# Cape Hatteras National Seashore Buxton and Frisco Flooding Mitigation Planning

Public Scoping Meetings, 10/19/2016 and 10/20/2016

Manteo, N.C. and Buxton N.C.

1. Historical overview of the area
2. Description of past drainage practices
3. Documentation of flooding impacts
4. Review of reports and data surrounding the issue
5. Next steps

# Partners

- NOAA
- North Carolina Department of Environmental Quality
- North Carolina Division of Coastal Management
- North Carolina Wildlife Resources Commission
- US Fish and Wildlife Service
- US Army Corp of Engineers

# The Challenge

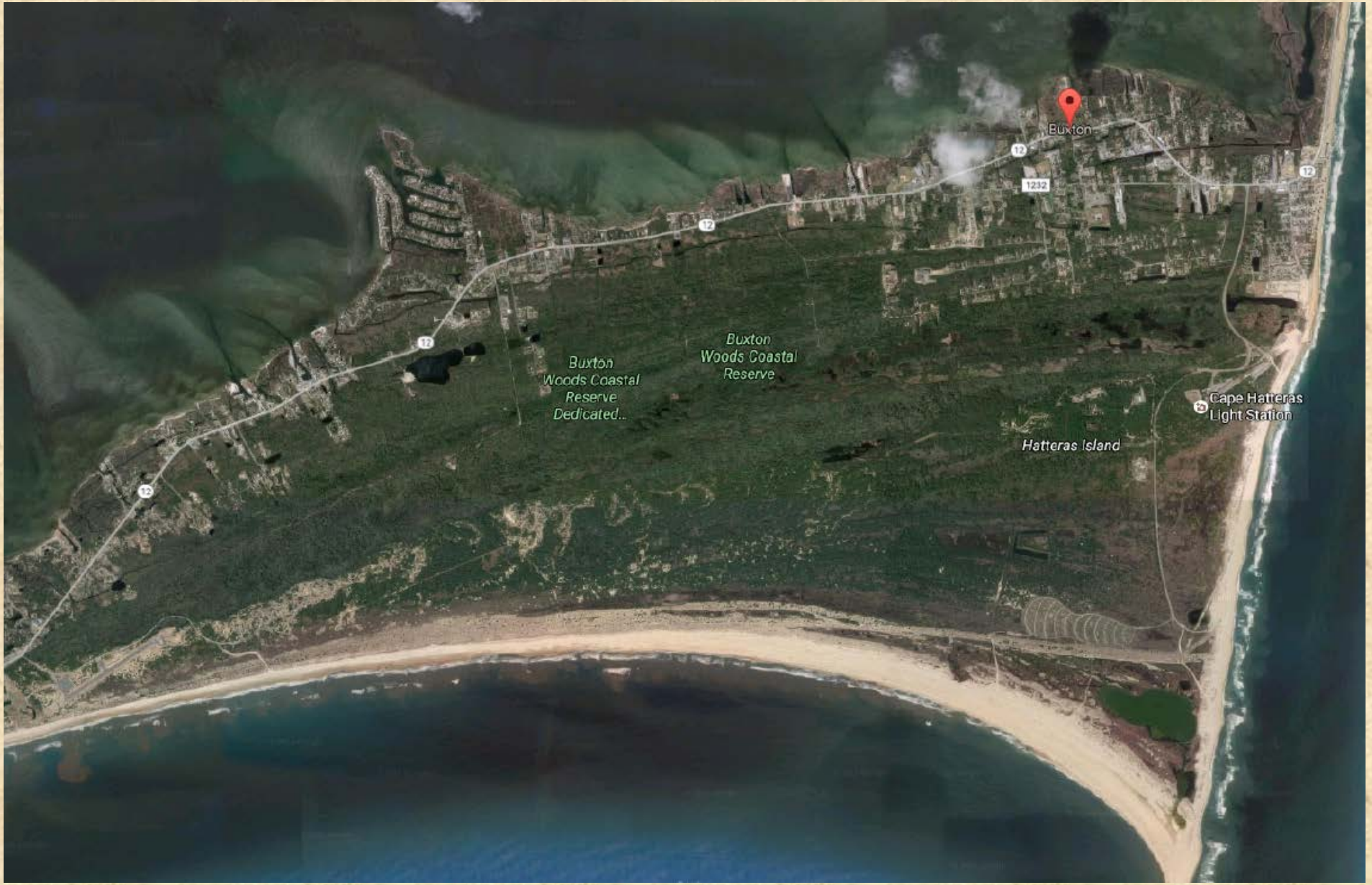
Several locations, including the Cape Point Campground, beach parking lots (near ramp 43 and old ramp 45), the Cape Hatteras Lighthouse parking lot, off-road vehicle ramps 43, 44, and 49, Lighthouse Road, and areas around the Seashore's administrative offices, have experienced persistent flooding over the last decade.

Although most Seashore facilities have remained open while flooded, flooding can diminish the visitor experience and make access to some areas challenging during large rainfall events.

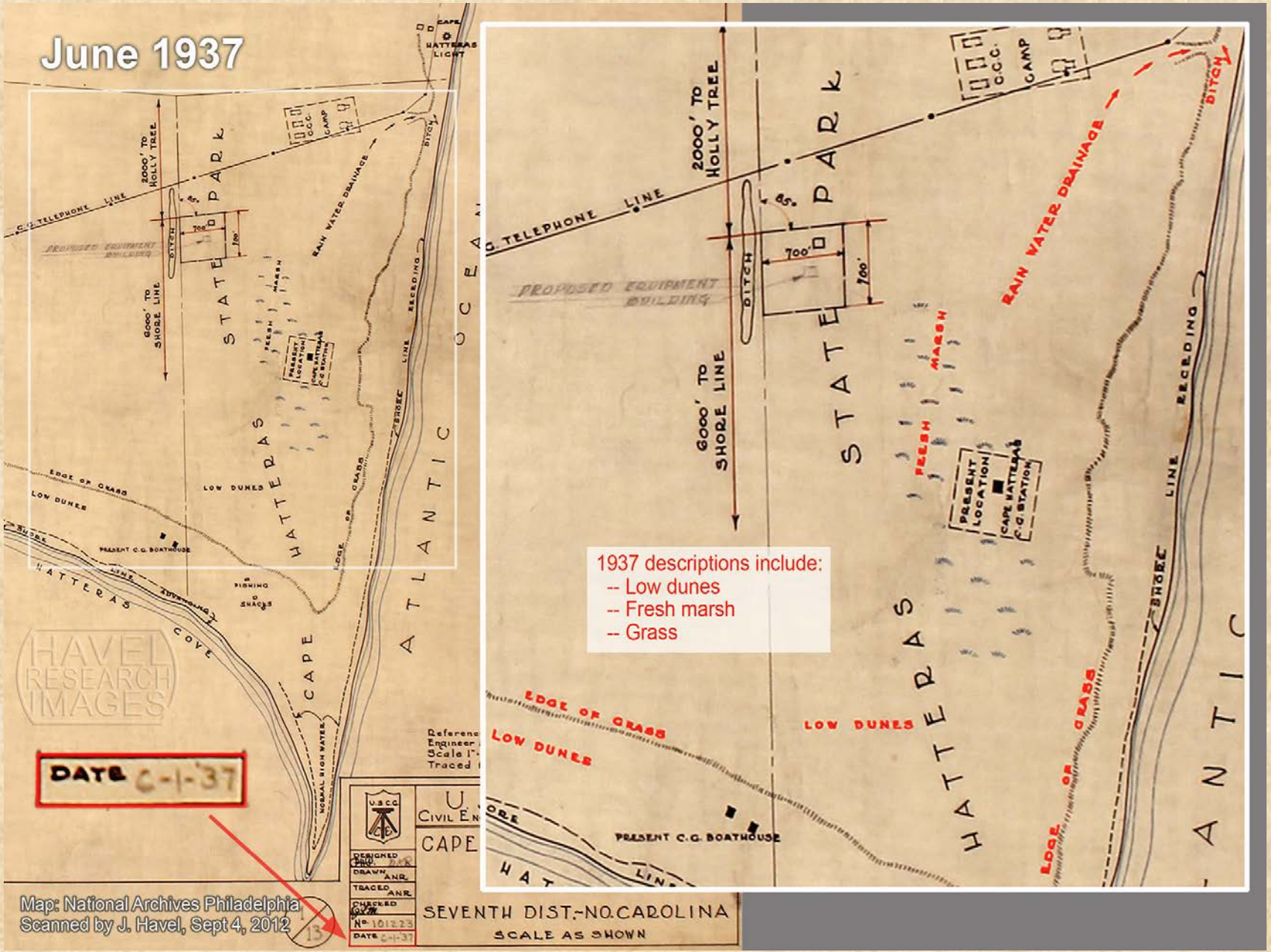
# What factors affect flooding in this area?

- The dredge pond?
- The dune line?
- Campground construction?
- Ditches, dikes, roads?
- Regional groundwater levels?
- Sea level rise?

# National Park Service



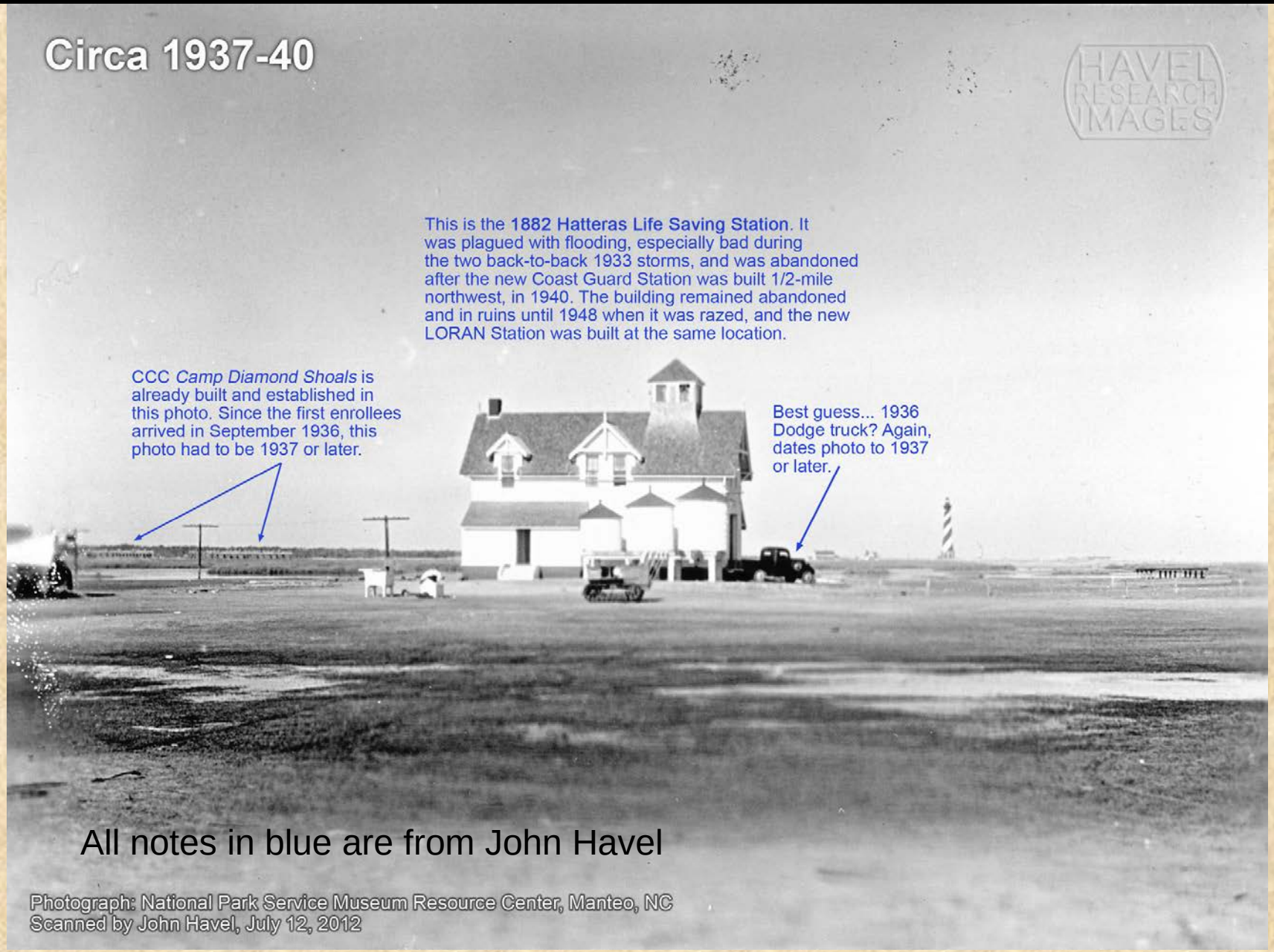
# National Park Service




Map: National Archives Philadelphia
Scanned by J. Havel, Sept 4, 2012

# National Park Service

# National Park Service



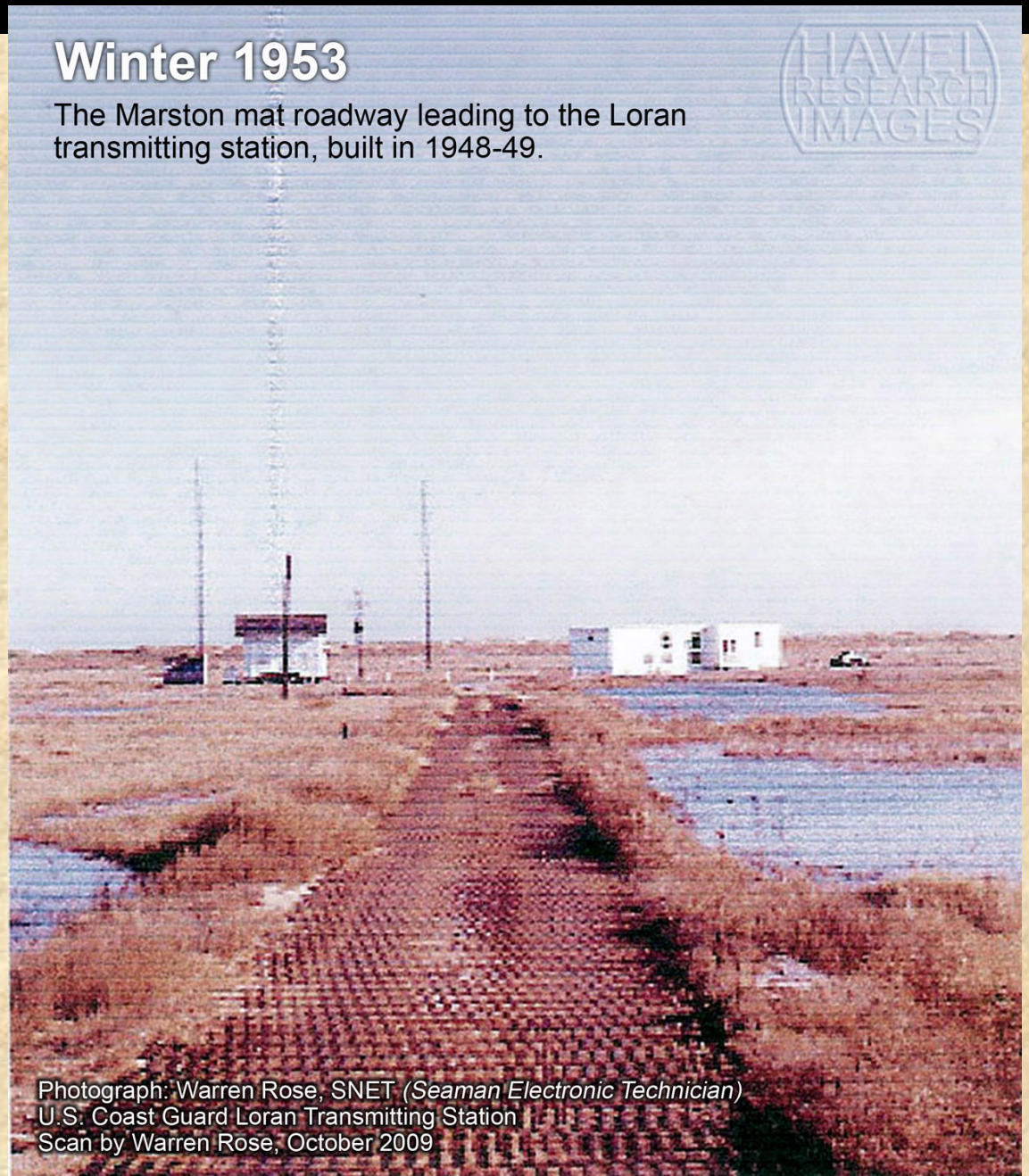
# National Park Service

April 1945


Winter 1953
Photograph taken in the winter of 1953 pointing north from the top of the 300-ft U.S. Coast Guard Loran transmitting tower by Seaman Electronic Technician Warren Rose. Although the photograph does not show the area south of the Loran Station or that of Cape Point, the general lack of any significant vegetation gives a clear idea of the terrain and topography of the area during the wintertime in this time period.
HAVEL RESEARCH IMAGES
Notes from John Havel
Photograph: Warren Rose, SNET (Seaman Electronic Technician)
U.S. Coast Guard Loran Transmitting Station
Scanned from 35mm slide by John Havel, October, 2009

## Winter 1953

The Marston mat roadway leading to the Loran transmitting station, built in 1948-49.




Photograph: Warren Rose, SNET *(Seaman Electronic Technician)*
U.S. Coast Guard Loran Transmitting Station
Scan by Warren Rose, October 2009

March 1955

# National Park Service


Figure 37.
A view from the top of Cape Hatteras Lighthouse looking southwest. This is an area that is classified as miniature sand dunes or a rolling dry sand flat. The darkest black spots are such plants as live oak, yaupon, or wax-myrtle. The remains of a pine plantation are in the upper third of the picture where the right hand road narrows. The maritime pine was planted in this area.

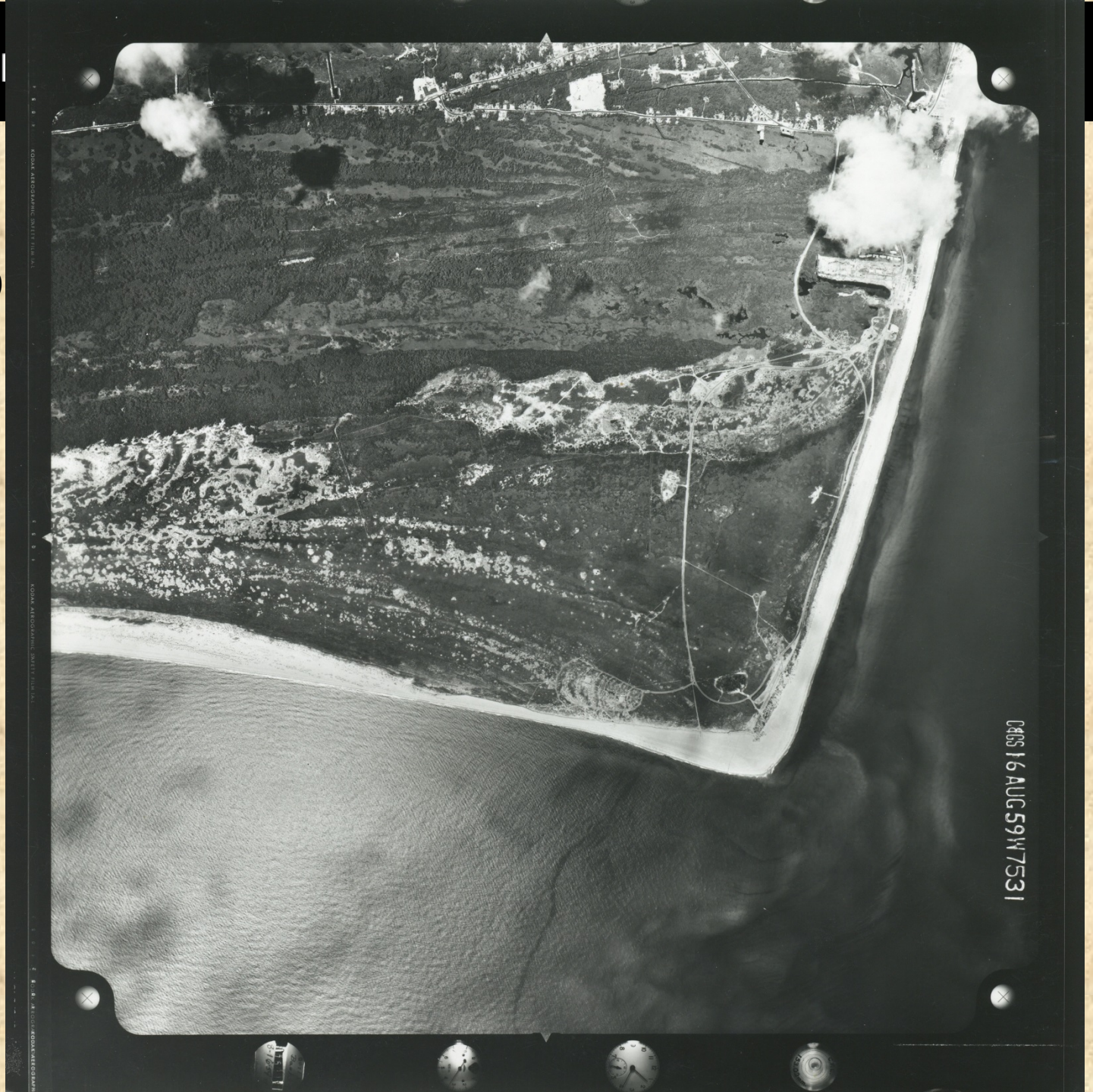
Photograph: Robert Dolan; Dune Stabilization & Beach Erosion, 1972
Scanned by John Havel

# National Park Service

## February 25, 1958

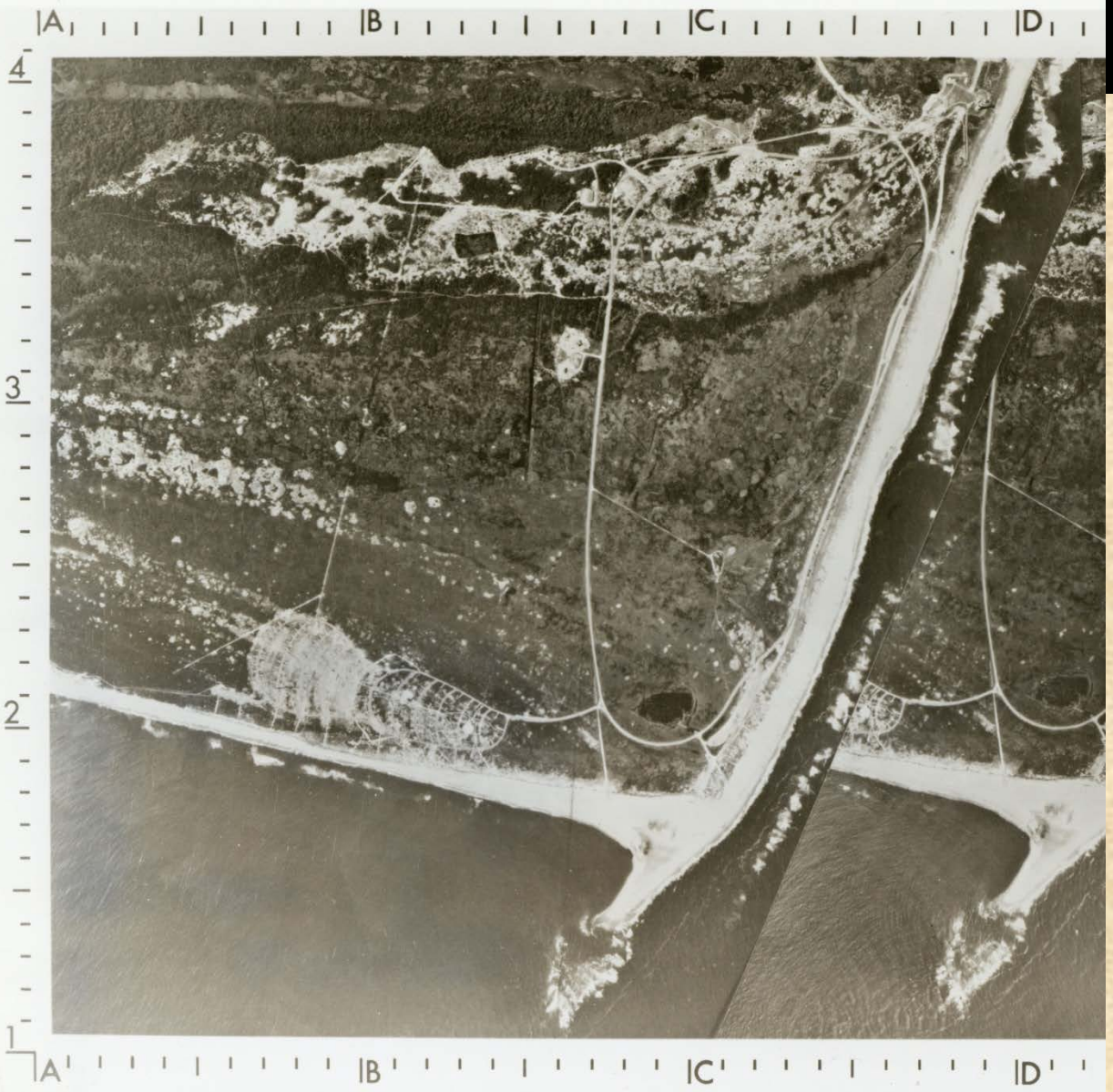

Photograph: NPS Outer Banks Group Museum Resource Center, Manteo, NC
Scan by John Havel July 12, 2012

August 1959

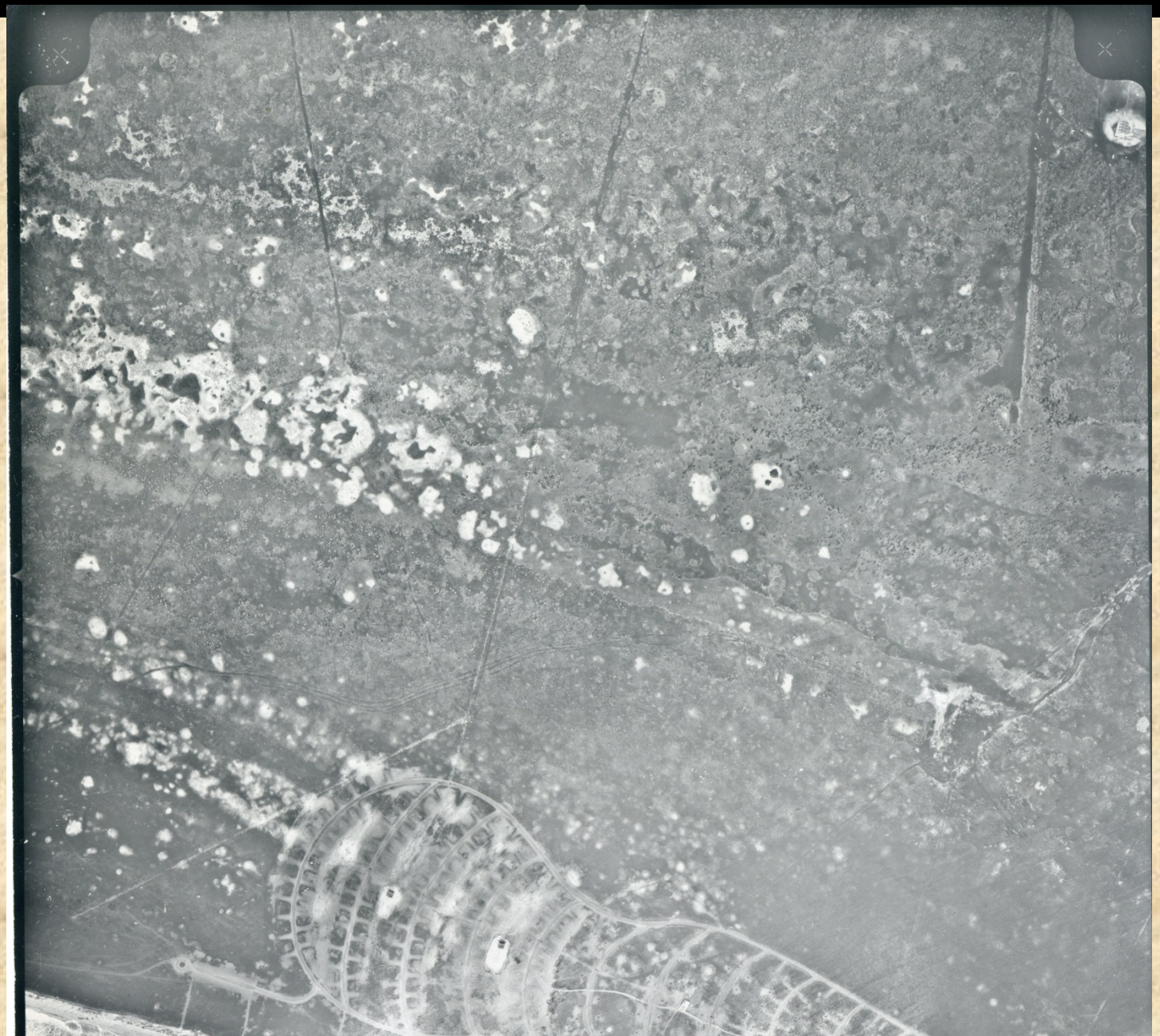


# National Park Service

May 1962

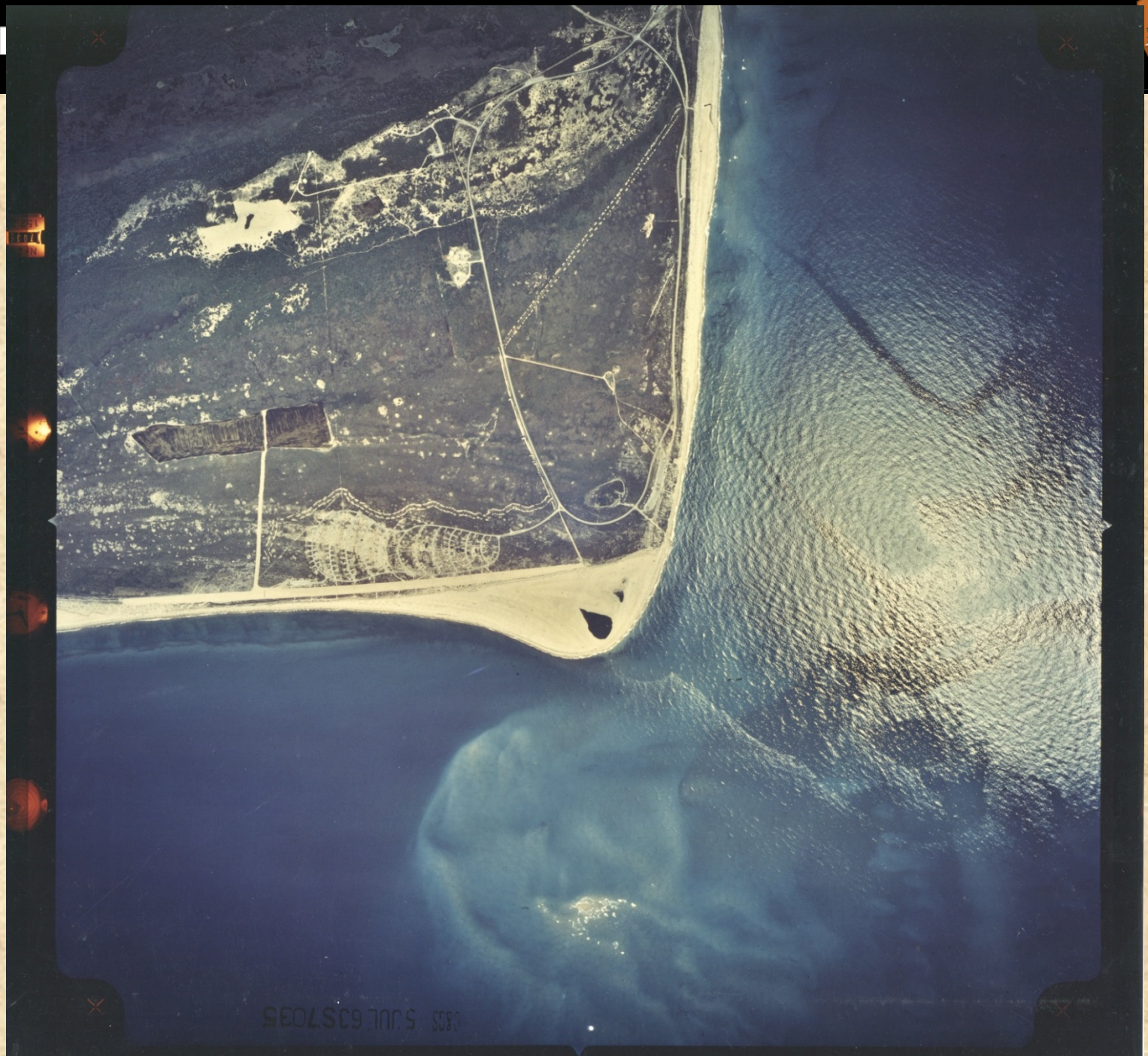

A
B
C
D
4
3
2
1
A'
B'
C'
D'
CAPE HATTERAS (1962)
Dare County, North Carolina
May 3, 1962
RF = 1:19,700 H = 10,020
Stereogram No. 611
Prepared from USC & GS P
By the University of Ill
Committee on Aerial Phot

Dec 1962



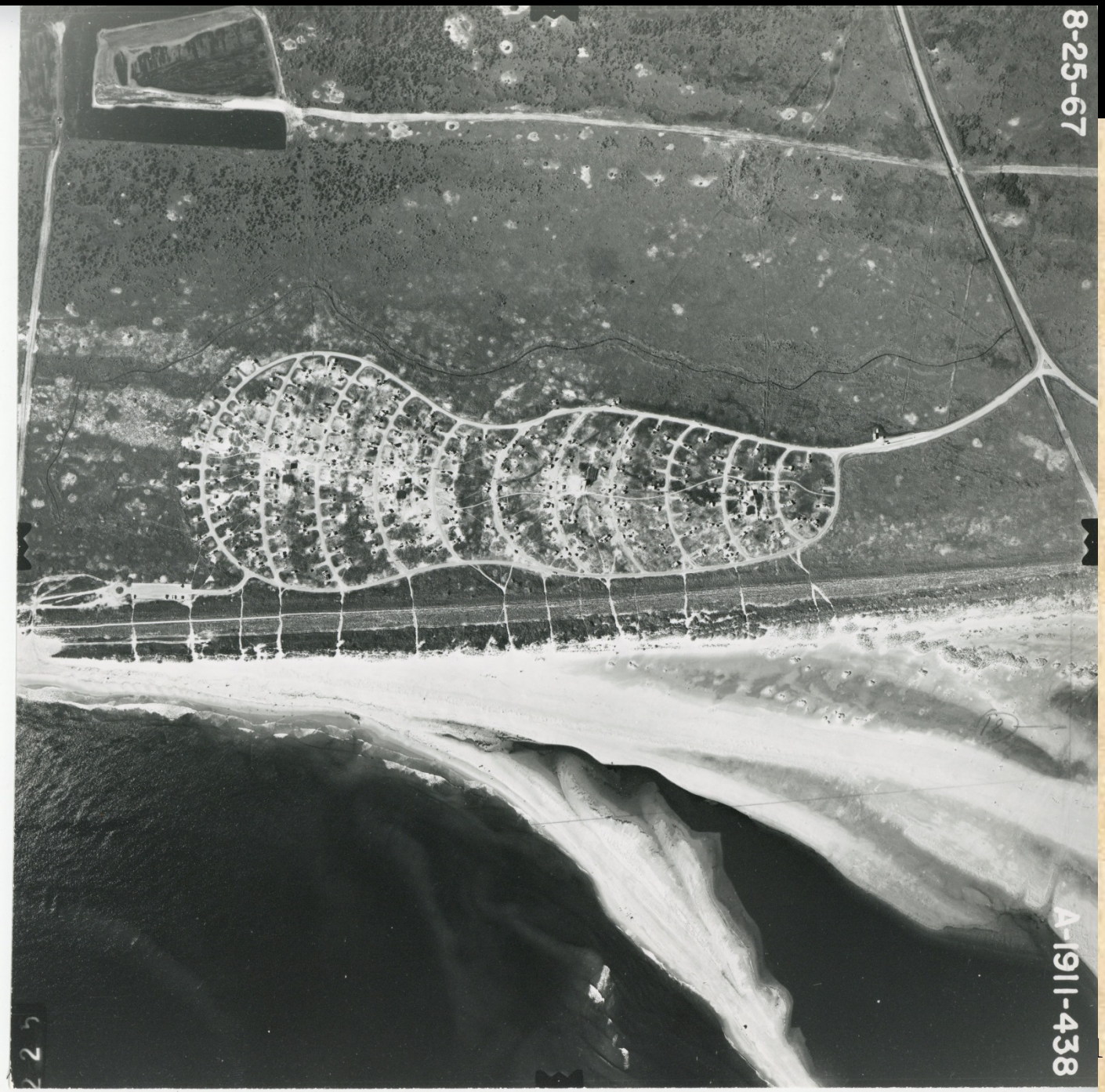
# Natio

July 1963

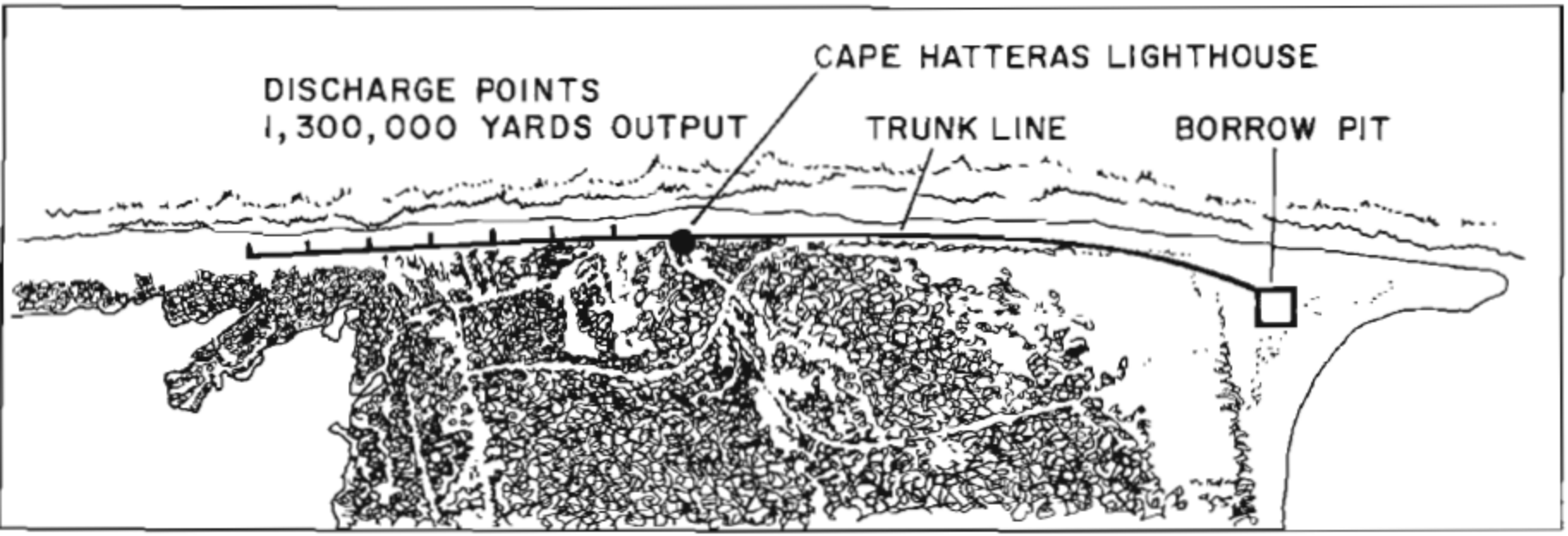


# Nation

August 1967



August 1972

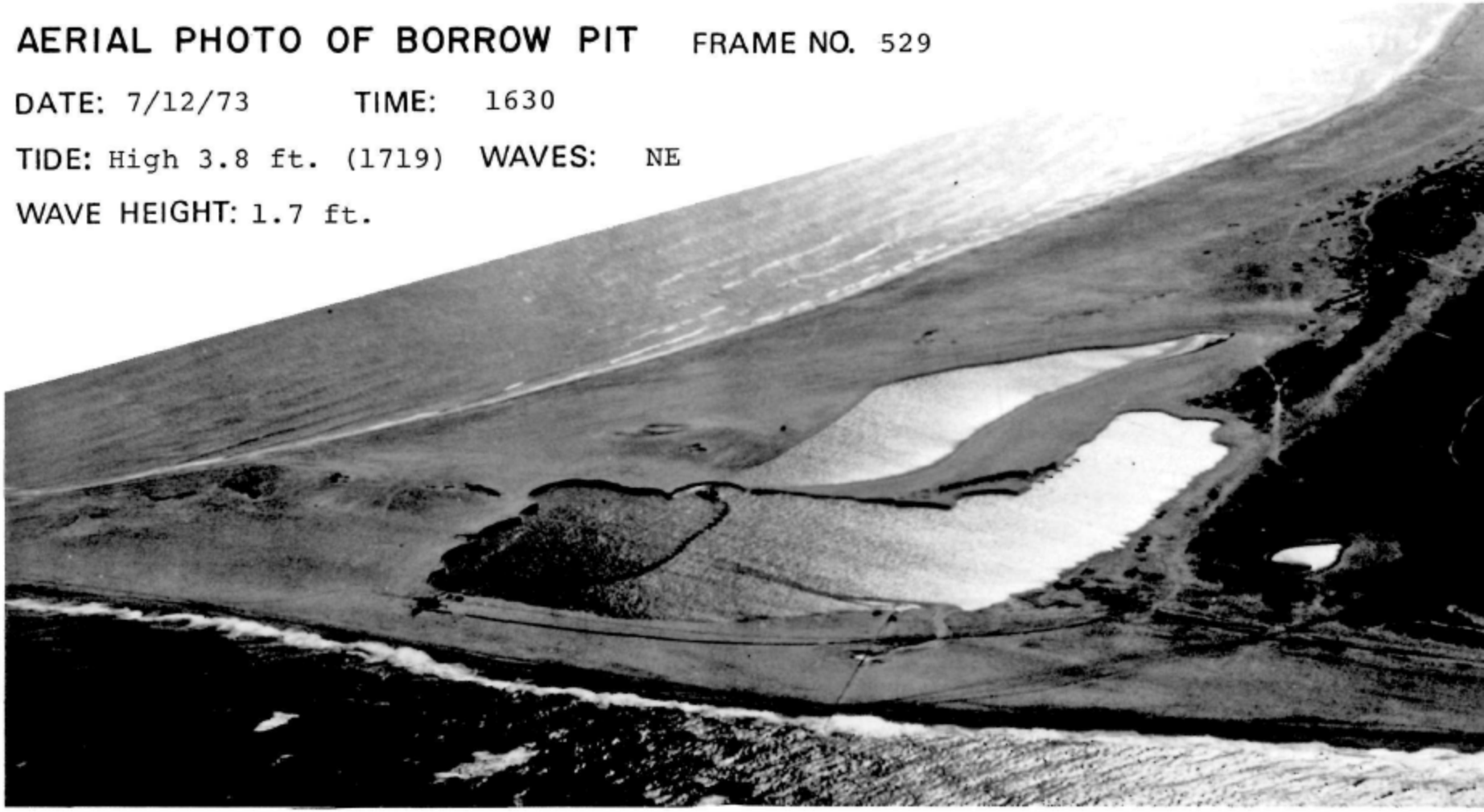

CAPE HATTERAS LIGHTHOUSE
DISCHARGE POINTS
1,300,000 YARDS OUTPUT
TRUNK LINE
BORROW PIT

AERIAL PHOTO OF BORROW PIT FRAME NO. 529

DATE: 7/12/73 TIME: 1630

TIDE: High 3.8 ft. (1719) WAVES: NE

WAVE HEIGHT: 1.7 ft.



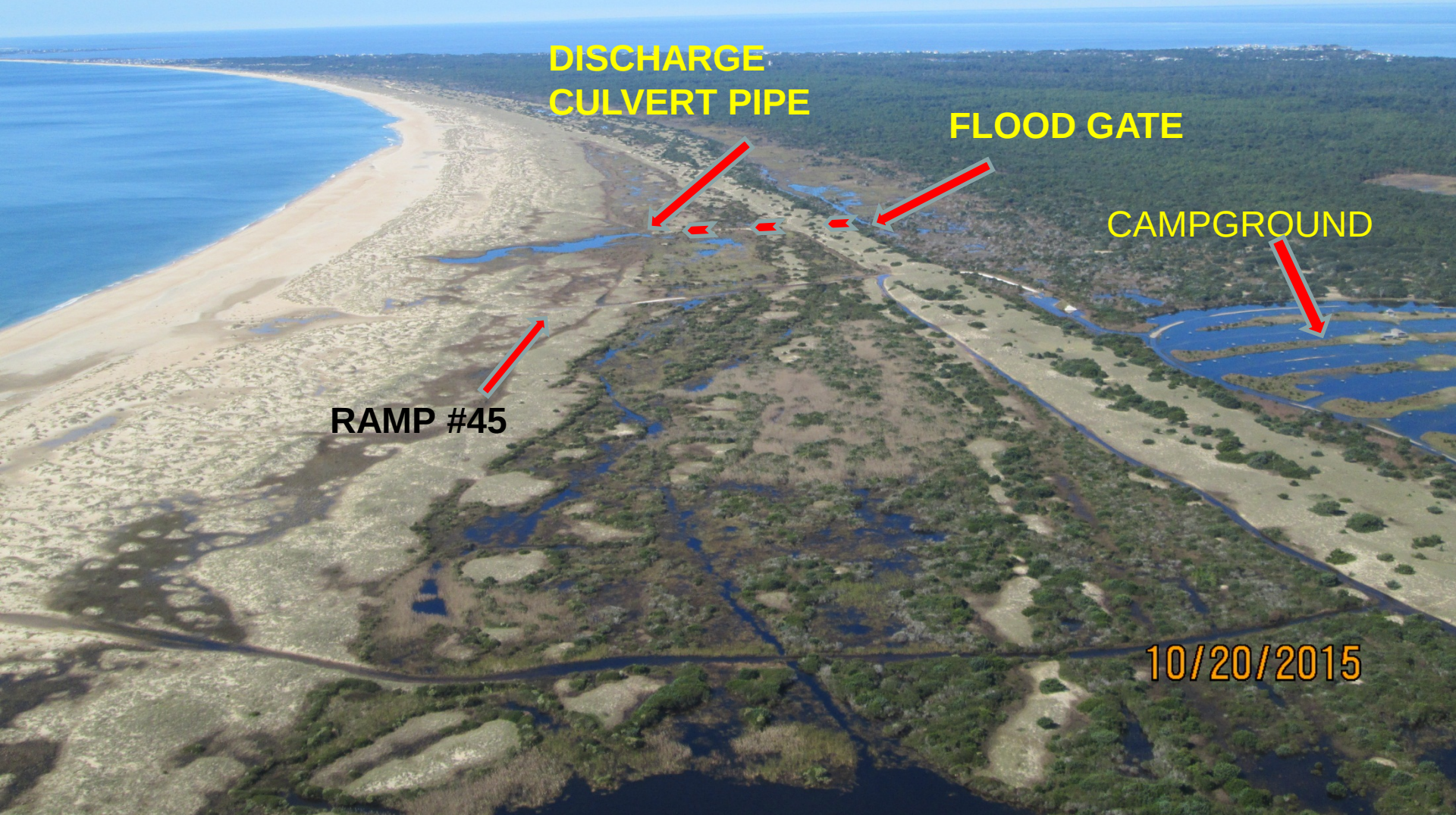
Over 750,000 yards$^3$ had been excavated from the borrow pit at the time of this pho

# National Park Service

May 1978


CAMPGROUND
FLOOD GATE
RAMP #45
DISCHARGE
10/20/2015

WHEN GATE IS OPEN WATER FLOWS THROUGH A CULVERT PIPE THAT RUNS UNDER THE DUNE TO A DISCHARGE END




Culvert Pipe
Discharge End
Existing Underground
Culvert Pipe
West of Cape Point Campground

# National Park Service

Michael F. Easley, Governor
William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources

Alan W. Klimek, P. E. Director
Division of Water Quality
Coleen H. Sullins, Deputy Director
Division of Water Quality

September 16, 2004

**CERTIFIED MAIL**
**RETURN RECEIPT REQUESTED**

Mr. Jim Ebert
National Resource Manager
National Park Service, Cape Hatteras Group
Manteo, North Carolina 27954

Subject: **Notice of Violation**
**Notice of Intent to Enforce**
Wetland Draining
Dare County

Dear Mr. Ebert,

On April 28, 2004, Tom Steffens from this office met with you, John Wescott of the National Park Service (NPS) and William Wescott of the U.S. Army Corps of Engineers to discuss the presence of a drainage feature located adjacent to the Cape Hatteras National Seashore Campground. This feature drains through the maritime forest and associated wetlands towards the Atlantic Ocean, under the secondary dune system via a steel culvert, daylights behind the primary dune system and drains directly into the ocean.

Subsequent investigation of this system indicates that the drainage way was opened up by the NPS to allow the waters of the drainage canal to discharge directly into the ocean. Draining of wetlands and subsequent altering of natural hydrology of wetlands is considered a violation of North Carolina Administrative Code 15A NCAC 02B .0231 (b)(5); Wetland Standards; which says:

(5) Hydrological conditions necessary to support the biological and physical characteristics naturally present in wetlands shall be protected to prevent adverse impacts on:
(A) Water currents, erosion or sedimentation patterns;
(B) Natural water temperature variations;
(C) The chemical, nutrient and dissolved oxygen regime of the wetland;
(D) The movement of aquatic fauna;
(E) The pH of the wetland; and
**(F) Water levels or elevations.**

It has been determined by the Division of Water Quality (DWQ) staff that the opening of this drainage way to the ocean and resulting draining of wetlands constitutes a violation of the wetland standard noted above.

# July – December of 2015 was a very wet time in North Carolina

http://www.ncdc.noaa.gov/temp-and-precip/climatological-rankings/

## North Carolina Precipitation Rankings, December 2015

« November 2015 January 2016 »

Record Driest | Bottom 1/10 | Bottom 1/3 | Normal | Top 1/3 | Top 1/10 | Record Wettest

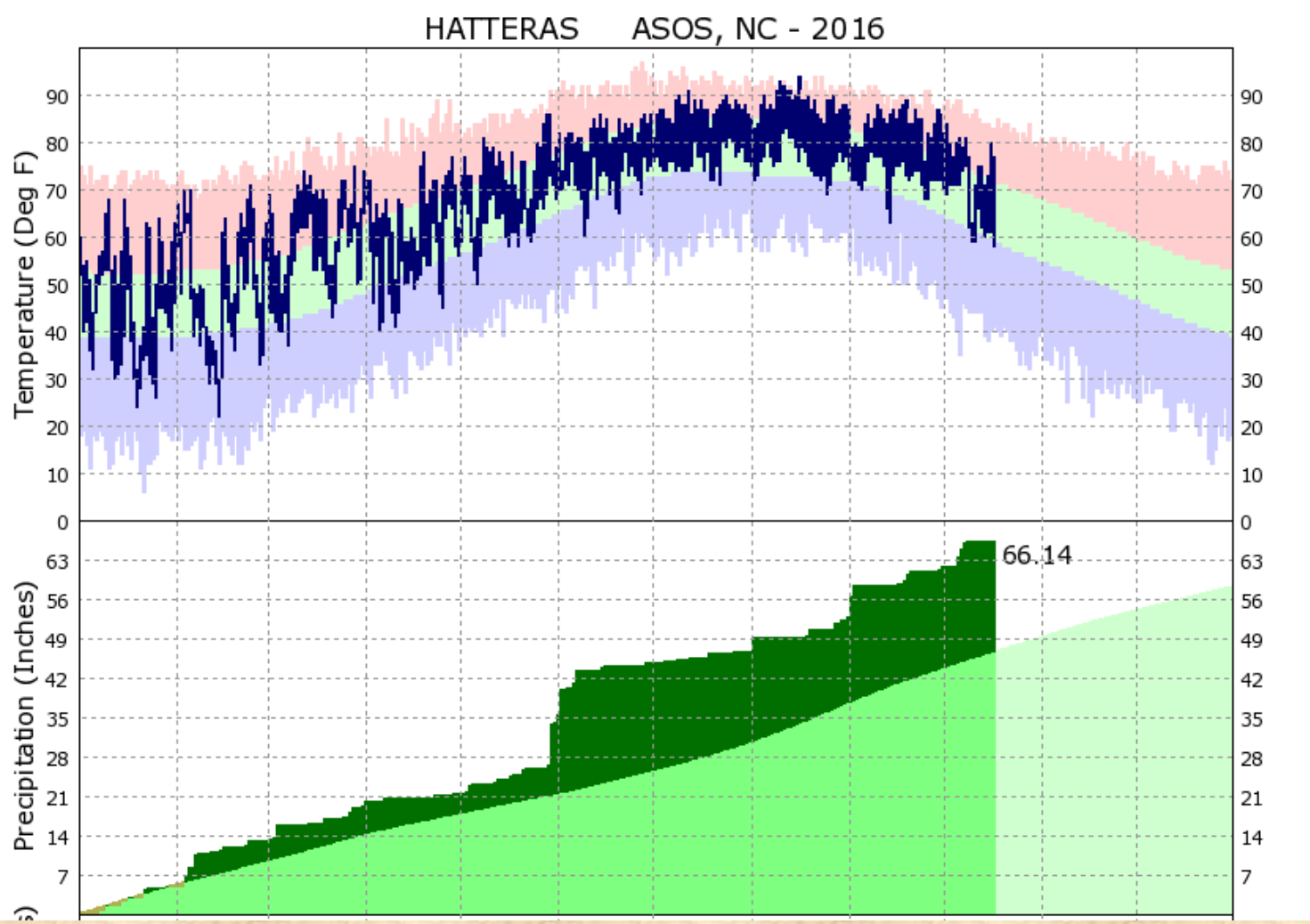
*More information on Climatological Rankings*

Download: XML

| PERIOD | PRECIP | 20TH CENTURY AVERAGE | DEPARTURE | RANK | WETTEST/DRIEST SINCE | RECORD |
|---|---|---|---|---|---|---|
| Jul - Dec 2015 6-month period | 35.27" (895.86 mm) | 25.21" (640.33 mm) | 10.06" (255.53 mm) | 121st Driest | Driest since: 2014 | 2001 |
| | | | | 1st Wettest | Wettest to Date | 2015 |

# Precipitation has been above average in 2016

From: National Weather Service: http://www.weather.gov/images/mhx/KHSE2016plot.png




FLY OVER 10/20/15
POST STORM FLOOD WATERS
CAPE POINT AND FRISCO
10/06/2015


HORSE SHOE PONDS
VACINITY OF LORAN STATION ROAD
10/20/2015


RAMP #49 FRISCO
10/20/2015

CAPE POINT CAMPGROUND AND
SURROUNDING AREAS


East Side of Cape Point
Campground


RAMP #44
10/20/2015


Cape Point
Campground and
Surrounding Areas

CAPE POINT AREA

10/20/2015


2/5/2016


Cape Hatteras
National
Seashore
RAMP
43
Driving Regulations
Beach Regulations


ONE WAY

# National Park Service

December 23, 2005

L54(2380)
CAHA/General

Memorandum

To: Superintendent, Cape Hatteras National Seashore

Through: William L. Jackson, Chief, Water Resources Division (WRD)
Gary Rosenlieb, Acting Chief, Water Operations Branch, WRD

From: Larry Martin, Hydrogeologist, Water Operations Branch, WRD

Subject: Trip Report for travel to Cape Hatteras National Seashore, November 15-17, 2005

Conclusions:

1. Flooding of roads in the interdunal area is directly related to maintaining high water levels in the interior part of the island, as directed by the NC Division of Water Quality to preserve the hydrological conditions of wetlands.
2. Raising the road elevations in the interdunal area above the normal water level would require large amounts of fill and could be susceptible to erosion during large storms. Wetland compliance review by Park Service, Corps of Engineers, and the State of North Carolina would be required.
3. Water levels in the interdunal area could be lowered by constructing a drain and discharging water directly to the ocean, although this would be contrary to North Carolina law and NPS management policies.
4. Preliminary data indicates that direct discharge to the ocean is a source of pollution and might require closing of beaches and posting of shellfishing and swimming advisories.
5. Rerouting the beach access roads to higher elevation areas could provide more reliable ORV access to the beaches without dewatering wetlands or discharging contaminated water to the ocean. The feasibility of rerouting the roads has not been fully explored.

December 13, 2006

L54(2380)
CAHA/General

Memorandum

To: Thayer Broili, Chief of Resource Management, Cape Hatteras National Seashore

From: Larry Martin, Hydrogeologist, Water Operations Branch, WRD

Subject: Issues related to water quality in the Cape Point area

## Conclusions

There is no evidence to indicate the septic leachfields at the Cape Point campground contribute to the presence or concentration of enterococci bacteria in adjacent surface water bodies. Most of the samples are within the range of 10-100 colonies/100 ml. Most of the higher concentrations are correlated to preceding rainfall that might contribute to flushing bacteria into the surface waters, or mobilizing bacteria already present. There are a few samples that appear to be anomalously high, for which no explanation is offered.

The only site that had bacteria concentrations consistently above background was St. Peters Ditch at the intersection of Forest Road and Hwy 12. St. Peters Ditch drains groundwater from heavily-developed, privately-owned areas having individual septic leachfields.

Larry Martin
NPS-WRD
April 2010

# Flooding Issues at Cape Point Campground
## Cape Hatteras National Seashore

In a previous memo to the park (December 23, 2005), I provided a summary of the issue and the hydrology of the Cape Point area. I also presented alternatives to alleviate the impact of flooding on beach access via interdunal roads. Those same alternatives apply to reducing the impact of flooding at the Cape Point campground. Briefly, those alternatives are;

1. Reactivate the system of drainage ditches and discharge flood water to the ocean.
2. Raise the elevation of the campground.
3. Relocate the campground to higher ground.

None of these alternatives seem very reasonable. The only remaining alternative is "no action". Simply accept the fact that the campground will sometimes be flooded and unusable.

In this report, I will demonstrate that the flooding is primarily a result of high water table conditions following wet periods. I will also show that the frequency and duration of flooding will continue to increase as sea level rises.

Summary

Flooding at the Cape Point campground is the result of natural hydrologic processes. The water table rises during wet periods. When the water table is higher than land surface, the area will be flooded. The frequency and duration of flooding can be expected to increase as sea level rises.

From Martin 2010

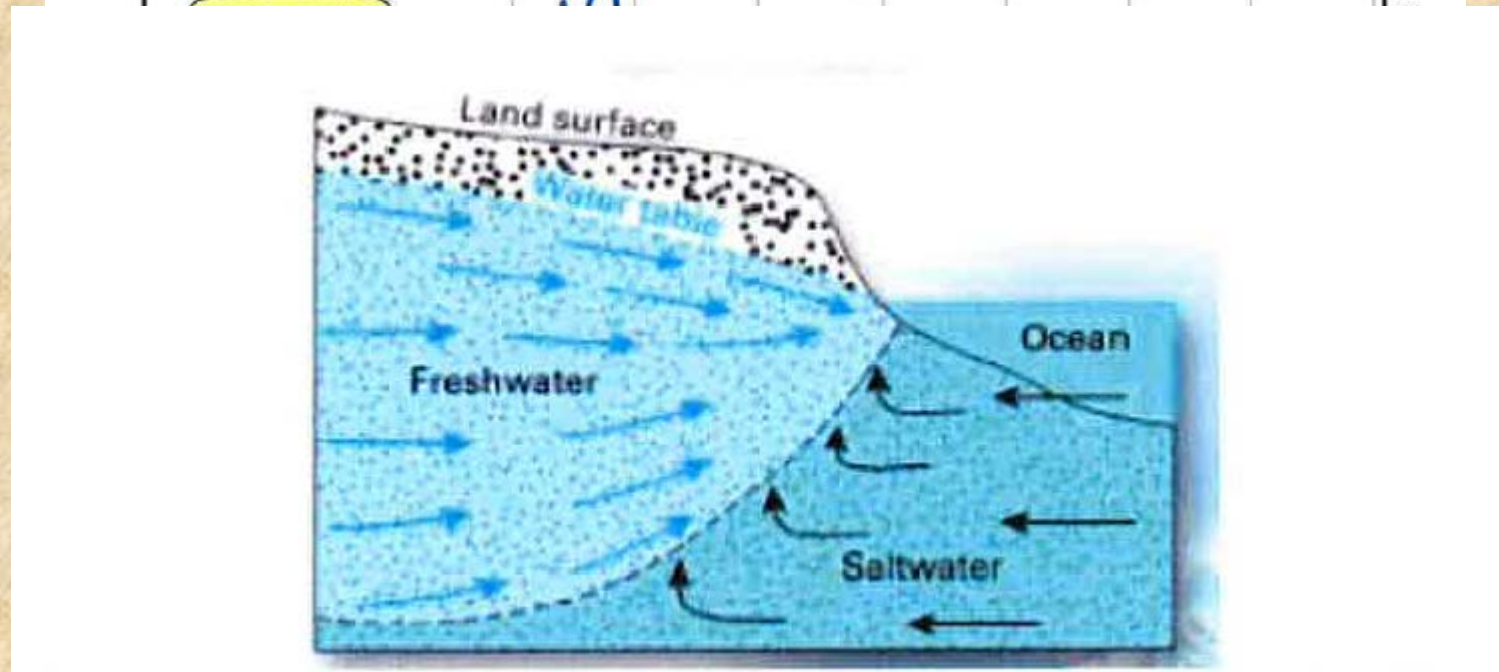



Figure 6. Relationship of freshwater and saltwater at the ocean shoreline.

# A highly dynamic area that is eroding

## PHOTO INTERPRETATION OF SHORELINE CHANGES BETWEEN CAPES HATTERAS AND FEAR (NORTH CAROLINA)

MOHAMED T. EL-ASHRY AND HAROLD R. WANLESS

TABLE I

DIMENSION CHANGES IN CAPES HATTERAS, LOOKOUT AND FEAR

*Marine Geol.*, 6 (1968) 347–379

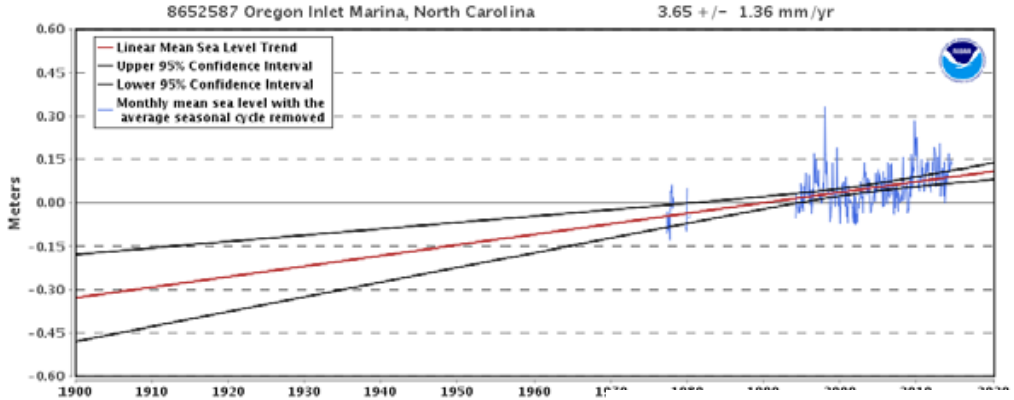
| *Location* | *Changes in Cape Hatteras (ft.)* | | | | | | |
|---|---|---|---|---|---|---|---|
| | *1852–1872* | *1872–1917* | *1917–1939* | *1939–1945* | *1949–1953* | *1953–1962* | *net change* |
| Beach just north of cape | —700 | —1,800 | +450 | 0 | +300 | 0 | —1,750 |
| Beach 1/2 mile west of cape | +900 | +2,100 | 0 | —1,200 | —1,200 | —800 | —200 |
| Southward extension of cape point | —2,100 | +3,200 | +900 | —4,100 | —1,100 | +700 | —2,500 |
| Eastward extension of cape point | —700 | —1,200 | —200 | +600 | +1,600 | —2,500 | —2,400 |

# National Park Service

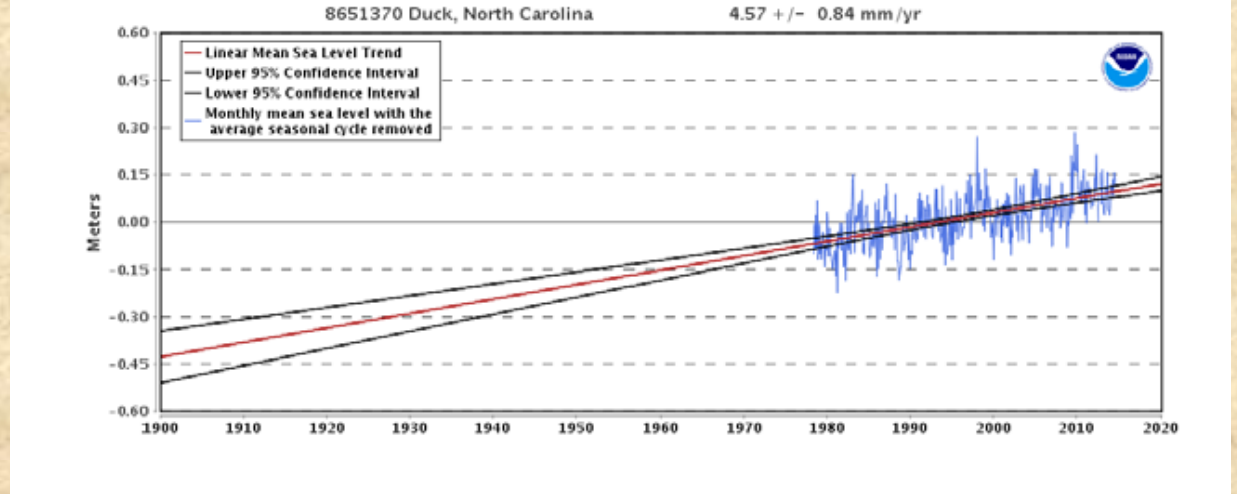
## April 1963


Photograph: NPS Outer Banks Group Museum Resource Center, Manteo, NC
Scan by John Havel July 12, 2012

**Sea level has risen** 3.65 mm/year at Oregon Inlet and 4.57 mm/year at Duck over about 37 years.




https://deq.nc.gov/about/divisions/coastal-management/coastal-resources-commission/sea-level-rise-study-update




Data and figures from: *N.C. Coastal Resources Commission Science Panel. **2015**. Sea Level Rise Assessment Report – 2015 Update to the 2010 report and 2012 addendum.*

# Sea Level is projected to continue to rise.

Table from: *N.C. Coastal Resources Commission Science Panel.* ***2015****. Sea Level Rise Assessment Report – 2015 Update to the 2010 report and 2012 addendum.*

| Station | Tide Gauge Projections | | IPCC RCP 2.6 + VLM | | IPCC RCP 8.5 + VLM | |
|---|---|---|---|---|---|---|
| | RSLR in 30 years (inches) | | RSLR in 30 years (inches) | | RSLR in 30 years (inches) | |
| | Mean | Range | Mean | Range | Mean | Range |
| Duck | 5.4 | 4.4-6.4 | 7.1 | 4.8-9.4 | 8.1 | 5.5-10.6 |
| Oregon Inlet | 4.3 | 2.7-5.9 | 6.3 | 3.9-8.7 | 7.3 | 4.7-9.9 |
| Beaufort | 3.2 | 2.8-3.6 | 6.5 | 4.2-8.7 | 7.5 | 5.0-10.0 |
| Wilmington | 2.4 | 2.0-2.8 | 5.8 | 3.5-8.0 | 6.8 | 4.3-9.3 |
| Southport | 2.4 | 1.9-2.8 | 5.9 | 3.7-8.2 | 6.9 | 4.4-9.4 |
| *Note: Projections were rounded to the nearest tenth of an inch. | | | | | | |

**Goals for our planning process:**

1. Review best available data on **hydrology**, **water quality**, and **elevation**

2. Understand the **constraints** that may affect the viability of certain management actions

3. Develop a **range of alternatives** that would mitigate impacts of flooding on visitor and administrative facilities

4. Develop a **preferred alternative** that can be **supported by our Interagency Team**

# Alternatives to be considered:


- Raising of fa
- Others water management ideas?

# Public Scoping Comments

- Deadline November 4
- Fill out comment sheet here or online
- Planning, Environment and Public Comment website:

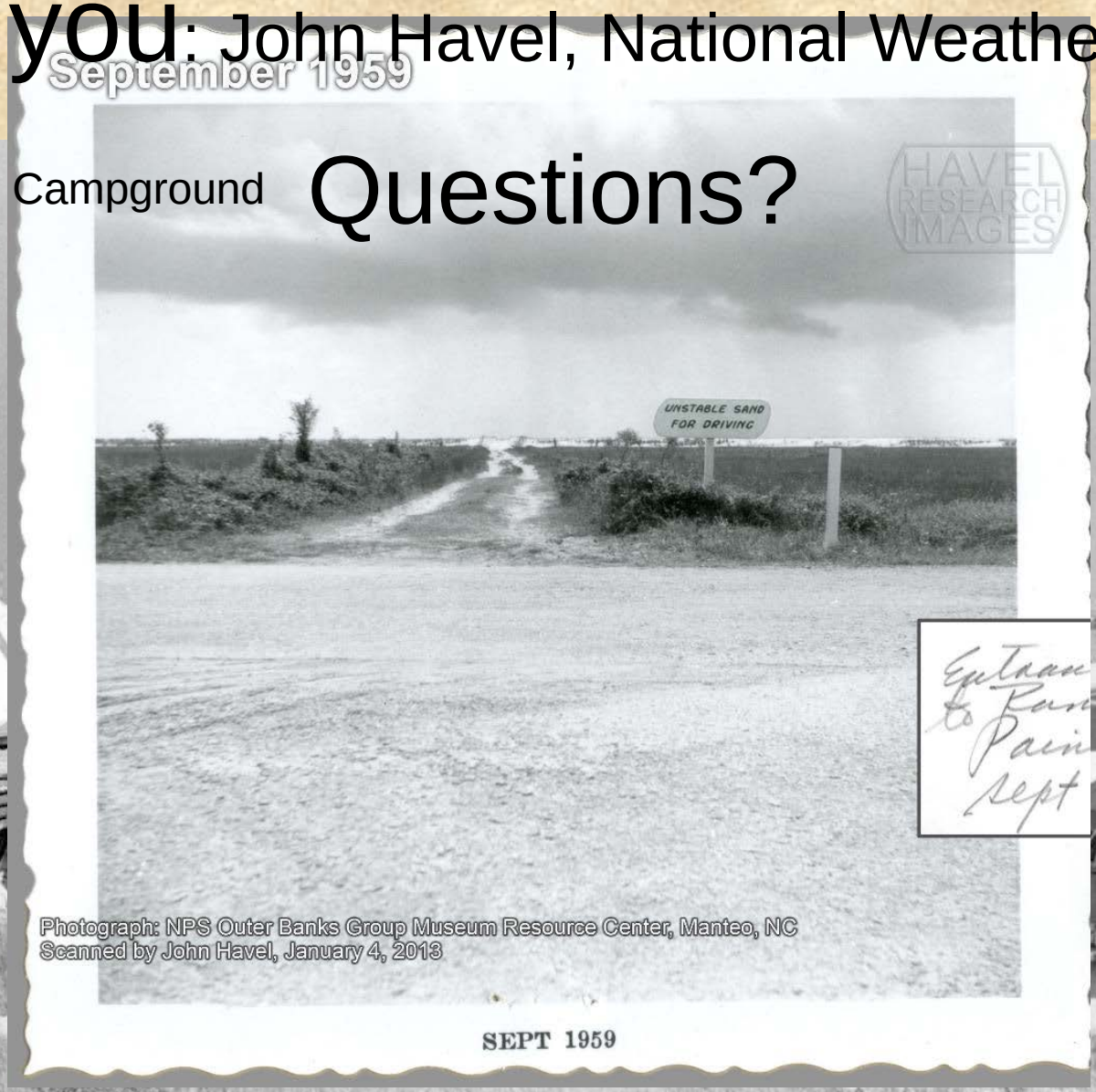
  https://parkplanning.nps.gov/caha_cape_point_flood_mitigation

# Timeline

1. Agency Scoping: **Fall 2016**
2. Public Scoping: **Fall 2016**
3. Data Acquisition: **ongoing**
4. Alternatives Planning: **Winter 2016/2017**
5. Environmental Review Document: **Summer/Fall 2017**
6. Decision Document: **Fall/Winter 2017**

# Thank you: John Havel, National Weather Service

1957 Cape Point Campground




Questions?