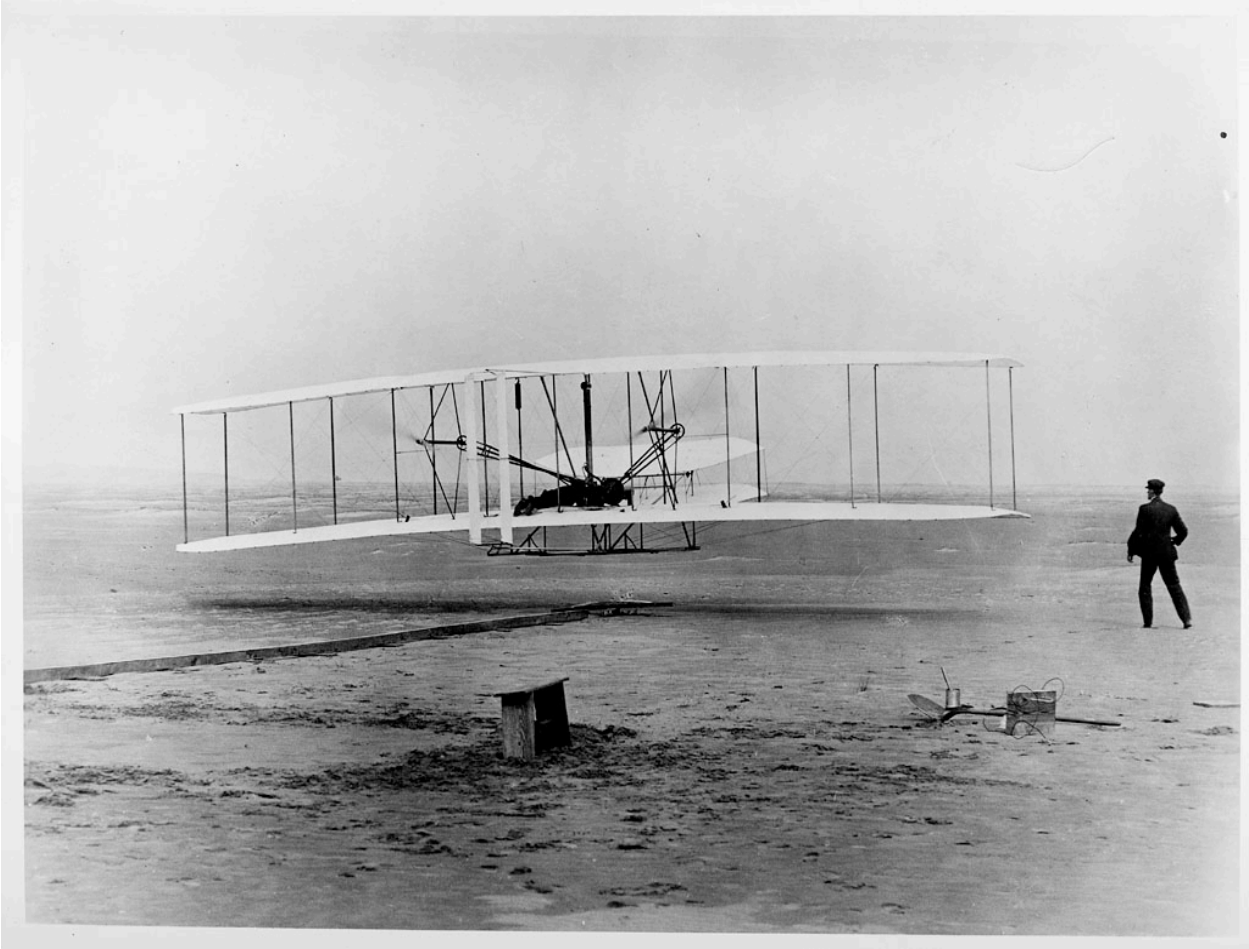
National Park Service
U.S. Department of the Interior

State of the Park Report

Wright Brothers National Memorial

North Carolina



2016

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On the cover: The first manned flight in history: December 17, 1903. At 10:35 a.m., Orville Wright takes off into a 27 mph wind. The distance covered was 120 feet; time aloft was 12 seconds. Wilbur is seen at right. The picture was taken on a preset camera belonging to Orville Wright by John T. Daniels. Photo courtesy of Smithsonian Institution Archives.

Disclaimer. This State of the Park report summarizes the current condition of park resources, visitor experience, and park infrastructure as assessed by a combination of available factual information and the expert opinion and professional judgment of park staff and subject matter experts. The internet version of this report provides the associated workshop summary report and additional details and sources of information about the findings summarized in the report, including references, accounts on the origin and quality of the data, and the methods and analytic approaches used in data collection and assessments of condition. This report provides evaluations of status and trends based on interpretation by NPS scientists and managers of both quantitative and non-quantitative assessments and observations. Future condition ratings may differ from findings in this report as new data and knowledge become available. The park superintendent approved the publication of this report.

Executive Summary

The mission of the National Park Service (NPS) is to preserve unimpaired the natural and cultural resources and values of national parks for the enjoyment, education, and inspiration of this and future generations. NPS Management Policies (2006) state that "The Service will also strive to ensure that park resources and values are passed on to future generations in a condition that is as good as, or better than, the conditions that exist today." As part of the stewardship of national parks for the American people, the NPS has begun to develop State of the Park reports to assess the overall status and trends of each park's resources. The NPS will use this information to improve park priority setting and to synthesize and communicate complex park condition information to the public in a clear and simple way.

The purpose of this State of the Park report is to:

- Provide to visitors and the American public a snapshot of the status and trend in the condition of a park's priority resources and values;
- Summarize and communicate complex scientific, scholarly, and park operations factual information and professional opinion using non-technical language and a visual format;
- Highlight park stewardship activities and accomplishments to maintain or improve the State of the Park;
- Identify key issues and challenges facing the park to help inform park management planning.

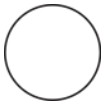
The Purpose of the Wright Brothers National Memorial (WRBR) is to commemorate the first successful human attempt at heavier-than-air, controlled, powered flight.

Significance statements express why the park unit's resources and values are important enough to warrant national park unit designation. WRBR is significant because:

- The Wright brothers' realization of humanity's age-old dream of powered, controlled, heavier-than-air flight at this site permanently transformed our perception of space and time, and changed the world forever.
- The idea of creating a monument to the Wright brothers on this site, initiated by local citizens and the subsequent efforts that brought it to fruition, marked the beginning of economic development of the Outer Banks.
- The park is an active educational resource offering unique opportunities for visitors and educational groups to learn about the Wrights' achievement, cultural stewardship, and preservation of natural and cultural resources.
- The park was listed on the National Register of Historic Places on October 16, 1966. Contributing elements include: Wright Brothers Monument, First Flight Market, Wright Brothers Monument Powerhouse, and Monument Curving Trail and Circular Road.

The summary table, following, and the supporting information that follows, provide an overall assessment of the condition of priority resources and values at WRBR based on scientific and scholarly studies and professional opinion. The internet version of this report, available at http://www.nps.gov/stateoftheparks/wrbr, provides additional detail and sources of information about the resources summarized in this report, including references, accounts on the origin and quality of the data, and the methods and analytical approaches used in the assessments. Reference conditions that represent "healthy" ecosystem parameters, and regulatory standards (such as those related to air or water quality) provide the rationale to describe current resource status. In coming years, rapidly evolving information regarding climate change and associated effects will inform our goals for managing park resources, and may alter how we measure the trend in condition of park resources. Thus, reference conditions, regulatory standards, and/or our judgment about resource status or trend may evolve as the rate of climate change accelerates and we respond to novel conditions. In this context, the status and trends documented here provide a useful point-in-time baseline to inform our understanding of emerging change, as well as a synthesis to share as we build broader climate change response strategies with partners.

The Status and Trend symbols used in the summary table following and throughout this report are summarized in the following key. The background color represents the current condition status, the direction of the arrow summarizes the trend in condition, and the thickness of the outside line represents the degree of confidence in the assessment. In some cases, the arrow is omitted because data are not sufficient for calculating a trend (e.g., data from a one-time inventory or insufficient sample size).

Condition Status		Trend in Condition		Confidence in Assessment	
	Warrants Significant Concern		Condition is Improving		High
	Warrants Moderate Concern		Condition is Unchanging		Medium
	Resource is in Good Condition		Condition is Deteriorating		Low

State of the Park Summary Table

Priority Resource or Value	Condition Status/Trend	Rationale
Natural Resources		web ▸
Air Quality		Overall air quality warrants significant concern and is relatively unchanged. Scenic views are often obscured by air pollution-caused haze; however visibility is improving. Average natural visual range during 2010–2014 was reduced from about 97 nautical miles (nm) (without the effects of pollution) to about 43 nm. Ozone sometimes reaches levels that can make breathing difficult for sensitive groups and cause injury to ozone-sensitive plants. Some vegetation communities and surface water in the park may be susceptible to nutrient enrichment effects of excess nitrogen deposition. Airborne toxics, including mercury, can deposit with rain or snow and accumulate in birds, mammals, amphibians, and fish, resulting in reduced foraging efficiency, survival, and reproductive success. Air quality indicator condition status and trend (where available) are determined by using the latest 5- and 10-year data sets, respectively (NPS-ARD 2016).
Acoustic Environment		All sound resources, whether audible or not, are referred to as the *acoustic environment* of a park. The quality of the acoustic environment affects park resources including wildlife, cultural resources, the visitor experience, and landscapes. The condition of the acoustic environment is assessed by determining how much man-made noise sources contribute to the acoustic environment through the use of a national noise pollution model. This measure is referred to as the *mean acoustic impact level*. Impact is measured in A-weighted decibels (dBA). The mean acoustic impact level at the park is 9.6 dBA, meaning that the condition of the acoustic environment warrants significant concern. Overall, long-term projected increases in ground-based and aircraft traffic indicate a deteriorating trend in the quality of acoustic resources at this location.

Priority Resource or Value	Condition Status/Trend	Rationale
Dark Night Sky		A photic environment is described as the physical amount and character of light at a particular location, irrespective of human perception. The NPS Night Sky Program characterizes a park's photic environment by measuring both anthropogenic and natural light. Anthropogenic Light Ratio (ALR) is a measure of light pollution calculated as the ratio of median Anthropogenic Sky Glow to average Natural Sky Luminance. ALR for Wright Brothers National Memorial is 1.23, which is a moderate condition. Trend is neutral based on slow five-year population growth of Kill Devil Hills (2%) and Nags Head (1%).
Cultural Resources		web ▸
Archeological Resources		WRBR possesses three currently recognized sites, all three of which are in Good condition. One site is associated with the Wright brothers' facilities during their efforts to achieve powered flight. The other two sites are associated with the subsequent history of commemorating the Wright brothers' achievements.
Cultural Anthropology		The Wright brothers did not work in total isolation; rather, they worked in context to families and communities in which they lived and worked, and in relationship to historical realities of their time. To date, there has been no documented ethnographic overview and assessment conducted at the site, a required baseline document. Such a study would provide a more nuanced understanding of people and communities and their knowledge of natural landscapes of the Outer Banks and their associations with the park historically and presently. Focus can be given to Wright family; Outer Banks families, witnesses of the Wright experiments, and their descendants; and to members of the First Flight Society (WRBR's Friends Group).
Cultural Landscapes		A Cultural Landscape Report (CLR) was completed for WRBR in 2002 and a Cultural Landscape Inventory (CLI) was completed in 2001. Striking changes to the topography and vegetation occurred when a commemorative landscape was established in 1928 that altered the barren, windswept terrain of the site. The 1947 Master Plan shifted focus from the Wright Brothers Monument to a visitor center, reconstructed camp buildings, and markers placed at the landing sites of the first powered flight. The WRBR Visitor Center was designated a National Historic Landmark in 2001 in recognition of its being a nationally significant example of a National Park Service Mission 66 visitor center and one of the most important early examples nationally of the Philadelphia School of modernist architecture. This early Mission 66 visitor center controlled the approach and entry from the parking lot into the building. The CLR did not evaluate the Mission 66 landscape features since the Mission 66 context study had not been completed.
Historic Structures		The WRBR Visitor Center was designated as a National Historic Landmark in 2001. The structure was constructed in 1960 and is a significant example of Mission 66 architecture. The structure will be rehabilitated in 2016–2017. The other historic structures at the site are the WRBR Monument and the Power House.
History		The Wright brothers' experiments and first flights at the park have been well researched and documented. The park's Historic Resource Study completed in 1997 and the 1987 Administrative History report need to be updated to reflect current scholarship and knowledge. National Register of Historic Places documentation is relatively recent and adequate.

Priority Resource or Value	Condition Status/Trend	Rationale
Museum Collections		One-hundred percent of the park's museum collection storage facilities are in good condition. The 2004 Scope of Collection statement is consistently implemented for new acquisitions to the Wright Brothers museum collection. The park needs to identify Natural History collections and archives created through permitting, resource management projects, and inventory and monitoring projects. Erosion of budgets over time has led to staffing changes to support the retention and management of park museum collections, archives, and overall records management.
Visitor Experience		**web** ▸
Number of Visitors		The total of 437,184 visitors in 2015 was slightly lower than the 5-year average of 453,357 visitors for 2010–2014.
Visitor Satisfaction		Based on the standard visitor satisfaction survey conducted each year, the percentage of visitors satisfied in 2015 was 96.0%, compared to the average for the previous five years (96.6%) and ten years (97.1%). Source: 2015 Visitor Survey Card Data Report
Interpretive Programs – Talks and Special Events		The Park is actively working to achieve the goals outlined in the 2010 Long-Range Interpretive Plan. Park staff and partners provide special commemorative events annually.
Interpretive Media – Brochures, Exhibits, Signs, and Digital Media		The Park has improved wayside exhibits throughout the site and is connecting with new audiences by implementing the park's Social Media Plan. New visitor center exhibit have been funded with a planned installation in 2018.
Scenic Resources		The park preserves an open landscape and scenic views from atop Big Kill Devil Hill including expansive views of Albemarle Sound to the west and the Atlantic Ocean to the east. Future development could impact scenic views.
Universal Access		The Park provides access for visitors that meet Americans with Disabilities Act (ADA) standards. Every project the park is working on addresses ADA compliance, which is included in the project if feasible. The renovated visitor center and new visitor center exhibits planned for installation in 2018 will be fully ADA-compliant.
Safety		Park staff dedicated to public safety activities (safety manager and park law enforcement rangers) monitors and responds to visitor safety incidents. Park staff regularly conducts visitor safety assessments. The park works closely with local emergency services agencies to manage incidents and ensure staff and visitor safety. The park's Law Enforcement staff is trained for handling Emergency Response including law enforcement and emergency medical incidents. Regular risk management educational messages are shared with staff and volunteers. The park recently implemented a robust employee safety program with a proactive approach to providing engaging and effective training opportunities for employees and volunteers with the aim of increasing awareness and reducing risks. The park has identified additional staff training needed and is developing a program to ensure appropriate safety training for all staff.
Partnerships		Volunteer hours have increased. The park's cooperating association, Eastern National, provides educational retail sales in the park's visitor center. In 2014, the First Flight Society became the park's official philanthropic partner. The park also partners with the First Flight Foundation, an organization that has provided significant support for park projects.

Priority Resource or Value	Condition Status/Trend	Rationale
Park Infrastructure		web ▸
Overall Facility Condition Index		The major infrastructure assets of the park are the Monument, Visitor Center, roads, and parking areas, all of which require attention. All roads and parking areas in the park require milling and re-paving. Restoration of the Visitor Center is scheduled to begin in 2016.

Summary of Stewardship Activities and Key Accomplishments to Maintain or Improve Priority Resource Condition

The list below provides examples of stewardship activities and accomplishments by park staff and partners to maintain or improve the condition of priority park resources and values for this and future generations:

Natural Resources

- In 2012, a Significant Natural Heritage Area was registered, recognizing the Beach Heather Dune communities present at the park and the abundant state-listed rare plants and butterflies they support.

Cultural Resources

- The First Flight Marker plaque was cleaned and the December 17, 1903 Sculpture was repaired in 2012.
- Continued working with the First Flight Foundation to address the water intrusion issues at the Wright Brothers Monument.
- Developed Museum Collection Hurricane Plan for Outer Banks Group Hurricane Plan.
- Hosted and participated in Nationally Significant Cultural Landscapes and Facility Management Software System (FMSS) Workshop.

Visitor Experience

- In 2014, the First Flight Society became the park's official philanthropic partner and each year the park and society partner to commemorate the December 17th first flight anniversary and National Aviation Day.
- The park has continued partnership with the First Flight Foundation, an organization that has provided significant support for park projects.
- In 2010, completed the park's Long-Range Interpretive Plan (LRIP). The completion of this plan provided direction for park interpretive service improvements, such as growing an active social media presence, adopting national standards as laid out by the NPS Interpretive Development Program, and competing successfully for wayside exhibit funding.
- The cultural landscape maintained by the park provides for a visitor experience that enhances the commemoration and celebration of what the Wrights accomplished at Kitty Hawk—the birthplace of aviation.
- The First Flight Airstrip, maintained through a partnership between the NPS and North Carolina Department of Transportation, Division of Aviation, is utilized by numerous user groups, including private aviators and the military. The airstrip provides visitors with the ongoing sense of evolution of flight.

Park Infrastructure

- Completed a value analysis to repair and renovate the Visitor Center. Construction is scheduled to begin November 2016.
- Treated and restored the December 17, 1903 Sculpture and the plaque on the First Flight Marker.
- The park removed several declining facilities in 2014, including the old superintendent's house, two trailers, and the two main sections of the temporary Pavilion structure.

Key Issues and Challenges for Consideration in Management Planning

Wright Brothers National Memorial is located in Kill Devil Hills, North Carolina. Wilbur and Orville Wright selected this site for their experiments because it provided vast expanses of soft sand for landings as well as steady winds. Also, the isolated location allowed the Wrights to conduct their flight experiments under secrecy. In 1900, they camped near the settlement of Kitty Hawk, North Carolina, and used nearby dunes to make numerous glider test-flights. After analyzing their data and conducting additional experiments in Dayton, Ohio, the brothers returned to the Kill Devil Hills in the fall of 1902 and launched nearly 1,000 glider flights from the dunes. During this period of experimentation they tested their new control system and wing shape. They set world records for gliding distance, time, angle of descent, and for a flight in high wind conditions. They then designed the world's first successful flying machine incorporating a specialized gasoline engine and unique propellers, and on December 17, 1903, near the base of the Big Kill Devil Hill, the Wright brothers made the first ever successful, powered, heavier-than-air, controlled flight.

The park was established on March 2, 1927, as Kill Devil Hill Monument, and an Executive Order on March 3, 1933, transferred administrative responsibility of the park to the National Park Service. The Secretarial Order of December 1, 1953, re-designated the area and monument as Wright Brothers National Memorial. The park, listed on the National Register of Historic Places in 1966, protects historic resources including the site where the Wright brothers conducted their experiments, the Wright Brothers Monument, and several commemorative markers. The park's visitor center provides opportunities to learn about the Wright brothers' achievements through interpretive talks, exhibits, and artifacts. The visitor center also houses a reproduction of the Wright Flyer in the First Flight Auditorium. In 2001, the Wright Brothers National Memorial Visitor Center was designated a national historic landmark for its architectural importance and as one of the most complete examples of a visitor center created during the National Park Service's "Mission 66" era of development.

Park staff will continue to work towards preserving the park's resources while managing for high-quality visitor experiences. Park managers will focus on the following topics over the coming years:

Partnerships and Community Relationships
The park intends to build and strengthen community relations, recognizing the importance of community, history, and local cultures in effectively managing the park's resources and enhancing visitor experiences.

Science Informing Management
The park plans to improve the quality, quantity, and breadth of scientific data used for management and decision-making.

Workforce Leadership Development
Park management will focus on developing and improving leadership skills within the park workforce including: building and maintaining a safety culture; building trust, transparency, and credibility throughout the organization; providing hands-on opportunities for staff to grow skills and careers; and mentoring staff on team and project management.

National Park Service Experience
The park will actively work to enhance the National Park Service experience for park visitors including: strengthening the park's identity as a unit of the National Park Service; providing more and enhanced visitor experiences; and proactively engaging youth.

Chapter 1. Introduction

The purpose of this State of the Park report for WRBR is to assess the overall condition of the park's priority resources and values, communicate complex park condition information to visitors and the American public in a clear and simple way, and to inform visitors and other stakeholders about stewardship actions being taken by park staff to maintain or improve the condition of priority park resources for future generations. The State of the Park report uses a standardized approach to focus attention on the priority resources and values of the park based on the park's purpose and significance, as described in the park's Foundation Document or General Management Plan. The report:

- Provides to visitors and the American public a snapshot of the status and trend in the condition of a park's priority resources and values.
- Summarizes and communicates complex scientific, scholarly, park operations factual information, and professional opinion using non-technical language and a visual format.
- Highlights park stewardship activities and accomplishments to maintain or improve the state of the park.
- Identifies key issues and challenges facing the park to inform park management planning.

The process of identifying priority park resources by park staff and partners, tracking their condition, organizing and synthesizing data and information, and communicating the results will be closely coordinated with the park planning process, including natural and cultural resource condition assessments and Resource Stewardship Strategy development. The term "priority resources" is used to identify the fundamental and other important resources and values for the park, based on a park's purpose and significance within the National Park System, as documented in the park's foundation document and other planning documents. This report summarizes and communicates the overall condition of priority park resources and values based on the available scientific and scholarly information and expert opinion, irrespective of the ability of the park superintendent or the NPS to influence it.

In 1900, Wilbur and Orville Wright camped outside Kitty Hawk and spent most of the time flying their glider as a kite. In 1901, they camped near Kill Devil Hills and used the small dunes in the nearby area to make numerous glider flights. After analyzing their data and conducting additional experiments in Dayton, Ohio, during the winter of 1901, the brothers returned to Kill Devil Hills in the fall of 1902, and launched nearly 1,000 glider flights from the hills. During this period of experimentation, they perfected their control system and wing shape. They set world records for flight distance, time, angle of descent, and for a successful flight in high wind conditions. The 1902 Glider was patented. They then designed the world's first flying machine incorporating a gasoline engine and propellers. On December 17, 1903, near the base of Kill Devil Hill, the first successful, powered, controlled flight occurred.

The Kill Devil Monument was established by an Act of Congress on March 2, 1927. The executive Order of March 3, 1933, transferred administrative responsibility of the monument to the NPS.

The Purpose of WRBR is to commemorate the first successful human attempt at heavier-than-air, controlled, powered flight. The existing 431-acre land base stabilizes the remaining dunes existing during the Wright brothers' flight experiments at the turn of the century. The Secretarial Order of December 1, 1953, designated the area and monuments as Wright Brothers National Memorial.

Significance statements express why the park unit's resources and values are important enough to warrant National Park unit designation. WRBR is significant because:

- The Wright brothers' realization of humanity's age-old dream of powered, controlled, heavier-than-air flight at this site permanently transformed our perception of space and time, and changed the world forever.
- The idea of creating a monument to the Wright brothers on this site, initiated by local citizens and the subsequent efforts that brought it to fruition, marked the beginning of economic development of the Outer Banks.
- The park is an active educational resource offering unique opportunities for visitors and educational groups to learn about the Wright's achievement, cultural stewardship, and preservation of natural and cultural resources.
- The park was listed on the National Register of Historic Places on October 16, 1966. Contributing elements include: Wright Brothers Monument, First Flight Marker, Wright Brothers Monument Powerhouse, and Monument Curving Trail and Circular Road.

Map of the Park

Chapter 2. State of the Park

The State of the Park is summarized below in four categories—Natural Resources, Cultural Resources, Visitor Experience, and Park Infrastructure—based on a synthesis of the park's monitoring, evaluation, management, information programs, and professional opinion. Brief resource summaries are provided below for a selection of the priority resources and values of the park. Clicking on the web ▸ symbol found in the tables and resource briefs below will take you to the internet site that contains content associated with specific topics in the report.

The scientific and scholarly reports, publications, datasets, methodologies, and other information that were used as the basis for the assessments of resource condition are referenced and linked throughout the report and through the internet version of this report that is linked to the NPS IRMA data system (Integrated Resource Management Applications). The internet version of each report, and the associated workshop summary report available from the internet site, provide additional detail and sources of information about the findings summarized in the report, including references, accounts on the origin and quality of the data, and the methods and analytical approaches used in data collection and the assessments of condition. Resource condition assessments reported in this State of the Park report involve professional opinion and the professional judgment of park staff and subject matter experts involved in developing the report. This professional opinion and judgment derive from the in-depth knowledge and expertise of park and regional staff gained from their being involved in the day-to-day practice of all aspects of park stewardship and from the professional experience of the participating subject matter experts. This professional opinion and judgment utilized available factual information for the analyses and conclusions presented in this report. This State of the Park report was developed in a park-convened workshop.

The status and trends documented in Chapter 2 provide a useful point-in-time baseline measured against reference conditions that represent "healthy" ecosystem parameters, or regulatory standards (such as those related to air or water quality). We also note that climate change adaptation requires us to continue to learn from the past, but attempting to manage for conditions based on our understanding of the historical "natural" range of variation will be increasingly futile in many locations. Thus, these reference conditions, and/or our judgment about resource condition or trend may evolve as the rate of climate change accelerates and we respond to novel conditions. Our management must be even more "forward looking," to anticipate plausible but unprecedented conditions, also recognizing there will be surprises. In this context, we will incorporate climate considerations in our decision processes and management planning as we consider adaptation options that may deviate from traditional practices.

2.1. Natural Resources

Air Quality

web ▸

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Visibility	Haze Index		Visibility warrants significant concern. This status is based on NPS Air Resource Division benchmarks and the 2010–2014 estimated visibility on mid-range days of 8.1 deciviews (dv) above estimated natural conditions of 7.6 dv (higher deciview values indicate poorer visibility). Data from the Swanquarter, NC visibility IMPROVE (Interagency Monitoring of Protected Visual Environments) monitoring site indicate that during the 2005–2014 decade, the trend in visibility improved on both the 20% clearest days and 20% haziest days, resulting in an overall improving visibility trend. The degree of confidence in the visibility status and trend at Wright Brothers N MEM is high because of the nearby visibility monitor (IMPROVE Site ID: SWAN1, NC; NPS-ARD 2016).

Air Quality (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Ozone	Human Health: Annual 4th-highest 8-hour concentration		Human health risk from ground-level ozone warrants moderate concern. This status is based on NPS Air Resource Division benchmarks and the 2010–2014 estimated ozone concentration (4th highest 8-hour average) of 68.2 parts per billion (ppb). Ozone is a respiratory irritant, causing coughing, sinus inflammation, chest pains, scratchy throat, lung damage, and reduced immune system functions. Children, the elderly, people with existing health problems, and active adults are most vulnerable. The degree of confidence in the status of human health risk from ground-level ozone is medium because estimates are based on interpolated data from more distant ozone monitors (NPS-ARD 2016).
	Vegetation Health: 3-month maximum 12-hour W126		Vegetation health risk from ground-level ozone warrants moderate concern. This status is based on NPS Air Resource Division benchmarks and the 2010–2014 estimated W126 metric of 8.5 parts per million-hours (ppm-hrs). The W126 metric relates plant response to ozone exposure during daylight hours over the growing season. There are likely several ozone-sensitive plants in the park including: red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), loblolly pine (*Pinus virginiana*), dogwood (*Cornus florida*), and Virginia creeper (*Parthenocissus quinquefolia*). The degree of confidence in the status of vegetation health risk from ground-level ozone is medium, because estimates are based on interpolated data from more distant ozone monitors (NPS-ARD 2016).
Deposition	Nitrogen Wet Deposition		Wet nitrogen deposition warrants significant concern. This status is based on NPS Air Resources Division benchmarks and the 2010–2014 estimated wet nitrogen deposition of 4.0 kilograms per hectare per year (kg/ha/yr). The degree of confidence in the wet nitrogen deposition status is medium, because estimates are based on interpolated data from more distant deposition monitors (NPS-ARD 2016). Excess nitrogen can also cause invasive exotic plant species to grow faster and out-compete native vegetation adapted to low nitrogen levels (Blett & Eckert 2013, Bobbink et al. 2010). Furthermore, the estimated total nitrogen deposition (wet plus dry) is above the minimum ecosystem critical loads for some park vegetation communities, suggesting that lichen and forest vegetation are at risk for harmful effects (NADP-TDEP 2014, Pardo et al. 2011).

Air Quality (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Deposition (continued)	Sulfur Wet Deposition		Wet sulfur deposition warrants moderate concern. This status is based on NPS Air Resources Division benchmarks and the 2010–2014 estimated wet sulfur deposition of 2.7 kilograms per hectare per year (kg/ha/yr). The degree of confidence in the wet sulfur deposition status is medium, because estimates are based on interpolated data from more distant deposition monitors (NPS-ARD 2016). Acidification effects can include changes in water and soil chemistry that impact ecosystem health.
	Mercury/Toxics Deposition		Mercury/toxics deposition warrants significant concern. Given landscape factors influence the uptake of mercury in the ecosystem, the status is based on estimated wet mercury deposition and predicted levels of methylmercury in surface waters. The 2011–2013 wet mercury deposition was high at the park, estimated to be 9.9 micrograms per square meter per year (NPS-ARD 2016) and the predicted methylmercury concentration in park surface waters is very high, estimated to be 0.34 nanogram per liter (USGS 2015). Values for both wet deposition and predicted methylmercury were compared to NPS Air Resource Division benchmarks to determine the significant concern status. The degree of confidence in the mercury/toxics deposition status is low, because wet deposition and methylmercury concentration estimates are based on interpolated or modeled data as there are no park-specific studies examining contaminant levels in species or species groups from park ecosystems. High mercury concentrations in birds, mammals, amphibians, and fish can result in reduced foraging efficiency, survival, and reproductive success. Elevated levels of mercury in humans can affect the brain, kidneys, and reproductive function. Wet and dry deposition can lead to mercury loadings in water bodies, where mercury may be converted to a bioavailable toxic form of mercury, methylmercury, and bioaccumulate through the food chain. Wetlands, especially those rich in organic matter, are important sites for methlymercury production.

Resource Brief: Natural Heritage Areas

Significant Natural Heritage Areas are defined by the North Carolina Natural Heritage Program as areas that "possess natural values justifying recognition by the State as an outstanding part of the natural heritage of North Carolina" (NCNHP 2012). The Nature Preserves Act of 1985 establishes SNHA Registry Agreements as a mutual understanding between landowners and the North Carolina Department of Environment and Natural Resources to "protect outstanding examples of the natural diversity occurring in North Carolina and preserve unique and unusual natural features." NPS staff works closely with the NCNHP to facilitate SNHA registries and is dedicated to protecting these areas from artificial alterations and allowing natural processes to operate unhindered.

In August 2012, the NPS entered into a Registry Agreement designating 193 acres of WRBR as the Wright Brothers Dunes Registered SNHA (NCNHP 2012). The center of WRBR is occupied by developed areas, but substantial natural vegetation patches remain on the periphery of the site. This area hosts the largest known population in North Carolina of State Endangered maritime pinweed and one of the largest populations of the State Threatened beach heather (Gadd 2012). The distinctive Stable Beach Heather Dune Barren Natural Community that supports these species occurs on the low, open dunes of the natural area and is surrounded by dense Maritime Evergreen Forest. Stable Dune Barren communities are characterized as interior dunes of relatively mature age that have little tendency for sand movement, often including substantial bare sand but also an open or patchy cover of woody vines, shrubs, and trees (Schafale 2012). Though small, the Stable Beach Heather Dune Barren at WRBR is one of the few remaining occurrences of this rare community type that was historically characteristic of the region. By entering into a registry agreement with the North Carolina Natural Heritage Program, the Outer Banks Group has committed to maintaining the natural character and integrity of the significant vegetative community and the species it supports at WRBR.

NC Natural Heritage Program ecologists identify state endangered maritime pinweed in WRBR Dunes Registered SNHA

State Threatened beach heather blooms at the Wright Brothers Dunes SNHA in early spring

Acoustic Environment

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Acoustic Impact Level	A modeled measure of the noise (in decibels adjusted or dBA) contributed to the acoustic environment by man-made sources		The condition of the acoustic environment is assessed by determining how much noise man-made sources contribute to the environment through the use of a national noise pollution model. The mean acoustic impact level at the park is 9.6 dBA, meaning that the condition of the acoustic environment warrants significant concern. Overall, long-term projected increases in ground-based (Federal Highway Administration 2013) and aircraft traffic (Federal Aviation Administration 2010) indicate a deteriorating trend in the quality of acoustic resources at this location. Confidence in condition is considered high due to the availability of 2011 acoustic monitoring results (Rapoza 2014).

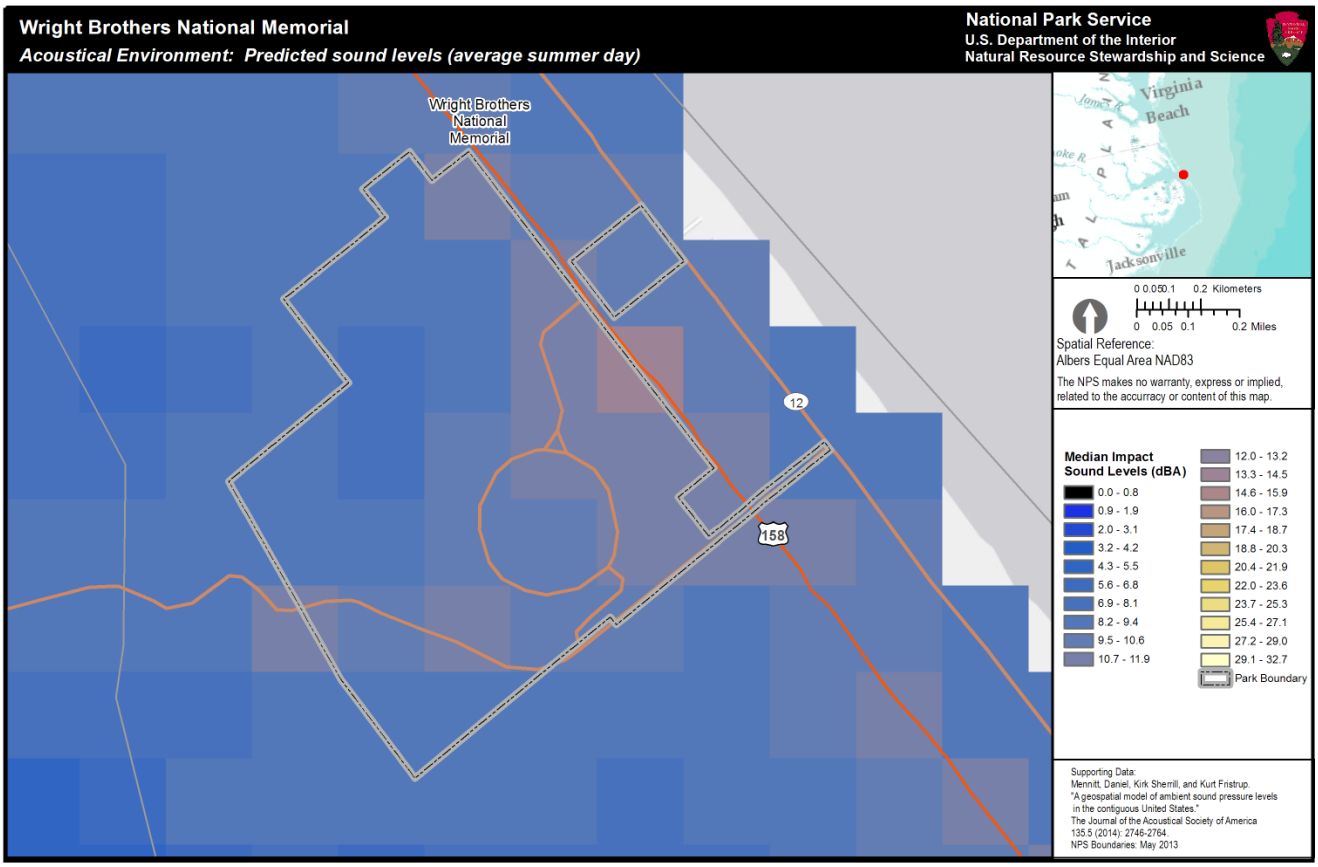
Resource Brief: Acoustic Environment at Wright Brothers National Memorial

To characterize the acoustic environment, the National Park Service has developed a national model of noise pollution (Mennitt et al. 2014). This model predicts the increase in sound level due to human activity on an average summer day. The model is based on measured sound levels from hundreds of national park sites and approximately 100 additional variables such as location, climate, vegetation, hydrology, wind speed, and proximity to noise sources such as roads, railroads, and airports. The model reveals how much quieter parks would be in the absence of human activities. The quality of the acoustic environment affects visitor experience and ecological health. Acoustic resource condition, both natural and cultural, should be evaluated in relation to visitor enjoyment, wilderness character, ecosystem health, and wildlife interactions. Learn more in the document Recommended indicators and thresholds of acoustic resources quality, the figures below, and the NPS Natural Sounds and Night Skies Division website. In 2011, long-term acoustical measurements were gathered at two sites in the park. These measurements are summarized in the report Wright Brothers National Memorial: Acoustical monitoring 2011.

Criteria for Condition Status/Trend
For State of the Park Reports, NPS has established acoustic standards (green, amber, red) and two sets of impact criteria for urban parks and non-urban parks. A park's status (urban or non-urban) is based on data from the U.S. Census Bureau (U.S. Census 2010). Parks outside designated urban areas typically possess lower sound levels, and exhibit less divergence between existing sound levels and predicted natural sound levels. These quiet areas are highly susceptible to subtle noise intrusions. Park units inside designated urban areas typically experience more interference from noise sources. The park is located in a non-urban area, so condition thresholds for non-urban parks are listed in the table below. Just as smog limits one's ability to survey a landscape, noise reduces the area in which important sound cues can be heard. Therefore, thresholds in the table are also explained in terms of listening area.

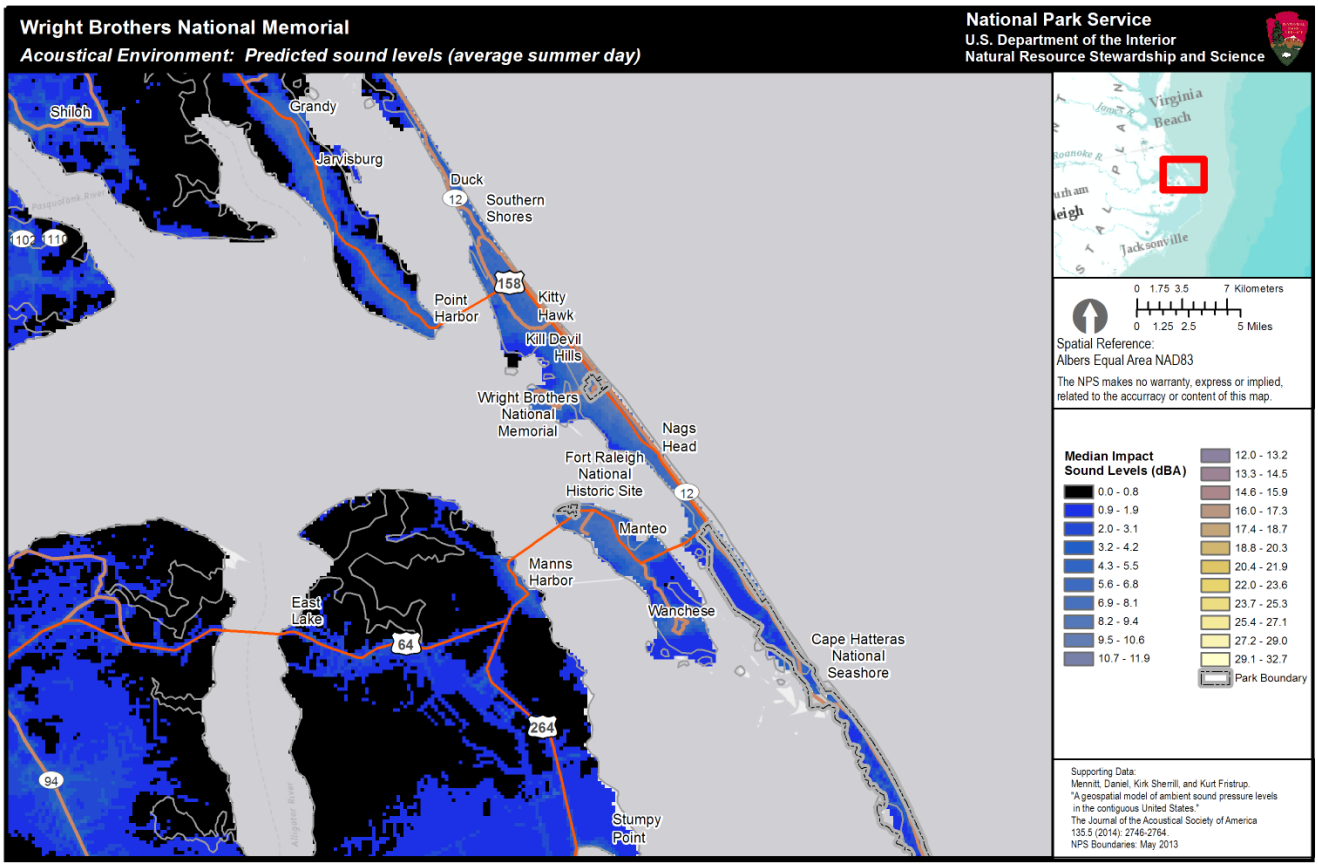
Condition thresholds for the acoustic environment in non-urban parks

Indicator	Threshold (dBA)
Acoustic Impact Level A modeled measure of the noise (in dBA) contributed to the acoustic environment by man-made sources.	Threshold ≤ 1.5 *Listening area reduced by ≤ 30%*
	1.5 < Threshold ≤ 3.0 *Listening area reduced by 30–50%*
	3.0 < Threshold *Listening area reduced by > 50%*



NPS Natural Sounds & Night Skies Division and NPS Inventory and Monitoring Program MAS Group 20150715

Map of predicted acoustic impact levels in the park for an average summer day. The color scale indicates how much man-made noise increases the sound level (in A-weighted decibels, or dBA), with 270 meter resolution. Black or dark blue colors indicate low impacts while yellow or white colors indicate greater impacts. Note that this graphic may not reflect recent localized changes such as new access roads or development.



NPS Natural Sounds & Night Skies Division and NPS Inventory and Monitoring Program MAS Group 20150715

Map of predicted acoustic impact levels in the park and the surrounding area for an average summer day. The color scale indicates how much man-made noise increases the sound level (in A-weighted decibels, or dBA), with 270 meter resolution. Black or dark blue colors indicate low impacts while yellow or white colors indicate greater impacts. Note that this graphic may not reflect recent localized changes such as new access roads or development.

Dark Night Sky

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Anthropogenic Light	Anthropogenic Light Ratio (ALR) — Average Anthropogenic Sky Glow: Average Natural Sky Luminance		A photic environment is described as the physical amount and character of light at a particular location, irrespective of human perception. The NPS Night Sky Program characterizes a park's photic environment by measuring both anthropogenic and natural light. ALR is a measure of light pollution calculated as the ratio of median Anthropogenic Sky Glow to average Natural Sky Luminance. ALR for Wright Brothers National Memorial is 1.23, which is a moderate condition. Trend is neutral based on slow five-year population growth of Kill Devil Hills (2%) and Nags Head (1%).

Resource Brief: Night Sky Resources at Wright Brothers National Memorial

The night sky has been a source of wonder, inspiration, and knowledge for thousands of years. Unfettered night skies with naturally-occurring cycles of light and dark are integral to ecosystem function as evidenced by the fact that nearly half the species on earth are nocturnal. The quality of the nighttime environment is relevant to nearly every unit of the NPS system as the nighttime photic environment and its perception of it by humans (the lightscape) are both a natural and a cultural resource and are critical aspects of scenery, visitor enjoyment, and wilderness character.

Condition and Functional Consequences
Night sky quality at Wright Brothers National Memorial is moderate with an ALR of 1.23. This is considered a moderate condition for non-urban parks. At the light levels observed from Wright Brothers National Memorial the Milky Way is visible, but has typically lost some of its detail and is not visible as a complete band. Zodiacal light (or "false dawn" which is faint glow at the horizon just before dawn or just after dusk) is rarely seen. Anthropogenic light likely dominates light from natural celestial features and shadows from distant lights may be seen.

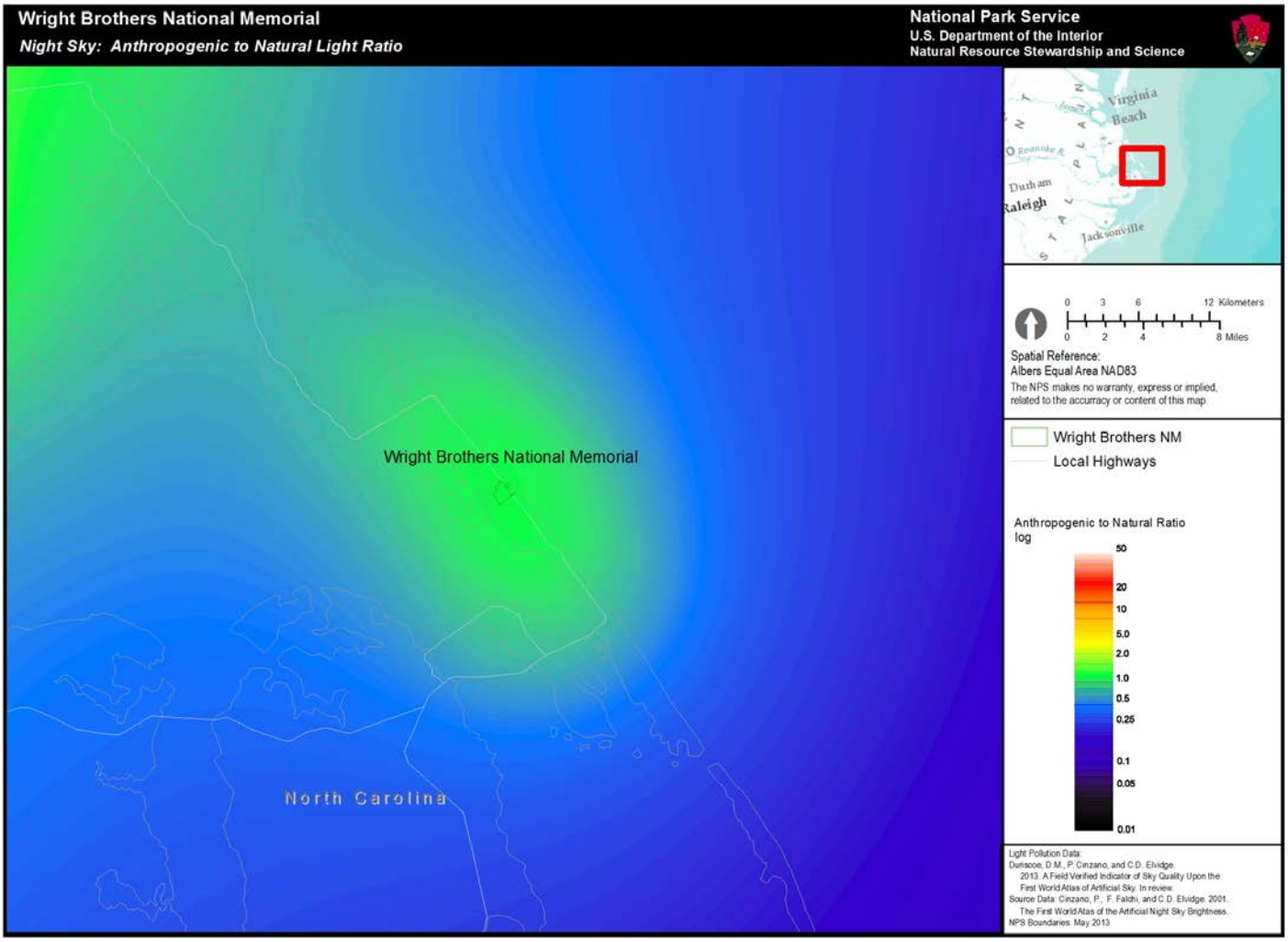
Assessment
One way the NPS Natural Sounds & Night Sky Division (NSNSD) scientists measure the quality of the photic environment is by measuring the median sky brightness levels across a park and comparing that value to average natural night sky luminance. This measure, called the ALR, can be directly measured with ground based measurements, or modeled when these data are unavailable. The geographic information system model, calibrated to ground based measurements in parks, is derived from the 2001 World Atlas of Night Sky Brightness, which depicts zenith sky brightness (the brightness directly above the observer). Anthropogenic light up to 200 kilometers from parks may degrade a park's night sky quality, and is considered in the neighborhood analysis. This impact is illustrated in the corresponding ALR map with a 200km ring around the park center.

The ALR thresholds are applied spatially to the park. For both urban and non-urban parks, the designated condition (green, amber, red) corresponds to the ALR level that exists in *at least half of* (median condition) the park's landscape (see table below). Thus it is probable that a visitor will be able to experience the specified night sky quality. It is also probable that the majority of wildlife and habitats found within the park will exist under the specified night sky quality. For parks with lands managed as wilderness, the designated condition is based on the ALR level that exists in more than 90% of the wilderness area.

Criteria for Impact
Two impact criteria were established to address the issue of urban and non-urban park night sky resources. Parks within urban areas, as designated by the U.S. Census Bureau, are considered less sensitive to the impact of anthropogenic light and are assessed using higher thresholds of impact. Parks outside of designated urban areas are considered more sensitive to the impact of anthropogenic light and are assed using lower thresholds of impact. According to the U.S. Census Bureau, Wright Brothers National Memorial is categorized as non-urban, or more sensitive (U.S. Census Bureau 2010). Learn more in the document Recommended Indicators of Night Sky Quality, and the NPS Natural Sounds & Night Skies Division website.

Thresholds for Level 1 and 2 Parks

Indicator	Threshold for Level 1 Parks – Non-Urban	Additional Threshold for Areas Managed as Wilderness	Threshold for Level 2 Parks – Urban
Anthropogenic Light Ratio (ALR) – Average Anthropogenic All-Sky Luminance: Average Natural All-Sky Luminance Light flux is totaled above the horizon (the terrain is omitted) and the anthropogenic and natural components are expressed as a unitless ratio The average natural sky luminance is 78 nL	ALR < 0.33 (<26 nL average anthropogenic light in sky) *At least half of park area should meet this criteria*	ALR < 0.33 (<26 nL average anthropogenic light in sky) *At least 90% of wilderness area should meet this criteria*	ALR < 2.00 (<156 nL average anthropogenic light in sky) *At least half of park area should meet this criteria*
	ALR 0.33–2.00 (26–156 nL average anthropogenic light in sky) *At least half of park area should meet this criteria*	ALR 0.33–2.00 (26–156 nL average anthropogenic light in sky) *At least 90% of wilderness area should meet this criteria*	ALR 2.00–18.00 (156–1404 nL average anthropogenic light in sky) *At least half of park area should meet this criteria*
	ALR > 2.00 (>156 nL average anthropogenic light in sky) *At least half of park area should meet this criteria*	ALR > 2.00 (>156 nL average anthropogenic light in sky) *At least 90% of wilderness area should meet this criteria*	ALR > 18.00 (>1404 nL average anthropogenic light in sky) *At least half of park area should meet this criteria*



Created by NPS Natural Sounds & Night Skies Division and NPS Inventory and Monitoring Program MAS Group on 20160329

Regional view of anthropogenic light near Wright Brothers National Memorial. White and red represents more environmental influence from artificial lights while blues and black represent less artificial light. This scale shows local context and how local artificial lighting can alter the natural environment. While Wright Brothers National Memorial may be influenced by artificial light it still maintains more naturalness than surrounding areas and serves as a harbor of dark skies.

2.2. Cultural Resources

Archeological Resources

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to understand the relationship of the park's archeological resources to the historic contexts for the park.		All three known archeological sites are directly linked to buildings associated with the Wright Brothers' experiments or with facilities that were built afterword to serve in the commemoration of their historic flight. They include the approximate locations of the quarters and hanger buildings built by the Wrights in 1902, the Wright Brothers Monument Powerhouse built in 1932, and Wright Brothers National Memorial Visitor Center built in 1959.
	Scope of archeological resources in the park is understood and a determination has been made whether or not they are a fundamental or other important resource.		Although their historical contributions are well understood, the archeological components of the three known sites have not been thoroughly evaluated. A Ground Penetrating Radar survey conducted around the reconstructed Wright Brother shed and hanger in 2014 did not reveal evidence of any of the original 1902 buildings, but an anomaly was found and reported to park staff with recommendations for further investigation. Archeological resources are not considered a fundamental value or resource in the park's Foundation Document.
Inventory	Percentage of park intensively surveyed.		Only a small percentage (0.7 percent) of the park has been fully surveyed to current NPS standards; however, a significant percentage of the park has a low probability of yielding archeological resources.
	Percentage of archeological resources with complete, accurate, and reliable documentation (a completed State site form).		No formal documentation (state site forms) has been prepared for these three National Register listed sites.
Documentation	Percentage of known sites with adequate National Register documentation.		One-hundred percent of the park's currently recognized sites (three) have sufficient documentation to evaluate their potential for listing on the National Register of Historic Places. All three of the park's sites are listed on the National Register by virtue of their historical associations.
	Research results are disseminated to park managers, planners, interpreters, and other NPS specialists and incorporated into appropriate park planning documents.		Three archeological projects involving excavations are known to have been carried out in the park, none yielded any firm evidence of an archeological nature, and all results were documented in reports prepared and submitted to the park.

Archeological Resources (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Certified Condition	Percentage of archeological resources certified as complete, accurate, and reliable in the Archeological Sites Management Information System (ASMIS) in good condition.		One-hundred percent of the park's currently recognized sites (three sites) are in Good condition.

Cultural Anthropology

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to understand the relationship of the park's ethnographic resources to the historic context(s) for the park.		There has been no documented ethnographic overview and assessment (EOA) conducted at the park, a required baseline document. In the case of WRBR this could include groups and communities, such as links between Outer Banks and Dayton, Ohio families, the U.S. Lifesaving Service, communities and businesses, the life and role of women of the time, as well as a focus on the Outer Banks families/witnesses and descendants.
Inventory	Appropriate studies and consultations document resources and uses, traditionally associated people, and other affected groups, and cultural affiliations.		No documented ethnographic overview and assessment exists for the park. Other cultural resource documents provide a foundation for understanding people and communities associated with the park, but do not provide the depth and nuance that a cultural anthropological focus would reveal. There is a potential connection between the park, the First Flight Society, National Aeronautics and Space Administration (NASA)—a piece of the original cloth and plane went to the moon with Neil Armstrong—and Dayton Aviation Heritage National Historic Park. There is a Native American presence, but it is transient (no settlement) and outside the scope of interpretation.
Documentation	Resources eligible for the National Register of Historic Places as traditional cultural properties are identified.		No documented ethnographic overview and assessment exists for the park and traditional cultural properties have not been identified.

Cultural Anthropology (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Documentation (continued)	Research results are disseminated to park managers, planners, interpreters, and other NPS specialists and incorporated into appropriate park planning documents.		No documented ethnographic overview and assessment exists for the park. Other cultural resource documents provide a foundation for understanding people and communities associated with the park, but do not provide the depth and nuance that a cultural anthropological focus would reveal.

Resource Brief: Mrs. Tate's Sewing Machine

Afflicted with the dream of human flight, Wilbur and Orville Wright decided that Kitty Hawk, North Carolina, had the most favorable conditions to conduct glider flights. Their 1900 Glider, covered with very expensive imported French sateen, was originally designed to be 18 feet in length. Prior to Wilbur's departure from Dayton, Ohio, the sateen was cut and sewn to cover the anticipated 18-foot wing span. Wilbur planned on purchasing wood to construct the spars for the wings on the way to Kitty Hawk, because spruce was more plentiful in the East and transporting 18-foot sections of wood from Dayton would be very difficult.

Upon arriving in the East, Wilbur discovered spruce was unobtainable in Norfolk or Elizabeth City. Only white pine in lengths no greater than 16 feet was available. Disappointed by the lack of suitable materials to complete the glider as planned, Wilbur was forced to cut two-foot sections from the center of each pre-sewn French sateen wing covering. He spliced the two halves on Mrs. Addie Tate's sewing machine after arriving at Kitty Hawk. When Orville joined him several weeks later, they assembled the glider, tested it as a kite, and conducted a few manned glides.

After their experiments ended in 1900, the brothers offered the glider to the Kitty Hawk Postmaster, Captain William Tate. His wife noted that the glider appeared to have unusually good fabric, more closely woven and much better than she had seen in the local store. The fabric was stripped from the glider and later used to make dresses for the Tates' two daughters, Irene and Pauline. The original 1899 Kenwood treadle sewing machine used to modify the Wrights' glider and to sew dresses for the Tates' daughters was purchased from a Sears and Roebuck catalog for $2.00.

Left: **Mr. William Tate, Kitty Hawk Postmaster, and wife Addie M.Tate demonstrating 1899 Kenwood treadle sewing machine;**
Right: **Sewing machine used by Wilbur Wright to modify fabric on the 1900 glider. NPS Photo.**

Resource Brief: Life Saving Station at Kill Devil Hills

On the morning of December 17, 1903, Surfman J. T. Daniels of the Kill Devil Hills Life Saving Station snapped the most famous aviation photograph ever taken. The 1903 Wright Flyer, piloted by Orville Wright, had just taken off from a monorail launching strip on a field at Kitty Hawk when Daniels captured the historic image of the airborne aircraft with Wilbur running alongside. Surfman Daniels and crew from the station assisted the Wright brothers during their flying experiments on the Outer Banks by hauling lumber to the camp, delivering mail, and moving the flying machine from the camp to the launching rail. More importantly, the men served as important eyewitnesses to the world's first flight in a power driven heavier-than-air machine.

Kill Devil Hills Life Saving Station and crew in 1900. Photo courtesy of NC State Archives.

In an article entitled "How We Made The First Flight" that appeared in the December 1913 issue of the American aviation journal, *Flying and The Aero Club of America*, Orville Wright wrote:

> *"During the night of December 16, 1903, a strong cold wind blew from the north. When we arose on the morning of the 17th, the puddles of water, which had been standing about the camp since the recent rains, were covered with ice. The wind had a velocity of 10 or 12 meters per second (22 to 27 miles an hour). We thought it would die down before long and so remained indoors the early part of the morning. But when 10:00 o'clock arrived and the wind was as brisk as ever, we decided we had better get the machine out and attempt a flight. We hung out the signal for the men of the life-saving stations… By the time all was ready, J. T. Daniels, W. S. Dough, and A. D. Etheridge, members of the Kill Devil Life-Saving Station, W. C. Brinkley of Manteo, and Johnny Moore, a boy from Nags Head, had arrived… One of the life-saving men snapped the camera for us, taking a picture just as the machine had reached the end of the track and had risen to a height of about 2 feet… This flight lasted only 12 seconds, but nevertheless it was the first in the history of the world, in which a machine carrying a man had raised itself by its own power in the air in full flight, and sailed forward without reduction of speed and had finally landed at a point as high as that from which it started."*

Ironically, Surfman J. T. Daniels, who took the photograph that has been awarded the title "The Photograph of the 20th Century," had never operated a camera until the morning of the flight.

Resource Brief: First Manned Lunar Landing

Sixty-six years after the Wright brothers inaugurated the aerial age with their heavier-than-air flight at Kitty Hawk, the first man walked on the moon. The landing of the Apollo XI lunar module in the *Mer Tranquilitus* (Sea of Tranquility) on July 20, 1969, was broadcast on live television to a world-wide audience, including a crowd that gathered at WRBR to watch the historic event on television. Commander Neil Armstrong became the first human to step on the surface of the moon. In his Personal Preference Kit (PPK), Armstrong carried a piece of original "Pride of the West" muslin fabric and a fragment of wood from the left propeller of the original 1903 Wright Flyer. These objects, framed along with letters of authentication from Harold Miller, Co-Executor of the Orville Wright Estate and Neil Armstrong, Command Pilot on the Apollo XI, are on display at WRBR Visitor Center.

Left: **Crowd gathered at the WRBR Visitor Center to watch the moon walk on televisions set up on the patio, July 20, 1969. Photo by Aycock Brown;** ***Right:*** **Framed pieces of the original 1903 Flyer that accompanied Apollo XI to the moon with letters of authentication. NPS Photo.**

First Flight Marker at WRBR illuminated by torches the evening of the Apollo XI moon walk, July 20, 1969. Photo by Aycock Brown.

Cultural Landscapes

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research exists to understand the relationship of the park's cultural landscapes to the historic context(s) for the park.		A Cultural Landscape Report was completed for the park in 2002. This report provides sufficient research for the park cultural landscapes.
	Scope of cultural landscapes in the park is understood and a determination has been made whether or not they are a fundamental or other important resource.		The 2002 Cultural Landscape Report provides information about the significance and integrity of these historic properties. The memorial landscape had been identified as a fundamental resource and value for the park.
	Adequate research exists to document and preserve the cultural landscape's physical attributes, biotic systems and uses when those uses contribute to historical significance.		The 2002 Cultural Landscape Report provides adequate research and treatment recommendations to preserve the cultural landscapes of the park.
Inventory	Percentage of landscapes eligible for the National Register in the CLI with certified complete, accurate, and reliable data.		A Cultural Landscape Inventory was completed in 2001, which included data on one-hundred percent of the park's eligible landscapes. In 2004, the North Carolina State Historic Preservation Office (NCSHPO) concurred on the significance of the cultural landscape through information provided in the 2002 Cultural Landscape Report.
Documentation	Percentage of cultural landscapes with adequate National Register documentation.		The park was listed in the National Register of Historic Places in 1966. A number of contexts, criteria, and periods of significance of the property's cultural landscape are not adequately documented in the existing National Register documentation.
Certified Condition	Percentage of cultural landscapes certified as complete, accurate, and reliable in the CLI in good condition.		One-hundred percent of the cultural landscapes are in good condition as certified in 2010.

Cultural Landscapes (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Certified Condition (continued)	Percentage of Maintained Landscapes (historic) in the Facility Management Software System (FMSS) with a Facility Condition Index (FCI) indicating good condition.		One-hundred percent of the maintained landscapes have an FCI that indicates good condition.

Resource Brief: Cultural Landscapes

Wright Brothers National Memorial is a 428-acre interpretive and commemorative site located in Kill Devil Hills, Dare County, North Carolina, about four miles south of the community of Kitty Hawk and about seven miles north of the coastal village of Nags Head, in a highly developed corridor along the Outer Banks. Administered by the National Park Service as part of the Outer Banks Group, the park incorporates the site of the first successful human attempt at heavier-than-air, controlled, powered flight. The designed landscape serves both to interpret this seminal event in aviation history and to memorialize the efforts of Orville and Wilbur Wright.

Wright Brothers National Memorial, 1953

Wright Brothers National Memorial Visitor Center and First Flight Marker, 1963

The analysis of the landscape development at Wright Brothers National Memorial suggests that the appropriate period of significance is 1900–1960. As the location of the Wright brothers' early experiments, culminating in the December 17, 1903, successful heavier-than-air powered flight, Wright Brothers National Memorial achieves its primary significance for its association with that historic event (1900–1903). However, radical changes that occurred to the site, beginning with the stabilization of Kill Devil Hill with grass and shrubs, as part of the Park Development era (1928–1942) altered the historic setting. Subsequent changes in the way the visitor is oriented to the site (1947–1960) altered the commemorative landscape. The 1947 Master Plan and later refinements that included a 1952–1954 visitor's center overlay reflect the culmination of design and development at Wright Brothers National Memorial, ending in 1960 with the construction of the Wright Brothers National Memorial Visitor Center.

The historic condition of the site was that of open, shifting sand flats devoid of vegetation punctuated by three large sand dunes and steady winds of 15–16 miles per hour. A major characteristic of the Wright-era landscape was its dynamic nature in response to natural forces and features. The Wrights chose the Outer Banks as the site of their experiments, because the landscape met certain criteria: broad and open expanses of soft sand, prevailing winds, and sparse vegetation. The landscape was characterized by continual and dynamic change due to the low profile, narrowness, sand deposition, and adjacent high wave energy. The high winds, storm overwash, and salt spray precluded the establishment of dense vegetation.

Beginning in 1928, the topography and vegetation of the site were dramatically changed by the stabilization of Kill Devil Hill and West Hill, which were planted with grasses and shrubs to stop their southwestwardly migration. Construction of artificial barrier dunes

along the Outer Banks between 1936 and 1940 reduced salt spray, sand movement, and storm overwash, dramatically altering the distribution and composition of the vegetation at Wright Brothers National Memorial.

These changes have resulted in the loss of the original setting of the Wright brothers' first flight of December 17, 1903. No Wright-era structures or vegetation remain on site. The World Heritage Committee denied the park's nomination in 1980 as a World Heritage site for this reason. The setting of Wright Brothers National Memorial has achieved significance as an example of a designed commemorative landscape that has evolved over time. Early efforts to memorialize the site focused on the Wright Brothers Monument, the First Flight Marker, and the spatial relationship between the two. With the decision to build a museum/visitor's center and landing strip in the early 1950s, emphasis shifted from the monument and marker to a larger interpretive program that included the reconstruction of the Wright brothers' camp buildings. Markers placed at the landing sites of the first powered flights (the first flight path) have gained importance as a later addition to the commemorative landscape. The landscape retains overall integrity of location, design, workmanship, feeling, and association.

The Wright Brothers landscape includes several historic landscape features: the Wright Brothers Monument and associated powerhouse (1932), the First Flight Marker (1928), the circular monument road and curvilinear pedestrian paths (1936), the original entrance gates (1933), the open, grassed mall that delineates the first flight area (1936), and the Wright Brothers National Memorial Visitor Center (1960). Although the setting of the Wright-era landscape has largely been lost, the open character remains intact. The landscape retains integrity of key features of its commemoration including spatial organization, structures, vegetation, and views and vistas.

Historic Structures

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Historic Structures are identified and evaluated using historical contexts.		The Wright Brothers National Memorial Historic Resource Study was completed in 1997. The park's Visitor Center, designated as a National Historic Landmark in 2001, has been evaluated and documented in a Historic Structure Report (HSR). A Historic Structure Report is needed for the Monument and Powerhouse. The First Flight marker, Curving Trails and Circular Road, and the park's historic Entrance Gateway need condition assessments and treatment documents for long-term management and planning.
	Adequate research exists to document and preserve the historic structure's physical attributes that contribute to historical significance.		The park's Visitor Center, designated as a National Historic Landmark in 2001, has been evaluated and documented in a HSR. The Wright Brothers Monument Historic Structure Assessment was completed in 1996. A Historic Structure Report is needed for the Monument and Powerhouse. The First Flight Marker, Curving Trails and Circular Road, and the WRBR Entrance Gateway need condition assessments and treatment documents for long-term management and planning.
Inventory	Percentage of historic structures eligible for the National Register in the List of Classified Structures (LCS) with accurate, complete, and reliable data.		One-hundred percent (five of five) of the listed properties have accurate, complete, and reliable data. The listed properties are the Monument, Powerhouse, First Flight Marker, Curving Trails and Circular Road, and Visitor Center.

Historic Structures (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Documentation	Percentage of historic structures with adequate National Register documentation.		One hundred percent (five of five) of the park's identified historic structures have adequate National Register documentation.
	Research results are disseminated to park managers, planners, interpreters, and other NPS specialists and incorporated into appropriate park planning documents.		The park's Visitor Center HSR has been provided to park management and field libraries and has been a valuable reference for the rehabilitation and exhibit projects. The park's Visitor Center HSR, Historic Resource Study, and Monument Historic Structure Assessment are available to management and in park field libraries.
Certified Condition	Percentage of historic structures certified as complete, accurate, and reliable in the LCS in good condition.		Eighty percent of the structures are in good condition. The current condition of the park's visitor center is poor, but the structure will be rehabilitated in 2016–2017. The Wright Brothers Monument was rehabilitated twice within the past 20 years and is in good condition. The Powerhouse was restered in 2001 and is in good condition.
	Percentage of historic structures in the FMSS with a FCI indicating good condition.		Seventy-five percent of the structures have an FCI indicating good condition. This includes all facilities except the Pylon Loop Road and Visitor Center.

Resource Brief: Restoration of the Wright Brothers Monument

WRBR commemorates the first successful sustained powered flights in a heavier-than-air machine. The Wright Brothers Monument includes a granite monument that sits atop Big Kill Devil Hill, and overlooks the historic flight line where Orville and Wilbur Wright conducted over 1,000 successful glider flights between 1900 and 1902.

The cornerstone for the Monument was laid during the 25th anniversary of the first powered flights. Orville Wright was the guest of honor at the cornerstone laying in 1928, along with Amelia Earhart, who had just recently become the first woman to fly across the Atlantic Ocean. Four years later, on November 19, 1932, Orville returned for the dedication of the Monument; by then, his brother Wilbur had been dead for twenty years. At the time of its completion, this was the largest monument ever dedicated to a living human being in America. Unfortunately over the years, exposure to saltwater corrosion, high humidity, and other environmental factors caused the structural and mechanical aspects of the monument to deteriorate. The NPS established an agreement with a partner organization, the First Flight Foundation, for the purposes of undertaking a full restoration of the Monument.

Restoration of the Wright Brothers Monument

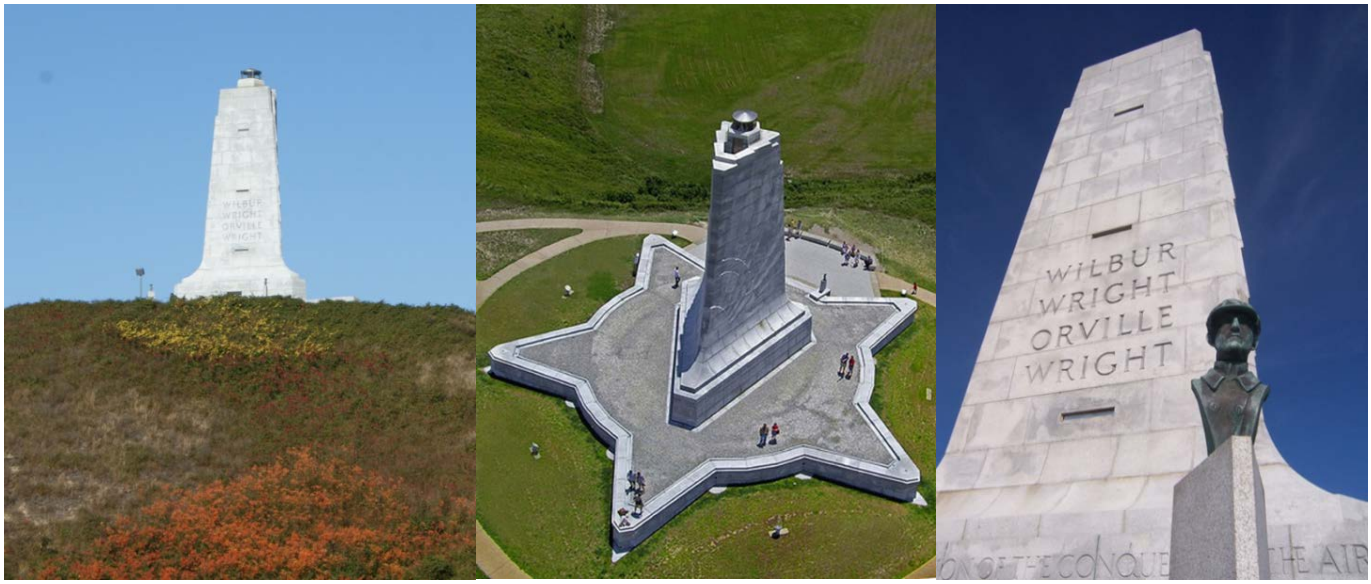
The Wright Brothers Monument

Restoration efforts began on December 18, 2007, the day after the 104th anniversary of the first heavier-than-air powered flight. The partner organization fully funded the project at a cost of $400,000, which included cleaning the entire interior and exterior surfaces of the granite Monument, re-pointing the exterior mortar, painting the stairs, and renovating the electrical and mechanical systems. A redesigned lighting system mirrors the original lighting, which at night improves the contrast and highlights the beautifully carved granite “wings” on the exterior surface of the Monument. The dome and beacon at the top of the monument, 161 feet above sea level, were also cleaned and reworked for maximum efficiency. A dedication ceremony occurred on June 25, 2008, to celebrate the renovation.

Although the 2007 restoration corrected many problems, there are ongoing issues with interior moisture accumulation. A contract was awarded in 2015 to paint the interior, replace lighting fixtures, clean the interior marble floor, and open up exterior weep holes to alleviate moisture accumulation. The contract was halted when paint peeling was detected and further investigation is necessary to determine the cause of the interior moisture accumulation.

Resource Brief: Wright Brothers Monument

The Wright Brothers Monument was designed by the New York architectural firm of Rodgers and Poor and was constructed in 1931–1932 at a final cost of about $285,000. Constructed of gray granite from Mount Airy, North Carolina, the Monument is a 60-foot-high Art Deco-inspired tower embellished with wings on its side and a five-pointed star serving as the base, symbolizing man's conquest of the air. At the time of its construction, the Wright Brothers Monument was the only monument ever built to honor someone who was still alive and remains the largest monument in this country built to a living person. Orville Wright and members of the Wright family attended the Monument dedication on November 19, 1932. Wilbur Wright had died in 1912.



Left: **Wright Brothers Monument. NPS Photo;** ***Center:*** **Aerial view of Wright Brothers Monument. Source Unknown;** ***Right:*** **Wright Brothers Monument. NPS Photo.**

Resource Brief: Wright Brothers National Memorial Visitor Center

The Wright Brothers Visitor Center was officially opened on July 15, 1960, and dedicated on December 17, 1960, the 57th Anniversary of the first flight. The Wright Brothers Visitor Center served as a prototype for the use of modernist architecture in the NPS and was one of more than 100 visitor centers constructed for the NPS Mission 66 project. This stunning photo captures the essence of mid-century modernist architecture that utilized less expensive building materials including steel, concrete, and glass. Architects Mitchell and Giurgola designed the low flat roof of the visitor center to reflect the site's sand flats, while the Flight Room dome and arched overhangs represent the sand dunes and flight. The building was designated a National Historic Landmark in 2001.

Looking across the Ceremonial Terrace into the Flight Room at dusk, October 29, 1962. Photo by Alexandre Georges.

History

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to understand the national significance and historical contexts for the park.		The park is in need of an updated Historic Resource Study. The most recent Historic Resource Study was completed in 1997. An update is needed to the park's 1967 and 1987 Administrative History.
	Research at the appropriate level of investigation (exhaustive, thorough, or limited) precedes planning decisions involving cultural resources.		An appropriate level of research is conducted preceding planning decisions. Projects are reviewed using Planning, Environment and Public Comment (PEPC), and assets are documented in the FMSS.
	Research is conducted by qualified scholars.		The park ensures that research is conducted by qualified scholars.
Inventory	Cultural resources are inventoried and evaluated in consultation with State Historic Preservation Officers (SHPOs).		National Register nomination documents including study applications are submitted to North Carolina SHPO for review. Park projects are reviewed by North Carolina SHPO using PEPC. The NC SHPO has been consulted regarding the WRBR rehabilitation/exhibit projects.
Documentation	Percentage of historic properties with adequate National Register documentation.		National Register documentation is relatively recent and adequate. One-hundred percent (five of five) of the properties have National Register documentation. The Wright Brothers Monument Entrance Gateway was deemed "Not Significant."

Resource Brief: Reproduction Wright Brothers Flyer

Reproduction 1903 Wright Flyer in Flight Room of WRBR Visitor Center. NPS Photo.

A full-scale authentic replica of the Wright brothers' 1903 powered flyer was donated by Harry B. Combs to the NPS as part of the 2003 First Flight Centennial Celebration of the Wright brothers' first powered flight. Mr. Combs, a member of the National Aviation Hall of Fame, was instrumental in developing America's general aviation industry into a world leader and is also a noted Wright brothers historian and author. The replica was constructed by The Wright Experience, Inc. of Warrenton, Virginia whose experts used the process of "reverse engineering" to examine original parts, artifacts, and photographs to remanufacture the 1903 Wright Flyer. The flyer was completed at a cost of one million dollars and is permanently displayed as an interpretive resource at the WRBR Visitor Center.

Resource Brief: Paul E. Garber First Flight Shrine

In 1966, the Kill Devil Hills Memorial Association was rekindled as the newly-incorporated First Flight Society. A keystone of the Society's work today is the close support it offers the NPS at WRBR. The Society established the Paul E. Garber First Flight Shrine displayed in the WRBR Visitor Center. The Shrine is named for Paul E. Garber, the first director of the Smithsonian's Air and Space Museum. The Shrine honors individuals and groups who have achieved significant "firsts" in aviation's development. A new member of the First Flight Shrine has been inducted during December 17 ceremonies every year since 1966 and is honored with the unveiling of their portrait.

Paul E. Garber First Flight Shrine, WRBR Visitor Center, Kill Devil Hills, NC. NPS Photo.

Museum Collections

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research and analysis exists to understand the relationship of the park's museum collection to the historic context(s) for the park.		Recent analysis of the museum collection was conducted by the Cultural Resource Manager and Interpretive staff in preparation for the WBRB exhibit project. A Collection Condition Survey was completed by Harpers Ferry Conservation in 2015. Research and analysis could be improved with additional cultural resource staff.
	Scope of museum collection in the park is understood and a determination has been made whether or not they are a fundamental or other important resource.		The most recent Scope of Collections Statement (SOCS) was completed in 2004. It is supported by the Enabling Legislation, resource management goals and objectives, and interpretive themes. The SOCS should be reviewed and updated every 3–5 years. The museum collection is identified as a fundamental resource and value for Wright Brothers National Memorial in the Foundation Document.
Inventory	Percentage of existing collection that is accessioned and cataloged.		Based on the 2015 Collection Management Report, seventy-seven percent of the museum collection is catalogued (collection includes 68,747 archives and objects). The bulk of the backlog is archives (16,073 items are in the archival backlog). An Archives survey was completed by an outside contractor in 2012 for unprocessed archives already in museum storage. A survey needs to be completed on all files throughout the park. The overall condition of the collection is good; however the burden for the management and planning for three museum collections is on the Cultural Resource Manager. Increasing workloads, administrative requirements, and funding constraints make this task more difficult.

Museum Collections (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Inventory (continued)	Scope of Collection is consistently implemented; items or objects are researched to determine their appropriateness for inclusion in the museum/archive collection.		The 2004 Scope of Collection statement is consistently implemented for new acquisitions to the Wright Brothers museum collection.
Documentation	Accession and deaccession files are complete with all appropriate signatures.		Accession and deaccession files are consistently maintained with hard copy files and in the NPS Interior Collection Management System (ICMS).
Certified Condition	Percentage of museum collection storage facilities in the FMSS with a FCI indicating good condition.		One-hundred percent of the park's museum collection storage facilities are in good condition.

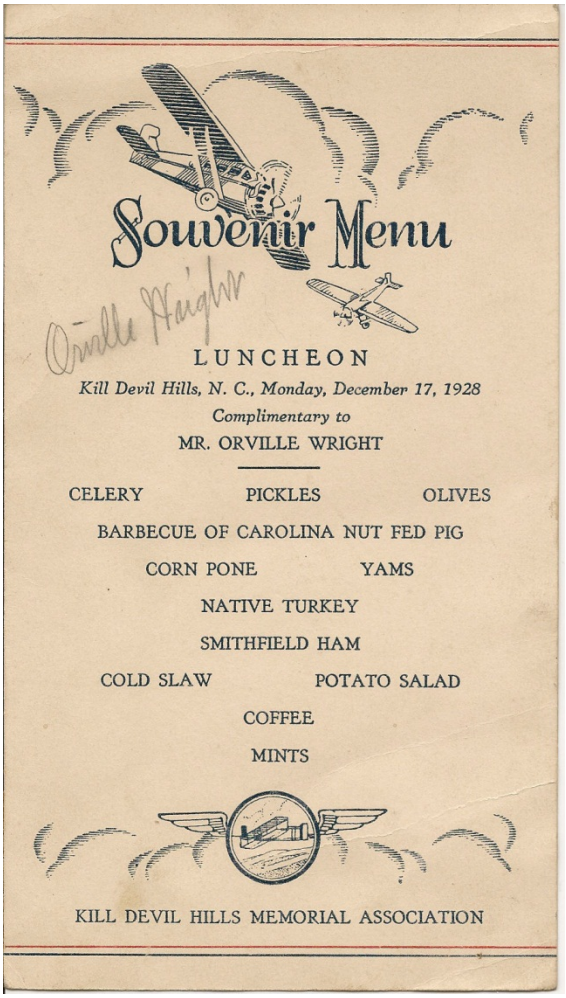
Resource Brief: 25th Anniversary Celebration of the First Flight

To celebrate the twenty-fifth anniversary of the first successful flight, the International Civil Aeronautics Conference and the National Aeronautic Association organized a pilgrimage from Washington, DC, to Kitty Hawk, NC. The delegation, including such notables as Orville Wright, Secretary of War Dwight F. Davis, aviatrix Amelia Earhart, aeronautical engineer Igor I. Sikorsky, and Italian airplane builder Giovanni B. Caproni, departed Washington on December 15, 1928 aboard the steamer *District of Columbia* for the difficult journey to Kitty Hawk. In 1928, the Outer Banks of North Carolina was one of the most remote destinations on the East Coast, and getting there was a considerable challenge.

When the delegation arrived on the Outer Banks on December 17, 1928, they attended a luncheon where they dined on pork barbecue and turkey provided by the Kill Devil Hills Memorial Association at Virginia Dare Shores (a local establishment) and subsequently traveled a distance of about three miles over the shifting sand to the site of the first flight ceremony. An amusing incident occurred just prior to the festivities when Amelia Earhart, along with Reed G. Landis, a celebrated World War I flyer, commandeered a Coast Guard wagon and two horses. Tired of waiting for the few cars to transport visitors to the site, Earhart and Landis, picking up passengers along the way, guided the team from the dock over the sand some three miles to the scene of the celebration.

The assembled crowd first gathered at a platform atop Kill Devil Hill to witness the laying of the cornerstone of the national monument. It was from this hill that the Wrights made numerous experimental glider flights during the three years leading up to the first engine-powered flight. The crowd then moved about a half-mile down the hill to the approximate site of the first flight for the dedication of a six-foot-high granite marker carved to look like a boulder. Here, they witnessed the unveiling of the First Flight Marker that marked the lift-off point for each of the Wright brothers' four powered flights on December 17, 1903. The marker contained a bronze tablet with an inscription commemorating the achievement of the Wrights. A wreath was also laid at the foot of the First Flight Marker in honor of Wilbur Wright, who had died in 1912. The modest Orville Wright did not make any public remarks during the ceremony. The silver anniversary celebration spearheaded the growth of WRBR.

***Left and Below*: Souvenir Booklet from 25th Anniversary conference signed by Amelia Earhart and Orville Wright. NPS Photos**



***Left*:1928 Souvenir Luncheon Menu signed by Orville Wright. Photo courtesy of donor Steve Runfola.**

***Left*: Dedication of First Flight Boulder on December 17, 1928 attended by Orville Wright (left of plaque) and Amelia Earhart (far right). Photo courtesy of NC State Archives.**

Resource Brief: Strut Fragment from the 1903 Wright Flyer

The original 1903 Wright Flyer that made the historic first flight at Kitty Hawk on December 17, 1903, was formally donated to the Smithsonian Institution by the Wright family in 1948. Among the collection of Wright brothers' artifacts stored at the Museum Resource Center at Fort Raleigh National Historic Site is a small piece of original strut from the 1903 Wright brothers' flying machine. Made of spruce, the strut was signed by both Orville and Wilbur Wright and presented as a gift to Otho Cartwright Ward.

Original wood from the 1903 Wright Flyer autographed "Compliments of Orville Wright, Wilbur Wright." NPS Photo.

2.3. Visitor Experience

Visitor Numbers and Visitor Satisfaction

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Number of Visitors	Number of visitors per year		The total of 437,184 visitors in 2015 was slightly lower than the 5-year average of 453,357 visitors for 2010–2014.
Visitor Satisfaction	Percent of visitors who were satisfied with their visit		Based on the standard visitor satisfaction survey conducted each year, the percentage of visitors satisfied in 2015 was 96.0%, compared to the average for the previous five years (96.6%) and ten years (97.1%). Source: 2015 Visitor Survey Card Data Report

Interpretive Programs – Talks and Special Events

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Interpretive Programs	Number and variety of ranger-led programs and attendance		Extensive training, coaching, and mentoring are provided to all interpretive staff to ensure a high quality experience for park visitors. Although removal of the First Flight Pavilion in 2014 resulted in some reduction in the number and variety of ranger-led programs, current visitor attendance at programs remains strong (averaging 120,000 per year) and program offerings are focused on core interpretive themes. The addition of a Park Guide position in 2014 has greatly helped in the provision of year-round interpretive service at the site.
Junior Ranger Program	Number of Junior Rangers		The number of Junior Rangers has been relatively consistent over the past five years at 6,000+ youth engaged per year. The time required to support this program has affected staff capacity to provide other needed interpretive and orientation services. The Junior Ranger booklet is in need of upgrading to provide better youth engagement in primary interpretive themes.
Special Events and Outreach	Number of events		Park staff and partners annually commemorate the December 17th first flight anniversary and National Aviation Day with special events. Other events are planned on an as-needed/appropriate basis (e.g., naturalization ceremonies), based on staff availability to manage the event planning and execution. The park has had a modest increase in local school outreach and is working towards introducing curricula-based education programs for youth in the local schools.

Resource Brief: Formal and Informal Interpretive Programs

As the demographics of park visitors shifts and the National Park Service focuses on engaging the next generation of park visitors, the interpretive programming and opportunities available to park visitors has also evolved. Audience-centered experiences provide an opportunity for connections, contribution, collaboration, and co-creation. Interpretive park rangers at Wright Brothers National Memorial are spending more time in the field to meet visitors and assist in the exploration of personal and societal meanings of the Wright Brothers' activities in the Outer Banks. In 2015, formal interpretive programs offered at the park reached 116,585 visitors. In 2015, audience-centered informal visitor contacts reached a total of 168,976 visitors. These audience-centered informal contacts are personalized experiences with the park visitor to help foster the connection the visitor has with the resources of the park and form their own connections.

Resource Brief: Junior Ranger Program

Becoming a Junior Ranger is a fun way for children to learn more about National Parks and how they can help protect them—just like the Park Rangers that they meet. The Junior Ranger program at Wright Brothers National Memorial is designed for ages 5 to 13. Children will earn a Junior Ranger badge when they have completed the booklet for their age group and have attended at least one ranger-led program. This program has grown significantly and remains a popular activity for children and their families. In 2015, the park swore in 6,333 Junior Rangers. The success of the program cannot be disputed; however it has created financial challenges as costs to provide the program are now at over $10,000 annually. That amount does not include the staff time to administer the program. The First Flight Society has generously provided funds for this program in the past, but is no longer able to financially support this program due to reduced philanthropic giving of individuals and corporations. The manpower needed for this program often overwhelms the information desk staff during summer months. Park staff will continue to be challenged to provide this program at the same level if staffing and funds continue to decrease.

Interpretive Media – Brochures, Exhibits, Signs, and Digital Media

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wayside Exhibits	Condition and currency of exhibits		The park installed 14 new wayside exhibits in 2015. This included the installation of orientation wayside exhibits in front of the visitor center and at the pilot's booth.
Park Directional Signs (off-site)	Usefulness, quantity, and placement		Few off-site directional signs exist for the park. The park has the opportunity to work with surrounding communities to improve off-site directional signs.
Park Informational Signs (on-site)	Usefulness, quantity, and placement		Park informational signs meet NPS standards. In recent years, the park installed new orientation wayside exhibits. The park will upgrade signs throughout the site in 2016.
Visitor Center Exhibits	Effectiveness and engaging quality of exhibits		Currently, the visitor center exhibits are outdated and are no longer relevant to our current park audiences. The park will replace and upgrade visitor center exhibits scheduled for completion in 2018.
Print Media	Accuracy and availability of primary park publications		The park brochure was upgraded in 2013 and is updated annually. The park's summer newspaper, *In The Park*, is available at the park, Cape Hatteras National Seashore visitor centers, Fort Raleigh National Historic Site visitor center, all Outer Banks Visitor's Bureau welcome centers, and on the park website. The newspaper has undergone considerable revision over the past five years to upgrade and streamline the publication.
Digital Media	Currency and scope of website; number of website visitors		Views of the park website have increased over the past five years. The website provides good basic orientation trip-planning information; however, the resource-based content needs to be updated. The park is currently working to refresh this content.
	Social media platforms, updates, posts, likes, and overall activity		The park created a Twitter account in 2012 and a Facebook page, Flicker site, and Instagram site in 2013. The addition of an Interpretive Media Specialist position in 2013 has greatly enhanced the park's social media capacity and produced steady growth of all social media platforms and other interpretive media.
	Mobile app development		The park is currently building a mobile app for the park with anticipated release date of early 2017.

Resource Brief: Media Improvements

The park is developing a mobile app for WRBR. The app will provide orientation, wayfinding, and interpretive content for multiple locations across the park. At each location, the app will show all services available at the location, information about that location, as well as any relevant interpretive context. The app will also provide audio-guided tours for various sites, i.e., the camp buildings. The app includes a list of scheduled events and park alerts. Accessibility to the park will be enhanced with audio description of each location for site-impaired individuals. Users will be able to use the app on site and at home to tour the park. This free app will be available on the Apple app store, as well as the Google Play store. The park will have the capability to update the content of the app at any time, allowing this media to adapt and stay up-to-date with accurate information.

The park has recently completed new wayside exhibits for the park. These durable wayside exhibits help tell the story of the Wrights, their success, and early commemorative efforts to visitors as they travel the park grounds.

Scenic Resources

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Scenic Views	Scenic Views Quality & Protection		The park preserves an open landscape and scenic views from atop Big Kill Devil Hill including expansive views of Albemarle Sound to the west and the Atlantic Ocean to the east. Future development could impact scenic views.

Universal Access

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Mobility	Americans with Disabilities Act (ADA) compliance		Many park facilities provide ADA compliant access to visitors. A comprehensive ADA accessibility assessment is needed to identify areas for improvement in order to meet standards as fully as possible.
Visual Accommodation	ADA compliance		There is currently no audio description for the visitor center exhibits and they do not meet low-vision compliance standards. The new visitor center exhibits, scheduled for installation in 2018, will be fully ADA compliant. The park brochure has been available in braille since 2013. Descriptive information of the park grounds and wayside exhibits will be provided in the mobile app currently under development.
Auditory Accommodation	ADA compliance		The new visitor center exhibits, scheduled for installation in 2018, will be fully ADA compliant. There is a need for provision of assistive listening devices for ranger-led programs and availability of sign language interpreters.
Multi-lingual Resources	Audio and print materials in multiple languages		The park brochure has been translated into Spanish, German, and French. The website visit planning information is available in Spanish. Visitor Center exhibits, wayside exhibits, and the park newspaper are not currently translated into different languages; however, there is opportunity to provide some of this access through the new mobile app.

Safety

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Visitor Safety	Visitor safety program		Park law enforcement staff monitors and responds to visitor safety incidents and other members of staff regularly conduct visitor safety assessments. The park works closely with local law enforcement agencies to manage incidents and ensure staff and visitor safety. Crime is uncommon. The park's Law Enforcement staff is specially-trained for handling Emergency Response, Law Enforcement, and Emergency Medical Services. The majority of the permanent law enforcement staff is trained in Operational Leadership and many in cardiopulmonary resuscitation, First Aid, Emergency Medical Responder, and Emergency Medical Technician.

Safety (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Staff Safety and Training	Staff training program		The majority of the permanent park staff is trained in Operational Leadership and many in CPR, automated external defibrillator and First Aid. Emergency Medical Responder, Emergency Medical Technician and Occupational Health and Safety Administration-required trainings are offered and required for emergency response staff. Risk assessments are conducted prior to task and project engagement. Regular risk management educational messages are shared with staff and volunteers. The park recently implemented a robust employee safety program with a proactive approach to providing engaging and effective training opportunities for employees and volunteers with the aim of increasing awareness and reducing risks. The park has identified additional staff training needed and is developing a program to ensure appropriate safety training for all staff.

Partnerships

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Volunteers	Number of volunteers and hours contributed		Volunteer hours have increased over the past five years. The addition of a dedicated full-time volunteer coordinator for the park in 2014 has greatly helped to professionalize this program. There is still opportunity to grow this program, especially with local community volunteers.
Partnerships, Cooperating Associations, and Agreements	Strength of official and unofficial partnerships		The park has many official and unofficial partnerships that contribute to visitor experiences and park operations including government entities and non-profit organizations. The park's cooperating association, Eastern National, provides educational retail sales in the park's visitor center. In 2014, the First Flight Society became the park's official philanthropic partner and each year the park and society partner to commemorate the December 17th first flight anniversary and National Aviation Day. The park also partners with the First Flight Foundation, an organization that has provided significant support for park projects.

Resource Brief: Volunteers

Volunteer Fred Hattman shows off the "moon cloth."

The Outer Banks Group volunteer program provides an opportunity for individuals and groups to serve their community by assisting the National Park Service in the preservation and protection of unique cultural and natural resources, and by providing visitor services at sites along the Outer Banks. Most volunteers at WRBR contribute to interpretive services, and the Facility Management Division has hosted volunteer groups who completed various projects. The new Outer Banks Group Volunteer Program Manager is working towards creating a successful cross-divisional volunteer program.

Resource Brief: Partnerships

The park has many partnerships that contribute to park operations, stewardship efforts, and visitor experiences. Partnerships are an essential and effective means for the National Park Service to fulfill parts of its mission and foster a shared sense of stewardship. Wright Brothers National Memorial's valued partnerships include the First Flight Society, Eastern National, and the First Flight Foundation. First Flight Society formed in 1927 to preserve the original site of the Wright brothers' flights of December 17, 1903, and supported the establishment of what later became known as Wright Brothers National Memorial. Each year, the park and First Flight Society partner to commemorate the December 17th first flight anniversary and National Aviation Day. Eastern National, the park's cooperating association, provides educational retail sales in the park's visitor center and donates to the park to support operations and visitor services. The First Flight Foundation has provided significant support for park projects including preservation and protection of the Wright Brothers National Memorial monument.

2.4. Park Infrastructure

Overall Facility Condition Index

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The NPS uses a facility condition index to indicate the condition of its facilities and infrastructure. FCI is the cost of repairing an asset, such as a building, road, trail, or water system, divided by the cost of replacing it. The lower the FCI number, the better the condition of the asset. The condition of the buildings and other infrastructure assets at each park is determined by regular facility inspections, or "condition assessments," including daily informal inspections and formal yearly inspections. Deficiencies identified from these assessments are documented in the NPS Facility Management Software System and the cost for each repair determined. Repairs that cannot be completed within the year count against the condition of a structure. The total cost of these deferred repairs divided by the total cost to replace the structure results in the FCI, with values between 0 and 1 (the lower the decimal number, the better the condition). The FCI is assigned a condition category of Good, Fair, Poor, or Serious based on industry and NPS standards. Deferred maintenance projects that require additional funding are identified based on FCI. Planned preventive maintenance on critical components occurs during the year, using a park's base budget. For additional information about how park managers use information about the condition of facilities and infrastructure to make decisions about the efficient use of funding for maintenance and restoration activities at the park, Click Here.

Asset Category	Number of Assets 2015	FCI 2010 / 2015	Condition Status/Trend	Rationale
Buildings	13	0.169 / 0.472		The Visitor Center is on the historic register and the current condition is poor. The park will begin a major renovation on the Visitor Center in 2016. The Pavilion was a temporary building and was removed, except for the restroom section, in 2015. The footprint at this site was reduced with the demolition and removal of two trailers and a housing unit. The completion of the Visitor Center rehabilitation will improve the overall condition of the park infrastructure.
Trails	2	0.009 / 0.012		The Historic Monuments Trail and the bike trail are in good condition. The sidewalks are nearing the end of their life cycle.
Paved Roads, Parking Areas	14	0.145 / 0.457		The condition of paved roads and parking areas is poor. All roads and parking areas in the park require milling and re-paving. The park has identified multiple projects to complete this work scheduled for funding in 2018 and 2019. Once completed, this work will change the trend and the condition.
All Others	17	0.004 / 0.007		The 17 assets in this category include the Wright Brothers Monument, landscapes, and flight line, all of which require regular maintenance.

Chapter 3. Summary of Key Stewardship Activities and Accomplishments

Activities and Accomplishments

The list below provides examples of stewardship activities and accomplishments by park staff and partners to maintain or improve the condition of priority park resources and values for this and future generations:

Natural Resources

- In 2012, a Significant Natural Heritage Area was registered, recognizing the Beach Heather Dune communities present at the park and the abundant state-listed rare plants and butterflies they support.

Cultural Resources

- The First Flight Marker plaque was cleaned and the December 17, 1903, Sculpture was repaired in 2012.
- Continued working with the First Flight Foundation to address the water intrusion issues at the Wright Brothers Monument at WRBR.
- Developed Museum Collection Hurricane Plan for Outer Banks Group Hurricane Plan.
- Hosted and participated in Nationally Significant Cultural Landscapes & FMSS Workshop.
- Analyzed environmental monitoring data quarterly for museum collections at the Museum Resource Center and Wright Brothers National Memorial.
- Collection Condition Survey was completed for WRBR collection in anticipation of new exhibit.
- Photographed and inventoried Wright Brothers Quarters Building objects.
- Completed annual reporting requirements on time including Annual Museum Inventory, National Catalog, Archeological Sites Management Information System (ASMIS), and Outer Banks Group Annual Property Inventory.
- Completed NHPA compliance for 20 PEPC projects.
- Leading Section 106 compliance for WRBR Visitor Center Rehabilitation and Exhibits projects.
- Conducted 9 tours at the Museum Resource Center to staff and general public.
- Hosted 10 researchers at Museum Resource Center.
- Responded to 23 internal staff research requests.
- Responded to 45 external public research requests.
- Provide Bally Building storage for First Flight Society's Wright Brothers Shrine portraits.

Visitor Experience

- In 2014, the First Flight Society became the park's official philanthropic partner and each year the park and society partner to commemorate the December 17th first flight anniversary and National Aviation Day.
- The park has continued partnership with the First Flight Foundation, an organization that has provided significant support for park projects.
- In 2010, completed the park's Long-Range Interpretive Plan (LRIP). The completion of this plan provided direction for park interpretive service improvements, such as growing an active social media presence, adopting national standards as laid out by the NPS Interpretive Development Program, and competing successfully for wayside exhibit funding.
- The cultural landscape maintained by the park provides for a visitor experience that enhances the commemoration and celebration of what the Wrights accomplished at Kitty Hawk—the birthplace of aviation.
- The First Flight Airstrip, maintained through a partnership between the NPS and North Carolina Department of Transportation, Division of Aviation, is utilized by numerous user groups, including private aviators and the military, which provides visitors with the ongoing sense of the evolution of flight.
- A reproduction of the Wright Flyer, on display in a National Historic Landmark-designated visitor center, provides visitors an opportunity to learn through demonstration, the secrets of flight discovered by the Wright brothers.
- Through the park's participation in the Junior Ranger Program and National History Day, the park provides learning opportunities to over 6,000 youths annually.
- In 2014, the park began implementing a professionalized occupational safety and health program.

Park Infrastructure

- Completed a value analysis to repair and renovate the Visitor Center. Construction is scheduled to begin November 2016.
- Treated and restored the December 17, 1903, Sculpture and the plaque on the First Flight Marker.
- The park removed several declining facilities in 2014, including the old superintendent's house, two trailers, and the two main sections of the temporary Pavilion structure.

Chapter 4. Key Issues and Challenges for Consideration in Management Planning

Wright Brothers National Memorial is located in Kill Devil Hills, North Carolina. Wilbur and Orville Wright selected this site for their experiments, because it provided vast expanses of soft sand for landings as well as steady winds. Also, the isolated location allowed the Wrights to conduct their flight experiments under secrecy. In 1900, they camped near the settlement of Kitty Hawk, North Carolina, and used nearby dunes to make numerous glider test-flights. After analyzing their data and conducting additional experiments in Dayton, Ohio, the brothers returned to the Kill Devil Hills in the fall of 1902 and launched nearly 1,000 glider flights from the dunes. During this period of experimentation they tested their new control system and wing shape. They set world records for gliding distance, time, angle of descent, and for a flight in high wind conditions. They then designed the world's first successful flying machine incorporating a specialized gasoline engine and unique propellers, and on December 17, 1903, near the base of the Big Kill Devil Hill, the Wright brothers made the first ever successful, powered, heavier-than-air, controlled flight.

The park was established on March 2, 1927, as Kill Devil Hill Monument, and an Executive Order on March 3, 1933, transferred administrative responsibility of the park to the National Park Service. The Secretarial Order of December 1, 1953, re-designated the area and monument as Wright Brothers National Memorial. The park, listed on the National Register of Historic Places in 1966, protects historic resources including the site where the Wright brothers conducted their experiments, the Wright Brothers Monument, and several commemorative markers. The park's visitor center provides opportunities to learn about the Wright brothers' achievements through interpretive talks, exhibits, and artifacts. The visitor center also houses a reproduction of the Wright Flyer in the First Flight Auditorium. In 2001, the Wright Brothers National Memorial Visitor Center was designated a national historic landmark for its architectural importance and as one of the most complete examples of a visitor center created during the National Park Service's "Mission 66" era of development.

Park staff will continue to work towards preserving the park's resources while managing for high-quality visitor experiences. Park managers will focus on the following topics over the coming years:

Partnerships and Community Relationships
The park intends to build and strengthen community relations, recognizing the importance of community, history, and local cultures in effectively managing the park's resources and enhancing visitor experiences. Park management and staff will continue to build trust and partner with the community and stakeholders to preserve park resources and provide for visitor enjoyment. Partnership and community initiatives could include: collaborating on youth and education programs; enhancing health and wellness opportunities; and growing volunteer programs. The park will recognize the importance of our employees and their role in community relations and perceptions. In an effort to provide additional resources to the park and allow park users to support the places they want to help steward, the park will work with partners to enhance opportunities for visitor engagement and stewardship.

Science Informing Management
The park plans to improve the quality, quantity, and breadth of scientific data used for management and decision-making. Although the park experiences nearly 470,000 visits every year, the National Park Service has limited data about Park visitors. For example, what activities do they prefer to engage in? How do they obtain information about conditions, activities, and resources? What is the carrying capacity of the park to protect resources while providing exceptional experiences for education and inspiration? The park seeks to understand how visitors experience the park; how park users affect resources; and the cultural and natural history of the park. Scientific information to help understand the current and projected impacts of climate change is also critical to improving park management. Although the impacts of climate change relative to the frequency, magnitude and intensity of storms is unknown, it is likely that it will exacerbate storm impacts. Consequently, the park faces difficult and complicated decisions regarding where, when, and if to rebuild structures and visitor facilities post-storm. Therefore, collecting scientific information such as physical monitoring data, vulnerability analyses, and appropriate scenario plans will help set the stage for long-term planning.

Workforce Leadership Development
Park management will focus on developing and improving leadership skills within the park workforce including: building and maintaining a safety culture; building trust, transparency, and credibility throughout the organization; providing hands-on opportunities for staff to grow skills and careers; and mentoring staff on team and project management. The park will accomplish these objectives through strategic hiring decisions, implementing interdisciplinary workgroups, and providing staff with training and development opportunities.

National Park Service Experience

The park will actively work to enhance the National Park Service experience for park visitors including: strengthening the park's identity as a unit of the National Park Service; providing more and enhanced visitor experiences; and proactively engaging youth. Examples of strengthening the park's National Park Service identity include: improving park signage and way-finding; increasing staff presence and engagement with visitors; and improving communication with visitors using the best available technology. Enhancing the visitor experience could include: improving safety and accessibility; enhancing visitor facilities; and providing new or improved educational programs. Examples of more fully engaging youth could include: providing more robust educational programs; engaging local schools and teachers in park programs; hosting multi-day experiences for youth; and conducting outreach and providing opportunities specifically for urban and minority youth groups.

References

See the State of the Park Report for the Park website for a more complete list of references to documents and data sets upon which the assessments in this State of the Park report are based. References for several of the key documents cited in this report are as follows:

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See Also:

Collection of Natural Resource-Related References

Collection of Cultural Resource-Related References

Collection of Visitor Experience-Related References

Glossary

See the State of the Parks home page for a link to a complete glossary of terms used in State of the Park reports. Definitions of key terms used in this report are as follows:

Americans with Disabilities Act (ADA)	Law enacted by the federal government that includes provisions to remove barriers that limit a disabled person's ability to engage in normal daily activity in the physical, public environment.
Archeological Sites Management Information System (ASMIS)	The National Park Service's standardized database for the basic registration and management of park prehistoric and historical archeological resources. ASMIS site records contain data on condition, threats and disturbances, site location, date of site discovery and documentation, description, proposed treatments, and management actions for known park archeological sites. It serves as a tool to support improved archeological resources preservation, protection, planning, and decision-making by parks, centers, regional offices, and the national program offices.
Baseline Documentation	Baseline documentation records the physical condition of a structure, object, or landscape at a specific point in time. A baseline provides a starting point against which future changes can be measured.
Carbon Footprint	Carbon footprint is generally defined as the total set of greenhouse gas emissions caused by an organization, event, product, or person.
Climate Friendly Park	The NPS Climate Friendly Park designation requires meeting three milestones: completing an application; completing a comprehensive greenhouse gas (GHG) inventory; and completing a Climate Action Plan, which is the actions, policies, programs, and measures a park will put into place to reduce its GHG emissions.
Cultural Landscapes Inventory (CLI)	A Cultural Landscapes Inventory describes historically significant landscapes within a park. The inventory identifies and documents each landscape's location, size, physical development, condition, characteristics, and features, as well as other information useful to park management.
Cultural Landscape Report (CLR)	A Cultural Landscape Report (CLR) is the principal treatment document for cultural landscapes and the primary tool for long-term management of those landscapes. It guides management and treatment decisions about a landscape's physical attributes, biotic systems, and use when that use contributes to historical significance.
Curation	National parks are the stewards of numerous types of objects, field notes, publications, maps, artifacts, photographs, and more. The assemblage of these materials comprises a museum collection. Curation is the process of managing, preserving, and safeguarding a collection according to professional museum and archival practices.
Exotic Plant Management Team (EPMT)	One of the ways the NPS is combating invasive plants is through the Exotic Plant Management Program. The program supports 16 Exotic Plant Management Teams working in more than 225 park units. EPMTs are led by individuals with specialized knowledge and experience in invasive plant management and control. Each field-based team operates over a wide geographic area and serves multiple parks.

Facility Condition Index (FCI)	FCI is the cost of repairing an asset (e.g., a building, road, bridge, or trail) divided by the cost of replacing it. The lower the FCI number, the better the condition of the resource.
Foundation Document	A park Foundation Document summarizes a park's purpose, significance, resources and values, primary interpretive themes, and special mandates. The document identifies a park's unique characteristics and what is most important about a park. The Foundation Document is fundamental to guiding park management and is an important component of a park's General Management Plan.
Fundamental and Other Important Resources and Values	Fundamental resources and values are the particular systems, processes, experiences, scenery, sounds, and other features that are key to achieving the park's purposes and maintaining its significance. Other important resources and values are those attributes that are determined to be particularly important to park management and planning, although they are not central to the park's purpose and significance. These priority resources are identified in the Park Foundation Document and/or General Management Plan. The short-cut name that will be used for this will be Priority Resources.
General Management Plan (GMP)	A General Management Plan is a strategic planning document that outlines the future management of a National Park Service site for the next 15 to 20 years. The plan will set the basic philosophy and broad guidance for management decisions that affect the park's resources and the visitor's experience.
Historic Integrity	Historic Integrity is the assemblage of physical values of a site, building, structure, or object and is a key element in assessing historical value and significance. The assessment of integrity is required to determine the eligibility of a property for listing in the National Register.
Historic Resource Study (HRS)	The historic resource study is the primary document used to identify and manage the historic resources in a park. It is the basis for understanding their significance and interrelationships, a point of departure for development of interpretive plans, and the framework within which additional research should be initiated.
Historic Structures Report (HSR)	The historic structure report is the primary guide to treatment and use of a historic structure and may also be used in managing a prehistoric structure.
Indicator of Condition	A selected subset of components or elements of a Priority Resource that are particularly "information rich" and that represent or "indicate" the overall condition of the Priority Resource. There may be one or several Indicators of Condition for a particular Priority Resource.
Integrated Resource Management Applications (IRMA)	The NPS-wide repository for documents, publications, and data sets that are related to NPS natural and cultural resources.
Interpretation	Interpretation is the explanation of the major features and significance of a park to visitors. Interpretation can include field trips, presentations, exhibits, and publications, as well as informal conversations with park visitors. A key feature of successful interpretation is allowing a person to form his or her own personal connection with the meaning and significance inherent in a resource.

Invasive Species	Invasive species are non-indigenous (or non-native) plants or animals that can spread widely and cause harm to an area, habitat, or bioregion. Invasive species can dominate a region or habitat, out-compete native or beneficial species, and threaten biological diversity.
List of Classified Structures (LCS)	LCS is an inventory system that records and tracks the condition of the approximately 27,000 historic structures listed in the National Register of Historic Places that are the responsibility of NPS.
Museum Collection	NPS is the steward of the largest network of museums in the United States. NPS museum collections document American, tribal, and ethnic histories; park cultural and natural resources; park histories; and other aspects of human experience. Collections are managed by professionally-trained NPS staff, who ensures long-term maintenance of collections in specialized facilities.
Natural Resource Condition Assessment (NRCA)	A synthesis of existing scientific data and knowledge, from multiple sources, that helps answer the question: what are current conditions of important park natural resources? NRCAs provide a mix of new insights and useful scientific data about current park resource conditions and factors influencing those conditions. NRCAs have practical value to park managers and help them conduct formal planning and develop strategies on how to best protect or restore park resources.
North Carolina Natural Heritage Program (NCNHP)	Agency within the NC Department of Environment and Natural Resources which serves as an information clearinghouse in support of conservation of the rarest and most outstanding elements of natural diversity in the state. These elements of natural diversity include plants and animals, which are so rare, or the natural communities, which are so significant that they merit special consideration as land-use decisions, are made.
Priority Resource or Value	This term refers to the Fundamental and Other Important Resources and Values of a park. These can include natural, cultural, and historic resources as well as opportunities for learning, discovery, and enjoyment. Priority Resources or Values include features that have been identified in park Foundation Documents, as well as other park assets or values that have been developed or recognized over the course of park operations. Priority Resources or Values warrant primary consideration during park planning and management because they are critical to a park's purpose and significance.
Project Management Information System (PMIS)	A servicewide intranet application within the National Park Service to manage information about requests for project funding. It enables parks and NPS offices to submit project proposals to be reviewed, approved, and prioritized at park units, regional directorates, and the Washington Office.
Resource Management	The term "resources" in NPS encompasses the many natural, cultural, historical, or sociological features and assets associated with parks. Resource management includes the knowledge, understanding, and long-term stewardship and preservation of these resources.
Southeast Coast Network (SECN)	One of 32 I&M networks established as part of the NPS Inventory and Monitoring Program. The Southeast Coast Network comprises 20 parks in Alabama, Florida, Georgia, North Carolina, and South Carolina.

Specific Measure of Condition	One or more specific measurements used to quantify or qualitatively evaluate the condition of an Indicator at a particular place and time. There may be one or more Specific Measures of Condition for each Indicator of Condition.
Visitor and Resource Protection (VRP)	VRP includes, among other responsibilities, protecting and preserving park natural and cultural resources, enforcing laws that protect people and the parks, fire management, search and rescue, managing large-scale incidents, and on-the-ground customer service.