National Park Service
United States Department of the Interior










# Sand Creek Massacre National Historic Site
# Resource Stewardship Strategy

## Colorado

Sand Creek Massacre National Historic Site
Resource Stewardship Strategy

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# SUMMARY

## OVERVIEW OF A RESOURCE STEWARDSHIP STRATEGY

A resource stewardship strategy is a National Park Service program plan that includes strategies for managing natural and cultural resources at a national park system unit. It is based on science and scholarship and is designed to achieve and maintain desired conditions for resources. The desired conditions for resources are generally described in a unit's general management plan and refined in the resource stewardship strategy. A resource stewardship strategy is a link between a unit's general management plan and strategic planning for the unit, where personnel and financial resources are allocated to implement stewardship activities.

The major components of a resource stewardship strategy include

- a description of the unit's fundamental (and other important) resources and values and their desired conditions,
- the status of knowledge of these resources,
- identification of resource condition indicators and target values for those indicators that allow the National Park Service to measure current conditions against desired conditions (see "What is a Resource Stewardship Strategy?" on page 3 of this document), and
- comprehensive strategies and the funding needed to achieve or maintain desired conditions.

## FUNDAMENTAL AND OTHER IMPORTANT RESOURCES AND VALUES — DESIRED CONDITIONS

The first step in developing comprehensive strategies is to identify the resources and values that the National Park Service is responsible for preserving.

Fundamental and other important resources and values support the purpose and significance of the unit by identifying the characteristics (features, processes, resources, and values) to which managers need to pay attention. The unit's general management plan identifies the fundamental or other important resources and values for the unit. The following paragraphs describe the fundamental and other important resources and values at the Sand Creek Massacre National Historic Site.

### Fundamental Resources and Values

- Cultural landscapes and viewsheds
- Upland plant and animal habitats
- Topographic features
- Archeological and other physical remains associated with the massacre
- Museum collections, artifacts, and archives
- Hydrological and hydraulic conditions
- Oral histories
- Riparian plant and animal habitats
- Wetlands areas
- Repatriation site
- Intangible spiritual qualities of the landscape (sense of place)
- Human remains and cultural items subject to the Native American Graves Protection and Repatriation Act still in the ground and those that may be repatriated
- Memorialization and commemoration activities such as spiritual healing runs and places that have been blessed or where ceremonies occur/have occurred
- Ethnographic resources

### Other Important Resources and Values

- 1950 monument and overlook
- Post-massacre land use and associated history: sheep ranch, SS ranch line shack, Chivington Brandon Canal

Desired conditions for these resources are derived from servicewide mandates and policies, and guidance provided according to the management zones established in the unit's general management plan.

## STATUS OF RESOURCE KNOWLEDGE

The second step in developing a resource stewardship strategy is to evaluate the body of knowledge for the unit's resources and compare that to what has been accomplished relative to the desired conditions. This provides the unit with an understanding of what kinds of information may be required to adequately assess a resource's condition and move the resource toward its desired condition. Following is a summary of natural and cultural resources inventories, studies, reports, and monitoring for the Sand Creek Massacre National Historic Site.

### Natural Resources

Many natural resource reports and plans have been completed. A few studies, inventories, reports, and plans are still needed, including determining the projected Big Sandy Creek flood levels in June of 1864, and an examination of whether threatened and endangered species reintroductions should occur. Updates to a variety of plans are or will be needed, including development of a prairie dog management plan based on the findings of the previous assessment.

Additional information on resources including the site's historic trail locations and the potential movement of Big Sandy Creek will be acquired through an ongoing process.

The Southern Plains Network Inventory and Monitoring Program has contributed and is currently contributing to the understanding of site resources; however, information is still being compiled and synthesized for plant and animal habitats.

The site's natural resources respond to natural changes in the physical or biological attributes of the landscape in different ways, making it difficult to fully understand the range of natural variability and ecology (interactions) of many site resources. Additional research needs to be completed to develop and select appropriate indicators and target values for some resources.

### Cultural Resources

A variety of resource inventories have been completed. Some additional specific cultural resource inventories are needed, including light detection and ranging (LIDAR), and range mapping of specific historical locations in the site.

A variety of reports and plans have been completed. Many studies, reports, and plans are still needed. Updates to a variety of plans will also be needed over time.

Research on ethnographic resources, Native American artifacts, and archeological resources is needed.

## INDICATORS OF RESOURCE CONDITION AND TARGET VALUES

The third step of the resource stewardship strategy process is to select indicators and establish target values. Indicators are measureable parameters that resource managers use to assess the condition of resources. Target values are values that represent desired conditions and allow a unit to compare the current condition of a resource with its desired condition. Selecting indicators and establishing target values is a difficult task, often pursued with imperfect or inadequate information. Seventy indicators

were selected to measure resource conditions at Sand Creek Massacre National Historic Site (table ES-1). Several indicators were used for multiple resources.

Target values were established for 66 of the 70 indicators selected, with only one "unknown" and 3 noted as "tentative" or "to be decided." Some target values were not developed for resources due to inadequate information. In some cases, interim target values were established until they can be refined through further data collection and monitoring efforts. Additional research and planning is needed to identify appropriate indicators and concise targets for these resources.

The current condition of many resources is not known — additional research and monitoring is required to evaluate their condition. Consequently, it is not possible to determine whether or not target values have been met for many resources.

**Table ES-1. Status of Resource Targets**

| Resource | Number of Targets | Number of Targets with Target Values Identified | Number of Targets with Target Values that have Information on Current Conditions | Number of Target Values Met |
|---|---|---|---|---|
| Cultural | 47 | 46 | 40 | 27 (including one that will be met as of Sept/Oct 2010) |
| Natural | 20 | 20 (including 3 TBDs that have tentative values) | 12 | 8 |



## COMPREHENSIVE STRATEGIES FOR ACHIEVING DESIRED CONDITIONS

The final step of the resource stewardship strategy process is development of comprehensive strategies and associated activities to ensure the National Park Service is attaining and maintaining desired conditions for all of a unit's resources and values. Sand Creek Massacre National Historic Site's comprehensive strategies address the major natural and cultural resources in the site, as well as strategies for resource program management and the completion of plans, reports, and inventories needed. The comprehensive strategies consist of 60 activities that address one of four primary needs:

- Filling data gaps necessary to define and evaluate indicators and target values for site resources.
- Monitoring and managing park resources to ensure target values for each indicator are achieved.
- Implementing research or resource management activities required by legislation or the site's general management plan.
- Implementing best management practices and activities designed to improve resource conditions.

## FUNDING SAND CREEK MASSACRE NATIONAL HISTORIC SITE'S RESOURCE STEWARDSHIP

One purpose of the resource stewardship strategy is to guide National Park Service investments (human and fiscal) in the stewardship of natural and cultural resources. The resource stewardship strategy assigns funding needs for implementing resource stewardship strategies (via projects) to base and project funding. Additionally, it provides a means of accountability for funds used to attain and maintain desired conditions.

Currently, funds allocated for resource stewardship (i.e., natural and cultural resource management) at Sand Creek Massacre National Historic Site account for 20% of the site's total budget (approximately $172,800 of $850,800). In the previous three years, average spending for resource management increased from 5% to 20% of the site's total annual expenditures (table ES-2).

Resource stewardship strategy budget projections show that the cost of resource management would be roughly 70% greater than current spending. To meet desired resource conditions, funding allocated to resource stewardship at the site would need to grow from $172,800 in fiscal year 2010 to roughly $294,000 in Year 1 of strategy implementation.

**Table ES-2. Resource Funding**

| Fiscal year | Park budget | Resource funding |
|---|---|---|
| 2007 | $671,000 | $35,000 |
| 2008 | $644,000 | $89,000 |
| 2009 | $790,000 | $133,000 |
| 2010 | $850,800 | $175,000 |

The site has targeted several funding sources to help meet this need such as the Servicewide Comprehensive Call and partnerships with the Natural Resource Program Center. Increases in Operation of the National Park Service base funding would also be required to meet the site's resource management needs and the goals of this resource stewardship strategy.

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# Introduction



# CHAPTER 1 — INTRODUCTION

## WHAT IS A RESOURCE STEWARDSHIP STRATEGY?

A resource stewardship strategy (RSS) serves as a bridge between the qualitative statements of desired conditions for resources and resource condition-dependent visitor experiences established in a national park system unit's general management plan and the measureable goals and implementation actions determined through strategic planning. The resource stewardship strategy is not a decision-making document. Instead it is an analytical document that focuses on identifying and tracking indicators of desired conditions, recommending comprehensive strategies to achieve and maintain desired conditions over time, and assessing and updating these comprehensive strategies periodically based on new information and the results of completed activities. It provides the unit with a strategy for investing human and fiscal resources in the stewardship of natural and cultural resources. It also reports accountability toward progress in attaining and maintaining desired resource conditions at the unit.

The resource stewardship strategy builds on the unit's fundamental and other important resources and values and seeks to improve or maintain the quality of these key resources.

At the heart of developing a resource stewardship strategy is identifying and selecting indicators of resource conditions and developing target values that represent the desired conditions. Together these two components allow unit managers to measure the status of their resources relative to their desired conditions and then develop comprehensive strategies designed to achieve or maintain desired conditions. See figure 1 for the planning components and process of developing a resource stewardship strategy.

**Fundamental (and Other Important) Resources and Values** — Resources and values critical to achieving the unit's purpose and maintaining its significance.

**Desired Conditions** — A qualitative statement established in the general management plan describing the condition of a resource that the unit is seeking to achieve.

**Attribute** — A feature of the resource that helps describe the resource and corresponds to resource condition. Attributes are broad categories that can be used as indicator topics.

**Indicator** — A measurable resource attribute that provides information on a resource's current condition relative to its desired condition. An indicator is only a representation of relative condition.

**Target Value** — A quantifiable indicator value that represents the desired condition.

**Comprehensive Strategy** — A sequence of activities or actions based on science and scholarship that enable the unit to achieve or maintain desired conditions for the affected resource.

The expert-reviewed comprehensive strategies of the resource stewardship strategy focus on an integrated, interdisciplinary approach. Preparation of a resource stewardship strategy is accompanied by consultations with stakeholders who have an interest in, resources in, and areas adjacent to, the unit. This ensures that the stakeholders understand the role of the resource stewardship strategy in the unit's planning framework. See appendix A for a list of participants in the development of the *Sand Creek Massacre National Historic Site Resource Stewardship Strategy*.

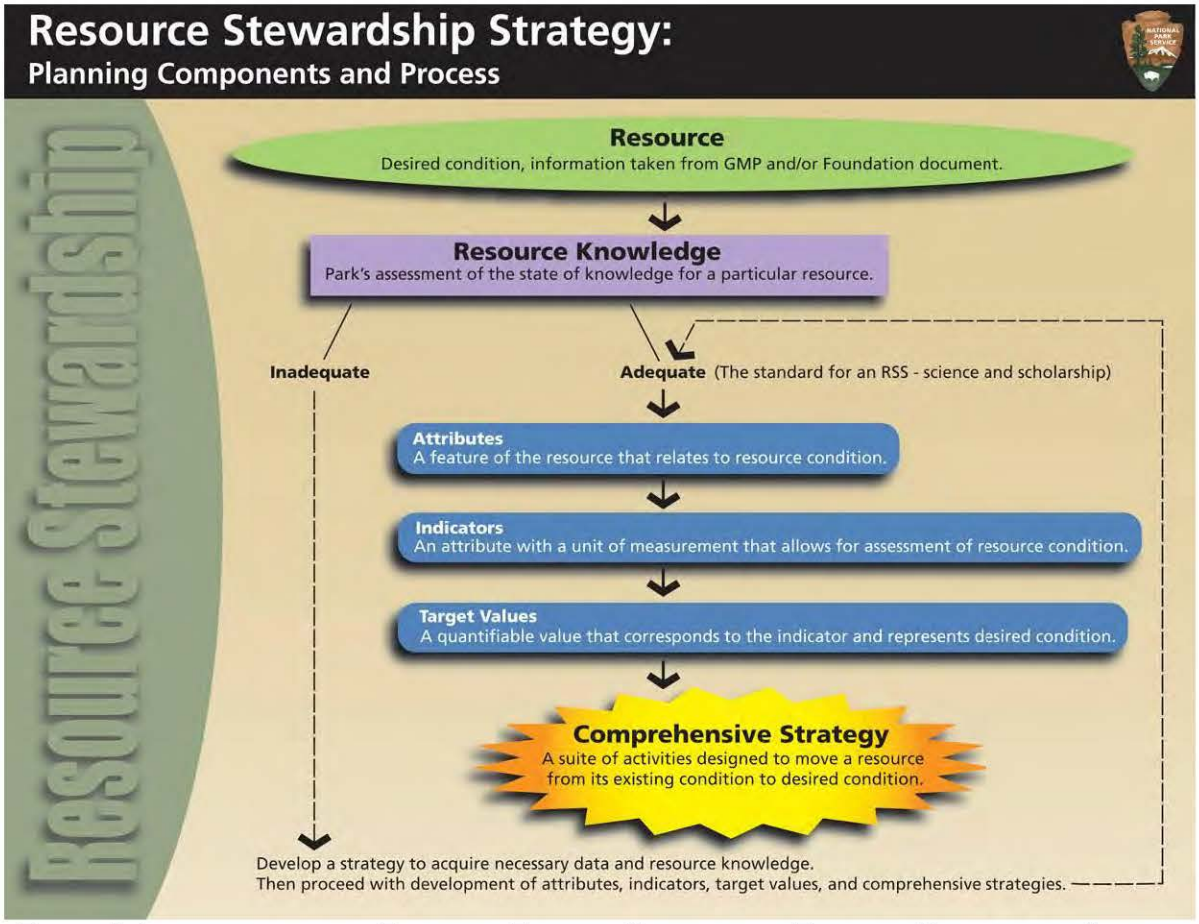



**FIGURE 1. ILLUSTRATION OF THE FLOW AND DECISION POINTS OF THE RESOURCE STEWARDSHIP STRATEGY PLANNING PROCESS**

A resource stewardship strategy includes identification of strategies to attain and maintain desired conditions. Before they can be implemented, these strategies are subject to appropriate environmental planning and compliance documentation when specific actions or undertakings are considered. The authority for the resource stewardship strategy lies in (and is limited by) Draft Director's Order 2-1: *Resource Stewardship Planning*, the unit's general management plan, and its associated environmental compliance documents. Implementation of the strategy would proceed as funds are made available.

## SITE PURPOSE, SIGNIFICANCE, AND FUNDAMENTAL AND OTHER IMPORTANT RESOURCES AND VALUES

### Purpose

Purpose statements reaffirm the reasons a national park system unit was set aside and provide the foundation for unit management and use.

The purpose of Sand Creek Massacre National Historic Site is to protect and preserve the cultural landscape of the massacre site and interpret the associated cultural values to enhance public understanding of the massacre and assist in minimizing the chances of similar incidents in the future.

## Site Significance and Associated Resources and Values

Significance statements capture the essence of a unit's importance to our country's natural and cultural heritage. Significance statements do not inventory a unit's resources, but instead answer questions about why a unit's resources are distinctive and how they contribute to our natural heritage. Defining a unit's significance helps managers make decisions that preserve the resources and values necessary to accomplish each unit's purpose.

Fundamental resources and values are those resources critical to achieving a unit's purpose and maintaining its significance. If fundamental resources and values are degraded, the unit's significance could be jeopardized. Fundamental resources and values are primarily derived from analyzing the unit's significance statement(s). They elaborate on what is most important about the unit and may include systems, processes, features, visitor experiences, stories, scenes, sounds, smells or other resources and values. The fundamental resources and values are part of the foundation for all planning and management at the unit, providing focus and allowing the unit to prioritize its management resources and actions.

Limiting fundamental features to those resources and values related directly to the unit's purpose and significance does not preclude the consideration of other resources and values. These other important resources and values include those determined to be important in their own right, despite not being fundamental to the unit's purpose and significance. They may be supportive of the unit's mission or they may be resources and values associated with other statutes and NPS policies affecting the stewardship of resources in the unit.

The *Sand Creek Massacre National Historic Site Draft General Management Plan* has identified fundamental and other important resources and values for the site.

### Significance Statement 1

The site of the Sand Creek Massacre has sacred significance to the Cheyenne and Arapaho tribes, particularly those who are descended from victims and survivors of the massacre.

**Fundamental Resources and Values.**

- Cultural landscapes and viewsheds
- Upland plant and animal habitats
- Oral histories
- Topographic features
- Archeological and other physical remains associated with the massacre
- Museum collections, artifacts, archives, and all other paper documents
- Hydrologic and hydraulic conditions
- Upland plant and animal habitats
- Riparian plant and animal habitats
- Repatriation site
- Intangible spiritual qualities of the landscape (sense of place)
- Human remains and cultural items subject to the Native American Graves Protection and Repatriation Act (NAGPRA) still in the ground and those that may be repatriated
- Memorialization and commemoration activities such as spiritual healing runs and places that have been blessed or where ceremonies occur/have occurred

**Other Important Resources and Values.**

- Wetlands plant and animal habitats

### Significance Statement 2

The site is a reminder of the tragic conflicts between Native Americans and Euro-Americans over the land that now comprises the United States.

**Fundamental Resources and Values.**

- Archeological and other physical remains associated with the massacre
- Museum collections, artifacts, and archives
- Oral histories
- Repatriation site
- Human remains and cultural items subject to NAGPRA in situ and those that may be repatriated
- Memorialization and commemoration activities such as spiritual healing runs, and places that have been blessed or where ceremonies occur/have occurred

**Other Important Resources and Values.**

- 1950 monument and overlook
- Post-massacre land use and associated history: sheep ranch, SS ranch line shack, Chivington Brandon Canal

### Significance Statement 3

The intense distrust resulting from the Sand Creek Massacre influenced virtually all subsequent conflicts between Native Americans and the U.S. Army.

**Fundamental Resources and Values.**

- Museum collections, artifacts, and archives
- Oral histories

**Other Important Resources and Values.**

- None

### Significance Statement 4

The Sand Creek Massacre is an essential symbol of the struggles of Native American tribes to maintain their ancestral ways of life.

**Fundamental Resources and Values.**

- Cultural landscapes and viewsheds
- Plant and animal habitats
- Topographic features

**Other Important Resources and Values.**

- Wetlands plant and animal habitats
- Post-massacre land use and associated history: sheep ranch, SS ranch line shack, Chivington Brandon Canal

### Significance Statement 5

The massacre profoundly disrupted the social, political, and economic structures of the Cheyenne and Arapaho tribes.

**Fundamental Resources and Values.**

- Oral histories
- Memorialization and commemoration activities such as spiritual healing runs and places that have been blessed or where ceremonies occur/have occurred

**Other Important Resources and Values.**

- None

### Significance Statement 6

Eliminating most of the Cheyenne's advocates for peace, the massacre hardened resistance to white expansion and escalated warfare between the army and the Cheyenne, Arapaho, and Sioux tribes.

**Fundamental Resources and Values.**

- Museum collections, artifacts, and archives
- Oral histories

**Other Important Resources and Values.**

- None

### Significance Statement 7

The circumstances of the massacre elicited national outrage — even against the backdrop

of the bloodshed of the Civil War — and forced substantial changes in U.S. government policy toward Native Americans.

**Fundamental Resources and Values.**

- Museum collections, artifacts, and archives
- Oral histories

**Other Important Resources and Values.**

- None

## DESIRED CONDITIONS FOR RESOURCES

Desired conditions are qualitative statements established in a unit's general management plan that describe the condition of a resource the unit is seeking to achieve. Table 1 contains desired conditions for site resources based on existing laws and policies.

A general management plan delineates zones or districts that correspond to desired conditions for unit management in an area. This delineation is called management zoning. Zoning descriptions include the general desired conditions for resources, visitor experience, and appropriate management activities that reflect the suitability of specific areas for specific uses.

The *Sand Creek Massacre National Historic Site General Management Plan* will identify management zones and provide management direction for the site's natural and cultural settings and transition areas. The resource stewardship strategy for the Sand Creek Massacre National Historic Site will be completed prior to the completion of the site's first general management plan. The draft general management plan is currently in the alternatives development phase of the planning process and a preferred alternative will not be selected until after this resource stewardship strategy has been finalized. Therefore, a map of the preferred alternative management zones is not included in this resource stewardship strategy but the zones described below are unlikely to change.

The resource stewardship strategy will provide site managers with recommended comprehensive strategies to achieve and maintain the desired conditions for the site's natural and cultural resources.

The draft general management plan will contain more detailed information on desired conditions relating to law and policy, along with a list of actions the site will take to meet legal and policy requirements. Other parts of the draft general management plan can be considered best practices for resource stewardship and should be treated as part of the standard operating procedures of the site's resource management program.

**TABLE 1. MANAGEMENT OBJECTIVES BASED ON SERVICEWIDE MANDATES AND POLICIES**

| Topic | Objectives at Sand Creek Massacre National Historic Site |
|---|---|
| Relations with Private and Public Organizations, Owners of Adjacent Land, and Government Agencies | The site is managed as part of a greater ecological, social, economic, and cultural system.<br>Good relations are maintained with adjacent landowners, surrounding communities, and private and public groups that affect, and are affected by, the site. The site is managed to resolve external issues and concerns and ensure that the site's values are not compromised.<br>Because the site is an integral part of a larger regional environment, the National Park Service works cooperatively with other entities to anticipate, avoid, and resolve potential conflicts, protect site resources, and address mutual interests in the quality of life for community residents. Regional cooperation involves federal, state, and local agencies, Native American tribes, neighboring landowners, and all other concerned parties. |
| | |
| Government-to-Government Relations between Native American Tribes and the Site | The National Park Service and Native American tribes culturally affiliated with the site maintain positive, productive, government-to-government relationships. Site managers and staff respect the viewpoints and needs of the tribes, continue to promptly address conflicts, and consider Native American values in site management and operation. |

| Topic | Objectives at Sand Creek Massacre National Historic Site |
|---|---|
| Natural Resources | |
| Air Quality | Air quality at the site meets National Ambient Air Quality Standards for criteria pollutants and protects air quality-sensitive resources. Natural visibility conditions exist at the site and scenic views of the landscape are not impaired by human activities. |
| Ecosystem Management | The site is managed holistically, as part of a greater ecological, social, economic, and cultural system. |
| Exotic Species | The management of populations of exotic plant and animal species, up to and including eradication, is undertaken wherever these species threaten site resources or public health and when control is prudent and feasible. |
| Fire Management | Site fire management programs are designed to meet resource management objectives prescribed for the areas of the site and to ensure the safety of firefighters and the public are not compromised. All wildland fires are effectively managed using the appropriate management strategy, including fire use, consideration of resource values to be protected and firefighter and public safety, and using the full range of strategic and tactical operations as described in an approved fire management plan. |
| Floodplains | Natural floodplain values and processes are preserved or restored. Occupancy and artificial modification of floodplains is avoided. When it is not practicable to locate (or relocate) development or other human activities to a site outside a floodplain (or a site that would affect an adjacent floodplain), the National Park Service prepares and approves a statement of findings in accordance with Director's Order 77-2. The Director's Order states that, when managing floodplains, the National Park service will specifically: protect, preserve and restore the natural resources and functions of floodplains; avoid the long- and short- term effects associated with the occupancy and modification of floodplains; avoid direct and indirect support of floodplain development and actions that could adversely affect the natural resources and functions of floodplains or increase the flood risk; and restore when practicable, natural floodplain values previously affected by land use activities within floodplains. Furthermore, the National Park Service will use nonstructural measures as much as practicable to reduce hazards to life and property, and ensure that structures and facilities are designed to be consistent with criteria of the National Flood Insurance Program (44 Code of Federal Regulations 60). |
| General Natural Resources/Restoration | Native plant and animal species populations that have been severely reduced in or extirpated from the site are restored where feasible and sustainable. Populations of native plant and animal species function in as natural a condition as possible except where special considerations are warranted. |
| Lightscape Management and Night Sky | Excellent opportunities to see the night sky continue to be available. Artificial light sources in and outside the site do not unacceptably adversely affect opportunities to see the night sky. |
| Natural Soundscapes | The National Park Service preserves natural ambient soundscapes, restores degraded soundscapes to their natural ambient condition wherever possible, and protects natural soundscapes from degradation due to human-caused noise. Disruptions from recreational uses are managed to provide a high-quality visitor experience consistent with the goal to preserve or restore the natural quiet and natural sounds. A baseline for high visitation was completed in June 2010 and a baseline for off-season visitation is currently underway. |
| Soils | The National Park Service actively seeks to understand and preserve the soil resources of the site and to prevent to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources. Natural soil resources and processes function in as natural a condition as possible, except where special considerations are allowable under policy. |
| Threatened and Endangered Species | State and federally listed threatened and endangered species and their habitats are protected and sustained. Native threatened and endangered species populations that have been severely reduced in or extirpated from the site are restored where feasible and sustainable. |
| Water Resources | Surface water and groundwater are protected and water quality meets or exceeds all applicable water quality standards.<br>Programs and facilities are maintained and operated to avoid pollution of surface water and groundwater.<br>Watersheds are managed as complete hydrologic systems. This includes minimizing human- |

| Topic | Objectives at Sand Creek Massacre National Historic Site |
|---|---|
| | caused disturbance to the natural upland processes that deliver water, sediment, and woody debris to streams. Natural fluvial processes are allowed to proceed unimpeded, and stream processes that create habitat features are protected. Where stream manipulation is unavoidable, maximum use is made of techniques that are visually unobtrusive and protect natural processes. |
| Wetlands | The natural and beneficial values of wetlands are preserved and, if appropriate, enhanced. A "no net loss of wetlands" policy is implemented, with an associated goal of net gain of wetlands through the restoration of previously degraded wetlands. The destruction or modification of wetlands is avoided. New construction in wetlands does not occur wherever there is a practicable alternative. The National Park Service compensates for unavoidable adverse impacts on wetlands by restoring wetlands that have been previously disturbed. |
| Cultural Resources | |
| Archeological Resources | Archeological sites are identified and inventoried, and their eligibility for listing in the National Register of Historic Places is determined and documented. The qualities that contribute to the listing or eligibility for listing are protected in accordance with the *Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines* unless it is determined through a formal process that disturbance or natural deterioration is unavoidable.<br>Archeological sites are protected in an undisturbed condition unless it is determined through formal processes that disturbance or natural deterioration is unavoidable. In such cases, the site is mitigated and professionally documented and excavated for data recovery. The resulting artifacts, materials, and records are curated and conserved in the site's museum collections and archives. Concurrence for mitigation is in consultation with the Colorado state historic preservation officer (and culturally affiliated Native American tribes). Some archeological sites that can be adequately protected may be interpreted to the visitor. |
| Ethnographic Resources including Ethnographic Landscapes | Appropriate cultural anthropological research is conducted in cooperation with groups associated with the site.<br>The National Park Service accommodates access to and ceremonial use of Native American sacred sites by Native American practitioners and avoids adversely affecting the physical integrity of sacred sites.<br>The National Park Service's general regulations on access to and use of natural and cultural resources at the site are applied in an informed, balanced manner that is consistent with site purposes, does not unreasonably interfere with Native American use of traditional areas or sacred resources, and does not result in the degradation of park resources.<br>Cheyenne and Arapaho tribal members or descendants are consulted when ethnically identifiable human remains, sacred objects, objects of cultural patrimony, and associated funerary objects are disturbed or are encountered on site lands.<br>All ethnographic resources, including ethnographic landscapes, are protected through tribal consultation. If disturbance of such resources is unavoidable, formal consultation with the Colorado state historic preservation officer and the Advisory Council for Historic Preservation, if necessary, and as appropriate with Native American tribes, is conducted.<br>The April 29, 1994, presidential memorandum on "Government-to-Government Relations with Native American Tribal Governments," codified at 3 *Code of Federal Regulations* 1007 (1995), states in part, "Each executive department and agency shall consult, to the greatest extent practicable and to the extent permitted by law, with tribal governments before taking actions that affect federally recognized tribal governments. All such consultations are to be open and candid so that all interested parties may evaluate for themselves the potential impact of relevant proposals." Section 5.2.1 of NPS *Management Policies 2006* (NPS 2006) states in part that "traditionally associated peoples should be consulted about . . . proposed National Park Service actions that may affect the treatment of, use of, and access to cultural and natural resources with known or potential cultural meaning for the groups."<br>The identities of community consultants and information about sacred and other culturally sensitive places and practices will be kept confidential when research agreements or other circumstances warrant. |
| Cultural Landscapes | A cultural landscape assessment conducted at the park determined that the entire park should be considered an ethnographic landscape and it is more appropriate to manage the park as an ethnographic rather than a cultural landscape. |

| Topic | Objectives at Sand Creek Massacre National Historic Site |
|---|---|
| Museum Collections | All museum collections (objects, artifacts, specimens, and manuscript collections) are identified, inventoried, catalogued, documented, preserved, and protected. Provisions are made for access to and use of items in the collections for exhibits, research, and interpretation. The qualities that contribute to the significance of collections are protected in accordance with established standards. |
| Visitor Use and Experience | |
| Site Use Requirements | Site resources are conserved "unimpaired" for the enjoyment of future generations. Visitors have opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found at the site. No activities occur that would cause degradation of the values and purposes for which the site was established.<br>For all zones, districts, or other logical management divisions in the site, the types and levels of visitor use are consistent with the desired resource and visitor experience conditions prescribed for those areas. Site visitors have opportunities to understand and appreciate the significance of the site and its resources and to develop a personal stewardship ethic. To the extent feasible, programs, services, and facilities at the site are accessible to and usable by all people, including those with disabilities. |
| Commercial Services | All commercial services are authorized, are necessary and appropriate, and are economically feasible. Appropriate planning is done to support commercial services authorization. |
| Public Health and Safety | Within the constraints of the Organic Act to not impair resources, and any other limitations on capability, the National Park Service and its concessioners, contractors, and cooperators seek to provide a safe and healthful environment for visitors and employees. The site staff strives to identify recognizable threats to safety and health and to protect property by applying nationally accepted standards consistent with mandates, such as closures, guarding, gating, education, and other actions. |
| Other Topics | |
| Sustainable Design and Development | Visitor management facilities are harmonious with site resources, compatible with natural processes, aesthetically pleasing, functional, as accessible as possible to all segments of the population, energy efficient, and cost-effective.<br>All decisions regarding site operations, facilities management, and development at the site, from the initial concept through design, construction, operation, and maintenance reflect principles of resource conservation. Thus, all site developments and site operations are sustainable to the maximum degree sustainable and practical. New developments and existing facilities are located, built, and modified according to the *Guiding Principle of Sustainable Design* (NPS 1993) or other similar guidelines. Management decision making and activities throughout the site use value analysis, which is mandatory for all the Department of the Interior bureaus, to help achieve this goal. Value planning, also called value analysis, value engineering, and value management, is used when value methods are applied to general management and lower-tier planning activities. |
| Transportation to and in the Site | Visitors have reasonable access to the site. Connections exist from the site to regional transportation systems, as appropriate.<br>Transportation facilities at the site provide access for the protection, use, and enjoyment of site resources. They preserve the integrity of the surroundings, respect ecological processes, protect site resources, and provide high visual quality and a rewarding visitor experience. The National Park Service participates in all transportation planning forums that may result in links to the site or impacts on site resources. This may involve working with federal, tribal, state, and local agencies on transportation issues to address site access and transportation connectivity. |
| Utilities and Communication Facilities | Site resources, or public enjoyment of the site, are not denigrated by nonconforming uses. Telecommunication structures do not jeopardize the site's mission and resources. No new nonconforming use or rights-of-way are permitted through the site without specific statutory authority and approval by the director of the National Park Service or his/her representative, and are permitted only if there is no practicable alternative to such use of NPS lands. |

## Management Zones

Five management zones would be applied to the site: Sensitive Resources, Restoration-Conservation, Contemplative, Extended Learning, and Development. Desired resource conditions for each of these zones are identified in table 2.

**Sensitive Resources.** This zone would protect the site's most sensitive and vulnerable resources. Resource preservation would be the overarching management goal.

**Restoration-Conservation.** The natural setting and character would prevail and the zone would be managed to preserve the broader ecological and historic integrity of the monument.

**Contemplative.** Visitor experiences would be focused on the commemoration of and reflection about the Sand Creek Massacre and its aftermath.

**Extended Learning.** This zone would emphasize comprehensive interpretation of and education about the Sand Creek Massacre and would be managed to provide greater access and enhance visitor understanding and appreciation of site resources.

**Development.** This zone would include development to support site functions such as visitor services, maintenance, administration, and resource management.

## Resources, Management Zones, and Desired Conditions

Most of the site's resources are not segmented by management zones — they occur on the land without respect to management zones and they often cross zone boundaries. Consequently, the desired conditions for most resources are guided by the requirements of existing laws and policies (referred to in the draft general management plan as "servicewide mandates and policies") plus information from site-specific studies currently underway.

For example, archeological resources occur throughout the site and their management does not necessarily differ by management zone. The same is true for vegetation communities in the site, which cross management zone boundaries; the only guidance the management zones provide is related to the tolerance of human-caused resource impacts. The same is true for cultural resources; however, management zone descriptions do include guidance on the treatment and use of cultural resources. With few exceptions, the monitoring of both natural and cultural resources would not be dependent on management zone boundaries.



Witness Tree

**TABLE 2. DESIRED CONDITIONS BY MANAGEMENT ZONES IDENTIFIED IN THE DRAFT SAND CREEK MASSACRE NATIONAL HISTORIC SITE GENERAL MANAGEMENT PLAN**

| Management Zones | | | | |
|---|---|---|---|---|
| Sensitive Resources | Restoration-Conservation | Contemplative | Extended Learning | Development |
| Zone Concept | | | | |
| This zone would protect the site's most sensitive and vulnerable resources. Resource preservation would be the overarching management goal. | The natural setting and character would prevail and the site would be managed to preserve its broader ecological and historic integrity. | Visitor experiences would focus on commemoration and reflection of the event of the Sand Creek Massacre and its aftermath. | This zone would emphasize comprehensive interpretation of and education about the Sand Creek Massacre and would be managed to provide greater access and enhance visitor understanding and appreciation of historic site resources. | This zone would include development to support site functions such as visitor services, maintenance, administration, and resource management. |
| Desired Condition: Visitor Experience | | | | |
| This zone would be closed to visitors owing to the sensitivity of resources.<br>This zone would be interpreted indirectly in other areas of the site open to the public. | Solitude, natural quiet, and self-discovery would be the prevailing qualities of this experience.<br>Visitor access would be limited in this zone.<br>Sensitively placed primitive trails would be allowed in this zone to provide for self-discovery.<br>Visitors would be encouraged to stay on trails to protect natural and cultural resources.<br>Unobtrusive interpretive media could be developed for visitor understanding and stewardship of site resources.<br>Ranger-guided activities could occasionally occur.<br>There would be a very low probability of encounters with site staff, other visitors, or evidence of visitor impacts.<br>Scientific research | Visitors would have an opportunity to make offerings within the policies established jointly by the National Park Service and affiliated tribes.<br>A contemplation area would be established where visitors can quietly sit, reflect, and discover their own intellectual and emotional connections to the site.<br>There would be a moderate-high probability of encounter with other visitors, depending on the season.<br>Visitors may encounter NPS staff in this zone. | Visitors would have the greatest opportunity to access the landscape, thus gaining an understanding of the multiple perspectives and chronological events of the massacre.<br>A wide variety of interpretive and educational programs and media, including regularly scheduled ranger programs, would be employed to provide visitors a comprehensive exploration of all themes.<br>Educational activities, especially with school groups, would be accommodated in this zone.<br>Encounters with other visitors would be moderate during peak seasons and minimal during the off-season.<br>Visitor access to culturally sensitive sites could be | Visitors experience orientation to the site and interpretive connections via multiple types of media and services.<br>There may be some small portions of this zone where visitor use is not allowed, such as a maintenance facility.<br>Visitors receive orientation and information at a staffed or unstaffed facility through exhibits and printed materials.<br>Visitor experiences would begin at the main visitor center in town and additional information would be available on site in this zone.<br>There would be a high probability of encountering other visitors and site staff in this zone.<br>Visitor activities could include viewing interpretive exhibits or displays, and planning a visit. |

| Management Zones | | | | |
|---|---|---|---|---|
| Sensitive Resources | Restoration-Conservation | Contemplative | Extended Learning | Development |
| | could take place in these areas.<br>Visitor activities would include walking, scenic and wildlife viewing, photography, and reflection. | | allowed by special permit for educational purposes. | |
| Desired Condition: Natural and Cultural Resources | | | | |
| The protection of highly sensitive or at-risk natural and cultural resources would be the management focus of this zone.<br>Resource protection would take precedence over visitor use.<br>Natural sounds would predominate; intrusions would be rare, of low intensity and duration, and would occur mainly from outside the zone (e.g., noise from vehicles). | Natural and cultural resources would be managed to achieve and maintain the desired condition as closely as practicable to the goals set forth in the legislation (1864 appearance) based on ongoing scientific research.<br>Resources would be managed as necessary to provide for visitor safety.<br>Resources would be restored and managed to closely reflect the appearance of the historic High Plains landscape with the long-term goal of resource conservation. | Natural resource management would be secondary to visitor use of this zone.<br>Monuments, trails, and reflective areas would be located to avoid sensitive resources. | Natural resources would be managed to maintain natural processes and functions but may be modified when necessary for visitor use or site operations.<br>Cultural resources would be monitored and protected, consistent with NPS law and policy. Visitor access could be allowed by special permit. | Natural resources would be managed to maintain natural processes and functions but could be modified when necessary for visitor use or site operations.<br>Cultural resources, if present, would be protected and monitored. |
| Desired Condition: Facilities | | | | |
| This zone would have no development for visitor use or site operations other than primitive roads for administrative access.<br>Management actions would be focused on resource protection.<br>Features of the 1864 cultural landscape such as reproductions of Cheyenne and Arapaho lodges could be placed in this zone but would not be open to the public. | Visitor facilities would be limited to trailheads and low-profile directional and interpretive signs.<br>Trails would be unpaved and sensitively located.<br>Minimal facilities for resource protection or safety may be needed in the future. Primitive roads for NPS administrative uses would be allowed. | Sheltered seating area and benches for contemplation would be allowed in this zone.<br>Interpretive media, such as signs and wayside exhibits, would be limited in size and scope and would not detract from the commemorative experience.<br>Trails would be allowed in this zone to access commemorative features of the historic site. | Sheltered area with seating for school groups to gather could be allowed.<br>This zone would allow for small-scale development, such as trails, interpretive panels/signs, benches, vault toilets, and shade shelters. | This zone would contain facilities and other major development for visitor services and site operations including visitor centers/contact stations, museums, maintenance facilities, staff offices, storage, trailheads, interpretive media, walkways, roads, parking areas, storage facilities, and utility lines. |

## RELATIONSHIP OF THE RESOURCE STEWARDSHIP STRATEGY TO OTHER PROGRAMS AND PLANS

The resource stewardship strategy is a program plan as defined in NPS *Management Policies 2006*. Program management planning for a unit provides a bridge between the broad direction provided in a unit's draft general management plan and specific actions taken to achieve goals. These plans provide a comprehensive approach for a single unit program area across all or most of the unit. Program management plans provide comprehensive recommendations about specific actions needed to achieve and maintain desired resource conditions and visitor experiences.

Unit-level strategic planning remains a critical step in decision making by unit management involving the allocation of unit financial and human resources. While the management plan describes the desired conditions to be ultimately achieved for the unit, the unit's 5-year plan and annual Government Performance and Results Act performance plan describe what can realistically be achieved based on foreseeable financial and human resources. Figure 2 illustrates the relationship among these types of plans.

The resource stewardship strategy presents 10- to 20-year comprehensive strategies to provide a logical, long-term investment in achieving and maintaining desired conditions. The activities comprising these comprehensive strategies inform the sequence, duration, and association between more detailed recurring and nonrecurring implementation actions that would be considered during unit strategic and implementation planning.

The Sand Creek Massacre National Historic Site already had several implementation and other plans in place at the time this resource stewardship strategy was developed. Where appropriate, information from these plans has been incorporated into this resource stewardship strategy. A summary and review of plans associated with and/or affected by the resource stewardship strategy is included in table 3.

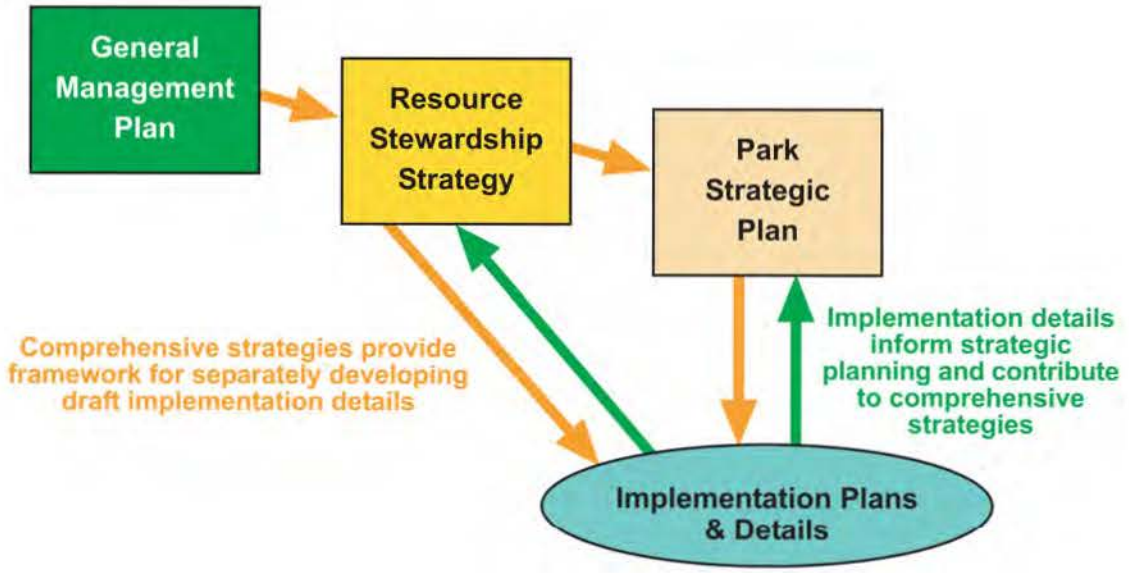



**FIGURE 2. ROLE OF THE RESOURCE STEWARDSHIP STRATEGY IN PARK PLANNING**

**TABLE 3. SUMMARY OF EXISTING SITE PLANS**

| Type of Plan/Plan Title | Status (Complete, Incomplete, In Process, Needed, Ongoing) | Notes |
|---|---|---|
| General Management Plan and Related Documents (15–20 years) | | |
| Site Location Study | Complete, 2000 | |
| Special Resource Study | Complete, 2000 | |
| Interim Site Management Plan | Complete, 2006 | |
| General Management Plan | In Process | To be completed in spring 2013 |
| Socioeconomic Background & Analysis | | To be completed in spring 2013 |
| Program Management Plans (Approximately 15–20 years) | | |
| Restoration Plan | Complete, 2010 | |
| Alternative Transportation Plan | | To be completed in winter 2010 |
| Comprehensive Interpretation Plan | Needed | |
| Strategic Plans (1–5 years) | | |
| Annual Performance Plan | Complete, Fiscal Year 2010 | |
| Implementation Plans (variable timeline) | | |
| Fire Management Plan | Complete, 2006 | |
| Integrated Pest Management Plan | | |

Many plans, such as the comprehensive interpretive plan, fire management plan, land protection plan, or the integrated pest management plan are critical to the implementation of this resource stewardship strategy. Programs such as the National Park Service Inventory and Monitoring (I&M) Program, initiated through the Natural Resources Challenge, also play an important role and have a connection to the resource stewardship strategy. The I&M Program uses a "network approach" — each unit is grouped with other units that have similar ecosystems.

Sand Creek Massacre National Historic Site is part of the Southern Plains Network (SOPN), along with Bent's Old Fort National Historic Site, Capulin Volcano National Monument, Fort Union National Monument, Pecos National Historical Park, Fort Larned National Historic Site, Lake Meredith National Recreation Area and Alibates Flint Quarries National Monument, Washita Battlefield National Historic Site, Chickasaw National Recreation Area, and Lyndon B. Johnson National Historical Park.

The SOPN I&M Program has completed phases I and II of their vital signs monitoring plan. This plan responds to a requirement in the 1998 National Parks Omnibus Management Act that the National Park Service conduct long-term inventory and monitoring of national park system resources. Phases I and II include gathering and assessing existing information, and developing a conceptual ecosystem model and vital signs. The third and final phase contains the details needed to implement monitoring, including monitoring protocols for selected vital signs and statistical sampling designs.

## Vital Signs Monitoring

The core of the I&M Program is the monitoring of vital signs. The servicewide goals of the vital signs program include the following:

1. Determine status and trends in selected indicators of the condition of national park system ecosystems to allow managers to make informed decisions and work effectively with other agencies and individuals for the benefit of national park system resources.

2. Provide early warning of abnormal conditions and impairment of selected resources to help develop effective mitigation measures and reduce costs of management.
3. Provide data to better understand the dynamic nature and condition of national park system ecosystems and to provide reference points for comparisons with other altered environments.
4. Provide data to meet legal and congressional mandates related to natural resource protection and visitor enjoyment.
5. Provide a means of measuring progress toward performance goals.

The vital signs program will need to be complimented by additional monitoring (either performed by site staff or cooperators) to fulfill the resource stewardship strategy.

The SOPN I&M Program has identified 29 vital signs to be monitored in network units. One vital sign refers to air quality, one refers to climate, ten to focal species or communities, two to threatened and endangered species and communities, two to invasive plants, two to invasive animals, two to landscape condition and dynamics, two to soils, three to vegetation communities (overlapping with focal species or communities), five to water quality and quantity, and two to human uses.

Of those vital signs, 11 are monitored at Sand Creek by the SOPN I&M Program. These are soil structure and chemistry, groundwater levels, water quantity, core parameters of water quality (pH, dissolved oxygen, conductivity, temperature, and E. coli), early detection of exotic plants, wetlands vegetation communities, grassland vegetation communities, bird communities, human demographics, fire and fuel dynamics, and landscape dynamics (see Appendix C). The SOPN I&M Program is in the process of developing monitoring protocols for the 11 selected vital signs. Protocols are peer-reviewed, revised as necessary, and given final approval from the intermountain region monitoring coordinator. Development of monitoring protocols was initiated in fiscal year (FY) 2009. Monitoring protocol development is a multiyear process, with final approvals expected between FY 2010 and FY 2012.

## Other Programs

A number of other programs contribute to, or are influenced by, the resource stewardship strategy. For example, a number of condition assessments provide information that inform and can be integrated into this resource stewardship strategy.

Condition assessments for cultural resources include the following: Cultural Landscape Inventory (CLI), List of Classified Structures (LCS), Automated National Catalog System (ANCS+), Archeological Sites Management Information System (ASMIS), and Facility Management Software System (FMSS).

Condition assessments for natural resources include the natural resources condition assessment (funded and managed by the Natural Resource Protection Center's Water Resources Division).

Strategic and implementation planning is influenced by the strategies included in the resource stewardship strategy and can directly support the development of project management information system and Operations Formula System requests. The resource stewardship strategy can be used to support the development and refinement of annual work plans. Data obtained from indicator monitoring should also support reporting to Government Performance and Results Act goals.

# Description of the Site's Resources



# CHAPTER 2 — DESCRIPTION OF THE SITE'S RESOURCES

## OVERVIEW

Sand Creek Massacre National Historic Site was authorized by an act of Congress (Public Law 106-465) in 2000. The stated management goals of the site are

1. "To protect and preserve the site, including: the topographic features that the Secretary determines are important to the site; Artifacts and other physical remains of the Sand Creek Massacre; and the cultural landscape of the site, in a manner that preserves, as closely as practicable, the cultural landscape of the site as it appeared at the time of the Sand Creek Massacre;

2. To interpret the natural and cultural resource values associated with the site; and provide for public understanding and appreciation of, and preserve for future generations, those values; and

3. To memorialize, commemorate, and provide information to visitors to the site to enhance cultural understanding about the site, and assist in minimizing the chances of similar incidents in the future."

The site, located in Kiowa County, Colorado, was formally established by the National Park Service in 2007.

Sand Creek Massacre National Historic Site is a 2,360-acre (971-hectare) site that lies within a 12,500-acre area identified by Congress as the location of the Sand Creek Massacre. This area is located along a 5.5-mile (8.85-kilometer) stretch of Big Sandy Creek in southeastern Colorado. The landscape of the historic site is largely mixed-grass prairies and wooded riparian areas. Trees on the site are eastern cottonwood found in groves of various ages close to current or historic seasonal stream traces of Big Sandy Creek.

Sand Creek Massacre National Historic Site is in the High Plains section of the Great Plains-Palouse Dry Steppe Province ecoregion.

Sand Creek Massacre National Historic Site commemorates the Sand Creek Massacre that occurred during November, 1864. This event occurred when 700 U.S. Army volunteer soldiers attacked and killed over 150 Cheyenne and Arapaho people, mainly women, children, and the elderly, who were peacefully encamped along Big Sandy Creek. The massacre was a running engagement that spanned an area approximately 5.5 miles long and 2 miles wide. Sand Creek Massacre National Historic Site recognizes the significance of this massacre in American history and its ongoing importance to the Cheyenne and Arapaho people and the descendants of the massacre victims. The site's authorizing legislation directs the National Park Service to manage the site as close as practicable to the 1864 cultural landscape.

Since the massacre, buffalo hunting, open range cattle ranching, and farming have occurred and continue to occur in the general location of the massacre. Some of the existing structures in the site include the 1950 monument, the Chivington Brandon canal, the SS/Thompson-Bohart ranch line shack foundation, the sheep corral, fence lines, wells, and dirt access roads (Langfield 2007). The draft general management plan contains a thorough description of the site's resources in the "Affected Environment" section. Excerpts from that section are included below for each of the major resource categories that are the subject of the resource stewardship strategy.

## CULTURAL RESOURCES

The National Park Service, as steward of many of America's most important cultural resources, is charged with preserving historic properties for the enjoyment of present and future generations. Management decisions

and activities throughout the National Park Service must reflect awareness of the irreplaceable nature of these resources. The National Park Service will protect, preserve, and foster appreciation of the cultural resources in its custody and demonstrate its respect for the peoples traditionally associated with those resources through appropriate programs of research, planning, and stewardship in accordance with NPS *Management Policies 2006* (NPS 2006a).

## Archeological Resources

In addition to the National Historic Preservation Act and NPS *Management Policies 2006* (NPS 2006a), National Park Service Director's Order 28A: *Archeology* (NPS 2004b) affirms a long-term commitment to the appropriate investigation, documentation, preservation, interpretation, and protection of archeological resources inside units of the national park system. As one of the principal stewards of America's heritage, the National Park Service is charged with the preservation of the commemorative, educational, scientific, and traditional cultural values of archeological resources for the benefit and enjoyment of present and future generations. Archeological resources are nonrenewable and irreplaceable, so it is important that all management decisions and activities throughout the National Park Service reflect a commitment to the conservation of archeological resources as elements of our national heritage.

Some cultural resource surveys have been conducted for previous actions at Sand Creek Massacre National Historic Site, several of which overlap the areas proposed for development under the *Interim Site Management Plan*. The following surveys are listed by the actions for which the surveys were taken.

**Site Survey (1998).** This survey was conducted by Fort Lewis College to establish the location of the Sand Creek Massacre. The project was designed to assess oral traditions and historical and archeological information to determine the massacre site boundary. Fieldwork was conducted in the fall of 1997 in conjunction with tribal consultations. Historic artifacts related to military use and Native American occupation were recorded. These investigations were only partially successful, possibly because a substantial portion of land was surveyed with metal detectors. Although few artifacts were uncovered, this survey suggested that soils in the area are prone to alteration and movement from wind, and there may be deposited soils covering artifacts and thereby skewing metal detector results. Ultimately, the area near the Dawson ranch was determined the likely location of the Sand Creek Massacre, and was ultimately sought for establishment of the national historic site (FLC 1998).

A comprehensive pedestrian cultural resource survey was conducted by an NPS archeologist in April of 2007 prior to the grand opening dedication of Sand Creek Massacre National Historic Site. Tribal representatives accompanied the archeologist during this survey for monitoring purposes. The survey occurred in the areas proposed for development in the *Interim Site Management Plan*, generally the 15 acres surrounding the overlook with the existing 1950 stone monument and in the 35 acres surrounding the former Dawson ranch.

**Site Location Study (1999).** The location and extent of the Sand Creek Massacre was conclusively identified by the site location study. The boundary extends approximately 11 square miles and corresponds to first-hand descriptions given by participants in the massacre. Approximately 400 massacre-related artifacts provide conclusive evidence. The study brought together the most comprehensive research regarding the massacre's location as of 2000, including numerous recordings of Cheyenne and Arapaho oral histories. The identified boundary served as a basis for management alternatives, administration, protection, and designation as a National Park Service unit in 2007.

**Dawson Residence Removal (2005).** In spring of 2005, a cultural resource inventory of the Dawson ranch complex was performed (for more information, see "Historic Structures" later in this section). The complex was determined to be not eligible for inclusion in the National Register of Historic Places (UCD 2005). The National Park Service proposed to remove the residence and an underground storage tank because they were no longer safe. Concurrence from the Colorado Historical Society on the determination of *no historic properties affected* was received on September 6, 2005 (CHS 2005).

**Repatriation Site Survey (2005).** From October 11 to 15, 2005, archeologists conducted archeological investigations at the national historic site for a site to be used by the Cheyenne and Arapaho tribes for repatriation purposes. The Chivington Canal and Thompson-Bohart line camp were re-evaluated for National Register eligibility and better documented as part of this survey. Pedestrian survey and shovel testing occurred in the presence of and in consultation with tribal representatives. The results of both the surface survey and shovel testing were negative, with no indication of the presence of archeological materials (CHS 2006b). This information was submitted to the Colorado Historical Society (state historic preservation officer) in a letter dated April 6, 2006. Concurrence from the Colorado Historical Society on the determination of *no historic properties affected* was received on April 19, 2006.

**Electrical Power Line Survey (2006).** Per consultations with the Colorado Historical Society and the Cheyenne and Arapaho tribes, a trench was dug and an electrical power line was laid in Sand Creek Massacre National Historic Site in 2006. The power line was installed near the existing easternmost ranch road. Construction activity was monitored by an archeologist; no cultural materials were revealed. This information was conveyed to the Colorado Historical Society in a letter January 9, 2007 (NPS 2007).The National Park Service has received concurrence from the Colorado Historical Society on a determination of *no historic properties affected.*

## Historic Structures

A historic structure is a constructed work consciously created to serve some human activity. Structures include buildings and monuments, dams, millraces and canals, bridges, tunnels and roads, stockades and fences, defensive works, temple mounds and kivas, ruins of all structural types, and outdoor sculpture.

The first Euro-American homesteaders were relatively late in legally claiming land in the Sand Creek Massacre area. The Sand Creek Massacre area was first surveyed by the government from 1879 to 1880. Settlement was apparently difficult since numerous claims were subsequently abandoned. Several laws were used to claim land, including the Homestead Act, the Desert Land Law, and the Timber Culture Act. The Union Pacific Railroad, patented in 1904, received the odd-numbered sections in the area. The following are descriptions of the historic buildings or structures situated in or near Sand Creek Massacre National Historic Site as a result of the land claims and settlements described.

**Line Camp (Site 5KW125).** Three years after the Sand Creek Massacre, the Medicine Lodge Treaty of 1867 eliminated the Cheyenne and Arapaho Reservation at Sand Creek and the lands were opened to settlement. By 1871, the area was well known as a buffalo hunting area and Hiram Holly had established the Holly ranch. This ranch evolved into the SS ranch, which encompassed much of southeastern Colorado, and open range cattle lands encompassed what would become the Sand Creek Massacre National Historic Site. By the 1880s, the SS ranch pasture was fenced, and the Sand Creek Massacre site marked the western boundary of the "north pasture." The fences were taken down by 1885, when homesteaders began moving onto the pastures previously controlled by the cattle ranches.

Among the remnants of the open range cattle industry, within the massacre site boundary, north of the former Dawson ranch, on the north side of Big Sandy Creek, is the extant foundation of a line shack associated with the SS ranch (NPS 2000b).

The National Park Service determined that this site is eligible for listing in the National Register of Historic Places under Criterion D (data potential) at the state level of significance. In a letter dated April 17, 2006, the Colorado Historical Society (state historic preservation officer) disagreed with this determination stating that additional information, such as subsurface testing, would be necessary to determine whether or not the property should be eligible for listing in the National Register of Historic Places (CHS 2006a).

**Chivington Canal (Site 5KW122.1).** Also in the Sand Creek Massacre National Historic Site are the remains of the Chivington Canal. The headgates of this abandoned canal, which were designed to divert water from Big Sandy Creek into Chivington Reservoir No. 4 south of Brandon, are in the southeast quarter of Section 24, Range 46 West, Township 17 South. The canal was one of several canals constructed by the Chivington Canal Company, circa 1910 to 1912; however, the canal was abandoned sometime after 1918, despite the approximately $200,000 spent on its construction. While the canal carried sufficient water for irrigation, the maintenance was too costly to be sustainable. The canal left a mark upon the landscape that is clearly visible today.

The National Park Service determined this site is eligible for listing in the National Register of Historic Places under Criterion D (data potential) at the state level of significance and a national register nomination has been prepared. In a letter dated April 17, 2006, the Colorado Historical Society (State Historic Preservation Officer) agreed with this determination stating that the good condition of the site, coupled with its significance in the development of Eastern Colorado, makes it eligible for listing in the National Register of Historic Places (CHS 2006a).

**Dawson Ranch (5KW123).** Throughout the 20th century, the location of the Sand Creek Massacre has been used for farming and stock raising. Prior to establishment of the Sand Creek Massacre National Historic Site, 13 landowners retained property within the boundary of the Sand Creek Massacre site, and all of the land was used for agricultural purposes. The former Dawson ranch property, which dates to the 1950s, is comprised of a barn, corral, railway car, motel cabin, metal utility building, and an air landing strip (UCD 2005). Dirt roads were also used to access the complex but are not listed in documentation associated with the property.

A cultural resources expert conducted a cultural resources survey in 2005 and determined that the Dawson ranch complex, including the buildings or structures therein, are not significant enough for listing in the National Register of Historic Places. The complex was officially determined not eligible for inclusion in the National Register of Historic Places in September 2005 (CHS 2005). In 2005, the original residence and an underground storage tank were removed after this determination when they were deemed dilapidated and unsafe.

**1950 Stone Marker.** In 1950, the local community placed the "Sand Creek Battleground" stone marker on the eastern edge of Section 25, Township 17 South, Range 46 West. The monument is situated atop a small hill. An old ranch road, now closed to the public, leads to the marker. From the monument overlook area, much of the valley is visible and still conveys a strong sense of its likely appearance at the time of the 1864 massacre. The National Park Service has not conducted a determination of eligibility for the marker for listing in the National Register of Historic Places.

**Town and Railroad.** One town was established in the general Sand Creek Massacre area. Upper Water Valley, also known as New Chicago, was established near

the southeast quarter of Section 14, Township 17 South, Range 46 West. This town was not within the current boundaries of Sand Creek Massacre National Historic Site. The town apparently lasted only one summer, "having died with the frost of 1887." When the town was established, the Missouri Pacific Railroad was conducting surveys for a railroad line, including a route through the vicinity of the Upper Water Valley townsite. The town quickly died when the railroad line was established to the south, near the present-day town of Chivington, Colorado. The railroad line does not run through the current boundary of the unit (NPS 2000b).

## Ethnographic Landscapes

The boundary of the Sand Creek Massacre site encompasses the primary features associated with the Sand Creek Massacre. (As noted previously, the Sand Creek Massacre was a running engagement that spanned an area approximately 5.5 miles long and 2 miles wide.)

A more detailed description of these features — as well as the tribal oral histories, traditional knowledge, historical documentation, and archeological evidence — is included in *Sand Creek Massacre Project, Volume 1: Site Location Study*.

Intermountain regional historic landscape architect Jill Cowley's trip report of June 29, 2004, identified the entire site as one ethnographic landscape. A more detailed ethnographic overview and assessment is currently underway. These reports, combined with information collected in the oral history program and from tribal traditional history will provide the baseline for evaluating specific ethnographic resources at the site.

## Ethnographic Resources

The Sand Creek Massacre site is particularly sacred to the Cheyenne and Arapaho tribes because it is along a primary migratory route where they hunted, gathered, held ceremonies, and camped. A portion of the massacre site is within the original reservation designated for the Cheyenne and Arapaho people. Also significant in the study area are places where spiritual experiences have occurred, where ceremonies have been conducted, and where artifacts have been located. Time, elements, and people have changed the site's natural features but the intangible spiritual qualities of the landscape are as strong, or even stronger, today than on the day of the massacre due to their connection to Cheyenne and Arapaho history and contemporary identities.



Colorado Plains at Sand Creek Massacre site

Among the apparent ethnographic resources in the area (but not within the massacre site boundary) is a natural spring in Section 20 of Township 17 South, Range 45 West, approximately 2 miles northeast of the Dawson South Bend. Cheyenne oral histories state that the village attacked by Chivington's troops may have been close to a large natural spring. Although the encampment was on the banks of Big Sandy Creek, Cheyenne tradition held that only animals would drink creek water, and people drank water from a clear running source, such as a spring. The Cheyenne believe the spring in section 20 may be the historic spring associated with the Native American encampment during the Sand Creek Massacre.

However, in order to address the site's importance to the Cheyenne and Arapaho tribes, the primary features of the Sand Creek Massacre site — including Big Sandy Creek,

the banks that hid the survivors, the encampment site, and the natural freshwater spring — were addressed in the proposed management alternatives in the special resource study for Sand Creek.

### Cultural Soundscapes

Culturally appropriate sounds are important elements of the experience in many national park system units. The National Park Service will preserve soundscape resources and values of the units to the greatest extent possible to protect opportunities for appropriate transmission of cultural and historic sounds that are fundamental components of the purposes and values for which the units were established. The National Park Service will prevent inappropriate or excessive types and levels of sound (noise) from unacceptably impacting the ability of the soundscape to transmit the cultural and historic resource sounds associated with unit purposes (NPS 2006a).

The predominant soundscape at the Sand Creek Massacre National Historic Site is comprised of natural sounds from wildlife and physical processes, with intermittent man-made noises. The site also has an intrinsic cultural soundscape, which exists primarily when tribes conduct ceremonies or other activities at the site. Ceremonies may include music, songs, chanting, speaking, instruments, and dancing, which are considered part of the cultural soundscape of the site. Other man-made noises from vehicles, aircraft, and people are not considered part of the cultural soundscape.

### Museum Collections

According to Director's Order 24: *Museum Collections Management,* the National Park Service is the custodian in perpetuity of irreplaceable and priceless museum collections including objects, specimens, and archival and manuscript materials (textual, electronic, and audio-visual documents), representing cultural and natural resources in the United States. The collections include but are not limited to the disciplines of archeology, biology, ethnology, geology, history, and paleontology. National Park Service museum collections are part of the natural and cultural heritage of the country and are collected, preserved, and interpreted for public benefit (2000c).

The museum and archival collections at Sand Creek Massacre National Historic Site total 53,817 items. These collections include manuscripts, maps, oral history recordings or transcripts, and artifacts from the site or which are associated with the massacre.

Archival collections would be housed in the proposed research center in the town of Eads.

## NATURAL RESOURCES

### Soils

Soils in the Big Sandy Creek floodplain are nearly level and somewhat poorly drained to poorly drained fluvaquents. Highly variable soil textures have developed over the years due to stream flooding and wind-caused erosion and depositions, and mixing of alluvial and eolian materials in the creek floodplain. Soils bordering the creek's eastern floodplain are deep and generally well drained, ranging from Kim-Harvey-Stoneham loams derived from calcareous material to the Wiley loam derived from loess. The Kim-Harvey-Stoneham loams lie on 1% to 12% slopes. Some of these soils are strongly calcareous and can adversely affect plant growth.

On both sides of the creek floodplain and rising in hills and bluffs bordering the floodplain are the Valent and Bijou-Valent loamy sands. These soils are formed from noncalcareous eolian sands and are deep and somewhat excessively to excessively drained, meaning permeability is extremely rapid. The Valent loamy sands on 3% to 10% slopes are deep and excessively drained. According to the Natural Resources Conservation Service, the Valent series has the highest wind

erodability out of all the 41 soil types in the county. The effects of light foot traffic and wind erosion are obvious on the Valent soils around the monument.

Severe dry periods have been recorded in the area during the last century, most notably during the 1930s and the 1950s. During the 1980s, dry periods elevated erosion concerns for open soil areas in eastern Colorado. Droughts have had various impacts on agriculture in Kiowa County, depending on specific climatic conditions and the type of agriculture. For example, local wind-caused soil erosion in eastern Colorado during the 1950s greatly exceeded that caused by the large dust storms of the 1930s because the amount of land cultivated by powerful mechanized farm implements increased during the 1940s and 1950s (NPS 2000b).

During the 1970s, numerous unvegetated and open sandy spots, and severely wind-eroded spots, were identified by soil scientists in central portions of the massacre site on both sides of Big Sandy Creek. These spots (called blowouts) were observed in the Sundance and Valent loamy sands west of the creek and the Colby silt loam and Wiley loam east of the creek, and were a result of combined factors of drought and exposure resulting from land use practices including overgrazing and trampling (NPS 2000b). The soil erosion issue is not addressed in the *Interim Site Management Plan*, but would be addressed in the general management plan.

Careful management is required to prevent wind and water erosion of all soils in the park. Because of the sensitive soils, vegetation communities destabilize quicker than plant communities in other areas. Any extended foot traffic (from visitors or grazing animals) and vehicle traffic on these soils will quickly destroy the delicate cover of native grasses and expose the sand subgrade to wind erosion blowouts. All land use management strategies should reflect an understanding of the sensitive nature of these soils. The Natural Resources Conservation Service recommends that on park soils, foot and vehicle traffic and grazing should be managed to protect the grasses and organic layers by leaving a good height of grasses standing to protect the soil from blowing and to catch and hold snow. If cattle are used to manage the grasslands or for fire fuel suppression, then they should be excluded from the sensitive soils and from wetlands and riparian areas. Also recommended is maintenance of the appropriate animal units on the property to mimic the effects caused by buffalo, deer, and elk grazing in the historic scene and, if necessary, development of a fencing exclusion plan to protect the sensitive areas.

The effort that went into the successful restoration of the farm road ruts located just west of the monument (done on slopes and soils very similar to those around the monument) is a good example of the tremendous effort needed to repair these damaged soil systems. Fran Pannebaker (Bent's Old Fort National Historic Site) and Karl Zimmermann (Natural Resource Specialists at Sand Creek) were responsible for the restoration.

## Geology

The historic site lies in eastern Kiowa County in the High Plains section of the Great Plains-Palouse Dry Steppe Province ecoregion. This ecoregion stretches from northeastern Oklahoma north-northwesterly through Montana. The site has gently rolling topography, with elevations of approximately 3,960 feet above sea level along the creek, over 4,000 feet above sea level on bluffs to the west, and rising slopes over 4,050 feet above sea level to the east. The Big Sandy Creek floodplain is terraced, but mostly level to gently sloping and varies from one-quarter to one-half mile in width through the site (NPS 2000b).

Big Sandy Creek drains the eastern side of a broad, southeasterly trending valley composed largely of Quaternary eolian (wind-deposited) sands. These Holocene and Pleistocene period sands overlay complex and discontinuous Pleistocene sands, silts, and gravels from 0 to 70 feet deep to the Smoky Hill Shale (part of the Niobrara Formation).

Dune sands compose the bluffs along and extending from the western side of the creek, while coarser, more silty valley fill and slope wash materials blanket the terraces and slopes extending eastward. Along Big Sandy Creek, just south of the Dawson South Bend, dune and valley fill deposits average 20 to 50 feet deep above the chalky Smoky Hill Shale (NPS 2000b).

Along and directly adjacent to the massacre site and Big Sandy Creek are distinct alluvial terraces which developed as secondarily worked deposits of Pliocene and lower Pleistocene materials that originated from the mountains to the west. Numerous climatic extremes of wet, dry, and wind periods over thousands of years have modified surficial conditions to allow the development of most of the alluvial and eolian soils seen on the site today (NPS 2000b).

## Air Quality and Related Resources

Air quality at Sand Creek Massacre National Historic Site and in Kiowa County is generally excellent and meets "attainment" status for all required air pollutants monitored in the National Ambient Air Quality Standards. The site is designated a Class II air quality area under the Clean Air Act. The Class II designation indicates the maximum allowable increase in concentrations of pollutants over baseline concentrations of sulfur dioxide and particulate matter, as specified in the 1963 Clean Air Act (42 U.S.C. 7401 et seq.) The Clean Air Act establishes that the federal land manager has an affirmative responsibility to protect air quality related values (including visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts.

Vehicle travel on the two county roads near the site occasionally results in vehicle emissions which may affect air quality at the site; however, these emissions quickly dissipate. Vehicles traveling on dirt roads within the site increase fugitive dust in the area which also dissipates quickly.

## Hydrology and Water Quantity

Big Sandy Creek is an intermittent stream which flows through Sand Creek Massacre National Historic Site. The creek's watershed stretches over 120 miles from El Paso County, Colorado, west of the site through the towns of Limon and Kit Carson before reaching the site. It continues over 30 miles south to join the Arkansas River 8 miles east of the City of Lamar, Colorado. A study conducted by the Army Corps of Engineers (COE 1974) concluded that north-side tributaries to the Arkansas River, including Big Sandy Creek, have large flood storage capacities and high infiltration rates in the adjoining soils. Although this creek drains over 3,400 square miles of southeastern Colorado valley, the sandy porous soils in the watershed reduce the amount of surface water flow from reaching the stream course in the park. This combination of watershed conditions limits the magnitude of surface water flows even during extreme storm events if they occur higher up in the watershed. The closer the extreme rainfalls are to the park, the greater the potential for surface water flows. Historic flow data indicate that fairly substantial floods have occurred on occasion (approximately every 35 years) over the creek reach within the park. These surface-flow events resulted from large, local rainfall events during the spring and summer. During normal and dry years, there are long periods when the creek does not flow through the site.

There are two gages operated by the U.S. Geological Survey (#07134000 and #07134100) on Big Sandy Creek; both are located about 25 miles downstream of the National Historic Site. The primary gage (#07134100) on Big Sandy Creek near Lamar, Colorado measures drainage from a watershed of 3,248 square miles, 2,663 of which contribute flow to the watershed.

Of the 23-year continuous record that began in 1968, almost 70 percent of the recorded peak flows are less than 500 cubic feet per second (cfs) and only two exceed 1,000 cfs. The highest flow was recorded in May, 1999 and reached a peak discharge of 2,850 cfs. The

second highest flow occurred in September, 1976, and reached a peak of 2,520 cfs. For comparison, regional flood frequency equations developed for Eastern Colorado suggest that an "average" watershed of this size should have an annual flood in the range of about 1,700 cfs (Ries and Crouse 2002). The annual peak flow on Big Sandy Creek is usually less than 500 cfs.

While severe floods do not appear to be a regular occurrence on Big Sandy Creek, drainages in this region of Colorado historically have experienced nuisance flooding resulting from highly localized summer thunderstorms (CWCB 1998). Park resource managers noted that during the summer of 1999, a severe and local storm event produced surface flows that extended more than 50 feet wide and 4 feet deep in some areas for a period of 10 days. Flood elevations during these moderate events are exacerbated by undersized culverts and bridge crossings, resulting in a backwater effect. Consequently, most flood damage associated with these local floods is to county roads and bridges with little inundation of populated areas.

Early in the 20th century, an attempt was made to divert flows from the creek into the Chivington irrigation canal. Prior to World War I, the Chivington Irrigation Company built and operated this short-lived and now defunct creek diversion canal that fed Chivington Reservoir No. 4, also known as Brandon Lake, for agricultural irrigation purposes. To create the canal channel, earth from the hill slope was excavated and side cast towards the creek floodplain, forming a levee along the east edge of the floodplain and above the outer terrace. Remnants of the ditch and levee structure begin in about the center of the current park land holdings and extend more than a mile to the southeast corner. Remnants of the canal extend for another 20 miles south of the park. The ditch remnants measure approximately 40 feet wide and the base of the levee is approximately 60 feet wide.

After almost 100 years of neglect, the bottom of the canal has eroded down below its original design grade. As a result, there are numerous "head cuts," which are areas in the channel bottom that are eroding at significantly higher rates than what would erode from within a stable stream channel. There is one head cut that should be stabilized to stop the erosion migration and to reduce sediment loading downstream. It is located just south of where the perennial spring stream crosses the canal levee.

There are two sections of the river that have very different geomorphological characteristics created primarily by the presence or absence of perennial surface water flow. One is the portion of the creek channel that extends for 4,000 feet from the Dawson South Bend to County Road W (the south park boundary). This is a wetlands system with perennial surface water present. The other section is the length of creek channel that extends from Dawson South Bend north (to the northwest property boundary). This is a riparian system with only periodic surface water flows from significant storm events.

The availability of surface water flows along the Big Sandy Creek appear significant to the maintenance of the general physical stream morphology, and visual appearance of the floodplain through the historic site. The only perennial water found in the riparian reach is in three depressions (small ponds) of exposed groundwater. Perennial surface flow is present within the channel created by surface-water input from the spring located 4,000 feet uphill from, and on the east side of, the creek floodplain. The spring is in Section 20, with water flowing through Section 30, Township 17 South, Range 45 West.

Within the riparian reach of the creek, moderate to large creek flows sometimes erode the floodway and create bank edges and shallow braided channels. These eroded areas are quickly covered with grasses and forbs within one or two growing seasons. Currently there is no clear channel present within the riparian reach; that is, there is very little

exposed sand or gravel and no defined channel morphology such as cut-back or slip-off slopes or eroded banks. This suggests that channel-forming flows are rare. The immediate floodplain is broad and flat in some areas and the current floodway is apparent on one side or the other.

It is difficult to tell if the floodway is in the same location as it was during the mid-1800s. However, some may argue that if wet hydrologic cycles existed in the 19th century the floodway could have been shifted (by one or more severe precipitation events) to other locations within the floodplain. The floodway in the riparian reach of the creek is bounded in some areas by five-to-ten-foot high fluvial terraces. This greater morphology was likely formed under wetter conditions associated with previous glacial cycles and is not indicative of the current hydrologic regime.

Most of the riparian creek channel and immediate floodplain vegetation is comprised of prairie plant species typical of riparian systems in the region. Cottonwood seedlings were established in the riparian floodplain during specific surface flooding events. The existing cottonwoods survive on the available groundwater that is located one to two meters below the floodway area and the immediate floodplain. Although cottonwood galleries became established in the 20th century, wildlife grazing by bison and horses and fuel wood gathering by Native Americans may have been primary forces that limited the successful establishment and growth of cottonwood seedlings throughout the 19th century (NPS 2000b).

According to oral histories, historic diaries, and interviews with Native Americans and historic accounts by U.S. Army soldiers familiar with the area, Big Sandy Creek is similar to historic conditions with a few notable exceptions. At the time of the Sand Creek Massacre, very few small and/or stunted cottonwoods existed along the creek within the site, compared to the numerous groves of large cottonwoods observed today (NPS 2000b). Given the fact that Native Americans camped along the creek and grazed large herds of horses, one explanation for the lack of woody plants is that the seedlings were overgrazed and mature tree wood was harvested for fuel.

Heavily browsed willow seedlings were recently observed in the hydric soils within the wetlands and riparian zones (Noon et.al. 2005). Willow communities are an important component of wildlife habitat along these river courses. Initiation of a willow establishment program has been recommended.

The wetlands segment of the creek is fed by a perennial spring that provides surface water flows into the southern portion of Big Sandy Creek floodplain. The spring is recharged by local groundwater from over 5 square miles of contributing watershed surface. Surface water from this perennial spring flows downhill for approximately 5,000 feet, crosses the Chivington canal, and flows into the Big Sandy Creek floodplain at the terminus of the Dawson South Bend. The spring historically produced enough water for two wells (with recorded water well "exempt" status) to tap portions of its source more than 2 miles northeast, up gradient of the historic site (NPS 2000b).

The geomorphology of the wetlands reach of the creek consists of a distinct channel with side slopes and bottom which is laced with standing water pools along its length. The surface flow channel continues south, through a culvert under County Road W and on to the adjacent property. The surface water appears to flow south for several thousand feet beyond the NPS boundary. Wetlands plant species, such as cattails, rushes and sedges, are limited to the wettest areas in surrounding surface water or shallow groundwater that is maintained by input from the spring.

There is a pond upstream from, and immediately adjacent to, County Road W which is dredged periodically by the county in order to provide an open water source for use in filling fire trucks when necessary. Road crossings over broad floodplains usually represent an extreme reduction in flow width

that greatly reduces flood conveyance. Just downstream of the Dawson Ranch, there is a good example of this at the County Road W crossing along the park boundary within the wetlands reach of the creek (located on the boundary between Section 30 and 31, Township 17S, Range 45W).

National Park Service Water Resources Division staff (Noon et.al. 2005) inspected this site and estimated the unobstructed flow width of Big Sandy Creek to be about 90 feet wide at this location. In contrast, the single culvert that allows water to pass under the road appeared to have a three-foot diameter. This represents a constriction ratio of about 30:1. Not surprisingly, overtopping of the road and associated erosion is very common during flow events. Besides being a maintenance problem, road material is washed downstream into the adjacent wetlands system. Improving flows under the road with a bridge, new box culverts, or numerous large culverts is recommended.

Drainage from the watershed (that is located adjacent to the spring fed watershed mentioned above) flowed directly into the creek floodplain prior to construction of the canal. The channels formed in the creek floodplain are still clearly visible. Because it is located along the toe of the slope and parallel to the floodplain, the canal intercepts flow from uphill drainage areas and diverts their flow along the inside of the canal levee. The canal was originally designed to intercept these periodic drainage flows. On park property, the canal intercepts two drainages — one is a small drainage just southwest of the perennial spring channel and the other is a larger drainage just northeast of the perennial spring channel. Both drainages flow down eroded channels and into the area where the spring flow intersects the canal.

As part of the original canal design, a culvert was placed where the perennial spring flow channel intersects the canal. No other culverts were placed in any of the intermittent watershed drainages that once flowed down the hill into the creek floodplain. Eventually the culvert failed and flow from the spring and the diverted flows from the two adjacent watersheds eventually eroded around the culvert. The constant flow from the spring and periodic flows from the adjacent watersheds eroded a large gap in the canal to a point where flow from the adjacent watersheds and the spring is now unimpeded by the canal structure.

## Water Quality

Water quality in Big Sandy Creek through the site varies somewhat throughout the year due to some storm events and the creek's intermittent character. It is generally of good quality although with limitations to use as potable water attributable to high alkalinity and periodic high suspended sediments. Local residents and Native American oral histories suggest the water quality in the creek or in the persistent ponding of water in the creek bottom was never considered of good enough quality as a potable source for humans, although cattle, horses, and wildlife still consumed it. Vegetation types and soil surfaces observed during site evaluations indicated no visible reaction of plants (e.g., increase in alkali tolerant species) to poor water quality or any significant deposits of alkali salts.

Little data exists on measured water quality in Big Sandy Creek, partially as a result of its intermittent character and lack of use of its surface water as a potable supply. Sporadic testing of the creek at the downstream gaging station yielded specific conductance measurements between 2,620 and 4,420 micro-ohms per centimeter at respective discharge flows of 126 to 50 cubic feet per second (October, 1997 through September, 1998) (NPS 2000b).

Salinity levels were measured (once in the fall of 2005) in two surface-water areas, one near the intake (upper end) of the canal (within the park boundary) and along County Road W where Big Sandy Creek crosses the road. The salinity was 1.5 parts per thousand (ppt) in the upper pool and 3.6 ppt in the pool adjacent to County Road W, both well above potability

standards. These relatively high salinity levels are typical for this region due to the presence of gypsum (CaSO4) in the bedrock.

The perennial spring in section 20 is of apparent excellent quality, and flows from the northeast into the easternmost extent of the Dawson South Bend. As noted previously, this spring has a local source, but also exists as a small groundwater drainage trace that flows discontinuously from sources more than 5 miles away. The spring and its entire watershed drainage throughout sections 20 and 30 are heavily used and impacted by grazing in those sections. Two shallow wells of unknown quality tap the groundwater that likely feeds this spring. Several other springs on the east side of the Big Sandy Creek floodplain, also mentioned previously, supply water of unknown quality for at least one stock watering use. Each of these springs may have been used historically by Native Americans, although the source or discharges may have changed since 1864 (NPS 2000b).

Groundwater quality in the vicinity of the creek has generally been rated fair to poor. In a 1967 report on local groundwater resources, 37 of 41 wells had sulfate contents greater than the 250 parts per million limit recommended by the U.S. Public Health Service and all of the wells contained over the recommended limit of 500 parts per million dissolved solids. One local well had an elevated selenium content of 0.11 parts per million and it was recommended that all wells be carefully tested for elevated levels of that potentially toxic element.

Current land uses on the site are not significantly affecting water quality in the creek. Groundwater beneath the site is considered hard (and high in sulfate and dissolved solids), and has been historically used for domestic and stock purposes. No current threat to surface or groundwater is apparent, particularly since livestock operations ceased in 2003 after the land was acquired for the national park system. The perennial spring and exposed groundwater ponds may have encouraged Native American tribes to make encampments on the site.

While the spring appears to tap shallow groundwater draining from the northeast, it apparently sustains its flow during dry periods through its connection to a large aquifer. The location of the source, flow discharge, and wetlands habitat of the spring may have been altered by the Chivington Canal, local farming practices, extensive grazing, and local erosion (NPS 2000b).

## Wetlands

For NPS regulatory and inventory purposes under *Directors Order 77-1: Protection of Wetlands*, wetlands are defined as "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year" (Cowardin et.al. 1979).

There are three types of wetlands on Sand Creek Massacre National Historic Site:

- Palustrine, Emergent
- Palustrine, Aquatic Bed
- Riverine, Upper Perennial, Unconsolidated Bottom

Some Palustrine, Emergent wetlands are located around the edges of the exposed surface water ponds in the riparian reach of the floodplain; but this type of wetlands is primarily located in the wetlands reach and adjacent to the stream channel. The Palustrine, Aquatic Bed wetlands are within the standing water ponds in the riparian and wetlands reaches of the creek floodplain. The Riverine, Upper Perennial, Unconsolidated Bottom wetlands are located in the channel leading downhill from the spring source and in the floodplain channel within the wetlands reach. All three wetlands types were determined by use of the Cowardin system of

wetlands classification, which the National Park Service has adopted for wetlands determination (NPS 2000b).

## Plant Communities and Vegetation Types

The primary grasses found in the area are blue gramma and buffalo grass, accompanied by switchgrass and side-oats gramma. Western wheatgrass is also found in the lower, moister swales. Where grazing has been excessive and on drier slopes, sand sage has gained a foothold. The only native trees located at the site are eastern cottonwood, found in groves close to current or historic seasonal stream traces of Big Sandy Creek. There is little active farming by cultivation on areas surrounding the site. The dry and sandy nature of the land is most suitable for grazing, although several sections within and bordering the site have been placed into the U.S. Department of Agriculture conservation reserve program. The conservation reserve program is a federal program administered by the Natural Resources Conservation Service; it was developed as part of the 1996 Farm Bill to preserve fragile lands that had been tilled and could be preserved for plant or wildlife habitat through planting and protection from grazing or future farming.

Two vegetation community studies were conducted for the site, one by Colorado State University (CSU), another contracted by the NPS Southern Plains I&M Network. These studies found that the vegetation on the site is primarily mixed grass prairie and sage (see figure 3).

Nonnative plants are found in Kiowa County and throughout southeastern Colorado, but are not currently a large problem along Big Sandy Creek. Cheat grass, sand burr, Russian thistle (tumbleweeds), and goat head are some of the more common nuisance species on the site. Canada thistle is an issue east of the site, and leafy spurge is prevalent in Lincoln County to the northwest. Changes in grazing, climate (precipitation), nearby tillage, and the ongoing spread of specific nonnative species may change the face of the landscape and the plant and animal community it supports (NPS 2000b).

## Wildlife and Fish

Numerous species depend on the diverse mosaic of habitats available in the national historic site. Many of the plant species in the short-grass prairie ecosystem have a fragile existence due to difficult growing conditions such as the dry, sandy soil.

Larger wildlife in the area consists of free-ranging mule deer, white-tail deer, and pronghorn. Other mammals include coyote, fox, raccoon, badger, and prairie dogs (NPS 2000b). A recent inventory shows two prairie dog towns in the site (refer to figure 3). Various reptiles, amphibians, and insects associated with high plains grasslands are also found here.

The Rocky Mountain Bird Observatory conducted a bird inventory in 2005, in which they collected valuable information about the birds present at the site. This resulted in an initial species list for the site and establishment of baseline information that can be used to evaluate population trends in the future (NPS 2005a). Compared with some habitat areas in Colorado, the grasslands harbor relatively few bird species. Birds abundant on the site only in summer when food, cover, and attractive nesting sites are available. Livestock grazing and crop farming have reduced bird use regionally, but lightly grazed and conservation reserve program lands provide excellent grassland habitat for birdlife (NPS 2000b).

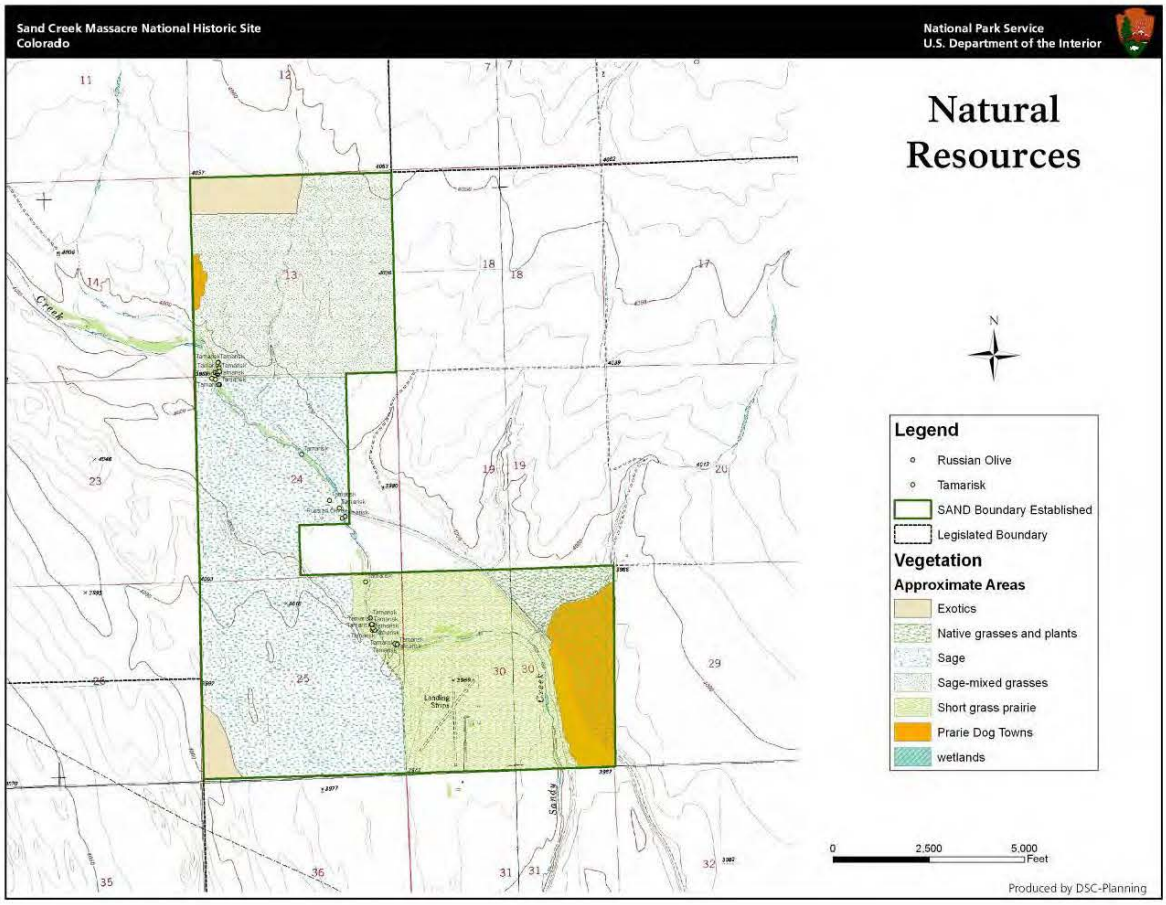



**FIGURE 3. NATURAL RESOURCES AT SAND CREEK MASSACRE NATIONAL HISTORIC SITE**

Riparian habitat along Big Sandy Creek provides suitable habitat for many probable breeding bird species, the most common being the western kingbird, orchard oriole, mourning dove, and western meadowlark. Another, less common probable breeding bird species detected in this habitat is the red-headed woodpecker, a species of conservation concern, according to the Partners in Flight *North American Landbird Conservation Plan* (NPS 2005a). During spring, the riparian area provides necessary stopover habitat for migrating birds, allowing them to replenish the reserves essential for the flight to their breeding grounds. More on migratory birds can be found in the discussion of special status species.

The upland habitats of the site host many species designated as species of conservation concern or stewardship species as defined in the Partners in Flight *North American Landbird Conservation Plan*. During the 2005 inventory, several designated species were detected: scaled quail, northern harrier, Swainson's hawk, mountain plover, burrowing owl, short-eared owl, Say's phoebe, western kingbird, horned lark, Cassin's sparrow, lark sparrow, lark bunting, grasshopper sparrow, dickcissel, and western meadowlark (NPS 2005a).

Plains killifish was found during a 2006 fish inventory conducted in the historic site (Tilmant et.al. 2006).

## Special Status Species

Under the Endangered Species Act, species may be listed as either "endangered" or "threatened." Endangered means a species is in danger of extinction throughout all or a significant portion of its range. Threatened means a species is likely to become endangered within the foreseeable future

throughout all or a significant portion of its range. All species of plants and animals, except pest insects and nonnative species, are eligible for listing as endangered or threatened.

The U.S. Fish and Wildlife Service also maintains a list of "candidate" species. These are species for which there is enough information to warrant proposing them for listing but that have not yet been proposed because of higher listing priorities. While listing actions of higher priority move forward, the U.S. Fish and Wildlife Service works with states, tribes, private landowners, private partners, and other federal agencies to fulfill conservation actions for these species to prevent further decline and possibly eliminate the need for these species to be listed.

The state of Colorado maintains a similar list of sensitive species. In addition to state endangered and threatened species, state species of special concern are listed due to their low population levels, restricted habitat availability, low reproductive potential, or their status as keystone indicators (CDOW 2008).

Table 4 lists the federal and state-listed special status species for Kiowa County. This list was generated according to a letter from the U.S. Fish and Wildlife Service dated January 17, 2008 (USFWS 2008), and from the Colorado Division of Wildlife (CDOW 2008). A formal rare species survey was conducted at the site in 2006 and this survey concluded that there are no known occurrences of federally listed special status species (CSU 2006). In 2005, a bird inventory at the site did not detect any federally listed bird species (NPS 2005a). Three state-listed species have been detected at the site: black-tailed prairie dog, burrowing owl, and mountain plover (NPS 2005a). Recommendations from the 2006 rare species inventory and the 2005 bird inventory were considered during the general management planning process.

**Black-footed Ferret (no occurrence at site).** These are large members of the weasel family, which are roughly the size of a mink. The last official record of a black-footed ferret in Colorado was near Buena Vista in 1943. Whether these animals live in Colorado today is doubtful. Experts say the widespread practice of poisoning prairie dogs during colonial-era expansion across the West is a major factor in the mammal's demise. Widely considered the most endangered mammal in North America, the black-footed ferret is being reintroduced in parts of the West. It appears black-footed ferrets were never abundant in Colorado. Their habitat included the eastern plains, mountain parks, and western valleys, grasslands, and shrublands that supported various species of prairie dog, the ferret's primary prey. Black-footed ferrets are considered an endangered species by federal and state authorities (CDOW 2007a).

Prairie dog towns are considered potential habitat for black-footed ferret. Black-tailed prairie dogs are the primary prey species of the ferret and the U.S. Fish and Wildlife Service discourages activities that would impact black-tailed prairie dog colonies over 80 acres (USFWS 2008). There are no recorded occurrences of black-footed ferrets in the Sand Creek Massacre National Historic Site.

**TABLE 4. STATE AND FEDERALLY LISTED SPECIES OCCURRING IN KIOWA COUNTY**

| Species | Federal Status | State Status |
|---|---|---|
| Black-footed ferret *Mustela nigripes* | Endangered | Endangered |
| Interior least tern *Sternula antillarum* | Endangered | Endangered |
| Piping plover *Charadrius melodus* | Threatened | Threatened |
| Lesser prairie chicken *Tympanuchus pallidicinctus* | Candidate | Threatened |
| Arkansas darter *Etheostoma cragini* | Candidate | Threatened |
| Swift fox *Vulpes velox* | Not listed | Special concern |
| Black-tailed prairie dog* *Cynomys ludovicianus* | Not listed (surrogate for black-footed ferret) | Special concern |
| Ferruginous hawk *Buteo regalis* | Not listed | Special concern |
| Burrowing owl* *Athene cunicularia* | Not listed | Threatened |

**TABLE 4. STATE AND FEDERALLY LISTED SPECIES OCCURRING IN KIOWA COUNTY**

| Species | Federal Status | State Status |
|---|---|---|
| Mountain plover* *Charadrius montanus* | Not listed | Special concern |
| Long-billed curlew *Numenius americanus* | Not listed | Special concern |
| Massasauga rattlesnake | Not listed | Special concern |
| Townsend's big-eared bat *Corynorhinus townsendii* | Entire species Not listed | Special concern |
| Texas horned lizard *Phrynosoma cornutum* | Not listed | Special concern |
| Texas blind snake *Leptotyphlops dulcis* | Not listed | Special concern |
| Northern leopard frog *Rana pipiens* | Not listed | Special concern |
| Plains leopard frog *Rana blairi* | Not listed | Special concern |
| Roundtail horned lizard *Phrynosoma modestum* | Not listed | Special concern |
| Common kingsnake *Lampropeltis getula* | Not listed | Special concern |
| Long-nosed snake *Rhinocheilus lecontei* | Not listed | Special concern |
| Night snake *Hypsiglena torquata* | Not listed | Special concern |

*Occurrence detected at the Sand Creek Massacre National Historic Site

**Interior Least Tern (no occurrence at site).** The least tern is the smallest of the North American terns. In Colorado, the least tern has bred in the southeastern portion of the state, primarily in the La Junta-Lamar area. The preferred nesting habitat is on sandy or pebbly beaches well above the water line, around lakes and reservoirs, or on sandy soil sandbars in river channels. The least tern is federally and state listed as endangered (CDOW 2007a).

Site staff have not documented any occurrences of the interior least tern. Big Sandy Creek is the primary water body at the site, and it is unlikely that the interior least tern is a resident of these waters.

**Piping Plover (no occurrence at site).** Plovers belong to a group of birds commonly referred to as shorebirds. Most members of this group are typically found inhabiting beaches, lake shores, marshes, and other wetlands areas. The piping plover is one of three small plovers found in Colorado, mostly in the eastern part of the state. Piping plovers occur as migrants, arriving in Colorado around the first of April, and most pass through by the end of May. The Arkansas and South Platte river drainages are the best areas to find these birds. Nesting habitat in Colorado is on sandy lakeshore beaches, sandbars within riverbeds, or even sandy wetlands pastures. An important aspect of this habitat is sparse vegetation. The piping plover is federally and state listed as threatened (CDOW 2007a).

Site staff have not documented any occurrences of piping plover at the site. Big Sandy Creek is the primary water body at the site, and it is unlikely that the piping plover is a resident of these waters.

**Lesser Prairie Chicken (no occurrence at site).** Mostly brown in color with horizontal barring and short, rounded tails, lesser prairie chickens are about the size of a small domestic chicken. These birds prefer sandy grassland areas with an abundance of midgrasses, sandsage, and yucca. Lesser prairie chickens historically occupied the grasslands of Texas, Oklahoma, New Mexico, Kansas, and southeastern Colorado. Populations have declined dramatically throughout their range during the past several decades from a loss of native prairie due to agriculture and overgrazing by livestock. Colorado's population is currently 1,200 to 1,600 breeding birds, located primarily on the Comanche National Grassland near the town of Campo in southeastern Colorado. Several smaller pockets of these birds are found on private ranches south of the town of Holly, east of the town of Eads, and south of the Cimarron River in the far southeastern corner of the state. The lesser prairie chicken is listed as threatened in Colorado and is a candidate for protection under the Endangered Species Act (CDOW 2007a).

There are no known occurrences of the lesser prairie chicken at Sand Creek Massacre National Historic Site. Before its establishment in 2000, the area was privately owned and used as ranchland. This would have disturbed potential habitat for the lesser prairie chicken. For future planning, it is possible to restore the prairie sufficiently to reintroduce the lesser prairie chicken.

**Arkansas Darter (no occurrence at site).** The Arkansas darter is a 3-inch long cousin of the walleye and yellow perch. The species is found in Big Sandy Creek, among other drainages in Colorado. The Arkansas darter prefers shallow, clear, sandy streams with spring-fed pools and abundant rooted aquatic vegetation. Darter populations persist in large, deep pools during late summer low-water periods when streams may become intermittent. Actions that would greatly enhance the Arkansas darters' habitat, abundance, and distribution include protection of riparian buffer corridors from overgrazing by livestock; protection of springs, pool refugia, and groundwater levels from depletion; removal of introduced fish predators; and elimination of water pollution along occupied streams. The Arkansas darter is listed as threatened in Colorado and is a candidate for protection under the Endangered Species Act (CDOW 2007a).

There are no known occurrences of the Arkansas darter in the portion of Big Sandy Creek that flows through Sand Creek Massacre National Historic Site. Jim Tilmant and David Vana-Miller, fisheries biologists from the Water Resources Division of the National Park Service, conducted a fish survey at Sand Creek Massacre National Historic Site in March of 2006 (Tilmant et.al. 2006). No darters were found at the site at that time.

David Vana-Miller previously found Big Sandy Creek to be one of two major population centers for the Arkansas darter within Colorado (Miller 1984). Vana-Miller reported finding the Arkansas darter at eight locations within the Big Sandy Creek watershed and, although most of the locations cited are in Lincoln and El Paso counties well above Sand Creek Massacre National Historic Site, one location is downstream near were Big Sandy Creek joins the Arkansas River. Vana-Miller did not sample within the area now designated as Sand Creek Massacre National Historic Site during his 1979 to 1981 study.

Based on the fact that the wetlands at Sand Creek Massacre National Historic Site are spring fed on sandy substrate, appear to provide suitable Arkansas darter habitat, and that this darter is known to inhabit sites both upstream and downstream of Sand Creek Massacre National Historic Site within this drainage, it seems reasonable that the Arkansas darter may occur within the park. Vana-Miller recommends several surveys be conducted to officially determine its presence or absence within the park.

Under the proposed *Interim Site Management Plan*, no construction, development, or visitor use would be permitted near Big Sandy Creek. If the site is determined to contain Arkansas darter habitat, this plan would have a beneficial impact by limiting the areas proposed for development. If drawdown in the aquifer causes adverse impacts to habitats on park property, then the presence of a listed fish species could add leverage to efforts to mitigate drawdown impacts.

**Swift Fox (no occurrence at site).** The swift fox, like other foxes, is a member of the dog family. This small, prairie dwelling mammal is completely adapted to grassland living, so the eastern plains are their stronghold in Colorado. One of North America's smallest foxes, an adult weighs about 4 pounds. The swift fox has a life span of 2 to 3 years. It is unlisted federally but is a state species of special concern (not a statutory category) (CDOW 2007a). There are no known occurrences of the swift fox at Sand Creek Massacre National Historic Site.

**Black-Tailed Prairie Dog (not present at site).** Historically the black-tailed prairie dog inhabits the eastern third of Colorado. According to one estimate, black-tailed prairie dogs once covered 7 million acres in Colorado. The largest areas of active prairie

dog colonies are located along the Front Range and in the south-central/southeastern portions of Colorado. Habitat fragmentation and the widespread occurrence of the plague have contributed to the decline of the black-tailed prairie dog population. The black-tailed prairie dog is not a federally listed species, but is a state species of special concern (not a statutory category) (CDOW 2007a).

The black-tailed prairie dog had occurred at Sand Creek Massacre National Historic Site and according to the *Special Resource Study* (NPS 2000), they were common on portions of the former Dawson ranch (NPS 2000b). Habitat for prairie dogs remains and the site could be re-inhabited in the future.

**Ferruginous Hawk (no occurrence at site).** The ferruginous hawk is one of the largest North American hawks. This species is a year-round resident of Colorado and is considered a common winter inhabitant on Colorado's eastern plains. The ferruginous hawk is not a federally listed species, but is a state species of special concern (not a statutory category) (CDOW 2007a).

According to the bird inventory and monitoring effort conducted in 2005, no ferruginous hawks were detected at Sand Creek Massacre National Historic Site. The survey determined the species could potentially use or may have potentially used the site during a portion of their life history (NPS 2005a).

**Burrowing Owl (present at site).** Burrowing owls are primarily found in eastern Colorado during the summer and occasionally during the winter on the eastern plains. They are predominantly found in grasslands and mountain parks, in or near prairie dog towns. Burrowing owl populations are declining in Colorado and have been nearly or completely extirpated in areas. Development, poisoning campaigns against ground squirrels and prairie dogs, and intensive agriculture have contributed to the decline of the burrowing owls. The burrowing owl is not a federally listed species, but is a state threatened species (CDOW 2007a).

Burrowing owls were detected at Sand Creek Massacre National Historic Site during the bird inventory and monitoring effort conducted in 2005 (NPS 2005a). The report suggested that management of the site is conducive to taller grass structure and the maintenance of prairie dog towns which provide the mosaic necessary for the presence of burrowing owls.

**Mountain Plover (present at site).** Colorado is the primary breeding ground for the mountain plover, with over half of the world's population nesting in the state. Mountain plovers inhabit prairie grasslands, arid plains, and fields. Nesting plovers choose shortgrass prairies grazed by prairie dogs, bison, and cattle, and overgrazed tallgrass and fallow fields. Threats include the conversion of native prairie grasslands to cultivation, predation from expanding swift fox populations, and the loss of prairie dog colonies. The mountain plover is not a federally listed species, but is a state species of special concern (not a statutory category) (CDOW 2007a).

According to the bird inventory and monitoring effort conducted in 2005, mountain plovers were detected at Sand Creek Massacre National Historic Site (NPS 2005a). The report suggested that management of the site is conducive to taller grass structure and the maintenance of prairie dogs which provides the mosaic necessary for the presence of the mountain plover.

**Long-billed Curlew (no occurrence at site).** Long-billed curlews nest on shortgrass prairie, and occasionally in wheat or fallow fields. Long-billed curlews were once widespread throughout Colorado's shortgrass prairie; however, conversion of grasslands for agriculture and livestock grazing has reduced their nesting habitat. Long-billed curlews are not a federally listed species, but are listed in Colorado as a species of special concern (CDOW 2007a).

According to the bird inventory and monitoring effort conducted in 2005, no long-billed curlews were detected at Sand Creek

Massacre National Historic Site. The inventory determined that the species could potentially use or may have potentially used the site during a portion of their life history (NPS 2005a).



Landscape at Sand Creek

## STATUS OF RESOURCE KNOWLEDGE

Knowledge of the site's natural and cultural resources is essential for the National Park Service to effectively meet its resource stewardship responsibilities. This knowledge is provided through basic resource inventories, long-term monitoring of resource conditions, investigations and research, and the integration or synthesis of scientific and scholarly resource information. Additionally, adaptive management requires ongoing updates concerning natural systems and how management decisions affect them. Several documents contain information on the status of the site's resources, including the *Interim Site Management Plan* (NPS 2006), *Site Inventory Report* (CSU 2006), and *Special Resource Study* (NPS 2000). Periodic status updates to resource knowledge are achieved through and recorded in the LCS; cultural landscape automated inventory management (CLAIMs); ASMIS; NPSpecies; and other databases of species of management concern and threatened and endangered species.

Information about park resources must be of sufficient quality and completeness to aid in making responsible stewardship decisions. Remediation of shortfalls in resource knowledge is integrated into comprehensive strategies in this resource stewardship strategy. Specific, focused investigations may be required to provide the necessary resource knowledge when managing complex issues. When the need is identified, these investigations are also integrated into the comprehensive strategies in the resource stewardship strategy.

Tables 5 and 6 present summaries of the status and completeness of resource knowledge for the Sand Creek Massacre National Historic Site. Where knowledge necessary for NPS resource stewardship is lacking, the needs are addressed in the comprehensive strategies recommended by this resource stewardship strategy.

**TABLE 5. CULTURAL RESOURCE INVENTORIES, STUDIES, AND RESEARCH REPORTS**

| Type or Title | Status (Complete, Incomplete, In Process, Needed, Ongoing) |
|---|---|
| Archeological Reconnaissance of Two Possible Sites of the Sand Creek Massacre of 1864 | Complete, 1998 |
| Historical Research on the Location of the Sand Creek Massacre Site, Interim Report No. 1 | Complete, 1999 |
| Historical Research on the Location of the Sand Creek Massacre Site, Interim Report No. 2 | Complete, 1999 |
| Historical Research on the Location of the Sand Creek Massacre Site, Interim Report No. 3 | Complete, 1999 |
| Sand Creek Massacre Special Study, Analysis of Aerial Photography from 1937-1938, 1954, and 1975, Draft Report | Complete, 1999 |
| The Search for Sand Creek Massacre | Complete, 1999 |
| Survey of the Dawson Ranch Buildings Complex (5KW123) and the Remains of the Thompson-Bohart Ranch/Dawson Family Line Camp, Sand Creek Massacre National Historic Site, Kiowa County, Colorado | Complete, 2005 |
| Chivington & Brandon Irrigation Canal | Complete, 2006 |

| Type or Title | Status (Complete, Incomplete, In Process, Needed, Ongoing) |
|---|---|
| Survey and Shovel Test for Repatriation Site | Complete, 2006 |
| Cultural Resources Assessment of Effect: Survey Prior to Facility Development. | Complete, 2007 |
| An Ethnological and Ethnohistorical Assessment of Ethnobotanical and Cultural Resources at the Sand Creek Massacre National Historic Site and Bent's Old Fort National Historic Site | Complete, 2007 |
| Placement of Groundwater Monitoring Wells | Complete, 2007 |
| Results of Monitoring of Underground Utility Line Trench and Water Monitoring Wells | Complete, 2007 |
| Survey Prior to Facility Development | Complete, 2007 |
| Scope of Collections, Draft | Complete, 2011 |
| Survey for Tornado Shelter Installation | Complete |
| Survey for 100 acre Mowing Project, NW ¼ section, 24 | Complete |
| Survey of Chivington Canal Removal | Complete |
| Completion of the Mapping Workshop — archeological needs, historic research needs, and/or clarifications | In Progress |
| LIDAR mapping of specific historical locations within the site (historic trail identified and used — 1868; specific battles identified as part of the massacre) | Needed |
| Mapping of the massacre site using 1' grids | Needed |
| Collections Management Plan | Needed |
| The Sand Creek Massacre NHS Nomination | Complete |
| Chivington and Brandon Canal National Register Nomination | Complete |
| Dawson Ranch House National Register Nomination | Complete |
| 1950 Battle Ground Marker National Register Nomination | Complete |
| Ray Irrigation Ditch National Register Nomination | Complete |
| SS Line Shack National Register Nomination | Complete |

**TABLE 6. NATURAL RESOURCE INVENTORIES, STUDIES, AND RESEARCH AND MONITORING REPORTS**

| Type or Title | Status (Complete, Incomplete, In Process, Needed, Ongoing) |
|---|---|
| Site Location Study, Volumes I & II | Complete, 2000 |
| Site Inventory | Complete, 2006 |
| Science Status Report | Complete, 2008 |
| Fire Management Plan | Complete, 2006 |
| Vegetation Classification and Mapping | Complete, 2007 |
| Environmental History | Complete, 2007 & 2009 |
| Rare Vertebrate Species Inventory | Complete, 2005 |
| Assessment of Wetlands, Riparian, Geomorphology and Floodplains Conditions | Complete, 2005 |
| Paleontological Resource Inventory and Mapping | Complete, 2003 |
| Geoarcheological Assessment | Complete, 1999 |
| Fish Assessment, Trip Report | Complete, 2006 |
| Riparian Forest Age Structure and Past Hydroclimate Variability | Complete, 2006 |
| Analysis of Aerial Photography | Complete, 1999 |
| Bird Inventory and Monitoring | Complete, 2005 & 2010 |
| Pollen Analysis of Sediment Cores from Big Sandy Creek | Complete, 2007 |
| Prairie Dog Assessment | Complete, 2008 |
| Acoustic Monitoring Report | Complete, 2009 |
| Soil Crusts and Playa Inventory | Needed/Requested |
| Soil Compaction to Identify Historic Trails and Potential Movement of the Big Sandy Creek | Needed/Requested |
| Determine T&E species reintroduction (Arkansas darter, lesser prairie chicken, etc.) | Needed/Requested |
| Introduction and Benefits of Prescribed Fire | Needed/Requested |
| Determine Projected Big Sandy Creek Flood Levels in June 1864 | Needed/Requested |
| Grazing Management Plan | Needed/Requested |
| Prairie Dog Management Plan | Needed/Requested |

# Indicators of Resource Condition and Target Values



# CHAPTER 3 — INDICATORS OF RESOURCE CONDITION AND TARGET VALUES

## METHODOLOGY

A multistep methodical process was used to select indicators and establish target values.

1. Understand desired conditions for the resource (fundamental and other important resources and values).
2. Identify the attribute(s) that describe the resource. The attributes often serve as the indicator topic.
3. Identify the influence(s) that affect the condition of the resource.
4. Identify the indicator(s) that will be used to monitor the resource condition. Specify the unit of measurement.
5. Establish quantifiable target value(s) representing the desired condition of the resource.
6. Determine the current condition of the resource according to the selected indicator.

The section below explains the types of information and databases used to select indicators and target values for each of the major resource types present at the site.

Existing natural and cultural resource databases were reviewed for information on resource condition assessment methods and appropriate indicators. The planning team for this resource stewardship strategy compiled a list of potential indicators and evaluated them using four factors — management significance, resource significance, feasibility and cost-effectiveness, and legal/policy mandates. The resulting data allowed the planning team to select the best indicators for each resource. In many cases, subject matter experts selected existing databases with measureable parameters to determine the physical condition and integrity of natural or cultural resources.

The following section explains what types of information and databases were used to select indicators and target values for each of the major resource types that exist at the site. The selected indicators are included in table 7.

The identification and organization of resource types within this section mirrors the organization of the site's fundamental (and other important) resources and values — the common thread that ties together all levels of planning in the National Park Service.

## CULTURAL RESOURCES

The cultural resource values of the site were categorized as archeological resources and other physical remains associated with the massacre. These resources include museum collections, artifacts and archives; oral histories; repatriation site (cemetery); intangible spiritual qualities of the landscape (sense of place); in situ human remains and cultural items subject to the Native American Graves Protection and Repatriation Act and those that may be repatriated; memorialization and commemoration activities such as spiritual healing runs and places that have been blessed or where ceremonies occur or have occurred; ethnographic resources; ethnographic landscapes and viewsheds; 1950 monument and overlook; historic canal; post-massacre land use and associated history; sheep ranch, SS ranch line shack, and the Chivington Brandon Canal. Where relevant and appropriate, existing resource condition assessment methods and databases were identified as resource stewardship strategy indicators.

The condition of archeological resources will be evaluated to document site conditions. Certain criteria (depositional integrity, site disturbance level, threats, and overall condition) were determined by site and regional staff to be the best evaluation factors

and will be used. The ASMIS condition assessment will also be used.
The condition of historic structures and cultural landscapes will be determined by means of the LCS condition assessment. The databases will be used together to determine resource conditions. Each of these databases has a monitoring component and is updated periodically. The facility maintenance software system is a repository of facility management information with an annual and 5-year inspection component. Appendix D contains a summary of the LCS condition assessment ratings for the site's classified structures.

The condition of historic objects and artifacts that are part of the site's museum collections and archives will be evaluated using existing databases (ANCS+ standards) and condition assessment procedures (random sample and controlled property inventories and photographic document).

## NATURAL RESOURCES

The natural resource values of the site were categorized as wetlands plant and animal habitat; riparian plant and animal habitat; upland plant and animal habitat; topographic features; and hydrological and hydraulic conditions. Where relevant and appropriate, the vital signs for the SOPN I&M Program and the site, included in appendix C, were used as indicators for this resource stewardship strategy. The vital signs monitoring program uses accepted scientific protocol and indices of condition to evaluate the condition of key unit resources.

The condition of wetlands plant and animal habitat will be evaluated by measuring the plant species composition and distribution, depth of the water table; number, location, and minimum depth of standing water ponds; presence of exotic species; plant and animal species composition and distribution. Measures for the condition of riparian plant and animal habitat include functionality assessments; health, age structure, and distribution of cottonwoods; species composition and distribution of riparian wildlife; presence of exotic species; species composition and distribution of riparian plants; accumulation of flood debris as measured in biomass; increase in the amount of bare ground, blowouts, and scouring of the soil surface; and decreases in soil stability. The condition of upland plant and animal habitat will be evaluated by measuring the representative prairie dog population maintained within the historic distribution; presence of exotic species; establishment of a native grassland representative of Colorado's eastern plains ecosystems; increase in the amount of bare ground, blowouts, and scouring of the soil surface; and decreases in soil stability.

The condition of natural hydrologic processes and hydraulic conditions will be evaluated by measuring unnatural changes in topographic (drainage channel) configuration, groundwater elevation, and flow volumes of surface and groundwater.

## MONITORING

Each of the indicators selected for this resource stewardship strategy has different monitoring requirements. Some of the monitoring requirements (including methodology and frequency of monitoring) are dependent upon the development of monitoring protocols. The I&M program will be responsible for developing these protocols and implementing the monitoring program. The comprehensive strategies that are part of this resource stewardship strategy contain activities designed to address these monitoring needs. It is possible that new or different monitoring priorities may arise over the life of this plan. Therefore, site staff will need to be diligent in adapting to and incorporating new initiatives and programs within the framework of this resource stewardship strategy. Table 7 identifies the desired conditions, attributes, influences (beneficial and detrimental), indicators, target values, and current conditions of the site's major resource categories.

**TABLE 7. DESIRED CONDITIONS, ATTRIBUTES, INFLUENCES, INDICATORS, TARGET VALUES, AND CURRENT CONDITIONS**

| Fundamental or Other Important Resources and Values | Desired Conditions* | Attributes | (+) Beneficial and (-) Detrimental Influences | Indicators | Target Value (=Desired Condition) | Current Condition | Target Met? |
|---|---|---|---|---|---|---|---|
| **CULTURAL RESOURCES** | | | | | | | |
| Archeological resources, and other physical remains associated with the massacre | All archeological sites are identified, documented, evaluated, mapped, and inventoried. All sites are protected in undisturbed condition. Potentially sensitive information is not made public. | Depositional Integrity | -Remote location (limited and limited security)<br>+Remote location (limited access)<br>-Natural processes and weathering<br>-Human disturbance and visitor impact<br>+Monitoring frequency<br>-Attrition of tribal elders/loss of institutional knowledge<br>-Additional archeological work needed<br>+Extensive archeological investigations completed | ASMIS Condition | Good; no further loss of integrity | 2 sites: moderate<br>1 site: well preserved | Yes |
| | | | | National Register documentation | 100% Complete (DOE) | 100% Complete (DOE) | Yes |
| | | | | Percentage of park covered by inventory (with tribal involvement) | 100% of priority areas surface surveyed/ inventoried | 26% of the area in the authorized boundary has been surveyed; 63% of the area in the established boundary has been surveyed | No |
| | | Site disturbance level | | ASMIS Disturbance Level | No further disturbance | 2 sites: Low<br>1 site: Moderate | Yes |
| | | Threats | | ASMIS Condition | All future threats mitigated | 1 site: undetermined<br>2 sites: partial loss | Yes |
| | | Overall condition | | ASMIS Condition | Good | 3 sites: Good | Yes |
| | | | | FMSS Condition | Good | 2 sites: Good<br>1 site: Not entered into FMSS, will not be entered in FMSS | Yes |

| Fundamental or Other Important Resources and Values | Desired Conditions* | Attributes | (+) Beneficial and (-) Detrimental Influences | Indicators | Target Value (=Desired Condition) | Current Condition | Target Met? |
|---|---|---|---|---|---|---|---|
| Museum collections, artifacts, and archives | All artifact collections are maintained locally (at Bent's Old Fort according to IMRO Museum Strategy) to NPS standards. Some artifacts are displayed for public viewing. | Field notes | +Scope of collections completed<br>+Restricted access (security)<br>-Restricted access (limited availability)<br>-Currently no local museum<br>-Increased cost to park base funding<br>+Controlled environment<br>-Scattered distribution of collection items<br>+Backup data in various locations (the database of items)<br>-Pest infestation<br>-Delays between accessioning and cataloguing<br>-Natural deterioration (effects of light, temperature, and relative humidity) | Percentage completed | 100% Completed | 100% completed | Yes |
| | | Condition of collections, including manuscripts and maps | | Checklist for Preservation and Protection of Museum Collections (automated checklist program) | =>95%<br>Most of the collection is housed at the Western Archeological and Conservation Center. The remainder of the collection (20 objects) is stored at Bent's Old Fort National Historic Site; Bent's Old Fort National Historic Site's checklist percentage is 86%. | 86% | No |
| | | | | Percentage catalogued and in International Committee for Museum Security | 100% catalogued | 90% catalogued | No |
| | | | | Number of museum management plans current and in place | Dependent on whether collections end up onsite:<br>Onsite = 8 of 8;<br>Offsite = 2 of 2 | 0%<br>*Scope of collections statement to be complete in July | No |

| Fundamental or Other Important Resources and Values | Desired Conditions* | Attributes | (+) Beneficial and (-) Detrimental Influences | Indicators | Target Value (=Desired Condition) | Current Condition | Target Met? |
|---|---|---|---|---|---|---|---|
| Oral Histories | Oral histories are preserved, collection of oral histories continues.<br>Available and accessible for interpretation and research covering both sides of the massacre. | Integrity and/or completeness/ongoing collection of stories | -Tribal attrition rates (loss of elders/ institutional knowledge)<br>-Missed opportunities to share stories with visitors<br>-Unaware of descendants<br>-Unavailability of the stories we do have (individual staff knowledge not documented)<br>+Archiving documents staff have researched and collected<br>+Access (research center and website)<br>+Previous work in oral history collection established contacts with tribes<br>+Cooperative agreements in place for consultation | Establishment of an oral history program that ties in descendants | Yes | No formal program in place | No |
| | | Relevance of future stories to the event | | Establishment of an oral history program that ties in descendants | Yes | No formal program in place | No |
| | | Level to which oral histories are used to preserve the memory of Sand Creek Massacre | | Percent of interpretive programs incorporating oral histories | 100% | 50% | No |
| | | Level of accessibility | | Percent of the total collection is accessible to varied audiences through different media sources | 100% | 100% | Yes |
| Repatriation Site (cemetery) | Maintained to preserve respectful, commemorative, and undisturbed setting. Individual grave locations identified but not marked. The site would also be interpreted. | Level of integrity | -Visitor impacts/human disturbance<br>-Natural processes (drought, etc.)<br>-No off-hours security<br>-Poor maintenance techniques<br>+Benefits National Park Service and tribal relations<br>+Consultation is in | Positive responses from tribal members through consultation regarding satisfaction with site integrity | 100% | 100% | Yes |
| | | | | Appropriate level of use and access | Parameters supported in accordance with NPS standards and legislation | Parameters are within NPS standards and legislation | Yes |

| Fundamental or Other Important Resources and Values | Desired Conditions* | Attributes | (+) Beneficial and (-) Detrimental Influences | Indicators | Target Value (=Desired Condition) | Current Condition | Target Met? |
|---|---|---|---|---|---|---|---|
| | | | place<br>+Regular monitoring<br>-Costs of consultation for repatriations is an unplanned NPS expense<br>-Costs of maintenance of the cemetery<br>+A site has been established and is being maintained<br>+Legislation indicates that remains associated with the massacre be interred | Presence of inappropriate items at the site | None; Routinely checked/staff follows policy | None; Routinely checked per policy | Yes |
| | | Level of disturbance | | Presence of visible disturbance or vandalism | None | None; Routinely checked per policy | Yes |
| Intangible spiritual qualities of the landscape (sense of place) | Physical design including facilities and interpretive media complement the spiritual qualities and integrity the place.<br>Items in the physical environment are consistent with maintaining the spiritual qualities. | Presence of items (including acoustic intrusions) in the physical environment that are not consistent with the spiritual qualities | +Functioning partnerships<br>-Visitor impacts/human disturbances<br>+Culturally, humans are seen as part of the natural environment<br>+The site is in a remote, rural location and therefore is naturally more quiet/current soundscape reasonably intact<br>+Impacts to the spiritual qualities of the site always considered | Presence of items in the physical environment that are not consistent with the spiritual qualities | Ability to interpret the 1864 landscape is maintained | Abandoned farmstead; windmill in the school section; power lines; agricultural equipment; county road traffic; occasional overflight; night sky intrusions; potential wind farm | No |
| | | | | Presence or absence of human-made or non-natural sounds inconsistent with the spiritual and contemplative quality | Under 35 decibels (Db<35) from specific human-made sources in contemplative zones | Occasional departure from Db<35 from specific human-made sources in contemplative zones | Yes |
| Human remains and cultural items subject to Native American Graves Protection and | Human remains and cultural items subject to NAGPRA, specific to the Sand Creek Massacre, discovered | Repatriation of discovered remains and other cultural items, specific to the Sand Creek Massacre, occurs | +Process established and on-going<br>-Funds for non-NAGPRA repatriation needed | Number of repatriations accomplished in consultation with tribes | All | All | Yes |

| Fundamental or Other Important Resources and Values | Desired Conditions* | Attributes | (+) Beneficial and (-) Detrimental Influences | Indicators | Target Value (=Desired Condition) | Current Condition | Target Met? |
|---|---|---|---|---|---|---|---|
| Repatriation Act (NAGPRA) still in the ground and those that may be repatriated | would be repatriated per NAGPRA or other legal requirements. | pursuant to NAGPRA or any other provision of law | +Bent's Old Fort National Historic Site has space to temporarily hold remains waiting to be buried<br>+Staff is knowledgeable about process/procedure | | | | |
| Memorialization and commemoration activities such as spiritual healing runs, and places that have been blessed or where ceremonies have occurred or do occur | Commemorative activities continue with NPS cooperation according to legislative requirements. | Appropriate commemorative activities follow established process, with appropriate NPS cooperation, and tribal consultation | +The walk from the parking area to the top of the hill prepares the visitor for the contemplative experience<br>+Tribal consultation process established<br>-Parameters for activities not clearly established<br>+Lack of facilities<br>-Lack of facilities | Number of memorializations and commemorative activities accomplished in consultation with tribes and in accordance with legislative requirements | All | All | Yes |
| | | | | Appropriateness of activities, level of use, and access | All appropriate within parameters and will be decided by park staff in consultation with tribes | Current activities, level of use and access are acceptable with on-going tribal consultation | Yes |
| Ethnographic resources | Culturally significant physical and biological components are identified, documented, evaluated, protected, inventoried, and interpreted.<br>Ethnobiological resources protected | Completeness of inventory | +Remote location<br>-Remote location<br>+Cultural proprietary concerns are discussed in consultation<br>-No parameters given by tribes for cultural proprietary concerns<br>-Lack of knowledge of ethnographic resources | Percentage of NPS site covered by inventory with tribal involvement | 100% | Percentage unknown; continued discussions with tribes | Unknown |
| | | | | Percentage of resource areas mapped | 100% | 0% | No |
| | | Significant plant and animal species reflect a healthy prairie ecosystem | | Presence of significant plant and animal species | Yes | Unknown | Unknown |

| Fundamental or Other Important Resources and Values | Desired Conditions* | Attributes | (+) Beneficial and (-) Detrimental Influences | Indicators | Target Value (=Desired Condition) | Current Condition | Target Met? |
|---|---|---|---|---|---|---|---|
| | in specific locations where appropriate. | | | Culturally significant distribution of the ethnobotanical species | Yes | Unknown | Unknown |
| | | Number, location, and accessibility of identified ethnobiological resources | | Culturally significant distribution of the ethnobotanical species | Yes | Unknown | Unknown |
| | | Significant places and features | | Known places of significance are protected in consultation with the tribes | Yes | Yes | Yes |
| | | Level to which non-sensitive cultural knowledge is used to interpret ethnographic resources | | Interpretive programs incorporate non-sensitive ethnographic resource information | Yes | Yes | Yes |
| Ethnographic landscapes and viewsheds | Cultural landscapes identified, documented, evaluated, protected, inventoried, and interpreted.<br>Viewsheds with no adverse intrusions. Preserve any spiritual viewsheds. | Condition of ethnographic landscape and viewshed | -Surrounded by non-protective lands<br>+Rural location<br>-Rural location (few zoning restrictions)<br>-Energy development planning adds the potential for wind farms<br>+Section 106 compliance<br>+Facilities (including climate data collection equipment) onsite placed and designed to have minimal impact on cultural landscape/viewsheds | Condition of landscape according to assessments | TBD | Unknown; some agricultural and utility impacts | Unknown |
| | | Completeness of inventory (360 degree perspective) | | Percentage of sight lines inventoried | 100% | Minor visual impacts | Yes |
| | | Viewshed intrusions | | Level of viewshed intrusions | 1864 viewshed as practicable and/or acceptable; very low level of intrusions | Visual impacts exist; viewshed analysis needed | Unknown |
| | | | | Change in land use cover type (# and scale of new structures, roads, | Changes would fall within parameters established in a development | Visual impacts exist; viewshed analysis needed | Unknown |

| Fundamental or Other Important Resources and Values | Desired Conditions* | Attributes | (+) Beneficial and (-) Detrimental Influences | Indicators | Target Value (=Desired Condition) | Current Condition | Target Met? |
|---|---|---|---|---|---|---|---|
| | | | +Exotic species are relatively minor | utility lines, disturbed land) in viewshed | concept plan | | |
| 1950 monument and overlook | Monument is preserved in its current condition and visitor access to overlook is maintained. Interpretation provided addressing perceptions of the era in the wording on the marker. | Condition of monument | +Tribes expressed desires in consultation to retain the marker wording to preserve era perceptions<br>+Frequency of monitoring<br>+Offerings policy in place resulting from consultation<br>-Human disturbance/visitor impacts<br>-Weathering/wind erosion on bluff and the monument | FMSS Asset Condition | Good | Good | Yes |
| | | | | LCS Condition Assessment | Good | Good | Yes |
| | | Interpretation of the monument | | Included in interpretive product(s) | Yes | Yes | Yes |
| Historic canal | National register eligibility to be determined. Current physical integrity of the canal, berm, and associated structures maintained according to the Secretary's standards. Interpretation provided addressing perceptions of the era in the creation and naming of the canal. | Condition of canal prism, berm, and associated structures | -Not associated with the massacre<br>+Evidences post-massacre perceptions<br>-The berm causes deviation to hydrology of floodplain, decreases water table in immediate area<br>-Erosion/weathering<br>-Has altered the historic landscape<br>+Provides a convenient potential trail system, which respects the culturally sensitive creek bed<br>-Portions of the canal that are privately held are not protected | Completion of photo documentation of the canal to establish baseline | Yes | No | No |
| | | | | Determination of national register eligibility | Yes — determination complete | In process | No |
| | | | | FMSS Asset Condition | Good | Good | Yes |
| | | | | LCS Condition Assessment | Good | Good | Yes |
| | | Interpretation of the canal | | Included in interpretive product(s) | Yes | Yes | Yes |

| Fundamental or Other Important Resources and Values | Desired Conditions* | Attributes | (+) Beneficial and (-) Detrimental Influences | Indicators | Target Value (=Desired Condition) | Current Condition | Target Met? |
|---|---|---|---|---|---|---|---|
| | | | -Degradation of the archeological resource in construction of the canal | | | | |
| Post-massacre land use and associated history: homestead, SS ranch line shack, Chivington Brandon Canal. | Post-massacre land use and associated history is interpreted. Determine national register eligibility of post-massacre resources. | Completed National Register forms of SS ranch line shack, Chivington Brandon Canal, and Dawson Ranch | +Post-massacre stewards did not greatly disturb the land<br>+The presence of the cottonwoods preserves hydrology crucial to retaining locations of cultural and historical areas<br>-More exists to be known about how post-massacre use affected the landscape | Determination of national register eligibilities completed | Yes — determinations complete | 2 sites: complete<br>1 site: complete | Yes |
| | | Site condition | | Determination of site conditions | Good | 2 sites: good<br>1 site: not assessed | No |
| | | Interpretation of post-massacre land use and associated history | | Included in interpretive product(s) | Yes, where applicable | Yes, where applicable | Yes |
| **NATURAL RESOURCES** | | | | | | | |
| Wetlands plant and animal habitat | Opportunities for Arkansas darter habitat and maintenance of fish migration.<br>Standing water ponds hydrology managed to maintain habitat quality and exposed groundwater, which is consistent with the cultural scene.<br>No exotic species or their biomass removed. | Functionality of wetlands systems interpreted from plant species health, composition, and distribution | -Fluctuating groundwater elevations<br>+Overall few exotic species<br>+Intermittent disturbance regimes are considered in planning<br>+Few roads<br>+Too few human vectors to import and spread non-native species<br>-Significant amounts of tumbleweeds accumulate annually in | Functionality of the physical and biological conditions<br>Plant species composition and distribution | Functioning at high levels across all physical and biological conditions as interpreted from plant species health, composition, and distribution | TBD via functional assessment, using the wetlands functional assessment rating including assessment of plant species composition and distribution | Unknown |
| | | Groundwater elevation hydrologic connectivity | | Average annual surface water flow | Not reduced from current natural flows or frequency | TBD by establishing baseline flows through wetlands | Yes |

| Fundamental or Other Important Resources and Values | Desired Conditions* | Attributes | (+) Beneficial and (-) Detrimental Influences | Indicators | Target Value (=Desired Condition) | Current Condition | Target Met? |
|---|---|---|---|---|---|---|---|
| | Soil function and soil resources are protected from human-induced accelerated wind and water erosion.<br>Groundwater elevations at or above annual average elevations of 2010. | | the wetlands<br>+Few visitors so human impacts are minimal<br>+There are no traditional agricultural practices conducted in the wetlands<br>+Human access to the majority of the site is limited to research and administrative purposes<br>+Ecosystem functionality is fairly high for fisheries habitat, wildlife habitat, groundwater recharge, and water quality, based on professional judgment<br>-Lack of control of upstream surface- and ground- water use that could impact surface and groundwater flows in wetlands<br>-The county road culverts restrict natural flow and create a backwater effect.<br>-The canal interferes with the natural drainage of the adjacent uplands to the creek floodplain<br>-Climate change is resulting in changed hydrologic patterns<br>+Monitoring effects of climate change on the resource for use and management decisions | Average depth to the water table | Not artificially reduced from 2010 elevations | Average groundwater depths for 2010 | Unknown |
| | | Number and size of wetlands and standing water ponds | | Number, size, and minimum depth of wetlands and standing water ponds that are not influenced by hydrology from the perennial spring and are located upstream of the spring input along Big Sandy Creek | Maintain wetlands and ponds that are not influenced by hydrology from the perennial spring and are located upstream of the spring input along Big Sandy Creek. | Four standing water ponds that are not influenced by hydrology from the perennial spring and are upstream of the spring input along Big Sandy Creek | Yes |
| | | Presence of non-native plant species | | Presence and distribution of non-native species in standing water and palustrine wetlands | No non-native plant or animal species in the wetlands. | Low presence in and around the wetlands | No |
| | | Composition and distribution of hydrophytic plants typical of older seral stage prairie wetlands (wetlands vegetation vital sign) | | Species composition and distribution typical of mature (older seral stage) prairie wetlands | TBD. The target values will be determined using the pollen study and best professional judgment then defined in the site vegetation management plan. | TBD To be determined by the I & M inventory and defined in a management plan | Unknown |
| | | Soil quality and function | | Increase in the amount of floodway erosion | Yes | Intermittent natural channel erosion, not substantive but cannot be quantified | Yes |
| | | | | Groundwater elevations | Groundwater elevations not | 2010 groundwater | Yes |

| Fundamental or Other Important Resources and Values | Desired Conditions* | Attributes | (+) Beneficial and (-) Detrimental Influences | Indicators | Target Value (=Desired Condition) | Current Condition | Target Met? |
|---|---|---|---|---|---|---|---|
| | | | +Reduction of biomass and exotics in the standing ponds preserves hydrology | | artificially reduced from 2010 levels or below the threshold to sustain cottonwoods | data (needs to be analyzed) | |
| Riparian plant and animal habitat | Density and distribution of cottonwoods maintained to reflect historic scene and protect existing cottonwoods.<br>Habitat maintained for native wildlife, including deer, pronghorn, prairie chicken, mountain plover, burrowing owls, and Monarch butterflies.<br>No exotic species or their biomass removed.<br>Flood debris is managed for safety, reduction of fuel load and wildlife habitat.<br>Soil function and soil resources are protected from accelerated wind and water erosion. | Functionality of riparian systems | -Fluctuating groundwater elevations<br>+Overall few exotic species<br>+Intermittent disturbance regimes are figured into planning<br>+Few roads<br>-Road crossing creek in riparian floodplain<br>+Relatively few visitor use impacts<br>+Few human vectors that can introduce invasives<br>+Access to creek bed only for research and administrative purposes<br>-A significant number of tumbleweeds blow into the floodplain and are trapped<br>+No traditional agricultural practices currently conducted in the riparian area<br>+Trail design, access, use, and monitoring minimize impacts<br>-Lack of control of upstream groundwater use | Functioning condition assessment rating | Functioning at high levels across all physical and biological conditions | TBD via functional assessment, using the Bureau of Land Management proper functioning condition assessment rating | Unknown |
| | | Cottonwood tree community | | Number and age of distinct cohorts of cottonwood trees | At least 3 cohorts at any given time, with at least 30 trees per cohort, separated by at least 30 years | Currently there are 3 cohorts; populations are separated by approximately 30 years | Yes |
| | | Riparian-dependent wildlife | | Presence of riparian-dependent wildlife (based on vital signs monitoring for birds, amphibians, etc.) | Full complement of riparian-dependent native fauna typical of the region | TBD; Reference Sovell report | Unknown |
| | | Presence of exotic species | | Level of presence and distribution of exotic species | No exotic species present | Low presence in and around the riparian areas | No |
| | | Soil quality and function | | Increase in the amount of bare ground, blowouts, and scouring of the soil surface, soil stability decreased (vital signs monitoring for soil movement and soil | No unnatural degradation from current condition | Currently in good, stable condition (as of 2010) | Yes |

| Fundamental or Other Important Resources and Values | Desired Conditions* | Attributes | (+) Beneficial and (-) Detrimental Influences | Indicators | Target Value (=Desired Condition) | Current Condition | Target Met? |
|---|---|---|---|---|---|---|---|
| | | | -Climate change is resulting in changed hydrologic, hydraulic, and precipitation patterns<br>+Monitoring effects of climate change on the resource for use and management decisions<br>+Reduction of biomass and exotics in the standing ponds as a routine maintenance activity has improved pond quality<br>-Potential changes in precipitation, evapotranspiration, and frequency of extreme flood/fire events due to climate change.<br>-Historical onsite and offsite land management actions have resulted in undesired changes to soil and habitat quality | structure and chemistry) | | | |
| Upland plant and animal habitat | Representative prairie dog population managed in appropriate location(s).<br>Exotic species and their biomass removed.<br>Native grasslands maintained in a mosaic of natural | Prairie dog population | -Potential changes in precipitation, evapotranspiration, and frequency of extreme flood/fire events due to climate change<br>-Invasive plants migrating from outside sources<br>-Land uses have altered nutrient deposition/water | Representative prairie dog population maintained within the historic distribution in the park | TBD based on a prairie dog management plan to be developed | Prairie dog habitat exists within the site boundary; former prairie dog habitat currently monitored for return animals | Unknown |
| | | Presence of exotic species | | Presence and distribution of exotic species | None | Low presence in the upland areas | No |

| Fundamental or Other Important Resources and Values | Desired Conditions* | Attributes | (+) Beneficial and (-) Detrimental Influences | Indicators | Target Value (=Desired Condition) | Current Condition | Target Met? |
|---|---|---|---|---|---|---|---|
| | seral stages, as practicable.<br>Soil function and soil resources are protected from accelerated wind and water erosion. | Composition and distribution of native grasslands | quality<br>-Past and sometimes distant land management actions have resulted in undesired changes to soil quality | Establishment of a representative native grassland community based on I&M vital signs | TBD (need vegetation management plan; need study of reference areas to come up with a target value) | TBD (need vegetation management plan; need to assess the current condition) | No |
| | | Soil quality and function | | Increase in the amount of bare ground, blowouts, and scouring of the soil surface, soil stability decreased (vital signs monitoring for soil movement and soil structure and chemistry) | No unnatural degradation from current condition | Currently in good, stable condition (as of 2010) | Yes |
| Topographic features | Natural evolution of topographic features is maintained. | Condition of the topographic features | +Geological change timeframes are slow enough to allow corrective action<br>-Potential changes in precipitation and frequency of extreme flood/fire events due to climate change | Change in topographic configuration | No unnatural degradation from current condition | Currently most of the site is in good, natural condition (as of 2010) with exception of the interrupted drainage flow above the canal | No |
| Hydrological and hydraulic conditions | Drainage features maintained in their natural condition.<br>Maintained or improved groundwater hydrologic conditions. | Condition of drainage features | +Geological change timeframes are slow enough to allow corrective action<br>-Potential changes in precipitation and frequency of extreme flood/fire events due to climate change. | Unnatural change in topographic (drainage channel) configuration | Natural drainage channel development processes maintained | Everything is functioning naturally except side drainages above the canal and the creek road crossing, and erosion in the canal | No |

| Fundamental or Other Important Resources and Values | Desired Conditions* | Attributes | (+) Beneficial and (-) Detrimental Influences | Indicators | Target Value (=Desired Condition) | Current Condition | Target Met? |
|---|---|---|---|---|---|---|---|
| | Maintained wetlands surface and groundwater conditions. Management actions do not artificially alter the hydrologic regime. | Continuation of natural hydrologic regime and conditions | -Potential change in precipitation, evapotranspiration, and frequency of extreme flood/drought events due to climate change.<br>-Potential changes to magnitude and timing of surface water flows and groundwater elevations due to groundwater draw-down | Depth to water table | Not artificially reduced from 2010 elevations or not below the threshold needed to sustain the cottonwood stands | TBD — need to determine the threshold needed to sustain the cottonwood stands. | Yes |

* The desired conditions described in this table are derived from those in the general management plan but contain additional detail.

TBD = to be determined

# Comprehensive Strategies to Achieve Desired Conditions



# CHAPTER 4 — COMPREHENSIVE STRATEGIES TO ACHIEVE DESIRED CONDITIONS

Comprehensive strategies are a sequence of activities or actions based on science and scholarship enabling the national park system unit to achieve or maintain desired conditions for the affected resource. These strategies were developed by examining the difference between current conditions and desired conditions. The comprehensive strategies were designed to "bridge the gap" where a lack of condition data existed. Once identified, a logical sequence of activities was designed to attain desired conditions in a reasonable timeframe. The activities focus on acquiring data and improving resource knowledge, investigating resource management and enhancement projects, and monitoring resource conditions over time.

The comprehensive strategies are presented in graphic form using a table to create a 20-year timeline. There is no specific calendar or fiscal year identified for a comprehensive strategy, because the timeline suggests a sequence of logical steps and not activity programming for any specific year. In order to create this timeline, the timing and priority of each of the comprehensive strategies was evaluated and determined.

Some related and contingent activities appear on a single line. Most activities appear on separate lines. Each comprehensive strategy contains activities that do not indicate a specific course of action unless compliance has been completed. No specific undertakings or actions are suggested at this level of planning. Potential funding sources are identified, but are not exclusive of other opportunities. The relationship between budgets and funding the resource stewardship strategy is explained in "Funding the Comprehensive Strategies."

## RELATIONSHIP OF COMPREHENSIVE STRATEGIES TO NATIONAL PARK SYSTEM UNIT RESOURCES AND INDICATORS

The comprehensive strategies included in this resource stewardship strategy are organized according to the unit's major resource types (geologic, scenic, natural, and cultural). These resource types are directly related to those resources identified as the unit's fundamental and other important resources and values (see "Park Purpose, Significance, and Fundamental and Other Important Resources and Values.") The indicators selected are directly related to the primary attributes of a resource that can be measured to determine its condition. Comprehensive strategies are designed to address all deficiencies and needs in the unit's resource management program.

For example, strategies include activities that investigate and acquire resource knowledge, assess and document resource condition, mitigate resource stressors, formulate plans for resource management, and develop partnerships to monitor and enhance resources. Together, these comprehensive strategies provide the unit with a road map that should enable staff to pursue the activities and actions that will be required to achieve or maintain desired conditions.

## COMPREHENSIVE STRATEGIES — ACTIVITIES AND TIMELINES

The following tables provide the comprehensive strategies that the Sand Creek Massacre National Historic Site will implement to achieve or maintain desired resource conditions. The timing and priority of each strategy was assigned using definition criteria in table 8. An implementation timeline of the comprehensive strategies is provided in table 9.

**Timing** — how long it will take to accomplish an action or activity:

- **Short-term (S)** actions can be initiated immediately and can be accomplished in 1 to 3 years.
- **Mid-term (M)** actions take between 4 to 10 years to accomplish and may not be able to be initiated immediately.
- **Long-term (L)** actions take longer than 10 years to complete once they have been started. Often times these activities cannot be started for a number of years.
- **Ongoing (O)** actions involve more routine tasks or projects that take place at regular intervals over time.

**Priority** — the importance of the activity. Each strategy is evaluated according to criteria such as urgency; relevance to mission, park significance, and fundamental resources and values; legal requirements; community need/public interest; and budget and personnel needed.

- **High priority (1)** actions should be accomplished first. These activities are considered extremely important to the protection of unit resources and values. High priority actions are directly related to the accomplishment of other comprehensive strategies.
- **Medium priority (2)** actions are considered important, but not urgent, and meet a combination of other resource objectives.
- **Low priority (3)** actions are important, but not critical to resource protection and management needs. Low priority action items do not have to be completed in the immediate future and primarily fulfill only one comprehensive strategy.

Each of the comprehensive strategies is represented graphically using a 10-year timescale. This timescale table serves as a workplan for implementing the resource stewardship strategy. Potential funding sources for activities are identified and displayed so staff can develop partnerships that support successful implementation of the strategies.

**TABLE 8. DEVELOPMENT OF COMPREHENSIVE STRATEGIES**

**TIMING:** S: Short-term; M: Mid-term; L: Long-term; O: Ongoing

**PRIORITY:** 1: High Priority; 2: Medium Priority; 3: Low Priority

**Potential Funding Sources:** Operation of the National Park Service (ONPS)-Park Base, Servicewide Comprehensive Call (SCC), Southern Plains Network I&M (SOPN), Fire Program (FP; LAMR=Lake Meredith), Cultural Resource Protection Program (CRPP), Exotic Plant Management Team (EPMT), Federal Lands Recreation Enhancement Act (FLREA), Non-NPS Partnership (General/No specified partner), National Oceanic and Atmospheric Administration (NOAA), Colorado State University (CSU)

| Comprehensive Strategies/Activities | Timing | Priority | Funding Source | Compliance Needed? |
|---|---|---|---|---|
| Archeological resources, and other physical remains associated with the massacre | | | | |
| Archeological sites monitored and managed | O | 1 | ONPS | None for monitoring. Possibly Yes for management actions. |
| Conduct archeological investigations of the massacre and pre- and post-massacre sites | M | 2 | ONPS | Yes |
| Museum collections artifacts, and archives | | | | |
| Develop a research/storage facility in Eads, CO | M | 1 | TBD | Yes |
| Support the regional storage facility by partnering with the Koshare Museum in La Junta, CO | O | 1 | Non-NPS Partnership | No |
| Complete and implement scope of collections plan | S/O | 1 | ONPS | No |
| Develop a collection management plan | M | 1 | TBD | No |
| Oral Histories | | | | |
| Develop and implement an oral history program to enhance the research center collection | L/O | 1 | ONPS | No |
| Incorporate the oral histories into the long-range interpretive plan | O | 2 | ONPS | No |
| Repatriation Site (cemetery) | | | | |
| Continue current management and monitoring processes | O | 1 | ONPS | No |
| Develop and implement a cemetery management plan | M/O | 1 | ONPS | No |
| Intangible spiritual qualities of the landscape (sense of place) | | | | |
| Develop and implement a soundscape management plan | L/O | 2 | SCC | Yes |
| Work with surrounding communities to improve night skies | O | 2 | SCC | No |
| Incorporate cultural interpretation of night skies into the long-range interpretive plan | O | 3 | ONPS | No |
| Work with surrounding communities and energy providers to maintain viewsheds | O | 2 | ONPS, Non-NPS Partnerships | No |
| Human remains and cultural items subject to NAGPRA still in the ground and those that may be repatriated | | | | |
| Continue current management process and practices | O | 1 | ONPS | No |

| Comprehensive Strategies/Activities | Timing | Priority | Funding Source | Compliance Needed? |
|---|---|---|---|---|
| Research funding sources for non-NAGPRA burials | O | 1 | ONPS | No |
| Memorialization and commemoration activities such as spiritual healing runs, and places that have been blessed or where ceremonies have occurred or do occur | | | | |
| Develop policy and guidance (with tribal consultation) for determining appropriate uses | L/O | 1 | ONPS | No |
| Ethnographic resources | | | | |
| Complete the ethnographic resource inventory and mapping | L | 2 | CRPP | No |
| Develop parameters for culturally proprietary concerns (in consultation with tribes) | M | 2 | ONPS | No |
| Cultural landscapes and viewsheds | | | | |
| Work with surrounding communities and energy providers to maintain viewsheds | O | 2 | ONPS | No |
| Complete a cultural landscape inventory and cultural landscape report | M | 1 | CRPP | No |
| Maintain cultural landscape in accordance with the cultural landscape report | O | 2 | ONPS | TBD (ESF to determine compliance need) |
| 1950 monument and overlook | | | | |
| Maintain and monitor the monument's integrity | O | 1 | ONPS | No |
| Incorporate interpretation of the monument and era perspective into the long-range interpretive plan | O | 1 | ONPS | No |
| Maintain park policy on offerings | O | 1 | ONPS | No |
| Historic canal | | | | |
| Culvert construction | M | 1 | SCC | Yes |
| Complete photo documentation / remote sensing data of the canal to establish a baseline | S | 2 | CRPP | No |
| Determine national register eligibility | S | 2 | ONPS | No |
| Incorporate interpretation of the canal and post-massacre era perspective into the long-range interpretive plan | O | 3 | ONPS | No |
| Post-massacre land use and associated history | | | | |
| Document for, and incorporate into, the long-range interpretive plan (including exploring ties to regionally linked heritage sites) | M | 2 | ONPS, CRPP | No |
| Determine site conditions | L | 2 | CRPP, SCC | No |

| Comprehensive Strategies/Activities | Timing | Priority | Funding Source | Compliance Needed? |
|---|---|---|---|---|
| Wetlands plant and animal habitat | | | | |
| Identify a schedule for reviewing site conditions in search of non-native plants; Modify the vegetation management plan to accommodate eradication of non-native plants. | O | 1 | EPMT, SCC, SOPN | Yes |
| Assess functional condition. Use the pollen study to create a reference condition of plant species composition and use best professional judgment for defining plant contribution and distribution for the wetlands system. Define how to achieve reference conditions which will be the desired conditions in a vegetation management plan. | S | 2 | SCC | No |
| Identify and remove non-native plant and animal species. | S | 2 | SCC, SOPN | No |
| Riparian plant and animal habitat | | | | |
| Monitoring of cottonwood gallery (included in vegetation management plan) | O | 1 | ONPS | No |
| Assess functional condition | S | 2 | SCC | No |
| Monitor cottonwood health, age structure, and distribution (included in vegetation management plan) | S | 1 | SCC, SOPN | No |
| Use the pollen study to create a reference condition of plant species composition and use best professional judgment for defining plant distribution for the riparian system. Based on the reference condition, modify the vegetation management plan to achieve reference conditions which will be the desired conditions. | L | 2 | SOPN, ONPS, FLREA, SCC | Yes |
| Thin hazard trees. Incorporate tribal assistance in the monitoring and thinning of hazard trees (included in vegetation management plan) and modify the vegetation management plan. | O | 1 | ONPS | Yes |
| Manage woody debris in the riparian zone. Reduce the fuel load around the base of the cottonwood trees, clear debris from social trail areas within the floodplain, and redistribute the woody debris so as to enhance the effects of hydraulic flows in the creek channel and provide wildlife habitat in the floodplain | O | 3 | ONPS | Yes |
| Identify and remove non-native plant and animal species (included in vegetation management plan). | O | 1 | EPMT, SCC | Yes |

| Comprehensive Strategies/Activities | Timing | Priority | Funding Source | Compliance Needed? |
|---|---|---|---|---|
| Maintain healthy stands of cottonwoods of different age classes. Determine the average age difference between each existing stand of cottonwoods, define a tree planting schedule based on the average age difference, and plant saplings according to that age interval, and modify the vegetation management plan. | L | 1 | ONPS | Yes |
| Upland plant and animal habitat | | | | |
| Use best professional judgment to create reference conditions for upland plant species composition and plant distribution. Based on the reference condition, modify the vegetation management plan to achieve reference conditions which will be the desired conditions. Enhance the species composition and distribution of upland plants according to the vegetation management plan. | S | 1 | SCC | Yes |
| Identify and remove exotic non-native plant and animal species. | O | 1 | SOPN, EPMT | Yes |
| Prepare a sitewide vegetation management plan. Many of the strategies concerning plants and animals listed above will be implemented according to this plan | S | 2 | SCC | Yes |
| Delineate the extent of the existing prairie dog towns. Create and implement a prairie dog management plan. | M | 2 | SCC | Yes |
| Identify animal species that are preferred using best professional judgment. Determine if they are present on the site and their distribution and abundance. Evaluate the potential for reintroduction and/or utilization (grazing) of native species (such as ungulates and prairie chickens). | L | 3 | ONPS | No |
| Continue implementing the *Fire Management Plan*. | O | 3 | LAMR-FP | No |
| Topographic features | | | | |
| Identify and document baseline topography Maintain the natural evolution of topographic features. | O | 3 | ONPS | No |

| Comprehensive Strategies/Activities | Timing | Priority | Funding Source | Compliance Needed? |
|---|---|---|---|---|
| Hydrological and hydraulic conditions | | | | |
| Document the condition and use of the shallow aquifer (e.g., groundwater modeling, water rights issues, precipitation and forecast analysis, etc.) to establish a baseline condition. Evaluate groundwater elevations and fluctuations using monitoring data. Determine a negative or positive correlation between greater aquifer drawdown and site aquifer drawdown. If there is a positive correlation, work with upstream landowners and state agencies (Natural Resources Conservation Service county conservation districts), and CSU county extension office to mitigate drawdown impacts to park aquifer. | S | 1 | SCC | No |
| Restore natural drainage flow. Breech or culvert under the canal to allow major drainages to return to their former channels. | M | 1 | SCC | Yes |
| Restore creek crossing of County Road W in order to restore hydrologic and hydraulic conditions downstream | M | 1 | Nonfederal sources | No |
| Continue groundwater monitoring | O | 1 | ONPS, SCC | No |
| **Climate Change | | | | |
| Planning for climate change scenario to be integrated into development of the adaptation management plan/strategy | M | 1 | CCRP | Yes |
| Continue, expand, and integrate climate monitoring | O | 1 | ONPS, CSU, NOAA | Yes |

** Although it is not a fundamental resource value, the topic of climate change is included in the comprehensive strategies table because it needs to be addressed.

**TABLE 9. SAND CREEK MASSACRE NATIONAL HISTORIC SITE - COMPREHENSIVE STRATEGIES IMPLEMENTATION TIMELINE**

| High Priority | Medium Priority | Low Priority |
|---|---|---|

| Related FRV | Comprehensive Strategies | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Archeological Resources and Artifacts | | | | | | | | | | | |
| | Archeological sites monitored and managed | | | | | | | | | | | $125,000 |
| 1a-b, 4a | Conduct archeological investigations of the massacre and pre- and post-massacre sites | | | | | | | | | | | $150,000 |
| 1a-b, 4a | Develop a research/storage facility in Eads, Colorado | | | | | | | | | | | $1,800,000 |
| | Support regional storage facility by partnering with the Koshare Museum in La Junta, Colorado | | | | | | | | | | | $250,000 |
| 1a-b, 4a | Update Scope of Collections Plan - every third year | | | | | | | | | | | $20,000 |
| 1a-b, 4a | Implement scope of collections plan | | | | | | | | | | | $35,000 |
| 1a-b, 4a | Develop a collection management plan | | | | | | | | | | | $60,000 |
| 1a-b, 4a | Develop an oral history program | | | | | | | | | | | $125,000 |
| | Implement oral history program | | | | | | | | | | | $450,000 |
| 1a-b, 2b, 3a-e, 4a | Incorporate the oral histories into the interpretive program | | | | | | | | | | | $40,000 |
| | Continue current management and monitoring processes | | | | | | | | | | | $75,000 |
| 1a-b, 2b, 3a-e, 4a | Develop a cemetery management plan | | | | | | | | | | | $60,000 |
| 1a-b, 4a | Implement a cemetery management plan | | | | | | | | | | | $180,000 |
| 1a-b, 4a | Develop a soundscape management plan | | | | | | | | | | | $30,000 |
| | Implement a soundscape management plan | | | | | | | | | | | $50,000 |

| Related FRV | Comprehensive Strategies | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1a-b, 4a | Work with surrounding communities to improve night skies | | | | | | | | | | | $50,000 |
| | Incorporate cultural interpretation of night skies into the interpretive program | | | | | | | | | | | $5,000 |
| | Work with surrounding communities and energy providers to maintain viewsheds | | | | | | | | | | | $50,000 |
| | Continue current human remains management practices and processes | | | | | | | | | | | |
| 1a-b, 3a-c, 4a, d-g | Research funding sources for non-NAGPRA burials | | | | | | | | | | | $10,000 |
| 1a-b, 3a-c, 4a, d-g | Develop policy and guidance (with tribal consultation) for determining appropriate memorialization and commemoration activities | | | | | | | | | | | $60,000 |
| 1a-b, 2c, 3d, 4e | Compile the ethnographic resource inventory and mapping | | | | | | | | | | | $150,000 |
| 4a-g | Complete a cultural landscape inventory and a cultural landscape report including resources associated with post-massacre history | | | | | | | | | | | $100,000 |
| | Maintain cultural landscape in accordance with the recommendations of the cultural landscape report | | | | | | | | | | | $30,000 |
| 4a-g | Maintain and monitor the site's integrity and continue site policy on offerings | | | | | | | | | | | $50,000 |
| 1a-b, 4a-g | Complete photo documentation/remote sensing data of the canal to establish a baseline condition | | | | | | | | | | | $10,000 |
| 1a-b, 4a-g | Complete national register nomination of canal | | | | | | | | | | | <$1,000 |
| Natural Resources | | | | | | | | | | | | |
| | Prepare vegetation management plan | | | | | | | | | | | $100,000 |
| | Implement vegetation management plan - disturbed lands restoration, native plant management, invasive plant management | | | | | | | | | | | $30,000 |

| Related FRV | Comprehensive Strategies | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Develop prairie dog management plan | | | | | | | | | | | $100,000 |
| | Implement prairie dog management plan | | | | | | | | | | | $10,000 |
| | Native plant and animal species reintroduction study | | | | | | | | | | | $100,000 |
| 1a-b, 4d-e, 2a, 3d-e | Continue implementation of fire management plan | Ongoing | | | | | | | | | | $200,000 |
| | Identify and document baseline topography | | | | | | | | | | | $100,000 |
| | Maintain natural evolution of topographic features | | | | | | | | | | | $160,000 |
| 1a-b, 3b, 4e | Install flood monitoring equipment | | | | | | | | | | | $10,000 |
| 1a-b, 3b, 4e | Monitor flooding | | | | | | | | | | | $35,000 |
| | Conduct study of upstream groundwater drawdown | | | | | | | | | | | $200,000 |
| | Work with upstream landowners, state agencies, and CSU county extensions to manage impacts of drawdown | | | | | | | | | | | $100,000 |
| 1a-b, 3a-d, 4d-g | Initiate climate change monitoring | | | | | | | | | | | $100,000 |
| | Develop adaptation management strategy/planning and incorporate climate change scenario planning | | | | | | | | | | | $100,000 |
| | Update national heritage library nominations | | | | | | | | | | | $25,000 |

## EXPERT REVIEW OF COMPREHENSIVE STRATEGIES

Conducted by individuals outside of the national park system unit or agency who have expert knowledge of a particular discipline, expert review ensures comprehensive strategies developed by the unit are the best management strategies possible based on current science and scholarship. The rationale for expert review suggests that an individual author or team may not identify every flaw in a complicated comprehensive strategy. Expert review increases the probability that weaknesses will be identified and corrected.

Although the resource stewardship strategy does not outline implementation procedures, it does lay out the methodical process necessary to improve or maintain current conditions. Expert reviewers are asked to look at methods for determining current conditions, measuring changes in those conditions, and the logical sequence of events needed to attain desired conditions. They then ascertain whether the comprehensive strategies are credible, feasible, and practicable given the current state of resource management. A list of the expert reviewers for this resource stewardship strategy is located in appendix A.

## FUNDING THE COMPREHENSIVE STRATEGIES

The resource stewardship strategy is designed to help unit management identify, prioritize, and fund resource management projects. Similar to a park asset management plan, the resource stewardship strategy documents needs and allows the park to develop project management information system statements and operations formula system requests corresponding to unit priorities, ultimately improving the unit's performance.

The resource stewardship strategy provides accountability of funds used for attaining and maintaining desired conditions as well as projections of necessary project and base funding. Although comprehensive strategies can be plotted for a 20-year time period, financial planning is difficult to accomplish over a similar time span. Project planning is generally completed for a 5-year span.

## FINALIZATION

The resource stewardship strategy is reviewed by experts for scientific/scholarly credibility and reviewed by the unit superintendent for approval prior to implementation. The resource stewardship strategy can be implemented upon final signature approval of the document. The document will be used as the guide for following a logical sequence of activities to attain and maintain desired resource conditions. The environmental planning process will be initiated in developing all implementation plans and decisions that have potential for impacting the resource or environment.

## IMPLEMENTATION — TRACKING AND EVALUATING ANNUAL PROGRESS

This resource stewardship strategy shall be reviewed annually to track and document progress. Additional information on resources, activities, and resource conditions shall be entered into annual addenda to this resource stewardship strategy. Comprehensive strategies within this document may have minor changes completed to accommodate unpredictable situations, but if a need for major change to the logical sequence and flow of activities occurs, the site would consider amending or rewriting the resource stewardship strategy.

The budget section of this resource stewardship strategy shall be reviewed and updated annually with actual program costs and estimates of future program needs. All materials shall be filed in an annual addendum.

Materials to include in addenda:

- Accomplishments from activities in comprehensive strategies and related

project and compliance documentation citations.

- Activities within the comprehensive strategies that were not accomplished and alternate plans to achieve objectives.
- Additional scholarly or scientific work or data that affect comprehensive strategies.
- General evaluation of progress toward attaining/maintaining desired conditions.
- Revised budget section.

Furthermore, if Microsoft Project is used to manage projects that are a part or an outcome of this resource stewardship strategy, then individual project files (including staffing resources, schedules, and budgets) must be managed on a routine basis.

# Appendixes



# APPENDIX A INTERDISCIPLINARY TEAM AND EXPERT REVIEWERS

## INTERDISCIPLINARY TEAM

### Core Team

Rhonda Brewer, Museum Curator, BEOL
Alden Miller, Superintendent, SAND
Christina Miller, Natural Resource Specialist/Planner, Denver Service Center
Fran Pannebaker, Chief of Resource Management, BEOL
Alexa Roberts, Superintendent, BEOL
Matt Safford, Natural Resource Specialist/Planner, Denver Service Center
Tom Thomas, Cultural Resource Specialist/Project Manager, Denver Service Center
Karl Zimmermann, Chief of Resource Management, SAND

### Extended Team

Rob Bennetts, Southern Plains Network I&M Program Manager, NPS
Patrick Malone, Project Manager, Denver Service Center, NPS
Gary Mason, National RSS Program Manager, Natural Resource Stewardship and Science Directorate (Washington, D.C.), NPS
Bonnie Semro, Regional RSS Coordinator for Natural Resources, Intermountain Region

### Subject Matter Experts

Pete Biggam, Soil Scientist, NRPC Geologic Resources Division
Christine Landrum, Ethnographer, Tribal Affairs, Intermountain Region
Kevin Noon, Wetlands Scientist, NRPC Water Resources Division

### Preparers

Christina Miller, Natural Resource Specialist/Planner, Denver Service Center
Matthew Safford, Natural Resource Specialist/Planner, Denver Service Center
Tom Thomas, Cultural Resource Specialist/Project Manager, Denver Service Center

# APPENDIX B LIST OF WORKSHOP PARTICIPANTS

**Indicators, Target Values, & Comprehensive Strategies Workshop Participants**
**June 7-10, 2010**

| Name | Title/Discipline | Agency/Organization | Email |
|---|---|---|---|
| Alden Miller | Superintendent | NPS-SAND | Alden_Miller@nps.gov |
| Christina Miller | Natural Resource Specialist/Planner | NPS-DSC | Christina_Miller@nps.gov |
| Christine Landrum | Management Assistant/Ethnographer – Tribal Affairs | NPS-IMRO | Christine_Landrum@nps.gov |
| Fran Pannebaker | Chief of Resources | NPS-BEOL | Fran_Pannebaker@nps.gov |
| Karl Zimmermann | Chief of Resources | NPS-SAND | Karl_Zimmermann@nps.gov |
| Kevin Noon | Wetlands Scientist | NPS-NRPC-WRD | Kevin_Noon@nps.gov |
| Linda Kerr | Fire Ecologist | NPS-IMRO | Linda_Kerr@nps.gov |
| Matt Safford | Natural Resource Specialist/Planner | NPS-DSC | Matthew_Safford@nps.gov |
| Patrick Malone | Project Manager/Natural Resource Specialist | NPS-DSC | Patrick_Malone@nps.gov |
| Rob Bennetts | Southern Plains Network I&M Program Manager | NPS-WASO/CAVO | Robert_Bennetts@nps.gov |
| Rhonda Brewer | Museum Curator | NPS-BEOL | Rhonda_Brewer@nps.gov |
| Tom Thomas | Project Manager/Cultural Resource Specialist | NPS-DSC | Tom_Thomas@nps.gov |

# APPENDIX C VITAL SIGNS

| SOPN Protocol | Vital Sign | Monitoring Objectives |
|---|---|---|
| Air and Climate | Wet and Dry Deposition<br>Weather Patterns | – Evaluate impacts of climate change, drought cycles, thunderstorm and winter storm activity, dust from county road traffic, and energy development. |
| Geology and Soils | Soil Structure and Chemistry*<br>Soil Movement | – Determine trends in annual soil respiration measurements.<br>– Detect changes in ecosystem carbon balance.<br>– Determine status and annual trends in soil cover, aggregate stability, compaction and erosion. |
| Water Quality and Quantity | Groundwater Levels*<br>Water Quantity*<br>Flooding Processes<br>Core Parameters*<br>Aquatic Invertebrates | – Determine the long-term trends in groundwater quantity levels.<br>– Document changes in hydrologic regime associated with hydrological modifications (e.g., dams, diversions) in the SOPN. |
| Biological Integrity | Early Detection Exotic Plants*<br>Fire Ants<br>Insect Pests and Outbreaks<br>Plant Pathogens<br>Wetlands Vegetation Communities*<br>Upland Spring Communities<br>Grassland Vegetation Communities*<br>Native Pollinators<br>Moths and Butterflies<br>Fish Communities<br>Amphibian Communities<br>Bird Communities*<br>Ungulates<br>Small Mammal Communities<br>Black-tailed Prairie Dogs<br>Lesser Prairie Chicken | – Detect incipient populations and new introductions of invasive exotic plant species.<br>– Define the trends in status of the vegetation species composition, structure, and diversity of remnant, disturbed, and restored prairies.<br>– Determine trends in cool season (C3) vegetation versus warm season (C4) vegetation. Determine long-term trends in invasive woody species abundance and distribution.<br>– Determine long-term trends in exotic plant abundance and distribution.<br>– Compare long-term trends in areas where exotic plants and woody invasives are purposefully managed.<br>– Identify significant temporal changes in composition and abundance of bird communities at SOPN parks during the breeding season.<br>– Improve our understanding of breeding bird and habitat relationships and the effects of management actions such as grazing and prescribed fire regimes on bird populations. |
| Human Use | Human Demographics*<br>Effects of Visitors on Natural Resources | – Detect trends in human demographic data in the vicinity of SOPN parks. |
| Landscapes | Fire and Fuel Dynamics*<br>Landscape Dynamics* | – Track the location, extent, timing, and severity of wildland and prescribed fires in SOPN parks.<br>– Track successional effects of fire and burn severity on: the species composition and structure of vegetation; soil temperature and moisture; and animal community composition.<br>– Determine long-term trends in land-use change within and adjacent to SOPN parks. |

* Vital signs monitored at Sand Creek Massacre National Historic Site

Source: Southern Plains Network Vital Signs Monitoring Plan, Phase 2 Report (NPS 2006)

# APPENDIX D CULTURAL RESOURCE ASSETS AND CURRENT CONDITION ASSESSMENTS

| Resource or Asset | Structure Number | LCS Condition | FMSS Condition (based on FCI) |
|---|---|---|---|
| 1950 Battle Ground Marker | LCS#: 660870<br>FMSS#: 112245 | Good | 93 |
| Chivington/Brandon Canal | LCS#: 652944 | Fair | Not yet in FMSS |

| Cultural Landscape | CLI Condition |
|---|---|
| Cultural Landscape Inventory assessment has not been done yet (expected to begin in FY 2011) | |

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[Items in red are from the Interim Site Management Plan]


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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public land and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging Stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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