and murky, and the trees are mostly bare, suggesting a late autumn or winter setting. The text is overlaid on the lower half of the image.

**ADDITIONAL FUNDING IS NEEDED FOR  
CLEARING AND SNAGGING  
OF OUTFALLS**

Kendricks Creek at Roper

# QUESTIONS AND COMMENTS

