Appendix A

Bill Thompson/USFWS

American Black Duck

The Proposed Assateague Wilderness: Building Blocks for the Wilderness Character Monitoring Report

2012

U.S. Fish & Wildlife Service
U.S. National Park Service

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[THE PROPOSED ASSATEAGUE ISLAND WILDERNESS]

Building Blocks for the Wilderness Character Monitoring Report

Executive Summary

The Assateague barrier island off the Maryland and Virginia mainland is managed, in part, by the U.S. Fish and Wildlife Service as the Chincoteague National Wildlife Refuge (CNWR), the U.S. National Park Service as the Assateague Island National Seashore (ASIS), and the Maryland Department of Natural Resources as Assateague State Park. Federal and state protection of this island provides a wildlife sanctuary, especially for shorebirds and migratory birds, and recreational opportunities for a high number of visitors.

In response to the Wilderness Act, 1964, the entire island was reviewed to see which areas still possessed primeval characteristics. As a result, the central 6,500 acres of Assateague Island was proposed as wilderness in 1974, but has yet to receive designation. Until such a Congressional decision is made, ASIS and CNWR manage the area to preserve its wilderness character. An evaluation of the current land status will set a 2012 baseline for wilderness character and support a plan for monitoring long-term trends.

An interagency team, representing the U.S. Fish & Wildlife Service (USFWS), National Park Service (NPS), U.S. Forest Service (USFS), and Bureau of Land Management (BLM), developed a guide for wilderness character monitoring. This national strategy is described in the 2008 “Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character across the national Wilderness Preservation System” publication, and will be followed herein.

The purpose of this document is to describe a wilderness character monitoring program for the proposed Assateague Island wilderness. The designed 33 measures are largely consistent for both ASIS and CNWR. They were developed with ASIS and CNWR staff as well as outside USFWS and NPS guidance. They are composed of readily available data such as field surveys, management policies, documented uses, and professional judgment.

First, the setting of the proposed wilderness is described, including current boundary descriptions, the island’s ecology, a legislative history and refuge and park purposes. Second, a wilderness narrative expresses what makes the proposed Island Wilderness special. Third, the process for developing these measures is explained. Fourth, the wilderness character hierarchy is expanded upon to provide context for the fifth section, the Measures. This section describes the suite of proposed measures, such as their relevance to wilderness character, how the data is collected, and 2012 data. This section also includes measures under development and those measures considered but ultimately dismissed as not functional. Lastly, concluding thoughts are given on the proposed monitoring program and continuing issues.

In effect, this document provides a 2012 baseline assessment and describes the wilderness character monitoring program for the proposed Assateague Island wilderness.

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Section 1. Setting of the Assateague Island Wilderness

1.1 Geographic setting: Current Land Status, Boundary Description and Map

The proposed Assateague Island Wilderness is located on the central portion of Assateague Island. This island resides to the east of the Delmarva Peninsula, situated between the Sinepuxent and Chincoteague Bays and Atlantic Ocean. Stretching longer than 37 miles, it crosses through Accomack County, Virginia and Worcester County, Maryland. While the island's shape is in a constant flux, it is approximately 15,616 land acres, and varies between 1.25 and 3 miles wide. The wilderness portion of the barrier island spans the state line. In Maryland it begins south of Fox Hills, stretches through Virginia and ends around the Old Fields Impoundment. The wilderness area is about 5,700 acres or 37% of the island.

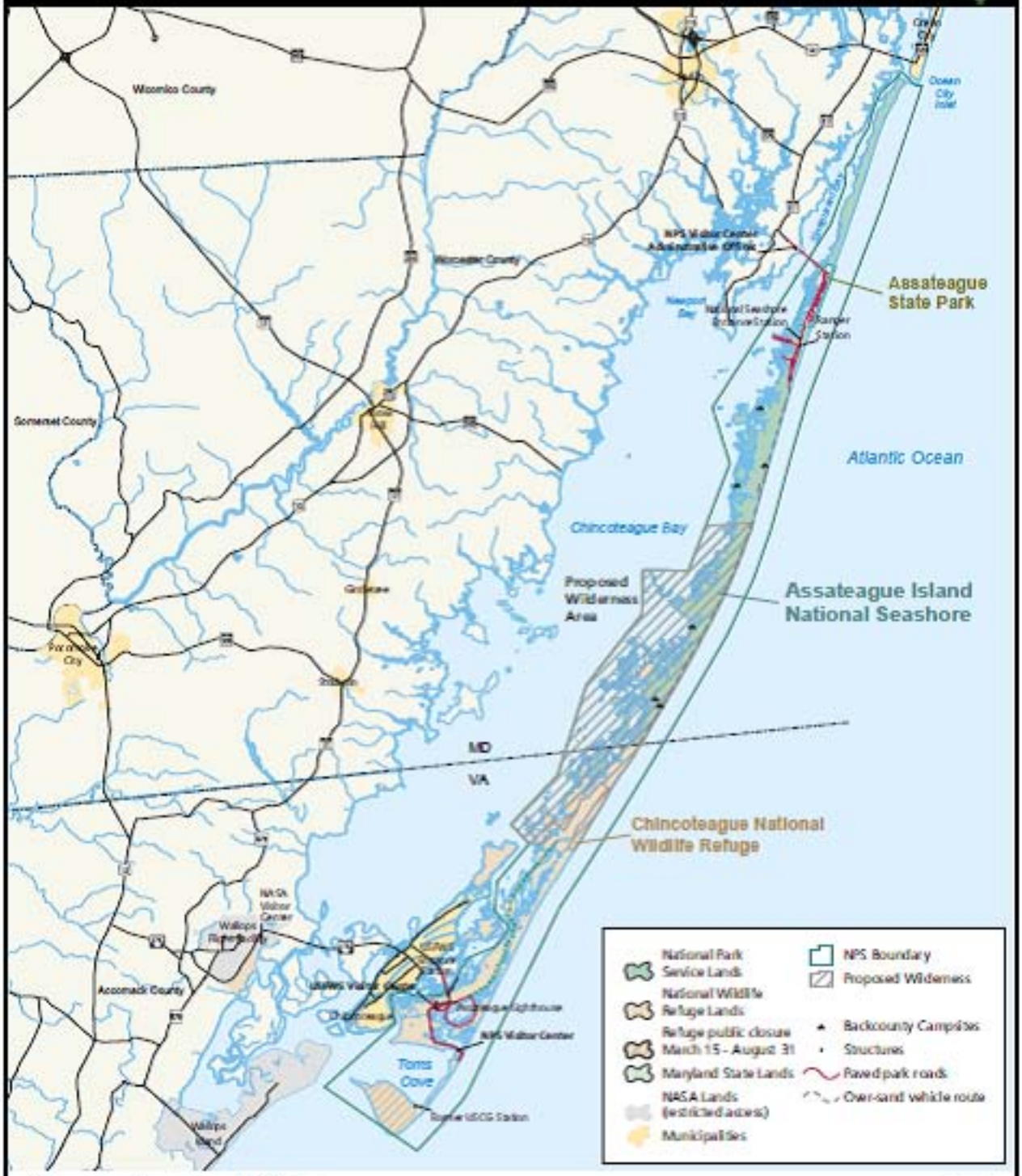
The length of the island is divided by three managing agencies. The Maryland Department of Natural Resources owns the Assateague State Park, 688 acres, in the northern part of the island across from the Sinepuxent Bay. The National Park Service (NPS) manages the northern tip of the barrier island, skips over the state park then reaches down to the Virginia state line as the Assateague Island National Seashore (ASIS). The NPS also owns a few small islands bayside of the state line and manages one mile of Tom's Cove Recreational Beach on the Fish and Wildlife Service (FWS) portion of the island through an interagency agreement with the Chincoteague National Wildlife Refuge (CNWR). The FWS manage 9,021 acres on the southern end of the barrier island in Virginia (17 miles) as well as a few islands in southern Maryland as the CNWR

At the time of the wilderness proposal, the FWS was to manage 1,300 acres (882 in Virginia and 418 in Maryland) of recommended wilderness. The NPS was to manage 440 acres of recommended wilderness as well as 4,760 proposed additional wilderness or 5,200 acres total. A recent NPS analysis using 2008 aerial photography and GIS has determined that the NPS wilderness area is actually 4,034 acres rather than 5,200 acres. The most recent GIS maps show that FWS manages 1,721 acres in Virginia. This difference in acreage between 1974 and 2011 is attributed to Assateague Island's changing shape and inaccuracies in the original land estimations.

Beach recreation and wildlife viewing make the Park and Refuge attractive destinations for the nearby urban and suburban residents. The island is within moderate driving distance of several major urban centers. Norfolk, VA is about two and half hours away (85 air miles), Washington D.C. is three and half hours away (110 air miles), and Philadelphia is less than four hours away (105 air miles). As such, CNWR is regularly one of the top six visited National Wildlife Refuges. In the 2011 fiscal year, it received 1,353,354 visitors. The Assateague Island National Seashore received 301,007 visitors (ASIS is ranked 36th in NPS recreation visits). A limited number of these total visitors (about 1% in CNWR and less than 10% in ASIS), however, enter into the Island Wilderness.

Assateague Island National Seashore
Maryland and Virginia

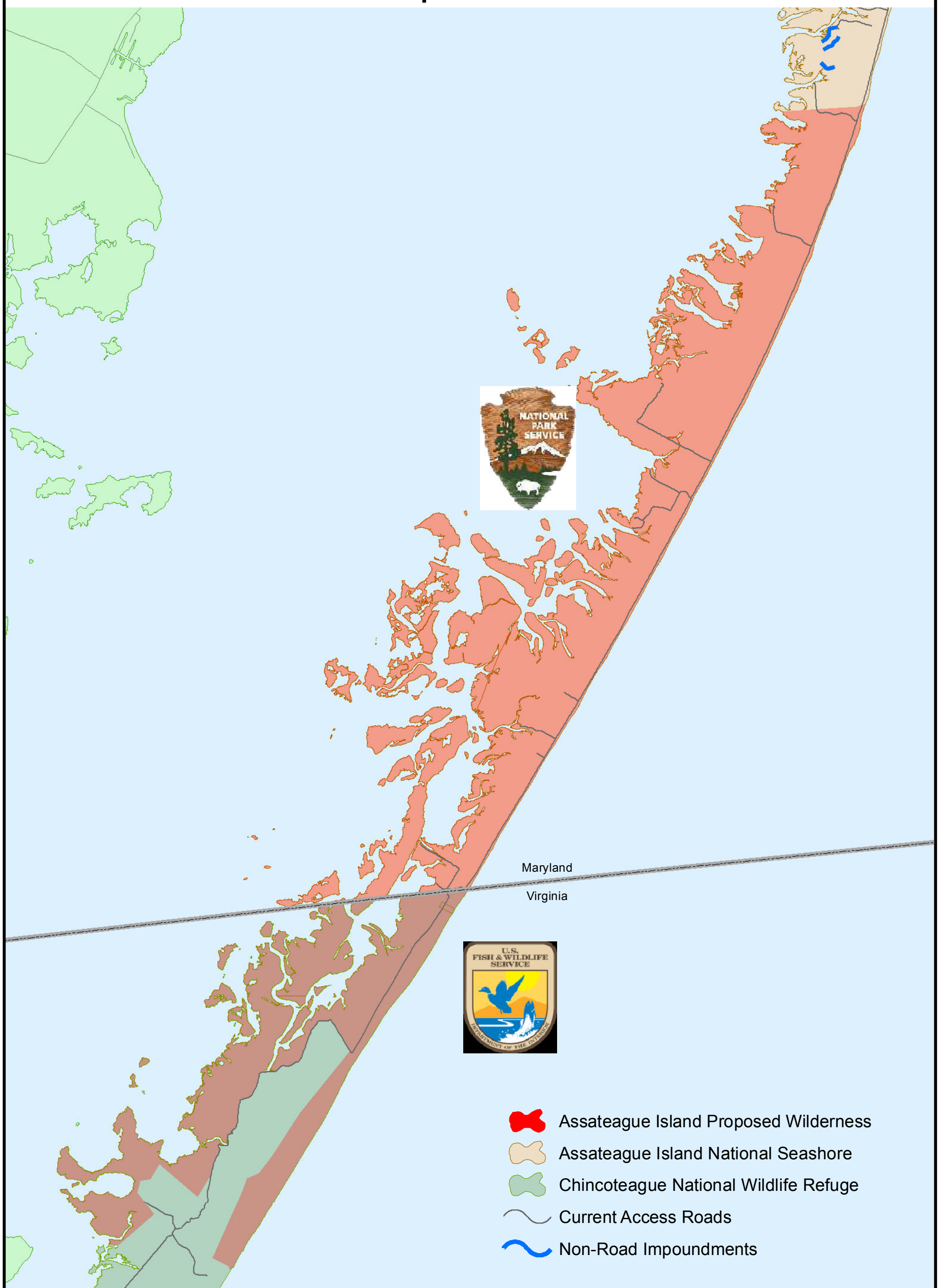
National Park Service
U.S. Department of the Interior



Produced by Assateague Island National Seashore, Resource Management, GIS

October 2006

ASIS Wilderness Character Map



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Produced by Assateague Island National Seashore, Resource Management, GIS

August 2012

1.2 Ecological setting

As a barrier island, Assateague Island is constantly responding to wind, waves, and storm surges. Strong waves and storm surges can erode the sand on the beach away from the dune line and back into the ocean or they can push the sand past the dunes and overwash the interior and western portions of the island with sand. Natural sand dunes form based off the frequency and extent of storms and prevailing winds as well as the growth of stabilizing vegetation. Historically the island had low dunes and was frequently overwashed. The coastal edge progressively moves to the west due to erosion and overwash. When the sand is spread across the dunes and marshes, and deposited into the bays on the island's backside, the process is sometimes described as "barrier island rollover" or "island migration."

During the 1950s and early 1960s, tall artificial dunes were built along the Maryland and Virginia portions of the Assateague coast to protect features on the island's interior such as impoundments (moist soil management units for migratory birds) and public use facilities. These tall dunes are vulnerable to strong storms that may blow out or wash the dunes away. Global climate change may bring greater storm events and higher sea levels which will accelerate erosion and overwash. Up until the 1990s, many of these artificial dunes were maintained. The 1993 Master Plan for CNWR deemphasized dune maintenance in Virginia. Strong coastal storm events in Maryland during the 1990s eliminated the majority of these relict artificial dune lines resulting in wide expansive ocean beaches. Allowing for natural barrier island migration is now the favored management practice, as opposed to dune maintenance, on ASIS and the CNWR.

The climate for Assateague Island is primarily influenced by the Atlantic Ocean. The barrier island acts as a buffer for the mainland against hurricanes or tropical storms that travel through the Atlantic. Summer days are usually hot and humid while autumn days are cool and clear. Autumn and winter, however, are Nor'easter season. Nor'easters are low pressure storms with heavy rains, very strong northeast winds, high tides and rough seas. Nor'easters can exert great force on the island. Winter temperatures average at 49 degrees Fahrenheit. Snowfall is uncommon, and rarely accumulates. Rainfall has a uniform distribution throughout the year with an average of 3.5 inches per month or 42 inches a year.

Multiple habitats occur on the barrier island and within the wilderness. These habitats transition from ocean to bayside:

The beach habitat hosts pioneer species such as American sea rocket and sea lavender that can tolerate shifting sands, overwash, limited fresh water, salt water sprays, and extreme winds and temperatures. The beach grass community establishes itself on the stabilized dunes beyond the high tide line. Sea beach Amaranth, a federally threatened plant, is present in low numbers across the island, including the wilderness area. Nesting birds such as the Piping Plover, American Oystercatcher, Least Tern and Black Skimmer will utilize the beach for nesting habitat. Loggerhead sea turtles will also opportunistically nest predominantly within CNWR.

Beyond the dunes are pockets of shrub/early successional habitat. This is composed of shrubs, small trees, and vines, such as wax myrtle, northern bayberry and false Mayberry. Land birds such as the Yellow Warblers, Pine Warblers and Brown Thrashers may be present. Monarch butterflies, tree swallows and Peregrine falcons all migrate through Assateague Island each Fall.

Ancient, stable dunes and stable sand ridges support the forested uplands. The soil is sandy and suited for loblolly pine, the dominant species, and dogwood, high-bush blueberry, greenbrier and fox grape in the understory. Rare or uncommon plants such as the Indian pipe, crested yellow orchid, and pink lady slipper can also be found in the Virginia uplands. The Delmarva Fox Squirrel is present in woodlands in the southern portion of CNWR and may have extended into the wilderness. The uplands may transition to shrub lands again before shifting into the salt marsh habitat.

Salt marshes are rich and productive ecosystems. The vegetation is influenced by tidal flooding and the silty loam soil. Salt marsh cordgrass dominants the low marsh (the zone between low and high tide). Northern sea lavender

and marsh elder grow along the marsh/upland edge. The Clapper Rail and Salt Marsh Sparrow are species of interest in the salt marsh. The Diamondback terrapin also inhabits the salt marsh islands.

1.3 History of land status, legislation, and establishing the wilderness

While no direct evidence has yet been found, it is likely that Assateague Island was used by Native Americans for thousands of years as a place for seasonal plant gathering, hunting and fishing. Giovanni da Verrazano first explored the island in 1524 while sailing for the King of France. For the next one hundred years explorers investigated the island, but colonists preferred the better soils and protected environment offered on the mainland. During the late-1600s, livestock grazed on the island as a way to avoid fencing ordinances on the mainland. The first Assateague Lighthouse was constructed in 1833 and later two life-saving stations, one near Green Run Inlet, MD, were occupied to respond to shipwrecks. Over time livestock herding, hunting, salt extraction and shell fishing brought more inhabitants to the island and established a small village.

In the 1930s and 1940s numerous, large ditches were dug in the salt marshes within Maryland as an effort to control the mosquito population. This failed to limit the mosquitoes and instead disrupted the salt marsh hydrology. In 1943 the Virginia portion of the island became the Chincoteague National Wildlife Refuge to provide a sanctuary for migratory birds, particularly the snow goose. On the Maryland portion, during the 1950s and 1960s intensive development was planned. Ultimately few houses were built but associated infrastructure such as forest clearing, roads and artificial dune construction was underway. In 1962 the Ash Wednesday Nor'easter struck, destroying much of the developments so that only about 30 structures remained in Maryland. When the national seashore was designated in 1965, these structures were moved or destroyed in place. Eleven property owners retained their rights within the seashore, occupying their properties which included roads, docks, and duck blinds over the next 25 years.

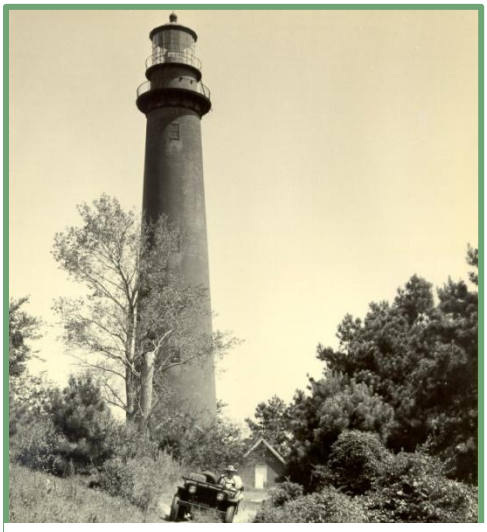

Photo: Chincoteague National Wildlife Refuge

The passing of the Wilderness Act of 1964 required that the Secretary of the Interior review every roadless area of 5,000 contiguous acres or more in the units of the NPS as well as any roadless area regardless of size within the NWR, for the suitability of wilderness designation. The results of this review would lead to a wilderness study for potential areas. Based off the wilderness studies, the Secretary of the Interior would make his recommendation to the President of the United States. From there the President would pass his recommendation to Congress, which would formally sign the bill for designated wilderness.

The Chincoteague National Wildlife Refuge was studied jointly with the Assateague Island National Seashore for the inclusion of land in the National Wilderness Preservation System in 1973. The entire island was considered at the time. Due to the heavy recreational uses at the islands poles, lands which still represented primeval character were reduced to the central portion of the island. In 1973, this estimated acreage was 6,500 acres, with 1,740 acres being recommended wilderness and 4,760 acres as additional wilderness. These 4,760 acres would be eligible as wilderness when nonconforming uses, such as multiple retained rights hunting camps were removed or terminated. The public had some concerns with regard to the prohibition of motorized vehicles, but were largely in favor of the wilderness proposal.

United States President, Gerald Ford, recommended this Assateague area as wilderness and Congress drew up the bill in 1974, but has not signed it since. Even though Assateague's lands have not been formally designated as Federal wilderness, the recommended and potential wilderness lands are meant to be managed to preserve the wilderness character. The NPS and FWS manage the land in a way that is generally consistent with the Wilderness Act.

1.4 Refuge and Park purposes

The Chincoteague NWR was established on May 13, 1943 under the authority of the Migratory Bird Conservation Act. This FWS ownership of the land was necessary for the protection of migratory birds, such as the snow goose. The purposes of the refuge are:

"…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (Migratory Bird Conservation Act)

"… suitable for – (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species…" (Refuge Recreation Act)

"… the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligation contained in various migratory bird treaties and conventions…" (Emergency Wetlands Resources Act of 1986)

The Assateague Island NS was established on September 21, 1965 by President Lyndon B. Johnson. The purposes of the seashore are to:

"Preserve the outstanding Mid-Atlantic coastal resources of Assateague Island and its adjacent waters and the natural processes upon which they depend;

"Provide high quality resource-compatible recreational opportunities."

According to the General Management Plan Wilderness Update, the primary goals in managing the Assateague Island Wilderness are to:

"Protect, restore, and preserve the area's natural resources and values, and the integrity of its wilderness character for present and future generations;

"Provide for freedom of public use and enjoyment of the wilderness area in a manner that is consistent with the Wilderness Act, NPS management policies, park purposes, and the protection of resources and values; and

"Provide for public understanding and support of wilderness resources and values"

1.5 Significant resources and values

Natural –As described in section 1.2, the proposed Island wilderness supports a continuum of habitats that include beach, dunes, shrub lands, maritime forest, and salt marsh. Specialized species have adapted to these habitats year round and this is an important stopover site for migratory birds. Aquatic habitats in the form of sea grasses, salt marshes, sand shallows and mudflats additionally support a high diversity of life. Additionally, the wilderness is intended to have high water quality. The island's hydrology includes the ocean, estuary, groundwater, and standing surface water. The wilderness is also an area to observe natural coastal processes such as dune formation and migration.

Photo: Taryn Sudol

Visitor Experiences –The proposed wilderness can provide visitors with panoramic views, natural sounds, inviting waters, and dark night skies. The diversity of ecosystem types in an accessible landscape is attractive to many locals in the surrounding area as well as long distance visitors. The refuge and seashore value recreation opportunities that include hunting, fishing, birding, hiking and swimming.

Cultural –Given the history of the island, certain sites have heritage value. The Green Run Hunting Lodge qualifies for the national register. There is a small cemetery in the northern portion of the wilderness as well. Old shipwrecks are still buried beneath the island's sands and should they emerge, they will be preserved on site or removed to protect their value.

Section 2. Wilderness Character Narrative

A wilderness character narrative is a positive and affirming description of what is unique and special about a given wilderness. The narrative describes the five tangible and measurable qualities of wilderness character. This is a description of values, issues, and threats for the subject wilderness; it is not a critique on the state of wilderness or recommendation for management.

In the beloved children's book, *Misty of Chincoteague,* Marguerite Henry describes the legendary arrival of the island's famous wild horses: "Then they rolled in the wiry grass, letting out great whinnies of happiness. They seemed unable to believe that the island was all their own. Not a human being anywhere. Only grass. And sea. And sky and the wind."

Assateague Island, the Virginia portion of which contains the Chincoteague National Wildlife Refuge, is a barrier island which has been set aside as a wild place of nature. An ocean breeze will push the sand up the beach, roll it over the dunes, rustle the leaves on the wax myrtle shrub and whistle through the tall loblolly pines in the upland forest, until it passes across the salt marshes to the Chincoteague Bay. There are no buildings for the breeze to collide against, no mail boxes to nudge it, and no drive-overs for it to whiz beneath. Although the entire island is preserved as a national park or wildlife refuge, the central 5,700 acres across the Maryland-Virginia state line, is a federally proposed wilderness, where the markings of man are minor and natural forces prevail.

Barrier islands are in constant flux, in response to climatologic impacts. Historically, man has applied his hand to these lands, but their dynamism, over time, erases the human imprint ---Mother Nature clears the scars. The island has existed for thousands of years but has only survived by constantly changing form. Therefore, when visitors stand atop an ancient dune on Assateague, a dune that is perhaps one hundred years old, they see a snapshot in time; they see how nature has meant a barrier island to evolve. The new shape of Assateague may be different, but it is still the barrier island that Giovanni da Verrazzano explored over four hundred years ago.

When the Island Wilderness was proposed in 1974, it was the only undeveloped barrier island between Massachusetts and North Carolina. It is a rarity, and yet within a moderate drive for millions of people from the Norfolk, Washington, DC, Baltimore and Philadelphia metropolises. President Johnson's philosophy was that the Assateague Wilderness would protect one of the few natural shorelines still left, and provide the greatest good for the greatest number of the public.

As of 2012, the United States Congress has yet to sign to bill for Island Wilderness designation but the Assateague Island National Seashore (ASIS) and the Chincoteague National Wildlife Refuge (CNWR) have managed to preserve the wilderness character of the proposed wilderness.

UNTRAMMELED

Wilderness is essentially unhindered and free from modern human actions that control or manipulate the community of life.

At the time of the wilderness recommendation, the Director of the CNWR and the Deputy Director of the ASIS decided that, "The really significant aspect of the proposal is to allow the natural processes of the barrier island to flourish."

A barrier island, without man's rigid grip, fluctuates, bends, and rolls over itself on a faster timescale than many other geological processes. The migration of the land has a natural push west to the mainland and to the south because of the tides and littoral drift. The sun, moon, and the Earth all exert their forces to shape this coastal sliver of sand. Storm events and sea level rise further mold the island: pulling sand away, pushing it into new dunes or creating entirely new inlets. These forces act on the island regardless of the presence of man.

One purpose of the proposed wilderness is to provide a natural laboratory, where geologists may observe and study how an island responds to the flow of wind and waves.

If current trends continue and future predications are actualized, it is likely that the island will subside, sea level will rise, and significant storm events will increase. The island, along with the rest of the region, is subsiding due to unknown reasons but scientists speculate the effects of deep aquifer removal. This subsidence adds to local trends in sea level rise. A rise in sea level may reduce the island's size, erode the sand, alter the habitat composition, and hasten the western and southern migration.

Major storm events reshape island morphology by causing breaks in the dune systems or creating new inlets between the Atlantic Ocean and Chincoteague Bay. With increasing sea level, there is an increased probability of these changes. Yet, much uncertainty remains about the pace of sea level rise and the consequences of global climate change.

An untrammeled wilderness, such as Assateague, allows for substantial alteration due to natural forces. But, the effect of potential landscape alterations may contest with what the public feels is appropriate. In such an instance, the ASIS and CNWR managers are obligated to meet the objectives of the federal Wilderness designation, as well as their specific mandates for the protection of resources. Any engineering, such as dune maintenance or shoreline stabilization, would interfere with the true, natural processes of the barrier island and be considered incompatible with the wilderness designation.

Day-to-day activities of the agencies managing the island's Wilderness is mostly passive: monitoring species of concern as well as implementation of necessary precautions for the successful proliferation of these species, such as predator exclosures; herbicide applications are made to invasive plants; and steps are taken for the management of the rare fire event. Mitigation efforts, such as removal of abandoned structures and salt marsh restoration activities are currently conducted to improve wilderness character. While these activities may temporarily trammel the environment, they are necessary to restore and enhance the untrammeled qualities of the barrier island.

It is evident that, given free reign, nature is a dynamic, changing force on the Island Wilderness.

NATURAL

Wilderness maintains ecological systems that are substantially free from the effects of modern civilization

Photo: Taryn Sudol

Assateague Island, in the ASIS Administrative History, was described as, "A barren place, swept by wind and sun, its solitude broken only by the shrill cry of wheeling gulls and the metronome boom of the surf."

In the glare of the bright white sand, pioneer species, such as the American sea rocket and the sea lavender, grasp for a foothold in constantly shifting sands and sprays of salt water. It is a harsh environment where the indigenous species have victoriously adapted.

The sea rocket, for example, has a long taproot to anchor it in the sand and thick, fleshy leaves to retain moisture. The speckled shorebird eggs mimic the seashells which dapple the sand. The dune grass community has established a foothold beyond the high tide line; these flora include American beach grass, sea-oats, seaside goldenrod and sea beach amaranth (a federally threatened plant).

On the other hand, Phragmites and Asiatic sand sedge are invasive non-native plants that have rapidly begun to dominant parts of the wilderness. These two species, left unchecked, will likely spread their monotypic stands, out-competing the native plants which provide better habitat for the wildlife.

The habitat types range from shrubs on the wind-rippled dunes to needle-carpeted upland forests. In these forests, loblolly pines have taken root on only the most stable interior dunes and sand ridges. Years ago these dunes formed as the island rolled over on itself. The continuum of habitats may shift from the sweet pungency of pine woods back to the shrubs, and then to the sharp, tangy salt marsh.

The sun is strong and the wind is often forceful, yet wildlife found here and have nestled closely with available flora. The wild horses and Sika deer, both introduced animal species, have adapted to this harsh, salty scrub by feeding on salt grasses and other plant life. Although the wild horses have become a cultural attraction, and the Sika deer have supplemented the hunter's catch, their grazing pressures and trampling effects have added strain to the fragile and challenged vegetation system.

In addition, climate change will expose vulnerabilities in current vegetation composition and wildlife populations. As mentioned above, the wilderness will likely face more frequent disturbances in the form of sea level rise as well as increased storms and droughts. The varieties of habitat may shift as the beach expands or contracts. Beach

nesting shorebirds and other wildlife can be significantly impacted from a single storm event. The amount and quality of forage, as well as freshwater may become further limited during droughts.

As the natural features change on the island, the new characteristics will not be any less natural, but they may cause a greater change in a shorter time period than would be expected without a change in climate.

UNDEVELOPED

Wilderness retains its primeval character and influence, and is essentially without permanent improvements or modern human occupation.

Photo: Taryn Sudol

An outstanding feature at the time of the wilderness recommendation was Assateague's undeveloped quality. This barren island, with its shrill gulls, was an "onlyness" which had to be protected.

Just as the wire cages protect the federally threatened Piping Plover nests from the common predators, the ASIS and CNWR policies have generally protected this natural landform from the human encroachment.

Assateague Island is relatively flat and one's sight extends far out to distant horizons. On the bay side, the skyline is pine trees; the view is a scattered jigsaw of salt marshes. On the Atlantic side, the blue of the ocean meets the blue of the sky. Within the wilderness, cottontail rabbits cut one off instead of cars; gulls, terns, warblers, and sparrows produce a more complex and pleasing cacophony than the sound of lawnmowers, motor vehicles, and sirens. The corner of one's eye will barely glimpse a deer before it soundlessly disappears into the shrub. What is the wilderness for, if not Beauty?

Luckily, the harsh, infertile qualities of the land have kept Assateague from ever being much developed. The hunting clubs and the fishing camps that did develop have been limited and could be removed. Private property rights from inholdings of 1964 have since been transferred to the National Park Service. Infrastructure associated with intended development such as roads, berms, artificial dunes, and mosquito ditches have been abandoned and eventually will be reset by nature or restored through management. The remaining weatherworn and warped old homes stand in stark contrast to the wind-swept grass and are a reminder of how transient humankind is.

There are still some persistent structures throughout the proposed wilderness. There are unpaved roads for administrative uses, research, and limited recreation. Three back country campsites in ASIS have minimal features such as picnic tables, toilets, or fire rings. Fencing along the state line between Maryland and Virginia is necessary to separate the Assateague and Chincoteague wild horse herds, creates barriers and closures throughout multiple parts of the wilderness. Research structures, signing, and the weather stations also punctuate an otherwise undeveloped landscape.

To sustain resource and visitor protection, staff for research/wildlife monitoring, and law enforcement patrols access the wilderness with motor vehicles. Additionally, recreationists with an Over Sand Vehicle (OSV) permit on the ASIS in Maryland are allowed to drive their vehicle along the beach. This combination of vehicular presence currently impacts the island's wilderness character.

SOLITUDE OR PRIMITIVE AND UNCONFINED RECREATION

Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation.

Photo: Taryn Sudol

The proposed Island Wilderness offers a vivid contrast to the recreational beaches of either of its sides. To the north or south, visitors can spy birds from the comfort of their own air-conditioned "SUV" seats or tote their cooler and beach blanket only a few yards between the parking lot and the beach.

But, to reach the wilderness on foot a seven mile hike from the Chincoteague side as well as a several mile hike from the Assateague side. It would seem that only the most intrepid would trek to the wilderness, having to brave the summer heat and the thick mosquitoes.

While the CNWR and ASIS are both highly visited, a small proportion of these visitors (approximately 1% on CNWR and less than 10% on ASIS) actually enter the wilderness.

In the wilderness, however, visitors will have escaped a thicket of beach umbrellas and reclining chairs. Here, they can find hoof prints of the wild horses instead of the footprints of flip-flops. When, a visitor reaches the wilderness, the only footprints he or she will see will be their own.

Hiking to the state line in the Island Wilderness makes the word "shipwrecked" feels much more real. It may generate a mixture of accomplishment and humbleness: an oneness with nature. A visitor may contemplate the steady roll of the waves or sympathize with the American sea rocket that has found a way to grow in the hot sun, sand, and salt. There is the chance to see more secretive wildlife that avoid the more populous areas in the park and refuge: a river otter may play on the banks of the Old Fields impoundment; a hunting eagle may soar overhead; a mare may even be giving birth to her colt.

In this scenario, it is easy to feel at peace with nature, but there are distractions which may intrude on any self-induced shipwreck: the persistent or abandoned structures may be more startling in this otherwise undeveloped environment; litter, from far away, may have drifted upon the shore; tire tracks from the last monitoring patrol may mar

the sand; an OSV permit owner may even drive up within a few minutes next to the exhausted hiker. The gas-powered OSV vehicle user, however, will not have the same experience as a human-powered encounter with nature.

This primitive, unconfined recreation on Assateague Island is the intention for its proposed wilderness designation.

OTHER FEATURES OF THE WILDERNESS

A wilderness' future existence and significance evolves with the current flow of natural forces.

The limited human development and the dynamic evolution of Assateague's landscape have left few cultural or archeological features on the island.

Nonetheless, Green Run, a former hunting lodge, has cultural significance and will be preserved. The small cemetery on site will also be protected. Also, an artifact of significance may arise at any time, such as after a major storm. For instance, beneath the feet of a wilderness visitor may await, ready to emerge at a given natural event, the ribs of a washed-up ship; under the drifting sand may be hundreds of ancient maritime relics or other archeological treasures --- for now, unknown and undiscovered.

In conclusion, Assateague Island is a living patch of land moving inexorably over the past and reacting only to the present.

Section 3. Resources and Process

3.1 Documents Consulted

The following is a list of documents consulted to inform the wilderness character monitoring report.

Assateague Island National Seashore. 2012. General Update-Wilderness.

Bureau of Land Management. Measuring Attributes of Wilderness Character: BLM Implementation Guide Version 1.4.

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3.2 Assateague NS and Chincoteague NWR Staff Consulted

The following is a list of staff that was consulted in the process of identifying measures and researching Assateague Island's wilderness properties. Their time and effort is greatly appreciated.

Assateague NS
Trish Kicklighter, Superintendent
Bill Hulslander, Chief, Resource Management
Jack Kumer, Natural Resource Specialist
Brian Sturgis, Aquatic Ecologist
Neil Winn, GIS Specialist
Walt West, Law Enforcement
Ish Ennis, Chief of Maintenance

Chincoteague NWR
Lou Hinds, Refuge Manager
Kim Halpin, Deputy Refuge Manager
Kevin Holcomb, Supervisory Wildlife Biologist
Emarie Ayala, Wildlife Biologist
Eva Savage, Biological Technician
Janelle Walters, Biological Technician
Charlene Swartz, Maintenance Worker
Grover "Drizz" Wilgus Jr., Engineering Equip. Operator
Jenny Owen, Park Ranger
Jim Fair, Law Enforcement Officer
Lee Woltman, Refuge Volunteer

3.3 Process Used For Identifying Measures

This section describes the process used to identify the measures for the Assateague Island wilderness character baseline assessment. From the beginning, measures were designed to fit within the "Keeping It Wild" Monitoring Framework.

Research for potential measures first began with an overview of internal Chincoteague NWR documents. The legislative history for the proposed wilderness, including the environmental impact statement and wilderness study, were reviewed to gain insight into valuable features of the lands or development present at the time of designation. Planning documents, such as the Chincoteague NWR Master Plan and Habitat Management Plan were read to learn about activities throughout the Refuge or specifically the proposed wilderness. A tour of the wilderness displayed the ecological systems on site as well as any human impacts within or adjacent to the wilderness. Short interviews with the biological staff further informed the types of activities that take place and led to other literature sources. A search through the CNWR Public drive also attempted to identify wilderness features. This initial overview was used to produce a general inventory of wilderness features and activities in order to determine which measures would be relevant to the assessment.

Reference material through the four land management agencies (BLM, FS, FWS, and NPS) largely informed the compilation of draft measures. Potential measures provided through the Ft. Collins Wilderness Fellows training suggested broad enough measures to be applicable to many refuges. The BLM technical manual was influential in setting measure protocols. Details, such as activity indexes, were completely specific to the proposed Island Wilderness. These were created based off literature and interviews and were further revised in the review process.

The wilderness fellow, Taryn Sudol, reviewed the draft measures with CNWR Supervisory Biologist, Kevin Holcomb, during multiple meetings. These draft measures were then presented to ASIS staff which included Bill Hulslander, Neil Winn, Jack Kumer, and Brian Sturgis. This thorough discussion revised the draft measures so that some measures were added while a few were dismissed. Primary concerns at the meeting included defining what best represented the Natural quality for wilderness character and whether the wilderness character monitoring would require too much time, effort, or resources for the staff to implement. When these measures were decided upon, the wilderness fellow completed her interpretation of the priority score worksheet. This draft was circulated and edits incorporated.

Data collection for the finalized measures occurred over the next several weeks. This included interviews with biological, maintenance and law enforcement staff for knowledge of actions and developments. Data were also collected through external research for regional data, internal data on number of hunters and harvest, and calculations with GIS. As data were collected, measures would be updated to better fit what was available. During this time the wilderness fellow also composed the other parts of the report. When data collection was near completion, Taryn Sudol, Kevin Holcomb, and Bill Hulslander convened to discuss what qualified as a significant change in data. What qualified as a significant change was measure-dependent, but tended to be based on the frequency and variability of when the measurable events occurred. The final time period was spent filling in any gaps in the data and refining the report.

Section 4. Framework For Wilderness Character Monitoring

The Wilderness Act mandates the "preservation of wilderness character." Based off the legal description of the wilderness definition, the "Keeping It Wild" publication derived five specific qualities to support wilderness character: Untrammeled, Natural, Undeveloped, Opportunities for Solitude or Primitive and Unconfined Recreation and Other Features. This monitoring framework further divides the five qualities of wilderness character into successively finer elements. This hierarchy, from the top down, is composed of qualities, monitoring questions, indicators, and measurements.

Qualities are the primary elements of the wilderness character that are directly related to the statutory language of the Wilderness Act.

Untrammeled –The Wilderness Act states that wilderness is "an area where the earth and its community of life are untrammeled by man," and "generally appears to have been affected primarily by the forces of nature." This quality is degraded by modern human activities or actions that control or manipulate the components or processes of ecological systems inside the wilderness. Any modern human action, authorized or unauthorized, that alters the wilderness is considered trammeling, meaning that restraint is a necessary tool in wilderness stewardship. An *action* for this monitoring report is an act or series of acts that purposefully manipulate the biophysical environment. Actions may degrade the untrammeled quality but have a desired impact on another quality.

Natural - The Wilderness Act states that wilderness should be free from the *effects* of "an increasing population, accompanied by expanding settlement and growing mechanization" and that the "earth and its community of life…is protected and managed so as to preserve its natural conditions." This quality is degraded by intended or unintended effects of modern people on the ecological systems inside the wilderness since the area was designated.

Native species' communities and the structure and function of ecological systems within wilderness are meant to be protected. All ecological systems change over time and vary from one place to another. This monitoring is not intended to maintain static or unchanging natural conditions in the wilderness nor is one habitat composition more natural than another (if natural forces shaped them). Trends in the indicators may suggest the need for research or more intensive monitoring to verify the change and understand its cause.

Undeveloped –The Wilderness Act states that wilderness is "an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation," "where man himself is a visitor who does not remain," and "with the imprint of man's work substantially unnoticeable." This quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport because these increase people's ability to occupy or modify the environment.

Only non-recreational developments are measured under this quality, while recreational structures are measured under a different quality (to avoid double-counting). Some cultural developments may be an important part of wilderness character. These features are allowed to persist in the wilderness.

Solitude or Primitive and Unconfined Recreation –The Wilderness Act states that wilderness has "outstanding opportunities for solitude or primitive and unconfined type of recreation." This quality is degraded by settings that reduce those opportunities, such as visitor encounters, signs of modern civilization, recreation facilities and management restrictions on visitor behavior. Solitude is meant to separate people from civilization. Primitive recreation relies on personal skills. Unconfined recreation is freedom from societal or managerial controls. Monitoring this quality assessment how the opportunity for people to experience is changing, not on how visitor experiences are changing.

Other Features – The Wilderness Act states that a wilderness "may also contain ecological, geological, or other features of scientific, education, scenic, or historical value." This quality is degraded by the deterioration or loss of cultural resources integral to the wilderness character. Cultural resources may be damaged by natural disasters or humans.

Monitoring questions are major elements under each quality that are significantly different from one another, which are meant to frame particular management questions.

Indicators are distinct and important elements within each monitoring question. Each monitoring question typically has more than one indicator. There are a total of thirteen indicators. Every indicator must have a measure.

Measures are specific aspects of wilderness on which data are collected to assess the trend of an indicator. More than one measure can describe an indicator therefore providing management with a range of options to assess indicator trends. All measures for the proposed Island Wilderness will be summarized and described in detail in section five.

This hierarchy allows for national assessments of trends while still allowing flexibility for individual agencies and wildernesses to monitoring the specific elements of wilderness character most meaningful to them. The Wilderness Act (P.L. 88-577, Section 7) requires the Secretaries of Agriculture and Interior to jointly report on the status of the National Wilderness Preservation System including descriptions of the areas, regulations in effect, and other pertinent information, together with any recommendations. This mandate necessitates individual wildernesses to monitor and assess wilderness character and report to the national level.

Baseline conditions must be set as a reference point against which change over time is measured and evaluated. Ideally, all baseline data would have been collected at the time of designation. Since few existing wilderness actually have the data that extends back to designation for the measurements created at the time of the monitoring report, the initial condition assessment will be the substitute. For the proposed Island Wilderness, the baseline assessment year is 2012.

With the baseline in place, change can be monitored over time. The trend (improving, degrading, or stable) will be assessed based on what is determined as a significant change. If a significant change has occurred since the last monitoring point, a ↑ is assigned for an increase, a ↓ is assigned for a decease and a ↔ for stable. These arrows trans into a numerical score: +1 for ↑, a -1 for ↓ and a 0 for ↔. These scores are summed together for the number of measures in each indicator to produce the trend for the indicator; the indicators' trends are summed for the monitoring question trend, the monitoring trends summed for the qualities' trend, and finally the qualities' trends summed for the overall wilderness character trend. If a +1 is added to a -1 this is an "offsetting stable". This process to compute the trend is automatically done in the wilderness character database when the measurement data is added at each monitoring period.

Section 5. Measurements

This section provides the suite of measures selected to actively monitor wilderness character in 2012 for the proposed Assateague Island Wilderness. Each of the five qualities and their associated measurements has a sub-section. Each sub-section has a table which summarizes the monitoring questions, indicators, measures, and frequency of reporting for each quality. Secondly, each quality will have the detailed attributes for each of its measurements. The following outlines the general format and definitions of the attributes that will discuss each measure.

Definitions of Attributes of Measures	
Measure	A *measure* is a specific aspect of wilderness on which data are collected to assess the trend of an indicator. The measure being discussed is listed in this section
Indicator	An *indicator* is defined as a distinct and important element within each monitoring question. The indicator corresponding with each measure is specified in this section to provide context.
Context	The *context* describes why the measure is appropriate for the site and any background for understanding or interpreting trend in the measure.
Data Source(s)	The *data source(s)* provides information on where or with whom the data is located for reference. If the data source changes over time, this field should be updated with appropriate information
Data Collection Process	The *data collection process* is the process used to compile or gather the data with as much detail as possible.
Significant change	A *significant change* provides information on what degree of change signifies a change in trend. This section also describes how a change in data would improve or degrade the quality or under what ranges the measurement is considered stable. A significant change can be defined as any change, a percent change, or other appropriate units.
Data adequacy (H/M/L)	The *data adequacy* discusses the degree of confidence in the quality of the data. Data adequacy is ranked high, medium, or low.
Confidence	The *confidence* describes how the staff feel toward the accuracy or comprehensiveness of the data provided. It is ranked high, medium, or low.
2012 Data	The *2012 data* refers to the data being reported for the baseline year. This row will provided the data for the subsequent monitoring years as well.
Condition	The *condition* comments on the staff's general impression of the state of the wilderness with regard to the particular measurement. It is ranked as good, caution, poor, or unknown.

5.1 Natural

Monitoring Question	Indicator	Measurement	Freq. of Reporting
What are the trends in terrestrial, aquatic, and atmospheric natural resources inside the wilderness?	Plant and animal species and communities	Population dynamics of selected non-native plant species	Every five years
		Population dynamics of non-native wild horses	Every five years
		Population dynamics of non-native Sika deer	Every five years
		Number of extirpated indigenous species	Every five years
	Physical	Visibility	Every five years

	Resources	Ozone air	Every five years
		Total Nitrogen and total Sulfur deposition	Every five years
	Biophysical Processes	Mean Sea Level Rise	Every five years
		Significance of storm events	Sum of past five years

Measure 1.1 Population dynamics of selected non-native plant species

Indicator	Plant and animal species and communities
Context	A wilderness area can provide protection for sensitive, native plant species. The presence of non-native plant species can shift the flora composition to a historically unnatural state. The proliferation of certain non-native plant species can outcompete native species, resulting in a loss of diversity that once made Assateague Island a distinct natural location. At the time of this baseline assessment, two non-native plants species are considered a threat, Phragmites and Asiatic Sand Sedge (CAKO). Phragmites is a large perennial grass that is capable of forming monotypic stands that out-competes native wetland vegetation and provide poorer habitat for the wetland fauna. Phragmites is able to proliferate in freshwater ponds and on the fringes of salt marshes, supposing the salinity is low enough. While Phragmites may provide cover and shoreline stabilization, the native plant composition would be preferable to supply stabilization, food (seed source), and cover. Asiatic sand sedge colonizes beach habitats and can out-compete American beach grass. Asiatic sand sedge is more vulnerable to wind blow outs or storm erosion. When it forms thick mats in the sand, it becomes poor Piping Plover habitat. While Asiatic sand sedge is a threat as of 2012, there is no known occupied acreage of it in the wilderness at this time.
Data source	Internal survey documents and professional judgment
Data collection process	A list is compiled for selected non-native plant species. Scouting and vegetative surveys provide the acreage occupied for the selected non-native plants. This is limited to monotypic stands rather than interspersed species. The total measure will be the sum of each specie's "Percent of acreage occupied" score.

Species	**estimated percent** of the wilderness on which it is found	Score
	Very Low (or Spot) = <1%	1
	Low = 1-5%	2
	Moderate = 5-20%	3
	High = 20-35%	4
	Very High = 35-65%	5
	Extreme = >65%	6

Data Entry	Every five years
Significant Change	ANY change in the acreage occupied score is significant. If the acreage occupied score increases since the last data monitoring point, then it degrades the measurement. If the acreage occupied score decreases, then it improves the measurement.
Data Adequacy	Medium-This is limited to monotypic stands. The baseline data is not 2012 but still considered representative of the site.

Confidence	Low –Given the age of the data set (1993/1995), staff does not feel it represents the invasive coverage of 2012
2012 Data	

Species	Percent Occupied Score	
	ASIS	CNWR
Phragmites	1	0
Asiatic Sand Sedge	0	0
Total	1	0

Condition	Good

Measure 1.2 Population dynamics of non-native wild horses

Indicator	Plant and animal species and communities
Context	While the wild horses on Assateague Island have become a cultural resource, the natural ecosystems on the island become stressed by grazing pressure and trampling effects when horse herds become too large. ASIS and CNWR both have management strategies to maintain a target wild horse population. The horses' island presence is an important feature to many visitors and the public, which requires careful management of the wild horse population.
Data source	Internal records –Bill Hulslander, Kim Halpin
Data collection process	The adult horse population (including foals bought back during the Chincoteague Volunteer Fire Company (CVFC auction) for the entire island (herds in both Assateague NS and Chincoteague NWR except the CNWR southern herd which does not have wilderness access) will serve as a surrogate measure for the horses' wilderness presence. These horses have access to large parts of the island including the wilderness area. ASIS monitors their horse population through routine surveys and manages their population through a fertility control program, while the CVFC keeps a number of the CNWR herds. Of the total horse population in CNWR, about two-thirds reside in the North herd which has access to the wilderness. This number may change as horses are transferred from one herd to the other.
Data Entry	Every five years
Significant Change	If the horse population increases by 50 since the last data monitoring point, then this degrades the measurement.
Data Adequacy	Medium-Wild Horse populations are monitored by ASIS staff and the CVFC. This does not directly comment on the amount of impact horses have in the wilderness.
Confidence	High
2012 Data	

Wild Horse herds	Population
Chincoteague NWR	83
Assateague ISLAND NS	113
Total	196

Condition	Good

Photo: Taryn Sudol

Measure 1.3 Population dynamics of non-native Sika deer

Indicator	Plant and animal species and communities
Context	The Sika deer were introduced in the early 1920s and have since grown into considerable population. While the island's carrying capacity for Sika deer is unknown, large populations impact the natural quality by overgrazing, competing white-tailed deer, and becoming a source for ticks. A hunting program, in place since the 1960s, have allowed for the harvest of Sika deer.
Data source	Distance sampling data, Mark Sturm, professional judgment, Jack Kumer
Data collection process	ASIS has four years of distance sampling data that is able to provide an estimated range for the Sika population as part of a study on ungulate grazing effects on vegetation by Mark Sturm. In the future, ASIS hopes to have new technology or population density methods so that the distance sampling technique does not have to be repeated but the new technique will provide comparable statistical results.
Data Entry	Every five years
Significant Change	If the Sika deer harvest increases by 25%, then this degrades the measurement. If the population decreases by 25%, then it improves the measurement.
Data Adequacy	Medium -This data reflects the island as a whole and is not confined to the wilderness.
Confidence	Medium –This is a best estimate from a recent but not current study.
2012 Data	Sika Harvest: Population Assateague NS: 24 sika per square mile
Condition	Unknown –Do not yet know what the island's carrying capacity is for Sika.

Measure 1.4 Number of extirpated indigenous species

Indicator	Plant and animal species and communities
Context	The loss of indigenous species on the island reduces biodiversity. This affects the public understanding and experience on the island. Potentially the loss of a certain species can have cascading effects through the ecosystem and reduce ecological services.
Data source	Internal survey documents and professional judgment, Kevin Holcomb, Jack Kumer
Data collection process	Based off an inventory of flora and fauna and professional judgment, a count is maintained of any indigenous species no longer believed to be present on the island within the past five years.
Data Entry	Every five years –any known extirpations since the last monitoring report
Significant	ANY change in the number of extirpated indigenous species is significant. The more

Change	species extirpated the more the measurement is degraded, unless it is believed that extirpation occurred through natural processes such as shifting habitats. If an extirpated species is recovered or reintroduced in the wilderness, then it would improve the measurement.
Data Adequacy	Medium- It is difficult to monitor every specie on the island and know whether is has been completely extirpated or still have a viable population.
Confidence	Medium
2012 Data	Extirpated Species: Estimated Date of Extirpation Total: 0 for ASIS/CNWR
Condition	Good

Measure 1.5 Visibility

Indicator	Physical Resources
Context	Deciview is a cumulative index to express light extinction. In other words, deciview indicates the amount of visibility in the landscape. Ideally, a wilderness area will have skies clear of anthropogenic pollutants. Deciview measures the fine nitrates and sulfates in the air, the accumulation of which reduces visibility. Deciview is not measured on site for the Assateague island, so the nearest Deciview reading location will be used.
Data source	USFWS National Air Quality Office
Data collection process	To evaluate the condition of each indicator we used all available monitoring data (from NPS, EPA, FS, FWS, state, tribal, and local monitors) to generate interpolations, averaged over five years, to derive estimates of air quality at NPS and FWS units located within the continental United States. Estimates for NPS areas are available at http://www.nature.nps.gov/air/Maps/AirAtlas/IM_materials.cfm. Estimates for FWS areas are available from the NPS Air Resources Division (contact ellen_porter@nps.gov).
Data Entry	Every five years
Significant Change	For examining temporal changes, we cannot perform a rigorous statistical trend analysis on interpolated data (and for only 2 data points). Instead, we are simply assessing whether the estimated value is increasing or decreasing. Visibility (deciviews – dv): < 2 dv - Good 2-8 dv - Moderate > 8 dv - Significant Concern
Data Adequacy	Medium --data for this measure came from a location farther than 100 km.
Confidence	Medium
2012 Data	Group 50 Visibility minus natural conditions= 11.7 for 2005-2009
Condition	Significant Concern

Measure 1.6 Ozone air pollution

Indicator	Physical Resources
Context	Ozone can be a man-made air pollutant. It is capable of traveling long distances and so may be an unnatural presence in the Island wilderness.
Data source	USFWS National Air Quality Office
Data collection	To evaluate the condition of each indicator we used all available monitoring data (from NPS, EPA, FS, FWS, state, tribal, and local monitors) to generate interpolations,

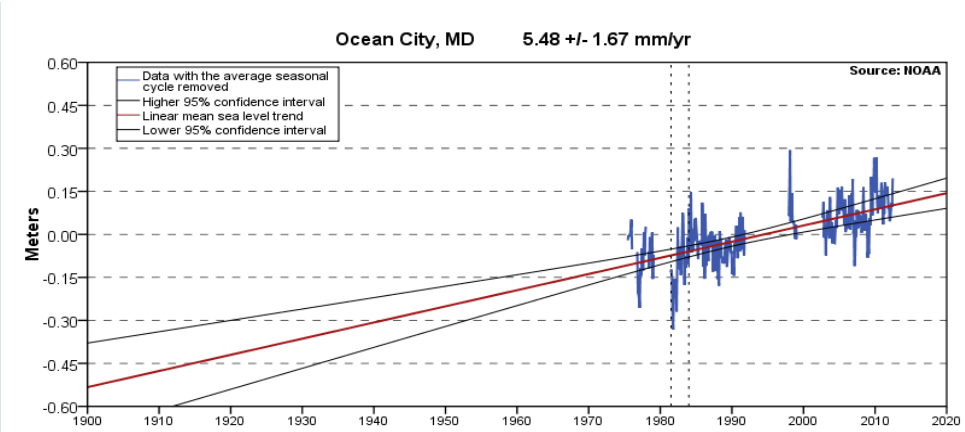
process	averaged over five years, to derive estimates of air quality at NPS and FWS units located within the continental United States. Estimates for NPS areas are available at http://www.nature.nps.gov/air/Maps/AirAtlas/IM_materials.cfm. Estimates for FWS areas are available from the NPS Air Resources Division (contact ellen_porter@nps.gov).
Data Entry	Every five years
Significant Change	For examining temporal changes, we cannot perform a rigorous statistical trend analysis on interpolated data (and for only 2 data points). Instead, we are simply assessing whether the estimated value is increasing or decreasing. Ozone (parts per billion – ppb): < 60 ppb - Good 61-75 - Moderate > 76 - Significant Concern
Data Adequacy	Medium –data for this measure came from a location farther than 16 km.
Confidence	Medium
2012 Data	Ozone 4th highest 8 hr= 79.1 ppb for 2005-2009
Condition	Significant Concern

Measure 1.7 Total Nitrogen and Total Sulfur deposition

Indicator	Physical Resources
Context	Acid deposition is the concentration of sulfur and nitrogen in the rain or snow. High concentrations can be detrimental for algae, aquatic invertebrates, amphibians, fish, soil microorganisms, plants and trees.
Data source	USFWS National Air Quality Office
Data collection process	To evaluate the condition of each indicator we used all available monitoring data (from NPS, EPA, FS, FWS, state, tribal, and local monitors) to generate interpolations, averaged over five years, to derive estimates of air quality at NPS and FWS units located within the continental United States. Estimates for NPS areas are available at http://www.nature.nps.gov/air/Maps/AirAtlas/IM_materials.cfm. Estimates for FWS areas are available from the NPS Air Resources Division (contact ellen_porter@nps.gov).
Data Entry	Every five years
Significant Change	For examining temporal changes, we cannot perform a rigorous statistical trend analysis on interpolated data (and for only 2 data points). Instead, we are simply assessing whether the estimated value is increasing or decreasing. Total-N and S (based on wet deposition in kilograms per hectare per year – kg/ha/yr): <1 - Good 1-3 - Moderate > 3 - Significant Concern
Data Adequacy	High – data for this measure came from a location within 16 km.
Confidence	High
2012 Data	Total N= 3.9, Total S= 5.0 for 2005-2009
Condition	Significant Concern

Measure 1.8 Mean Sea Level Rise

Indicator	Biophysical Processes
Context	Sea level rise exerts a major impact on barrier island dynamics. Assateague Island is

	subsiding and may continue to subside in the future. The island's subsidence also contributes to a relative rise in sea level. An increase in sea level causes increases in erosion and quickens the island's westward and southern migration. Sea level rise can disrupt and alter salt marshes. Also, sea level rise is connected to salt water intrusion and storm surge impacts. Should the sea level rise in the future, it may be responsible for changes in wilderness acreage and habitat composition. The altered landscape will not be considered more unnatural than the original. The change in sea level will be monitored, however, to potentially provide an explanation to ecological changes.
Data source	NOAA Mean Sea Level Trend, Ocean City Inlet, MD http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8570283
Data collection process	The mean sea level trend and a plot (from 1900 to 2010) shows the monthly mean sea level without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. This data is taken from NOAA Tides and Currents at the Ocean City Inlet, MD, which is the nearest station to Assateague Island.
Data Entry	Every five years
Significant Change	At this time, the Refuge and NPS has not determined a sea level rise which is unnatural. The trend will remain stable unless staff's discretion agrees that the current sea level rise is degrading or improving the natural quality for the wilderness.
Data Adequacy	High- The data was collected with a high degree of confidence from the Ocean City station that is monitored by NOAA
Confidence	High
2012 Data	 As of July, 25 2012 the mean sea level trend shows a 5.48 mm/yr rise in sea level with a 95% confidence level of +/- 1.67 mm/yr based on monthly mean sea level data from 1975 to 2006. This is equal to 1.8 feet of sea level rise in 100 years.
Condition	Unknown –While the trend shows a rise in sea level it is difficult to directly comment on how the natural quality is being affected.

Measure 1.9 Frequency of Storm Events

Indicator	Biophysical process
Context	Storm events can influence the barrier island's shape in terms of shore line and dune formation. Strong wind and waves can cause blow outs or overwash as well as erosion. Some meteorological models suggest an increase in storm events due to climate change, thereby exposing the island possibly to more storm events. The resulting landscape from the storm events will not be considered unnatural, but the effects of these storm events may prompt other management actions or developments.
Data source	Hurricanes/Tropical Storms/Tropical Depressions are logged at NOAA Historical

	Hurricane Tracks http://csc.noaa.gov/hurricanes/index.html and Nor'easters are logged at National Weather Service Forecast Office: Wakefield VA http://www.erh.noaa.gov/er/akq/EREVIEW.php
Data collection process	Hurricane/Tropical Storms/Tropical Depressions are recorded at NOAA's website above. Locations, Chincoteague and ASIS, are entered in and the storm events are recorded for the five year monitoring period or annually. To learn about Nor'easters go to the National Weather Service Forecast Office for Wakefield VA and see if any Historical Winter Storm Graphics/Events are labeled as Nor'easters in the drop down menu. If so, check the Nor'easter data to make sure it affected the ASIS/CNWR wilderness. As monitoring continues, other weather events that appear to have significantly affected the landscape can be included in this measure so long as it is confirmed and titled consistently with NOAA or the Wakefield Forecast Office.
Data Entry	Sum of storms for the past five years
Significant Change	Storm events are variable from year to year but a trend may be visible over time that shows an increase in storms or a decrease in storms. At this time there is no determination of how many storms would be considered unnatural. Depending on the trend over time, future staff may decide whether the number of storms has improved or degraded the natural quality.
Data Adequacy	High –NOAA's tracking is reliable and CNWR/ASIS staff can determine if the reported storm occurred on the island.
Confidence	High
2012 Data	Number of significant storms in the past five years: 3

Year	Storm
2007	
2008	Hanna H1
2009	Nor'easter 11/11-11/13
2010	
2011	Irene H2 8/12-8/30
Total	3

Condition	Unknown –Are three storms in five years normal?

5.2 Untrammeled

Monitoring Question	Indicator	Measurement	Freq. of Reporting
What are the trends in actions that control or manipulate the "earth and its community of life" inside the wilderness?	Actions authorized by the Federal land manager that manipulates biophysical the environment	Number of actions to manage plants, animals, pathogens, soil, water, or fire	Annually
		Number of actions to manipulate fire	Annually
		Number of actions for dune maintenance	Annually
	Actions not authorized by the Federal land manager that manipulate	Number of unauthorized actions to manipulate plant, wildlife, insects, fish, pathogens, soil, water, or fire	Annually

	the biophysical environment		

Measure 2.1 Number of actions to manage plants, animals, pathogens, soil, water or fire

Indicator	Actions authorized by the Federal land manager that manipulates biophysical environment
Context	An action is the implementation of an intentional decision to manipulate the biophysical environment. Large or significant actions taken within the proposed wilderness are trammeling the biophysical environment. Some actions in the wilderness are accounted for in the management plan. Unforeseen, intentional actions will be added to the record as they occur. The authorized actions by the ASIS and CNWR Federal land managers are recorded below. Actions that apply to fire or dune maintenance are not recorded here but in their own separate measures. The tools, equipment, structures or transportation used in association with these actions will be included under the Undeveloped measurements.
Data source	Internal staff inventory of actions: Charlene Swartz/Drizz Wilgus, Eva Savage, Jim Fair and Ish Ennis, Jack Kumer, Walt West
Data collection process	Actions are counted annually and entered into the database each year. The time spent on each activity (recorded as number of days that staff entered the wilderness and worked some period of time on the activity) is listed. It is assumed that the more time spent conducting the action, the more trammeling has occurred (this is not always the case but given the breath of activities, the generalization applies). This table is condensed, but a detailed list of specific activities for monitoring, maintenance, etc is located in Appendix D.
Data Entry	Annually
Significant Change	+/- 25%. An increase of 25% in time spent on actions in the wilderness since the last monitoring point degrades the measurement; A decrease of 25% in time spent in the wilderness improves the measurement.
Data Adequacy	High- These are authorized activities which staff can reliably record. This first year may not be as accurate as future years because it was a recall of the past year, not day to day tracking.
Confidence	Medium
2012 Data	

Activity	Time Spent on Activity	
	ASIS	CNWR
Set up for monitoring	103	13
Installing informational signs	38	1
Maintaining existing structures	24	5
Mowing	14	8
Horse Management	25	4
Treating Phragmites	60	
Marsh Restoration	100	
Survey Benchmark installation and maintenance	15	
Trapping		60
TOTAL	379	91

Condition	Caution –There is a considerable amount of activities in the wilderness even though they all serve a purpose.

Measure 2.2 Number of actions to manage fire

Indicator	Actions authorized by the Federal land manager that manipulates biophysical environment
Context	Fire has not been a historical disturbance on the island. Wildfires, however, may occur through natural or human ignitions. Any actions associated with fire will be listed here. If a fire is allowed to burn without intervention then it will not be recorded. Wildfires may be suppressed or contained. This distinction between these actions will be made in the data table.
Data source	Internal staff inventory of actions as well as outside fire crews
Data collection process	Actions are counted annually and entered into the database each year. Refer to measure 2.1. For this measurement, two types of activities are expected: fire suppression or fire containment, in which fire is allowed within a designated area but prevented from spreading to undesirable areas. Fire suppression should be weighted more heavily than fire containment.
Data Entry	Annually
Significant Change	ANY action to manage fire is significant. A greater amount of actions in the wilderness degrades the measurement; fewer actions improve the measurement.
Data Adequacy	High-While it is possible for small fires to go undetected, on the whole fire events and associated actions are noticeable and well recorded.
Confidence	High
2012 Data	Activity: 0; Time Spent on Activity: While one call came to ASIS about a fire in the wilderness, no fire was found. No fire events have occurred in ASIS or CNWR in the past year.
Condition	Good

Measure 2.3 Number of actions for dune maintenance

Indicator	Actions authorized by the Federal land manager that manipulates biophysical environment
Context	Dunes form, accumulate, or erode naturally, however, man can and has manipulated dunes to serve his purposes on Assateague Island. Artificial dunes in the past have been built as storm breaks to protect the interior lands. These artificial dunes may blow out or wash out during storms. Sometimes these dunes will then be repaired, however, they are costly to maintain and impede the natural migration of the islands, sand transport, and overwash habitat creation. Both ASIS and CWNR have planned to allow natural processes to dominate where possible. Any actions in dune maintenance will highlight a departure from the planning process.
Data source	Internal staff inventory of actions
Data collection process	Actions are counted annually and entered into the database each year. Refer to measure 2.1.
Data Entry	Annual average of past five years
Significant Change	ANY change in dune maintenance is significant. A greater amount of actions in the wilderness degrades the measurement; fewer actions improve the measurement.
Data Adequacy	High- Alteration to dunes requires a deliberate management decision. Any alterations will be well recorded.
Confidence	High
2012 Data	Activity; Time Spent on Activity

	0 | 0
	No dune maintenance occurred in ASIS or CNWR this year.
Condition	Good

Measure 2.4 Number of unauthorized actions to manipulate plant, wildlife, insects, fish, pathogens, soil, water, or fire

Indicator	Actions not authorized by the Federal land manager that manipulate the biophysical environment
Context	Actions may be taken on the island without the authorization of the federal land managers. An unauthorized action is any action undertaken by any individual, group, or agency without specific approval by the authorized officer. The individuals, citizen groups, or agencies may take actions which are not necessarily violations but still trammel the environment. At this time, staff at ASIS and CNWR is not aware of any regular, unauthorized actions or the frequency of possible unauthorized actions. This data is limited, therefore, to only specific actions that are known to have occurred rather than any estimation on what the staff suspects may be occurring.
Data source	Internal staff observations and personal judgment of different actions and occurrences: Jim Fair, Walt West
Data collection process	Actions are counted annually and entered into the database each year. Actions are organized by type of activity and number of times this activity was reported or estimated.
Data Entry	Annual average of past five years
Significant Change	+/- 15 cases. Fifteen more unauthorized actions since the last monitoring point in the wilderness degrades the measurement; fifteen fewer actions improve the measurement.
Data Adequacy	Medium- Many potential unauthorized activities are difficult to catch in the act, so a precise count is likely impossible.
Confidence	Medium
2012 Data	Type of Activity | Agency/Group/Person responsible | No. of times reported/estimated Littering | Public | 14 (CNWR) It is also possible that pets are within the proposed wilderness, but it is difficult to know for sure and no reports have been made within the last year.
Condition	Good

5.3 Undeveloped

Monitoring Question	Indicator	Measurement	Freq. of Reporting
What are the trends in non-recreational development inside the wilderness?	Non-recreational structures, installations, and developments	Index of authorized physical structures, installations, or developments	Annually
		Length of active roads and fence	Every five years
		Index of unauthorized physical structures, installations, or developments	Every five years
		Index of abandoned structures	Every five years
		Length of abandoned roads and fence	Every five years
	Inholdings	Index of inholdings with wilderness	Every five years

What are the trends in mechanization inside the wilderness?	Use of motor vehicles, motorized equipment, and mechanical transport	Type and amount of administrative use of motor vehicles, motorized equipment, or mechanical transport	Annually
		Authorized Recreational Motor Vehicle Use	Annually
		Type and amount of motor vehicles, motorized equipment, or mechanical transport use not authorized by the Federal land manager	Annually

Measure 3.1 Index of authorized physical structures, installations, or developments

Indicator	Non-recreational structures, installations, and developments
Context	The wilderness area is meant to be free of man's imprint on the landscape. Any man-made features therefore detract from the undeveloped quality. The Island Wilderness was designated with some man-made features already present; other features, such as research equipment have been added over time. This measure includes all active, authorized physical structures, installations and developments that are currently within the wilderness such as those present prior to designation and temporary structures. This measure does not include unauthorized structures, recreational structures, or abandoned structures. These developments are included in subsequent measures.
Data source	Internal documentation/GIS/knowledge of structures: Eva Savage, Jack Kumer
Data collection process	A list of structures, installations, and developments will be created based off of inventories already present in GIS as well as any unmapped features known to be on the ground. The list of structures, installations, and developments are multiplied by the weight defined in an index. This weight includes the magnitude of the structure and how long the structure was in place. The sum of the product of structure, installations, and developments and weight will be the measure for the five year monitoring period. A detailed list of known structures is in Appendix G, which is intended to help track added structures.
Data Entry	Annually
Significant Change	More than 25% of new developments in the wilderness since the last monitoring period degrade the measure; 10% fewer developments since the last monitoring period improve the measurement.
Data Adequacy	Medium-Some structures are mapped, but the temporary or minor structures such as posts and flags are best estimates.
Confidence	Medium
2012 Data	

Structure, Installation, or Development	Number present x fraction of the year present		Weight	Total	
	ASIS	CNWR		ASIS	CNWR
Bridges	1		5	5	
Gates	6	5	3	18	15
Weather Station	1	1	3	3	3
Traps		50	1		50
Squirrel boxes		5	2		10
Biological exclosures	Am: (120 x .33) + PP: (6 x .19) =40.74	(4 x .25)	2	81.48	2

Biological signs	PP: (100 x.19) + BE (25 X .33) + BB (140 X .49) =95.85	(22 x .46)	2	191.7	20
Cultural sites	2 (Green Run, Graveyard)		5	10	
Fence lines	PP: (30 posts + rope x .19) =5.7		2	11.4	
Deer cameras	(12 x .16) =1.92		2	3.84	
Fox cameras	(90 x .33)=29.6		2	59.2	
PVC Pipe	124		2	248	
Wells	8		2	16	
Flags	100		1	100	
Posts for pond marsh	10		2	20	
Survey benchmark	3	2	1	3	2
No Hunting sings	150		2	300	
Pond hydrology instruments	6		2	12	
OSV boundary posts	160		2	320	
SETs	3		1	3	
Deer/Horse grazing posts	336		2	672	
TOTAL				2,077.62	100

Condition	Caution –Increases in structures will reduce the undeveloped quality

Measure 3.2 Length of authorized physical structures, installations, or developments

Indicator	Non-recreational structures, installations, and developments
Context	This measure lists any authorized, active, physical structures, installations, or developments that are measured by length –primarily roads and fences. Refer to measure 3.1.
Data source	Internal documentation/GIS/knowledge of structures: Jack Kumer
Data collection process	Features that are measured by length, primarily roads and fences, are listed below. The sum of roads and fences will be compared every five years. Roads and fences are not weighted because while the roads may have a greater footprint, they are unpaved and access routes and fences cause barriers.
Data Entry	Every five years
Significant Change	+/- 1000 m. More than 1000 m of road or fence in the wilderness degrade the measure; a reduction of 1000 m of road or fence improves the measurement.
Data Adequacy	High –All known road and fence accounted for

Confidence	High
2012 Data	

Structure, Installation, or Development	Length	
	ASIS	CNWR
Roads	20380 m	8351 m
Pony Fence		6437 m
State line Fence	1145 m	
Post and cable fence along roadways	FX: 989 + BL: 1943 + CB: 443 =3375	
Horse fence	1200 m	
Deer fence	240 m	
Deer/horse grazing fence	1600 m	
Total	27940 m	14788 m

Condition	Good –But could be improved

Photo: Taryn Sudol

Measure 3.3 Index of unauthorized physical structures, installations, or developments

Indicator	Non-recreational structures, installations, and developments
Context	Unauthorized physical structures, installations, or developments still show man's impact or present on the natural landscape. Any features erected by individuals, citizen groups or Federal or state agencies that have not been authorized will be included in this measurement. Any unauthorized recreational structures will not be included here but in a subsequent measure under a Solitude or Primitive and Unconfined Recreation Quality measure.
Data source	Internal documentation/knowledge of structures, etc.
Data collection	A list of unauthorized features will be developed based off any maps and on the ground observations. The sum of these developments will be compared every five years.
Data Entry	Every five years
Significant Change	ANY change in the number of unauthorized developments is significant. More developments in the wilderness degrade the measurement; fewer developments

	improve the measurement.
Data Adequacy	Medium-These are on the ground chance observations. While there is fairly high confidence in these judgments, no survey was conducted and it is possible that that unauthorized structures went unnoticed.
Confidence	Medium
2012 Data	

Structure, Installation, or Development	Number present	Length	Weight	Total
0				

There are no known unauthorized structures in the proposed wilderness at this time.

Condition: Good

Measure 3.4 Index of abandoned structures

Indicator	Non-recreational structures, installations, and developments
Context	Some structures, installations or developments are no longer active in the wilderness. They remain present, but are not being used. Over time the features may be removed or naturally decompose and be absorbed in the landscape. We will determine when these structures have decomposed enough or been absorbed back into the landscape. A significant number of features have been abandoned on Assateague and have therefore been separated as a single measure. In a sense, abandoned structures are "on their way out" and may be viewed differently from active, maintained structures.
Data source	Internal documentation/GIS/knowledge of structures, etc.
Data collection process	This list will be created based off maps and on the ground observations. The list of structures, installations, and developments is multiplied by the weight defined in an index. This list will be limited to abandoned structures that may be both authorized and unauthorized. Recreational structures that are now abandoned are also included in this measure because they no longer serve a recreational function. The sum of the product of structure, installations, and developments and weight will be the measure for the five year monitoring period.
Data Entry	Every five years
Significant Change	An increase of 25% of abandoned developments in the wilderness degrade the measurement; Any reduction in the abandoned developments improve the measurement.
Data Adequacy	High-Staff is confident in their knowledge of abandoned structures
Confidence	High
2012 Data	

Structure, Installation, or Development	Number present		Weight	Total	
	ASIS	CNWR		ASIS	CNWR
Retention Structures	7		5	35	
Mosquito ditches	812 affected acres		2	1624	
Blinds	0		3		
TOTAL				1659	

While there are known berms and dikes on ASIS at this time, they are not mapped and estimation on their footprint cannot be made. When berms/dikes are quantified they will be weighted a 3.

Condition: Good

Photo: Taryn Sudol

Measure 3.5 Length of abandoned physical structures, installations, and developments

Indicator	Non-recreational structures, installations, and developments
Context	Refer to measure 3.4
Data source	Internal documentation/GIS/knowledge of structures, etc.
Data collection process	Refer to measure 3.3. The same protocol is followed except that applicable structures are measured by length in meters.
Data Entry	Every five years
Significant Change	An increase of 25% in abandoned developments in the wilderness degrade the measurement; any fewer abandoned developments improve the measurement.
Data Adequacy	High-Staff is confident in their knowledge of abandoned structures
Confidence	High
2012 Data	

Structure, Installation, or Development	Length	
	ASIS	CNWR
Roads	14293 m	
Fences	0	
TOTAL	14293 m	

Condition	Good

Measure 3.6 Inholdings

Indicator	Inholdings
Context	An inholding is any non-federal land within the wilderness boundary. It does not include cherry-stemmed parcels or external edge-holdings that may be acquired in the future. While inholdings existed at the time of the wilderness proposal, those rights have since expired and been transferred to NPS. Some of those old inholdings may still be on site but they are now included in the abandoned structure measure. At the time of this baseline assessment, there are no inholdings on site nor is there any foreseeable properties that may become inholdings.

Data source	Internal inventory
Data collection process	A count of each inholding and its acreage
Data Entry	Every five years
Significant Change	ANY change in the number of inholdings is significant. More inholdings degrade the measurement while fewer inholdings improve the measurement.
Data Adequacy	High –There is an accurate count of the number of inholdings.
Confidence	High
2012 Data	Number of Inholdings and Their Acreage in the Proposed Island Wilderness Inholding: 0 Acreage: 0 There are no inholdings for ASIS or CNWR in 2012. Any old inholdings are now included in the abandoned structures measure.
Condition	Good

Measure 3.7 Type and amount of administrative use of motor vehicles, motorized equipment, or mechanical transport

Indicator	Use of motor vehicles, motorized equipment, and mechanical transport
Context	"Motor vehicles" are any machines used to transport people or material across or over land, water, or air, and which are powered by the use of a motor, engine, or other nonliving power source. This includes, but is not limited to, ATVS, motor boats, trucks and aircraft that either land or drop off or pick up people or material (i.e., not aircraft that merely fly over the wilderness). "Motorized equipment" are any machines that are not used for transportation by are powered by a motor, engine, or other nonliving source. This includes, but is not limited to, machines such as chainsaws and generators. It does not include small hand-carried devices such as shavers, wristwatches, flashlights, cameras, etc. "Mechanical transport" refers to any contrivance for moving people or material in or over land, water, or air, having moving parts, that provides a mechanical advantage to the user, and that is powered by a living or non-motorized power source. This includes, but is not limited to, sailboats, bicycles, game carriers, carts, and wagons. It does not include wheelchairs when used as necessary medical appliances. It also does not include rafts, canoes, or similar primitive devices without moving parts. This measure applies to all sectors of the NPS and FWS staff or other authorized bodies. This includes law enforcement patrols or those agencies that respond to emergencies. Since emergencies are rare events, they are included in this measure instead of being a separate measure. At the time of this baseline assessment, recreational OSVs are permitted in the NPS portion of the Island Wilderness. At most, 145 OSVs are allowed per day in the wilderness zone during certain portions of the year.
Data source	Internal staff reporting of activities and associated transport/equipment. CNWR: Charlene Swartz and Drizz Wilgus, Eva Savage and Jim Fair. ASIS: Ish Ennis, Jack Kumer, and Walt West.
Data collection process	Use of motorized vehicles and equipment and mechanical transport is recorded based on activity, the number of times it was used (a "time" means it entered and exited the wilderness. A time does not exceed one whole day in length, but otherwise this does not indicate the length the vehicle or equipment was in use). Transportation and equipment used is assumed based on the activity done. Refer to Appendix G for a

	detailed list of activities.
Significant Change	+/- 10%. An increase of 10% of motorized vehicles, motorized equipment, and mechanical transport in the wilderness degrades the measurement while 10% less motorized vehicles, motorized equipment, and mechanical transport improves the measurement.
Data Entry	Annually
Data Adequacy	Medium –Interviewers have confidence what they reported, but this tracking remains a retroactive estimation. Admittedly several activities may have been forgotten/unaccounted for. There is also the possibility that double counting has occurred because some activities may have been accomplished in one vehicle trip.
Confidence	Medium
2012 Data	

Activity	No. of times motorized vehicles used		No. of times mechanical transport used		No. of times motorized equipment used	
	ASIS	CNWR	ASIS	CNWR	ASIS	CNWR
Monitoring	594	89				
Research	142	64				
Other Biological Actions	234				126	
Patrolling	1220	800				
Maintenance	135	69		15	48	1
Mowing	14	16		8		
TOTAL	2,339	1038	0	23	174	1

Condition	Caution/Poor –There is a high frequency of motor vehicles in the wilderness

Measure 3.8 Authorized Recreational Motor Vehicle Use

Indicator	Use of motor vehicles, motorized equipment, and mechanical transport
Context	As of 2012, ASIS policy allows for recreationalists to use motor vehicles in two ways within the wilderness. If OSV users have a permit, they can drive their vehicles on the beach. During hunt season, hunters can enter their areas with their vehicles as well.
Data Source	Number of OSV users counted through gate entry automated counter. OSV use in the wilderness based on Katherina Forgue's thesis. Hunter vehicles for duck hunting logged by check-in and hunter vehicles for deer hunting is professional judgment by Walt West.
Data collection process	To calculate the OSV usage, use the total traffic count per month from August of the previous year to July of the current year. The assumption is that 10% of OSVs that enter the zone will travel to the wilderness zone. This assumption was derived from Katherina Forgues' thesis observations. To calculate hunter vehicles in the wilderness, use a count of the sign in and sign out for duck hunting. For deer hunting use professional judgment of how many vehicles entered the wilderness.
Significant Change	+/- 10%. An increase of 10% of motorized vehicles, motorized equipment, and mechanical transport in the wilderness degrades the measurement while 10% less motorized vehicles, motorized equipment, and mechanical transport improves the measurement.
Data Entry	Annually
Data Adequacy	Medium- While the traffic count for OSV should be accurate, how many OSV users enter the wilderness is an estimation. Duck hunting vehicle counts should be accurate but deer hunting vehicles is another estimation.
Confidence	Medium
2012 Data	

Use of Motor Vehicle	No. of motor vehicles
OSVs	2748

Hunter Vehicles –Duck	73
Hunter Vehicles –Deer	<20
TOTAL	2841

Condition: Poor /Unknown–Motor vehicles are prohibited in the wilderness. Do not know whether this is a high or low year of recreational use.

Measure 3.9 Type and amount of motor vehicles, motorized equipment, or mechanical transport use unauthorized by the Federal land manager

Indicator: Use of motor vehicles, mechanical transport and motorized equipment

Context: Ref to measure 3.7 for motor vehicle, motorized equipment, and mechanical transport definitions. The use of these devices by any individuals, citizen groups or unauthorized Federal and state agencies will be listed here. The awareness of unauthorized use depends in part on the amount of monitoring and patrolling (which has its own wilderness impacts). At this time the amount of use of different types of transport and equipment will be given a score based on a range of frequency and extent. Recreational uses are also recorded here.

Data source: Observations and professional judgment from law enforcement: Walt West, Jim Fair.

Data collection process: The use of unauthorized motorized and mechanical transportation and equipment will fall within frequency ranges. Staff will decide the range for frequency (week, month, and year) and then use observations and informed personal judgments to assign a score to the different type of uses.

Category	Frequency of unauthorized use	Score
Public	less than 5x per year	1
	5x/year to 1x/month	2
	more than 1x/month	3
Permittees	less than 5x per year	1
	5x/year to 1x/month	2
	more than 1x/month	3
Agencies	less than 5x per year	1
	5x/year to 1x/month	2
	more than 1x/month	3

Data Entry: Annual average of past five years

Significant Change: +/- 3 points. If more unauthorized use of motorized vehicles, motorized equipment, or mechanical transport occurs this degrades the measurement, while less use improved the measurement.

Data Adequacy: Medium –Unauthorized activities are not readily recorded and staff is only aware of it through chance observation.

Confidence: Medium

2012 Data

Type of Use	Category	Frequency Score
Bikes (CNWR)	Public	1
Vehicles (ASIS)	Public	1

Condition	Good

5.4 Solitude or Primitive and Unconfined Recreation

Monitoring Question	Indicator	Measurement	Freq. of Reporting
What are the trends for outstanding opportunities for solitude within the wilderness?	Remoteness from sights and sounds of people inside the wilderness	Percent of wilderness affected by access or travel routes inside the wilderness	Every five years
		Amount of litter on CNWR	Annually
	Remoteness from occupied and modified areas outside the wilderness	Permanent Viewshed	Every five years
		Temporary Viewshed	Every five years
		Percent of wilderness affected by access or travel routes outside the wilderness	Every five years
What are the trends for outstanding opportunities for primitive and unconfined recreation inside the wilderness?	Facilities that decrease self-reliant recreation	Agency-provided recreation facilities	Every five years
		User-created recreation facilities	Every five years
	Management restrictions on visitor behavior	Visitor restriction index	Every five years
		Extent of management restrictions	Every five years

Measure 4.1 Percent of wilderness affected by access or travel routes inside the wilderness

Indicator	Remoteness from sights and sounds of people inside the wilderness		
Context	The wilderness is intended as a place to feel isolated from the sites and sounds of people. It provides an opportunity for solitude with nature. Being within proximity to access or travel routes exposes visitors to people and motorized transport. For the purposes of this measurement, travel routes include active roads or routes used by vehicles, authorized or unauthorized. This includes routes in the sand typically used by OSVs. It does not include abandoned roads that are no longer used.		
Data source	Internal GIS records		
Data collection process	Staff will create a 35 ft buffer area around access or travel routes. The total of this buffer area calculated in GIS will be divided by the total wilderness area for the percent affected. Travel routes will include roads or routes that are actively being used by vehicles. It does not apply to foot traffic. Roads that are abandoned are no longer considered travel routes.		
Data Entry	Every five years		
Significant Change	+/-5% An increase of 5% from the last monitoring data point in the percent of wilderness affected degrades the measurement, while a decrease of 5% is an improvement.		
Data Adequacy	High-Travel routes are known and mapped. The most up-to-date total acreage should be used.		
Confidence	High		
2012 Data		ASIS	CNWR

Area Affected	443554 m^2	178191 m^2
Percent Affected	3%	3%

Condition: Good

Measure 4.2 Amount of litter on CNWR

Indicator: Non-recreational structures, installations, and developments

Context: Litter is any discarded man-made materials. While litter from visiting individuals may be low, a noticeable amount of litter washes up on the shore from the ocean. From Mylar balloons to old tires, this garbage interrupts the natural landscape and may pose a threat to wildlife.

Data source: Ocean Conservancy International Coastal Clean Up Summary Card. The beach cleanup is conducted on Chincoteague NWR by volunteers who are led by Jenny Owen, Volunteer Coordinator, or Sally Bowen.

Data collection: Annually on CNWR there is a beach cleanup as part of the Ocean Conservancy. Since the wash up of trash from the ocean is a random process and not wilderness specific, this measure will track the amount of litter collected on the whole CNWR. The clean up occurs in mid-September. Data collected includes number of volunteers, the distanced cleaned at the site, the pounds of debris collected, and what that debris is composed of. For the purposes of this measure, the average weight of debris collected will be compared over each five year monitoring period. The number of volunteers and the distance cleaned will be listed also as a possible explanation for the amount of debris collected, but will not be included in the final measurement (average pounds of debris collected).

Data Entry: Annually

Significant Change: +/- 1500 pounds. The litter collected can be highly variable from year to year. The measurement is improved if litter decreases by 1,500 pounds or is degraded if litter increases by 1,500 pounds.

Data Adequacy: Medium –This data is not specific to the wilderness and the amount of debris collected may be influenced by number of volunteers to area of beach cleaned. This data therefore does not precisely reflect the exact amount of litter in the wilderness.

Confidence: High

2012 Data:

	Annual Average for Pounds of Litter Collected on Chincoteague NWR		
Year	Volunteers	Distance cleaned (Miles)	Pounds of litter collected
2006	153	16	6560
2007	139	18	15,660
2008	Not collected due to a hurricane		
2009	117	16	3280
2010	200	12	920
2011	137	15.5	4760
Annual Average	151	14.5	4627*

*Year 2007 is not included in the average because it is an extreme outlier

Condition: Unknown –The past five years is fairly scattered

Measure 4.3 Permanent Viewshed

Indicator: Remoteness from occupied and modified areas outside the wilderness

Context: Visitors to the wilderness are not meant to feel surrounded by civilization. A visitor to

	the wilderness ideally should only see a natural landscape. Visible developments outside of the wilderness boundary detract from a feeling of solitude. This measure tracks permanent man-made structures within view of the wilderness. While some structures may come and go, if they are not seasonal or temporary at the time of data collection, they are considered permanent. Across the bay, some houses are present but they are distant and indistinguishable so were not included in the count. Crab floats are also present in the bay, but also because of their small size and distance from the wilderness boundary, they are not included in the count.
Data source	Field count
Data collection	Count number of man-made structures visible in wilderness that are permanent features through the on-the-ground surveys. A boat ride in the bay along the length of the wilderness will provide a count of visible structures. Effort is made to be as close to the shore as possible, but is limited by the water depth.
Data Entry	Every five years
Significant Change	+/-10% If the number of structures in the permanent viewshed increases by 10% since the last monitoring data point, then the measurement degrades. If the number of structures deceases by 10%, the measurement improves.
Data Adequacy	Medium- While this was a physical survey, it was limited by how close the boat could get to the border and what could be seen.
Confidence	Medium
2012 Data	

Type of Structure	No. of structures	
	ASIS	CNWR
House/oyster shacks	2	10
Blinds	2	37
TOTAL	4	47

Condition	Good

Measure 4.4 Temporary Viewshed

Indicator	Remoteness from occupied and modified areas outside the wilderness
Context	Some structures only pass by the wilderness, yet still interrupt a visitor's solitude experience. In this case, motor boats, OSVs, or aircraft may be within view of certain parts of the wilderness. For this measure, visible OSV will be included even though they are within the wilderness. This is because OSV is prohibited in wildernesses in general, and their presence is detraction from the feeling of solitude and primitive recreation.
Data source	Field count
Data collection process	A sample will be taken (15 min) of the number of temporary man-made structures that pass through the viewshed during a designated time (10:00 am) at a specified location, the state line fence. During the sample the monitor will list mobile structures that pass within view (not sound), how long it takes to pass, and how close the structures are based on a distance score (4-Just outside the boundary to 1-Distant, on the horizon or high in the sky).
Data Entry	Every five years
Significant Change	+/-5 mobile structures. If the number of structures in the temporary viewshed increases by 5 since the last monitoring data point, then the measurement degrades. If the number of structures deceases by 5, the measurement improves.
Data Adequacy	Low –This is one fifteen window in five years. While it provides a snap shot, it does not capture the whole picture. Data adequacy can be improved if more points were measured with greater frequency, but this requires greater time and effort from the staff.
Confidence	Confidence is data collected from protocol is high.

2012 Data

Site	Type of structure	No. of structures	Time in viewshed	Distance from viewer	TOTAL
Stateline-Ocean	OSV	2	15 min	1	30
Stateline-Bayside	0				
Bay view	0				

Condition: Good

Photo: Taryn Sudol

Measure 4.5 Percent of wilderness affected by access or travel routes outside the wilderness

Indicator	Remoteness from occupied and modified areas outside the wilderness
Context	Being within proximity of travel routes can detract from a solitude experience even if the routes are not within the wilderness boundary. These travel routes are still accounted for. For the purposes of this measurement, travel routes include active roads or routes used by vehicles, authorized or unauthorized. This includes routes in the sand typically used by OSVs. It does not include abandoned roads that are no longer used.
Data source	GIS data on travel routes determined to be adjacent to wilderness
Data collection	Staff will create a 35 ft buffer area around adjacent access or travel routes. The total of this buffer area calculated in GIS will be divided by the total wilderness area for the percent affected. Travel routes will include roads or routes that are actively being used by vehicles. It does not apply to foot traffic.
Data Entry	Every five years
Significant Change	+/- 5%. If there is an increase of 5% of the percent affected since the last monitoring point, then this is degradation to the measurement. If there is a decrease of 5% of the percent affected, then this is an improvement.
Data Adequacy	High-Traveled routes are known and mapped. The most accurate, up to date acreage should be used.
Confidence	High

2012 Data

	ASIS	CNWR
Area Affected	228 m^2	78945 m^2
Percent Affected	>1%	1.13%

Condition: Good

Measure 4.6 Agency-provided recreation facilities

Indicator	Facilities that decrease self-reliant recreation
Context	Recreation facilities reduce the feeling of primitive recreation, which is meant to be provided in a wilderness setting. Even though some visitors may enjoy or appreciate facilities, and in some cases the facilities are authorized by law, they are inconsistent with primitive recreation. As such, this measure tracks the number of ASIS and CWNR provided recreational facilities.
Data source	Internal staff inventory
Data collection	The recreational facilities will be counted and organized by type.
Significant Change	ANY change in the number of trails or campsites is significant. If the number of trails/campsites is reduced, then this improves the measurement. If the number of trails/campsites is increased, this degrades the measurement. If any combination of picnic tables, toilets or fire rings is greater than 3, this qualifies as a campsite. Two hunting blinds also qualifies as a campsite. The addition or removal of 15 white rods for hunting posts qualifies as a trail.
Data Adequacy	CNWR does not provide campsites or recreational facilities in the proposed wilderness. ASIS has three back country campsite areas within the wilderness.

2012 Data

Type of Recreation Facility	No. of facilities	
	ASIS	CNWR
Hunting Trails	8	
White Rods	175	
Blinds	8	
Campsites:	3	
Picnic Tables	9 (3 per site)	
Toilets	9 (3 per site)	
Fire Rings	9 (3 per site)	

Condition: Unknown –This is a baseline. The state of recreational facilities has not changed much.

Photo: Taryn Sudol

Measure 4.7 User-created recreation facilities

Indicator	Facilities that decrease self-reliant recreation
Context	Some visitors may create their own recreation facilities, such as hunting blinds, but these detract from primitive recreation for them, other people who utilize them, and those who see them as man-made features. These user-created recreation facilities must also be tracked to the best available knowledge.
Data source	Observations and professional judgment from law enforcement: Walt West, Jim Fair.
Data collection process	Unauthorized recreational facilities will be counted and organized by type.
Significant Change	+/- 3. If the users create 3 more new recreation facilities since the last monitoring data point, then this is a degradation of the measurement. A decrease of 3 since the last monitoring data point would be an improvement of the measurement.
Data Adequacy	Medium –This count is gained only through chance observation rather than a complete survey. The general feeling is that user-created facilities are few. Hunting blinds/aids may be created each year.
Confidence	Medium
2012 Data	

Type of recreation facility	No. of facilities	Weight	Total
Temporary tree stands	~7		

Law enforcement on ASIS believes that maybe 5-10 temporary tree stands for hunters are found each year.

Condition	Unknown –This is a baseline. A 5-10 range might be good or it could be reduced?

Measure 4.8 Visitor Restrictions Index

Indicator	Management restrictions on visitor behavior
Context	Being in a wilderness an opportunity to experience freedom or be unconfined. Restrictions on activities will be tracked as degradation to unconfined recreation. While regulations in most cases serve to protect resources in the wilderness, a decrease in the level of restrictions indicates an improvement in unconfined creation.
Data source	Internal records
Data collection	A score will be given to ASIS and CNWR based on the type of restrictions. These restrictions will be organized by category and the score assigned based on if there is no regulation or total prohibition. The higher the sum of the scores the more restrictions exist in the wilderness.

Category	Type of Restriction	Score
Camping	No Restriction	0
	Designated site or mandatory setback	1
	Total prohibition	2
Campfires	No Restriction	0
	Any mandatory setback (e.g. designated site)	1
	Total prohibition	2
Fees	No Fees	0
	Fees charged of selected user type	1
	Fees charged of all visitors	2
Length of Stay	No restrictions on length of stay	0
	Length of stay limited	1
Group size limits	No restriction	0
	Group size limits in place	1

Leash requirement	No restriction	0
	Pets required to be on leash	1
	Total prohibition	2
Hunting Restrictions	No restriction	0
	Designated Season	1
	Total prohibition	2

Significant Change: ANY change in the visitor restriction score is significant. A higher score is degradation to the measure while a lower score is an improvement to the measurement.

Data Entry: Every five years

Data Adequacy: High-Management policies are definite

Confidence: High

2012 Data

Type of Restriction	ASIS Score	CNWR Score
Camping	1	2
Campfire	1	2
Fees	2	2
Length of Stay	1	1
Group Size Limits	1	0
Leash Requirement	2	2
Hunting Restrictions	1	1
TOTAL SCORE	9	10

Condition: Caution –The maximum score possible in this index is 12.

Measure 4.9 Percent of wilderness closed to public access year-round

Indicator: Management restrictions on visitor behavior

Context: If areas of the wilderness are closed off the there is a restriction in visitor behavior. This measure focuses on the percent of wilderness closed to public access over a certain number of days. In general, CNWR restricts visitors to the service road and wet beach except during the hunting season. Predator exclosures for nest are also blocked off in ASIS and CNWR but these are small enough to be considered insignificant.

Data source: Internal records –GIS layer delineation of wilderness area and roadways.

Data collection: This is a GIS calculation of the accessible travel routes area within the wilderness. All area outside these travel routes is restricted in the CNWR portion of the land. This number (area restricted/total area) is then compared to the number of days it is prohibited (year minus hunting season). Restricted areas in ASIS include retention structures and research plots.

Data Entry: Every five years

Significant Change: If a greater amount of the wilderness is prohibited, then this degrades the measurement. If less of the wilderness is prohibited, then this improves the measurement.

Data Adequacy: High –Management policies are clear and the calculation is reliable in GIS.

Confidence: High

2012 Data

	Percent area restricted	Days area is restricted
ASIS	<1%	365
CNWR	99%	315

Condition: Good for ASIS. Poor for CNWR.

5.5 Other Features

Monitoring Question	Indicator	Measurement	Freq. of Reporting
Other Features	Deterioration or loss of cultural resources integral to wilderness character	Number of actions that result in disturbances to cultural resources (looting, trespass activities, non-compliance with NHPA)	Annual average of past five years

Measure 5.1 Number of actions that result in disturbances or improvements to cultural resources

Indicator	Deterioration or loss of cultural resources integral to wilderness character
Context	Certain sites in the wilderness have cultural significance. Any damage or disturbance of these sites, including unauthorized activities such as looting, would result in a loss of Assateague's wilderness character. If actions are taken to preserve or restore these cultural sites, this will improve the measurement. These sites include the graveyard, Green Run Hunting Lodge, and shipwrecks. If any cultural feature emerges in the future, any damages or preservation actions to it must also be tracked.
Data source	Internal staff consultation of associated activities.
Data collection process	An inventory of the cultural sites will be created then any actions that occur on these sites will be listed. If the activity is damaging it will receive a negative score. If the activity preserves or restores the site it will receive a positive score. The sum of the activities will be tracked during the five year monitoring period.
Significant Change	ANY change in the number of actions that disrupt or improve cultural resources is significant. If more actions have disrupted cultural sites since the last monitoring data point, then this degrades to the measurement. If fewer actions have disrupted since the last monitoring data point or more actions have improved the cultural site, then this improves the measurement. If the score for a subsequent monitoring period is less because fewer improvements were made but no damaging activities occurred, this is not degradation but stable.
Data Entry	Annual Average of past five years
Data Adequacy	High- Cultural sites and activities associated with them are well tracked.
Confidence	High
2012 Data	Cultural Site: ; Activity: 0 ; Score:
Condition	Good

5.6 Measures under Development

Indicator Biophysical processes

Measure	Salt Marsh Integrity
Context	Salt marshes, or coastal wetlands, are unique ecosystems comprising of flora and fauna that have adapted and evolved to extreme conditions of hydrology, soils, and salinity. Numerous wildlife species are highly dependent on salt marshes as breeding, feeding, migratory, or wintering habitat. Unfortunately, the majority of salt marshes have experienced some form of anthropogenic alteration such as oil spills, chemical mosquito control, drainage for mosquito control, salt hay farming, introduction of invasive species, restricted tidal flow, road construction, or channelization. These

	alterations impact both the intrinsic value of salt marshes as well as the quality of salt marsh habitat for the unique wildlife they support. Among the most important anthropogenic changes operating at the landscape/regional scale are the threats posed by global climate change. Sea level rise is a specific consequence of global climate change, and as sea-level rise accelerates and inundates some salt marshes, migration/creation of new salt marshes will be severely hampered by human development of adjoining lands.
Data source	Internal Survey documents
Data collection process	A series of metrics have been identified for Salt Marsh Integrity (Tidal flushing, natural butter, nekton density, bird abundance, salinity, etc). For each metric a utility function has been devised based on values from the literature and fieldwork. Based off these utility functions (graphical relationships: linear, parabolic, logarithmic), the measure in the field is converted to a score between 0-1 (good, bad or ugly). The sum of these scores is the Salt Marsh Integrity. This rank can be compared over time or between salt marshes, and is meant to be measured on a 3-5 year rotation. Since this is the first year (2012) that data is being collected, utility functions and scores may still require adjustment.
Data Entry	Every five years
Significant Change	Cannot yet be determined
Data Adequacy	High-Protocol is functioning on a regional level and has been studied/tested for a balance between feasibility and accuracy.

Measure	Night Sky Visibility
Indicator	Remoteness from occupied and modified areas outside the wilderness
Context	Light pollution by artificial light sources reduces visibility of stars and nebulae. A visible night sky can be associated with feelings of humility and being part of something larger. Also, light pollution can disorient wildlife. ASIS and CNWR have limited control of light pollution from the surrounding areas but they may take action at administrative sites and work with local communities. As light pollution increases only the brightest stars remain visible. Based on how many stars are visible on a clear night, the park and refuge can estimate night sky visibility and compare over time.
Data source	Staff observation. Protocol derived from GLOBE at Night http://www.globeatnight.org/observe_magnitude_orion.html
Data collection process	An hour after sunset on a clear night, a staff/volunteer will travel to point within the wilderness and locate the Orion constellation. The amount of visible stars associated with this constellation will be compared to magnitude charts provided by GLOBE at Night. The visible constellation that is most similar to whichever magnitude chart (1-7) will receive that magnitude score. The higher the magnitude score, the better night sky visibility. Higher night sky visibility increases the remoteness of people within the wilderness.
Significant Change	ANY change in the magnitude score is significant. If the magnitude score increases since the last monitoring data point, this improves the measurement. If the magnitude score decreases, this degrades the measurement.
Data Adequacy	Medium –The protocol is simple and requires low resources but can be influenced by weather and subjective estimations.
2012 Data	

5.7 Measures Not Used

Measures Not Used			
Quality	Indicator	Measure	Comments
Natural	Plant and Animal Species Communities	Composition of habitat types	It was ultimately decided that under no circumstances would the loss of habitat types suggest that the wilderness is less natural then it was before
Natural	Biophysical	Change in Natural Fire Regime	Fire has not been historical disturbance on the island. It is a rare event caused by lighting or human ignitions
Natural	Biophysical	Subsidence Rate	At this time it is not possible to distinguish between the island subsiding and a rise in the surround ocean. It would be useless to separate the between sea level rise and subsidence because sea level rise is caused by more global processes while subsidence is caused by a reduction in the groundwater aquifers.
Natural	Biophysical	Volume of Sand	On further consideration, it would be impossible to attribute whether the island is changing due to natural processes or man-made events. As such, any shape of the island with whatever volume of sand is considered natural.
Natural	Plant and Animal Communities	Status of Species of Concern	Species of concern have populations that are too variable to allow for trends for improvements or decreases. They are dependent on available habitat. At the moment wilderness areas particularly do not offer prime habitat compared to other portions of the island
Solitude or Primitive and Unconfined Recreation	Remoteness from modified and occupied areas outside the wilderness	Seasonal Viewshed	At this point in time, there are two possible seasonal features in the bay: blinds and crab floats. It was determined that crab floats are not visible in the viewshed. There is no current knowledge of which blinds are seasonal. If this is determined these temporary blinds will be accounted of the permanent viewshed but will receive a lesser weight (the fraction of the year it occupies the viewshed).
Solitude or Primitive and Unconfined Recreation	Remoteness from sights and sounds of people inside the wilderness	Number of Hunters in Wilderness Zones	Hunters may choose to hunt in zones that are within the wilderness in order to have a solitude experience. This measure attempted to quantify the number of hunters per zone, however, data was not available on the number of hunters in each zone per day. Management does not intend to reduce the number of hunters in the wilderness nor discourage hunters from accessing the wilderness. The measure therefore would be sporadic and not experience administrative actions.

Section 6. Issues and Conclusion

The 2012 wilderness character baseline assessment designed 35 measures to be monitored into the future. Three measures are under development and should be incorporated by the next monitoring period. If new technologies make more sophisticated and precise measures possible, these measures may be revised.

The completed measures, and those soon to be implemented, comprehensively represent trends in the five wilderness character qualities. Tracking these measures over time will indicate whether the wilderness remains stable, improves, or degrades. Given that some measures may be more variable than others, management on ASIS and CNWR may target certain measures for improvement or address measures that continually face challenges.

One issue of environmental concern is that the barrier island may undergo significant alterations from future climate change. There may be pressures for dramatic intervention to preserve the island at a certain state. When deciding on how to treat the barrier island dynamics, consideration should also be given to wilderness character.

In Maryland, it is currently permissible for permit-holders to access the wilderness on OSVs, yet, a minimal number of motorized vehicles best represents primitive recreation. OSV usage can be a contentious issue. As mentioned in the ASIS General Management Plan update, “OSVs are the greatest obstacle to public acceptance of wilderness designation and the most serious impact to wilderness character.” When considering the alternatives to the present OSV access, the impact they have on wilderness character should hopefully be reflected in the designed wilderness measures.

A ranking of Good, Caution, Poor or Unknown described the condition for each measure in 2012. While many of the measures are in good condition, a few measures are in danger of becoming poor. For these measures, which include authorized actions, authorized developments and authorized motorize vehicles, Minimum Requirement Analysis may guide which management alternatives are most appropriate in the wilderness.

This baseline assessment may serve as a tool to develop awareness of the proposed wilderness and key features within it. Staff can communicate to the public the state of the wilderness and the opportunities they have to experience it. Additionally, because the proposed Assateague Island wilderness is managed by both USFWS and NPS, there is the opportunity to coordinate management approaches so that this area is treated as one wilderness. As it stands, actions taken on one side of the state line may affect the experiences visitors may have on the other side.

In sum, the developed wilderness measures encompass wilderness character for the proposed Assateague Island wilderness. Commitment to monitoring these measures will track wilderness status. This can then inform management plans and encourage public appreciation for the wilderness.

Appendix A. Wilderness Act

WILDERNESS ACT
Public Law 88-577 (16 U.S. C. 1131-1136)
88th Congress, Second Session
September 3, 1964
AN ACT

To establish a National Wilderness Preservation System for the permanent good of the whole people, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled.

Short Title

Section 1. This Act may be cited as the "Wilderness Act."

WILDERNESS SYSTEM ESTABLISHED STATEMENT OF POLICY

Section 2.(a) In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness. For this purpose there is hereby established a National Wilderness Preservation System to be composed of federally owned areas designated by Congress as ''wilderness areas'', and these shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness; and no Federal lands shall be designated as ''wilderness areas'' except as provided for in this Act or by a subsequent Act.

(b) The inclusion of an area in the National Wilderness Preservation System notwithstanding, the area shall continue to be managed by the Department and agency having jurisdiction thereover immediately before its inclusion in the National Wilderness Preservation System unless otherwise provided by Act of Congress. No appropriation shall be available for the payment of expenses or salaries for the administration of the National Wilderness Preservation System as a separate unit nor shall any appropriations be available for additional personnel stated as being required solely for the purpose of managing or administering areas solely because they are included within the National Wilderness Preservation System.

DEFINITION OF WILDERNESS

(c) A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

NATIONAL WILDERNESS PRESERVATION SYSTEM - EXTENT OF SYSTEM

Section 3.(a) All areas within the national forests classified at least 30 days before September 3, 1964 by the Secretary of Agriculture or the Chief of the Forest Service as ''wilderness'', ''wild'', or ''canoe'' are hereby designated as wilderness areas. The Secretary of Agriculture shall - **(1)** Within one year after September 3, 1964, file a map and legal description of each wilderness area with the Interior and Insular Affairs Committees of the United States Senate and the House of Representatives, and such descriptions shall have the same force and effect as if included in this Act: Provided, however, That correction of clerical and typographical errors in such legal descriptions and maps may be made.

(2) Maintain, available to the public, records pertaining to said wilderness areas, including maps and legal descriptions, copies of regulations governing them, copies of public notices of, and reports submitted to Congress regarding pending additions, eliminations, or modifications. Maps, legal descriptions, and regulations pertaining to wilderness areas within their respective jurisdictions also shall be available to the public in the offices of regional foresters, national forest supervisors, and forest rangers.

Classification. (b) The Secretary of Agriculture shall, within ten years after September 3, 1964, review, as to its suitability or nonsuitability for preservation as wilderness, each area in the national forests classified on September 3, 1964 by the Secretary of Agriculture or the Chief of the Forest Service as ''primitive'' and report his findings to the President.

Presidential recommendation to Congress. The President shall advise the United States Senate and House of Representatives of his recommendations with respect to the designation as ''wilderness'' or other reclassification of each area on which review has been completed, together with maps and a definition of boundaries. Such advice shall be given with respect to not less than one-third of all the areas now classified as ''primitive'' within three years after September 3, 1964, not less than two-thirds within seven years after September 3, 1964, and the remaining areas within ten years after September 3, 1964.

Congressional approval. Each recommendation of the President for designation as ''wilderness'' shall become effective only if so provided by an Act of Congress. Areas classified as ''primitive'' on September 3, 1964 shall continue to be administered under the rules and regulations affecting such areas on September 3, 1964 until Congress has determined otherwise. Any such area may be increased in size by the President at the time he submits his recommendations to the Congress by not more than five thousand acres with no more than one thousand two hundred and eighty acres of such increase in any one compact unit; if it is proposed to increase the size of any such area by more than five thousand acres or by more than one thousand two hundred and eighty acres in any one compact unit the increase in size shall not become effective until acted upon by Congress. Nothing herein contained shall limit the President in proposing, as part of his recommendations to Congress, the alteration of existing boundaries of primitive areas or recommending the addition of any contiguous area of national forest lands predominantly of wilderness value. Notwithstanding any other provisions of this Act, the Secretary of Agriculture may complete his review and delete such area as may be necessary, but not to exceed seven thousand acres, from the southern tip of the Gore Range-Eagles Nest Primitive Area, Colorado, if the Secretary determines that such action is in the public interest.

Report to President. (c) Within ten years after September 3, 1964 the Secretary of the Interior shall review every roadless area of five thousand contiguous acres or more in the national parks, monuments and other units of the national park system and every such area of, and every roadless island within the national wildlife refuges and game ranges, under his jurisdiction on September 3, 1964 and shall report to the President his recommendation as to the suitability or nonsuitability of each such area or island for preservation as wilderness.

Presidential recommendation to Congress. The President shall advise the President of the Senate and the Speaker of the House of Representatives of his recommendation with respect to the designation as wilderness of each such area or island on which review has been completed, together with a map thereof and a definition of its boundaries. Such advice shall be given with respect to not less than one-third of the areas and islands to be reviewed under this subsection within three years after September 3, 1964, not less than two-thirds within seven years of September 3, 1964 and the remainder within ten years of September 3, 1964.

Congressional approval. A recommendation of the President for designation as wilderness shall become effective only if so provided by an Act of Congress. Nothing contained herein shall, by implication or otherwise, be construed to lessen the present statutory authority of the Secretary of the Interior with respect to the maintenance of roadless areas within units of the national park system.

Suitability. (d)(1) The Secretary of Agriculture and the Secretary of the Interior shall, prior to submitting any recommendations to the President with respect to the suitability of any area for preservation as wilderness –

Publication in Federal Register. (A) give such public notice of the proposed action as they deem appropriate, including publication in the Federal Register and in a newspaper having general circulation in the area or areas in the vicinity of the affected land;

Hearings. (B) hold a public hearing or hearings at a location or locations convenient to the area affected. The hearings shall be announced through such means as the respective Secretaries involved deem appropriate, including notices in the Federal Register and in newspapers of general circulation in the area: Provided, That if the lands involved are located in more than one State, at least one hearing shall be held in each State in which a portion of the land lies;

(C) at least thirty days before the date of a hearing advise the Governor of each State and the governing board of each county, or in Alaska the borough, in which the lands are located, and Federal departments and agencies concerned, and invite such officials and Federal agencies to submit their views on the proposed action at the hearing or by no later than thirty days following the date of the hearing.

Any views submitted to the appropriate Secretary under the provisions of (1) of this subsection with respect to any area shall be included with any recommendations to the President and to Congress with respect to such area.

Proposed modification. (e) Any modification or adjustment of boundaries of any wilderness area shall be recommended by the appropriate Secretary after public notice of such proposal and public hearing or hearings as provided in subsection (d) of this section. The proposed modification or adjustment shall then be recommended with map and description thereof to the President. The President shall advise the United States Senate and the House of Representatives of his recommendations with respect to such modification or adjustment and such recommendations shall become effective only in the same manner as provided for in subsections (b) and (c) of this section.

USE OF WILDERNESS AREAS

Section 4.(a) The purposes of this Act are hereby declared to be within and supplemental to the purposes for which national forests and units of the national park and national wildlife refuge systems are established and administered and -

(1) Nothing in this Act shall be deemed to be in interference with the purpose for which national forests are established as set forth in the Act of June 4, 1897 (30 Stat. 11), and the Multiple-Use Sustained-Yield Act of June 12, 1960 (74 Stat. 215) (16 U.S.C. 528-531).

(2) Nothing in this Act shall modify the restrictions and provisions of the Shipstead-Nolan Act (Public Law 539, Seventy-first Congress, July 10, 1930; 46 Stat. 1020), the Thye–Blatnik Act (Public Law 733, Eightieth Congress, June 22, 1948; 62 Stat. 568), and the Humphrey-Thye-Blatnik-Andresen Act (Public Law 607, Eighty-Fourth Congress, June 22, 1956; 70 Stat. 326), as applying to the Superior National Forest or the regulations of the Secretary of Agriculture.

(3) Nothing in this Act shall modify the statutory authority under which units of the national park system are created. Further, the designation of any area of any park, monument, or other unit of the national park system as a wilderness area pursuant to this Act shall in no manner lower the standards evolved for the use and preservation of such park, monument, or other unit of the national park system in accordance with sections 1, 2, 3, and 4 of this title, the statutory authority under which the area was created, or any other Act of Congress which might pertain to or affect such area, including, but not limited to, the Act of June 8, 1906 (34 Stat. 225; 16 U.S.C. 432 et seq.); section 3(2) of the Federal Power Act (16 U.S.C. 796(2)); and the Act of August 21, 1935 (49 Stat. 666; 16 U.S.C. 461 et seq.).

(b) Except as otherwise provided in this Act, each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use.

PROHIBITION OF CERTAIN USES

(c) Except as specifically provided for in this Act, and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and, except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.

SPECIAL PROVISIONS

(d) The following special provisions are hereby made:

(1) Within wilderness areas designated by this Act the use of aircraft or motorboats, where these uses have already become established, may be permitted to continue subject to such restrictions as the Secretary of Agriculture deems desirable. In addition, such measures may be taken as may be necessary in the control of fire, insects, and diseases, subject to such conditions as the Secretary deems desirable.

(2) Nothing in this Act shall prevent within national forest wilderness areas any activity, including prospecting, for the purpose of gathering information about mineral or other resources, if such activity is carried on in a manner compatible with the preservation of the wilderness environment. Furthermore, in accordance with such program as the Secretary of the Interior shall develop and conduct in consultation with the Secretary of Agriculture, such areas shall be surveyed on a planned, recurring basis consistent with the concept of wilderness preservation by the United States Geological Survey and the United States Bureau of Mines to determine the mineral values, if any, that may be present; and the results of such surveys shall be made available to the public and submitted to the President and Congress.

Mineral leases, claims, etc. (3) Not withstanding any other provisions of this Act, until midnight December 31, 1983, the United States mining laws and all laws pertaining to mineral leasing shall, to the extent as applicable prior to September 3, 1964, extend to those national forest lands designated by this Act as "wilderness areas"; subject, however, to such reasonable regulations governing ingress and egress as may be prescribed by the Secretary of Agriculture consistent with the use of the land for mineral location and development and exploration, drilling, and production, and use of land for transmission lines, waterlines, telephone lines, or facilities necessary in exploring, drilling, producing, mining, and processing operations, including where essential the use of mechanized ground or air equipment and restoration as near as practicable of the surface of the land disturbed in performing prospecting, location, and , in oil and gas leasing, discovery work, exploration, drilling, and production, as soon as they have served their purpose. Mining locations lying within the boundaries of said wilderness areas shall be held and used solely for mining or processing operations and uses reasonably incident thereto; and hereafter, subject to valid existing rights, all patents issued under the mining laws of the United States affecting national forest lands designated by this Act as wilderness areas shall convey title to the mineral deposits within the claim, together with the right to cut and use so much of the mature timber therefrom as may be needed in the extraction, removal, and beneficiation of the mineral deposits, if needed timber is not otherwise reasonably available, and if the timber is cut under sound principles of forest management as defined by the national forest rules and regulations, but each such patent shall reserve to the United States all title in or to the surface of the lands and products thereof, and no use of the surface of the claim or the resources therefrom not reasonably required for carrying on mining or prospecting shall be allowed except as otherwise expressly provided in this Act: Provided, That, unless hereafter specifically authorized, no patent

within wilderness areas designated by this Act shall issue after December 31, 1983, except for the valid claims existing on or before December 31, 1983. Mining claims located after September 3, 1964, within the boundaries of wilderness areas designated by this Act shall create no rights in excess of those rights which may be patented under the provisions of this subsection. Mineral leases, permits, and licenses covering lands within national forest wilderness areas designated by this Act shall contain such reasonable stipulations as may 32

Appendix B. Worksheet to Prioritize Measures

In each row, write the indicator and potential measure in the left column. Use the following criteria and ranking guide to create an overall score for each measure. Those measures with the highest overall scores should be the highest priority for assessing trends in wilderness character.

A. Level of importance (the measure is highly relevant to the quality and indicator of wilderness character, and is highly useful for managing the wilderness):

High = 3 points, Medium = 2 points, Low = 1 point

B. Level of vulnerability (measures an attribute of wilderness character that currently is at risk, or might likely be at risk over 10-15 years):

High = 3 points, Medium = 2 points, Low = 1 point

C. Degree of reliability (the measure can be monitored accurately with a high degree of confidence, and would yield the same result if measured by different people at different times):

High = 3 points, Medium = 2 points, Low = 1 point

D. Degree of reasonableness (the measure is related to an existing effort or could be monitored without significant additional effort):

High = 1 point, Low = 0 point

Potential Measure	Criteria for Prioritizing Potential Measures				OVERALL SCORE
	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
Indicator: Plant and animal species and communities Measure: Composition of habitat types	2 – Diversity does not influence wilderness character. Further discussion (possibly lower)	2- Habitat areas will likely change but may not be significant (uncertainty esp of storms)	3- If the protocol clearly specifies what habitat the land will fall under, this subjective determination can easily be duplicated in the GIS calculation	0- This measure may have a fairly easy determination system, but requires time to classify in GIS, which has not been done before	7
Indicator: Plant and animal species and communities Measure: Population dynamics of selected non-native plant species (phragmites and CAKO)	3- Invasive, non-native plant species have the potential to dominant ecosystems and reduce biodiversity of indigenous species	3- Unless invasives are managed for, their coverage may spread significantly	3-Protocols for invasive coverage are in place/ in development that involve ground surveying and GIS determination	1- Surveys already in place for monoculture stands only	10
Indicator: Plant and animal species and communities Measure: Population dynamics of wild horses	3- Current horse population is a severe detriment to natural barrier island ecosystems. Differentiate between Maryland (suite of wildlife) and	2- Horses have been under an effective population management strategy for years, and not likely to explode (may be politically harder to reduce herd, if suspected it is now too	3- Horse populations are closely monitored	1- Horse populations are currently being monitored islandwide (but not wilderness	9

Potential Measure	Criteria for Prioritizing Potential Measures				OVERALL SCORE
	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
	Virginia herd (exotic).	high). Would become low vulnerability if we reduce herd or remove from certain areas. (There is room for improvement).		specific)	
Indicator: Plant and animal species and communities Measure: Population dynamics of Sika Deer	3- Sika have high population numbers and stress certain habitats	3-Sika may be outcompeting white-tail deer and are already inhabiting the salt marsh. Hunting is a population control mechanism.	1- Sika harvest may provide some estimate of population trends, but catch can be influenced by factors besides size.	1- Use of data that is already being collected	8
Indicator: Plant and animal species and communities Measure: Number of extirpated indigenous species	3- An extirpation is a significant event and may indicate a disruption of a functional ecosystem (unless evolutionary decline or climate change)	2- No suspected imminent extirpations	2- Professional judgment would be informed by inventories, but always a hard call to make if a species is completely extirpated	1- Professional judgement does not require additional monitoring	8
Indicator: Physical Resources	Monitored at a national level				High

Potential Measure	Criteria for Prioritizing Potential Measures				OVERALL SCORE
	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
Measure: Visibility based on average deciview and sum of anthropogenic fine nitrate and sulfate					
Indicator: Physical Resources Measure: Ozone air pollution based on concentration of N100 episodic and W126 chronic ozone exposure affecting sensitive plants	Monitored at a national level				High
Indicator: Physical Resources Measure: Acid deposition based on concentration of sulfur and nitrogen in wet deposition	Monitored at a national level				High

Potential Measure	Criteria for Prioritizing Potential Measures				OVERALL SCORE
	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
Indicator: Biophysical Processes Measure: Salt Marsh Integrity	3- Salt Marshes are very productive ecosystems	3- Salt marshes face multiple threats	3- These are established protocols in the FWS Region 5. Led by Susan Adamowicz.	1- Protocols in development	10
Indicator: Biophysical Processes Measure: Mean Sea Level Rise	3- Sea level rise is a major influence on island dynamics	2-Sea level will likely rise although there is uncertainty about the amount or the effects	2- Taken from NOAA but data not collected on site	1-Data retrieved from outside source, not internal monitoring	8
Indicator: Biophysical Processes Measure: Subsidence Rate	3- Subsidence is a contributing factor when calculating sea level rise.	3-Subsidence is occurring faster than sea level rise.	3-Established protocol and measures	1-Already being monitored	10
Indicator: Biophysical Processes Measure: Frequency of storm events	3- Storm events are major influences on island habitats and system dynamics	3-Uncertainty as well as randomness of whether storm events will occur. High suspicion of more storms.	3-Taken from NOAA	1- Data retrieved from outside source, not internal monitoring	10
Indicator: Biophysical	3- Measure considers island as a whole and	1-Not sure if a major enough change will alter	3-Accurate	1-Simple GIS	8

Potential Measure	Criteria for Prioritizing Potential Measures				OVERALL SCORE
	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
Processes Measure: Volume of Sand on Island	whether it has been reduced or growing	island in next 10-15 years	measurements in GIS	calculation	
Indicator: Actions authorized by the Federal land manager that manipulates biophysical the environment Measure: Number of actions to manage plants, animals, pathogens, soil, water or fire	3-Directly relevant to the indicator	3-Actions likely to vary from year to year, and can potentially managed to reduce/minimize	2-Actions may be estimated rather than detailed recording. Some actions likely to be missed. (Can keep better track after baseline)	1-Time only necessary to record actions	9
Indicator: Actions authorized by the Federal land manager that manipulates the biophysical environment Measure: Actions used to maintain dunes	3-Directly relevant to the indicator	2-Dunes are not intended to be maintained so any actions would be a major event. Could be told to build them again by Congress.	3- Since dune maintenance is rare, it should be easy to keep track of	1 –Time only necessary to record actions	9

Potential Measure	Criteria for Prioritizing Potential Measures				OVERALL SCORE
	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
Indicator: Actions authorized by Federal land manager that manipulates the biophysical environment Measure: Action to Control Fire	3- Directly relevant to the indicator	1- Fire is an infrequent event	3-Since fire is infrequent, it should be easy to keep track of	1-Time only necessary to record actions	9
Indicator: Actions not authorized by the Federal land manager that manipulate the biophysical environment Measure: Number of unauthorized actions to manipulate plant, wildlife, insects, fish, pathogens, soil, water, or fire	3-Directly relevant to the indicator	2-Not suspected that many unauthorized actions occur	2-Impossible to monitor or patrol all unauthorized actions. Must make estimations (although there could be high confidence in estimations)	1-Time only necessary to make estimations	8
Indicator: Non-recreational structures, installations, and developments Measure: Index of authorized physical	3-Directly relevant to indicator	2-Not anticipating addition of many physical features. May remove some.	3-Should be possible to track all physical features	1-Initial research may take time, if features not already mapped	9

Potential Measure	Criteria for Prioritizing Potential Measures				OVERALL SCORE
	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
structures, installations, or developments					
Indicator: Non-recreational structures, installations, and developments Measure: Length of active roads and fence	3-Directly relevant to indicator	2-Not anticipating addition of many physical features.	3-Should be possible to track all physical features	1-Roads mapped, fences accounted for	9
Indicator: Non-recreational structures, installations, and developments Measure: Index of unauthorized physical structures, installations, or developments	3-Directly relevant to indicator	2-Not anticipating major change in unauthorized habits	2-Unless visible on Google Earth, harder to survey on-the-ground.	0-Research required about any additional features that are likely unreported	7
Indicator: Non-recreational structures, installations, and developments Measure: Index of abandoned structures	3-Directly relevant to indicator	2-Abandoned structures should be stable unless removed, decomposed, or active structures become abandoned	3-Should be mostly aware of abandoned structures as they've been present for awhile	0-Initial inventory must be made for unmapped structures and determination of when to be	8

Potential Measure	Criteria for Prioritizing Potential Measures				OVERALL SCORE
	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
				decomposed. Future tracking should take less time.	
Indicator: Non-recreational structures, installations, and developments Measure: Length of abandoned roads and fences	3-Directly relevant to indicator	2-Abandoned strucutres should be stable unless removed, decomposed, or active structures become abandoned	3-Should be mostly aware of abandoned structures	1-Old roads are mapped	9
Indicator: Inholdings Measure: Index of inholdings with wilderness	1-Does not pertain to us	1-No inholdings now or in unforseeable future	3-Easily tracked	1-Easily tracked	6
Indicator: Inholdings Measure: Miles of road associated with inholdings	1-Does not pertain to us	1-No inholding roads now or in forseeable future	3-Easily tracked	1-Easily tracked	6
Indicator: Use of motor vehicles, motorized equipment, and	3-Directly relevant to indicator	3-Variable amount of motorized/mechanical uses. OSV use a management issue.	2-Try to estimate usage based on activity. Difficult to track all usage,	0-Should use existing data of planned activities, but requires time	8

Potential Measure	Criteria for Prioritizing Potential Measures				OVERALL SCORE
	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
mechanical transport Measure: Type and amount of administrative use of motor vehicles, motorized equipment, or mechanical transport		Multiple pressures applied to usage or not	especially unplanned trips.	for organization, interviews, and brainstorming	
Indicator: Use of motor vehicles, motorized equipment, and mechanical transport Measure: Type and amount of administrative use of motor vehicles, motorized equipment, or mechanical transport use not authorized by the Federal land manager	3-Directly relevant to indicator	2-Authorized use occurs more oftern than unauthorized.	2-Difficult to track all usage. Estimations not as accurate as detailed recordings, but may show high confidence	1-Time spent on estimations. Use best judgment and known occurrences.	8
Indicator: Remoteness from sights and sounds of people inside the	3- OSV route is having significant effect on the	3- OSV boundary may change which will produce a significant effect on the measure.	3-Simple GIS calculation	1-Simple GIS calculation	10

Potential Measure	Criteria for Prioritizing Potential Measures				OVERALL SCORE
	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
wilderness Measure: Percent of wilderness affected by access or travel routes inside the wilderness	wilderness.	to			
Indicator: Remoteness from sights and sounds of people inside the wilderness Measure: Hunter use in Virginia	2-Hunters make up just one type of visitor. Currently low hunter density in zones 8,9, & 10	1-No anticipated change in hunter density	3-Easy to track hunters in CNWR wilderness zones	1-Data available	7
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Permanent Viewshed	2-Viewshed should influence only the perimeter of wilderness	1-Not expecting rapid development in viewshed	3-Easy to track	1-Will require a reevaluation every five years, but additions shouldn't be too high.	7

Potential Measure	Criteria for Prioritizing Potential Measures				OVERALL SCORE
	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Seasonal Viewshed	2-Viewshed should influence only perimeter of wilderness	1-Not expecting signficant change in seasonal structures	2-Requires more vigilant monitoring at different times of year	0-Requires tracking of whole year of probably unauthorized structures	5
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Temporary Viewshed	2-Viewshed will mostly influence perimeter (boats) and aircrafts fairly rare	2-Motorboats and aircrafts usage may change. More variable.	2-Protocol is consistent, but only a sample once every five years at limited locations and times	1-Will require limited monitoring every five years	7
Indicator: Remoteness from occupied and modified areas outside the wilderness Measure: Percent of wilderness affected by access or travel routes outside the wilderness	3- OSV usage may significantly affect feeling of remoteness	3-Likely that OSV boundary may be considered outside of the wilderness	3-Simple GIS calculation	1-Simple GIS calculation	10

Potential Measure	Criteria for Prioritizing Potential Measures				OVERALL SCORE
	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
Indicator: Facilities that decrease self-reliant recreation Measure: Agency-provided recreation facilities	3-Directly relevant to measure	1-No anticipated additional facilites or removal of facilities, but nrew access points and distrubution of trails/roads, safety/personal facilities, staff infrastructure	3-Easy to keep track of	1-Retrieved from already available data	9
Indicator: Facilities that decrease self-reliant recreation Measure: User-created recreation facilities	3-Directly relevant to measure	2-May change more so than provided facilities	2-Hard to be fully aware of any user created facilities (hunting blinds)	0-Will require review each five years	7
Indicator: Facilities that decrease self-reliant recreation Measure: Abandoned recreational structures	3-Directly relevant to measure	1-No anticipated additional facilites, may degrade over time.	3-Easy to keep track of because they're more persistent	1-Should have data of agency facilities abandoned. Harder to monitor user created abandoned.	8
Indicator: Management restrictions on visitor	3-Directly relevant to	1-Policies are mostly set	3-Staff determinations.	1- already available	9

Potential Measure	Criteria for Prioritizing Potential Measures				OVERALL SCORE
	A. Importance	B. Vulnerability	C. Reliability	D. Reasonableness	
behavior Measure: Type of management restrictions	measure	in place	Should be documented	data	
Indicator: Management restrictions on visitor behavior Measure: Percent of area restricted	3-Directly relevant to measure	1-Policies are mostly set in place	3-Staff determinations.	1-Already available data. Requires calculation.	9
Indicator: Deterioriation or loss of cultural resources integral to wilderness character Measure: Number of actions that affect cultural resources	3-Directly relevant to measure	1-Minimal activities on cultural sights	2-Hard to track unauthorized activities, but smaller area to track	1-Will be based on of known occurrences	7

Names of team members filling out this worksheet:

Taryn Sudol
Kevin Holcomb
Jack Kumer

Appendix C. Summary of Measures

Measure	Priority (H, M, or L)	Detailed Description of the Data Source(s) and How the Data Were Gathered
Natural		
1.1 Population dynamics of selected non-native plant species	H	*Source:* Internal survey documents and professional judgment *Protocol:* A list is compiled for selected non-native plant species. Scouting and vegetative surveys provide the acreage occupied for the selected non-native plants. This is limited to monotypic stands rather than interspersed species. The total measure will be the sum of each specie's "Percent of acreage occupied" score. See measure 1.2 for acreage occupied score.
1.2 Population dynamics of non-native wild horses	H	*Source:* Internal records –Bill Hulslander, Kim Halpin *Protocol:* The adult horse population (including foals bought back during the Chincoteague Volunteer Fire Company (CVFC auction) for the entire island (herds in both Assateague NS and Chincoteague NWR except the CNWR southern herd which does not have wilderness access) will serve as a surrogate measure for the horses' wilderness presence. These horses have access to large parts of the island including the wilderness area. ASIS monitors their horse population through routine surveys and manages their population through a fertility control program, while the CVFC keeps a number of the CNWR herds. Of the total horse population in CNWR, about two-thirds reside in the North herd which has access to the wilderness. This number may change as horses are transferred from one herd to the other.
1.3 Population dynamics of non-native sika deer	M	*Source:* Distance sampling data, Mark Sturm, professional judgment, Jack Kumer *Protocol:* ASIS has four years of distance sampling data that is able to provide an estimated range for the Sika population as part of a study on ungulate grazing effects on vegetation by Mark Sturm. In the future, ASIS hopes to have new technology or population density methods so that the distance sampling technique does not have to be repeated but will provide comparable statistical results.
1.4 Number of extirpated indigenous species	M	*Source:* Internal survey documents and professional judgment, Kevin Holcomb, Jack Kumer *Protocol:* Based off an inventory of flora and fauna and professional judgment, a count is maintained of any indigenous species no longer believed to be present on the island within the past five years.
1.5 Visibility	H	*Source:* USFWS National Air Quality Office *Protocol:* To evaluate the condition of each indicator we used all available monitoring data (from NPS, EPA, FS, FWS, state, tribal, and local monitors) to generate interpolations, averaged over five years, to derive estimates of air quality at NPS and FWS units located within the continental United States. Estimates for NPS areas are available at http://www.nature.nps.gov/air/Maps/AirAtlas/IM_materials.cfm. Estimates for FWS areas are available from the NPS Air Resources Division (contact ellen_porter@nps.gov).
1.6 Ozone air	H	*Source:* USFWS National Air Quality Office

pollution		*Protocol:* To evaluate the condition of each indicator we used all available monitoring data (from NPS, EPA, FS, FWS, state, tribal, and local monitors) to generate interpolations, averaged over five years, to derive estimates of air quality at NPS and FWS units located within the continental United States. Estimates for NPS areas are available at http://www.nature.nps.gov/air/Maps/AirAtlas/IM_materials.cfm. Estimates for FWS areas are available from the NPS Air Resources Division (contact ellen_porter@nps.gov).
1.7 Total Nitrogen and Total Sulfur Deposition	H	*Source:* USFWS National Air Quality Office *Protocol:* To evaluate the condition of each indicator we used all available monitoring data (from NPS, EPA, FS, FWS, state, tribal, and local monitors) to generate interpolations, averaged over five years, to derive estimates of air quality at NPS and FWS units located within the continental United States. Estimates for NPS areas are available at http://www.nature.nps.gov/air/Maps/AirAtlas/IM_materials.cfm. Estimates for FWS areas are available from the NPS Air Resources Division (contact ellen_porter@nps.gov).
1.8 Mean Sea Level Rise	M	*Source:* NOAA Mean Sea Level Trend, Ocean City Inlet, MD http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8570283 *Protocol:* The mean sea level trend and a plot (from 1900 to 2010) shows the monthly mean sea level without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. This data is taken from NOAA Tides and Currents at the Ocean City Inlet, MD, which is the nearest station to Assateague Island.
1.9 Significance of storm events	H	*Source:* Hurricanes/Tropical Storms/Tropical Depressions are logged at NOAA Historical Hurricane Tracks http://csc.noaa.gov/hurricanes/index.html and Nor'Easters are logged at National Weather Service Forecast Office: Wakefield VA http://www.erh.noaa.gov/er/akq/EREVIEW.php *Protocol:* Hurricane/Tropical Storms/Tropical Depressions are recorded at NOAA's website above. Locations, Chinoteague and ASIS, are entered in and the storm events are recorded for the five year monitoring period or annually. To learn about Nor'easters go to the National Weather Service Forecast Office for Wakefield VA and see if any Historical Winter Storm Graphics/Events are labeled as Nor'Easters in the drop down menu. If so, check the Nor'easter data to make sure it affected the ASIS/CNWR wilderness. As monitoring continues, other weather events that appear to have significantly affected the landscape can be included in this measure so long as it is confirmed and titled consistently with NOAA or the Wakefield Forecast Office.
Untrammeled		
2.1 Number of actions to manage plants, animals, pathogens, soil, water or	H	*Source:* Internal staff inventory of actions: Charlene/Drizz, Eva Savage, Jim Fair and Ish Ennis, Jack Kumer, Walt West *Protocol:* Actions are counted annually and entered into the database each year. The time spent on each activity (recorded as number of days that staff entered the wilderness and worked some period of time on the activity) is listed. It is assumed that the more time spent conducting the action, the more trammeling has occurred (this is not always the case but given the

fire		breath of activities, the generalization applies). This table is condensed, but a detailed list of specific activities for monitoring, maintenance, etc is located in Appendix D.
2.2 Number of actions to manipulate fire	H	*Source:* Internal staff inventory of actions as well as outside fire crews *Protocol:* Actions are counted annually and entered into the database each year. Refer to measure 2.1. For this measurement, two types of activities are expected: fire suppression or fire containment, in which fire is allowed within a designated area but prevented from spreading to undesirable areas.
2.3 Number of actions for dune maintenance	H	*Source:* Internal staff inventory of actions *Protocol:* Actions are counted annually and entered into the database each year. Refer to measure 2.1.
2.4 Number of unauthorized actions to manipulate plant, wildlife, insects, fish, pathogens, soil, water, or fire	M	*Source:* Internal staff observations and personal judgment of different actions and occurrences. *Protocol:* Actions are counted annually and entered into the database each year. Actions are organized by type of activity and number of times this activity was reported or estimated.
Undeveloped		
3.1 Index of authorized physical structures, installations, or developments	H	*Source:* Internal documentation/GIS/knowledge of structures: Eva Savage, Jack Kumer *Protocol:* A list of structures, installations, and developments will be created based off of inventories already present in GIS as well as any unmapped features known to be on the ground. The list of structures, installations, and developments are multiplied by the weight defined in an index. This weight includes the magnitude of the structure and how long the structure was in place. The sum of the product of structure, installations, and developments and weight will be the measure each year. A detailed list of known structures is in Appendix F, which is intended to help track added structures.
3.2 Length of authorized physical structures, installations, and developments	H	*Source:* Internal documentation/GIS/knowledge of structures: Jack Kumer *Protocol:* Features that are measured by length, primarily roads and fences, are listed below. The sum of roads and fences will be compared every five years. Roads and fences are not weighted because while the roads may have a greater footprint, they are unpaved and access routes and fences cause barriers.
3.3 Index of unauthorized physical structures, installations,	M	*Source:* Internal documentation/knowledge of structures, etc. *Protocol:* A list of unauthorized features will be developed based off any maps and on the ground observations. The list of structures, installations, and developments multiplied by the weight defined in an index. The sum of the product of structure, installations, and developments and weight will be

or developments		the measure for the five year monitoring period.
3.4 Index of abandoned structures	M	*Source:* Internal documentation/GIS/knowledge of structures, etc. *Protocol:* This list will be created based off maps and on the ground observations. The list of structures, installations, and developments is multiplied by the weight defined in an index. This list will be limited to abandoned structures that may be both authorized and unauthorized. Recreational structures that are now abandoned are also included in this measure because they no longer serve a recreational function. The sum of the product of structure, installations, and developments and weight will be the measure for the five year monitoring period.
3.5 Length of abandoned physical structures,	M	*Source:* Internal documentation/GIS/knowledge of structures, etc. *Protocol:* Refer to measure 3.4. The same protocol is followed except that applicable structures are measured by length in meters.
3.6 Index of inholdings with wilderness	L	*Source:* Internal inventory *Protocol:* A count of each inholding and its acreage
3.7 Type and amount of administrative use of motor vehicles, motorized equipment, or mechanical transport	M	*Source:* Internal staff reporting of activities and associated transport/equipment. CNWR: Charlene and Drizz, Eva Savage and Jim Fair. ASIS: Ish Ennis, Jack Kumer, and Walt West. *Protocol:* Use of motorized vehicles and equipment and mechanical transport is recorded based on activity, the number of times it was used (a "time" means if it entered and exited the wilderness. A time does not exceed one whole day in length, but otherwise this does not indicate the length the vehicle or equipment was in use). Transportation and equipment used is assumed based on the activity done. Refer to Appendix G for a detailed list of activities.
3.8 Authorized Recreational Motor Vehicle Use	M	*Source:* Number of OSV users counted through gate entry automated counter. OSV use in the wilderness based on Katherina Forgue's thesis. Hunter vehicles for duck hunting logged by check-in and hunter vehicles for deer hunting is professional judgment by Walt West. *Protocol:* To calculate the OSV usage, use the total traffic count per month from August of the previous year to July of the current year. The assumption is that 10% of OSVs that enter the zone will travel to the wilderness zone. This assumption was derived from Katherina Forgues' thesis observations. To calculate hunter vehicles in the wilderness, use a count of the sign in and sign out for duck hunting. For deer hunting use professional judgment of how many vehicles entered the wilderness.
3.11 Type and amount of motor vehicles, motorized	M	*Source:* Observations and professional judgment from law enforcement: Jim Fair, Walt West. *Protocol:* The use of unauthorized motorized and mechanical transportation and equipment will fall within frequency ranges. Staff will decide the range for frequency (week, month, year) and then use observations and informed

equipment, or mechanical transport use not authorized by the Federal land manager		personal judgments to assign a score to the different type of uses. Refer to measure for score table.
Solitude or Primitive and Unconfined Recreation		
4.1 Percent of wilderness affected by access or travel routes inside the wilderness	H	*Source:* Internal GIS records *Protocol:* Staff will create a 35 ft buffer area around access or travel routes. The total of this buffer area calculated in GIS will be divided by the total wilderness area for the percent affected. Travel routes will include roads or routes that are actively being used by vehicles. It does not apply to foot traffic. Roads that are abandoned are no longer considered travel routes.
4.2 Amount of litter on the Refuge's coast		*Source:* Ocean Conservancy International Coastal Clean Up Summary Card. The beach cleanup is conducted on Chincoteague NWR by volunteers who are led by Jenny Owen, Volunteer Coordinator, or Sally Bowen. *Protocol:* Annually on CNWR there is a beach clean up as part of the Ocean Conservancy. Since the wash up of trash from the ocean is a random process and not wilderness specific, this measure will track the amount of litter collected on the whole CNWR. The clean up occurs in mid-September. Data collected includes number of volunteers, the distanced cleaned at the site, the pounds of debris collected, and what that debris is composed of. For the purposes of this measure, the average weight of debris collected will be compared over each five year monitoring period. The number of volunteers and the distance cleaned will be listed also as a possible explanation for the amount of debris collected, but will not be included in the final measurement (average pounds of debris collected).
4.3 Permanent Viewshed	M	*Source:* Field count *Protocol:* Count number of man-made structures visible in wilderness that are permanent features through the on-the-ground surveys. A boat ride in the bay along the length of the wilderness will provide a count of visible structures. Effort is made to be as close to the shore as possible, but is limited by the water depth.
4.4 Temporary Viewshed	M	*Source:* Field count *Protocol:* A sample will be taken (15 min) of the number of temporary man-made structures that pass through the viewshed during a designated time (10:00 am) at a specified location (state line). During the sample the monitor will list mobile structures that pass within view (not sound), how long it takes to pass, and how close the structures are based on a distance score (4-Just outside the boundary to 1-Distant, on the horizon or high in the sky).
4.5 Percent of wilderness affected by access or	H	*Source:* GIS data on travel routes determined to be adjacent to wilderness *Protocol:* Staff will create a 35 ft buffer area around adjacent access or travel routes. The total of this buffer area calculated in GIS will be divided by the total wilderness area for the percent affected. Travel routes will include

travel routes outside the wilderness		roads or routes that are actively being used by vehicles. It does not apply to foot traffic.
4.6 Agency-provided recreation facilities	H	*Source:* Internal staff inventory *Protocol:* The recreational facilities will be counted and organized by type.
4.7 User-created recreation facilities	M	*Source:* Observations and professional judgment from law enforcement: Walt West, Jim Fair. *Protocol:* Unauthorized recreational facilities will be counted and organized by type.
4.8 Visitor Restriction Index	H	*Source:* Internal records *Protocol:* A score will be given to ASIS and CNWR based on the type of restrictions. These restrictions will be organized by category and the score assigned based on if there is no regulation or total prohibition. The higher the sum of the scores the more restrictions exist in the wilderness. Refer to measure for score table.
4.9 Extent of management restrictions	H	*Source:* Internal records –GIS layer delineation of wilderness area and roadways. *Protocol:* This is a GIS calculation of the accessible travel routes area within the wilderness. All area outside these travel routes is restricted in the CNWR portion of the land. This number (area restricted/total area) is then compared to the number of days it is prohibited (year minus hunting season).
Other Features		
5.1 Number of actions that result in disturbances to cultural resources (looting, trepass activities, non-compliance with NHPA)	M	*Source:* Internal staff consultation of associated activities *Protocol:* An inventory of the cultural sites will be created then any actions that occur on these sites will be listed. If the activity is damaging it will receive a negative score. If the activity preserves or restores the site it will receive a positive score. The sum of the activities will be tracked during the five year monitoring period.

Appendix D. Effort

Effort Required for Wilderness Character Monitoring					
FWS Wilderness Fellows, 2012					
Table completed by: **TARYN SUDOL**					
Refuge: **CHINCOTEAGUE NATIONAL WILDLIFE REFUGE & ASSATEAGUE NATIONAL SEASHORE**					
Quality	**Indicator**	**Measure**	**Were data gathered from office paper files, computer files, or field work (professional judgment is an option)?**	**Time you spent gathering data for each measure (in whole hours)**	**Comments**
Natural	Plant and Animal species and communities	Population dynamics of selected non-native plant species	paper, computer, GIS	3	Keep in mind that the time estimations include discussion and data collection among both ASIS and CNWR. This does not include time to identify or write the measures for the report.
		Population dynamics of non-native wild horses	professional judgment	1	
		Population dynamics of non-native sika deer	paper, office paper files on harvest	2	
		Number of extirpated indigenous species	professional judgment	1	
	Physical Resources	Visibility based on average deciview and sum of	National office		Not supplied by ASIS or CNWR by USFWS National Air Quality Office

		anthropogenic fine nitrate and sulfate			
		Ozone air pollution based on concentration of N100 episodic and W126 chronic ozone exposure affecting sensitive plants	National office		
		Acid deposition based on concentration of sulfur and nitrogen in wet deposition	National office		
	Biophysical Processes	Mean Sea Level Rise	Computer, NOAA	2	
		Significance of storm events	Computer, NOAA	4	
Untrammeled	Actions authorized by the Federal land manager that manipulates	Number of actions to manage plants, animals, pathogens, soil, water or fire	Computer file, professional judgment	7	This includes all the interviews plus organizing the data.
		Number of actions to manipulate fire	Professional judgment	1	

	biophysical the environment	Number of actions for dune maintenance	professional judgment	1
	Actions not authorized by the Federal land manager that manipulate the biophysical environment	Number of unauthorized actions to manipulate plant, wildlife, insects, fish, pathogens, soil, water, or fire	professional judgment	3
Undeveloped	Non-recreational structures, installations, and developments	Index of authorized physical structures, installations, or developments	Computer file, GIS, professional judgment	6
		Length of active roads and fences	Computer file, GIS	2
		Index of unauthorized physical structures, installations, or developments	professional judgment	3
		Index of abandoned structures	Computer file, GIS, professional judgment	5
		Length of abandoned roads and fence	Computer file, GIS	1
	Inholdings	Index of inholdings with wilderness	Computer file	1

	Use of motor vehicles, motorized equipment, and mechanical transport	Type and amount of administrative use of motor vehicles, motorized equipment, or mechanical transport	professional judgment	6
		Authorized Recreational Motor Vehicle Use	Traffic counter, sign in –sign out sheets, professional judgement	3
		Type and amount of motor vehicles, motorized equipment, or mechanical transport use not authorized by the Federal land manager	professional judgment	2
Solitude or Primitive and Unconfined Recreation	Remoteness from sights and sounds of people inside the wilderness	Percent of wilderness affected by access or travel routes inside the wilderness	Computer file, GIS	3
		Amount of Litter on CNWR	Data sheet from cleanup	1
	Remoteness from occupied and modified areas outside	Permanent Viewshed	Field data collection	5
		Temporary Viewshed	Field data collection	4

	the wilderness	Percent of wilderness affected by access or travel routes outside the wilderness	Computer file, GIS	3
	Facilities that decrease self-reliant recreation	Agency-provided recreation facilities	Computer file, GIS, professional judgement	3
		User-created recreation facilities	professional judgement	2
	Management restrictions on visitor behavior	Visitor restriction index	professional judgement, known policies	2
		Extent of management restrictions	Known policies, GIS	2
Other Features	Deterioration or loss of cultural resources integral to wilderness character	Number of actions that affect cultural resources (looting, trepass activities, non-compliance with NHPA)	Professional judgment	2

Effort Required for Wilderness Character Monitoring		
FWS Wilderness Fellows, 2012		
Table completed by: Taryn Sudol		
Refuge: Chincoteague National Wildlife Refuge and Assateague National Seashore		
Title of staff involved in identifying, prioritizing, and selecting measures	**Staff time to identify, prioritize, and select measures (in whole hrs)**	**Comments**
Lou Hinds	10	Conference call, initial meeting with ASIS, interviews

Kim Halpin	10	Conference call, initial meeting with ASIS, interviews
Kevin Holcomb	32	Conference call, initial meeting with ASIS, interviews, second ASIS visit, outside time??
Emarie Ayala	2	Interview
Eva Savage	1	Interview, harvest data
Janelle Walters	1	Interview
Charlene Swartz	1	Interview
Drizz Wilgus Jr.	1	Interview
Jim Fair	1	Interview
Aubrey Hall	1	Hunter questions
Trish Kicklighter	3	Initial meeting with CNWR
Bill Hulslander	15	Initial meeting with CNWR, second visit, interview, outside time??
Jack Kumer	29	Identify measures, interview, compose and organize activity table
Brian Sturgis	4	Identify measures
Neil Winn	5	Identify measures, compile data
Walt West	1	Interview
Ish Ennis	1	Interview

Effort Required for Wilderness Character Monitoring				
FWS Wilderness Fellows, 2012				
Table completed by: Taryn Sudol				
Refuge: Chincoteague National Wildlife Refuge and Assateague National Seashore				
Time you spent to identify, prioritize, and select all the measures (in whole hours)	**Time you spent to learn how to enter data into the WCM database application (in whole hours)**	**Time you spent to enter all data into the WCM database application (in whole hours)**	**Time you spent on other tasks directly related to WCM (e.g., reading CCP, giving presentations, talking with staff) (in whole hours)**	**Time you spent doing <u>other</u> Refuge tasks not directly related to WCM (in whole hours)**
156	3	5	18	77

Appendix E. Actions –Detailed

Action	Days Spent to Complete Action	
	ASIS	CNWR
Set up for monitoring:		
Piping plover management	15	
Bald Eagle management	5	
Breeding bird signage	4	
Deer monitoring set up/ fence repair	8	
Set up amaranth cages	12	
Post signs after marsh restoration	30	
Install instruments in pond marsh	10	
Marsh bird monitoring installations	2	
Set up for fox ecology study	12	
Soil analysis set up	1	
Groundwater monitoring set up	4	
Erect nest exclosures		3
Salt Marsh Monitoring set up		10
Installing informational signs:		
Put up signs	9	
OSV trail boundary signs	15	
White rods on hunting trails	14	
Post biological signs		1
Maintaining existing structures:		
Horse fence repair	4	
Horse/deer grazing fences	6	
Stateline fence	14	
Pony fence repair		5
Mowing:		
Cross island roads	14	
Service road		5
Weather station		2
Other:		
Jeep trail		1
Horse Management	25	4
Treating Phragmites	60	
Marsh Restoration	100	
Survey Benchmark installation and maintenance	15	
Trapping		60
TOTAL		

Appendix F. List of Authorized Developments

Feature	Name of Components
Bridge	Valentine's Road Bridge
Gates	Backtrail/ Cable
	Pope Bay Road/Cable
	Backtrail/ Cable
	Boat Launch Road/Road Q /Single Wooden Arm
	Green Run Road/ Cable
	Valentine's Road/ SIngle Wooden Arm
Duckblinds	A-17
	A-18
	A-19
	B-21
	A-23
	B-22
	B-24
	B-25
Old Roads	Dune Crossing 9
	Dune Crossing 11
	Dune Crossing 12
	Dune Crossing 14
	Dune Crossing 16
	Peoples/Lynch Road
	Backtrail
	Road P
	Jims Gut Campsite
	Blind 18 Access Road
	Valentines Road
	Road Scar
	Mussers Road
	Clements Road
Current Roads	OSV Zone
	Fox Hills Road
	Green Run Road
	Clements Boathouse Road
	Valentines Road
	Backtrail
	Big Levels Road
	Pope Bay Access Road
	State Line Road
	Back Country Road
	Peoples/Lynch
Hunting Trails	B-22
	B-24

	B-25
	B-21
	A-23
	A-20
	A-17
	A-18
Retention Structures	Valentines
	People's Lynch
	BobOdell
	Clements
	Clements Boathouse
	Musser
Cultural Site	Jackson's Green Run
	Graveyard

Appendix G. Authorized motorized vehicles, mechanical transport and motorized equipment –Detailed

Activity	No. of times motorized vehicles used*		No. of times mechanical transport used		No. of times motorized equipment used	
	ASIS	CNWR	ASIS	CNWR	ASIS	CNWR
Monitoring:						
Horses	40					
Plover	140	42				
Bald Eagle	25					
Other breeding birds	14	34				
Herpetology	10					
Deer	75	3				
Goose	5					
General survey: rare or invasive plants	12					
General survey: rare of invasive animals	12					
Amaranth	20	1				
Sea turtle	20					
Mosquito	30					
Shoreline	8					
Pond hydrology	10					
SETs	4	3				
Nekton	20	3				
Marsh vegetation	15	3				
Marsh birds	12					
Tiger Beetle	1					
Falcons	21					
Groundwater	15					
Cross Island Elevation	15					
Post marsh hydrology	60					
Post marsh restoration	10					
Research:						
Mapping invasive plants	20					
Assessment of cultural resources	12					
Assessment of storm/flood events	20					
Fox ecology	60					
Soil Analysis	30					
Other Biological Actions						
Horse Management	25					
Treating Phragmites	60				25 (generato	

				r)	
Mammal strandings	10				
Marsh restoration	100 (dump trucks, loaders, pick up)			100 (generator, chainsaws	
Survey Benchmark	15			1 (jackhammer)	
No hunting signs	9				
OSV trail boundaries	15				
Trapping		60			
Nest exclosures		3			
Post signs		1			
Patrolling					
Hunting: waterfowl	360				
Hunting: big game	360	350			
Daily	485	450			
Assistance response	14				
Fire report	1				
Maintenance					
Horse/marsh fencing	4				
Deer/horse forest fencing	6				
Stateline fencing	42 (wheel loader, tracter)				
Pony fence		5			
Pony penning		1			
Roadwork leveling		60 (dump truck, loader, bobcat, fuel truck)	15 (equipment trailer)		
Post storm surveillance		1			
Remove trees	12	1			1 (chainsaw)
Check weather station		1			
RomTech Service	48			48 (pumper)	
Maintain bridges	1 (fill-in loader)				
Maintain gates	6				
Beach route	12				
Cross island roads	14 (mower)				
Fill in potholes	4 (loader)				

Service road mowing		10 (pickup, mower)		5 (trailer)		
Mow weather station		4 (pick up, mower)		2(trailer)		
Mow Jeep Trail		2 (pick up, mower)		1(trailer)		
TOTAL	2338	1038	0	23	174	1