ANNUAL REPORT FOR 2025

Bodie Island Lighthouse Pond Mitigation Site
Dare County

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SUMMARY

The Bodie Island Lighthouse Pond Mitigation Site (Site) is located in Dare County, North Carolina. Wetland mitigation consists of rehabilitating former *Spartina*-dominated marsh habitat through exotic plant control measures for *Phragmites australis* in accordance with the approved *Final Wetland Mitigation Plan NC 12 Replacement of Herbert C. Bonner Bridge (Bridge No. 11) over Oregon Inlet* (dated January 30, 2013, hereafter referred to as Mitigation Plan). Herbicide hand treatment began in May 2018 in areas adjacent to the Bodie Island Lighthouse Boardwalk. Aerial herbicide applications (via Unmanned Aerial Systems (UAS)) began on October 2018 following final mitigation approval by the National Park Service (NPS). Approximately 2.5 acres of wetland mitigation will be debited from the Site for unavoidable wetland impacts associated with the Replacement of the NC 12 Herbert C. Bonner Bridge (Bridge No. 11) over Oregon Inlet.

Based on 2011 aerial photography, the North Carolina Department of Transportation (NCDOT) proposed wetland mitigation that encompassed approximately 50 acres of wetland restoration through the rehabilitation of marsh habitat. *Phragmites* mapping and modeling efforts conducted in May 2019 estimated approximately 53.4 acres of *Phragmites*-affected marsh were located within the Site. Additional mapping and modeling has been conducted over the past six years and the total area treated has expanded to approximately 73.3 acres, most of which contains sparse amounts of *Phragmites*. Due to the success of maintenance efforts, results from the 2025 modeling efforts were inconclusive and are no longer effective at predicting *Phragmites* coverage on the Site. On-site vegetation monitoring data indicates that live *Phragmites* comprises approximately 2% of the Site. The distribution of *Phragmites* is sparse throughout the Site, with a few homogeneous patches persisting from previous years. Areas that appeared to contain *Phragmites* at densities greater than 50% were sprayed using the UAS on September 17, 2025. This area totaled approximately 7.8 acres. Hand spraying was also conducted over 65.5 acres of the site, including areas surrounding the boardwalk and lighthouse, and along the wood line surrounding the marsh. Hand spraying treatments were conducted in the spring and fall of 2025 and consisted mostly of spot treatment due to the scattered nature of *Phragmites* on-site. Burning was not conducted in 2025; however, approximately 8.6 acres of Phragmites was hand trimmed in April 2025 to facilitate hand spraying along the woodline.

Restoration success criteria include: 1) a decrease in total aerial coverage of dense *Phragmites* stands from the current densities after first-year treatment; 2) a decreasing trend in aerial coverage of mapped *Phragmites* each treatment year; and 3) total aerial coverage of dense *Phragmites* stands of 10 acres or less with stems less than three feet tall at the end of the final monitoring year. Hydrologic monitoring is not required for this project. Based on the 2020 Monitoring Report, the total aerial coverage of dense *Phragmites* stands decreased within treated areas after first-year treatment. In addition, aerial coverage of *Phragmites* has consistently decreased between 2019 and 2025. One hundred (100), one square meter vegetation monitoring plots were surveyed to ground truth *Phragmites* coverage across the site (Figure 2). Vegetation monitoring data indicates that *Phragmites* coverage has decreased from 8% in 2024 to 2% in 2025, and native marsh species are repopulating the site. Average height of live Phragmites across the site exceeded three feet when the site was treated in the fall.

NCDOT proposes to continue hand and aerial herbicide applications to *Phragmites* affected marsh areas in 2026 and perform vegetation monitoring via aerial photography, and in-situ vegetation plots. NCDOT will also visually monitor the Site to ensure that new *Phragmites* is not intruding into unmapped areas. Based on discussions with NPS, it is unlikely that a burn will be conducted in 2026; therefore, manual trimming of dead Phragmites stems may be conducted to facilitate hand spraying in 2025, if necessary.

1.0 INTRODUCTION

1.1 Project Description

The Site is located adjacent to the Bodie Island Lighthouse six miles south of Nags Head, NC and three miles north of Oregon Inlet (Figure 1). The Site now consists of approximately 73.3 acres of wetland restoration through treatment of *Phragmites* affected areas. Proposed debits to the Site include 2.5 acres of wetland mitigation for wetland impacts associated with construction of the Replacement of the NC 12 Herbert C. Bonner Bridge (Bridge No. 11) over Oregon Inlet. Wetland mitigation measures include reducing and controlling percent aerial coverage of the exotic plant *Phragmites australis* using approved herbicides and prescribed burning, while allowing natural reestablishment of native marsh plant species.

1.2 Purpose

In order for the Site to be considered successful it must meet success criteria established in the *Final Wetland Mitigation Plan, NC 12 Replacement of the NC 12 Herbert C. Bonner Bridge (Bridge No. 11) over Oregon Inlet* dated January 30, 2013 (hereafter referred to as Mitigation Plan). This report details mitigation activities at the Site in 2025, as recommended through the adaptive management guidelines approved in the Mitigation Plan. Hydrologic monitoring is not required for the Site.

1.3 Project History

May 2018	Begin Hand Herbicide Application in Selected Areas
October 2018	NPS Issues Special Use Permit for UAS Application
October 2018	Begin Herbicide Application Season 2018
November 2018	End Herbicide Application Season 2018
June 2019	Begin Herbicide Application Season 2019
November 2019	End Herbicide Application Season 2019
January 2020	USDOI Grounds all UAS Flights over all DOI Property
October 2020	Hand Herbicide Application in Selected Areas
Oct-Nov 2021	UAS Herbicide Application over 59.37 Acres
August 2022	NCDOT Collected Aerial Imagery for Modeling Purposes
September 2022	UAS Herbicide Application over 58.94 acres
September 2022	Hand Herbicide Application over 1.12 acres
April-May 2023	Manual Trimming of ~4 acres along Woodline
June 2023	NCDOT Collected Aerial Imagery for Modeling Purposes
June-July 2023	Hand Herbicide Application over 3.17 acres
September 2023	UAS Herbicide Application over 61.4 acres
March 2024	Manual Trimming of ~5 acres along Woodline
April-May 2024	Hand Herbicide Application over 4.7 acres
June 2024	In-Situ Vegetation Surveys
July 2024	NCDOT Collected Aerial Imagery for Modeling Purposes
September 2024	Hand Herbicide Application over 3.8 acres
September 2024	UAS Herbicide Application over 61.4 acres
March 2025	Establishment of Three Permanent 30’ Radius Vegetation Monitoring Plots
April 2025	Manual Trimming of ~8.6 acres along Woodline

May 2025	Hand Herbicide Application over ~17.7 acres
June 2025	In-Situ Vegetation Surveys and Rare Plant Survey
July 2025	NCDOT Collected Aerial Imagery for Modeling Purposes
August 2025	On-site spray boundary assessment/mapping
September 2025	Hand Herbicide Application over 65.5 acres
September 2025	UAS Herbicide Application over ~7.8 acres
October 2025	Follow-up Inspection and Hand Herbicide Application over 65.5 acres

1.4 Debit Ledger

A total of 2.5 wetland acres of the Site will be debited for unavoidable wetland impacts associated with the NC 12 Replacement of the Herbert C. Bonner Bridge (Bridge No. 11) over Oregon Inlet. Remaining site assets must have regulatory agency approval prior to use as mitigation on other projects.

2.0 VEGETATION

2.1 Success Criteria

NCDOT shall monitor wetland mitigation by photographs and determinations of aerial percent vegetation cover of *Phragmites* stands. Vegetation success criteria are:

- Total aerial coverage of dense *Phragmites* stands will decrease from mapped acreage after the first-year treatment.
- The trend of decreased aerial coverage of mapped *Phragmites* will continue each treatment year.
- Total aerial coverage of dense *Phragmites* stands will be 10 acres or less with stems less than three feet tall at the end of the final monitoring year.

The Site will be monitored until success criteria are met with a brief annual progress report being submitted to the United States Army Corps of Engineers (USACOE), North Carolina Division of Water Resources (NCDWR), and North Carolina Division of Coastal Management (NCDCM). Upon meeting success criteria, NCDOT will schedule an agency field meeting to determine if the restored areas have achieved mitigation requirements. For purposes of determining success NCDOT proposes to define dense *Phragmites* stands as areas larger than 0.1 hectares (1,000 m^2 or ~0.25 acre), composed of greater than 70% coverage of live *Phragmites*.

2.2 Vegetation Treatment

Prior to conducting aerial herbicide applications, Davey Resource Group, Inc. (DRG) completed rare plant surveys within the Site on June 3, 2025. *Eleocharis* species observed within the site were located using a sub-meter GPS unit and aerial herbicide applications were designed to avoid these areas. Due to previously observed high bird activity within the marsh during summer months, NCDOT scheduled aerial herbicide applications to occur in September, outside of the avian nesting period.

Approved *Phragmites* control treatments for the Site include Glyphosate and Imazapyr

herbicide application, hand trimming, and prescribed burning. A total of 7.8 acres of the Project Area (Figure 2) was treated with UAS aerial herbicide applications in September 2025. An additional 17.7 acres were treated in May 2025 by hand spraying around the boardwalk and wood line surrounding the marsh. It is important to note that herbicide was not applied to all 17.7 acres. Most of the acreage consisted of spot treatment only. Follow up hand spraying treatments were conducted on 65.5 acres of the site in September and October. Similarly to spring treatments, most of the acreage treated was spot treatment only.

Treatments included a mixture of both Glyphosate (Roundup Custom® and AquaMaster®) and Imazapyr (Imazapyr 2SL®) herbicides. Aerial herbicide treatment consisted of Imazapyr 2SL®/AquaMaster®/Methylated Seed Oil (MSO) (17%/17%/1%) per acre. Spring hand spraying treatment consisted of Imazapyr 2SL®/Roundup Custom®/Precision Spreader (6%/6%/2%) per acre. Fall hand spraying treatment consisted of Imazapyr 2SL®/AquaMaster®/Precision Spreader (6%/6%/2%) per acre. The treatment area consisted of *Phragmites* affected marsh surrounding the Bodie Island Lighthouse Pond as depicted in Figure 2. Prescribed burning was not conducted in 2025 and based on discussions with NPS, NCDOT does not anticipate burning to occur in 2026. NCOT manually trimmed approximately 8.6 acres of living and dead *Phragmites* stems along the woodline to facilitate hand spraying in 2025 and will likely continue hand trimming in the absence of burning to thin out the dead stems of *Phragmites*.

2.3 Vegetation Modeling

Vegetation modeling was conducted by Geo Owl from August to November 2025. Visual spectrum imagery (RGB) and multispectral imagery (MSI) were collected by NCDOT on July 15, 2025, with a Wingtra RGB61 and a MicaSense RedEdge-MX, respectively, both onboard a WingtraOne GEN II. All imagery was post-processed in Pix4Dmapper v4.8.4 by Geo Owl.

Model assessment was performed using 100 ground verification plots where fractional cover of live *Phragmites* was recorded *in-situ*. Observed *in-situ* fractional cover of Phragmites was compared to model predictions to calculate Pearson correlation coefficient (Correlation), coefficient of determination (R^2), Root Mean Squared Error (RMSE) and Mean Absolute Error (MAE) between the observations and model predictions (Table 1).

Table 1. Summary Statistics of Field Observations versus SVM Model Predictions.

Indicator	Correlation	R^2	RMSE	MAE
Fractional Coverage of *Phragmites*	-0.11	0.012	10.7	4.2

Overall, the model's predictions for 2025 are inconclusive. The model's ability to predict live *Phragmites* when it is mixed with other vegetative species and vegetative litter, early lifecycle *Phragmites*, and shadowed areas remain a source of misclassification for the model due to limitations to sensor resolution versus the human eye and spectral differences that emerge from shadowed vegetation. However, its inaccuracy is most likely due to low densities of *Phragmites* documented on-site in 2025.

Table 2 outlines model performance from 2019 to 2024 and indicates a decrease in overall Phragmites presence at the Bodie Island site. While the model data is inconclusive for 2025,

visual observations and vegetation monitoring indicate this trend has continued into the 2025 monitoring period.

Table 2. *Phragmites australis* delineations at Bodie Island, 2019-2025

Method	Year	Area (US Survey Area)
Original NCDOT Delineation	2019	68.1
UNCW Model Results	2019	53.4
Geo Owl Model Results	2022	19.4
Geo Owl Model Results	2023	9.9
Geo Owl Model Results	2024	12.1
Geo Owl Model Results	2025	*inconclusive*

Given the poor performance of the model in 2025 and the reduction of dense *Phragmites* that has occurred since the initiation of the project, vegetation modeling is no longer recommended for monitoring purposes.

2.4 Vegetation Monitoring Results

One hundred vegetation plots were surveyed in 2025 for the purpose of quantifying percent coverage of *Phragmites* across the Site. Fourteen of the 100 plots were collected in the same location as the original monitoring plots that were established in 2019 (Figure 2). Representative photographs of the 14 plots are presented in Appendix A. Vegetation monitoring results for 2025 showed approximately 2 percent average coverage of live Phragmites across the Site, down from 8 percent in 2024. Individual monitoring plot results are presented in Appendix A.

Three test plots (~30-ft radius) were cleared in March 2025 to emulate conditions following a burn. Standing vegetation within each plot was trimmed to the ground and the ground surface was raked to remove the thatch layer of dead vegetative litter. The purpose of these test plots was to see how the site may react when the dense thatch of vegetative litter is removed from the ground surface. Test plots were revisited at the end of the growing season and while *Phragmites* was still present in the plots, native vegetation was also found in each plot including chairmaker's bulrush (*Schoenoplectus americanus*), black needlerush (*Juncus roemerianus*), fireweed (*Erechtites hieraciifolius*), and a variety of other native species similar to those found in other vegetation plots on-site (see Appendix A).

2.5 Conclusions

Phragmites coverage at the Site has decreased significantly from 2019 to 2025. Mapping efforts in August 2025 identified approximately 7.8 acres of *Phragmites* that had densities sufficient enough (i.e. <50%) to justify UAS application. These areas were drone sprayed September 17, 2025.

Spot treatment, using backpack sprayers, was conducted in the spring and fall of 2025 (17.7 acres and 65.5 acres, respectively). Burning was not conducted in 2025 but approximately 8.6 acres of living and dead *Phragmites* were manually trimmed along the woodline to facilitate hand spraying. Results of 2019-2024 herbicide applications were assessed between

June and August 2025 via aerial imagery, vegetation monitoring, and *Phragmites* modeling. However, modeling for 2025 was inconclusive and application type and area was determined utilizing vegetation monitoring data. Vegetation monitoring plots showed approximately 2 percent average coverage of live *Phragmites* across the Site. At this time, *Phragmites* regrowth will continue to be evaluated and any adjustments to herbicide application rates will be made in accordance with the pesticide label.

The Site continues to meet success criteria, showing a continued trend in decreasing coverage of *Phragmites*. While dense patches observed on-site are less than 10 acres, average height of live Phragmites remains above 3 feet.

As in previous years, continued successes at the Site will include: 1) Precise application of herbicide to *Phragmites* dominated areas with no unintended adverse impacts to the park vegetation or wildlife, and 2) Minimal disturbances to Bodie Island Lighthouse Park operations and visitors. Evaluation of the approved herbicides and herbicide delivery methods used at the Site have demonstrated that herbicide applications continue to remain viable and effective methods for delivering pesticide application in environmentally sensitive areas.

3.0 RECOMMENDATIONS

In 2026, NCDOT anticipates continued herbicide applications to *Phragmites* affected marsh areas located within the Site. Total acres to be treated in 2026 are contingent on NPS approvals, site weather conditions, and 2026 vegetation monitoring. Due to the inconclusive nature of the *Phragmites* model data for 2025, it is not recommended that modeling take place in 2026. At this time, it is not known whether aerial herbicide applications will be necessary in 2026. If aerial applications are necessary in 2026, they are anticipated to occur in September 2026, outside of the avian nesting season. Hand applications will likely occur in May and September of 2025. Based on discussions with NPS, NCDOT does not anticipate burning to occur in 2026 and will likely continue manual trimming throughout the site to facilitate hand spraying in 2026.

NCDOT met with CAMA on December 12, 2025 to discuss requirements for obtaining CAMA restoration credits on-site. As a result of this meeting, NCDOT plans to delineate areas of CAMA marsh plant species, collect salinity measurements, and document regular or occasional tidal flooding within the project area in 2026.

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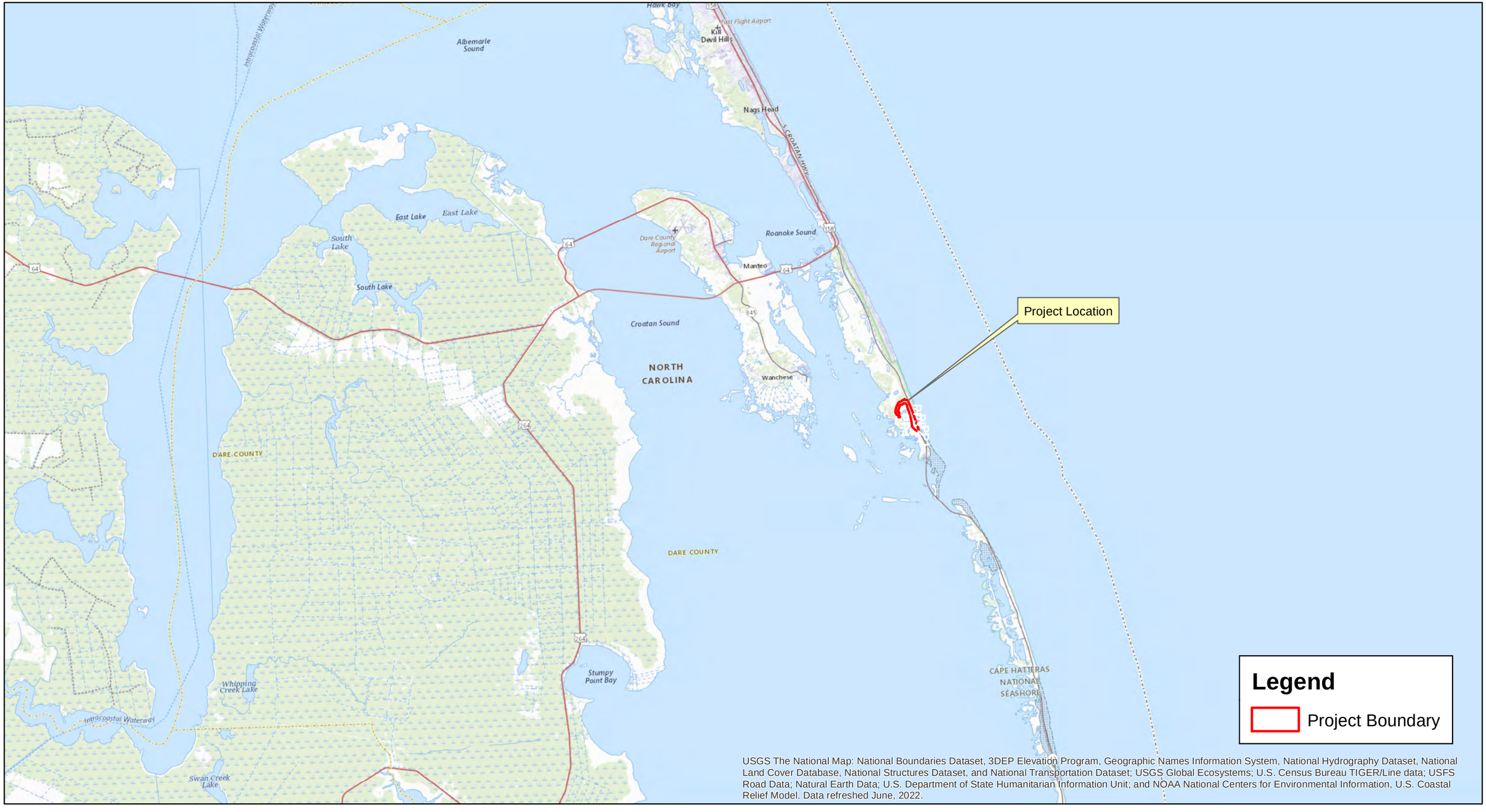
With continued maintenance, NCDOT anticipates the Site meeting success criteria at the conclusion of the 2026 monitoring period. Upon agency approval, NCDOT plans to transfer site maintenance efforts to the National Park Service in January of 2027. NCDOT has also been seeking grant funding opportunities to assist NPS with continued maintenance once the transfer is complete. NCDOT will continue to work with NPS to solicit grant funding through the 2026 monitoring period.



This Exhibit is for planning purposes only and shown herein does not meet NC 47-30 Requirements and therefore is not for design, construction, or recording or transfer of ittle. The Exhibit was compiled from available information obtained from the sources listed below.

Sources: NCOneMap - 2020 Aerial Imagery

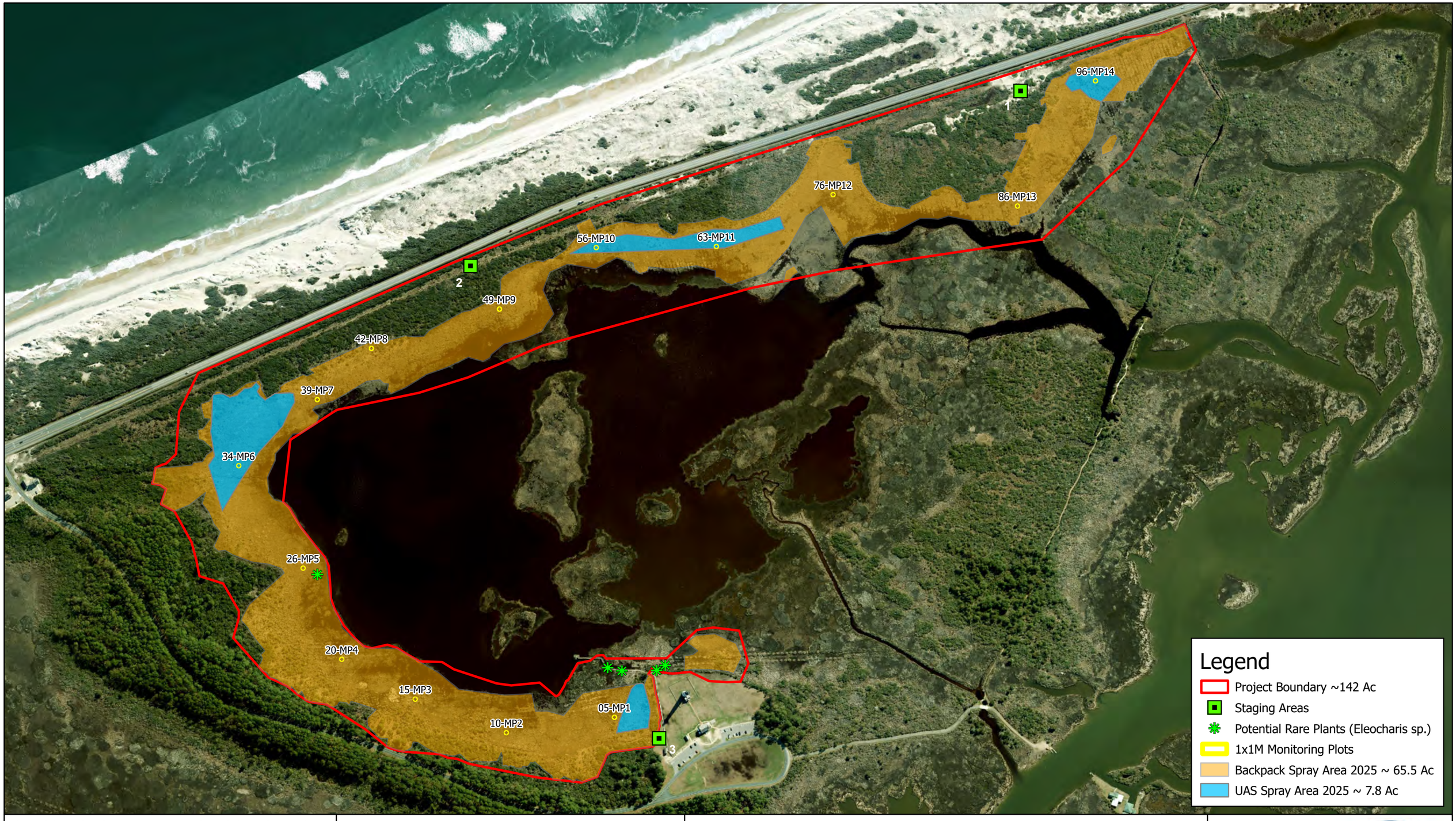
NOT TO SCALE

GRAPHIC SCALE

0 12,500 25,000 50,000 Feet

FIGURE 1
Bodie Island Lighthouse Pond Mitigation Site
Vicinity Map

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION



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Sources: Esri, Maxar, Earthstar Geographics, and the GIS User Community

NOT TO SCALE

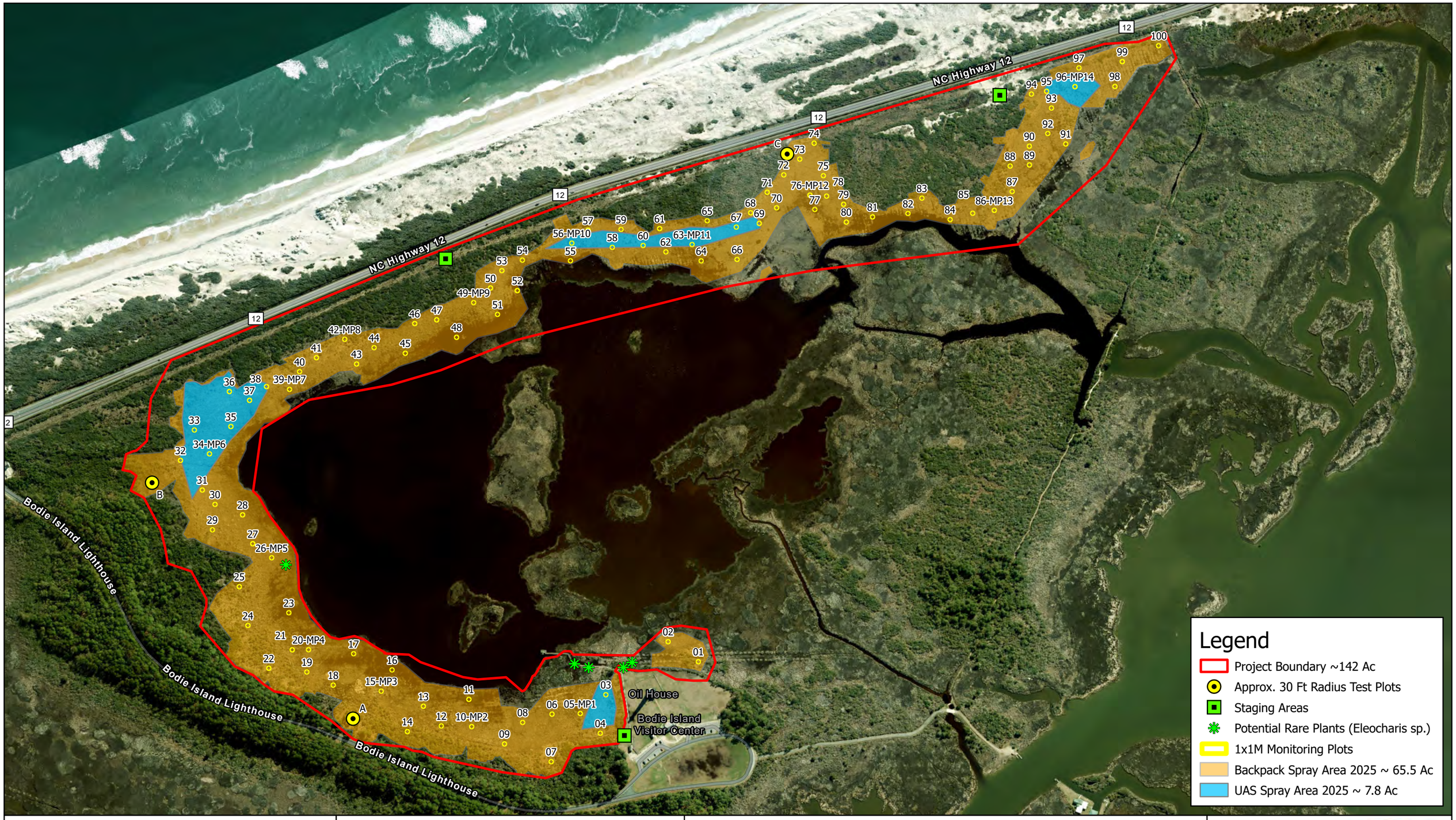
GRAPHIC SCALE

0 375 750 1,500 Feet

FIGURE 2
Bodie Island Lighthouse Pond Mitigation Site
Herbicide Treatment Areas - 2025

DAVEY Resource Group

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION ·



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NOT TO SCALE

GRAPHIC SCALE

0 375 750 1,500 Feet

FIGURE 3
Bodie Island Lighthouse Pond Mitigation Site
Vegetation Assessment - 2025

DAVEY Resource Group

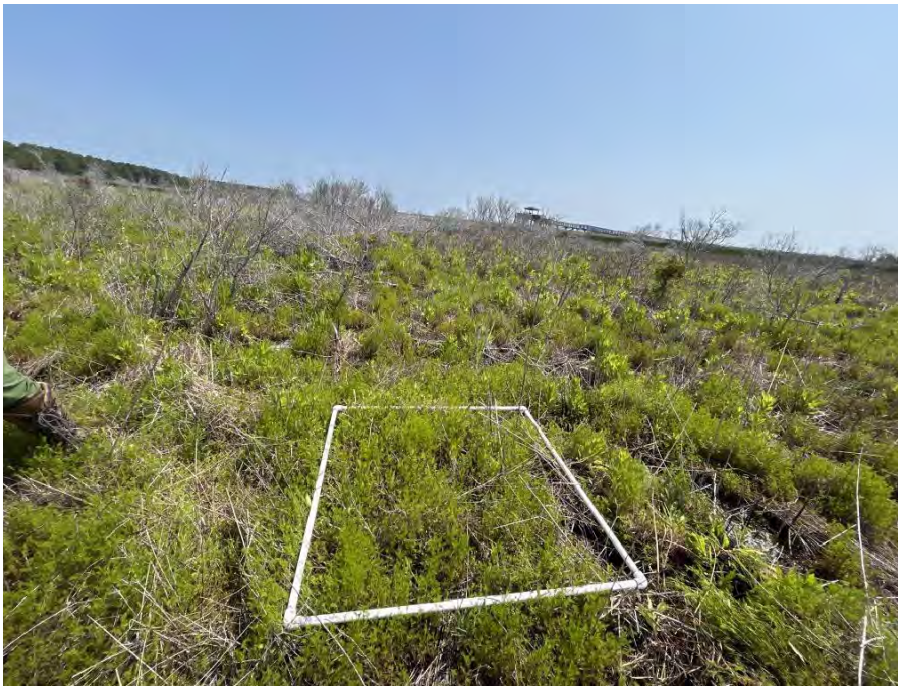
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

APPENDIX A

SITE PHOTO LOG and VEGETATION DATA

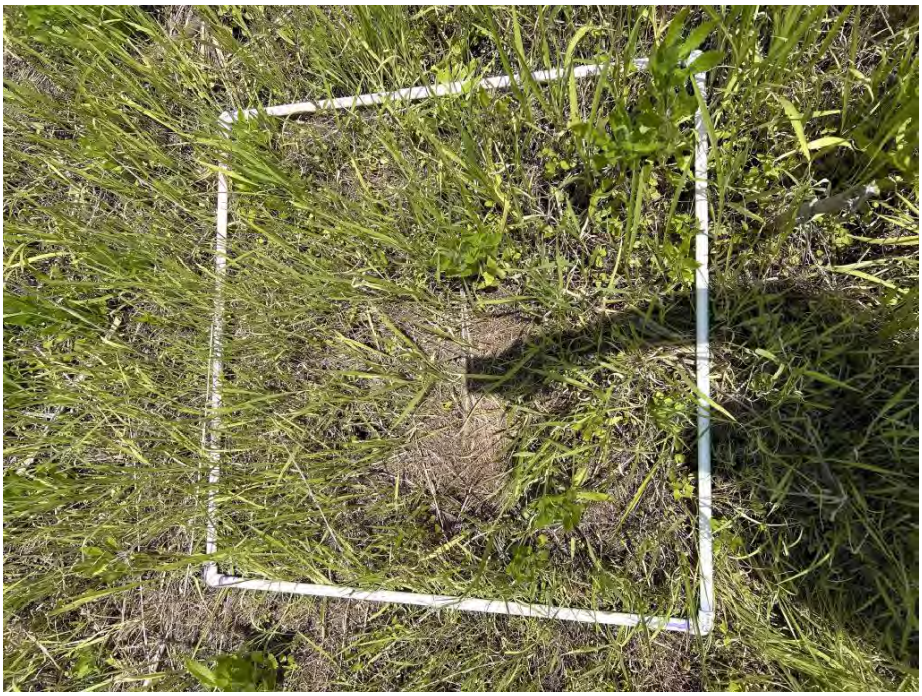
Bodie Island Lighthouse Pond Mitigation Site

Photo Log – 2025



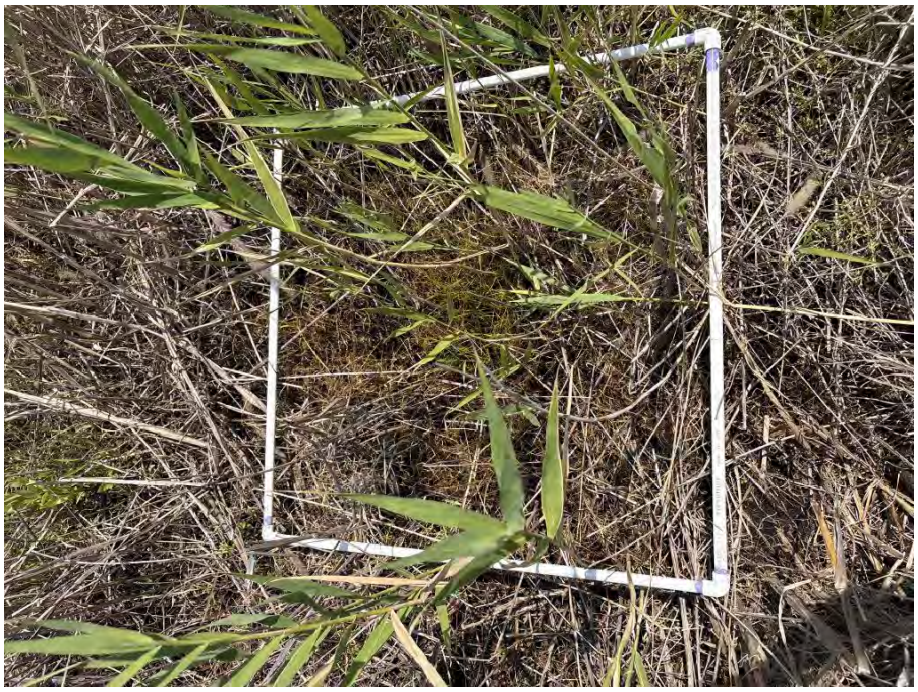
VP5-MP1: 0% *Phragmites* coverage (June 2025)

VP10-MP2: 0% live *Phragmites* coverage (June 2025)

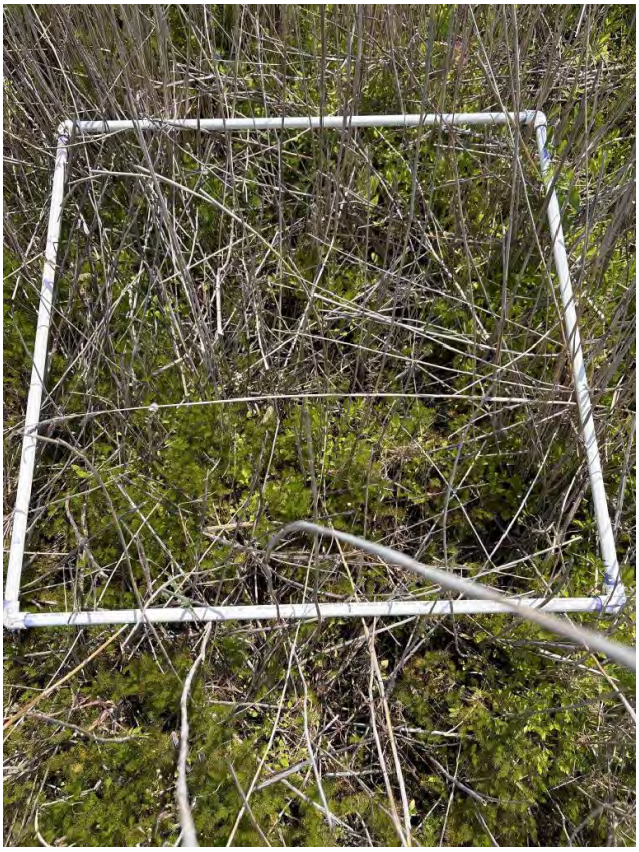


VP15-MP3: 0% *Phragmites* coverage (June 2025)

VP20-MP4: 0% *Phragmites* coverage (June 2025)



VP26-MP5: 6-25% *Phragmites* coverage (June 2025)

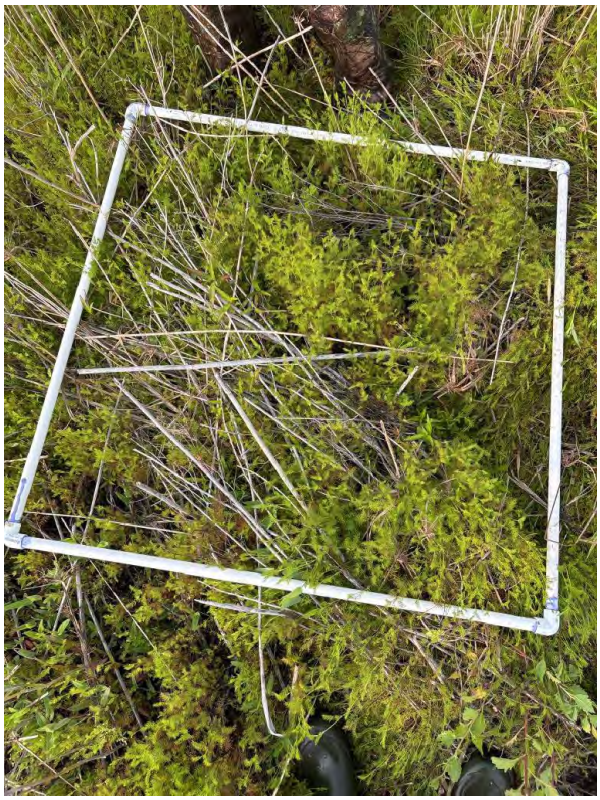


VP34-MP6: <1% *Phragmites* coverage (June 2025)

VP39-MP7: 0% *Phragmites* coverage (June 2025)

VP42-MP8: 0% *Phragmites* coverage (June 2025

VP49-MP9: 0% *Phragmites* coverage (June 2025)



VP56-MP10: 0% *Phragmites* coverage (June 2025)

VP63-MP11: 0% *Phragmites* coverage (June 2025)

VP76-M12: 0% *Phragmites* coverage (June 2025)

VP86-MP13: 0% *Phragmites* coverage (June 2025)

VP96-MP14: 1-5% *Phragmites* coverage (June 2025)

Raking thatch within Test Plot A (March 2025)

Test Plot B following thatch removal (March 2025)

Test Plot C following thatch removal (March 2025)

Chairmaker's bulrush mixed with other natives within Site (August 2025)

Chairmaker's bulrush mixed with other natives within Site (August 2025)

Dense stand of Chairmaker's bulrush (August 2025)

Chairmaker's bulrush and other natives within the Site (August 2025)

Chairmaker's bulrush and other natives within the Site (August 2025)

Black needlerush and other natives within the Site (August 2025)

Marsh fleabane and giant bristlegrass mixed with other natives within the Site (August 2025)

Hand cleared zone along edge of treatment area (April 2025)

Hand cleared zone along edge of treatment area (April 2025)

Cluster of *Phragmites* within drone treatment area, prior to spraying (August 2025)

Dead Phragmites following fall treatment (October 2025)

Dead Phragmites following fall treatment (October 2025)

Bodie Island Mitigation Site - Vegetation Survey

	Plot ID	VP1	VP2	VP3	VP4	VP5-MP1	VP6	VP7	VP8	VP9	VP10-MP2	VP11	VP12	VP13
Scientific Name	Common Name	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover
Baccharis halimifolia	Groundsel bush	6-25				1-5	1-5			1-5	<1	1-5		
Bacopa monnieri	Herb of grace													1-5
Briza sp.	Quaking grass				<1									
Erechtites hieraciifolius	Fireweed	1-5	1-5	51-75	26-50	1-5	6-25	51-75	6-25	6-25	1-5		26-50	<1
Galium tinctorium	Dye bedstraw					6-25				<1				
Hibiscus laevis	Rose mallow	1-5												
Ipomoea sagittata	Salt marsh morning glory						6-25		51-75	1-5	<1		6-25	
Iva frutescens	Marsh elder		1-5											
Nigella sp.	Nigella			6-25		51-75								
Phragmites australis	**Common reed (live)**			**6-25**										
Phragmites australis	**Common reed (dead)**			**6-25**	**6-25**			**6-25**		**1-5**	**<1**			**1-5**
Pluchea baccharis	Camphorweed											6-25		1-5
Polygonum sp.	Smartweed				26-50	6-25								
Schoenoplectus americanus	Chairmaker's bulrush	26-50	76-95											<1
Setaria viridis	Green foxtail	51-75												
	Native species (dead)						26-50	1-5		6-25	6-25	26-50	6-25	1-5
	Unknown grass								6-25	6-25		1-5	26-50	
	Open water								6-25		26-50	51-75		26-50

	Plot ID	VP14	VP15-MP3	VP16	VP17	VP18	VP19	VP20-MP4	VP21	VP22	VP23	VP24	VP25	VP26-MP5
Scientific Name	Common Name	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover
Baccharis halimifolia	Groundsel bush				1-5		1-5							
Bacopa monnieri	Herb of grace							1-5						
Cyperus polystachyos	Bunchy sedge													6-25
Erechtites hieraciifolius	Fireweed		6-25		1-5	1-5		1-5		6-25	1-5	26-50	6-25	
Galium tinctorium	Dye bedstraw												1-5	1-5
Ipomoea sagittata	Salt marsh morning glory	1-5	1-5				6-25	6-25		1-5			1-5	
Nigella sp.	Nigella											1-5	1-5	
Phragmites australis	**Common reed (live)**									**6-25**				**6-25**
Phragmites australis	**Common reed (dead)**	**76-95**								**6-25**				
Pinus taeda	Loblolly pine	<1												
Pluchea baccharis	Camphorweed								1-5					
Pluchea odorata	Marsh fleabane					51-75	6-25	6-25			1-5			
Polygonum sp.	Smartweed		1-5										6-25	
Thelypteris thelypteroides	Marsh fern									1-5				
	Native species (dead)	51-75		96-100	26-50	6-25	26-50	6-25	96-100		76-95	26-50	1-5	6-25
	Unknown grass		51-75										1-5	
	Open water			1-5		6-25	26-50	1-5			6-25			

	Plot ID	VP27	VP28	VP29	VP30	VP31	VP32	VP33	VP34-MP6	VP35	VP36	VP37	VP38	VP39-MP7
Scientific Name	Common Name	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover
Baccharis halimifolia	Groundsel bush											1-5		
Cyperus polystachyos	Bunchy sedge				<1									
Erechtites hieraciifolius	Fireweed	1-5	1-5		51-75	51-75			6-25		1-5	76-95	1-5	1-5
Galium tinctorium	Dye bedstraw	6-25		<1		6-25		6-25		6-25		1-5	<1	6-25
Ipomoea sagittata	Salt marsh morning glory		1-5				1-5						1-5	
Nigella sp.	Nigella	51-75		76-95	1-5		51-75	51-75	6-25	26-50	26-50	1-5	51-75	76-95
Phragmites australis	**Common reed (live)**			**1-5**			**6-25**	**6-25**	**<1**		**1-5**	**6-25**	**1-5**	
Phragmites australis	**Common reed (dead)**	**6-25**		**6-25**	**6-25**	**6-25**	**6-25**	**1-5**	**26-50**	**1-5**		**1-5**	**1-5**	**6-25**
Polygonum sp.	Smartweed	1-5		1-5				6-25		6-25	1-5		6-25	
Schoenoplectus americanus	Chairmaker's bulrush										1-5			
Sonchus asper	Spiny sowthistle		<1	1-5			1-5	1-5	1-5		1-5	1-5		
	Native species (dead)		6-25		6-25					1-5	6-25		1-5	1-5
	Unknown grass		6-25											
	Open water				6-25									

	Plot ID	VP40	VP41	VP42-MP8	VP43	VP44	VP45	VP46	VP47	VP48	VP49-MP9	VP50	VP51	VP52
Scientific Name	Common Name	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover
Baccharis halimifolia	Groundsel bush				6-25		1-5		1-5	6-25		1-5	1-5	
Cirsium horridulum	Yellow thistle		1-5											
Cyperus polystachyos	Bunchy sedge						6-25							
Erechtites hieraciifolius	Fireweed		1-5	6-25	1-5	1-5	6-25	<1	1-5		6-25		6-25	
Galium tinctorium	Dye bedstraw	1-5				6-25	1-5		6-25		<1	6-25		
Ipomoea sagittata	Salt marsh morning glory		1-5	<1				1-5			1-5	<1	1-5	
Nigella sp.	Nigella	26-50	51-75	6-25	26-50	51-75	1-5	1-5	51-75		6-25	51-75		
Panicum scoparium	Velvety rosette-panicgrass			1-5										
Phragmites australis	**Common reed (live)**							**6-25**						
Phragmites australis	**Common reed (dead)**	**6-25**	**6-25**					**76-95**	**1-5**		**26-50**	**6-25**		
Pluchea odorata	Marsh fleabane						1-5			6-25			6-25	
Polygonum sp.	Smartweed	6-25	6-25		1-5	51-75	1-5		26-50		<1	1-5		
Schoenoplectus americanus	Chairmaker's bulrush		<1							51-75			6-25	
Solidago sempervirens	Seaside goldenrod									<1				
Sonchus asper	Spiny sowthistle	1-5	1-5											
	Native species (dead)			26-50	26-50	6-25	6-25		1-5	1-5			26-50	1-5
	Bare ground												6-25	95-100

	Plot ID	VP53	VP54	VP55	VP56-MP10	VP57	VP58	VP59	VP60	VP61	VP62	VP63-MP11	VP64	VP65
Scientific Name	Common Name	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover
Amaranthus palmeri	Palmer's amaranth						<1							
Baccharis halimifolia	Groundsel bush			6-25	1-5									
Carex sp.	Sedges									6-25				<1
Cirsium horridulum	Yellow thistle													6-25
Erechtites hieraciifolius	Fireweed			6-25	1-5		6-25		26-50		6-25	6-25	6-25	51-75
Galium tinctorium	Dye bedstraw		<1	1-5			6-25		1-5		1-5			1-5
Ipomoea sagittata	Salt marsh morning glory									<1		6-25	1-5	
Nigella sp.	Nigella	51-75	51-75		76-95	51-75		51-75	51-75	51-75	6-25	6-25	<1	1-5
Panicum scoparium	Velvety rosette-panicgrass								<1					
Phragmites australis	**Common reed (live)**	**<1**						**1-5**		**6-25**	**1-5**			
Phragmites australis	**Common reed (dead)**	**6-25**			**6-25**				**6-25**	**6-25**	**26-50**	**6-25**		**6-25**
Pluchea odorata	Marsh fleabane			26-50								6-25	6-25	
Polygonum sp.	Smartweed	6-25	26-50		50-75		6-25		1-5		6-25			
Polypogon monspeliensis	Annual beard-grass					6-25								
Ranunculus sceleratus	Celery-leaved buttercup		6-25											
Rubus sp.	Blackberry									1-5				
Schoenoplectus americanus	Chairmaker's bulrush		<1										6-25	
Solidago sempervirens	Seaside goldenrod			1-5										
Sonchus asper	Spiny sowthistle										1-5			
Strophostyles sp.	Fuzzybean							1-5						
Thelypteris thelypteroides	Marsh fern									1-5				
	Native species (dead)				6-25	1-5							6-25	
	Unknown grass											6-25		
	Bare ground			26-50								1-5	26-50	

	Plot ID	VP66	VP67	VP68	VP69	VP70	VP71	VP72	VP73	VP74	VP75	VP76-MP12	VP77	VP78
Scientific Name	Common Name	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover
Bacopa monnieri	Herb of grace					26-50							6-25	
Cirsium horridulum	Yellow thistle						26-50							
Erechtites hieraciifolius	Fireweed		6-25	1-5	6-25	6-25	1-5	26-50	51-75	6-25			6-25	6-25
Galium tinctorium	Dye bedstraw		1-5	1-5	<1						1-5		6-25	
Ipomoea sagittata	Salt marsh morning glory	51-75									1-5	1-5		
Nigella sp.	Nigella		1-5	26-50	26-50		1-5	6-25	1-5		51-75	26-50		26-50
Phragmites australis	**Common reed (live)**			**1-5**				**6-25**			**1-5**			
Phragmites australis	**Common reed (dead)**		**6-25**	**6-25**	**1-5**		**26-50**	**6-25**	**51-75**	**26-50**	**6-25**			**6-25**
Polygonum sp.	Smartweed		6-25	1-5			1-5	1-5		6-25	26-50			6-25
Samolus parviflorus	Brookweed					1-5							1-5	
Schoenoplectus americanus	Chairmaker's bulrush					6-25						1-5		
Sonchus asper	Spiny sowthistle								<1					
Strophostyles sp.	Fuzzybean				1-5									
	Native species (dead)	76-95			6-25	6-25							26-50	6-25
	Bare ground			6-25			6-25					51-75		

	Plot ID	VP79	VP80	VP81	VP82	VP83	VP84	VP85	VP86-MP13	VP87	VP88	VP89	VP90	VP91
Scientific Name	Common Name	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover
Baccharis halimifolia	Groundsel bush		1-5				1-5							
Bacopa monnieri	Herb of grace			1-5										
Carex sp.	Sedges											1-5		
Erechtites hieraciifolius	Fireweed		1-5	1-5	1-5	6-25	<1	1-5	6-25	26-50	26-50	6-25	6-25	6-25
Eupatorium capillifolium	Dog fennel													<1
Galium tinctorium	Dye bedstraw	1-5	26-50											
Ipomoea sagittata	Salt marsh morning glory	6-25				6-25		26-50	6-25	26-50	1-5	26-50	6-25	6-25
Iva frutescens	Marsh elder						6-25							
Juncus roemerianus	Black needlerush			surrounding plot										
Nigella sp.	Nigella	6-25												
Phragmites australis	**Common reed (live)**									**<1**				
Phragmites australis	**Common reed (dead)**	**6-25**				**76-95**		**26-50**	**1-5**	**6-25**	**26-50**	**6-25**	**1-5**	
Pluchea baccharis	Camphorweed			1-5	6-25		1-5							
Polygonum sp.	Smartweed	1-5	6-25			1-5								
Samolus parviflorus	Brookweed					6-25			6-25					1-5
	Native species (dead)	1-5	6-25		76-95		6-25	6-25	76-95			1-5	6-25	6-25
	Unknown grass	1-5		6-25		6-25	6-25	1-5			1-5	<1		6-25
	Bare ground			26-50	6-25		6-25	1-5			6-25			6-25

	Plot ID	VP92	VP93	VP94	VP95	VP96-MP14	VP97	VP98	VP99	VP100
Scientific Name	Common Name	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover
Erechtites hieraciifolius	Fireweed	1-5		6-25		26-50	26-50	26-50	26-50	6-25
Galium tinctorium	Dye bedstraw								1-5	
Ipomoea sagittata	Salt marsh morning glory	6-25						6-25		
Nigella sp.	Nigella		76-95	51-75	26-50	1-5		6-25	1-5	
Phragmites australis	**Common reed (live)**					**1-5**	**1-5**			**6-25**
Phragmites australis	**Common reed (dead)**		**26-50**		**26-50**	**26-50**	**6-25**			**26-50**
Polygonum sp.	Smartweed		6-25	6-25	6-25	26-50	26-50		6-25	6-25
Sonchus asper	Spiny sowthistle						<1			
	Native species (dead)	6-25		6-25				6-25	6-25	
	Bare ground	26-50						6-25	6-25	

APPENDIX B

PESTICIDE RECORD FORMS

Herbicide Application Record

Client, Project Name:	NC DOT, Bodie Island Herbicide Spray							
Site Address:	Bodie Island Lighthouse (8210 Bodie Island Lighthouse Road, Nags Head NC 27959)							
Category:	Riparian Habitat	Wetland						Other:

PRODUCT APPLIED and SITE CONDITIONS

Date	Occurrence Site Name	Species controlled	Mix Code	Quantity of Mix Applied (GAL)	End Use Concentrate	Air Temp	Wind Speed	Wind Direct	Start Time	End Time	Equip. Code	MoA Code	Acres Treated & Comments
5/19/2025-5/20/2025 5/22/2025	Bodie Island	Phragmites (*Phragmites australis*)	1	124	6%	75°F	9 MPH	WSW	5/19/2025 14:00	5/22/2025 11:00	B	i	~7.8AC
5/19/2025-5/20/2025 5/22/2025	Bodie Island	Phragmites (*Phragmites australis*)	2	124	6%	75°F	9 MPH	WSW	5/19/2025 14:00	5/22/2025 11:00	B	i	~7.8AC
5/19/2025-5/20/2025 5/22/2025	Bodie Island	Phragmites (*Phragmites australis*)	3	124	2%	75°F	9 MPH	WSW	5/19/2025 14:00	5/22/2025 11:00	B	i	~7.8AC

STAFF

Employee Name	Pesticide License #	Hours	Comments	Employee Name	Pesticide License #	Hours	Comments
Michael Foster	NC#026-38079	15					
Nick Dominic		15					
Jason Cade		15					
Teen Dawson		15					

MATERIAL and EQUIPMENT

Herbicide/Adjuvant Information					Equipment Information			
EPA Reg. No.	Brand Name	Manufacturer	Mix Code	Mix Description	Equip. Code	Equipment Description	MoA Code	Mode of Application (MoA)
524-343	Aquamaster	Bayer	**1**	6% Solution Roundup Custom	**A**	Engine Sprayer	**i**	Foliar
81927-22	Ecomazapyr	Alligare	**2**	6 % Solution Ecomazapyr	**B**	Backpack Sprayer	**ii**	Basal Bark
N/A	Precision Spreader	Precision Laboratories	**3**	2% Solution Precision Spreader	**C**	Wicking Device	**iii**	Hack-and-Squirt
					D	Injector	**iv**	Aerial
					E		**v**	Stump Cut

ADDITIONAL DATA REQUESTED BY CLIENT

Mix codes 1-3 were tank mixed. No herbicide applied on Wednesday May 21, 2025 due to thunderstorms and high winds.

Herbicide Application Record

Client, Project Name:	NC DOT, Bodie Island Herbicide Spray							
Site Address:	Bodie Island Lighthouse (8210 Bodie Island Lighthouse Road, Nags Head NC 27959)							
Category:	Riparian Habitat	Wetland					Other:	

PRODUCT APPLIED and SITE CONDITIONS

Date	Occurrence Site Name	Species controlled	Mix Code	Quantity of Mix Applied (GAL)	End Use Concentrate	Air Temp	Wind Speed	Wind Direct	Start Time	End Time	Equip. Code	MoA Code	Acres Treated & Comments
9/16/2025-9/19/2025 10/06/2025-10/07/2025 10/16/2025	Bodie Island	Phragmites (*Phragmites australis*)	1	264	6%	75°F	9 MPH	WSW	9/16/2025 2:00 PM 10/06/2025 2:00 PM 10/16/2025 8:00 AM	9/19/2025 11:00 AM 10/7/2025 4:00 PM 10/16/2025 4:00 PM	B	i	~65 (majority of acreage was spot treatment only)
9/16/2025-9/19/2025 10/06/2025-10/07/2025 10/16/2026	Bodie Island	Phragmites (*Phragmites australis*)	2	264	6%	75°F	9 MPH	WSW	9/16/2025 2:00 PM 10/06/2025 2:00 PM 10/16/2025 8:00 AM	9/19/2025 11:00 AM 10/7/2025 4:00 PM 10/16/2025 4:00 PM	B	i	~65 (majority of acreage was spot treatment only)

STAFF

Employee Name	Pesticide License #	Hours	Comments	Employee Name	Pesticide License #	Hours	Comments
Michael Foster	NC#026-38079	47					
Nick Dominic		27					
Jason Cade		37					
Ava Gray		37					

MATERIAL and EQUIPMENT

Herbicide/Adjuvant Information

EPA Reg. No.	Brand Name	Manufacturer	Mix Code	Mix Description
524-343	Aquamaster	Bayer	1	6% Solution Roundup Custom
81927-22	Ecomazapyr	Alligare	2	6 % Solution Ecomazapyr
N/A	Precision Spreader	Precision Laboratories	3	2% Solution Precision Spreader

Equipment Information

Equip. Code	Equipment Description	MoA Code	Mode of Application (MoA)
A	Engine Sprayer	i	Foliar
B	Backpack Sprayer	ii	Basal Bark
C	Wicking Device	iii	Hack-and-Squirt
D	Injector	iv	Aerial
E		v	Stump Cut

ADDITIONAL DATA REQUESTED BY CLIENT

Mix codes 1-3 were tank mixed.

Herbicide Application Record

Client, Project Name:	NC DOT, Bodie Island Spray						
Site Address:	Bodie Island Lighthouse (8210 Bodie Island Lighthouse Road, Nags Head NC 27959)						
Category:	Phragmities Spray					Other: 9-17-2025	

PRODUCT APPLIED and SITE CONDITIONS

Date	Occurrence Site Name	Species controlled	Mix Code	Quantity of Mix Applied	End Use Concentrate	Air Temp	Wind Speed	Wind Direct	Start Time	End Time	Equip. Code	MoA Code	Acres Treated & Comments
9/17/2025	DRG Area 3	Phragmites australis	1	2.8 Gallons	17%	75°F	5-9 MPH	West	9:55 AM	10:05 AM	A	i, iv	0.9 acres total
9/17/2025	DRG Area 3	Phragmites australis	2	2.8 Gallons	17%	75°F	5-9 MPH	West	9:55 AM	10:05 AM	A	i, iv	0.9 acres total
9/17/2025	DRG Area 1	Phragmites australis	1	7.6 Gallons	17%	75°F	5-9 MPH	West	10:55 AM	11:30 AM	A	i, iv	2.5 acres total
9/17/2025	DRG Area 1	Phragmites australis	2	7.6 Gallons	17%	75°F	5-9 MPH	West	10:55 AM	11:30 AM	A	i, iv	2.5 acres total
9/17/2025	DRG Area 4	Phragmites australis	1	11.0 Gallons	17%	75°F	5-9 MPH	West	11:30 AM	12:40 PM	A	i, iv	3.6 acres total
9/17/2025	DRG Area 4	Phragmites australis	2	11.0 Gallons	17%	75°F	5-9 MPH	West	11:30 AM	12:40 PM	A	i, iv	3.6 acres total
9/17/2025	DRG Area 2	Phragmites australis	1	2.6 Gallons	17%	75°F	5-9 MPH	West	1:30 PM	1:40 PM	A	i, iv	0.8 acres total
9/17/2025	DRG Area 2	Phragmites australis	2	2.6 Gallons	17%	75°F	5-9 MPH	West	1:30 PM	1:40 PM	A	i, iv	0.8 acres total

STAFF

Employee Name	Pesticide License #	Hours	Comments	Employee Name	Pesticide License #	Hours	Comments
William Dortch (DRG)	027-951 and 028-775	1 day					
Ben Furr (DRG)	027-954	1 day					
Michael Foster (DRG)	026-38079 and 029-756	1 day					

MATERIAL and EQUIPMENT

Herbicide/Adjuvant Information					Equipment Information			
Mix Code	EPA Reg. No.	Brand Name	Manufacturer	Mix Description	Equip. Code	Equipment Description	MoA Code	Mode of Application (MoA)
1	524-343	Roundup Custom	Bayer	17% Solution Roundup Custom (64 oz)	A	UAS Sprayer	i	Foliar
2	81927-22	Ecomazapyr	Alligare	17% Solution Habitat (64 oz)	B	Backpack Sprayer	ii	Basal Bark
3	n/a	Sunwet	Brewer	4 oz	C	Wicking Device	iii	Hack-and-Squirt
4	n/a	n/a	n/a	Water to make 3 gallon solution (278 oz)	D	Injector	iv	Aerial

ADDITIONAL DATA REQUESTED BY CLIENT