

# HUMAN IMPACTS TO SENSITIVE NATURAL RESOURCES ON THE ATLANTIC BARRIER ISLANDS ON THE EASTERN SHORE OF VIRGINIA

## 2004 REPORT



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Cover photo: Visitors on Metompkin Island, R. Ayers 2001

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## Introduction

Land managers responsible for the protection of the Atlantic barrier islands on the Eastern Shore of Virginia have been concerned about the effects of human activity on the sensitive natural resources of the islands for many years. Although most of the discussion has been focused around colonial and solitary beach nesting birds, impacts to other fauna and flora have also been of concern. To address these concerns, the Virginia Eastern Shorekeeper Program received funding from the Virginia Coastal Program to conduct on-the-water monitoring to investigate, assess and document harmful human activity along the Atlantic coastal bays of the Virginia Eastern Shore.

### **OBJECTIVE: Document human impacts to sensitive marine resources.**

Product #2; "The Shorekeeper will conduct on-site monitoring to provide protection for oyster reef sanctuaries, planted and restored eelgrass beds, nesting shorebirds and colonial nesting bird colonies. The Shorekeeper will maintain a close working relationship with the Virginia Marine Resources Commission and all other Seaside Heritage Program partners. As volunteer Creek Watchers are trained, they will provide periodic monitoring of their assigned area. When observations indicate an imminent impact to the coastal resources, the Creek Watchers will report the activity to the appropriate federal, state or local agency. Potential impacts reported by the Creek Watchers, individual citizens or the Shorekeeper would be investigated and documented by the Shorekeeper. The Shorekeeper will convey public education information to citizens whose activities are not in violation of existing laws, but may pose a threat to coastal waters. Activities resulting in infractions of existing laws will be referred to the appropriate agency, with follow-up monitoring by the Shorekeeper. A report documenting specific human impacts, including scale of impacts and suggested strategies to offset any documented impacts will be provided."

**HUMAN HISTORY:** Historically the Virginia barrier islands have had modest spikes of human settlement. Since the first arrivals of European settlers, the islands have been primarily used for animal grazing, waterfowl hunting and supporting the once abundant seafood industry on the Eastern Shore. Most notable was the town of Broadwater, located on the southern end of Hog Island. Settled shortly after the Revolutionary War, the population of the town grew to around 250. In the early 1900's, severe storms and coastal erosion began to force the residents to move inland. Hunting lodges, U.S. Lifesaving Stations and lighthouses were also scattered throughout the islands. Small caretaker houses, used to maintain seasonal lodges and oversee livestock herds, and watch houses, primarily used by waterman to watch over their oyster and scallop grounds, were abundant. A series of storms in the 1930's, as well as changes in the coastal fisheries along with improved powerboats, caused most remaining island inhabitants to leave the islands permanently. The only remaining inhabited structures were U.S. Coast Guard Stations, watch houses and a few hunting lodges. In the early 1960's, developers produced plans to develop several of the islands. The plans included elaborate bridges, airports and marinas. Before these projects could be



Figure 1. Cottages on Cedar Island south in August 2004.

implemented, however, The Nature Conservancy (TNC), and state and federal agencies were able to purchase and protect most of the barrier islands. The exception was Cedar Island, which was platted for several hundred residential lots. Although in the late 1980's the island supported nearly forty seasonal cottages, the project never fully succeeded due to erosion and natural island migration processes. Today, the island continues to be breached by storms and an inlet divides the island in two. Only thirteen cottages remain, five of which are abandoned (Figure 1).

**OWNERSHIP:** Within the survey area of Gargathy Inlet south to the mouth of the Chesapeake Bay, the islands are primarily in protective ownership. The Nature Conservancy owns all of Parramore Island, Revel Island, Little Cobb Island, Ship Shoal Island, Myrtle Island and Smith Island. The Nature Conservancy also owns the southern

two thirds of Metompkin Island, and most of Hog Island and Cobb's Island. The US Fish & Wildlife Service (USF&WS) owns the north third of Metompkin Island and manages it through the Chincoteague National Wildlife Refuge (NWR). Fisherman Island National Wildlife Refuge is owned by USF&WS, but has a significant road right of way for a four lane highway connection from the Eastern Shore to the Chesapeake Bay Bridge Tunnel. Wreck Island Natural Area Preserve (NAP) is owned by the Virginia Department of Conservation and Recreation, Division of National Heritage (DCR/DNH). Large private in-holdings still remain on Cedar Island(s). Some parcels on the island have been purchased by or donated to the USF&WS and TNC. Other smaller in-holdings remain on Hog Island and Cobb's Island. In addition, several interior marsh islands are in protective ownership and the Virginia Marine Resources Commission (VMRC) owns most of the tidal salt marsh.

## METHODS

The scale of the patrol area was the major consideration in developing survey methods. With approximately 50 miles of Atlantic coastal beaches along the barrier islands, over 500 miles of tidal shoreline along the mainland and thousands of acres of island upland and tidal marsh, plus the variability of weather and tides, no systematic sampling method was considered feasible. Random samplings, augmented by targeted patrols during known seasonal activities, were selected. Anecdotal information derived from Seaside Heritage partners and local contacts reinforced these methods. In addition, as a condition of the grant, all monitoring activities were conducted from the water or public land. No privately owned land was accessed and persons on privately owned land were not approached. This limited most of the public education but did not adversely affect any field observations.

A survey area from Gargathy Inlet at the north end of Metompkin Island south to the Chesapeake Bay was selected. The area from Gargathy Inlet north is primarily managed and patrolled by USF&WS personnel from the Chincoteague Island NWR. Because Assateague, Wallops and Assawoman Islands are all accessible by vehicle and patrolled by the USF&WS, boat surveys were deemed unnecessary. Fisherman Island NWR was included in the survey area.

The primary method of observation was frequent and random on-the-water patrols. The Virginia Eastern Shorekeeper operates a 22-foot *BayRider* skiff with a 115 HP outboard. This flat bottom boat can operate comfortably in 18 inches of water and in the nearshore waters of the Atlantic Ocean. In addition, the Shorekeeper took advantage of other Seaside Heritage partners, local waterman and private boaters to access broad areas along the seaside. For remote access, kayaks were transported in the *Shorekeeper* boat and launched to access even more remote island areas. Between October 2003 and September 2004, over 500 hours of on-the-water observations were logged by the Shorekeeper and volunteers (Figure 2).



Figure 2. The Virginia Eastern Shorekeeper and boat on patrol. Photo by D. Field, DCR/DNH

The patrol method that produced the best results consisted of launching the boat at either the northern or southern end of the survey area, depending on winds, and motor offshore of the barrier islands, as close to the coastline as safely possible. This allowed the entire coastal portion of the survey area to be observed. All human activity was noted. After the entire eastern coastline was surveyed, the patrol was continued on the backside, or western side, of the islands. Patrolling the coastal bay side of the islands helped locate the access points, or boat landing points, that were used for a specific activity. This type of patrol was weather dependent and was often broken into two smaller patrol areas.

Patrols were primarily scheduled around weather, tide and season. Weather was the predominant variable for observing recreational use of the barrier islands. However, patrols were conducted during adverse weather and at night to fully survey the human impacts. Winter observations were limited due to safety concerns. Tide was more a variable for safe boat operation and access to some remote locations. Restored eelgrass beds and Virginia Oyster Heritage Program (VOHP) oyster reefs were primarily patrolled during low tide to allow for physical observation of growth and turbidity monitoring. Seasonal variability allowed for targeted surveys. For example, more coastal beach patrols were conducted during spring and fall surf fishing seasons, and more marsh surveys to monitor hunting and hand harvesting of oysters by watermen were conducted during the winter. Although random, more patrols were conducted on Friday and Saturday than the remainder of the week to better observe impacts from recreational use. Once shorebird nesting activity was observed in the spring, targeted patrols were increased near nesting areas.

Historic data and current input from island land managers was used to rank the general sensitivity of individual Atlantic barrier islands (Table 1). All observed human activity was noted. Activities were categorized into two groups; authorized and unauthorized. Authorized activities included any activity allowed by law and in compliance with policies or restrictions imposed by the land owners. Unauthorized activities included any activities not allowed by laws or inconsistent with landowner policies and restrictions. Laws pertaining to on-the-water activities and related to coastal fisheries and hunting are well documented and concerns were directly addressed to the Virginia Marine Resources Commission or the Department of Game and Inland Fisheries, when appropriate. Laws pertaining to nesting birds and individual landowner policies and restrictions were more ambiguous. All privately owned property was considered closed to the public, except for property owned by TNC, which allows conditional activities on their land. Two examples of unclear activities follow. (1) Driving a vehicle on the beach on Cedar Island North would be considered an authorized activity. However, it would be considered an unauthorized activity to drive on the same beach near a Piping Plover nest. (2) Surf fishing would be an authorized activity in the early spring and an unauthorized activity during the posted summer bird nesting season (Figure 3). Virtually all activities conducted by land owners and land managers were considered authorized. Most activities revolve around research and are authorized by research permits and agreements. Island surveys that were conducted by the Virginia Eastern Shorekeeper for discarded aquaculture clam netting were covered under separate permits and observations were not used as part of the human impact survey.



Figure 3. Surf fisherman with cart on Smith Island

Both authorized and unauthorized activities were further broken down into the individual human impact and the collateral impact related activities. Table 2 summarizes the “Observed impacts of human visitation on the Atlantic barrier island” and will be reviewed in the Discussion section. Human Impacts were grouped into the following categories:

1. BEACH - Any recreational activity on the beach. i.e. beach walks, shell collection, artifact hunting, bird watching, picnicking and using the island as a rest room.
2. FISH - Fishing activities, primarily surf fishing. Includes inlet fishing and accessing fishing areas.
3. HUNT- Hunting activities, including waterfowl, Rail hunting, building and accessing blinds or hunting areas and flushing waterfowl from closed areas to open areas. Raccoon and fox collection are included under research.
4. RESEARCH - Scientific activities conducted by the land owners or with a valid research permit or agreement.

5. NIGHT - Any activity conducted between sunset and sunrise. Generally, overnight activities.
6. OWNER - Any activity authorized by the owner that is not covered in another category. This includes mowing, prescribed fire, herbicide application, construction and repair of structures.

The collateral impacts from human impact were grouped into the following:

1. BOAT - Use of a boat, other than a canoe or kayak, to gain access to the impacted area (Figure 4).
2. KAYAK - Use of a canoe or kayak to access the impacted area.
3. VEHICLE - Use of any type of vehicle to access the impacted area. Includes trucks, ATV's and pull carts.
4. TRAILS - Describes new and historic trails and roads maintained to provide access. Does not include animal trails.
5. COTTAGE - Any permanent structure used for temporary occupancy or storage. Includes the Cape Charles Lighthouse on Smith Island. Does not include abandoned structures.
6. CAMP – Any activity relating to camping or setting up an area beyond a simple picnic. Includes setting up tents, cooking equipment, tables, volley ball nets, temporary generators and building campfires.
7. DOGS - Any domestic pet that is released on a barrier island, except for dogs that are authorized for use while hunting (Figure 5)

## RESULTS



Figure 4, Visitors on Little Cobb Island

Results indicate widely distributed recreational usage throughout the survey area. Observed impacts of human visitation and collateral activity are summarized by general impacts (Table 2). In 340 hours of patrolling by the Shorekeeper, human activity was observed on a barrier island or near a sensitive restoration area on all but 3 dates. Above average rainfall this summer, particularly on the weekends, seem to reduce the total number of boaters on the water. Casual entry by recreational beachcombers into colonial and solitary bird nesting sites was the most often observed impact. Between April and September 2004, over 20 intrusions were observed near large nesting bird colonies on Metompkin Island, Cedar Island north, Dawson Shoal and Little Cobb Island. Six intrusions into bird colonies were noted on Wreck Island NAP and Fisherman Island NWR. Most observations consisted of two persons walking along the beach. Unleashed, mostly large dogs were observed on Metompkin, Cedar north and south, Parramore, Hog, Little Cobb, Myrtle and Smith Island (Figure 1). Personal vehicles or ATV's were regularly noted on Cedar Island north and south, Parramore Island NAP, and Fisherman Island NWR. Seasonal ATV use was observed on Metompkin and Cedar Island North and Cedar Island South and Smith Island in conjunction with spring mammal research. The only unauthorized vehicle use observed was on Cedar Island north where on two occasions a truck was observed driving on the upper beach and in over-wash areas near where solitary nesting birds were reported to be. Visible vehicle tracks observed on Cedar Island north were believed to be on USF&WS land, though no boundary markers were visible. Eighteen separate surf fishing events were noted, with non-motorized carts used in four events. In all but two cases, the boat was within sight of the fisherman. On Hog Island and Wreck Island NAP, surf fishermen were observed fishing from the beach during the autumn. The accompanying boats were anchored behind tidal sandbars on the ocean side of the island. Large groups of 6 or more were observed picnicking on Metompkin Island, Cedar Island north, Dawson Shoal, Hog Island, Cobb's Island, Little Cobb Island and Smith Island. Cedar Island North and Dawson Shoal appeared to be the preferred areas for locals citizens to picnic. Little Cobb Island was used primarily by people from North Carolina, indicated by the boat registration numbers, during the Croaker fishing season. Researchers accounted for nearly 35 percent of the humans observed on the islands. Research did account for the most hours on the

island with routine daylong activities and numerous overnight activities on Parramore Island NAP, Hog Island and Smith Island.

## DISCUSSION



Figure 5, People with dog on Metompkin Island

There is a clear indication that human activity on the Atlantic barrier islands are having a negative effect on some, but not all, sensitive resources on the Atlantic barrier islands of the Eastern Shore. Results indicate that both colonial and solitary nesting birds are being negatively affected by frequent disruption (Figure 4) However, human activities near or over restored eelgrass restoration beds do not appear to be having a negative effect on restoration efforts. Human activities near or over VOHP oyster restoration beds are inconclusive. Although harmful activity was not observed during the survey period, VMRC reports indicate that illegal harvests have destroyed or greatly damaged VOHP restoration efforts in some areas.

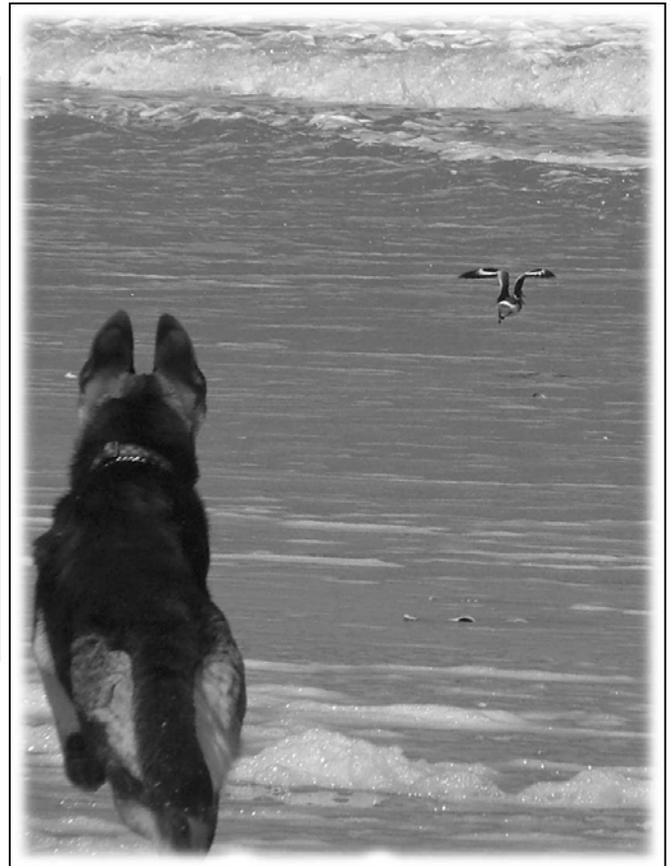


Figure 6, Dog chasing a willet on Cedar Island

Overall human usage within the Seaside Heritage area surveyed may not be increasing. Based on historical and anecdotal information (Badger and Kellam, 1989; Barnes and Truitt, 1997; Personal observation) human usage on the barrier islands appears to have decreased between the peak of activity in the early 1900's and 1994. Since 1994, there has been a steady decline of hunting lodges, watch houses, U.S. Coast Guard Stations and seasonal cottage construction (personal observation). Currently, all the Coast Guard Stations are closed, only a few hunting lodges used primarily by small groups of hunters, are present on Cedar, Hog and Cobb's Islands and only a few watch houses are located behind the islands. In addition, these watch houses are used only sporadically, primarily by waterman awaiting a rising tide. The numbers of cottages on both Cedar Islands has been reduced dramatically and are continually threatened by adverse weather.

By stark contrast, a majority of the Atlantic coast has seen dramatic increases in human impacts in the past one hundred years (U.S. Commission on Ocean Policy, 2000). Areas north and south of the Virginia barrier islands have been subject to residential and commercial development, impacted by shoreline hardening, modification and replenishment and now support year-round human populations. The general assumption, by land managers along the Virginia barrier islands, is that the wholesale loss of coastal habitat to the north and south along the East Coast places even more importance on the conservation value of the remaining natural communities on these islands. Although that point is not in question, it does pertain to the relevance of human impact on the Virginia barrier islands. By scale, human usage on all of the islands within the survey area is

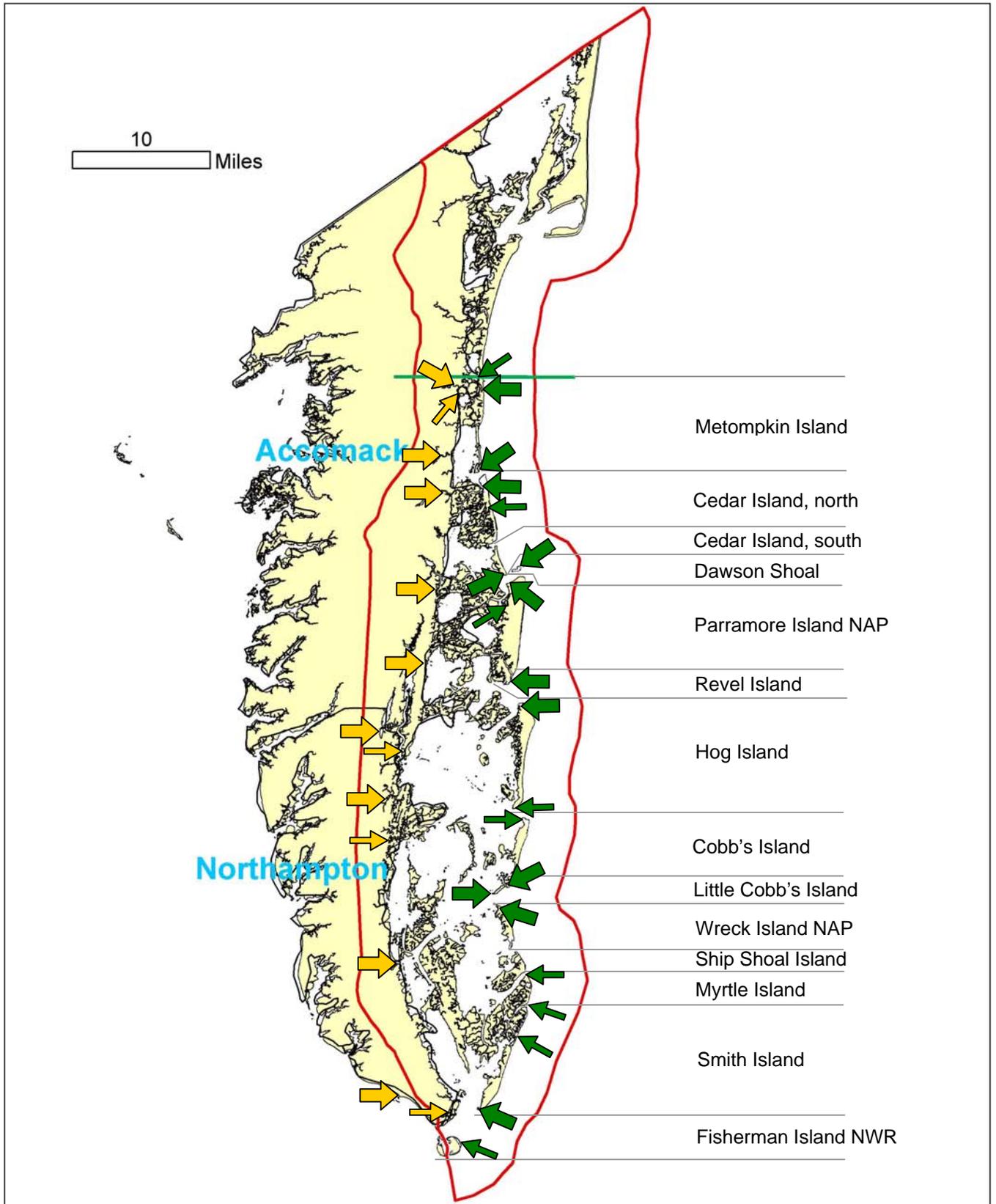


Figure 5. Seaside Heritage Program area showing mainland debarkation points and island access points. Red outline indicates program area. = Public boat ramps, = Private boat ramps that are regularly used, = Primary island access points, = Secondary access points. Surveys were not conducted north of Gargatha Inlet, indicated by green line.

substantially less than, for example Fenwick Island, Ocean City, Maryland, with its millions of annual visitors (Maryland Coastal Bays Program, 2004). The relative low amount of human visitation on the Eastern Shore Atlantic barrier islands offset by the high number of important natural resources.

**ISLAND ACCESS POINTS:** Getting from the mainland to the islands appears to be a strong variable in where the islands are impacted. As expected, the relationship to the mainland public boat ramps to the closest landing point on the islands clearly affects the number of recreational visitors. Virtually all island access was on to sandy beaches either near an inlet or at an over-wash area. It was thought that the increased use of kayaks would begin to provide access to areas not normally accessed by larger boats. The kayakers that were observed on the islands were accessing the islands in the same locations as the boats. The more remote island landings were by island researchers, surf fishermen and hunters who used local knowledge to access small creeks and guts. The preferred island landing points are sandy beach on the inlet or backside of the island. Current and tide did not seem to affect the decision to land, though it often affected how long they remained there. Under ideal weather and tide conditions, local boaters would beach their boat and anchor the stern into deeper water. Out of town boats would anchor out in deeper water and wade or swim in or simply beach the boat for short periods of time. Kayaks, canoes and small aluminum boats would always be pulled up on the beach away from wave activity.

Figure 5 shows mainland debarkation points and island access points within the Seaside Heritage Program survey area. Public ramps in Wachapreague, Folly Creek, Gargathy Creek and Oyster were the launching points for most boaters accessing the islands. Ramps in Quinby, Willis Wharf and Red Bank were frequently used, but had a lower number of boats that accessed the islands. The ramp at Kiptopeake State Park is also shown since it had a large number of boats that used the ramp to access Fisherman Island NWR and the southern end of Smith Island.

## RECOMMENDATIONS:

1. Land managers, large property owners and resource managers should meet to discuss the issue of human impacts on the barrier islands. The first discussion should involve primary stakeholders in natural resources protection and should address measures needed to best protect the resources. The second discussion should include all property owners and address ways to best implement protection measures. This would not necessarily mean bringing all the property owners together; rather addressing ways to protect the resources without compromising private property rights, particularly for the small parcel owners on Cedar, Hog and Cobb's Islands. Special focus is needed on protecting solitary nesters on private lands.
2. Use policies need to be clarified and made available to the public. This is more of a legal need than a practical protection measure. Most out-of-town boaters believe the islands, all the islands, are some type of "park". However, there is confusion about whether the "park" is open to the public. Conversely, many local residents believe all the islands except Fisherman Island NWR, are open to the public. The four primary land managers all have slightly different land use policies that, at best, are difficult to find on their web sites and often refer the person to a daytime business phone number. Even web site information differs in newspaper articles detailing use policies. I believe that the primary land managers could reach a comfortable compromise and provide a consistent land use policy that would address seasonally closed areas, public access, public activities and prohibited areas. Plans are already underway to install kiosks at 6 public launching points for kayaks along the seaside. The Seaside Heritage Program through the VCP is funding the construction of these information centers. This could be the ideal location to post island access information and address the general protection needs of the natural resources. Serious consideration should be given to creating a barrier island visitation brochure. In 2004, The Nature Conservancy circulated a draft brochure on visitation. However, with the complexities and variability of use plans by land managers, the maps and keys within the brochure were overly comprehensive and difficult to interpret. However, this was a good initial effort and could serve as a template for future brochures.



Figure 6, Bird posing on Wreck Island NAP

**Table 1:** The general sensitivity of flora and fauna to human impacts on Atlantic barrier islands on the Eastern Shore

HIGH - Would normally be disturbed or affected by most human activities. Animal population is large or activity is significant.

MED - May be disturbed or affected by most human activities. Animal population or activity is important.

LOW - Could be disturbed or affected by excessive human activities. Animal population is low or questionable.

\*1 Cedar Island is currently divided by a significant ocean inlet and is shown as two separate islands.

\*2 The south end of Parramore Island and Revel Island has merged.

ISLAND	Birds					Other		Habitat		
	Solitary	Colonial	Wading	Marsh	Waterfowl	Mammal	Reptile	Dune	Upland	Fresh W
Metompkin Island	HIGH	MED	LOW	MED	MED	HIGH	MED	MED	-	-
Cedar Island, North (*1)	HIGH	HIGH	LOW	MED	MED	HIGH	MED	HIGH	HIGH	-
Cedar Island, South (*1)	MED	LOW	MED	MED	MED	LOW	MED	HIGH	HIGH	-
Dawson Shoal	LOW	HIGH	LOW	LOW	LOW	LOW	MED	LOW	-	-
Parramore Island NAP (*2)	LOW	LOW	LOW	MED	HIGH	HIGH	MED	MED	MED	MED
Revel Island (*2)	LOW	LOW	LOW	MED	MED	MED	MED	LOW	LOW	-
Hog Island	MED	MED	MED	MED	HIGH	LOW	MED	MED	MED	MED
Cobb's Island	MED	MED	HIGH	MED	HIGH	LOW	MED	LOW	LOW	MED
Little Cobb's Island	LOW	HIGH	LOW	LOW	LOW	LOW	MED	LOW	-	-
Wreck Island NAP	HIGH	HIGH	HIGH	MED	MED	LOW	MED	LOW	LOW	-
Ship Shoal Island	MED	MED	LOW	MED	MED	MED	MED	LOW	-	-
Myrtle Island	MED	MED	LOW	MED	MED	MED	MED	LOW		-
Smith Island	LOW	LOW	LOW	MED	HIGH	HIGH	MED	MED	MED	MED
Fisherman Island NWR	HIGH	HIGH	MED	MED	HIGH	HIGH	MED	HIGH	HIGH	-

**Table 2: Observed impacts of human visitation and collateral activity on the Atlantic barrier islands.**  
Does not include the effects of traffic from the Chesapeake Bay Bridge Tunnel right-of-way through Fisherman Island NWR.

		Human impact						Collateral use impact						
		Beach	Fish	Hunt	Research	Night	Owner	Boat	Kayak	Vehicle	Trails	Cabin	Cottage	Dogs
Metompkin Island	Authorized	HIGH	-	-	HIGH	-	MED	MED	HIGH	MED	-	-	-	-
	Unauthorized	HIGH	HIGH	LOW	-	-	-	HIGH	HIGH	-	-	-	MED	HIGH
Cedar Island, North	Authorized	HIGH	-	-	HIGH	HIGH	HIGH	HIGH	MED	HIGH	HIGH	HIGH	-	HIGH
	Unauthorized	HIGH	HIGH	MED	-	MED	-	HIGH	HIGH	-	-	-	HIGH	HIGH
Cedar Island, South	Authorized	HIGH	LOW	MED	LOW	HIGH	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	LOW	HIGH
	Unauthorized	HIGH	MED	LOW	-	MED	-	HIGH	MED	-	-	-	MED	HIGH
Dawson Shoal	Authorized	HIGH	LOW	-	LOW	-	-	LOW	-	-	-	-	-	-
	Unauthorized	HIGH	MED	-	-	MED	-	HIGH	MED	-	-	-	HIGH	HIGH
Parramore Is NAP	Authorized	MED	LOW	-	HIGH	MED	MED	HIGH	-	HIGH	HIGH	HIGH	-	-
	Unauthorized	HIGH	MED	LOW	-	MED	-	HIGH	MED	-	-	-	HIGH	MED
Revel Island	Authorized	LOW	-	-	MED	-	-	LOW	-	LOW	-	-	-	-
	Unauthorized	MED	LOW	LOW	-	-	-	MED	LOW	-	-	-	-	MED
Hog Island	Authorized	MED	-	MED	HIGH	MED	MED	HIGH	-	MED	HIGH	HIGH	MED	MED
	Unauthorized	MED	HIGH	MED	-	MED	-	HIGH	LOW	-	-	-	MED	MED
Cobb's Island	Authorized	LOW	-	LOW	LOW	-	LOW	LOW	-	-	-	LOW	-	MED
	Unauthorized	HIGH	MED	LOW	-	-	-	MED	LOW	-	-	-	MED	MED
Little Cobb's Island	Authorized	LOW	-	-	LOW	-	-	LOW	-	-	-	-	-	-
	Unauthorized	HIGH	HIGH	-	-	MED	-	HIGH	MED	-	-	-	MED	HIGH
Wreck Island NAP	Authorized	MED	-	-	MED	-	MED	MED	-	-	-	-	-	-
	Unauthorized	HIGH	HIGH	-	-	-	-	HIGH	LOW	-	-	-	-	HIGH
Ship Shoal Island	Authorized	LOW	-	-	LOW	-	-	LOW	-	-	-	-	-	-
	Unauthorized	MED	MED	-	-	-	-	MED	-	-	-	-	-	MED
Myrtle Island	Authorized	LOW	MED	-	LOW	-	-	LOW	-	-	-	-	-	-
	Unauthorized	LOW	-	-	-	-	-	-	-	-	-	-	-	MED
Smith Island	Authorized	MED	-	-	HIGH	LOW	HIGH	HIGH	-	HIGH	HIGH	HIGH	-	-
	Unauthorized	HIGH	HIGH	?	-	-	-	HIGH	HIGH	-	-	-	MED	HIGH
Fisherman Is NAP *	Authorized	HIGH	-	-	HIGH	LOW	HIGH	-	-	HIGH	HIGH	-	-	-
	Unauthorized	HIGH	HIGH	-	-	-	-	HIGH	HIGH	-	-	-	-	MED

3. Colonial nesting bird areas need to be more clearly defined and posted. Most visitors will respect the posted areas. Discussions need to address the posting of solitary nesting sites (Figure 6).
4. Islands that are closed to the public should be posted as such. Closure signs on the south end of Assawoman Island, though unsightly to some and a maintenance issue, appear to be effective. If land managers do not want visitors accessing particular islands, they need to take reasonable measures to post their property at known access points. This step is critical if land managers decide to pursue trespassing cases.
5. Temporary barriers, like those used on Metompkin Island, Wire Passage landing appear to be effective. A simple rope was tied between posting signs and were arranged to channel visitors from the boat landing to the beach. Though this method will not work at all sites, it may provide a simple way to divert visitors around critical areas.

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