Resource Advisor - Final Report
Hurricane Irene Cape Hatteras National Seashore

MEMO TO: Mike Murray Superintendent
Darrell Echols, Deputy Superintendent
Zeph Cunningham, Incident Commander, Incident Management Team

FROM: Tristan Holland, Resource Advisor (READ), EVER
Missy Forder, Resource Advisor (READ), SHEN

Incident Dates: Begin August 23, 2011 - September 10, 2011
Incident Name: Hurricane Irene
Incident Number: NC-CHP-110001
Location: Cape Hatteras National Seashore 35.212 N, 75.531 W
Incident Commander: Zeph Cunningham

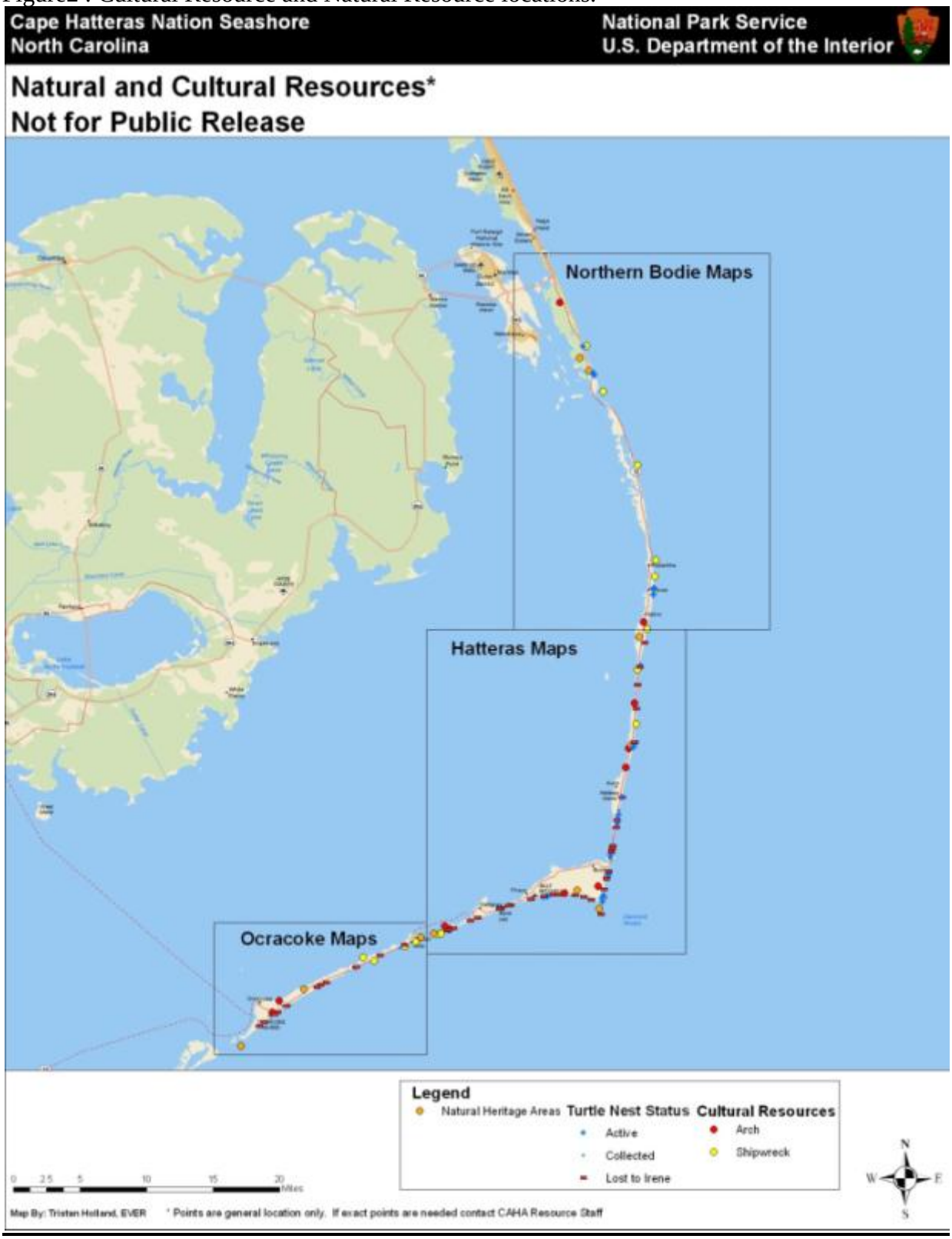
Additional Resource Advisors (READ) assigned to incident
Figure 1

Name	Incident Position	Specialty	Park
Britta Muiznieks	READ	Wildlife Biologist	CAHA
Paul Doshkov	BIOT	Wildlife Technician	CAHA
Mike Piatak	BIOT	Wildlife Technician	CAHA
Will Thompson	THSP	Wildlife Technician	CAHA
Troy Buckel	THSP	Wildlife Technician	CAHA
Jennifer Hale	THSP	Interpretation	CAHA
Sara Strickland	READ	Vegetation Technician	CAHA
Randy Swilling	READ	Natural Resources Manager	CAHA
Doug Stover	CULT	Cultural Resources Manager	CAHA
Christopher Price	READ	Museum Technician	CAHA
James Bailey	THSP	Exhibits Specialist	CAHA
Jocelyn Wright	BIOT	Wildlife Technician	CAHA
Colleen Holland	READ	Resource Advisor	EVER

Issues reviewed by the READs during the incident:

- Turtles – Federally Threatened
- Birds
- Duck Blinds
- Vegetation – Significant Natural Heritage Areas
- Photo-monitoring
- Vegetation – Salt Kill
- Hazard Tree Cutting/Removal
- Structures
- Air Curtain Furnace (ACI)
- Hazardous Materials
- Dune Replenishment
- Debris Removal
- Compliance
- Archeology
- Museum Objects
- Coastal Over Flight
- Historic Structures

Figure2 : Cultural Resource and Natural Resource locations.



Resource maps by district can be found in Appendix A.

Natural Resources Threatened, Damaged or Destroyed

Turtles

The beaches of Cape Hatteras National Seashore support important nesting habitat for the Federally Threatened loggerhead sea turtle *(Caretta caretta)* and the federally threatened Green seaturtle *(Chelonia mydas)*. Previously known turtle nests were inventoried immediately following the storm to assess impact and loss from the storm. The nests along the East facing beaches fared significantly better in terms of total nest loss and damage than the South facing beaches which sustained substantial dune loss and damage. Following the post storm inventory of nests, turtle patrols resumed as normal.

Summary of the federally listed Loggerhead Sea turtle

Figure 2

District	Pre-Storm	Post-Storm
Bodie Hatteras District	12	9
Hatteras District	46	15
Ocracoke	11	0
Totals	**69**	**24**

Of the total 147 nests in 2011, 69 were still in the ground prior to the storm. Prior to the storm's arrival, 18 nests were excavated early thus affecting our emergence success totals for the year. Nests are normally excavated 3 days after the first emergence is observed. Nests within the hatch window (50 days and older) were checked prior to the storm for hatchlings and/or pipped eggs and if either was found the nest was excavated early as hatchlings/pipped eggs cannot survive inundation within the nest cavity.

Of the 69 nests in the ground prior to the storm:

- 20 nests are still active,
- 40 were lost (washed out or dead) ,
- 4 were impacted (combination of successful hatch/dead hatchlings or sand deposition w/live hatchlings documented during nest check),
- 3 normal hatches during/post-storm
- 2 dead or infertile (loss not storm related)

Numbers lost to Hurricane Irene are expected to increase as more nests are excavated. This number may be confounded by the abnormally high tides we are currently having as a result of Hurricane Katia. It will be difficult to attribute the loss of a nest to either Hurricane Irene (8/26-8/28) or Hurricane Katia (9/7-9/8) or both after this second storm event. New false crawls or nests have not been documented since the storm. The last nest in 2010 was found on 9/6/2010 north of Ramp 27. If no more nests are found, the last nest for 2011 was found on 8/21/2011 south of Ramp 38.
(See Appendix A for approximate nest locations).

Other Damage

There was some vehicular damage to a turtle closure at Ramp 49 that partially hatched out. The nest was in the process of hatching and approximately 20 hatchlings have survived. The tire tracks were raked out (no dead hatchlings found) and the closure was repaired. There also was nest vandalism in the Buxton Village area with PVC being moved during the incident.

More detailed information can be obtained by contacting Britta Muiznieks, Wildlife Biologist.

Loggerhead and Green Seaturtle hatchlings

Least Tern chicks near Ramp 1

Birds

The Hatteras area is inhabited by thousands of birds each year utilizing the tidal ponds, dunes and shorelines for food, forage and resting. The Federally Threatened piping plover (*Charadrius melodus*) nests on low dunes and sand flats from Cape Hatteras Point to Ocracoke Inlet. The gull-billed tern *(Gelochelidon nilotica)* is State Threatened. The North Carolina species of concern, American oystercatcher *(Haematopus palliates),* common tern *(Sterna hirundo),* least tern *(Sternula antillarum),* and black skimmer *(Rynchops niger)* also nest throughout the area. Most shorebirds were done with their nesting cycle and therefore not directly impacted by the storm.

Hatteras

Following the storm, 1 surviving Least Tern chick was located at Ramp 27 following the storm. The ramp was closed 1/10 mile to the north and south. On September 3, 2011 the ramp was re-opened due to the tern chick not being seen a few days prior. Numerous Oystercatchers and other shore birds have been seen in Hatteras District.

Oystercatchers

Ocracoke

The lead wildlife technician has stated that the birds of Ocracoke appear to be thriving. Numerous bird species have been seen throughout the island including red knots, sanderlings, royal terns, least terns, common terns, goldbills, oystercatchers and gulls.

Bodie Island - Duck Blinds

Figure 3: Duck blind storm survival

Pre-storm	Intact	Destroyed	Partially Intact
20	7	12	1

Following hurricane Irene attempts were made to locate twenty duck blinds in the Bodie Island district. Twelve of the blinds were completely swept away in the storm, one blind was found partially intact and seven were located intact.

Intact duck blind

Vegetation

North Carolina Natural Heritage Areas

There are several historic rare species occurrences of the Federally Threatened seabeach amaranth (*Amaranthus pumilus*) found throughout the hurricane area. Other significant rare species include dune bluecurls (*Trichostema* spp.1), beaked spikerush (*Eleocharis rostellata*), and Illinois pondweed (*Potamogeton illinoiensis*).

Bodie Island Natural Heritage Areas

Rare Species of Concern

Figure 4

Common Name	Scientific name	Significance
Beaked spikerush	*Eleocharis rostellata*	NC Significantly rare
Marsh spikerush	*Eleocharis halophila*	NC Significantly rare
Sand heather	*Hudsonia tomentosa*	NC Significantly rare
Maritime pinweed	*Lechea maritima var. virginica*	NC Significantly rare
Olney's Threesquare	*Schoenoplectus americanus*	NC NHP watchlist

Non Native Species of Concern

Figure 5

Common Name	Scientific name	Significance
Common Reed	*Phragmites australis*	Exotic

Marshes on Bodie Island

Bodie Island Lighthouse Ponds, Marshes and Dunes

Observations: These areas have sustained salt water inundation and most plant matter is salt burned. There was no visible *Eleocharis* sp. observed. Populations of *Hudsonia tomentosa* and *Lechea maritime var. virginica* in open dunes remain intact.

Overall Recommendations: Considering installing salinity stations to monitor how fast the salinity drops back. These were designated significant due to the unique freshwater ponds.

Bodie Island Lighthouse Pond

Observations: Saltwater inundation has resulted in the majority of plant matter being salt burned including large populations of *Phragmites australis* (~40 – 50 acres). There was no visible beaked *Eleocharis* spp. observed at the site however, water level was still very high at the time of the site visit.

Overall Recommendations: The Communities Ecologist (Mike Schafale) from the North Carolina Natural Heritage Program was consulted and stated that the plants will likely bounce back from the storm. In his opinion, the main concern would be a change in land mass and land form habitat. Bodie Island sustained limited changes in land mass and should be revisited in a few months to survey for rare plant presence and condition. The density and extent of *Phragmites* should likewise be monitored for spread into un-infested sensitive areas.

Trichostema near Billy Mitchell Airstrip

Hatteras Natural Heritage Areas

Rare Species of Concern

Figure 6

Common Name	Scientific name	Significance
Seabeach amaranth	*Amaranthus pumilus*	Federally Threatened
Dune bluecurls	*Trichostema* sp. 1	Federal species of concern and Significantly Rare in NC
Nerved witch grass	*Dichanthelium aciculare ssp. neuranthum*	NC Significantly Rare
Beaked spikerush	*Eleocharis rostellata*	NC Significantly rare
Saltwater false-willow	*Baccharis angustifolia*	NC NHP watchlist
Pondweed	*Potamogeton illinoensis*	NC Significantly rare
Winged seedbox	*Ludwigia alata*	NC Significantly rare
Carolina grasswort	*Lilaeopsis carolinesis*	NC Significantly rare
Yucca	*Yucca gloriosa*	NC Significantly rare

Blue witchgrass	*Dichanthelium caerulescens*	NC Significantly rare
Shortleaf basketgrass	*Oplismenus hirtellus ssp. hirtellus*	NC Significantly rare
Four angled flatsedge	*Cyperus tetragonus*	NC Significantly rare
Florida adder's mouth	*Malaxis spicata*	NC Significantly rare

Non Native Species of Concern

Figure 7

Common Name	Scientific name	Significance
Common Reed	*Phragmites australis*	Exotic
Beach Vitex	*Vitex rotundifolia*	Exotic
Chinese silver grass	*Miscanthus sinensis*	Exotic
Watermilfoils	*Myriophyllum spp.*	Exotic (not confirmed)

Turtle Pond and (Cape Hatteras) Lighthouse Pond

Overall Observations: The overall condition of the pond indicated that it was slightly above the normal stage of water at this time of year. Very little damage was observed to trees surrounding the pond with minor salt water intrusion. The site was surveyed for pondweed (*Potamognton illinoensis)*. No full plants were identified however, green leaves were observed floating in the pond. A new site record for the NC significantly rare *Yucca gloriosa* plants was recorded during this site visit. Additionally, one small clump of the exotic native Chinese silvergrass (*Miscanthus sinensis)* was recorded. An aquatic plant resembling the non-native, invasive Parrot-feather (*Myriophyllum brasiliense)* was also present.

Overall Recommendations: The area should continue to be monitored for the invasion of the non-native Chinese silvergrass. The small patch located should be treated and the possible sighting of the *Myriophyllum brasiliense* should be confirmed and monitored.

Buxton Woods

Overall Observations: The area was surveyed for pondweed (*Potamogeton illinoensis)*. At a recent site visit this plant was located however, the pond was lower at the time of the visit. The east end of the trail sustained more wind and salt damage to all species of trees however this did not warrant concern on part of resource specialists.

Pond in Buxton Woods

Overall Recommendations: The area should be monitored for the invasion of the non-native *Phragmites* and beach vitex.

Cape Hatteras Point

Overall Observations: This site was not surveyed**.**

Overall Recommendations: The area should be monitored using aerial photos. Also, this area should be monitored for *Phragmites* and *Vitex*. This is a historic *Amaranthus* site and should be monitored to possible new plants.

Hatteras Sand Flats

Overall Observations: This site underwent the most change as the result of hurricane Irene. Previously, the area had a significant dune component with heavy vegetation cover. Following the storm, many of the dune areas have been over washed by sand. Threatened species (*Trichostema spp.),* previously abundant in the dunes, has been buried by overwash. Significant salt burn was seen making some vegetation unrecognizable. Many pictures were taken at this location. Upon evaluation of aerial photos, it appears a significant portion of the landmass on the western tip was removed during the storm.

Overwash on Hatteras Sand Flats

Overall Recommendations: The extent of the changes to the landscape will be best quantified through aerial photography. This area should be monitored for use by shorebirds for nesting and foraging. While there were many changes to the dunes in this area, there are still many dunes left allowing for potential habitat for the plant species of concern. The area should be monitored for the invasion of the non-native beach vitex. *Trichostema* should be monitored for recovery from overwash. This is also a historic amaranth site and should be surveyed next year.

Ocracoke Island Natural Heritage Areas

Rare Species of Concern

Figure 8

Common Name	Scientific name	Significance
Seabeach amaranth	*Amaranthus pumilus*	Federally Threatened
Dune bluecurls	*Trichostema* sp. 1	Federal species of concern and Significantly Rare in NC
Fragrant beaksedge	*Rhynchospora odorata*	Special Concern vulnerable
Seashore crown grass	*Paspalum vaginatum*	NC Significantly Rare
Nerved witch grass	*Dichanthelium aciculare ssp. neuranthum*	Special Concern vulnerable
Blue witchgrass	*Dichanthelium caerulescens*	NC Significantly rare
Gulfcoast spikersuh	*Eleocharis cellulosa*	NC Significantly rare
Beaked spikerush	*Eleocharis rostellata*	NC Significantly rare
Savanna nutrush	*Sceleria verticillata*	NC Significantly rare
Seashore crown grass	*Paspalum vaginatum*	NC Significantly rare
Sand spikerush	*Eleocharis montevidensis*	NC Significantly rare
Winged seedbox	*Ludwigia alata*	NC Significantly rare
Yucca	*Yucca gloriosa*	NC Significantly rare

Non Native Species of Concern

Figure 9

Common Name	Scientific name	Significance
Common Reed	*Phragmites australis*	Exotic
Beach Vitex	*Vitex rotundifolia*	Exotic
Chinese silver grass	*Miscanthus sinensis*	Exotic

Eastern End

Overall Observations:

There was minimal impact to the dunes on the Eastern end of the island. The vegetation on Ocracoke is shorter and appears to have a higher ratio of cedar/shrub than the other islands. The cedar seems to have limited impacts from the salt intrusion, while many of the broadleaf shrubs show signs of browning. There was a significant amount of hazardous trash that washed up on the eastern shore, this information was passed to the incident management team, who was checking to make sure the Coast Guard knew of the area.

Overall Recommendations: The area of trash should be monitored for clean-up. The area should be monitored for the invasion of the non-native Phragmites and beach vitex. Also, this is a historic amaranth site and should be surveyed next year.

Central Section

Overall Observations: The only area significantly impacted in the central portion of the island was the overwash where the dune replenishment was completed by the NCDOT. There are still several vegetated dunes intermixed with the repaired dunes. On September 8th, the surge from Katia overwashed the road a second time. Currently the extent of the flooding and washout is unknown, as is the proposed clean-up plan. Ramp 67, a previously known site for *Trichostema spp.1*, was resurveyed and several plants were found alive, but buried in the sand.

The back of the dunes on Ramp 67, where the Trichostema is located.

Overall Recommendations: Monitor the new dunes for re-vegetation. The area should be monitored for the invasion of the non-native Phragmites and beach vitex.

Western End (Sand Flats)

Overall Observations: Some sand overwash occurred in the dunes, but not a significant amount. The vegetation appears to have been minimally impacted. Aerial imagry suggests that there were significant changes to the western tip of the island; however, it does not appear to be as dramatic as on Hatteras.

Overall Recommendations: Complete aerial photo comparisons to measure exact changes to the sand flats. The area should be monitored for the invasion of the non-native Phragmites and beach vitex.

Beach on Western tip of Ocracoke Island

Photo-monitoring of Cape Hatteras National Seashore
The Resource Advisors on the Irene Incident requested the locations any past photo monitoring projects on the Islands. The resource staff did not know of any. These photos could have been retaken and used for evaluating damages. The Natural Resource staff at the Seashore is now planning on installing photo-monitoring locations across the islands. These points will be used to monitor recovery from Hurricane Irene, as comparisons for future large scale events, and for numerous other potential projects in the future. The Resource Advisors are providing several examples of photo-monitoring protocols for the Cape Hatteras Resource Staff.

Vegetation – Salt Kill
For vegetation and hazardous fuel analyses see Appendix C.

Hazard Tree Cutting/Removal
Hazardous tree cutting was evaluated and from resources stand point did not pose a significant concern. However, brush piles and woodchips will contribute to an increase in fuel loading and could pose an increased threat to catastrophic fire particularly in the Wildland Urban Interface.

Structures
All structures were inspected by the Southeast Region Facility Management Incident Response Team and deficiency work orders were generated for those with damage.


Pea Island NWR building damaged by Hurricane Irene

Air Curtain Furnace (ACI)
On September 2, 2011 Dare County submitted an application to use an Air Curtain Furnace (ACI) to incinerate storm debris on Hatteras Island. The proposal was to set up the furnace in the center of the Salvo Day Use Area to incinerate debris that had been collected on the island. Only vegetation and chemical free dry lumber will be burned in the ACI. This was previously done during the 2003 hurricane. Air quality and solid waste permits have been obtained from North Carolina Department of Natural Resources. The day use area will be closed to visitors for safety reason, while the operations are going. The ACI will only be operated during daylight hours and if eye level winds are less than 25mph. Concrete and non-organic debris will be staged at the site, before it is hauled off to disposal. Ash will be mixed with sand and removed from the site.


Air Curtain Furnace

When the operation is complete, the site will be scraped and seeded with a natural vegetation mix prescribed by the CAHA resource staff.

Hazardous Materials

On September 3, 2011 a low level reconnaissance was conducted by helicopter on the sound side from Bodie Island to Avon. Only normal storm debris was noted during this search. Hazardous material was found on the North (East) tip of Ocracoke on the East-Northeast side of the ferry port. Items found included propane tanks, appliances, paint, aerosol cans and miscellaneous trash. The Coast Guard will be contacted to handle the disposal of these items.

Floating trash collecting on the Eastern tip of Ocracoke Island

Dune Replenishment

Dune replenishment was surveyed on the Northern (Eastern) portion of Ocracoke island. There was about 2 miles of road that was washed over with sand during the storm. The sand was placed back in the dunes along the south side of the road. Also, sand from the ferry dredge spoil area would be used if more sand was needed. These dunes match the height of the original dunes that survived the storm (based on comparing the new un-vegetated dunes with the vegetated dunes that were intermixed). The beach is very narrow in this stretch. In the overwash area, the vegetation on the north side of the road showed the most extensive salt burn on the island, as would be expected. For the most part the vegetation on the island showed less salt burn than the other islands, but this may be a reflection of the smaller percentage of broadleaf shrubs.

Dune replenishment, Ocracoke

Debris Removal

Maintenance crews removed vegetation and debris from the shoulders along the NPS section of NC12 south of the Whalebone Junction. Trash and non-organic debris was placed in dumpsters

while organic debris was dried and mulched. Road shoulder areas free from non-organic debris were mowed. Concerns were expressed by Corey Smith (CAHA Fire Management) regarding the added fuel loading along the shoulders. Debris may also affect the drainage function of ditches and wetlands if too much debris is placed in one area. After considering these concerns, the management option chosen was the best option to mitigate cost and time limitations.

Compliance

Compliance for FMSS and PMIS project statements entered by the Incident Management Team will be handled by Cape Hatteras staff. Doug Stover will address Section 106 compliance and Randy Swilling will administer NEPA and PEPC.

Coastal Overview

A coastal overview flight was conducted 9/9/11 with Rebecca Beavers (NPS Coastal Geology and Adaptation Coordinator). Rebecca will be completing a report and will pass the information on to CAHA when it is complete. She noted that the new island created in Oregon Inlet will provide for great bird nesting and foraging habitat.

Cultural Resource Report

Prepared by Doug Stover, Cultural Resource Specialist

Date: 9/5/11

(See Appendix B for approximate Archeological and Cultural locations)

The cultural resource specialist worked with SHPO in order to address Section 106 compliance needs.

Archeology

There are 32 (CAHA), 17 (FORA), 1 (WRBR), with a total of 70 recorded archeological sites located within the Outer Banks Group. Fourteen (14) of these sites are prehistoric Woodland or have Woodland components. Nineteen (19) are historic (18th, 19th, 20th century or historic shipwrecks). Twenty-five (25) archeological structures, one (1) site is Archaic.

Hatteras Island Salvo Cemetery

CAHA Cultural Resource staff reviewed the three Gray Cemetery sites, including the prehistoric site that received sound side flooding. The sites are reported as stable. The road to the sites need major repairs, the FMSS assessment team provided a cost estimate for these repairs. There was no damage to the stones, or erosion of the site

Submerged Cultural Resources: There are 63 shipwrecks within the park bounties that have been recorded and tagged with the NC Underwater Archeology Unit. Two shipwrecks were exposed:

<u>The Laura A. Barnes Shipwreck</u>
The ship was driven aground during high seas in 1921. This shipwreck was exposed and disturbed when the storm surge from Hurricane Irene washed away the protective sand dune that formed over the remains of the vessel. No historic artifacts were found associated with the remains of the ship's hull.

Laura A. Barnes Shipwreck

Action taken:

- Stabilize the timbers by leaving in situ and placing sand fence to allow sand to cover the shipwreck.
- Document the timbers with photography, drawings and detailed mapping of remaining ship fabric, Conduct a condition assessment into AMIS.

Hurricane Isabel Wreck (Spanish 1800's)
This shipwreck was exposed and disturbed when the storm surge from Hurricane Irene washed away the protective sand dune that formed over the remains of the vessel. No historic artifacts were found associated with the remains of the ship's hull. Some if the ship's timbers were displace 30 to 40 yards to the North by the storm surge. Historic artifacts are stable and the ship is being covered naturally with sand.

Action taken:

- Pickup ship's timbers displace 30 to 40 yards away; timbers will be place on the dune sound side next to the shipwreck.
- Document the timbers with photography, drawings and detailed mapping of remaining ship fabric, Conduct a condition assessment into AMIS.

Museum Objects
There are 147,079 (CAHA), 41,615 (FORA), 52,597 (WRBR), museum objects cataloged.

There was no damage to the Museum Storage faculty at Fort Raleigh NHS. The Wright Brothers Plane was covered with no damage. Two civil war musket balls were recovered from Pear Pad Beach.

Hatteras Keepers Quarters exhibits with artifacts on display were removed and stored on the second floor, receiving no damage from the storm.

Items that were on loan to the Historic Chicamacomico Life Saving Station, a private museum in Rodanthe, are stable. However, the building sustained major flooding from water and sewage. The CAHA engineer determined that the building was unsafe to enter. When the structure is declared safe, by the Dare County Building Inspector, the loaned items will be brought back to Fort Raleigh for storage.

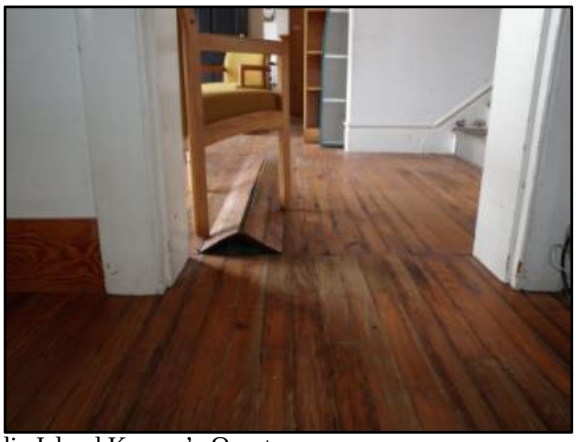
Historic Structures
There are 36 (CAHA), 5 (FORA), 5 (WRBR) with a total of 44 historic structures on the List of Classified Structures. Two sites are listed as National Historic Landmarks (WRBR-Visitor Center and CAHA-CHLH).

Cultural resources worked with the FMSS Assessment team and the Historic Preservation Specialist to perform historic structure assessments.

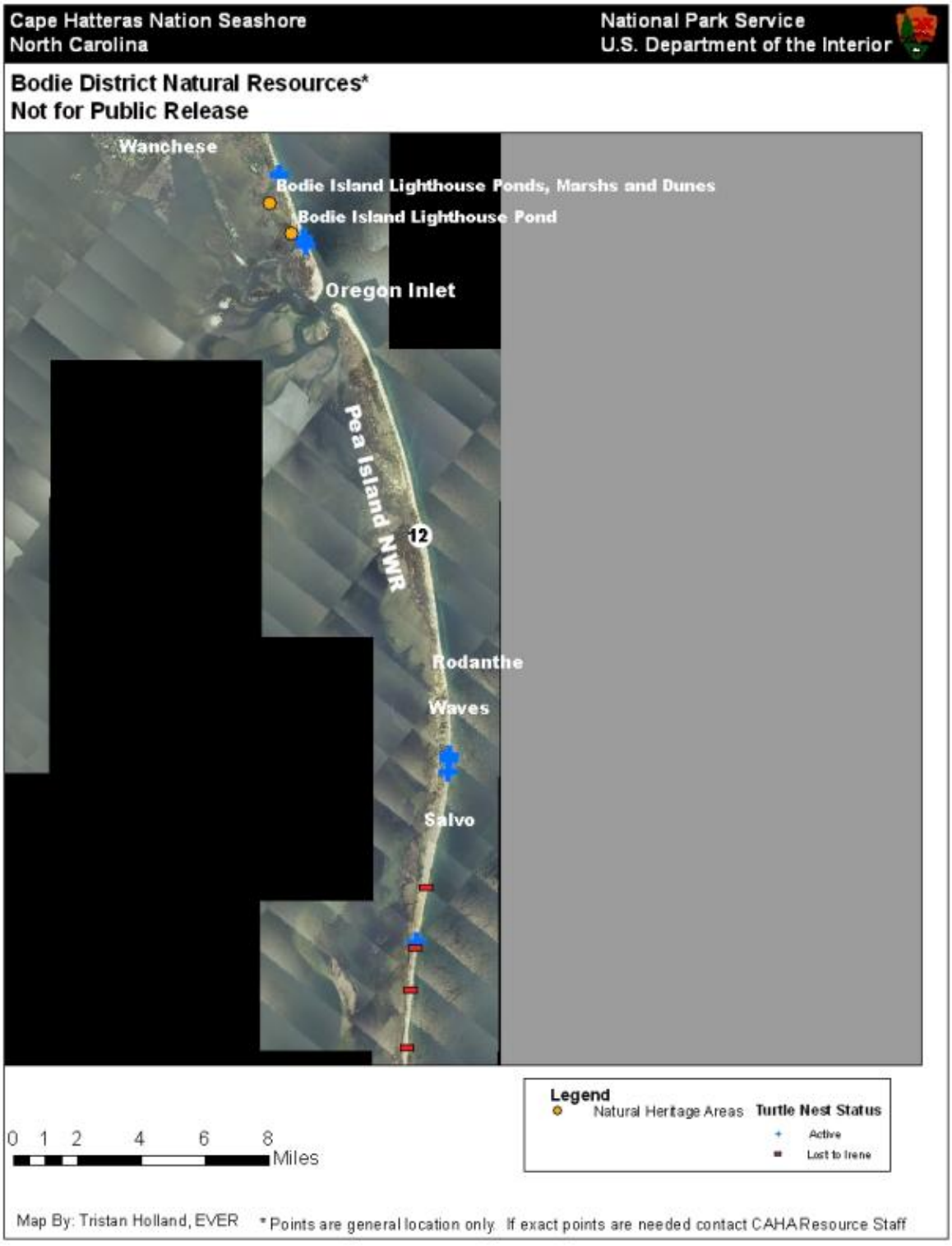
Areas needing attention:

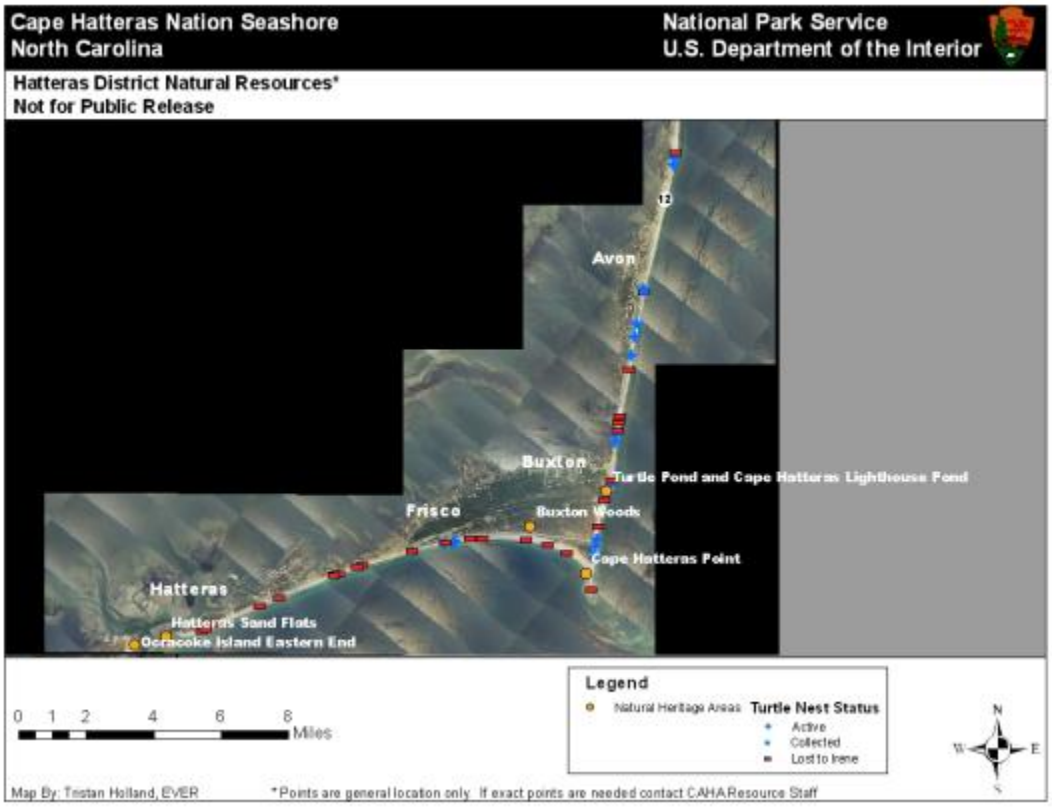
- Hatteras Double Keepers Quarters and Principle Keepers Quarter roof structure was entered into FMSS Damage Assessment

- Bodie Island Double Keepers Quarters floor damage was assessed entered into FMSS Damage Assessment


Bodie Island Keeper's Quarters

Appendix A - Natural Resources Maps by District




Cape Hatteras Nation Seashore
North Carolina
National Park Service
U.S. Department of the Interior
Hatteras District Natural Resources*
Not for Public Release
Avon
Buxton
Turtle Pond and Cape Hatteras Lighthouse Pond
Frisco
Buxton Woods
Cape Hatteras Point
Hatteras
Hatteras Sand Flats
Ocracoke Island Eastern End
0 1 2 4 6 8 Miles
Legend
Natural Heritage Areas
Turtle Nest Status
Active
Collected
Lost to Irene
N
W
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Map By: Tristan Holland, EVER
*Points are general location only. If exact points are needed contact CAHA Resource Staff


Cape Hatteras Nation Seashore
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Hatteras Sand Flats
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Ocracoke Island Central Section
Ocracoke
Ocracoke Island Western End
0 0.5 1 2 3 4 Miles
Legend
Natural Heritage Areas
Turtle Nest Status
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Map By: Tristan Holland, EVER
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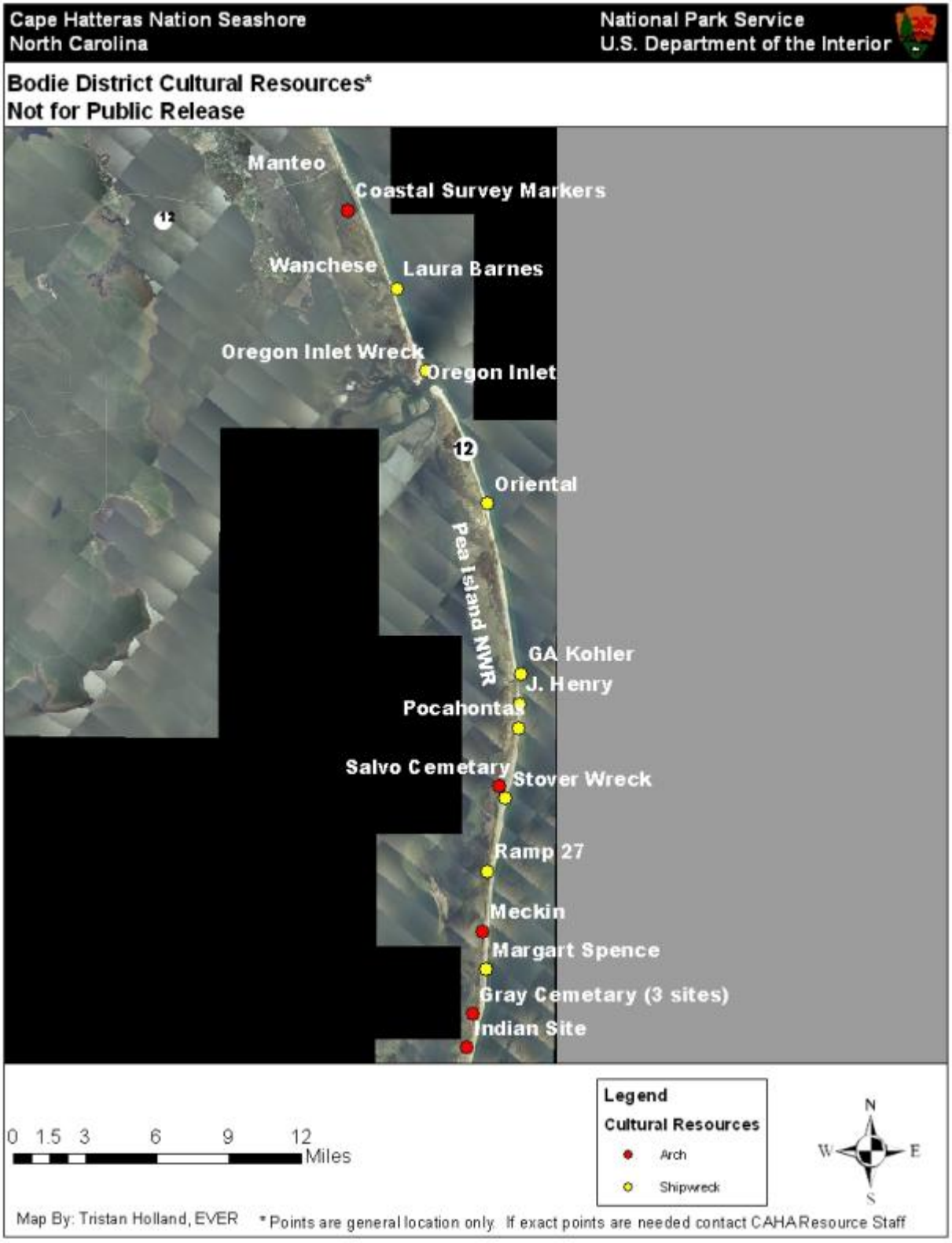
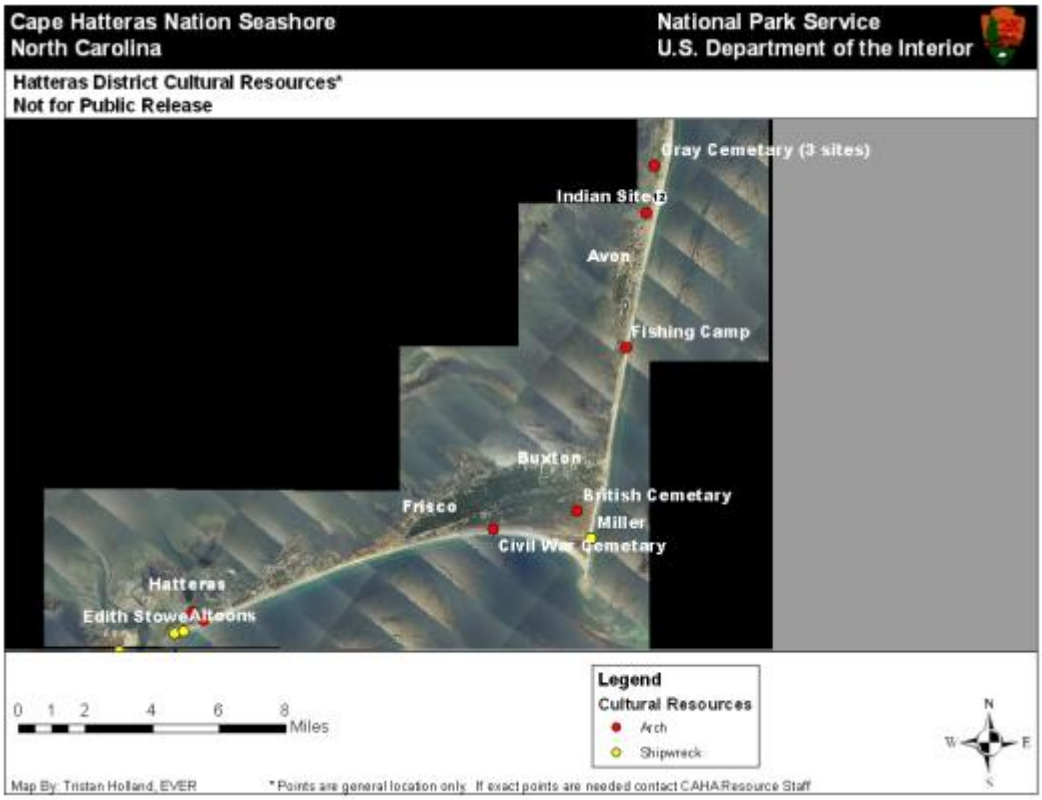
Appendix B – Cultural Resources by District




Cape Hatteras Nation Seashore
North Carolina
National Park Service
U.S. Department of the Interior
Hatteras District Cultural Resources*
Not for Public Release
Gray Cemetary (3 sites)
Indian Site
Avon
Fishing Camp
Buxton
British Cemetary
Frisco
Miller
Civil War Cemetary
Hatteras
Edith Stowe
Altoons
0 1 2 4 6 8 Miles
Legend
Cultural Resources
Arch
Shipwreck
N
W
E
S
Map By: Tristan Holland, EVER
* Points are general location only. If exact points are needed contact CAHA Resource Staff


Cape Hatteras Nation Seashore
North Carolina
National Park Service
U.S. Department of the Interior
Ocracoke District Cultural Resources*
Not for Public Release
Edith Stowe
Altoons
Thompson
Pony Wreck
Deak Rail Site
Loop Shack
Ocracoke
Navy Base from WW II
0 0.5 1 2 3 4 Miles
Legend
Cultural Resources
Arch
Shipwreck
N
W
E
S
Map By: Tristan Holland, EVER
* Points are general location only. If exact points are needed contact CAHA Resource Staff

Appendix C: Hazard Fuel Report
Post Hurricane Irene Hazard Fuel Assessment- Nags Head WUI area
09/08/2011
Alex Scronce and Colleen Holland

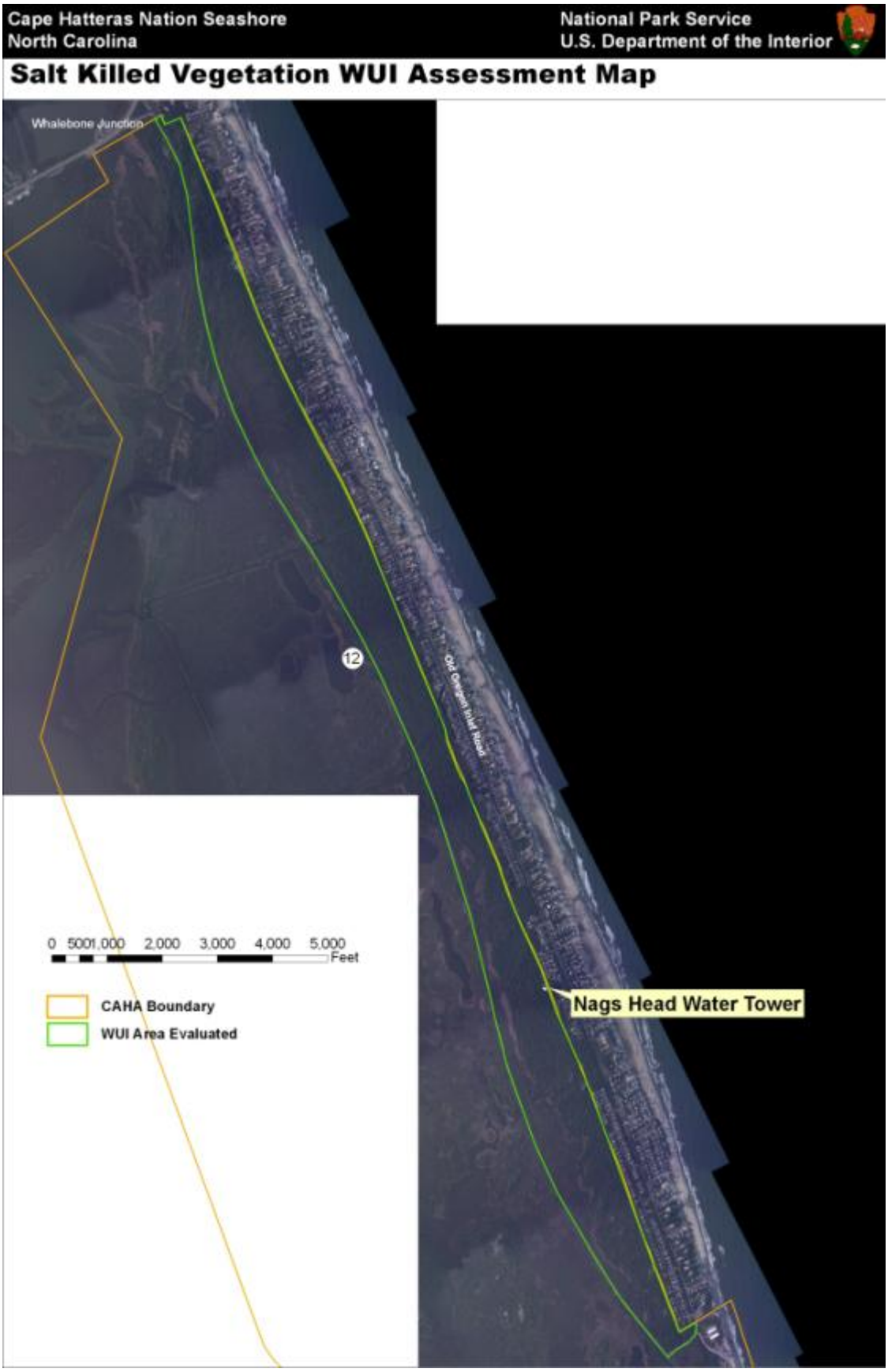
The Nags Head WUI tract was evaluated for hazardous fuel conditions caused by Hurricane Irene. Hurricane Irene came with a significant sound side storm surge strong enough to carry dead grass material and miscellaneous garbage across Highway 12 into the area of concern. With the influx of fuel from the surge, the salt inundation caused significant browning of the shrubby vegetation and cured most of the grasses in the unit. This unit runs the length of Cape Hatteras National Seashore's boundary with the Village of Nag's head to the East (Figure 1). There is a large powerline that separates the village from the Seashore. The power company maintains a large mowed area under this line, creating a large (approximately 50 ft) break between a majority of the fuels and the houses. The Seashore is working with Dominion power company to enlarge this fuel break in the coming years.

Fuel conditions vary across the unit. The north end consists of a pine forest with either an oak, shrub or pine regeneration understory. The shrub and pine regeneration understories will be much more receptive to fire, and are at a higher fuel loading than the oak understory. The rest of the unit is a mix of shrub and grass fuel types (fuel types 2 and 4). The shrubs consist of *Myrica cerifera* (wax myrtle), *Persea palustris* (swamp bay), *Lingustrum spp.* (privet), *Quercus spp.* (oak). The oaks and privet are fairly resistant to fire under most conditions, but the wax myrtle and swamp bay will burn even when they are green. An estimated 25% of the shrub vegetation has been browned by the salt intrusion, with the bays reflecting the greatest salt damage. There is a grass understory beneath many of the shrub areas, facilitating fire spread. The grass areas are comprised of various marsh grasses and have been severely impacted by the salt intrusion. There are also several prairies with significant shrub encroachment, a potential resource management concern.

The Park Service boundary follows the powerline; however, there is a significant amount of fuel build up in the vacant lots and undeveloped land just outside the boundary. The shrubs are generally 10-15 feet tall, and continuous through the lots. Many of the houses in Nags head have limited defensible space and are constructed out of fire prone building materials (wooden porches, roofs and sidings, exposed wooden supports). This adds to the concern of wildfire impact on the Nags Head community.

Management Suggestions:
There are several canals throughout the unit, but none connect the East and West ends of the unit. Additional fuel breaks should be installed off the canals to dissect the unit. These breaks will provide more options for managing wildfires, without having to impact the entire four miles of houses. Future prescribed burns are also recommended to reduce fuel loading, allowing easier control of potential wildfires.

Figure 1: Map of assessed area.



Cured grass marsh, taken from Hwy 12.

Dense shrubs, east of power line at south end of unit, only Park Service property east of the power lines in this unit.

Dense shrub cover on Nags Head side of power line break

Clean fire break under power lines. This break should be maintained to be free of shrubs with short grass.

Shrub fuel loading on Park Service property, just west of the power line break.