National Park Service
U.S. Department of the Interior

State of the Park Report

Palo Alto Battlefield National Historical Park

Texas

2016

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On the cover: Resaca de la Palma at Sunrise

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 expert 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.

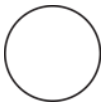
The purpose of Palo Alto Battlefield National Historical Park (PAAL) is to preserve the sites of the opening battles of the U.S.–Mexican War, using historical information and perspectives of both nations to tell the story of the battles; the war; the related political, diplomatic, military, and social causes; and the lasting consequences.

Significance statements express why PAAL resources and values are important enough to merit national park unit designation. Statements of significance describe why an area is important within a global, national, regional, and systemwide context. These statements are linked to the purpose of the park unit, and are supported by data, research, and consensus. Significance statements describe the distinctive nature of the park and inform management decisions, focusing efforts on preserving and protecting the most important resources and values of the park unit. PAAL is significant because:

- PAAL commemorates and preserves the sites of the first and only major battles of the U.S.–Mexican War fought north of the Rio Grande.
- PAAL allows visitors to experience one of the few U.S.–Mexican War battle sites on a landscape that is largely unchanged since 1846.
- The battles of Palo Alto and Resaca de la Palma opened a war that resulted in Mexico ceding half of its land, thus extending U.S. territory to the Pacific Ocean.
- Numerous individuals who participated in the battles on the Rio Grande, including future presidents Mariano Arista, Rómulo Díaz de la Vega, Ulysses S. Grant, and Zachary Taylor, went on to shape their respective nations as military and political leaders.
- PAAL remains a symbol of a war that shaped two nations and provides an emotional and physical focal point for understanding and reflecting on this conflict, its causes, and its consequences.

The summary table, below, and the supporting information that follows, provide an overall assessment of the condition of priority resources and values at PAAL based on scientific and scholarly studies and expert opinion. The internet version of this report, available at http://www.nps.gov/stateoftheparks/paal/, 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 below 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		For 2008–2012, ozone condition warrants moderate concern; sulfur and nitrogen wet deposition conditions warrant moderate concern; and visibility condition warrants moderate concern.
Geologic Features and Processes		The surface geologic features at Palo Alto were created by the deltaic processes of the Rio Grande River. Human-caused alterations to the river have stopped those processes from occurring.
Water Quality		Surface water exists in ephemeral state in the Battlefield as resacas are temporarily filled after extreme rainfalls, usually a product of tropical storms. The Resaca de la Palma, adjacent to the Resaca de la Palma Unit is owned by the City of Brownsville and operated in storm water management capacity—city owned resacas are typically lowered prior to tropical storms. The city routinely monitors the quality of water in the resacas, but has been reluctant to share these data with the park. There are currently insufficient data for a meaningful evaluation. The water of the Resaca de la Palma is not managed by the NPS.
Ecological Communities		There are three habitat types that are generally recognized within PAAL: brush lands, salt prairies, and wetlands (Cooper et al. 2004). Historic agricultural practices cleared many of the grasslands of PAAL and introduced non-native plants for livestock grazing; these practices also contributed to increased erosion rates in the resacas, as well as alterations to the historic hydrologic cycle (Cooper et al. 2004, Segura et al. 2007). Ecological communities have begun to recover to natural conditions since the park was designated and agricultural activities stopped. Efforts by the park to restore the historic vegetation communities will remove non-native vegetation and improve these communities.
Birds		PAAL is located in an area known for its bird diversity. Despite being a small park, PAAL is home to a variety of habitat types and associated bird communities. Rapidly changing land use surrounding the park may impact bird populations in the future.

Priority Resource or Value	Condition Status/Trend	Rationale
Mammals		There are few studies that have documented the status of mammals at PAAL. The presence of several species of interest has been documented but little is known about the population trends of any of these species. Rapidly changing land use surrounding the park will impact mammal populations in the future.
Herptiles		The park supports several species of reptiles and amphibians, including 6 species of amphibians and 21 species of reptiles. The Texas tortoise is a species of conservation concern in the park and is monitored biannually by the GULN and park staff. Continued development around the park is of concern for long-term viability.
Viewscape		The increasing conversion of open land to residential and industrial use within Brownsville impacts the viewshed. Recent and proposed developments outside of the park that impact the viewshed include: 550 toll road connecting the Port of Brownsville to the I-69 corridor, TENASKA electric generating plant and associated power lines, and a 13-acre truck stop within a quarter-mile of the park.
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 Palo Alto Battlefield NHS is 5.96, which is considered a poor condition. Population growth over the past 5 years (2007–2012) has been moderate to high for the Brownsville-Harlingen-Raymondville, TX combined statistical area (<10%), resulting in a neutral trend (U.S. Census Bureau).
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*. The mean acoustic impact level at the park is 7.8 dBA (A-weighted decibels), 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.
Cultural Resources		web ▸
Archeological Resources		Currently PAAL baseline data for its archeological resources are improving with the completion of the systematic survey of the core battlefield by the NPS Southeast Archeological Center (SEAC). Sites/locations listed in ASMIS are in good condition.
Cultural Anthropology		Currently PAAL lacks baseline cultural anthropology/ethnographic resource documentation regarding the relationship between Native American tribes and other distinct cultural communities to the lands and resources managed by the park. Lack of information and documentation warrants moderate concern given the inability to assess condition and/or adequate protection of unknown or undocumented resource(s).

Priority Resource or Value	Condition Status/Trend	Rationale
Cultural Landscapes		CLIs complete for 2 component landscapes (Palo Alto Battlefield and Resaca de la Palma). NHL nomination amendments needed for both to include contributing landscape resources. Both are in Fair condition (2010 assessment), and need to be brought up to Good condition. Period of Significance for both component landscapes is 1846–1916. Two other potential cultural landscapes found not eligible.
Historic Structures		100% of the historic structures have been evaluated using appropriate historical contexts. The known historic structures have been documented and will be added to the Historic Structures Inventory database for this park.
History		The park has conducted extensive research but lacks staffing and funding to complete baseline data for its history resources. The park needs an updated Historic Resource Study and Administrative History. Also, NR/NHL nomination amendments should include contributing cultural landscape resources.
Museum Collections		Overall improvement in documentation and preservation of the museum collection is occurring as a result of park initiatives. Archeological and historic metal objects that are integral to interpreting the first battle of the U.S.-Mexican War are actively deteriorating and significant material loss that is occurring. Conservation treatment is urgent for 228 of the 14,136 items (less than 2%). Museum planning documents, particularly the Scope of Collections Statement and the Collections Management Plan, need to be updated or created to guide effective curation efforts. Cataloging of accessioned collections is timely and 100% complete.
Visitor Experience		web ▸
Number of Visitors		The number of visitors to the park in 2013 is approximately 13% higher than the 10-year average for 2003–2012.
Visitor Satisfaction		The percentage of visitors satisfied in FY13 was 99.0%, which is similar to the averages for the previous five years and ten years.
Interpretive and Education Programs – Talks, Tours, and Special Events		The park does an excellent job of community involvement. They offer a wide range of events to include all segments of the community and many community partners.
Interpretive Media – Brochures, Exhibits, Signs, and Website		All interpretive media in the park has been developed in the last ten years. All Visitor Center exhibits are less than two years old. Brochures, signs, and other media are continually being improved.
Accessibility		The park has actively pursued ways to make the park more accessible by improving road and trail access and making accommodations for visually and hearing impaired visitors.
Safety		The safety of visitors is a park priority. The park safety record is excellent. All employees receive annual training. Operational Leadership is practiced routinely for daily work and special events.
Partnerships		The park has vibrant volunteer and partnership programs. Over the last 5 years 24,986 volunteer hours have been contributed and the park adds new partnerships annually.

Priority Resource or Value	Condition Status/Trend	Rationale
Park Infrastructure		web ▸
Overall Facility Condition Index		Palo Alto Battlefield has been operational for just over a decade and has the benefit of new facilities that have not had time to deteriorate greatly. The park also has strived to maintain its assets on a regular cyclic basis. The park has likewise used funds from lapsed and unfilled positions to make repairs and fund improvements to park infrastructure that might otherwise have not been possible.

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

- Completed an Integrated Vegetation Management Plan and Environmental Assessment to determine the most effective and environmentally-sensitive alternative for restoring and maintaining the gulf cordgrass prairie (Cultural Landscape) in the core battlefield area of the Palo Alto Unit; control exotic plant species throughout the park; and provide visitors with safe and enjoyable access to the park resources.
- Acquired an additional 500 acres within the authorized boundaries of the park, including the 34-acre Resaca de la Palma Unit.
- Completion of basic natural resource inventories and initiation of long-term monitoring of a subset of the park's natural resources by the Gulf Coast Inventory and Monitoring Network (GULN), including Texas tortoise, reptile and amphibian communities, breeding and overwintering birds, and land use outside of park boundaries.

Cultural Resources

- Completion of the Archeology Survey field work, 2005–2012.
- Completion of the Vegetation Management Plan and impending restoration of the cultural landscape.
- 2014 initiated restoration of the Palo Alto Resaca.
- Acquired nearly 500 acres of land to preserve the battlefields.
- Presented a Battlefield Archeology Symposium at the International Fields of Conflict Conference in Columbia, SC, March 2014.

Visitor Experience

- Acquisition of the Resaca de la Palma unit and making it accessible to the visiting public.
- The Resaca de la Palma is interpreted, waysides are present, and ranger-led tours are available.
- Memorandum of Agreement (MOA) with the International Boundary and Water Commission for stewardship of the Fort Brown NHL. The park is also working to expand the boundary of the NHL to include the cultural landscape and is providing ranger-led tours to increase public awareness of the site.
- Addressed major accessibility issues by replacing the Visitor Center floor.
- Developed and installed new Visitor Center exhibits and 22 wayside exhibits for Palo Alto unit. Museum exhibits are made ADA compliant.

Park Infrastructure

- Replacement of Visitor Center HVAC system 2011; Visitor Center doors 2011; and Visitor Center floor, 2010.
- Resurfacing of park paved roads, 2012.
- Paving of park unpaved road, 2012.
- Development and installation of a new Visitor Center exhibit, 2011.

Key Issues and Challenges for Consideration in Management Planning

Key issues and challenges facing the park in the near future include:

External Park Development – The growth and development of Brownsville coupled with planning and zoning efforts that do not promote, enhance, or protect the park are creating some of the most difficult challenges for short-term management and have long-term consequences.

Land Acquisition – The park continues to move closer to the goal of acquiring all lands within the authorized boundary. The majority of the Valley Sound subdivision tracts on the east side of Palo Alto are now in Federal ownership. Tract 101–06, long referred to as the Sanchez tract, remains in private ownership despite acquisition attempts. This property contains significant features related to the position of the Mexican army during the battle.

Development of Visitor Facilities at Resaca de la Palma Unit – The Resaca de la Palma Unit was added to the authorized boundary of the park via legislation in 2009. The NPS acquired fee simple ownership of the site in 2011. The site requires basic visitor amenities to be constructed via approved PMIS projects in 2015 (parking lot); 2016 (restrooms); 2018 (visitor kiosk). The site also lacks water and power at this time. Part of the mitigation package the NPS will receive from the Tenaska power plant includes funding or in-kind assistance to provide a 100-yard utility connection from the street to a point on the Resaca de la Palma unit where restrooms and facilities will be constructed.

Cultural Landscape Maintenance – Natural factors also affect the park's viewshed. Growth of tall brush limits the visitor's ability to view all of the historic battlefield area. A park goal for the Palo Alto Unit is to open up vistas and return the core battlefield area of the park to a dominate prairie grassland consistent with the descriptions of the 1846 battlefield.

Connecting Communities to the Park – Connecting the park to the communities of Brownsville has long confounded the staff at Palo Alto. The question of relevancy is very valid in a community that has little understanding of and time for the traditional "National Park experience." More than 93% of the residents of the city of Brownsville, Texas are Hispanic, many recent immigrants. A large portion of the community lives below the poverty line in one of the poorest areas in the nation. Although the town population has soared to near 200,000 people, these residents often have little awareness of the park and limited opportunity or inclination to visit the site. Understanding what a "National Park experience" looks like and providing that desired park experience to a Hispanic majority is a challenge facing the NPS as the agency begins its second century. This is a current reality for the park with the community of Brownsville.

Partnerships – Closely tied to the issue of connecting to the community is development and maintenance of partnerships. Palo Alto has a robust list of current partners within Brownsville and beyond. Many of these partnerships are "traditional" in nature—museums, schools, historic groups. Park staff should move to engage emerging, non-traditional groups and attract them as partners. This may involve hosting or participating in new or unconventional park activities. It may also involve a virtual partnership that exists on the internet. Employing social media and moving to a digital world is key to reaching the next generation of park supporters.

Staffing Model – need for additional Protection, Maintenance, and Interpretive staff – Palo Alto completed the IMR Core Operations evaluation in 2007, which resulted in the elimination of the Protection Ranger position and combining the Chief of Interpretation with the Chief of Maintenance positions to create an Operations Chief for those functional areas. This staffing model is quickly becoming untenable. The increased workload for both Maintenance due to FMSS and additional facilities and for Interpretation due to the additional programs and staff is rapidly overwhelming the Operations Chief position and it will not be a sustainable model in the future.

Other Potential Issues –
Mineral exploration. Palo Alto does not own the subsurface mineral rights in the park and has been identified as a potential park for oil and gas development. With the advent of new technologies for extracting natural gas from shale, there is potential for oil and gas development under and around the park. Park staff should be vigilant to the possibility of oil and gas development. The IMR Energy and Minerals Program advocates protecting the park through purchase of the mineral rights under Palo Alto if funding should become available from any source.

Wind Farms. Wind energy developments abound north of Cameron County. The Port of Brownsville has entertained placing wind turbines on Navigation District land east of the park, which have potential to further impact the eastern viewshed of the park. Park staff needs to stay engaged on local development plans and maintain open communications with USFWS and others about plans and proposals that could involve or potentially impact the park.

Detailed discussion on each of these challenges can be found in Chapter 4 of this report.

Chapter 1. Introduction

The purpose of this State of the Park report for Palo Alto Battlefield National Historical Park (PAAL) is to assess the overall condition of the park's priority resources and values, to 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, and park operations factual information and expert 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 National Park Service to influence it.

PAAL consists of two units, the Palo Alto Battlefield and the Resaca de la Palma Battlefield. PAAL was authorized by Congress in 1978, and the Resaca de la Palma Battlefield was added to the park as a discontinuous unit in 2008. The 1992 Palo Alto Battlefield National Historic Site Act allows the Secretary of the Interior to "... enter into cooperative agreements with the United States of Mexico, in accordance with existing international agreements and with other owners of Mexican-American War properties within the United States of America for the purposes of conducting joint research and interpretive planning for the historic site and related Mexican-American War sites".

The PAAL encompasses the approximately 3,400-acre historic U.S.–Mexican War battle site 10 miles north of downtown Brownsville, Texas, in Cameron County, near the heart of a growing metropolitan area on both sides of the U.S.-Mexico border. Palo Alto Battlefield is the site of the first major battle of the war between the United States and Mexico. With the exception of some impact from agricultural and ranching activity, the battlefield looks much as it did at the time of the battle more than 150 years ago.

The Resaca de la Palma Battlefield comprises 34.4 acres and is 3.5 miles north of downtown Brownsville, Texas. This unit represents only a small portion of the actual battlefield, as the remainder has been lost to urban development. The site is bounded on the west by Paredes Line Road and to the north, east, and south by Resaca de la Palma, a former channel of the Rio Grande. Resaca de la Palma is the site of the second major battle of the war between Mexico and the United States and is one of only two protected battlefields of the war on what is now U.S. soil. The Resaca de la Palma Battlefield has been affected by dredging, vegetation removal, and prior uses including a residential dwelling and recreational polo field, the remains of which can be found among dense areas of grasses and overstory tree canopy.

The purpose of PAAL is to preserve the sites of the opening battles of the U.S.–Mexican War, using historical information and perspectives of both nations to tell the story of the battles; the war; the related political, diplomatic, military, and social causes; and the lasting consequences.

Significance statements express why PAAL resources and values are important enough to merit national park unit designation. Statements of significance describe why an area is important within a global, national, regional, and systemwide context. These statements are linked to the purpose of the park unit, and are supported by data, research, and consensus. Significance statements describe the distinctive nature of the park and inform management decisions, focusing efforts on preserving and protecting the most important resources and values of the park unit. PAAL is significant because:

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- The battles of Palo Alto and Resaca de la Palma opened a war that resulted in Mexico ceding half of its land, thus extending U.S. territory to the Pacific Ocean.
- Numerous individuals who participated in the battles on the Rio Grande, including future presidents Mariano Arista, Rómulo Díaz de la Vega, Ulysses S. Grant, and Zachary Taylor, went on to shape their respective nations as military and political leaders.
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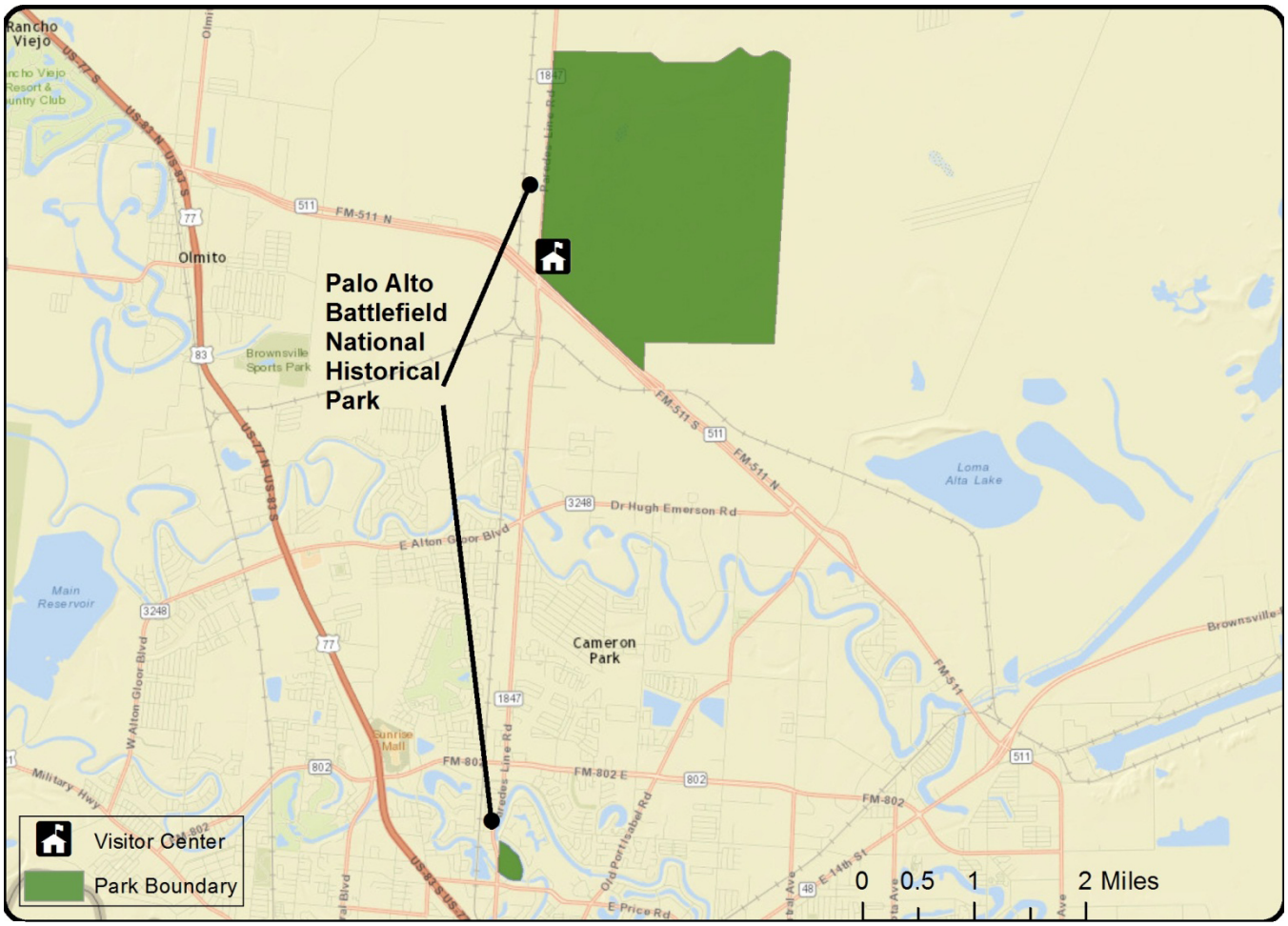

Map of the Park

Location of the Park in Texas

Chapter 2. State of the Park

The State of the Park is summarized below for four categories—Natural Resources, Cultural Resources, Visitor Experience, and Park Infrastructure—based on a synthesis of the park's monitoring, evaluation, management, and information programs, and expert 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 expert opinion and the professional judgment of park staff and subject matter experts involved in developing the report. This expert opinion and professional 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 expert opinion and professional 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
Ozone	Annual 4th-Highest 8-Hour Concentration		Ozone warrants moderate concern. This condition is based on NPS Air Resource Division benchmarks and the 2008–2012 estimated ozone of 63.1 parts per billion (ppb) (NPS-ARD 2015). For 2003–2012, the trend in ozone concentration at PAAL remained relatively unchanged (no statistically significant trend). The degree of confidence is high because there is a nearby ozone monitor in Brownsville, TX.
Deposition	Sulfur Wet Deposition		Wet sulfur deposition warrants moderate concern. This condition is based on NPS Air Resource Division benchmarks and the 2008–2012 estimated wet sulfur deposition of 2.1 kilograms per hectare per year (kg/ha/yr) (NPS-ARD 2015). No trend information is available because there are not sufficient on-site or nearby wet deposition monitor data. The degree of confidence is medium because estimates are based on interpolated data from distant wet deposition monitors.

Air Quality (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Deposition (continued)	Nitrogen Wet Deposition		Wet nitrogen deposition warrants moderate concern. This condition is based on NPS Air Resource Division benchmarks and the 2008–2012 estimated wet nitrogen deposition of 2.6 kilograms per hectare per year (kg/ha/yr) (NPS-ARD 2015). No trend information is available because there are not sufficient on-site or nearby wet deposition monitor data. The degree of confidence is medium because estimates are based on interpolated data from distant wet deposition monitors.
Visibility	Haze Index		Visibility warrants moderate concern. The nearest visibility station is 400 miles away. Much of the haze is mostly caused by humidity, which is common to the area (NPS-ARD 2015).

Geologic Features and Processes

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Active Surface Geological Processes	Frequency and duration of course change and migration of the Rio Grande River.		The surface geologic features at Palo Alto were created by the deltaic processes of the Rio Grande River. Human caused alterations to the river have stopped those processes from occurring. Historically, the Rio Grande likely overflowed its banks nearly every year (Judd and Lonard 2004, Caran et al. 2005). Due to water diversions, dam construction, and other flood control, agriculture, and groundwater developments, flooding is now rare. Inundation is now associated with rainfall and surface runoff, especially during tropical storm systems

Water Quality

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Water Chemistry	Temperature		Water temperature influences water chemistry and the organisms that live in aquatic systems. Texas water quality standard is not to exceed 5 °F above ambient temperature. Condition is based on professional judgment and no trend is assigned due to lack of data.
	Specific conductance		Specific conductance is a measure of the ability of water to conduct an electrical current. It is highly dependent on the amount of dissolved solids, such as salt. There is no state standard for specific conductance. Condition is based on professional judgment and no trend is assigned due to lack of data.
	Dissolved oxygen		Dissolved oxygen (DO) is critical for organisms that live in water. As the amount of DO drops it becomes more difficult for aquatic organisms to survive. Texas standard is not to be below 3.0 mg/l. The condition is based on professional judgment and no trend is assigned due to lack of data.
	pH		pH is a measure of the level of acidity or alkalinity of water and is measured on a scale from 0 to 14, where 7 is neutral. Water with a pH of less than 7 indicates acidity whereas water with a pH greater than 7 indicates alkalinity. There is no standard issued for the Resaca de la Palma, but as a general guidance see the most applicable Texas standard between 6.0 and 9.0 SU. Condition is based on professional judgment and no trend is assigned due to lack of data.

Resource Brief: Water Quality

PAAL is located within the Rio Grande Delta, a landscape characterized by low ridges and truncated meander loops of former channels of the Rio Grande called resacas that once functioned as part of a vast distributary network during times of flood. These seasonal waterways historically flowed with enough energy to maintain flow channels and transport sediment but are now fully removed from the Rio Grande by levees, ditches and the Brownsville Ship Channel. Furthermore, floods that historically carved new channels, thus creating new resacas of the former channel, are now attenuated by the large dams upstream on the Rio Grande. The resacas of the lower valley now act as static water storage mechanisms, or in the case of the larger features, are managed by the City of Brownsville to transfer irrigation waters, to capture stormwater runoff, and to provide an aesthetic backdrop throughout the city. In summary, the resacas at PAAL and the lower Rio Grande Delta are remnants of a hydrologic system completely removed from natural function.

Resaca at the Palo Alto Battlefield Unit after Hurricane Dolly in 2008.

Within the 3,400-acre Palo Alto Battlefield Unit are several resaca remnants that have been left mostly in their natural state, aside from several livestock tanks and associated feeder ditches that were excavated within the resaca beds during the twentieth century. These features are generally dry, occasionally retaining water after heavy rains. In contrast the 34-acre Resaca de la Palma Battlefield Unit is contained within a former meander loop that is maintained as a waterway by the City of Brownsville.

Water Quality Monitoring at PAAL

GULN Hydrologist Joe Meiman made several trips to PAAL to determine the need and feasibility of establishing a surface water quality monitoring program in the remnant resacas. The first monitoring effort focused on an attempt to sample the resacas after a large rainfall. A series of samples were to be taken as water level dropped in the weeks following the rain. As soil salination may be a factor in controlling vegetation, sodium, calcium, and magnesium were added in addition to the required temperature, pH, dissolved oxygen, and specific conductance. After a series of samples it became apparent that the variability in all parameters was too great to be able to detect change over time—thus of little use to the park.

A second effort was made, this time focusing on groundwater. A quick survey of existing wells showed that the larger, deeper wells contain perennial water while the shallow wells are dry throughout most of the typical year. The deeper wells—drilled by Millennium Engineers Group under contract with TA&MU Agricultural Experiment Station Department of Rangeland Ecology in 2003–2005—were drilled through the surficial clay confining layer and into a sand aquifer that lies approximately 3 m below the land surface. At the time of drilling, water was reported in two of the ten wells drilled. Measurements made during the October 2010 site visit shows that the deeper water is saline. In other words, there are deep wells with water that impacts the surface resources very little and shallow wells with no water. Groundwater monitoring would provide the park with no useful long-term data—although it may be used if the park is interested in properly abandoning (plugging) the wells.

Proposed Water Quality Monitoring at PAAL

While there is no perennial surface or natural near-surface groundwater in the Palo Alto Battlefield Unit, the newly acquired Resaca de la Palma Unit is largely bordered by water. The actual water that borders the park is owned and managed by the City of Brownsville but serves as an important aesthetic cultural backdrop to the park. In 2015 the University of Texas at Brownsville (UTB) initiated a three-year project designed to monitor the quality of the ecosystem of the resacas and in part measure the results of the city's ongoing effort to dredge the resacas. This partner-driven project, called Resaca Rangers, enlists teachers and students from various schools to collect the data. This innovative project provides local students with real-world science experience and an opportunity to connect to their natural environment. The most practical long- term monitoring opportunity may lie in a partnership between the park and UTB. An agreement would stipulate the use of the GULN Water Quality Monitoring Protocol and SOP and the sharing of data. Such an agreement would give practical field experience to students and give the park a natural resource presence in the new park unit. The GULN hydrologist will provide technical information towards the development of the agreement with UTB and will continue technical support to PAAL regarding hydrological issues.

Map showing the Resaca de la Palma Battlefield Unit with the UTB Resaca Ranger Monitoring Area overlaid on 2012 NAIP aerial imagery.

Ecological Communities

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Open Prairie Community	Areal extent		The extent of grassland species is directly reduced by encroachment of woody species. In the absence of disturbance, woody species can invade and take over the prairie communities that are characteristic of the historic battlefield conditions. Both analysis of historical photos (Ramsey et al. 2004) and observations by park staff show that the extent of grassland species has decreased since 1934. Control of these woody species is included in the park's vegetation management plan designed to restore and maintain the cultural landscape. Implementation of this plan will be phased in as funding allows.
	Species richness		The vascular plant inventory (Lonard et al. 2004) documented 23 species in the areas encompassing the open prairie community. Condition is based on park staff professional judgment.
	Ratio of native to non-native species		Although there are 21 non-native species documented at PAAL, no non-native plants were documented in the salt flats or coastal marshes in the latest plant inventory (Lonard et al. 2004). Several non-native species known to be highly invasive are present in and bordering the park. The park actively manages non-native species with the assistance of the Gulf Coast Exotic Plant Management Team (EPMT).
Tamaulipan Brushland	Diversity of native species		Although there are a few species that are typical of Tamaulipan Brushland that have not been documented in the park, there is little evidence that the species composition has changed substantially since the historic reference condition of the time of the battle.
	Areal extent		The areal extent of this vegetation type has increased since 1934. Although some of these areas consist of an earlier successional stage, the overall area of coverage is of low concern.
Resaca Wetland and Riparian Community	Native species richness		The most recent inventory documented 60 native and non-native plant species in these areas (Lonard et al. 2004). Condition is based on park staff professional judgment.
	Areal extent of wetland and riparian community		Historic accounts indicate that wetland area was likely much larger at the time of the battle. Hydrologic modifications have reduced the wetland areas and restoring that hydrology is outside of the park's control.
	Characteristics of wetland soil		Soil moisture and redox potential are useful indicators of wetland soil conditions; data are very limited in the park. Native wetland species such as *Spartina* can maintain wetland soil conditions (Cooper and Wagner 2013). Periodic tropical rain fall events are capable of maintaining wetland soil conditions (Cooper and Wagner 2013).

Resource Brief: Vegetation Management Plan to Restore the Cultural Landscape of the Core Battlefield at Palo Alto

Despite the largely undeveloped nature of Palo Alto, twentieth-century activities have altered the physical environment and continue to degrade the historic character of the battlefield. The primary concern is the continuing process of encroachment, and eventual domination, of native woody and cacti species on the historic gulf cordgrass prairie as a result of an altered hydrologic regime, past land management practices, and the lack of a proactive vegetation management program. Despite these changes, the park has distinct opportunities to restore or mitigate altered landscape situations on the core battlefield of Palo Alto through vegetation management practices. Consequently, PAAL could fulfill its legislative mandate of preserving the historic character of site by developing a comprehensive and integrated plan for managing the vegetation with the goal of restoring and maintaining the cultural landscape of the core battlefield at the Palo Alto Battlefield Unit.

In FY 2014 PAAL finalized the *Integrated Vegetation Management Plan and Environmental Assessment* including a signed *Finding of No Significant Impacts* for the NPS preferred alternative. The NPS's preferred alternative was the selected action because it best met the project objectives:

1. Restore and maintain the cultural landscape and the historic character of the core battlefield area of Palo Alto in most effective, efficient, and environmentally-sensitive manner;
2. Control, with the long-term goal of eliminating, the presence of exotic plants within the park; and
3. Provide visitors with safe and enjoyable access to the resources the park is charged with preserving and interpreting.

***Left*: Brush and prickly pear cactus overtaking the historic coastal prairie at Palo Alto Battlefield. Photograph 2/23/2015.; *Right*: Temporary nursery for growing gulf cordgrass. Photograph 9/19/2014.**

PAAL can now implement a vegetation management program utilizing a full range of mechanical, cultural (including the use of prescribed fire), chemical, and biological treatments to restore and maintain the cultural landscape in the core battlefield area at Palo Alto. In brief, the park plans to remove the invasive woody and cacti vegetation from historic grassland prairie, reintroduce gulf cordgrass, and use prescribed fire to promote the development of the cordgrass and keep the woody and cacti plant species at bay. As part of this program, specific multi-purpose and targeted vegetation monitoring protocols will be developed and implemented in coordination with the NPS personnel of the Gulf Coast Inventory and Monitoring Network, Gulf Coast Exotic Plant Management Team, and fire ecologists to: (1) define the effectiveness of specific vegetation management treatments, (2) provide early detection of newly invading species, (3) determine fire effects on native and non-native vegetation, and (4) determine cultural landscape restoration success in the core battlefield of Palo Alto.

Planting gulf cordgrass on the core battlefield at Palo Alto. Photo 10/31/2014.

Birds

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Breeding Birds	Species abundance and diversity		The NPS certified species list confirms the presence of 67 species of breeding birds within PAAL. Three years of GULN breeding bird point count sampling has confirmed 59 breeding bird species. Of these species, only 4 species were detected with great enough frequency to estimate density and park population (Linder 2013). Condition is based on professional judgment and local observations.
Raptors	Species abundance and diversity		The diverse habitats of PAAL can support a variety of different raptor species, including the endangered Aplomado falcon. There are currently 18 raptor species on the certified species list, 10 of which have been confirmed in the GULN breeding and wintering bird surveys. Condition is based on professional judgment and local observations.

Resource Brief: Birds

PAAL is located in the Rio Grande Valley of Texas, an area known for its bird diversity. PAAL is home to several unique habitat types including open prairies, dense thickets of mesquite, thorny undergrowth, and a series of resacas crossing the landscape. The unique ecosystems and landforms in PAAL provide bird species with a wealth of habitat types and food sources. Despite being a small park, PAAL supports resident avian species and provides wintering habitat for migratory species. The avian community of PAAL is a unique collection of species and serves as an important component of the avifauna in the national park system.

Many of the breeding bird species present in PAAL are common to other areas of the U.S. and Mexico (e.g., northern cardinal, northern mockingbird). However, PAAL is also home to several unique breeding species whose home ranges only extend into the U.S. near the U.S./Mexico border. Examples of these species include the Texas Botteri's sparrow, the plain chachalaca, and the great kiskadee.

PAAL is also home to three bird species listed as threatened by the Texas Parks and Wildlife Department (TPWD). These species are the white ibis, the Texas Botteri's sparrow, and the white-tailed hawk. In addition, the northern aplomado falcon, which is both state- and federally-listed as endangered, is also known to occur in the park.

Eastern meadowlark singing in PAAL. Photograph by: Rolando Garza.

Threats to Birds at PAAL

The primary threats to birds at PAAL are related to habitat change and the rapid development and land use change outside of park boundaries. These changes include the development of traditional power plants and alternative energy wind farms in south Texas. Brownsville has grown rapidly over the last 20 years, and residential and commercial developments around PAAL have especially increased in recent years (Garza, personal communication, 29 June 2012). This process of urbanization will likely result in a transformation of the natural landscape of the area, and PAAL will likely become an "island" of natural habitat in an area surrounded by urban structures. If this occurs, the breeding bird population in the area could become fragmented, lose valuable nesting habitat, and could lose vital food sources.

Monitoring Birds at PAAL

Because the park recognized the broad interest in birds, in 2011 PAAL became the first unit of the National Park Service to install an eBird kiosk in the visitor center. The kiosk provides an interactive way for the public to both learn about the birds on the park and to report bird observations directly into the eBird database managed by The Cornell Laboratory of Ornithology. It is expected that new species will be observed and documented using this kiosk.

In 2011 the GULN began a point-count based monitoring program to monitor both breeding and wintering bird populations. The long term objective of this program is to document changes in density estimates and species abundance over time. Although many bird species are being detected in the monitoring effort there are not yet enough years of data to determine any trends.

Northern aplomado falcon sitting on a fence post eating a mouse. Photograph by: Rolando Garza

Mammals

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Coyotes	Population density and distribution		In PAAL, coyotes are year-round residents of the park's brush and prairie habitats (Hays 2004), and are one of the few top-level predators in the park. Although they are seen in the park, there are no estimates of population size or distribution. Trend is based on land use changes outside the park.
Collared Peccary	Population density and distribution		Although collared peccaries have been documented in the park (Richard and Richardson 1993), there are no data regarding population density or distribution. Park staff rarely sees them. Trend is based on land use changes outside the park.
Wild Cats	Species abundance and distribution		PAAL is one of the few places in Texas that provides potential habitat for four native wild cat species: the bobcat, the mountain lion (*Puma concolor stanleyana*), the ocelot (*Leopardus pardalis*), and the jaguarundi (*Felis yagouaroundi cacomitli*). These species are often associates with the Tamaulipan brushlands that are found along the lomas and higher elevations in the park. There are no data regarding population density or distribution of these species on the park. In the last five years there has been one mountain lion documented. Bobcats are frequently detected by park staff. Trend is based on land use changes outside the park.
Native Rodents	Species abundance, diversity, and distribution		PAAL provides diverse habitats and ground cover for four native rodent species: the southern plains wood rat, the white-footed mouse, the hispid cotton rat, and the Mexican ground squirrel. Recent inventory (Hays 2004) documented two of these species: southern plains wood rat and Mexican ground squirrel. There are no data regarding species abundance, diversity, or distribution of these species on the park. Condition and trend are based on observations by park staff.

Herptiles

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Amphibians	Species abundance, diversity, and distribution		Six species of amphibians have been confirmed at PAAL, including 3 toads and 3 frogs. The hydrologic modifications and dry, saline environment of the park creates a harsh habitat for amphibians and may be the reason for low numbers (Cooper et al. 2004). There are no estimates of species abundance or distribution and the presence of amphibians is closely tied to periods of rain. Consequently, few individuals have been detected during the monthly herp monitoring begun by GULN in 2011.
Reptiles	Species abundance, diversity, and distribution		PAAL provides habitat for a number of reptiles, including snakes, lizards, turtles, and tortoises (Duran 2004). Snakes are the most diverse reptile group in PAAL, with 14 species documented in the park (NPSpecies, Duran 2004). There are also four lizard species documented in PAAL. Four turtle species are found in PAAL, including one non-native species, the red-eared slider (*Trachemys scripta*), as well as one species of tortoise, Berlandier's tortoise (also known as the Texas tortoise). Very little information characterizing reptile populations is currently available. The GULN began monthly herp monitoring in 2011, which has confirmed species in the park, but the low numbers detected do not yet allow for estimates of abundance or distribution parameters.
Texas Tortoise	Population density and distribution		Habitat modeling and prior studies show that prime tortoise habitat comprises approximately 120 ha within the park. Sampling from 2008 through 2014 revealed that tortoises are widely distributed within best available habitat areas across the park and >200 unique individuals have been identified to date. Trial data also suggest that, in good habitats, the tortoise population on PAAL may exceed 8–10 individuals/hectare—a density comparable to that reported for other Texas tortoise populations (Kazmaier et al. 2001, Hellgren et al. 2000, Judd and Rose 1983). The continued development around the park may be of concern for long-term viability.
	Sex ratio age class structure		The combination of a fundamentally equal sex ratio in adults and evidence for ongoing reproduction (capture of hatchlings, observation of juveniles 1–4 years old and frequent observation of hatched egg shells) suggests viable reproduction. The continued development around the park may be of concern for long-term viability.

Resource Brief: Texas Tortoise

The Texas tortoise (*Gopherus berlandieri*) is the smallest of four North American tortoise species with distribution in the United States limited to the lower Texas plain from Brownsville to south of San Antonio and westerly to the east side of the Big Bend area. Historically, this tortoise was more abundant and associated with drier scrub and thorn-brush habitats throughout its range, but by the mid-20th century, populations were in decline in many areas (Rose and Judd 1982). The combination of increasing habitat-loss and fragmentation, coupled with documented declines in tortoise range and density, led to increasing interest and concern for this species. Consequently, the Texas Parks and Wildlife Department initially listed the Texas tortoise as a Texas state species-of-concern and then, in 1982, raised that listing to threatened species status (Judd and Rose 2000).

Texas Tortoise, *Gopherus berlandieri*, being weighed, PAAL, 2012 Photograph by: RL Woodman, Gulf Coast Inventory and Monitoring Network

Monitoring of Texas Tortoises on PAAL

The Texas tortoise is of specific interest to PAAL because 1.) it has legal status and protection as a Texas state-listed threatened species, 2.) it is historically associated with specific thorn scrub vegetation and habitat conditions which are well-represented on PAAL and which also constitute a focus in park vegetation management planning, and 3.) the park encompasses a potentially secure and well-protected island of better habitat for this species in an otherwise rapidly-changing environment threatened by accelerating land conversion and urban development.

The GULN began development of the tortoise monitoring project in 2008 in collaboration with Drs. K. Buhlmann and T. Tuberville, University of Georgia –Savannah Ecological Laboratory (SREL). Sampling to date has revealed that tortoises are widely distributed within the best available habitat areas across the park and >200 unique individuals have been identified and marked. The findings of a fundamentally equal sex ratio in adults, evidence for ongoing reproduction (capture of hatchlings and observation of juveniles 1–4 years old), and frequent observation of hatched egg-shells, suggests a viable population on the park. Trial data also suggest that, in good habitats, the tortoise population on PAAL may exceed 8–10 individuals/hectare—a density comparable to that reported for other Texas tortoise populations (Kazmaier et al. 2001, Hellgren et al. 2000, Judd and Rose 1983).

Potential Threats to Texas Tortoises on PAAL

Potential threats to Texas tortoises include habitat alteration, population isolation due to increased development surrounding the park, disease, predation, and direct human induced mortality such as being struck by vehicles on the roads surrounding the park. Since sampling began by the GULN in 2008, a total of 12 tortoise mortalities have been documented. Of these, 1 marked individual was killed on the highway outside the park's main gate. This confirmed that this was a potential threat and that earlier observations of dead tortoises along the road ways could have been individuals leaving the park. Consequently, the park decided to construct tortoise-proof fencing along portions of the boundary to reduce this source of mortality.

There was one notable group mortality event discovered during the November 2012 sampling visit; 4 mature tortoises were found dead in close proximity in the northwest portion of the park. The remains of all of the individuals looked very similar, suggesting they died at the same time and possibly by the similar means. Likely cause of death was attributed to potential predation by feral hogs, given as all showed damage and disarticulation that could be hog-related and the event occurred in an area with substantial recent hog sign. Two additional dead tortoises were found in the same area in 2014, also presumably killed by hogs. Feral hogs are a recognized threat to reptiles and amphibians on other public lands (Jolley et al. 2010) and to Texas tortoise specifically (Rose and Judd 2014 and citations therein), and hogs are a current management concern on PAAL.

With the exception of those killed by vehicle strikes, the specific cause of death could not be discerned from most the remains; all were found as reasonably intact carapaces and generally limb bones were present.

Texas tortoise (*Gopherus berlandieri*) at Palo Alto Battlefield National Historic Site. Photo courtesy of Robert Woodman, Gulf Coast Inventory & Monitoring Network. National Park Service

No clear evidence of predation, significant injury, or disease was observed.

Overall, there appears to be little evidence for strong predation pressure or large scavenger pressure acting on the PAAL population, other than the events reported in 2012 and 2014. Dead tortoises and remains are only occasionally seen by field crew, although remains are readily visible in most cases. No remains, other than the 6 believed to be victims of feral hogs, seem to exhibit evidence of damage of the sort expected during attacks by larger carnivores.

Viewscape

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Viewshed	Change in land use cover outside the park		The city of Brownsville is growing and development is building closer to the park, impacting both the viewshed and the isolation of park habitats. Analysis of parcel data conducted by GULN confirms a high number of parcels undergoing development within a close proximity to the park.

Dark Night Sky

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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. 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 Palo Alto Battlefield NHS is **5.96**, which is considered a poor condition. Population growth over the past 5 years (2007–2012) has been moderate for the Brownsville-Harlingen-Raymondville, TX combined statistical area (<10%), resulting in a neutral trend (U.S. Census Bureau).

Resource Brief: Night Sky Resources at Palo Alto Battlefield NHP

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 evident 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 Palo Alto Battlefield NHP is poor with a median ALR of 5.96. This is considered a poor condition for non-urban parks. At these light levels the Milky Way has lost most of its detail and is not visible near horizon. Zodiacal light is rarely seen and anthropogenic light dominates natural celestial features. Some shadows from distant lights may be seen, and dark adaption may be possible in at least some directions, though visible shadows are likely present.

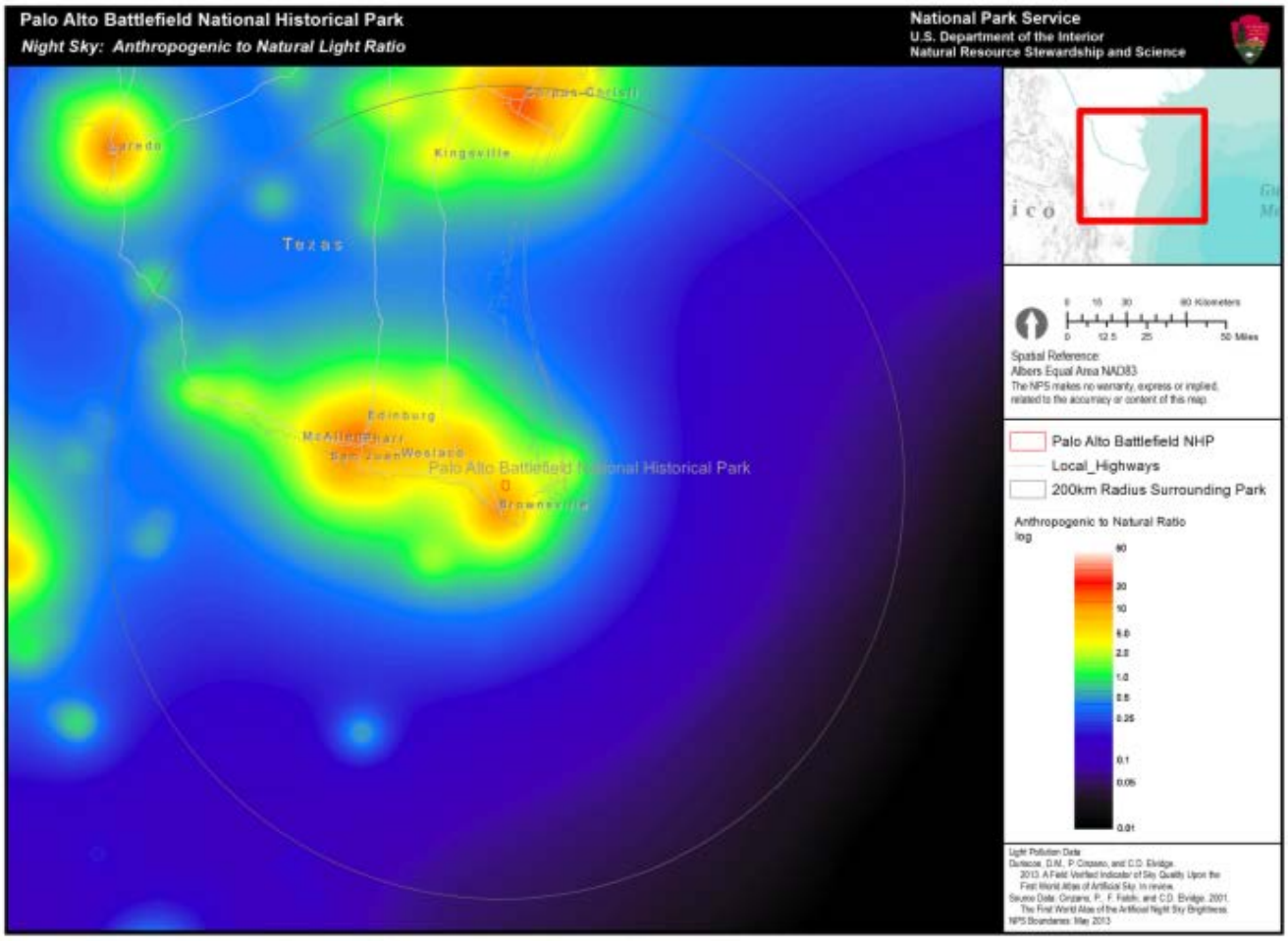
Assessment
One way the Natural Sounds & Night Sky Division (NSNSD) scientists measure the quality of the photic environment is by measuring the median sky brightness levels across a park and comparing that value to average natural night sky luminance. This measure, called the Anthropogenic Light Ratio (ALR), can be directly measured with ground based measurements, or when these data are unavailable are modeled. The GIS 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 assessed using lower thresholds of impact. According to the U.S. Census Bureau, Palo Alto Battlefield NHP 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 20150324

Regional view of anthropogenic light near Palo Alto Battlefield NHP. The circle around the park represents the distance at which anthropogenic light influences the night sky quality of the park.

Acoustic Environment

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Acoustic Impact Level	A modeled measure of the noise (in 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 7.8 dBA (A-weighted decibels), 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.

Resource Brief: Acoustic Environment at Palo Alto Battlefield National Historical Park

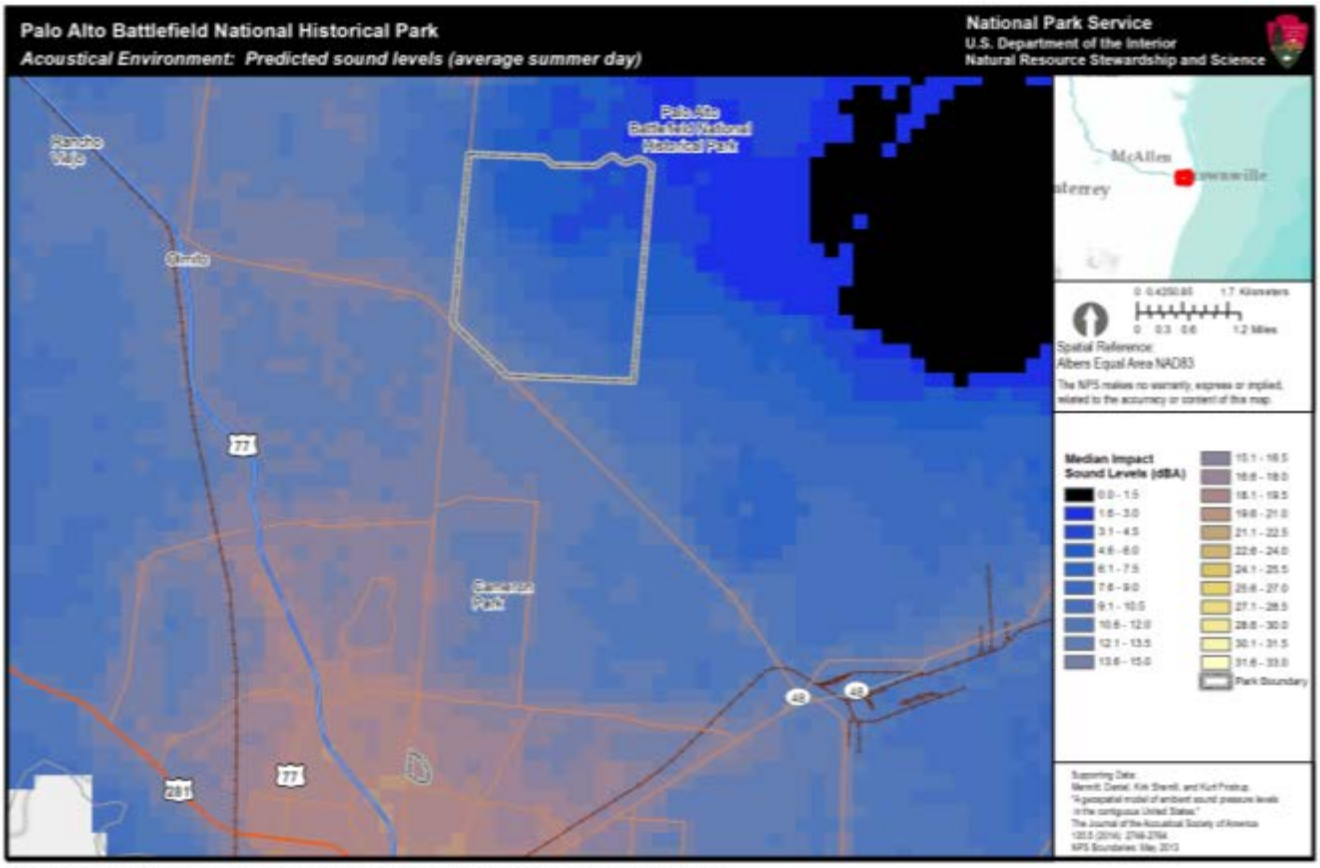
To characterize the acoustic environment, the National Park Service has developed a national model of noise pollution (Mennitt et al. 2014). This model predicts the increase in sound level due to human activity on an average summer day. The model is based on measured sound levels from hundreds of national park sites and approximately 100 other 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.

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. 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 below are also explained in terms of listening area.

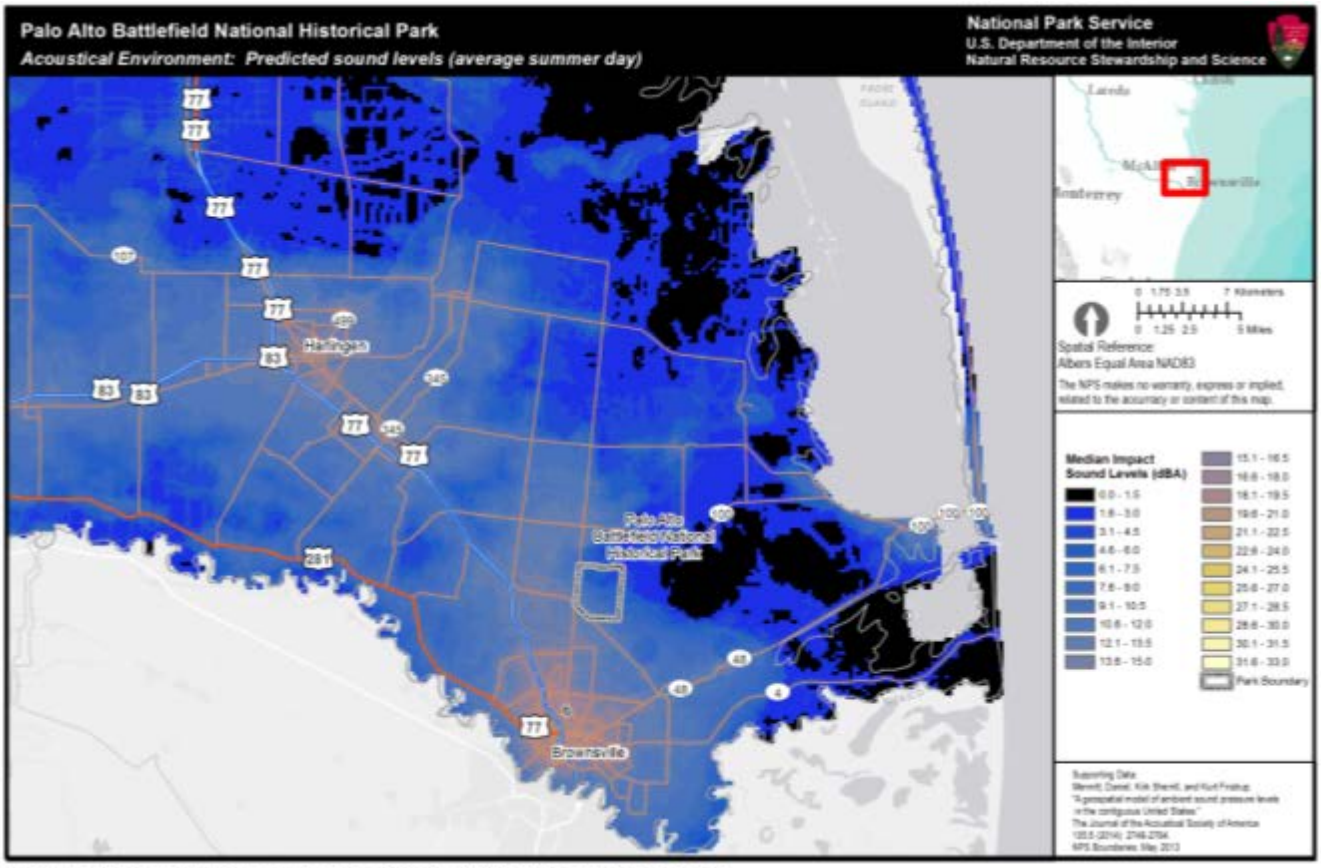
Condition thresholds for the acoustic environment in non-urban parks

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 20150324

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 20150324

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.

Resource Brief: Historical and Projected Changes in Climate for Palo Alto Battlefield National Historical Park

Climate change impacts all aspects of park management from natural and cultural resource protection to park operations and visitor experience. Effective planning and management must be grounded in our comprehension of past dynamics as well as the realization that future conditions may shift beyond the historical range of variability. Climate change will manifest itself not only as shifts in mean conditions (e.g., increasing mean annual temperature and sea level) but also as changes in climate variability (e.g., more intense storms and flooding). These changes may alter vegetation type and structure of cultural landscapes and accelerate weathering, deterioration, and loss of other cultural resources. Park managers are dealing with both rapid directional change and tremendous uncertainty (see references in Fisichelli 2014). Understanding climate change projections and associated levels of uncertainty will facilitate planning actions that are robust regardless of the precise magnitude of change experienced in the coming decades.

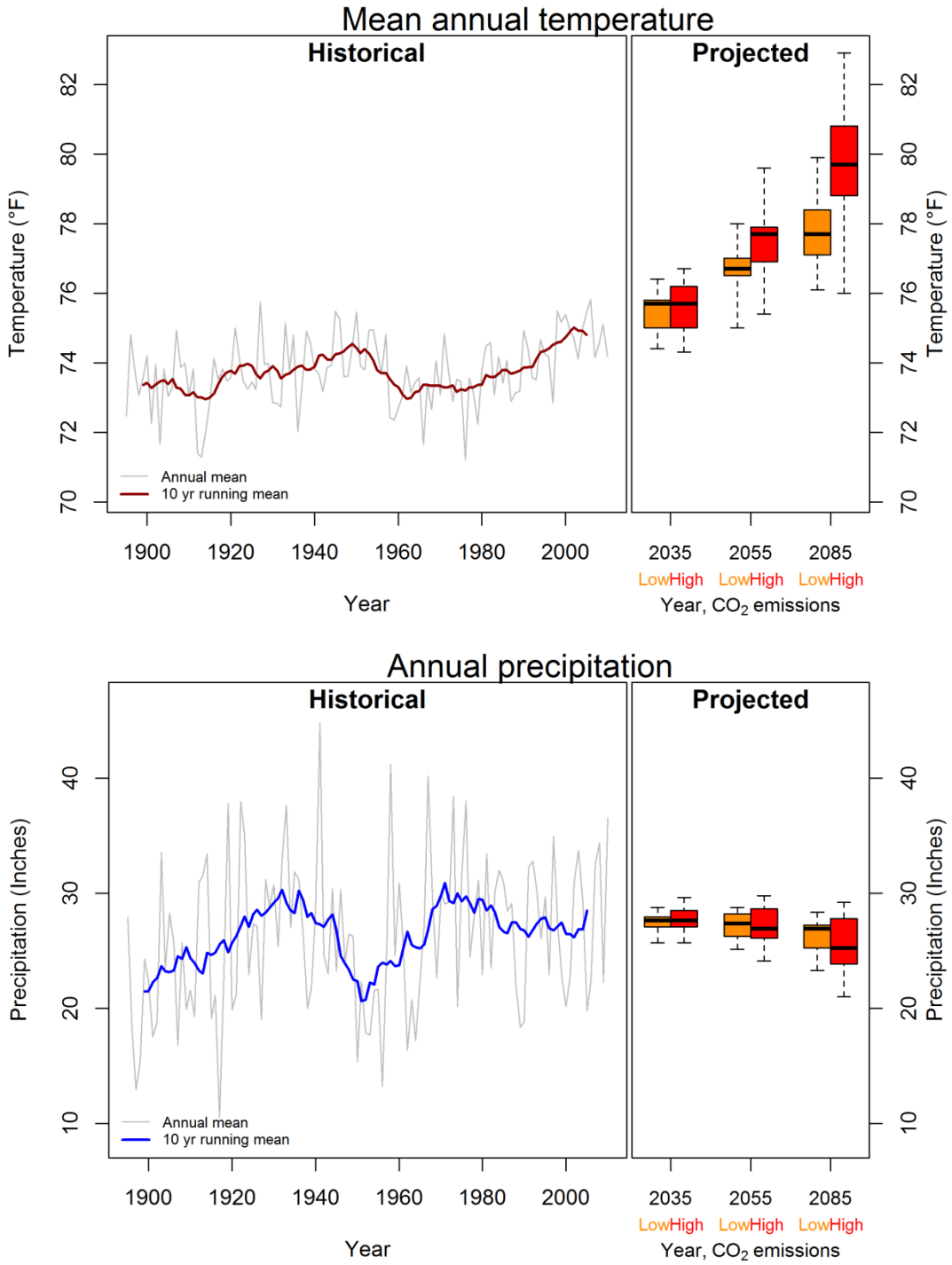
Historical climate trends
Historical annual temperature and precipitation trends for Palo Alto Battlefield are based on climate maps of the park and surrounding landscape (Fisichelli 2014). Over the 116 year record (1895–2010), mean annual temperature showed an increasing linear trend (+0.1 °F per decade; see figure below), and this warming trend accelerated since 1970 (+0.5 °F per decade). Annual precipitation showed strong interannual variability and a slight increasing trend over the entire record (+0.4 inches per decade; see figure below). However, unlike temperature, annual precipitation has not shown a significant linear increase or decrease since 1970.

Sea level in the region has also shown a significant increase over the past century (see references in Caffrey 2014). Sea level near Palo Alto Battlefield has risen more than 10 inches over the last 68 years.

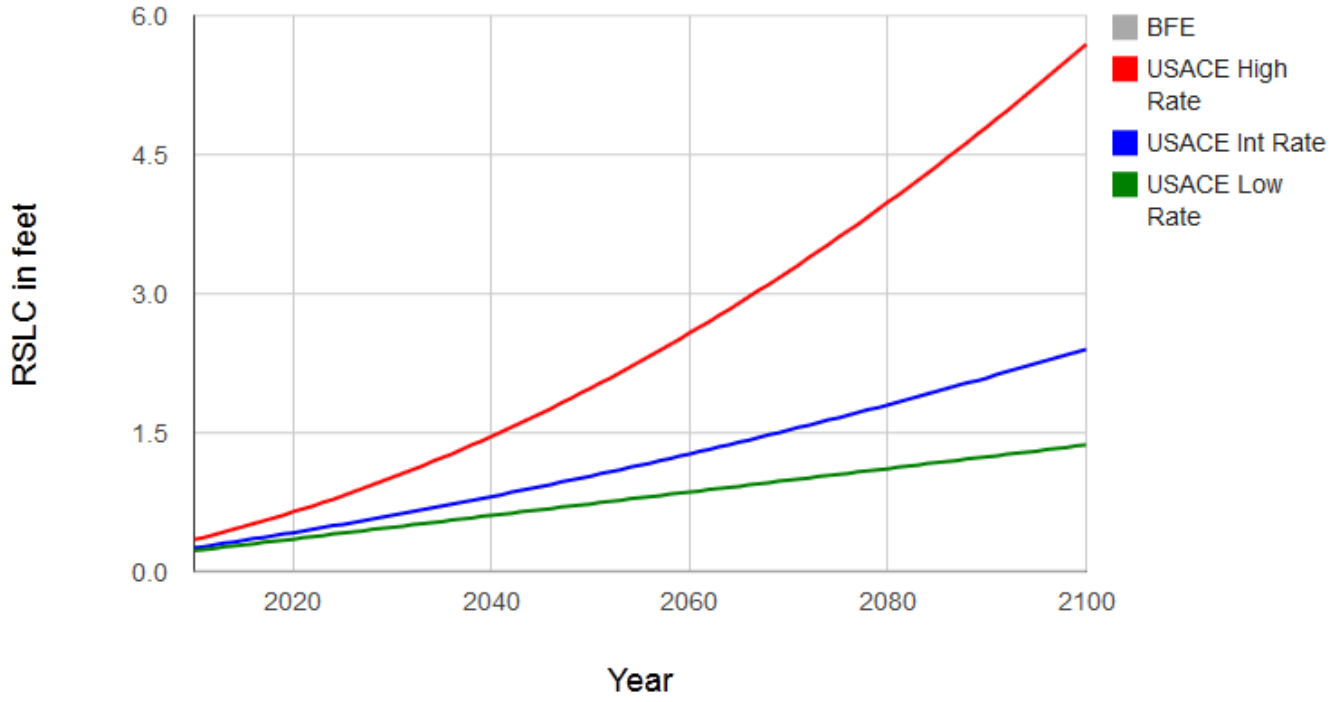
Future climate projections
Future climate projections for the area including Palo Alto Battlefield are from multi-model averaged data (see references in Fisichelli 2014). Mean annual temperature, compared with the 1971–1999 average, is projected to increase 3–4 °F by mid-century and 4–6 °F by the end of the century, depending on the greenhouse gas emissions scenario (see figure below). Past greenhouse gas emissions, long residence times of these gases in the atmosphere, and our current emissions trajectory suggest that climate change will be substantial. Warming by mid-century is projected for all seasons, with the greatest increases likely in summer and fall (figure below). There is wide agreement among individual climate models in the direction and general magnitude of warming over the coming decades. Total annual precipitation is not projected to change substantially by mid-century; however, precipitation variability is likely to remain large over the coming decades, and there is greater uncertainty in precipitation than temperature projections.

Sea level near Palo Alto Battlefield is projected to substantially increase over the current century, with projected increases ranging from roughly 2–5 feet (see figure below and references in Caffrey 2014). Storm intensity and storm surge are also likely to increase in the future. Presently, storm surges are predicted to reach up to 15.3 ft at the park if a category 3 hurricane strikes at high tide.

In addition to warmer mean temperatures and rising sea level, climate change will exhibit itself in many other ways within the region including Palo Alto Battlefield (see references in Fisichelli 2014). These include more frequent heat waves, droughts, and floods. The annual number of days with maximum temperatures > 95 °F is projected to increase 25–30 days by mid-century and the maximum number of days between rain events may increase by a few days (high [A2] emissions scenario, 2041–2070 compared with 1980–2000). Significantly warmer temperatures and a more variable precipitation regime may lead to both more frequent droughts and more severe flooding and erosion.



Historical and projected mean annual temperature and annual precipitation for Palo Alto Battlefield region. Historical trends are based on gridded climate data (www.prism.oregonstate.edu) averaged across the entire park. Projected climate change (30 year means) for the region including the park (data from Kunkel et al. 2013, see Fisichelli [2014] for references) are for three future periods centered on 2035 (2021–2050), 2055 (2041–2070), and 2085 (2070–2099). Two greenhouse gas emissions scenarios are presented, the low (B1) and high (A2) scenarios (IPCC 2007). Projected climate boxplots indicate the variability in future projections among 14–15 climate models. Values for the area including the park are based on the mean model output for that location (bold horizontal black line) and the range of climate model projections for the region (the upper and lower bounds of the boxes indicate the 25th and 75th percentile model output values and the whiskers show the minimum and maximum change).



Projected rates of sea level change (RSLC) for Port Isabel, TX (USACE 2014). The three rates indicate different potential trajectories of sea level rise based on different rates of warming and ice melt. The 'Low' trajectory is a linear extrapolation of recent trends while the other two trajectories indicate increasing rates of sea level rise over time. See Caffrey (2014) for full description.

2.2. Cultural Resources

Archeological Resources

web

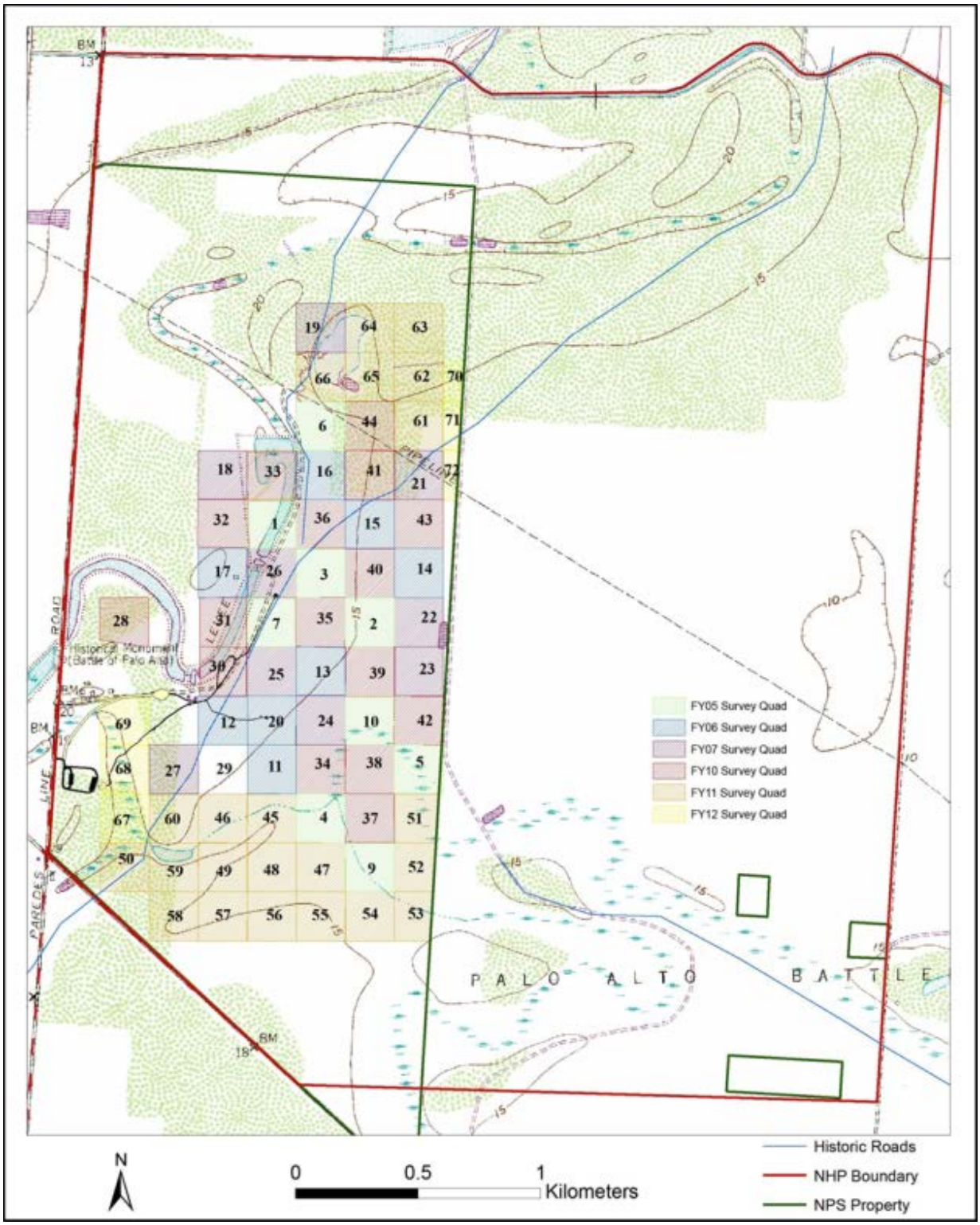
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Percent of sites with known date ranges associated with a research theme.		Completed systematic survey of core battlefield within park ownership including Resaca de la Palma. Based on this survey park knowledge of archeological resources is good and improving.
Inventory	Percent of park adequately surveyed.		Greater than 95% of Palo Alto's core battlefield on NPS owned property has been systematically surveyed through the NPS Southeast Archeological Center (SEAC). The report of the systematic metal detector survey of the core battlefield will be forthcoming.
Documentation	Percentage of known sites with adequate National Register documentation.		There are a total of 5 sites recorded for PAAL in Archeological Sites Management Information System (ASMIS). 20% (one site) of PAAL's known archeological sites in ASMIS have adequate National Register documentation. The remaining 4 sites are listed as unevaluated for the National Register. An update to the National Register nomination for PAAL is recommended to include these resources.
Condition	Percentage of archeological resources in good condition.		100% of PAAL's archeological sites in ASMIS are listed in good condition.

Resource Brief: Archeological Survey

Palo Alto Battlefield National Historical Park has been able to successfully conduct systematic archeological metal detector survey on the entire portion of the core battlefield at Palo Alto that the NPS currently owns. As mandated by the 1992 establishing legislation, the NPS conducted a reconnaissance level systematic metal detector survey that effectively defined the limits of the engagement and loosely identified battle lines and movements. Systematic archeological metal detector surveys were also conducted on the Area of Potential Effect prior to the construction of the Visitor Center and current trail system as part of the compliance process with Section 106 of the National Historic Preservation Act of 1966. However, as PAAL moved forward with plans to expand the trail system on the core battlefield, the park decided to conduct a more intensive, broad-scoped archeological investigation on the core battlefield, rather than narrow-scoped compliance surveys. This would allow the archeological evidence to determine where future interpretive development on the core battlefield is located, instead of letting the proposed development determine where the archeological investigations be conducted.

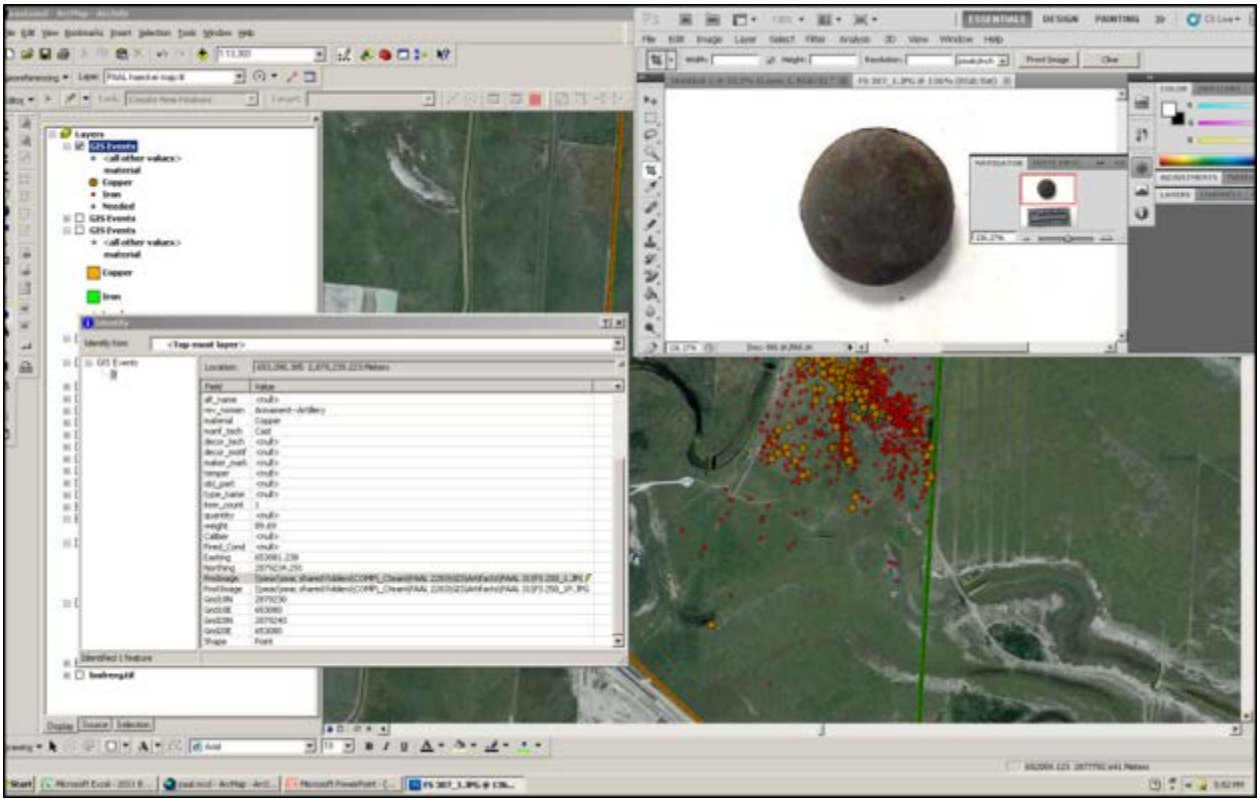
In 2005 PAAL Archeologist partnered with Archeologists from NPS Southeast Archeological Center (SEAC) and Santa Fe's Southwest System Support Office (SSSO), and GIS Specialists from the Cultural Resource GIS Program (CRGIS) to initiate this more intensive archeological investigation. This would begin the first of three years of systematic archeological metal detector surveys to be carried out on the core battlefield funded out of the park's base operations budget. Through this partnership the park was able to carry out these investigations for the cost of travel, survey supplies, field preparation, and metal conservation. The park was responsible for the subsequent analysis and cataloging of the artifacts, and report production. Although the analysis, cataloging, and report production was a lot to expect from a small park with limited staff, this arrangement allowed PAAL to systematically survey large portions of the core battlefield and retrieve archeological data critical to the development of the site at a minimal cost. Meanwhile PAAL was applying for adequate project funds to survey 100% of the core battlefield; conserve, analyze and catalog all artifacts; and produce a technical report on the multi-year archeological investigation.

In 2010 PAAL began to receive three years' worth of project funds that provided the park with a means for completing the survey of the core battlefield, as well as complete the analysis and cataloging of the artifacts collected during the three previous years of survey. PAAL utilized the same partnerships and strategies to complete this portion of this multi-year endeavor. By 2012 the park was able to survey the entire core battlefield area on the property it owned, but failed at attempts to gain access on to the large privately-owned tract of land within the legislative boundary that contains the evidence of the eastern terminus of the engagement. Nonetheless, this investigation recovered data critical for the management of the park. The results of this investigation refined the position and location of the initial battle lines, confirmed the location of historic road used during the battle, confirmed which body of water that the soldiers referred to as the Pond of Palo Alto, loosely identified the location where the U.S. wagon train was stationed during the battle, and identified a probable exit route used by the Mexican Army.



Map showing the survey quadrats by year overlaid on 7.5 USGS topographic map.

Photograph of Archeologists and Volunteers-In-Parks starting a survey transect.



Using Geographic Information Systems software to display and analyze the data in an effort to discern the patterns in the archeological record.

Resource Brief: Palo Alto Symposium

Palo Alto Battlefield National Historical Park sponsored a Battlefield Archeology Symposium as part of the Public Outreach and Education component of the Systematic Archeological Survey of the Core Battlefield conducted from 2005–2012. The symposium was designed to not only provide a platform to disseminate the results of the archeological investigations at Palo Alto, but to present the latest research on a wide range of battlefield sites in an effort to illustrate what can be learned through this branch of archeology.

The team of Principal Investigators from the Palo Alto project partnered with battlefield archeologists from the University of Nebraska to hold the symposium. The team recruited a dozen leading battlefield archeologists from around the country and abroad to present their latest research. The results of archeological research on sites, ranging from 16th-century battlefields in Mexico and Japan through the late 20th-century Falkland War, were presented.

The symposium was originally intended to provide members of PAAL's local community with an opportunity to learn about the latest advances in battlefield archeology through a day of professional papers on Friday, October 11, 2013, followed by the poster presentations at the 7th Annual Rio Grande Delta International Archeology Fair on Saturday, October 12, 2013. Due to the government shutdown in October 2013 the symposium was added to the biennial International Fields of Conflict professional conference hosted by the University of South Carolina in March of 2014, sponsored by a grant from the NPS American Battlefield Protection Program. Although the symposium was a success, the relocation to South Carolina prevented the local participation that had been planned.

***Left*: Question for the NPS American Battlefield Protection Program at the start of the conference. *Right*: Major Nathan Ledbetter presenting the results of his research on the 1575 battle of Nagashino.**

Cultural Anthropology

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research exists to understand the relationship of tribes and distinct cultural communities to park resources and the historic contexts.		Some research exists documenting the existence of Native American tribes in southern Texas and their connections to certain areas through treaties, final judgments of the Indian Claims Commission, etc. However, little to no research exists regarding the connection to lands and resources now managed by the NPS at PAAL. Lack of information warrants moderate to high concern given the inability to assess condition and/or adequate protection of unknown or undocumented resource(s). Additionally, a lack of information regarding which cultural groups have traditional associations to park lands and resources may lead to a lack of necessary information to determine who should be included as consulting parties for park planning and compliance processes.
	Park has current and appropriate baseline documentation, studies, and consultations documenting ethnographic resources and uses with regards to the park.		Currently PAAL lacks baseline cultural anthropology/ethnographic resource. Lack of baseline documentation warrants moderate concern given the inability to assess condition and/or adequate protection of unknown or undocumented resource(s).

Cultural Landscapes

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research exists to understand the relationship of the park cultural landscapes to the historic contexts of the park.		Cultural Landscape Inventory (CLI) for the two National Historic Landmark component landscapes (Palo Alto Battlefield and Resaca de la Palma) has been completed. Condition for both is Fair (2010 assessment). Next condition assessment due in 2016. CLI updates can be completed as needed. Two other potential cultural landscapes (Martinez Ranch and Palo Alto House/Inn) were found not eligible for listing in the National Register by CLI (2005).
	Adequate research exists to document and preserve the cultural landscape of the park.		Cultural Landscape Report (CLR) for both component landscapes needed to provide pro-active recommendations for treatment of NHL landscapes.

Cultural Landscapes (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Inventory	The scope of cultural landscapes in the park is understood and a determination has been made whether or not they are a fundamental resource.		Basic information on two cultural landscapes is understood but CLRs are needed. Because the landscape (both component landscapes) is the battlefield, it is a fundamental resource.
	Percentage of landscapes eligible for the National Register with accurate, complete, and reliable Cultural Landscape Inventory (CLI) data.		100% – both CLIs are done. Condition updates are needed at least every 6 years.
Documentation	Percentage of cultural landscapes with adequate National Register documentation.		Cultural Landscapes have inadequate National Register documentation. Existing NHL district nomination amendments for both component landscapes are needed to include contributing landscape resources.

Historic Structures

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Percentage of historic structures evaluated using appropriate historical contexts.		The park has two historic structures. These are Cameron County Drainage District Main Ditch number 2 and the 1916 cannon memorial. All of the historic structures have been evaluated using appropriate historical contexts. The historic character of the ditch has been lost over time. The park needs to reevaluate whether this should remain a historic structure.
Documentation	Percentage of historic structures with adequate National Register documentation.		The known historic structures have been found eligible by the Texas State Historic Preservation Office in 2010. The next step is a National Register nomination.
	All historic structures have been recorded commensurate with their significance and mandated purposes.		The known historic structures have been documented and will be added to the Historic Structures Inventory database for this park.
Condition	Percentage of historic structures in good condition.		In 2010, both eligible historic structures were in fair condition. The condition of these structures needs to be reevaluated prior to listing on the LCS.

History

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to understand significance of site.		Research exists documenting the history of PAAL, including National Register Nominations and a National Historic Landmark Study. The preparation of a Historic Resource Study for the battlefield is recommended that would synthesize earlier studies into a history of the battlefield that represents current scholarship on the subject.
	Sufficient research is conducted to establish the reasons for park creation and site history.		The preparation of an updated Administrative History for PAAL is recommended that would tie together the history of the creation of the park and its management history.
	Research at the appropriate level precedes planning decisions involving cultural resources.		Research is at the appropriate level that precedes planning decisions involving cultural resources. There is a completed National Register of Historic Places Nomination and a National Historic Landmark for the battlefield. In 2010, there were two consensus determination of eligibility for cultural landscape elements associated with Palo Alto Battlefield and Resaca de la Palma Battlefield.
Inventory	Percentage of cultural resources listed in appropriate Servicewide inventories, including the National Register.		The majority of PAAL cultural resources are listed in appropriate Servicewide inventories, including the National Register.
Documentation	Percentage of historic properties with adequate National Register documentation or with Determinations of Eligibility.		All PAAL historic properties have adequate National Register documentation or are documented with a Determinations of Eligibility. The NR/NHL nomination may be updated to include components of the cultural landscape identified in the 2 current cultural landscape inventories.

Museum Collections

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Inventory	The scope of museum collections in the park is understood. All resources have been surveyed to determine their appropriateness for inclusion in the museum/archive collection.		The current park Scope of Collections Statement (SOCS) dates to 1994; an updated draft prepared in 2010 has not been completed. A current SOCS that meets standards is critical to ensure that the park is only accepting appropriate objects, specimens, and archives for long-term preservation. An archival survey was completed in 2013 and identified resource management records that should be accessioned as museum collections.
	Percentage of objects accessioned and cataloged.		At the end of FY13 the park's museum collection consisted of 14,136 items, of which 100% were cataloged. The park archeologist should be commended for his proactive efforts to ensure that objects recovered during archeological investigations are always cataloged at the end of the project. The large number of archives identified during the 2013 archival survey need to be accessioned and cataloged.
Documentation	Park has current and appropriate baseline documentation (scope of collections statement, collection management plan, housekeeping plan(s), IPM plans(s), EOP, security and fire safety plan(s), and conservation survey(s).		The park completed a collection condition survey in 2013 and reported in FY13 that the Housekeeping Plan was current and museum collections were included in the Emergency Operations Plan. The Scope of Collections Statement, dating to 1994, is out of date. The park is lacking critical management plans for its museum collection, including a Collection Management Plan, IPM Plan, and Security and Fire Plans.
Condition	Overall condition of the collection based on condition survey and improvements to storage.		The 2013 Collection Condition Survey confirmed that 10% of the metal objects are actively corroding due to inherent instability and the nature of the storage environment or are at risk of active corrosion despite previous treatment efforts. The remainder of the cataloged collection and the recently identified archival records are in stable condition. Conservation treatment of the 228 deteriorating metal items is urgent, particularly since they are integral to the interpretation of the first battle of the U.S.-Mexican War and active corrosion is causing significant material loss. Rehousing the metals in microclimate storage containers improve the storage environment significantly. Cyclic maintenance will be required. The Collection Condition Survey recommends other storage improvements to enhance long-term preservation. The park has created PMIS 211011 for conservation treatment and is actively seeking funding.

Resource Brief: Rehousing of PAAL's Museum Collection

WACC Cooperator, Audrey Harrison, placing cannonball in micro-climate storage box.

In FY 2014 PAAL began a project to transfer all of the Archeology Items from the park's Museum Collection in storage into Micro-Climate storage boxes. The majority of this collection is comprised of metal artifacts recovered during archeological metal detector surveys. The remainder of the collections consists of a few prehistoric stone artifacts, ceramic and glass vessel fragments, and a few animal bones. The park's headquarter building, where the Museum Collection storage facility is located, is in a lease building in town. The storage facility does not have a dedicated HVAC unit, nor does the park have control over the HVAC system for the portion of the building it occupies. To make the situation worse, the building owners turn off the air conditioning at nights and on the weekends. Consequently the park has dramatically limited ability to control the temperature and the relative humidity of the storage facility for the Museum Collection, which can wreak havoc on some of the artifacts in the collection, in particular the sensitive iron objects. To combat this situation and provide a stable low humidity environment for these artifacts, the park has begun to transfer these items into Micro-Climate storage boxes.

This project was developed by Dana Senge, Metal Conservator at the NPS's Western Archeological and Conservation Center (WACC). Depending on the size of the artifact, one to a dozen artifacts are placed into small plastic storage containers with air-tight silicone gaskets and locking levers. Cannonballs and other large objects always get their own box. Packets of desiccants and relative humidity indicator cards are also placed in the boxes. This system allows the park to store these metal items in the low relative humidity that they need, and also lets the park staff know when it is time to replace the desiccants.

Micro-climate storage boxes in the park's museum cabinets.

In June of 2014 WACC Cooperator, Audrey Harrison from the University of Arizona came to PAAL for two weeks to start the 3rd project and train park staff and volunteers. In the two weeks Audrey was able to rehouse about 60% of the collection, including all cannonballs and oversized items. After Audrey left, Volunteer-In-Park Larry Culp came every Wednesday to complete the project, which was completed in November of 2014.

Volunteer-In-Park Larry Culp transferring artifacts into a mico-climate storage box.

2.3. Visitor Experience

Visitor Numbers and Visitor Satisfaction

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Number of Visitors	Number of visitors per year		The total of 32,522 visitors to the park in 2013 is higher than that of 2011 (24,752) but lower than 2012 (36,707). 2013 was higher than the 10-year average of 28,689 visitors for 2003–2012.
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 FY13 was 99.0%, which is close to the averages for the previous five years (98.8%) and ten years (99.1%). Source: 2013 Visitor Survey Card Data Report

Resource Brief: Resaca de la Palma Acquisition

The preservation and acquisition of the Resaca de la Palma unit of the park is one of the most notable successes at Palo Alto Battlefield. In the summer of 2002, the surviving 30-acre portion of the site was placed on the real estate market and targeted for development as a subdivision. At that time, the park worked in partnership with the Brownsville Community Foundation (BCF) to obtain $2.5 million in grant funds to purchase the site and protect it from destruction. Over the next several years, the park and the BCF worked in concert to develop interpretive trails and media and provide special events on the site.

The BCF also worked with other partners to initiate legislation that would extend the legislative boundary of Palo Alto to include the Resaca de la Palma. That effort culminated in the Omnibus Public Lands Act of 2009, which designated the Resaca de la Palma as a second unit of Palo Alto Battlefield National Historical Park and permitted the NPS to begin efforts to purchase the site. That next step was completed in 2011 when the BCF transferred the battlefield to the National Park Service.

Since taking over ownership of the site, Palo Alto has continued to improve trails and interpretive offerings. The park has also initiated operations of the site and currently opens the area to the public on a daily basis. The park is currently pursuing a Development Concept Plan for the site and plans to develop restroom and visitor contact facilities in the next several years.

Interpretive and Education Programs – Talks, Tours, and Special Events

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Education Programs	Number and quality of programs, and number of participants		The park has programs in the park and off-site at schools, actively going to the schools to present education programs to school age children. Teacher/Ranger teachers are brought to the park to work with park rangers to develop curriculum to take back to their school classrooms. The park provides online lesson plans for teachers. Last year education programs were delivered to 19,993 participants. While the number of participants varies from year-to-year, last year was approximately 51% higher than the 5-year average.
Ranger Programs	Number and quality of programs and attendance		The park offers ranger-led tours at the Battlefield, Resaca de la Palma, and Fort Brown NHL. Monthly living history programs are presented September–May each year. Regular off-site programs are offered at civic clubs, RV parks, historical societies, and other community groups. In 2013, the park delivered Ranger Programs to 70,333 individuals. This is 52% higher than the 5-year average.
Junior Ranger Programs	Number of programs and attendance		The park created a new Junior Ranger booklet under the Active Parks Initiative. An online Junior Ranger Program is also being reconfigured as web Ranger Program. The park conducts a Junior Ranger day that is well attended. Over the last 5 years 3,772 Junior Ranger certificates were issued.
Special Events	Variety and longevity of events, community involvement		The park conducts four Special Events annually. These are Junior Ranger Day, Archeology Fair, Memorial Illumination, and Battle Anniversary event. The park also held a Naturalization Ceremony for military that earned citizen ship through military service on Veteran's Day 2013.

Resource Brief: Education Programs

Palo Alto Battlefield is dedicated to developing and maintaining a strong education program both within and beyond the confines of the park. In fiscal years 2009–13, the park averaged 184 educational programs for an average of 13,239 students each year. Local and regional school children regularly visit the site for field trips that generally last 3–4 hours. Park staff also travels to the schools throughout the area, providing a diverse array of programs about Palo Alto, the U.S.-Mexican War, the National Park Service, and its mission of preservation and conservation.

In an effort to ensure that more students had the opportunity to experience the park and its offerings, Palo Alto has also sought out grants to facilitate visits. In FY12, the park used funds from a National Park Foundation Small Impact Grant, to train a corps of 20 "student rangers" from a local high school to serve as docents and guides for field trips for elementary students. That grant and a 2013 Ticket to Ride grant also funded bus transportation to help local school systems cover the cost of field trips to the park. The park has also been an active participant in the Teacher-Ranger-Teacher program. For the last five years the park has brought a teacher on staff for the summer to learn about the park and carry that knowledge and programs back to his or her school in the following school year. Teachers have come from the local community and as far away as Arizona and Kentucky. These teachers have also developed a variety of program lesson plans for the park, on topics as diverse as history, physics, art, and music.

Interpretive Media – Brochures, Exhibits, Signs, and Website

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wayside Signs	Condition and currency of signs		The park provides wayside signs at the two park sites and community bike trails. All signs were developed since 2004 and are in good condition. All panels include both English and Spanish content to reflect the diversity of the local community.
Park Directional Signs (off-site)	Usefulness, quantity, and placement		The park has been actively worked with TxDOT to provide directional signs along all major corridors to the site. In 2012 signs were provided along the I-69 corridor. In 2013 signs were added to FM-511. In addition to those there are 24 other signs around the community at major intersections.
Exhibits	Visitor Center Exhibit		In FY 2013 the park completed installation of a new exhibit for the Visitor Center. The exhibit is ADA compliant providing audio assist, tactile features, and wheelchair accessibility.
	Fort Brown earthworks		The park has a small exhibit on the history of Fort Brown located in the club house of the Fort Brown Memorial Golf Course adjacent to the 1846 earthworks. This was installed in 2013.
	Trade show exhibit		In 2012 the park created a mobile exhibit to take to trade shows and exhibits to promote the park.
Print Media	Accuracy and availability of primary park publications		The park guide was updated in 2013. The park has a variety of other brochures and publications. The primary park guide is only in English and the park is pursuing permissions to produce a Spanish version.
Audio-visual Media	Orientation Films		The park orientation film was developed in 1998 and updated in 2005. Open captioning was added in 2011. Both audio and captioning are in English and Spanish.
	Cell phone tours		Beginning in FY 2012 the park developed a cell phone and mobile app tour of the battlefield and associated sites covering Taylor's campaign trail to the Rio Grande valley. A Spanish version is under development. The park is working in partnership with the University of Texas Pan American to develop a similar tour for Civil War sites in the region.
Websites	Currency and scope of website; number of website visitors		The park actively manages its website through the NPS Content Management System and has revamped numerous pages during FYs 2013 and 2014 to provide new/expanded content. Number of web site visitors has been consistent but has only been tracked for the last two years.
	Social media: Facebook updates and "likes," overall activity		The park has been active in efforts to develop social media presence including Facebook, Twitter, Instagram, Pinterest, and Vine. The park has seen a significant increase in social media contacts in the last fiscal year.

Resource Brief: Interpretive Media

Interpretive media is an important part of the visitor experience at Palo Alto. Many visitors arrive at the site with no knowledge of the significance of the place and rely heavily on the Visitor Center exhibits and audio-visual program to introduce them to the topic. The 15-minute park AV program "War on the Rio Grande" provides a basic overview of the opening battles of the U.S.-Mexican War, their causes, and the aftermath. Although this is an in-house production by the park, the presentation is very popular with visitors and effectively introduces them to the site.

The park's primary exhibit supplements this video. Installed in October of 2012, the display also covers the broad topic of causes and consequences of the U.S. Mexican War with emphasis on local battles and sites. Although the exhibit was created on a limited budget of about $350,000, it includes a variety of interactives, audio-visual features, and artifacts that make it much more effective than the static display it replaced.

Waysides exhibits are another important part of the visitor experience. Although the battlefield is important, it is also relatively featureless. Therefore, waysides are vital for orientation and understanding of the site. More than 20 panels rely on artwork and quotes to convey the story of the events and experience of May 8, 1846. An additional 8 panels focus on the natural features and natural history of the site.

Resource Brief: Living History Programs

The park's living history program is an important and growing form of outreach to park visitors and the surrounding community. In 2009, the program was a moderate success, providing 5,948 visitor contacts. By 2013 that number climbed to 21,357 visitor contacts. The programs that occur monthly from September to May each year remain some of the park's most popular offerings. Efforts to expand interest by taking small living history groups to local schools, clubs, expos, and community celebrations has also proven to be popular and a unique form of outreach for Palo Alto.

Living History is also an important aspect of the park's volunteer program. Most of the living history interpreters for the park are teachers and history enthusiasts from the surrounding region who have been drawn to the park by the opportunity to practice black powder techniques and interact with others of similar interests. These volunteers—many of whom carry vast stores of knowledge—have played a vital role in making the program a success.

The park continues to develop the program. In 2014 the program coordinator began making contact with local ROTC groups with the aim of drawing new volunteers and conducting coordinated programs. The park interpretive staff meets annually to discuss ways to improve and expand the living history program to make it more appealing and effective. The park also has two trained black powder safety specialists to ensure that programs continue safely.

Accessibility

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Mobility	ADA compliance		The park has made significant improvements to provide accessibility at the battlefield site. Improvements include replacing the floor in the Visitor Center, developing accessible exhibits, paving the parking lot, and trail improvements. The Resaca de la Palma trail has improved but does not meet ADA requirements.
Visual Accommodation	ADA compliance		Audio description for the park video is provided for the visually impaired. Exhibits include braille and tactile features as well as audio description of the exhibit.
Auditory Accommodation	ADA compliance		Open captioning on the park video and written text for the audio portion of the exhibits is provided. One interpretive ranger has sign language skills and on occasion has provided interpretive services for visitors.
Public Transportation	Access to park via public transportation		No public transportation is provided to the Palo Alto unit of the park. There is a bus stop near the Resaca de la Palma unit. The city hike/bike trail connects the two units. The park is actively engaged with the city to improve alternative transportation options to visit the park.
Multi-lingual Resources	Audio and print materials in multiple languages Bi-lingual staff		All park audio, video, and exhibit materials are in English and Spanish. The park official guide is only in English. Spanish versions of the web site and the cell phone tour are under development. Approximately 80 percent of the park staff is bi-lingual.

Resource Brief: Accessibility

Palo Alto works to make continual improvement to provide accessibility for visitors with special needs. In the Visitor Center, concerns about access lead the park to remove the original stone textured floor and replace it with a smooth surface that is easier to navigate by visitors who require wheel chairs, walkers, canes, and crutches or who simply have difficulty walking on an uneven surface. Door handles and doors were also replaced with fixtures that are easier to manipulate and open.

Exhibits have also been a priority. In 2012, the park modified its video from the previous closed-captions format to a preferred open caption format for the hearing importance. The park also provides headsets with audio-description for the visually impaired. Similarly, the park's visitor center exhibit contains many features for visitors with special need. Panels contain large print, braille, and tactile features for the visually impaired. Audio assist headsets are available to help those without sight navigate the exhibit and hear all text materials. For the hearing impaired, printed text cards are available with a summary of audio programs.

The park also is making strides to improve the accessibility of its grounds. Several rounds and parking areas were recently paved to make them more accessible for visitors with difficulty walking. The park is also developing a virtual tour so that those who are unable to venture along trails can experience views of the park and its wayside panels from a computer.

Safety

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Visitor Safety	Recordable incidents		The safety of visitors is a park priority. The park works to quickly identify and mitigate potential hazards, and the number of accidents is very low. The park had one visitor incident in 2008 and none since then.
Staff Safety and Training	Number of staff trained		Operational Leadership, CPR, First Aid, and AED training has been completed by park staff. Job Hazard Analysis is conducted before jobs throughout the park. Regular safety messages are given and distributed to staff members. Annual hazardous communication (HAZCOM) training is conducted.

Partnerships

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Volunteers	Number and hours contributed		The park has a committed corps of living history volunteers who contribute hundreds of hours to provide programming 9 months of the year. Additionally, 5,547 volunteers contributed 24,986 hours over the last 5 years.
Partnerships	Number of official and unofficial partnerships		The park has 15 official and numerous unofficial active partnerships including USFWS, USDA-NRCS, International Boundary and Water Commission, City of Brownsville, multiple museums and historic groups, Brownsville Independent School District, University of Texas at Brownsville, the Brownsville Housing Authority, and many others.

Resource Brief: Volunteers and Partnerships

Volunteers and partners serve as the engines that have helped drive Palo Alto forward and have permitted the park to achieve goals and results far beyond the means of the park's limited staff. From FY 2009–2013 Palo Alto reaped the benefits of service from 4,646 volunteers who performed a total of 26,383 hours of work for the park. These volunteers come from a variety of backgrounds, ranging from local high school students seeking a few minutes or hours of community service time to retirees who travel to the area for the winter and serve the park for an extended period. Projects vary as well. Large numbers of volunteers serve the park in preparing and running special events like the annual Memorial Illumination and Junior Ranger Day. A group of dedicated history enthusiasts fill the ranks of the park's Living History regiment from September to May. Others stay throughout the year, providing coverage at the park visitor center, providing tours of the battlefield, and offering of-site programs. Those with interest in biology and the natural sciences have contributed as well by assisting with species surveys and counts in the park Resource Management Program. Likewise, numerous volunteers have participated in efforts to complete an archeological survey of the core battlefield area of the park.

Partnerships have been just as important, if not more so. By means of Cooperative Agreements, Memoranda of Understanding and, often, simply through verbal agreements, Palo Alto Battlefield has been able to complete numerous development projects and markedly expand its outreach and scope of operations. Numerous partnerships focus on connecting the park to regional youth, including non-traditional NPS audiences and those of disadvantaged backgrounds. By working in partnership with entities like the Brownsville and Los Fresnos Independent School Districts, the Boy and Girl Scouts of America, the Brownsville Housing Authority, Proyecto Juan Diego, and many others, the park is able to expand its impact on the community. Other partnerships—with the Brownsville Police Department, Cameron County Sheriff Department, Brownsville Fire Department, and U.S. Border Patrol help the park manage law enforcement, fire, and emergency situations. Still other partnerships preserve resources. For example, an agreement with Texas A&M University provides for the housing of the park's natural resource specimen collection, while an arrangement with the University of Texas at Brownsville allows the park to maintain its book collection in the university library.

The longest-standing and perhaps most important partnership is with the City of Brownsville, Texas. For two decades, the city has provided a variety of assistance, ranging from construction services to funding of park living history materials. In 2012, the city was especially helpful in providing road equipment and personnel to assist with a park road paving project.

2.4. Park Infrastructure

Overall Facility Condition Index

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The National Park Service uses a facility condition index (FCI) 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 2008 / 2013	FCI 2008 / 2013	Condition Status/Trend	Rationale
Buildings	5 / 7	0.042 / 0.076		Park structures are relatively new with all constructed between 2004 and 2010; all remain in good condition. The increase in FCI does not necessarily indicate a deterioration of the buildings. 2008 was the first year that the park had a Facility Management position. Prior to that date many maintenance needs were not adequately identified and entered into the Facility Maintenance Software System. The increased FCI indicates better identification of maintenance needs rather than an increase in those needs.
Trails	5 / 7	0.128 / 0.092		Palo Alto trails are relatively new, with the first trail constructed in 2003 and the latest portion of trail added in 2009. The park performs regular cyclic maintenance to maintain the condition. The Resaca de la Palma trail remains a concern. Although the current FCI is low, the trail will soon deteriorate rapidly without work. It also requires substantial work to make it fully accessible. The park plans to combine several trails into a single FBMS/FMSS entity for tracking purposes.
Unpaved Roads	2 / 2	0.033 / 0.023		The park is in the process of transforming all unpaved roads into hard surface roads. In 2012 Palo Alto regraded roads and placed a chip seal surface on top. In 2014 the park will microseal the road to further improve this surface. From 2014 onward, these roads will be treated as paved roads. In the FCI calculation sheet the main parking area is listed as an unpaved road—it is not. The auxiliary road, maintenance area road, and auxiliary lot are all listed as paved but, as noted, that paving was only recently completed.

Overall Facility Condition Index (continued)

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Asset Category	Number of Assets 2008 / 2013	FCI 2008 / 2013	Condition Status/Trend	Rationale
Paved Roads, Parking Areas, Bridges, Tunnels	4 / 5	0.097 / 0.100		Paved roads and parking areas at Palo Alto were all constructed in the period from 2003–2004. These areas were resurfaced in 2012 as part of the IMR pavement preservation program. The park will address several issues with microsealing in parking areas in 2013. In the FCI calculation sheet the main parking area is listed as an unpaved road—it is not. The auxiliary road, maintenance area road, and auxiliary lot are all listed as paved but, as noted, that paving was only recently completed.
All Others	7 / 16	0.144 / 0.056		Most interpretive media at Palo Alto was installed in the years since 2008. A new exhibit was installed in the park Visitor Center in 2011. The park picnic area and maintenance fence were installed in 2006 and 2007 and receive regularly-scheduled preventative maintenance.

Resource Brief: Green Parks Plan

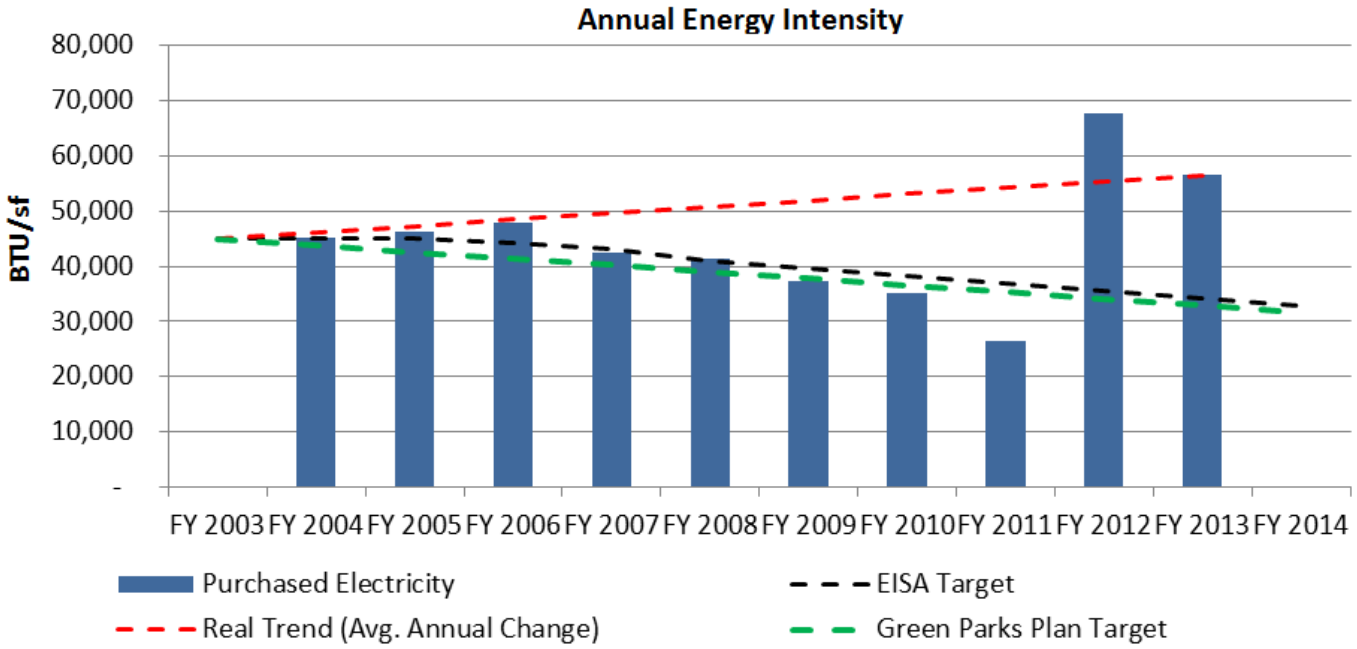
The NPS manages the largest number of constructed assets of any civilian agency in the Federal Government. It operates more than 67,000 structures that account for more than 50 million square feet of constructed space such as visitor centers and historic structures. The Green Parks Plan (GPP) defines a collective vision and a long-term strategic plan for sustainable management of NPS operations. A critical component of the implementation of the GPP will be informing and engaging parks' staff, visitors, and community partners about climate change and sustainability to broaden opportunities to foster change.

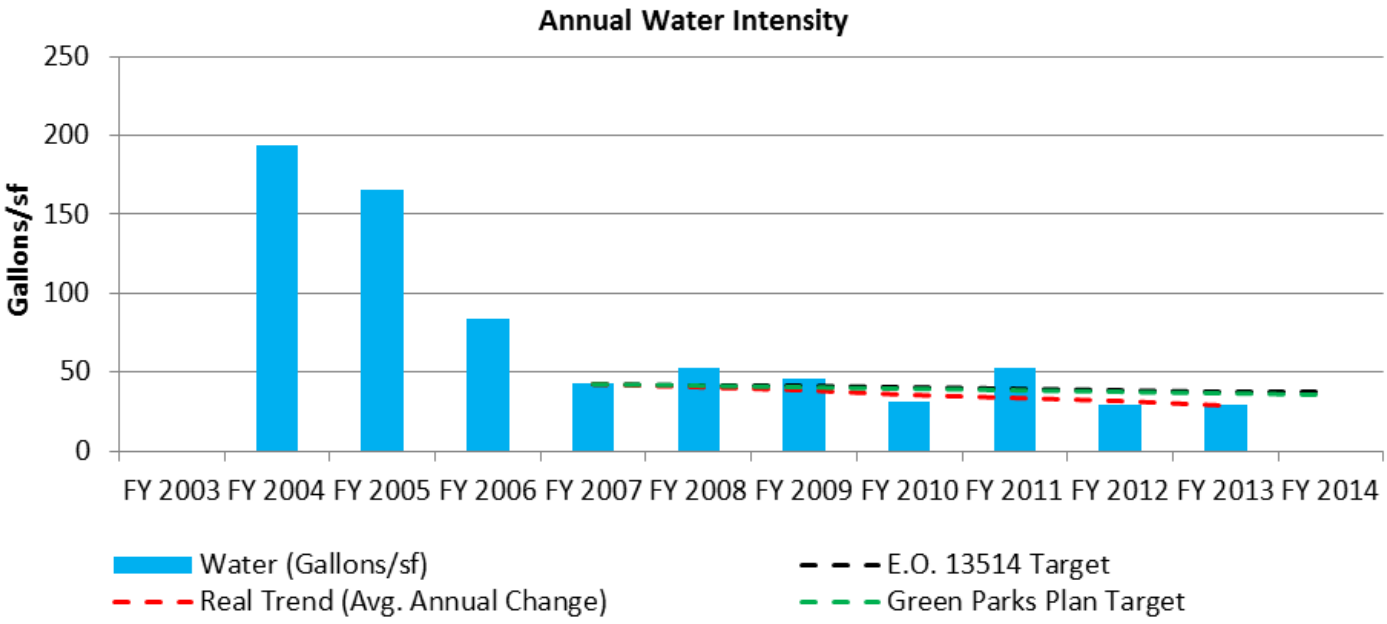
The Vision defined in the GPP plan is, "The NPS will preserve park resources unimpaired for the enjoyment of current and future generations by reducing its environmental impact through sustainable operations, design, decisions, and management at every level of the organization." The plan is based on nine strategic goals that focus on the impact of facilities on the environment and human welfare. Two of those goals are closely aligned with Park Infrastructure as defined in this State of the Park report. Those are:

- Be Energy Smart: The NPS will improve facility energy performance and increase reliance on renewable energy; and
- Be Water Wise: The NPS will improve facility water use efficiency.

For Energy, one of the performance objectives is to reduce Servicewide building energy intensity by 35 percent by 2016 from the 2003 baseline, where energy intensity is energy consumption per square foot of building space. For Water, one of the performance objectives is to reduce potable water use intensity by 30 percent by 2020 from the 2007 baseline.

Historical data for energy and water consumption reported by PAAL and available in the Energy Data Reporting Tool (EDRT) are shown below.





Highlights for PAAL include:

- Energy use declined from 2004 through 2011 but has increased in recent years due to the addition of a maintenance facility and as a result of changes to the Visitor Center HVAC system. The air conditioning system has had the greatest effect. The initial HVAC system installed in the facility did not provide adequate cooling and in 2011 one unit failed entirely, causing a dramatic drop in electrical consumption. To address the cooling deficiencies, PAAL had to install dehumidifier units in the ventilation ducts of each cooling zone of the Visitor Center. These units caused a sharp rise in the consumption of electricity. The park addressed this by installing a computerized controller system that automatically reduces consumption when the facility is closed. The park is also planning to install CO2 sensors on the HVAC system, which will permit the park to reduce the fresh air intake of the system and will reduce costs associated with dehumidifying this humid air.
- Water use has declined since 2007 and has remained low since then. The park attributes the decline to general conservation efforts, to efforts to landscape the visitor center front lawn with drought resistant plants, and the installation of an irrigation system that has reduced the amount of water needed to maintain landscaping.
- Electrical and water consumption may climb as the park introduces facilities and initiates operations at the Resaca de la Palma unit of the park.

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

- Completed an Integrated Vegetation Management Plan and Environmental Assessment to determine the most effective and environmentally sensitive alternative for restoring and maintaining the gulf cordgrass prairie (Cultural Landscape) in the core battlefield area of the Palo Alto Unit; to control exotic plant species throughout the park; and to provide visitors with safe and enjoyable access to the park resources.
- Acquired an additional 500 acres within the authorized boundaries of the park, including the 34-acre Resaca de la Palma Unit.
- Completed basic natural resource inventories and initiated long-term monitoring of a subset of the park's natural resources by the Gulf Coast Inventory and Monitoring Network (GULN), including Texas tortoise, reptile and amphibian communities, breeding and overwintering birds, and land use outside of park boundaries.
- Worked with the Gulf Coast Exotic Plant Management Liaison to identify and treat various exotic grasses and noxious weeds. Successfully controlled one invasive species (*Kalanchoe daigremontiana*).
- Worked with NPS Hydrologist and Wetland Ecologist from Colorado State University to develop and initiate the implementation of a plan to restore portions of the resaca and adjacent wetland prairies in the core battlefield area of the Palo Alto Unit.
- Contracted the construction of a tortoise fence in 2014 to help protect the state-listed threatened species: the Texas Tortoise (*Gopherus berlandieri*).

Cultural Resources

- Completion of the Archeology Survey field work, 2005–2012.
- Completion of the Vegetation Management Plan and impending restoration of the cultural landscape.
- 2014 – initiated restoration of the Palo Alto Resaca.
- Acquired nearly 500 acres of land to preserve the battlefields.
- Presented a Battlefield Archeology Symposium at the International Fields of Conflict Conference in Columbia, SC, March 2014.
- The park ensures that all cultural resource projects include funds for accessioning, cataloging, and properly storing the resulting objects and archives. The park has been highly effective in following through with the cataloging of archeological collections and few other parks in the region can boast of an accessioned collection that is 100% cataloged.
- The park has been proactive about applying and sharing best practices in museum management. Park storage conditions have improved significantly as a result of these dedicated efforts. Several years ago the park sponsored training for partners on preservation strategies for museum collections. The park also is actively seeking funds for the conservation treatment of its highly significant archeological and historic metals to address the active corrosion causing significant material loss.

Visitor Experience

- Acquisition of the Resaca de la Palma unit and making it accessible to the visiting public.
- The Resaca de la Palma is interpreted, waysides are present, and ranger-led tours are available.
- Memorandum of Agreement (MOA) with the International Boundary and Water Commission for stewardship of the Fort Brown NHL. The park is also working to expand the boundary of the NHL to include the cultural landscape and is providing ranger-led tours to increase public awareness of the site.
- Addressed major accessibility issues by replacing the Visitor Center floor.
- Developed and installed new Visitor Center exhibits and 22 wayside exhibits for Palo Alto unit. Museum exhibits are made ADA compliant.
- Active social media presence and development of cell phone tours.
- Involved with partnerships to develop other interpretive opportunities within the region.
- Improved ADA accessibility of roads and trails.
- Active involvement at local schools including working with them to help find ways to bring students to the site.

Park Infrastructure

- Replacement of Visitor Center HVAC system, 2011; Visitor Center doors, 2011; and Visitor Center floor, 2010.
- Resurfacing of park paved roads, 2012.
- Paving of park unpaved road, 2012.
- Development and installation of a new Visitor Center exhibit, 2011.
- Cyclic Maintenance of park boardwalks, 2010.
- Cyclic maintenance of park fencelines, 2010.
- Expansion of park trail system, Mexican line trail, 2008 and U.S. line trail, 2009.
- Repair of Visitor Center front doors, 2009.
- Cyclic resurfacing of park trails, 2009.
- Construction of park maintenance facility, 2008.
- Replacement of portions of Visitor Center HVAC system, 2008.
- Replacement of park boundary fence, 2008.

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

External Park Development
The growth and development of Brownsville coupled with planning and zoning efforts that do not promote, enhance, or protect the park are creating some of the most difficult challenges for short term management and have long term consequences.

Constrained by Mexico to the south, the City of Brownsville can only grow northward. When established, the park was surrounded by open land. Today development is poised to completely envelop the park within the next few years creating an island of green in an urban landscape. The broad open landscape that surrounded the battlefield in 1846 will soon be gone and park property will be the only surviving remnant of the historic ecosystem. Earlier planning and zoning efforts to protect the park are being cast aside. The park must continue to engage the City of Brownsville to promote responsible development around the Palo Alto Unit.

The current viewshed is impaired by the presence of several man-made features outside the park. Examples of these features include a highway overpasses and associated 46 m (150 ft) light towers, and the 18 m (60 ft) Titan Tire factory building façade located south of the park. To the east, facilities at the Port of Brownsville are clearly visible on the horizon and introduce modern elements into the background of those viewing the battlefield area.

When the proposed Tenaska natural gas power generating plant is constructed, two smokestacks approximately 48 m (160 ft tall) will be built and located approximately 2 km (1.2 mi) west of the park's visitor center. Additionally, a power transmission line with 78 towers some as tall as 51 m (170 ft) will be constructed from the power plant along the northern boundary of the park and off to the east and will be visible from the battlefield overlook and trails. In the summer of 2014 plans were unveiled to construct a truck stop facility on the southwest corner of 511 and Paredes Line Road and a retail outlet mall, hotel and restaurant on the southeast corner. The park and public unsuccessfully pushed back against these developments highlighting issues related to zoning around the park.

The addition of the 550 toll road and expansion of FM 1847, Paredes Line Road, to four lanes dramatically increased noise from traffic. The addition of a truck stop, expansion of industrial park developments and associated truck traffic on the toll road will increase over time. The power plant will operate at or above a 55 db threshold creating additional background noise.

Recognition that the park will become an "island" in the future should factor in current and future planning and resource management efforts. Increasing visitation and a change in the types of visitors, additional maintenance needs and law enforcement-related incidents should be expected. The park needs to continue to engage the City of Brownsville and other entities on issues related to responsible development and protection of park resources and values.

Land Acquisition
The park continues to move closer to the goal of acquiring all lands within the authorized boundary. The majority of the Valley Sound subdivision tracts on the east side of Palo Alto are now in Federal ownership. Tract 101-06, long referred to as the Sanchez tract, continues to elude Federal purchase. This land contains significant features related to the position of the Mexican army during the battle.

Land and Water Conservation Funds received in 2010 fell some $3 million short of the $7 million dollar appraisal for this tract. Current development around the park continues to push area land prices higher. Future purchase estimates as high as $11 million dollars currently exist. The NPS and partner, The Conservation Fund, continue to explore acquisition strategies for this tract.

As development swallows up available lands near the park, those remaining tracts inside the boundary will become attractive even with the added burden of federal laws on some types of development. Loss of land within the park boundary to development is the single largest threat facing the park in the immediate future. The NPS needs to be innovative and "think outside the box" on strategies to complete the acquisition of land. New or unconventional partnerships should be considered or established to purchase this land or to secure funding toward the acquisition of these tracts.

Development of Visitor Facilities at Resaca de la Palma Unit
The Resaca de la Palma Unit was added to the authorized boundary of the park via legislation in 2009. The NPS acquired fee simple ownership of the site in 2011. The site requires basic visitor amenities to be constructed via approved PMIS projects in 2015 (parking lot); 2016 (restrooms); 2018 (visitor kiosk). The site also lacks water and power at this time. Part of the mitigation package the NPS will receive from the Tenaska power plant includes funding or in-kind assistance to provide a 100 yard utility connection from the street to a point on the Resaca de la Palma unit where restrooms and facilities will be constructed.

Because RDLP is surrounded by urban Brownsville, visitor use demands will consist of many activities outside of those normally associated with historic areas. The park will have to balance the mission of preserving the historic and memorial character of the battlefield with a demand for traditional city park type recreation within the city. Without law enforcement capacity, enforcement of the key federal regulations specific to management and protection of park lands is impossible. City police do not have the jurisdiction or capacity to assist the NPS with anything other than enforcement related to personal or property crimes.

Cultural Landscape Maintenance
Natural factors also affect the park's viewshed. Growth of tall brush limits the visitor's ability to view all of the historic battlefield area. A park goal for the Palo Alto Unit is to open up vistas and return the core battlefield area of the park to a dominate prairie grassland consistent with the descriptions of the 1846 battlefield.

The park completed a Vegetation Management Plan with a signed FONSI in 2014. The document is guiding efforts to remove cactus and small woody vegetation that is beginning to dominate former prairie grasslands on the core battlefield due to the cessation of grazing, land clearing and the lack of fire on the land since the NPS has managed the area.

Efforts to remove twentieth-century water control features, restore a resaca, and begin to replant the prairie with Spartina grass are under way. This project will require continued park support for several years. Expansion of replanting efforts can and should be expanded to restore prairie once cleared of woody vegetation.

The park's Fire Management Plan is being updated to provide for fuels reduction through the use of managed fire on the battlefield, which will return a regular fire regime to the prairie areas of the park and control vegetation. A strong partnership is in place with the USFWS for fire management. Strong consideration should be given to expanding the partnership to place the park under the umbrella of the USFWS Fire Management program in South Texas rather than appending the park to a distant NPS FMO. If the park moves ahead with an active fuels reduction program it would be much more effective and efficient to utilize an existing, established program with a partner agency.

Facilities Maintenance
Palo Alto remains a new unit of the NPS with very little on-site development dating back more than 11 years. This new infrastructure has been relatively easy to maintain, with most work focusing on preventative maintenance rather than rehabilitation. Nevertheless, as the park embarks on a second decade of operation, buildings, trails, and facilities are beginning to show signs of wear and deterioration. In the coming years, Palo Alto will need to focus more time, attention, and funds to revitalizing and replacing older assets. This will occur at a time while the park continues to focus attention on development of a new area and opportunities expected of a young and developing site. The park will need to carefully balance new development with site maintenance and find a balance that serves park goals and meets visitor demands.

Connecting Communities to the Park
Connecting the park to the communities of Brownsville has long confounded the staff at Palo Alto. The question of relevancy is very valid in a community with that has little understanding of and time for the traditional "National Park experience." More than 93% of the residents of the city of Brownsville Texas are Hispanic, many recent immigrants. A large portion of the community lives below the poverty line in one of the poorest areas in the nation. Although the town population has soared to near 200,000 people, these residents often have little awareness of the park and limited opportunity or inclination to visit the site. Understanding what a "National Park experience" looks like and providing that desired park experience to a Hispanic majority is a challenge facing the NPS as the agency begins its second century. This is a current reality for the park with the community of Brownsville.

The other issue that the park faces is a weak or absent connection between the community and the National Park Service as an agency. The NPS has little "brand name" recognition in this area. Community pride in and promotion of a unit of the NPS is not readily apparent. Brownsville, a generation ago, supported the establishment of the park and worked hard from the grassroots level to make the park a reality. Since that time, community leadership and activists who supported the park in the early years have faded from the scene. The current generation of civic leaders appears to under value the park both as a point of civic pride and as an economic entity that draws visitation from outside the area, creates jobs and revenue, and is a quality of life factor that helps attract new business.

Park staff works hard to counter these issues and will need to continue to do so in the future. Building a connection between the NPS, the City, and business leaders where recognition and promotion of the park is one goal. Outreach to youth and the next generations of park visitors and supporters needs to continue. Public engagement, listening sessions, and application of some of the desired expectations for park use should occur. Creating employment opportunities for local university students should continue if an applicable program and funding is available.

Partnerships
Closely tied to the issue of connecting to the community is development and maintenance of partnerships. Palo Alto has a robust list of current partners within Brownsville and beyond. Many of these partnerships are "traditional" in nature—museums, schools, historic groups. Park staff should move to engage emerging, non-traditional groups and attract them as partners. This may involve hosting or

participating in new or unconventional park activities. It may also involve a virtual partnership that exists on the internet. Employing social media and moving to a digital world is key to reaching the next generation of park supporters.

Staffing Model – need for additional Protection, Maintenance, and Interpretive staff
Palo Alto completed the IMR Core Operations evaluation in 2007, which resulted in the elimination of the Protection Ranger position and combining the Chief of Interpretation with the Chief of Maintenance positions to create an Operations Chief for those functional areas. This staffing model is quickly becoming untenable. The increased workload for both Maintenance due to FMSS and additional facilities and for Interpretation due to the additional programs and staff is rapidly overwhelming the Operations Chief position and it will not be a sustainable model in the future.

A reconfiguration to split the Operations Chief back into two traditional division or program roles, the addition of a lower graded FMSS position, or a reconfiguration of the interpretive staff should be considered. Additionally, increased visitor use, development around the park, and an expanding need to enforce NPS specific regulations within the park will require reestablishment of the Protection Ranger position to protect park visitors and resources. Increased staffing will require a base increase or very innovative hiring of seasonal, term, and lower graded employees to fund the staff needed to meet additional workloads. Outside the box solutions such as “Service First” agreements with U.S. Fish and Wildlife Service for shared positions and contracts or pooling of funds or resources to accomplish work or projects should be explored.

Other Potential Issues
Mineral exploration. Palo Alto does not own the subsurface mineral rights in the park and has been identified as a potential park for oil and gas development. With the advent of new technologies for extracting natural gas from shale, there is potential for oil and gas development under and around the park. Park staff should be vigilant to the possibility of oil and gas development. The IMR Energy and Minerals Program advocates protecting the park through purchase of the mineral rights under Palo Alto if funding should become available from any source.

Wind Farms. Wind energy developments abound north of Cameron County. The Port of Brownsville has entertained placing wind turbines on Navigation District land east of the park, which have potential to further impact the eastern viewshed of the park. Park staff needs to stay engaged on local development plans and maintain open communications with USFWS and others about plans and proposals that could involve or potentially impact the park.

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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.
Green Parks Plan (GPP)	The Green Parks Plan defines a collective vision and a long-term strategic plan for sustainable management of NPS operations. A critical component of the implementation of the GPP will be informing and engaging park staff, visitors, and community partners about climate change and sustainability to broaden opportunities to foster change.
Gulf Coast Network (GULN)	One of 32 I&M networks established as part of the NPS Inventory and Monitoring Program. The Gulf Coast Network provides scientific data and expertise for natural resources in 8 parks located in Florida, Mississippi, Louisiana, Texas, Alabama, and Tennessee.
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 ensure long-term maintenance of collections in specialized facilities.
National Historical Park (NHP)	Historic areas in the National Park System that have great physical extent and complexity. NHPs are automatically listed on the National Register of Historic Places.
Native American Graves Protection and Repatriation Act (NAGPRA)	A federal law passed in 1990. NAGPRA provides a process for museums and federal agencies to return certain Native American cultural items (e.g., human remains, funerary objects, sacred objects, objects of cultural patrimony) to lineal descendants and culturally-affiliated Indian tribes and Native Hawaiian organizations.
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.
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 Archeological Center (SEAC)	Located in Tallahassee, Florida, the Southeast Archeological Center (a unit of the National Park Service) is dedicated to the study, interpretation, and preservation of archeological resources within National Park Service units.
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.
Volunteers In Parks Program (VIP)	The Volunteers In Parks Program was authorized by Public Law 91–357 enacted 1970. The primary purpose of the VIP program is to provide a vehicle through which the National Park Service can accept and utilize voluntary help and services from the public. The major objective of the program is to utilize this voluntary help in such a way that is mutually beneficial to the National Park Service and the volunteer. Volunteers are accepted from the public without regard to race, creed, religion, age, sex, sexual orientation, national origin, or disability.
Wilderness	A designation applied to certain federal lands set aside for preservation and protection in their natural condition, in accordance with the Wilderness Act of 1964.