CHAPTER 11. BENTHIC MACROINVERTEBRATES, APPENDIX 11.E COMPARISON OF FULL1995NN AND FULL2030PN SCENARIOS IN THE BENTHIC SAMPLING AREA OF LAKE POINSETT

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Comparison of FULL1995NN and FULL2030PN Scenarios in the Benthic Sampling Area of Lake Poinsett

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Purpose

The purpose of this appendix is to provide a comparison of the impact of two water withdrawal scenarios (FULL1995NN and FULL2030PN) on the benthic sampling area at the north end of Lake Poinsett (Figures 1 and 2) using the SFWMD "Hydroperiod Tool." The Hydroperiod Tool is a geographic information system (GIS) customization briefly described in Chapter 10 and in more detail in Appendix X of this report. Areal impact is determined with the Hydroperiod Tool by GIS change analysis, in which the area of wetlands inundated historically is compared to the area that is inundated as a result of each scenario. Area of wetland inundation is determined by the intersection of a digital elevation model (DEM) representing the land surface ("bare earth") and a GIS interpolated surface representing the elevation of surface water at a given river stage. The stage data used was derived statistically from exceedence curves that are calculated from 10 years worth of data (January 1, 1996 to December 31, 2005) from the historic record and from the modeled scenarios. Hydrologic data preparation for the Hydroperiod Tool is described in greater detail in Appendix Z. The exceedence curves used are shown in Figures 3 and 4. Water elevation data input for the Hydroperiod Tool is provided in Table 1. Areal impact is accompanied by a change in days of inundation (Table 2, Results are focused on areas receiving less inundation as a result of the withdrawal scenarios (Figures 5 through 23; Tables 3 and 4). The greatest impact occurs at the 50% exceedence value in both scenarios, the effect of the FULL2030PN scenario being minimal compared to the FULL1995NN scenario (7.3 hectares and 38.6 hectares, respectively). As an index to compare the magnitude of impact, the total area impacted over all exceedence values is 165.2 hectares (approximately 27% of the total area) from the FULL1995NN scenarios and 21.9 hectares (less than 4% of the total area) from the FULL2030PN scenario

Figures

Tables

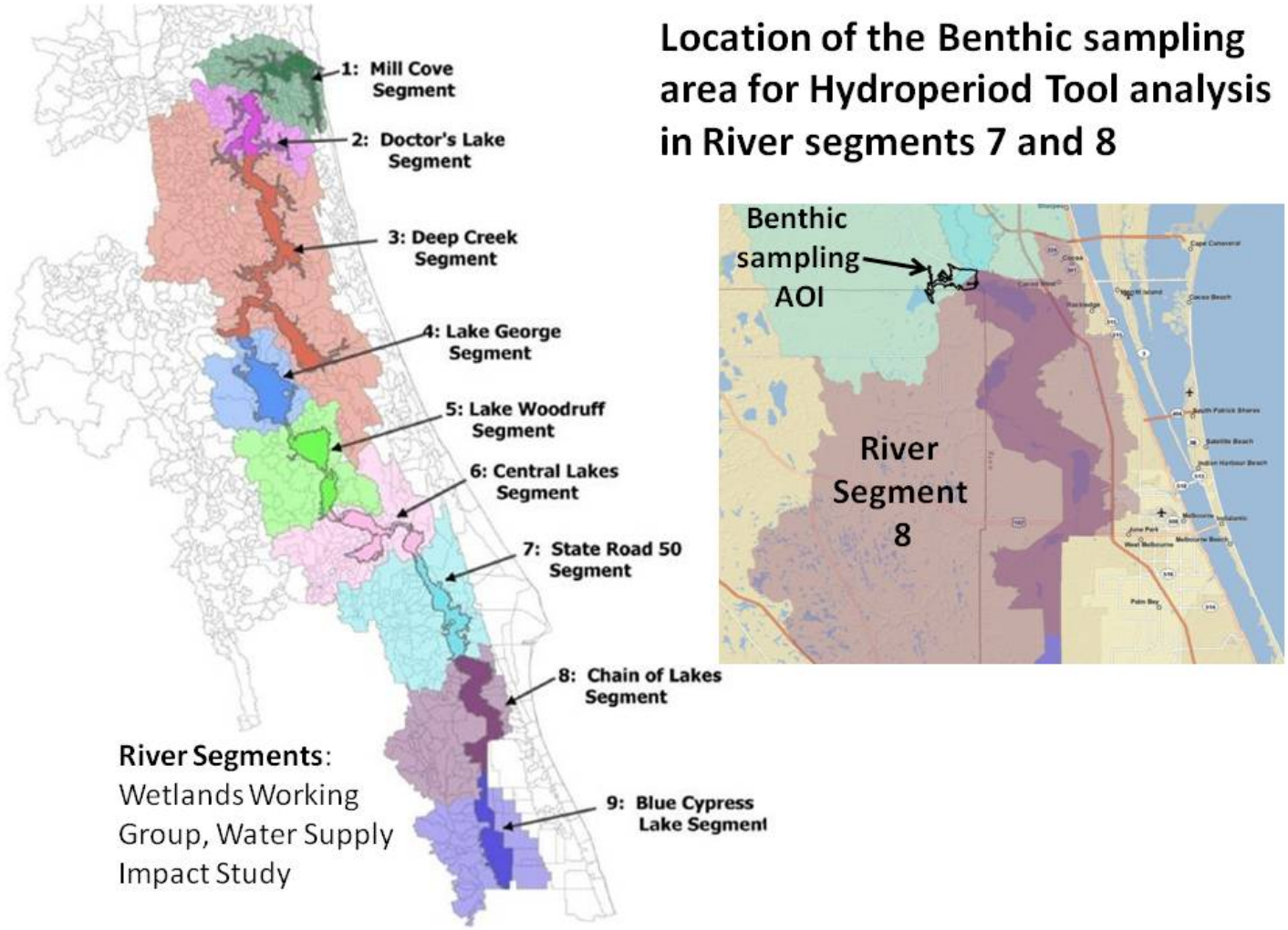

Figure 1. **Location of the benthic sampling area**. Wetlands contiguous with the St. Johns River and/or Lake Poinsett in the benthic sampling area comprise approximately 945.5 hectares (black outline in inset.).

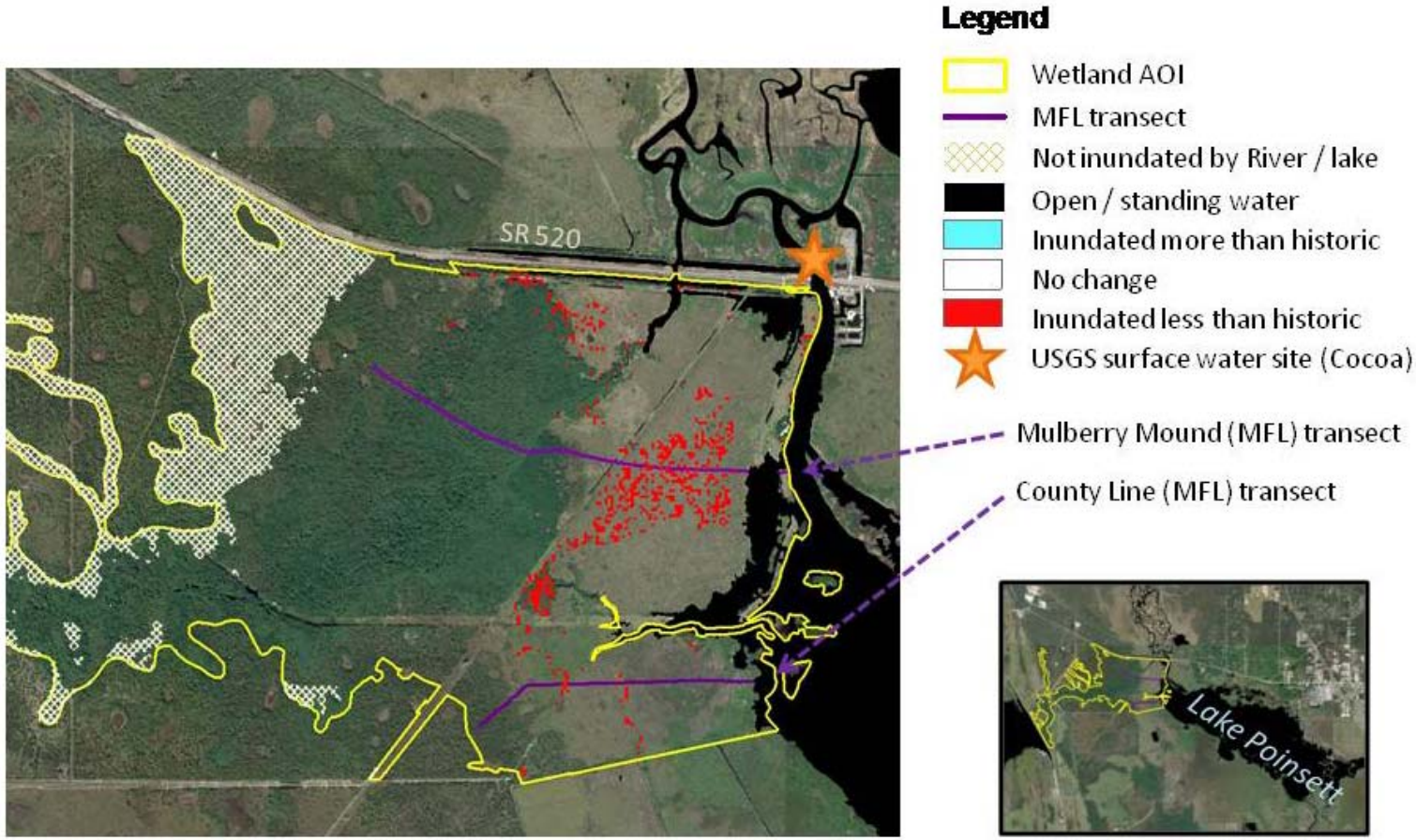

Figure 2. **Benthic sampling area with legend for subsequent figures.** Of the 945.5 hectares of wetlands contiguous with the River / Lake, a portion (approximately 324.7 hectares, yellow hatched area) has never received inundation directly from the River, based on the historic record. Thus, the effective wetland area of interest for the benthic sampling area is 620.8 hectares. The legend in this figure applies to the results figures (Figures 5 – 22)

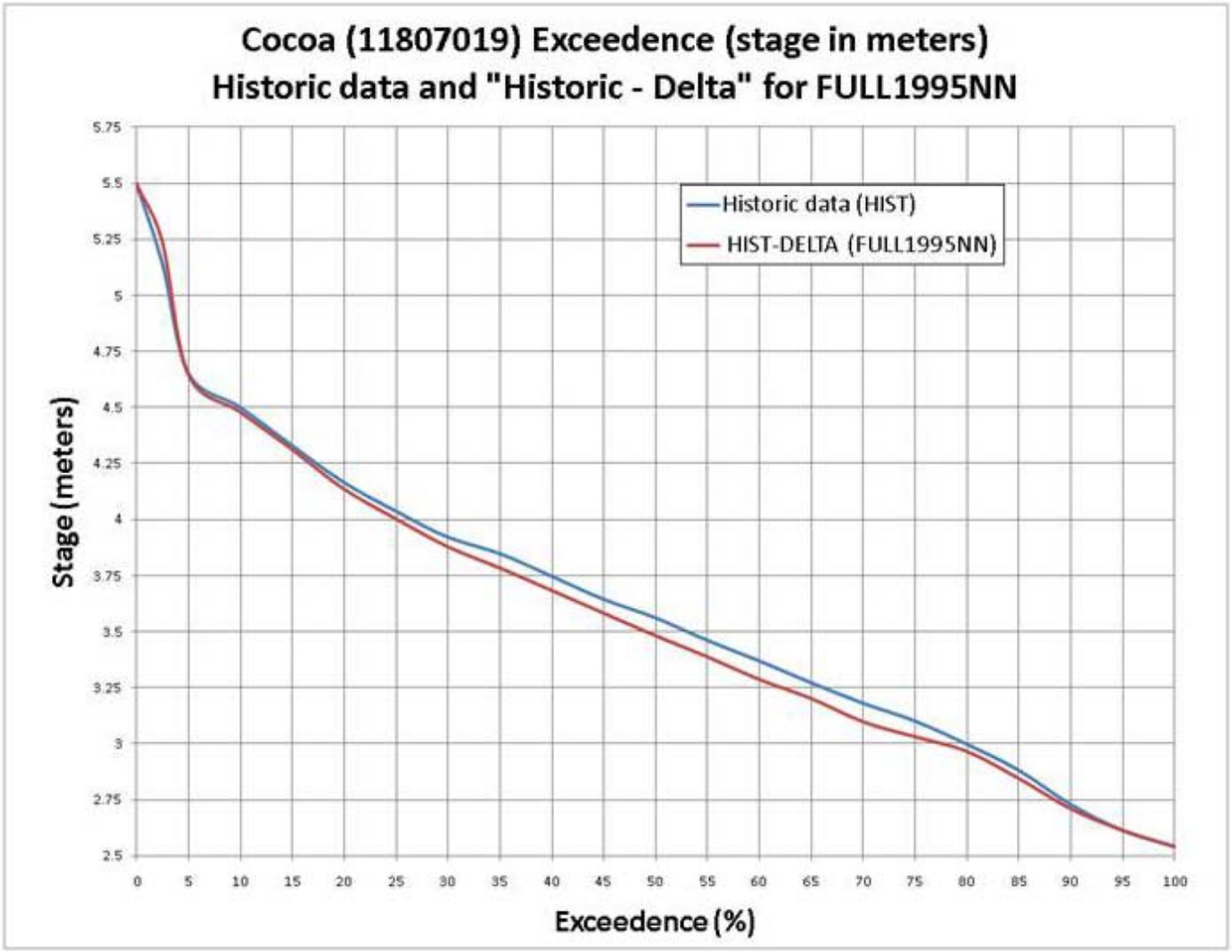

Figure 3. **Percentage exceedence curves for historic data and FULL1995NN scenario for USGS surface water site Cocoa.** The location of the USGS water surface site is shown in Figure 2.

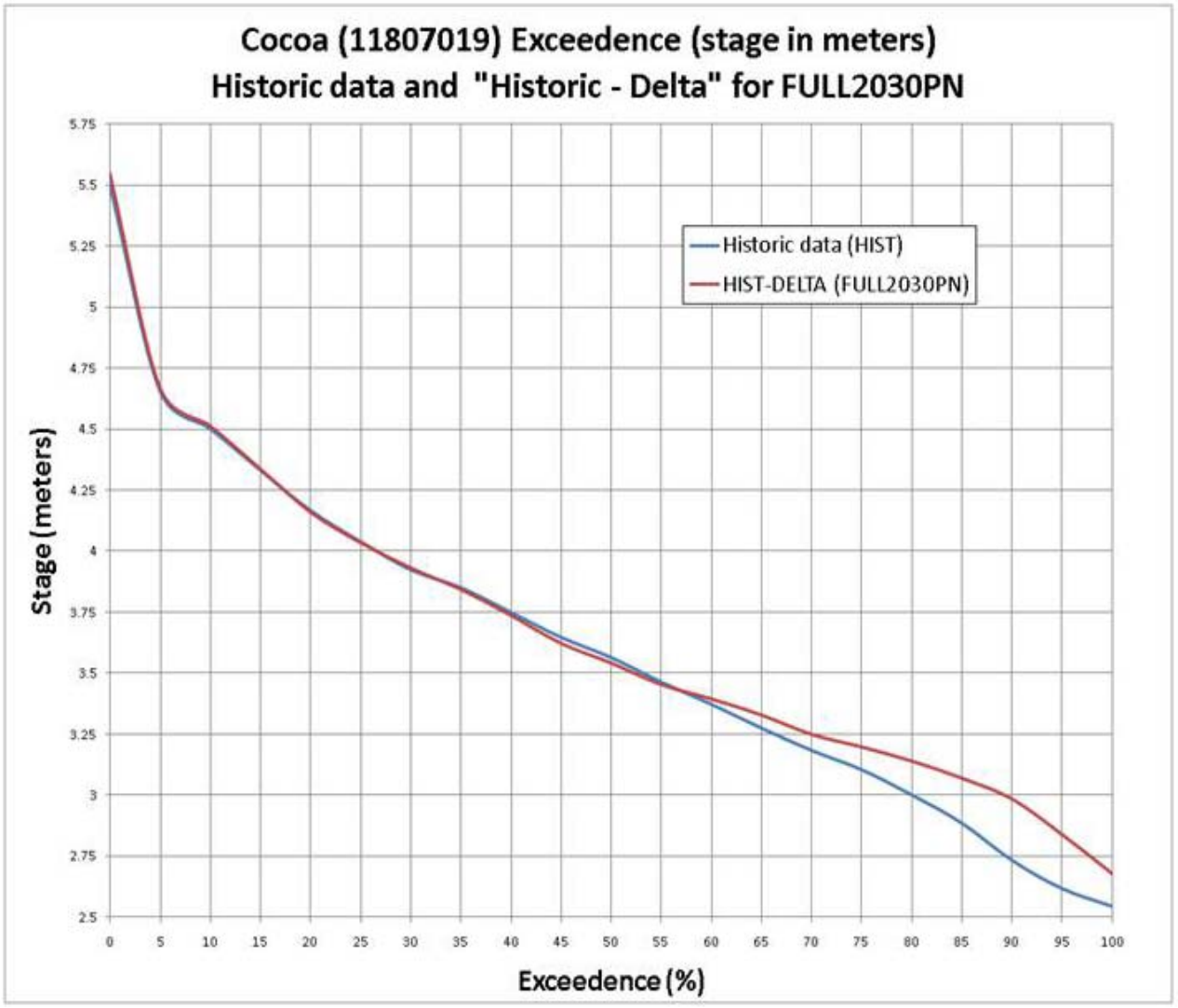

Figure 4. **Percentage exceedence curves for historic data and FULL2030PN scenario for USGS surface water site Cocoa.** The location is shown in Figure 2.

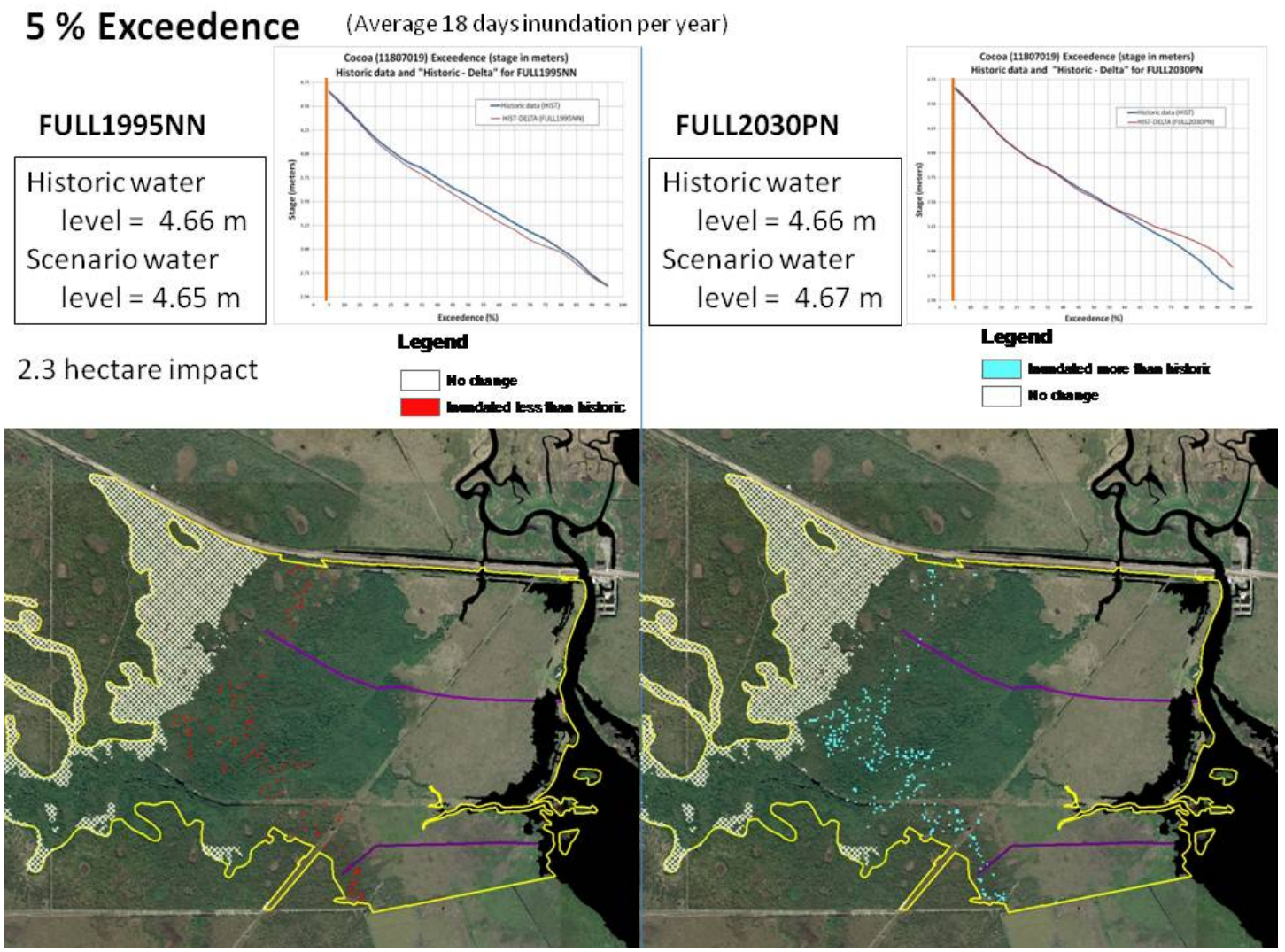

Figure 5. **Comparison of FULL1995NN and FULL2030PN impact at 5% exceedence.** Based on the historic record, water reached this level in only 6 out of the 10 years in the study period (January 1, 1996 – December 31, 2005). 2.3 hectares (FULL1995NN) is less than 1% of the total area. There is no impact from the FULL2030PN scenario at this exceedence level.

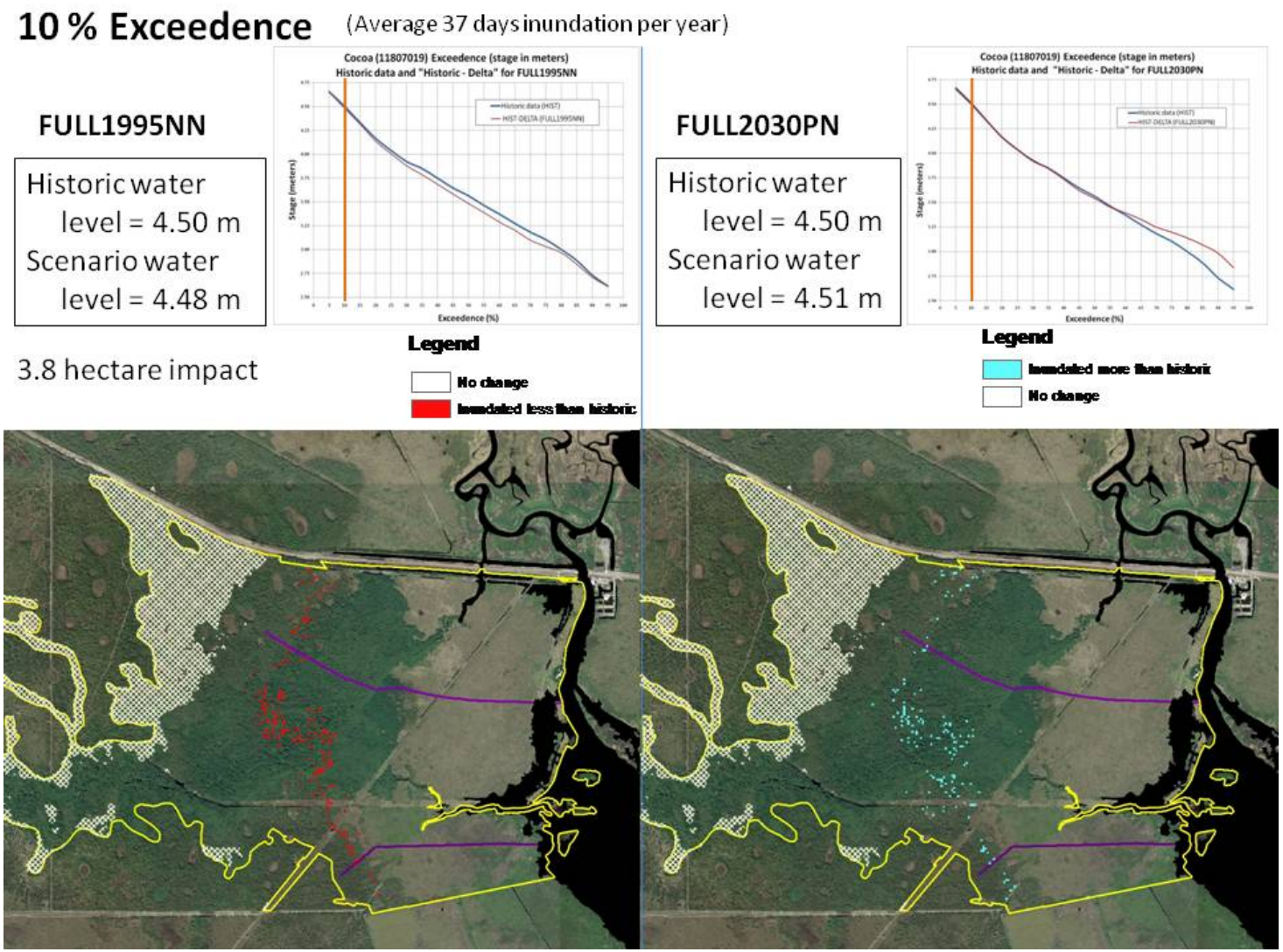

Figure 6. **Comparison of FULL1995NN and FULL2030PN impact at 10% exceedence.** Based on the historic record, water reached this level in only 6 out of the 10 years in the study period (January 1, 1996 – December 31, 2005). 3.8 hectares (FULL1995NN) is less than 1% of the total area. There is no impact from the FULL2030PN scenario at this exceedence level.

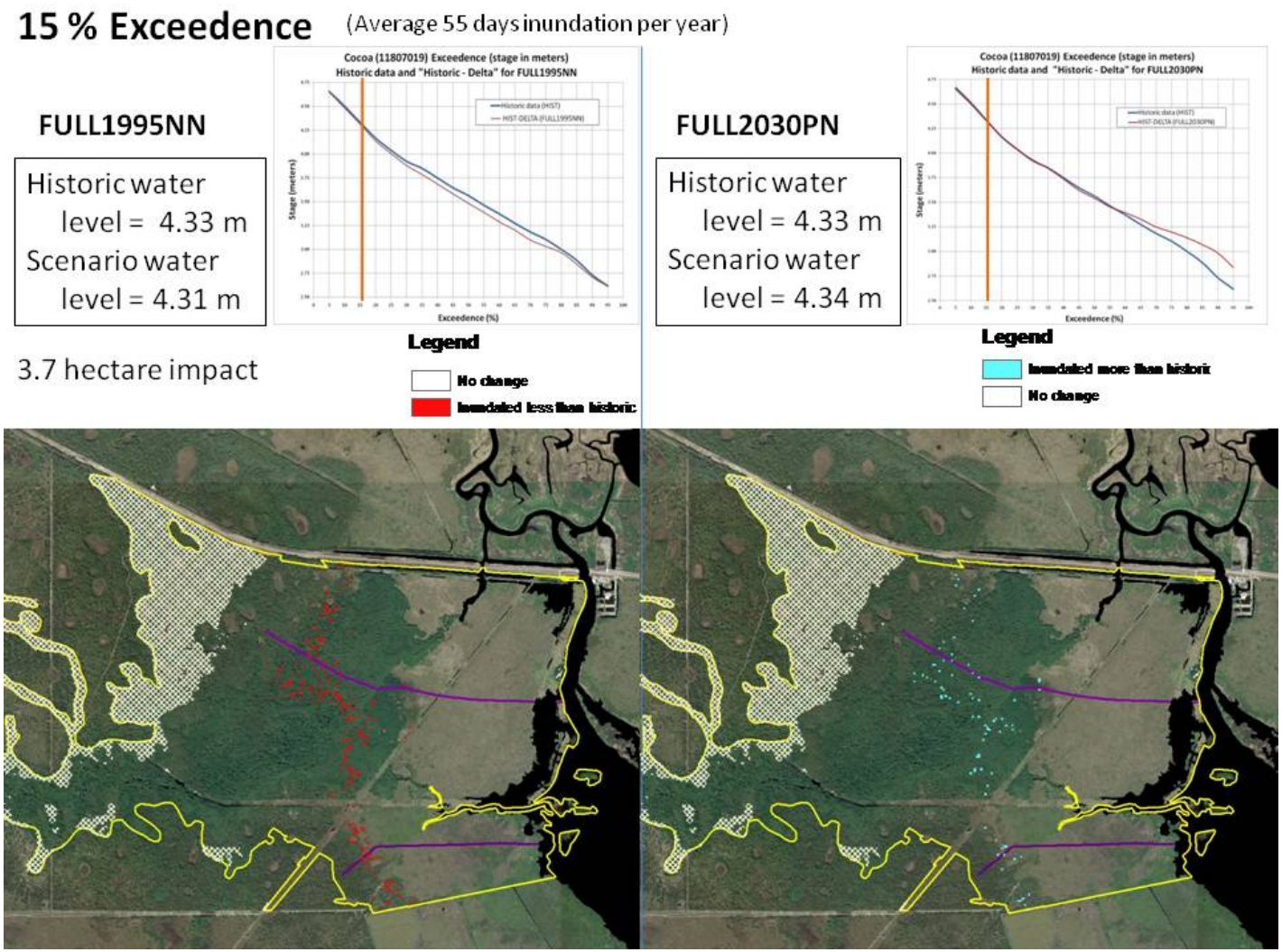

Figure 7. **Comparison of FULL1995NN and FULL2030PN impact at 15% exceedence.** Based on the historic record, water reached this level in only 7 out of the 10 years in the study period (January 1, 1996 – December 31, 2005). 3.7 hectares (FULL1995NN) is less than 1% of the total area. There is no impact from the FULL2030PN scenario at this exceedence level.

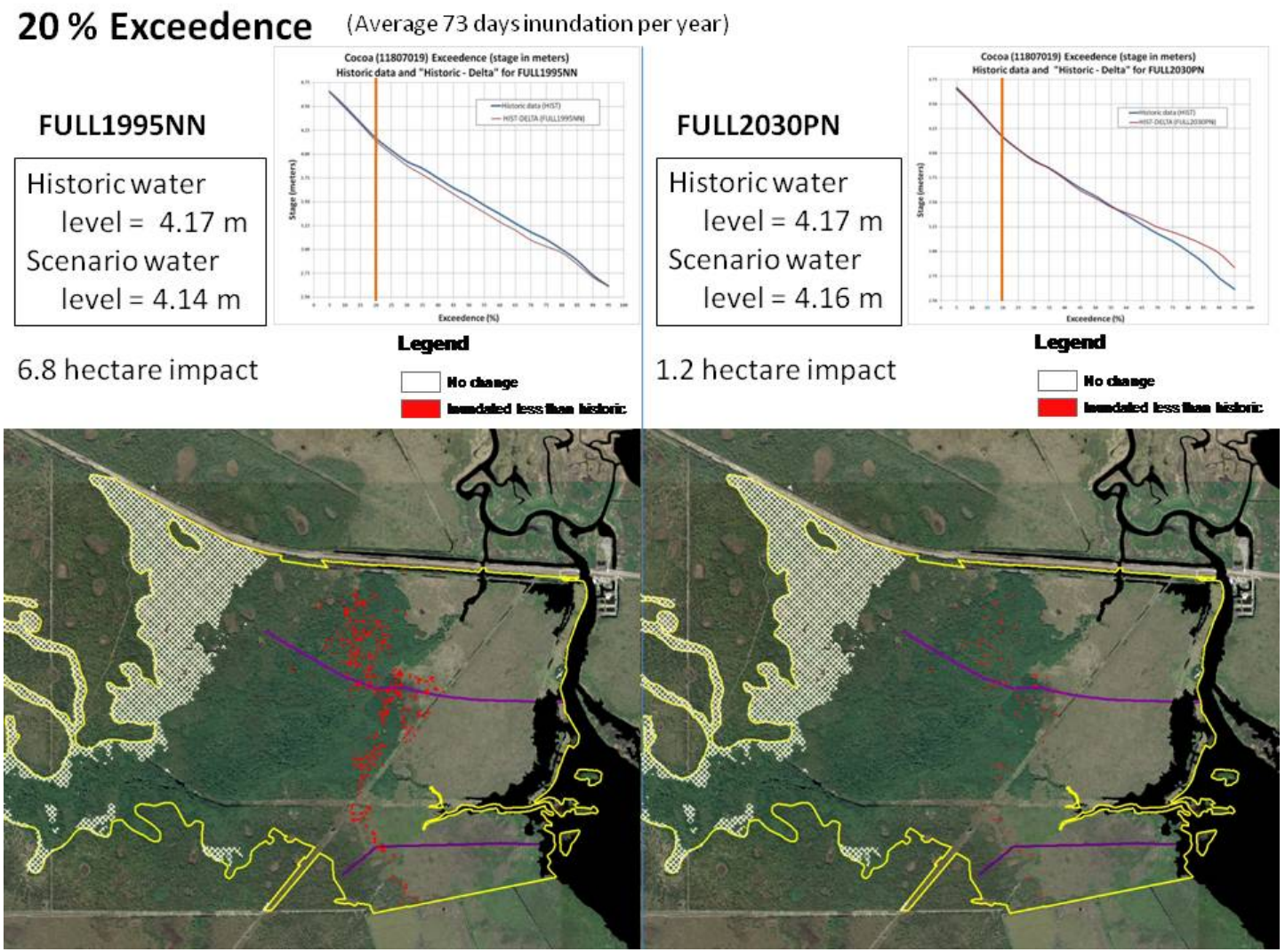

Figure 8. **Comparison of FULL1995NN and FULL2030PN impact at 20% exceedence**. Based on the historic record, water reached this level in only 8 out of the 10 years in the study period (January 1, 1996 – December 31, 2005). 6.8 hectares (FULL1995NN) is approximately 1% of the total area and 1.2 hectares (FULL2030PN) is less than 0.2 % of the total area.

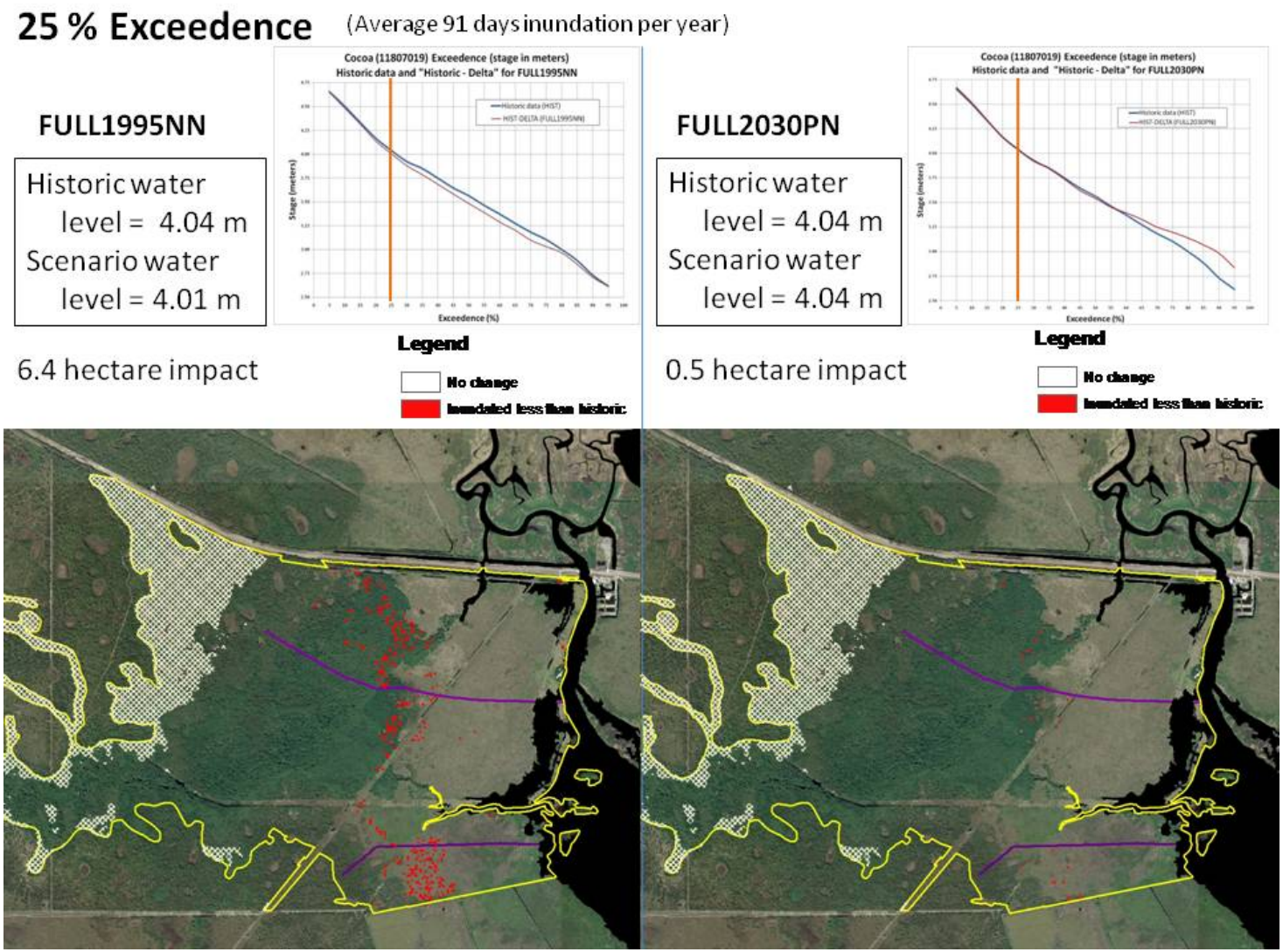

Figure 9. **Comparison of FULL1995NN and FULL2030PN impact at 25% exceedence.** Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). 6.4 hectares (FULL1995NN) is approximately 1% of the total area. 0.5 hectares (FULL2030PN) is negligible.

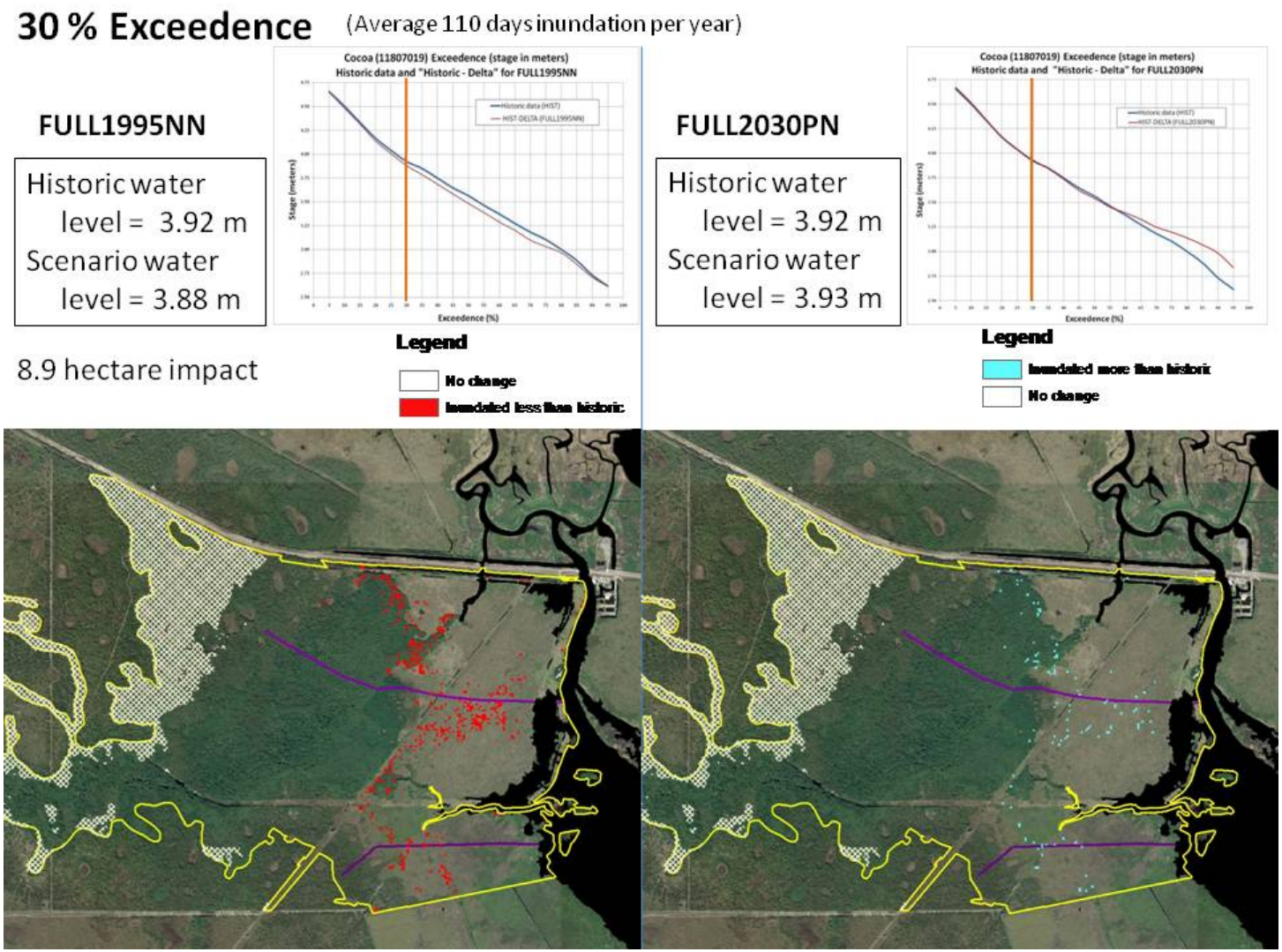

Figure 10. **Comparison of FULL1995NN and FULL2030PN impact at 30% exceedence**. Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). 8.9 hectares (FULL1995NN) is approximately 1.5% of the total area. There is no impact from the FULL2030PN scenario at this exceedence level.

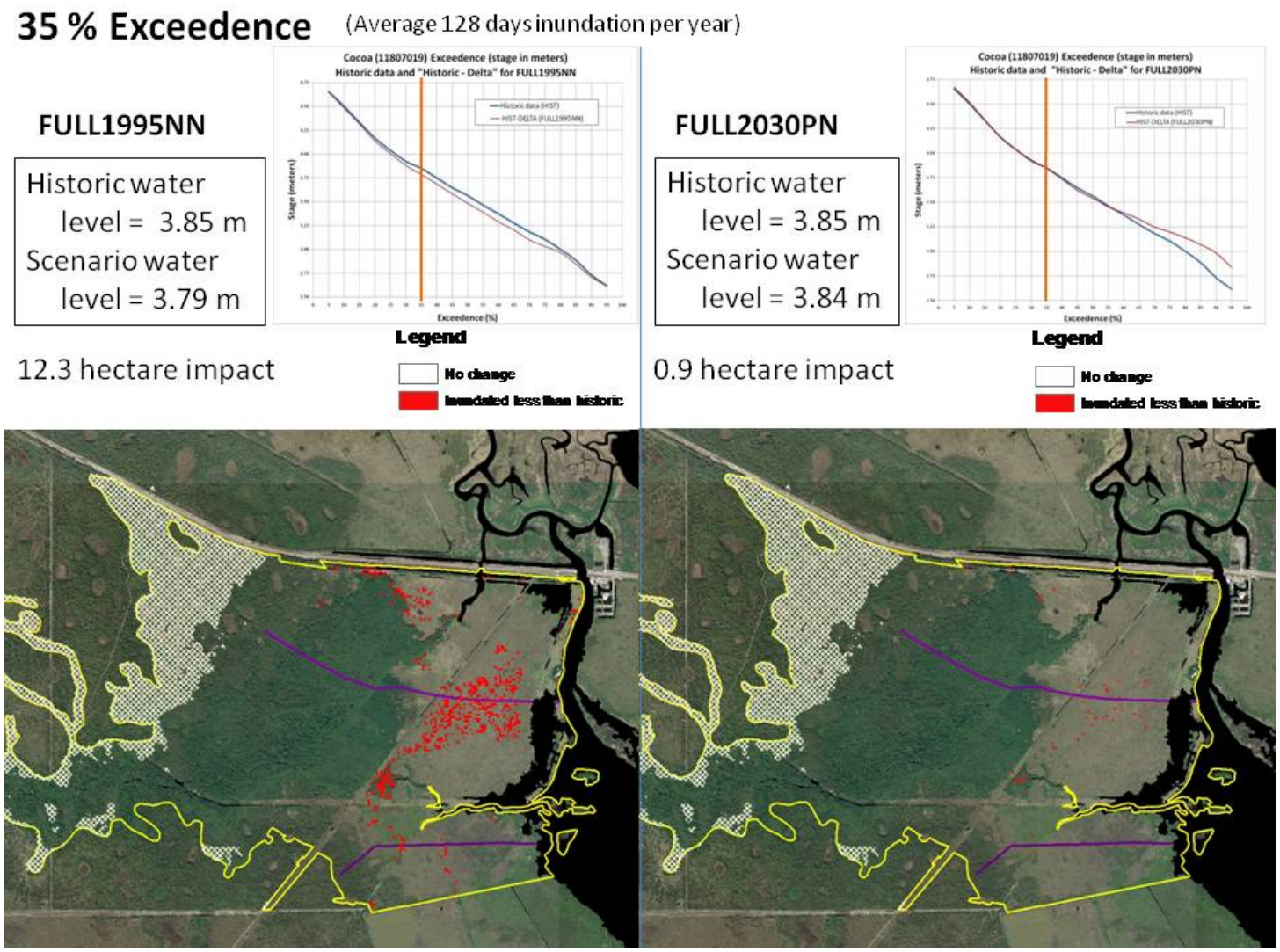

Figure 11. **Comparison of FULL1995NN and FULL2030PN impact at 35% exceedence.** Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). 12.3 hectares (FULL1995NN) is approximately 2% of the total area. 0.9 hectares (FULL2030PN) is less than 0.2% of the total area.

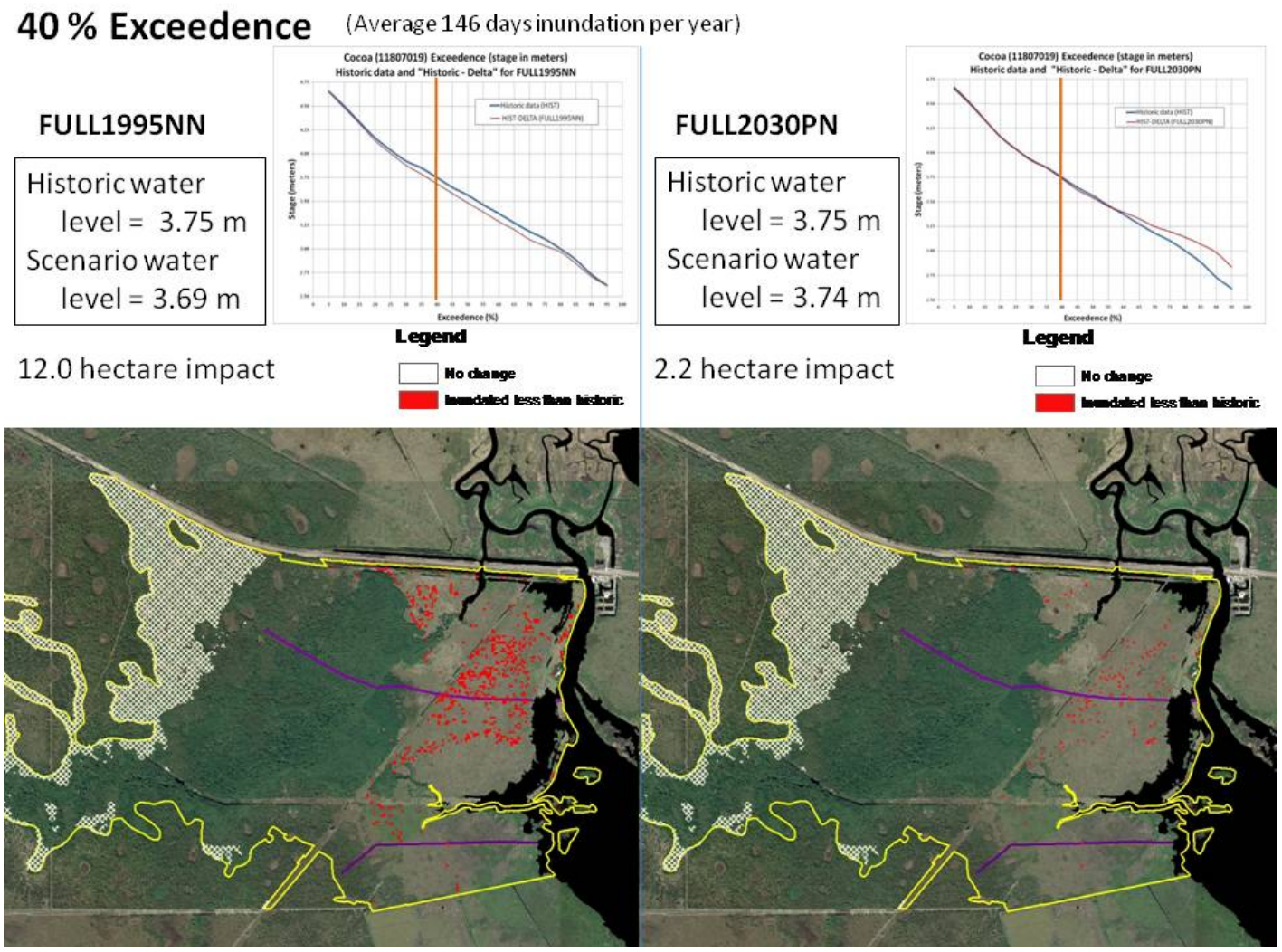

Figure 12. **Comparison of FULL1995NN and FULL2030PN impact at 40% exceedence**. Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). 12.0 hectares (FULL1995NN) is approximately 2% of the total area. 2.2 hectares (FULL2030PN) is less than 0.4% of the total area.

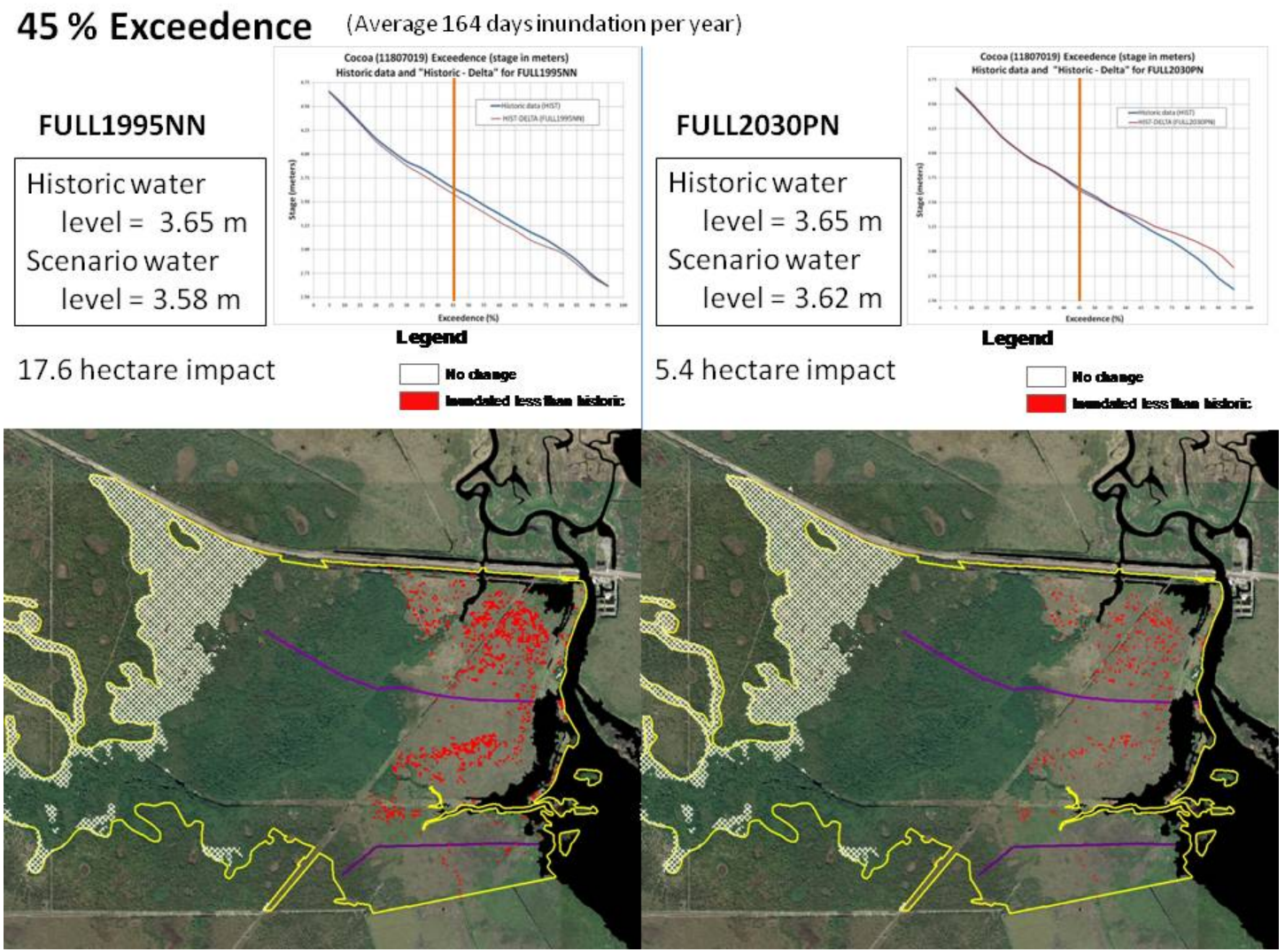

Figure 13. **Comparison of FULL1995NN and FULL2030PN impact at 45% exceedence.** Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). 17.6 hectares (FULL1995NN) is approximately 2.9 % of the total area. 5.4 hectares (FULL2030PN) is less than 0.9% of the total area.

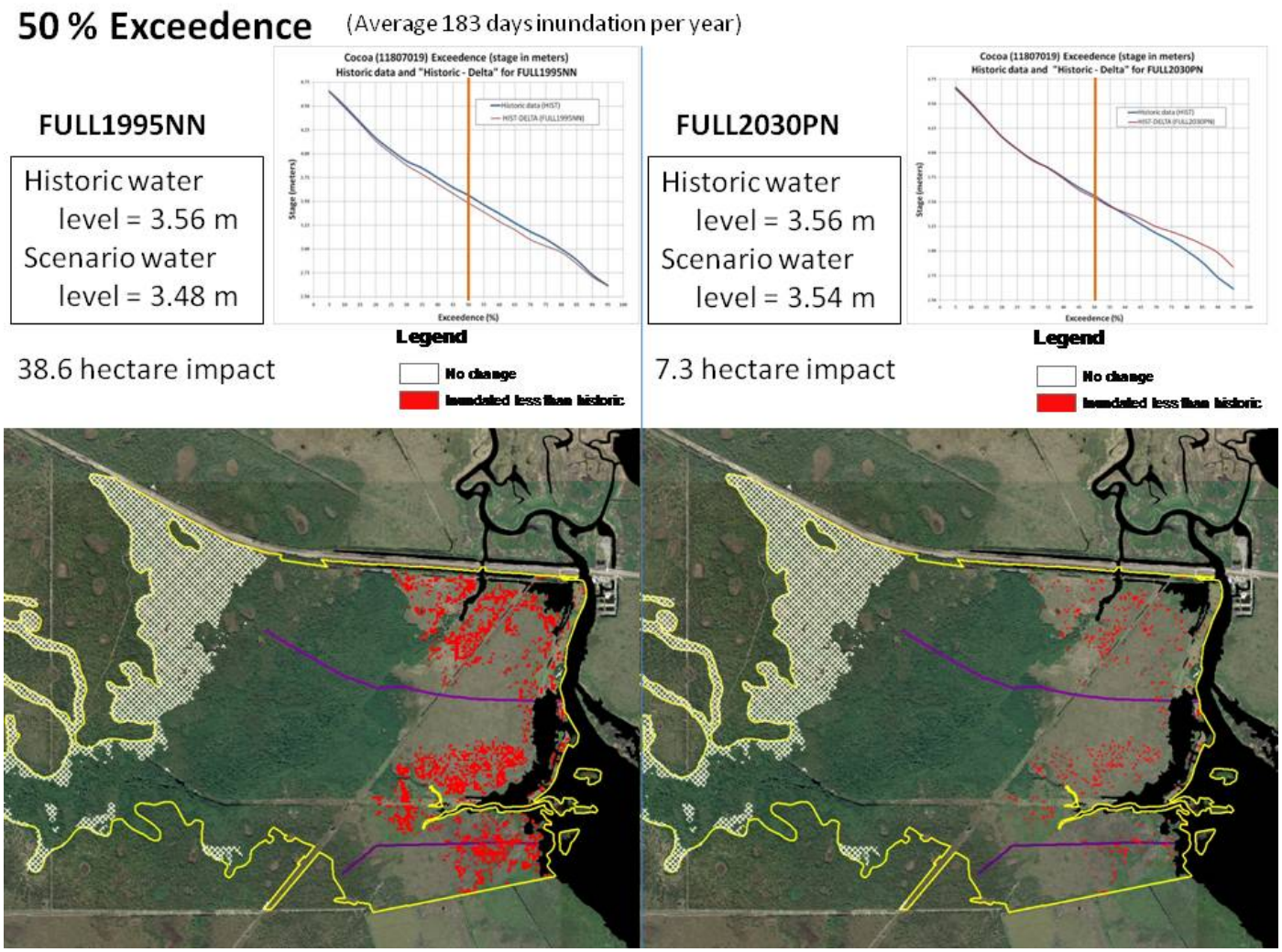

Figure 14. **Comparison of FULL1995NN and FULL2030PN impact at 50% exceedence.** Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). The greatest impact occurs at this exceedence level in both scenarios. 38.6 hectares (FULL1995NN) is approximately 6.2 % of the total area. 7.3 hectares (FULL2030PN) is approximately 1.2 % of the total area.

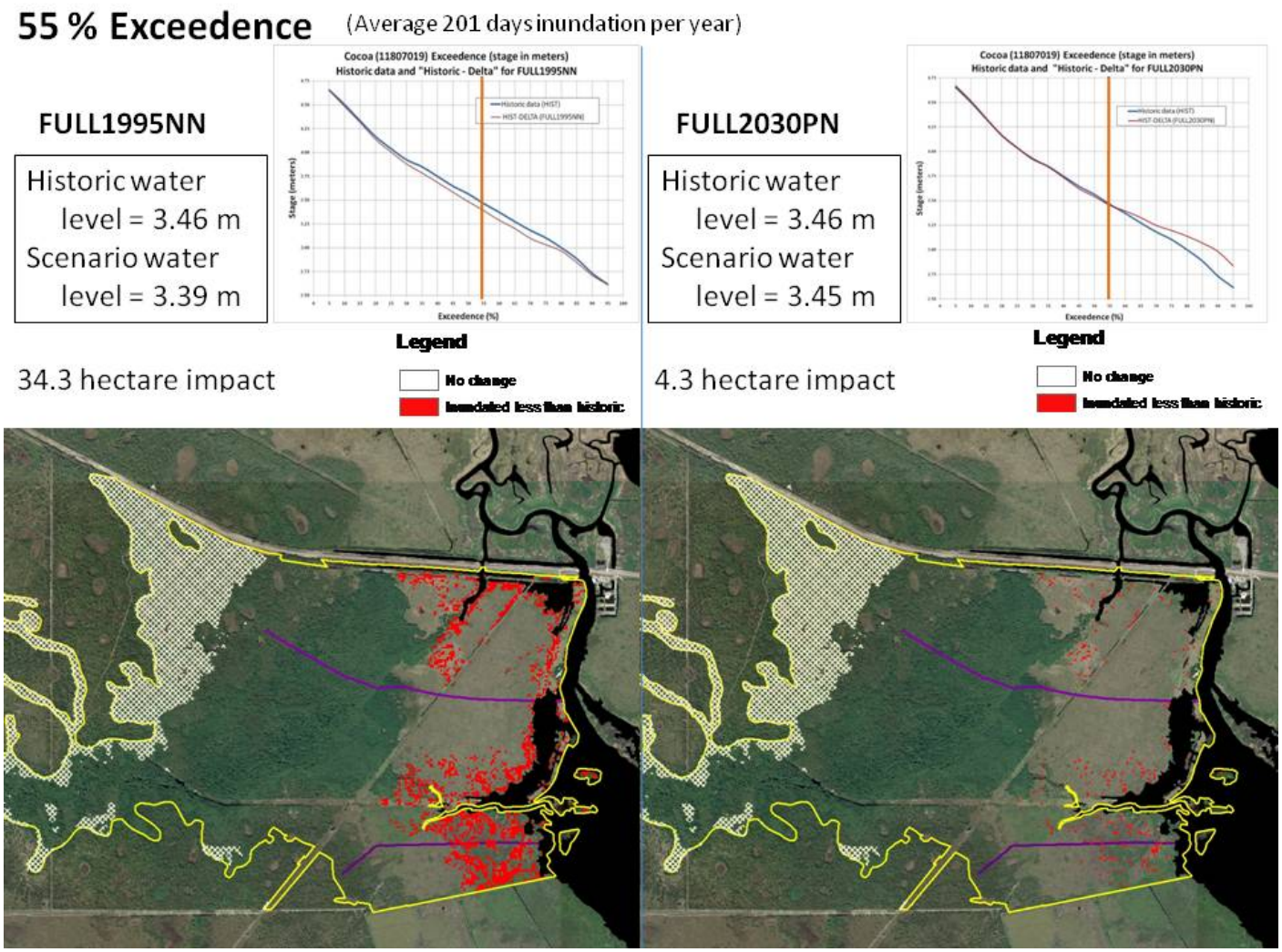

Figure 15. **Comparison of FULL1995NN and FULL2030PN impact at 55% exceedence.** Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). The second greatest impact occurs at this exceedence level in the FULL1995NN scenario. 34.3 hectares (FULL1995NN) is approximately 6 % of the total area. 4.3 hectares (FULL2030PN) is less than 0.7% of the total area.

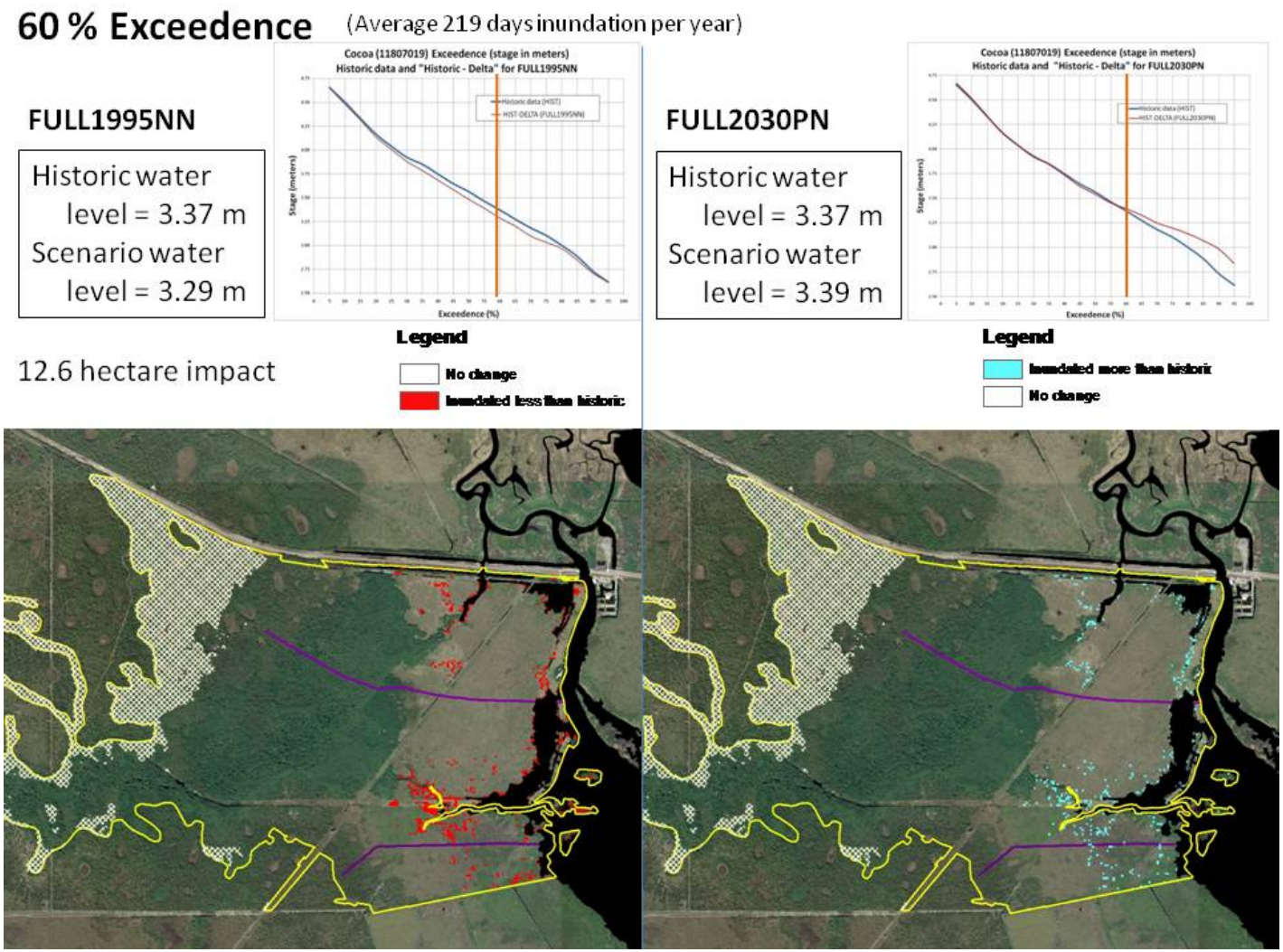

Figure 16. **Comparison of FULL1995NN and FULL2030PN impact at 60% exceedence.** Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). 12.6 hectares (FULL1995NN) is approximately 2 % of the total area. There is no impact from the FULL2030PN scenario at this exceedence level.

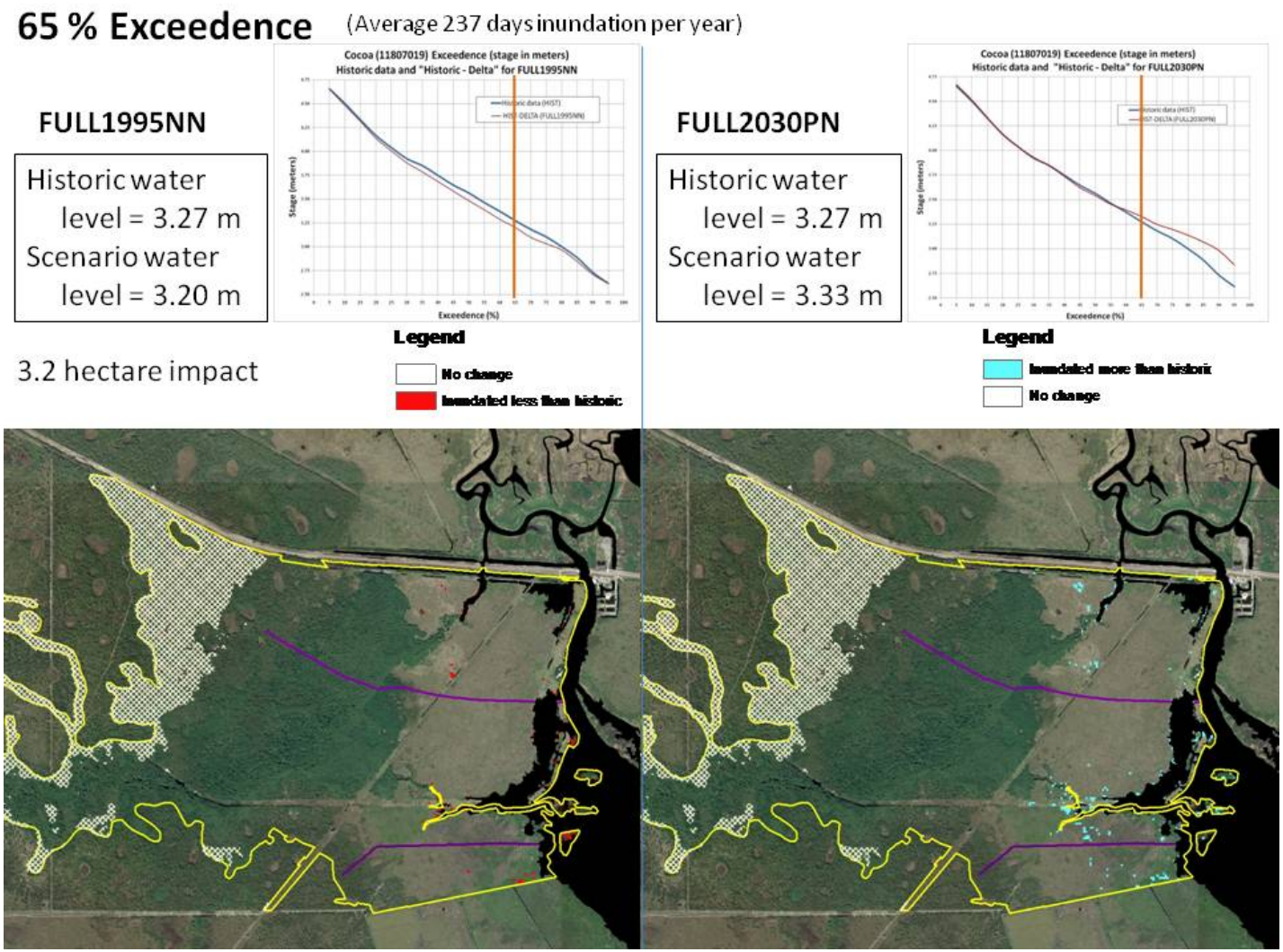

Figure 17. **Comparison of FULL1995NN and FULL2030PN impact at 65% exceedence.** Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). 3.2 hectares (FULL1995NN) is approximately 0.5 % of the total area. There is no impact from the FULL2030PN scenario at this exceedence level.

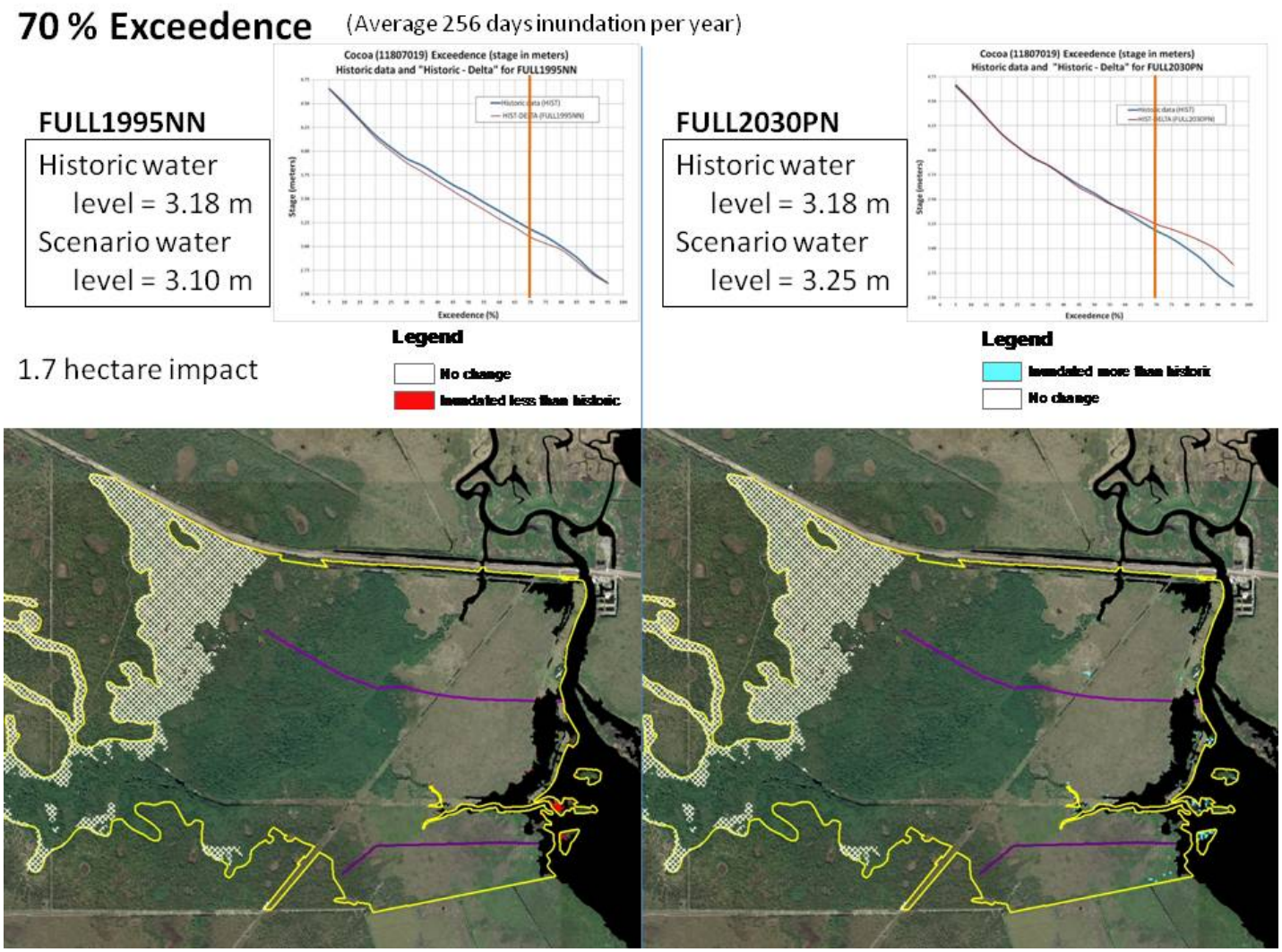

Figure 18. **Comparison of FULL1995NN and FULL2030PN impact at 70% exceedence.** Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). 1.7 hectares (FULL1995NN) is approximately 0.3 % of the total area. There is no impact from the FULL2030PN scenario at this exceedence level.

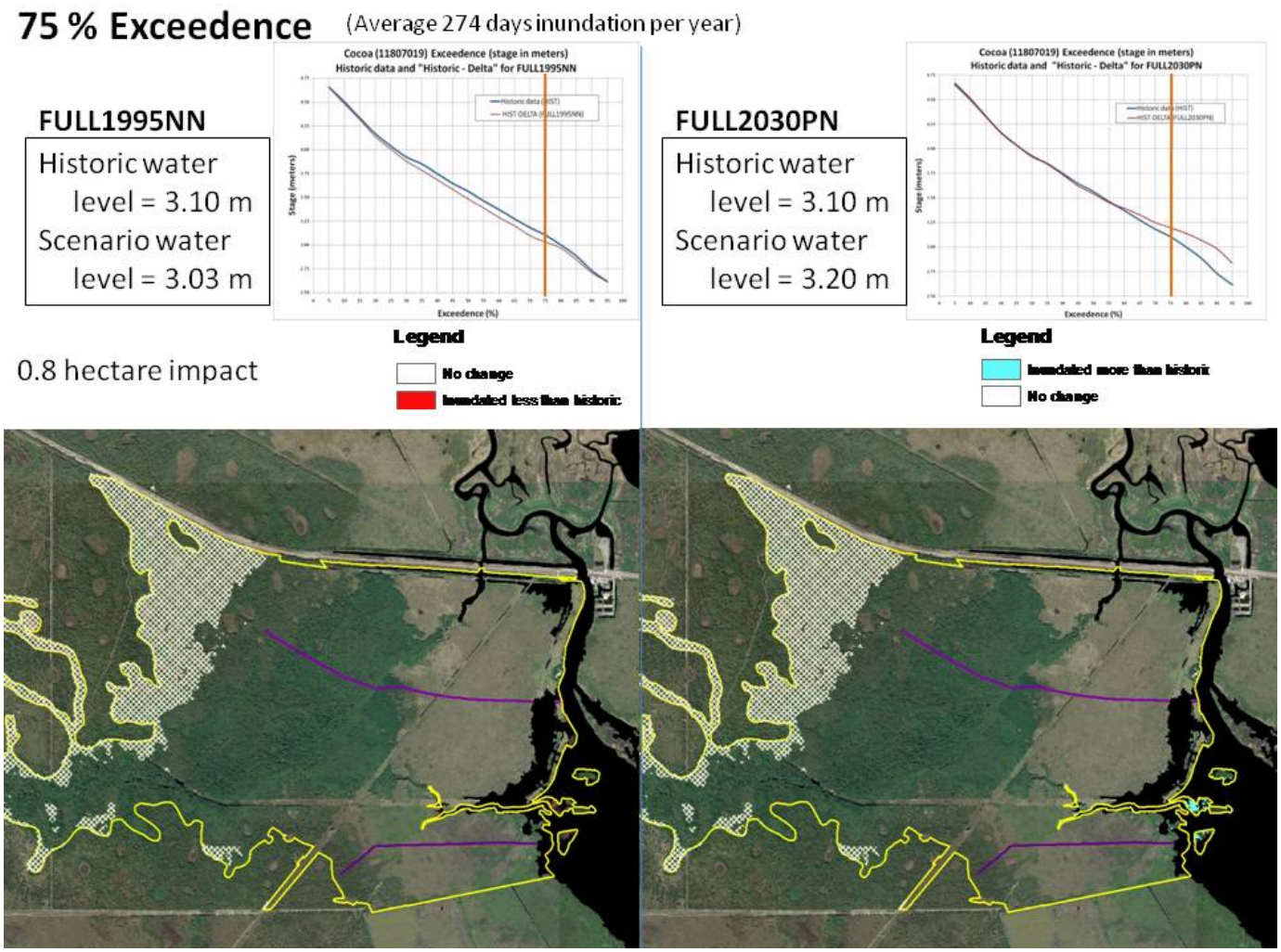

Figure 19. **Comparison of FULL1995NN and FULL2030PN impact at 75% exceedence.** Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). 0.8 hectares (FULL1995NN) is approximately 0.1 % of the total area. There is no impact from the FULL2030PN scenario at this exceedence level.

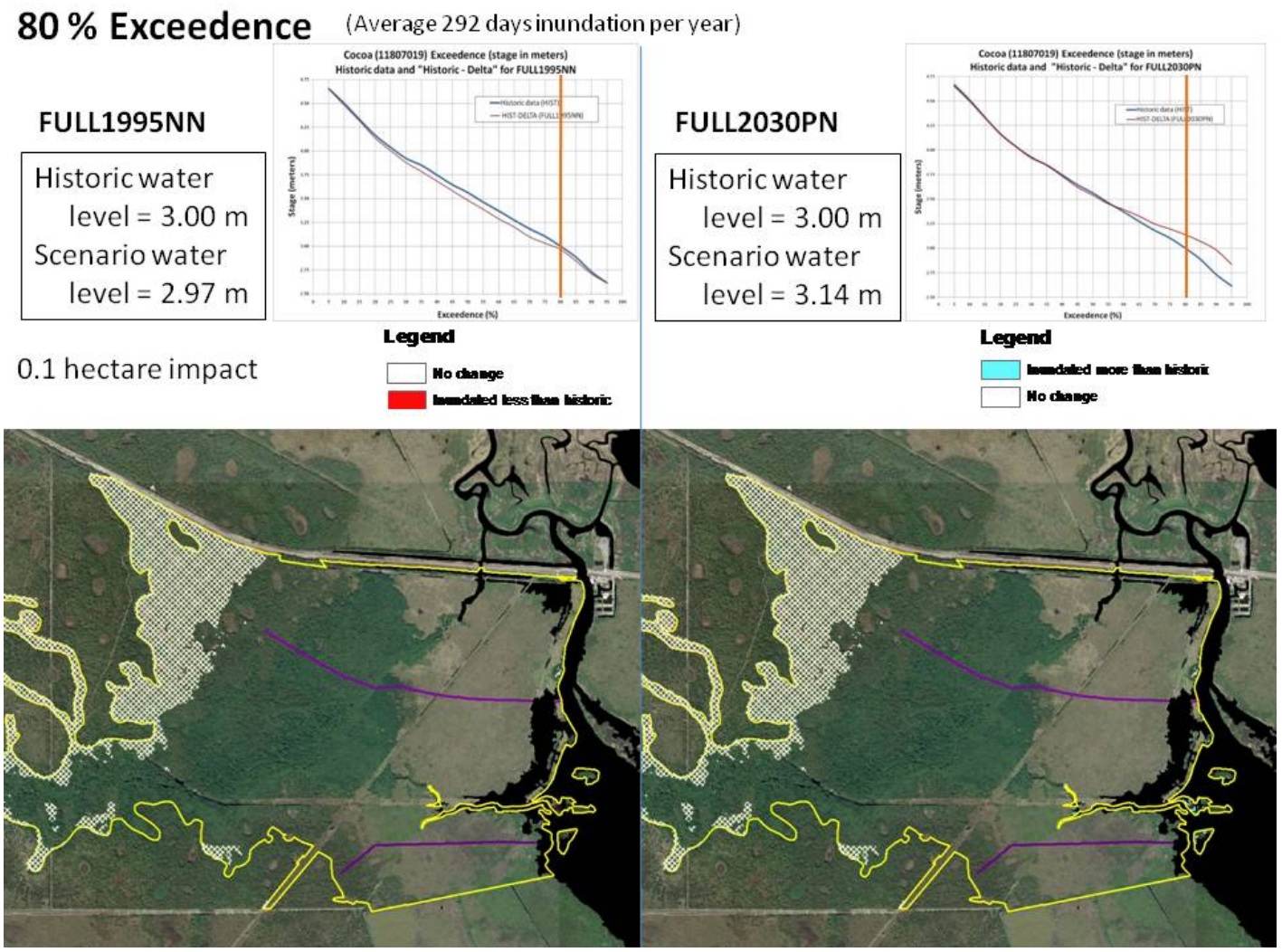

Figure 20. **Comparison of FULL1995NN and FULL2030PN impact at 80% exceedence.** Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). 0.1 hectare (FULL1995NN) is approximately 0.01 % of the total area. There is no impact from the FULL2030PN scenario at this exceedence level.

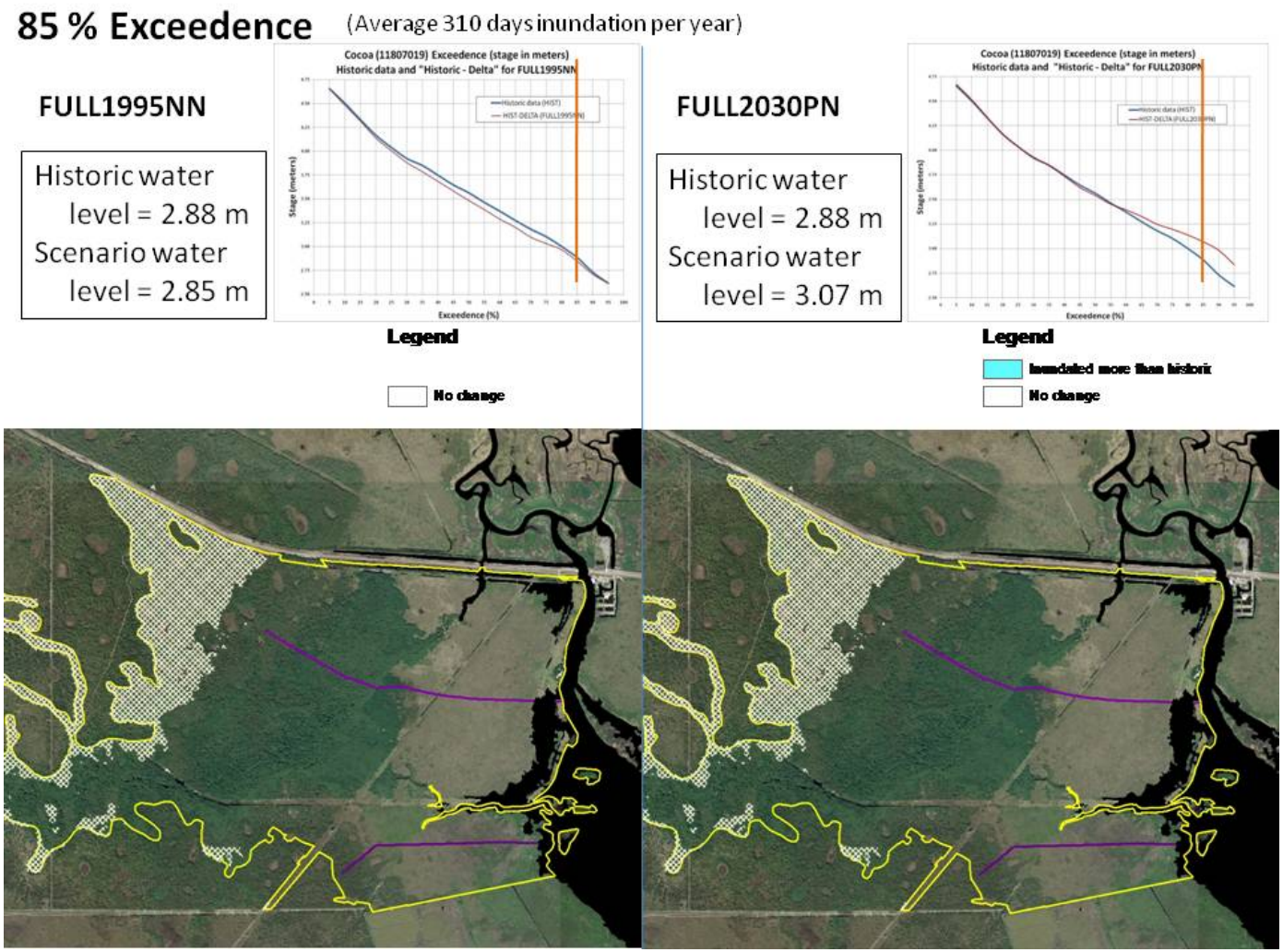

Figure 21. **Comparison of FULL1995NN and FULL2030PN impact at 85% exceedence.** Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). Impact at this level may be obscured by a limitation inherent in the LiDAR-derived digital elevation model used for Hydroperiod Tool analysis, based on relatively high water at the time the LiDAR was flown (standing water shown in Figure 2).

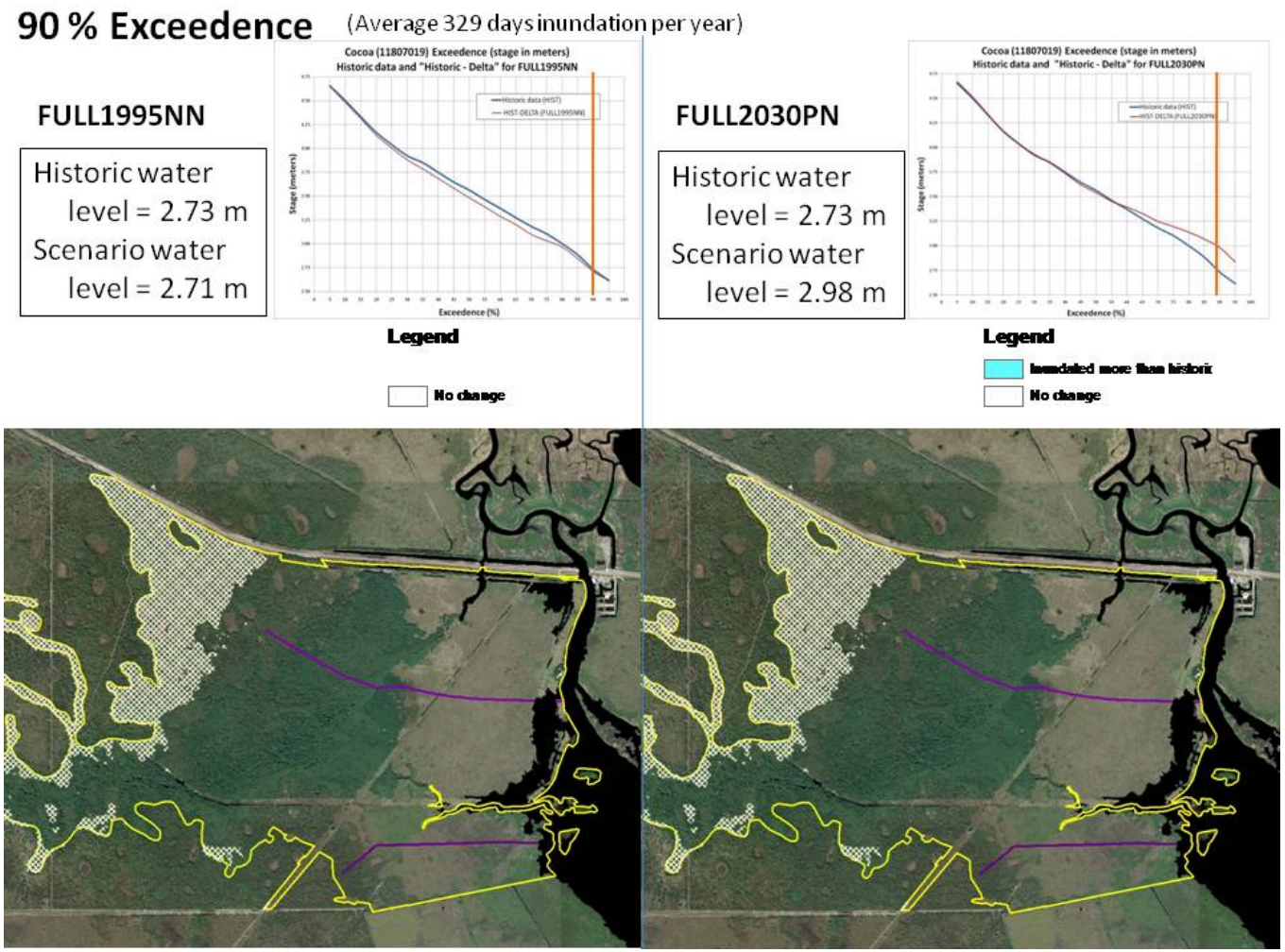

Figure 22. **Comparison of FULL1995NN and FULL2030PN impact at 90% exceedence.** Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). Impact at this level may be obscured by a limitation inherent in the LiDAR-derived digital elevation model used for Hydroperiod Tool analysis, based on relatively high water at the time the LiDAR was flown (standing water shown in Figure 2).

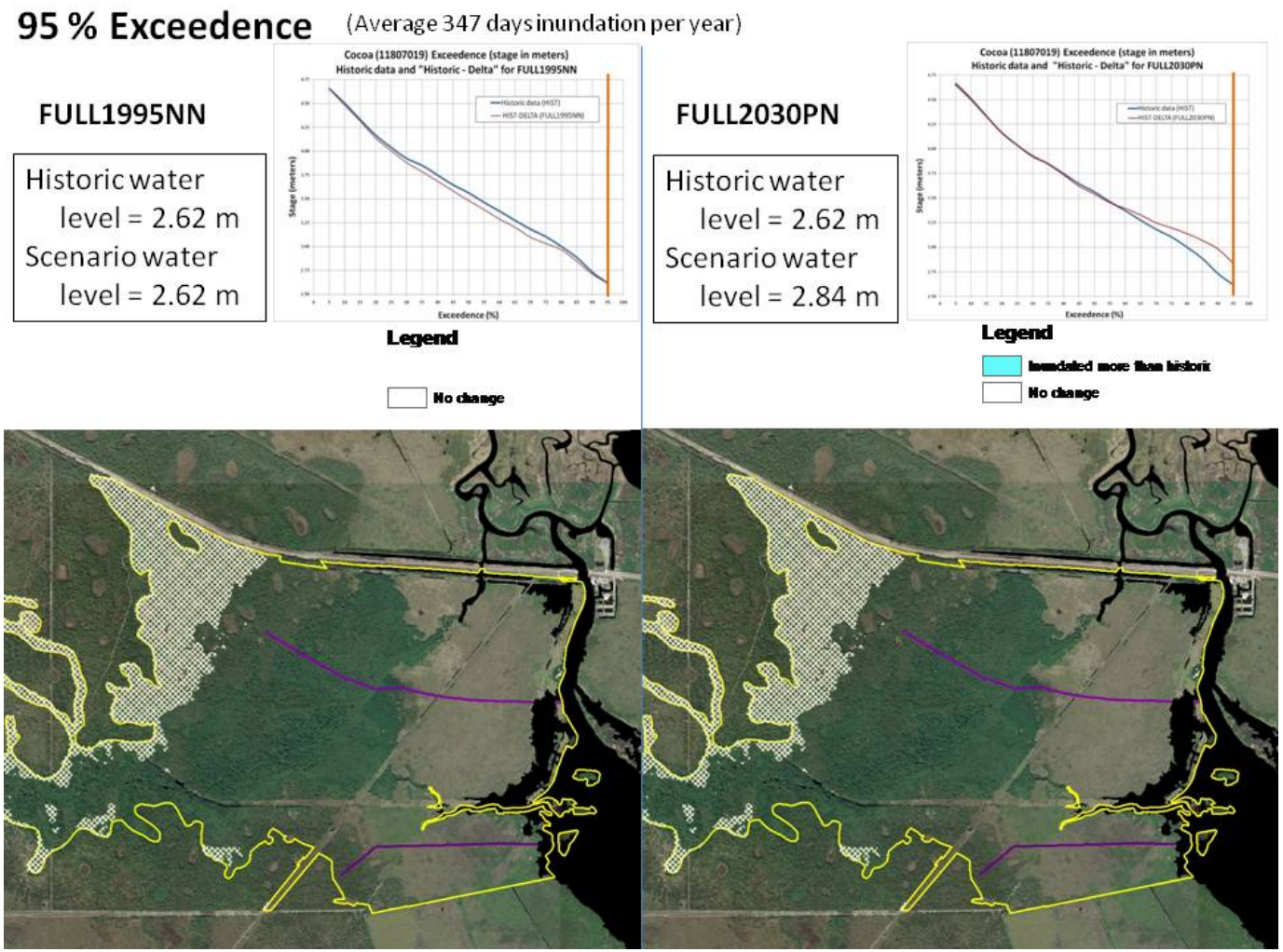

Figure 23. **Comparison of FULL1995NN and FULL2030PN impact at 95% exceedence.** Based on the historic record, water reached this level every year in the 10-year study period (January 1, 1996 – December 31, 2005). Impact at this level may be obscured by a limitation inherent in the LiDAR-derived digital elevation model used for Hydroperiod Tool analysis, based on relatively high water at the time the LiDAR was flown (standing water shown in Figure 2).

Table 1. **Water elevation input for Hydroperiod Tool.** Data from the exceedence curves that are shown in figures 3 and 4.

Exceedence (%)	Historic data (HIST)	HIST-DELTA (FULL1995NN)	HIST-DELTA (FULL2030PN)
5	4.66	4.65	4.67
10	4.50	4.48	4.51
15	4.33	4.31	4.34
20	4.17	4.14	4.16
25	4.04	4.01	4.04
30	3.92	3.88	3.93
35	3.85	3.79	3.84
40	3.75	3.69	3.74
45	3.65	3.58	3.62
50	3.56	3.48	3.54
55	3.46	3.39	3.45
60	3.37	3.29	3.39
65	3.27	3.20	3.33
70	3.18	3.10	3.25
75	3.10	3.03	3.20
80	3.00	2.97	3.14
85	2.88	2.85	3.07
90	2.73	2.71	2.98
95	2.62	2.62	2.84
N	3614	3600	3600

Table 2. **Fewer days of inundation by scenario and exceedence.** Annual average fewer days of inundation was calculated only for stage values (Table 1) that were reached every year of the 10-year study period.

% Exceedence	Cocoa HIST-DELTA (FULL1995NN)		Cocoa HIST-DELTA (FULL2030PN)	
	Fewer days of inundation - change over 10 years	Fewer days of inundation - change over 1 year (average)	Fewer days of inundation - change over 10 years	Fewer days of inundation - change over 1 year (average)
5	11	NA		NA
10	23	NA		NA
15	12	NA		NA
20	32	NA	10	NA
25	53	5	7	1
30	68	7		
35	127	13	13	1
40	101	10	23	2
45	145	14	41	4
50	148	15	57	6
55	136	14	36	4
60	162	16		
65	157	16		
70	148	15		
75	204	20		
80	77	8		
85	70	7		
90	40	4		
95	6	1		

Table 3. **Impact of FULL1995NN scenario on benthic sampling area expressed in hectares and as percent of total area**. The bulk of the impact occurs between 35 and 60 %,, with the greatest impact occurring at 50%. Note: 945.5 hectares of wetlands contiguous with River / Lake minus 324.7 hectares of wetlands that not inundated historically by the River/Lake equals 620.8 hectares in final AOI.

	Hectares impacted	% based on 945.5 ha total	% based on 620.8 ha total
FULL1995NN % exceedence	Area impacted (less water) (hectares)	Area impacted (less water) as % total	Area impacted (less water) as % total
5	2.3	0.24	0.36
10	3.8	0.40	0.61
15	3.7	0.39	0.59
20	6.8	0.72	1.09
25	6.4	0.68	1.03
30	8.9	0.95	1.44
35	12.3	1.30	1.98
40	12.0	1.27	1.93
45	17.6	1.87	2.84
50	38.6	4.09	6.22
55	34.3	3.63	5.53
60	12.6	1.34	2.03
65	3.2	0.34	0.52
70	1.7	0.18	0.28
75	0.8	0.09	0.13
80	0.1	0.01	0.01
85			
90			
95			
TOTAL	165.2	17.5	26.6

Table 4. **Impact of FULL2030PN scenario on benthic sampling area expressed in hectares and as percent of total area**. Impact occurs at only seven out of the nineteen exceedence values. The highest impact occurs at 50% exceedence, but effects approximately 1% of the total area. All other impacts are less than 1% of the total area. Note: 945.5 hectares of wetlands contiguous with River / Lake minus 324.7 hectares of wetlands that not inundated historically by the River/Lake equals 620.8 hectares in final AOI.

	Hectares impacted		% based on 945.5 ha total		% based on 620.8 ha total	
FULL2030PN % exceedence	Area impacted (more water) (hectares)	Area impacted (less water) (hectares)	Area impacted (more water) as % total	Area impacted (less water) as % total	Area impacted (more water) as % total	Area impacted (less water) as % total
5	4.5		0.47		0.72	
10	2.4		0.25		0.39	
15	1.2		0.13		0.20	
20		1.2		0.13		0.19
25		0.5		0.06		0.08
30	1.7		0.18		0.27	
35		0.9		0.10		0.15
40		2.2		0.24		0.36
45		5.4		0.57		0.87
50		7.3		0.77		1.18
55		4.3		0.45		0.69
60	5.3		0.56		0.86	
65	5.3		0.56		0.85	
70	3.0		0.31		0.48	
75	2.5		0.26		0.40	
80	1.7		0.18		0.27	
85	0.7		0.08		0.12	
90	0.2		0.02		0.03	
95	0.0		0.00		0.00	
TOTAL	28.4	21.9	3.0	2.3	4.6	3.5