



# Manassas National Battlefield Park

## Natural Resource Condition Assessment—SUMMARY

### *National Capital Region*



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## Natural Resource Condition Assessment

### National Capital Region

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This document has adapted the Executive Summary of the Natural Resource Condition Assessment report that the University of Maryland Center for Environmental Science produced in collaboration with staff from Manassas National Battlefield Park and the National Capital Region Network Inventory & Monitoring Program.

The full 142-page report can be accessed via <https://irma.nps.gov/App/Reference/Profile/2172113> and <http://www.ian.umces.edu/press>.

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#### ON THE COVER

Manassas National Battlefield Park has been selected as an Audubon Important Bird Area.  
 Jane Thomas, IAN.

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U.S. Department of the Interior  
 National Park Service  
 Natural Resources Stewardship and Science  
 Fort Collins, Colorado

#### BACKGROUND AND CONTEXT

Manassas National Battlefield park was established in 1940 to preserve the scene of two major Civil War battles, the Battle of First Manassas (First Bull Run) and the Battle of Second Manassas (Second Bull Run). Located a few miles north of the prized railroad junction of Manassas, Virginia, the peaceful countryside there bore witness to clashes between the armies of the north and south in 1861 and 1862.

During the Civil War, Manassas was a patchwork of open fields and woodlots scattered across gently rolling hills. Situated in the growing Washington, DC metropolitan area, the park faces challenges from nearby development that threatens both natural and cultural resources. Yet, the park's wartime character is still largely preserved and the park continues to be a valuable player in telling the story of pivotal events in the nation's history, as well as providing precious natural space in an increasingly urban area.

The park is charged with maintaining the property in historical land use to preserve the view of the battle. Manassas National Battlefield Park covers 2,052 ha (5,071 acres) and is located in Fairfax and Prince William Counties in northern Virginia. A heavily used park, visitation to Manassas has declined over the past decade, from 815,000 in 1999 to 595,000 in 2008.

In the face of encroaching development and with its diverse landscape including forests, wetlands, waterways, and grasslands, the park represents a sanctuary for many plant and animal species. A wide range of mammals, birds, amphibians, reptiles, and threatened plant species make their home in the park.

The first step in framing this Natural Resource Condition Assessment for Manassas National Battlefield Park was to define the key habitats within the park. Habitats 'managed for natural resource values' were the natural habitats (forests, wetlands and waterways, warm-season grasslands) and were assessed for ecological value, while habitats 'managed for agricultural values' (croplands and pastures) were assessed for being the most ecologically sustainable croplands and pastures possible.



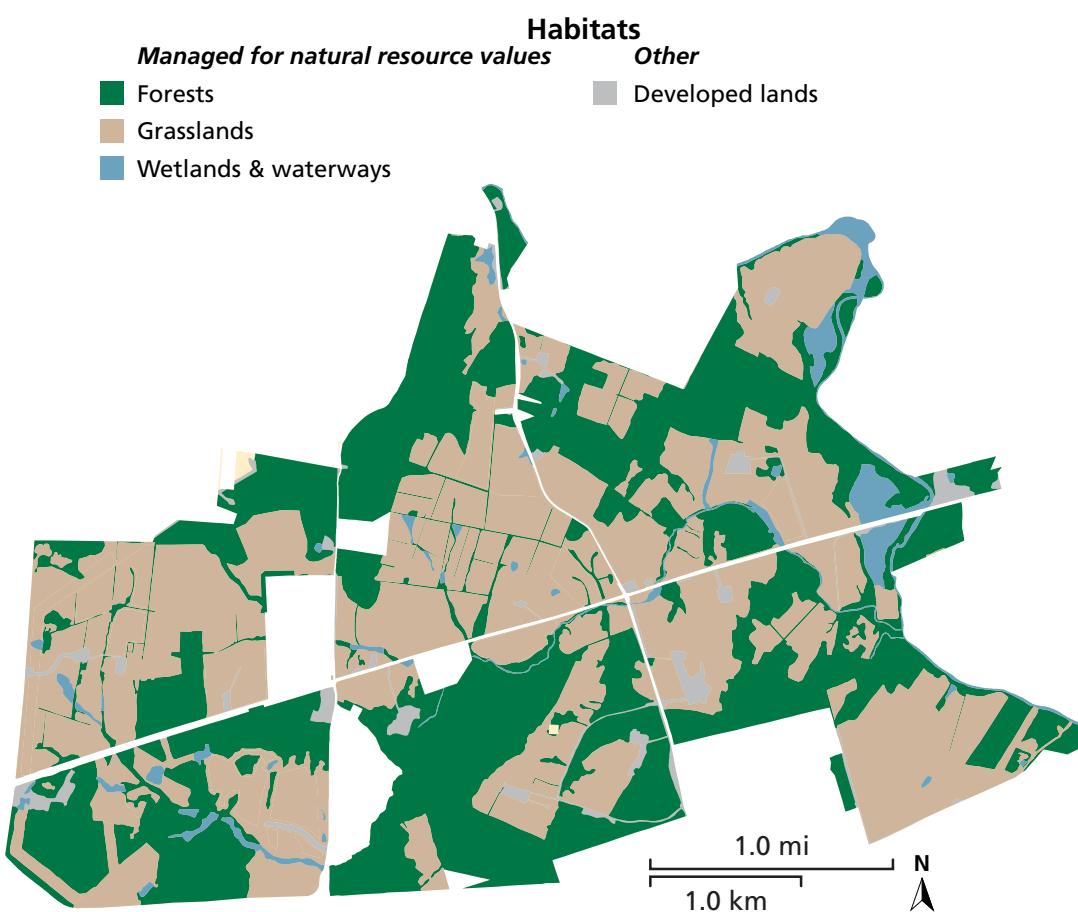
Vernal pool in Manassas National Battlefield Park.

NPS/Tom Paradis

## APPROACH

A habitat framework was used to assess natural resource condition within Manassas National Battlefield Park. After determining key habitats, potential indicators to inform the current condition of these habitats were identified and data sourced. Reference conditions were determined based on published scientific literature, federal or state guidelines, and historic data as appropriate. Attainment of reference condition was assessed for each metric and summarized by habitat and ultimately for the whole park. Based on these key findings, management recommendations were developed.

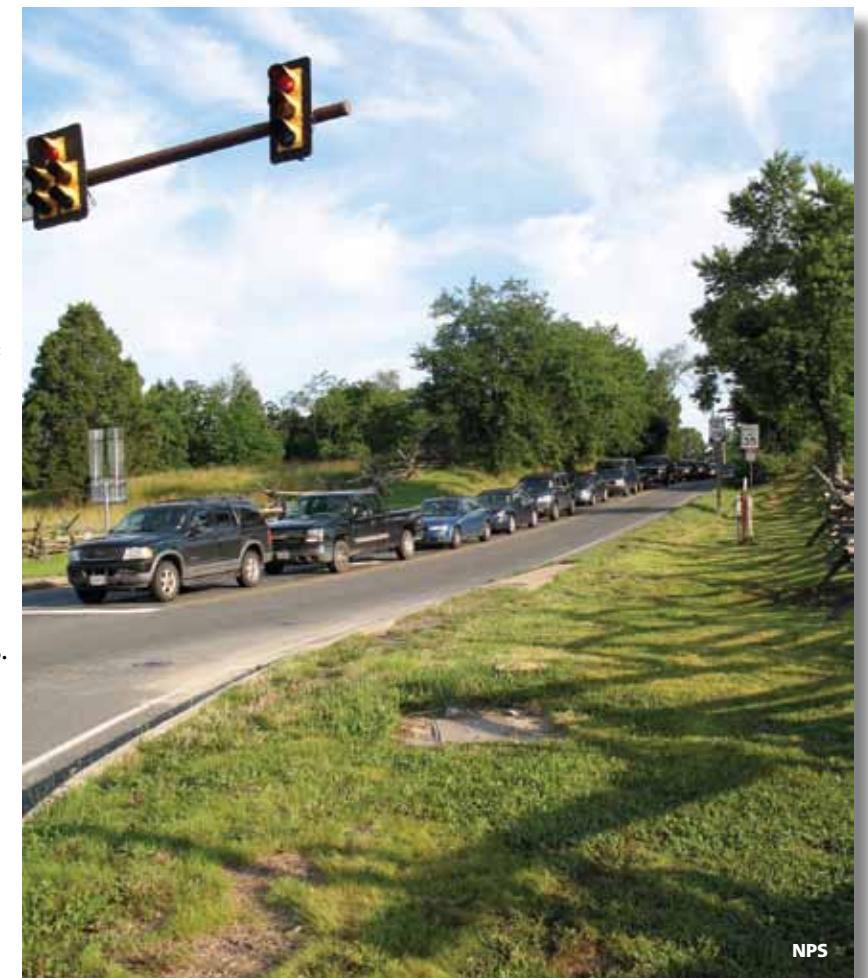
Map of major habitat types in Manassas National Battlefield Park.



## FEATURES OF MANASSAS NATIONAL BATTLEFIELD PARK

Manassas National Battlefield Park consists of the rolling hills and relatively low relief typical of the central Piedmont physiographic province. Soils in the park are generally strongly acidic, well-drained loams. In the western half of the park, the sedimentary rocks have been intruded by igneous dikes and sills of diabase. Soils derived from diabase are typically loamy, very rich in clay minerals, and have limited permeability (Figure 2.7). These diabase-derived soils support many rare grassland species, and the other soils in the park support eight different types of forest in Manassas National Battlefield Park. The diverse ecosystems and habitats of the park are also a direct result of the geology, with wetlands, meadows, hill slopes, and ridge tops.

The diverse forests of Manassas National Battlefield Park make up nearly half of its area. Eight different forest types have been identified within the park, ranging from early-successional Virginia pine (*Pinus virginiana*) stands to relatively mature oak-hickory and bottomland hardwood forests. There are several types of wetlands within Manassas National Battlefield Park. These areas are mostly comprised of freshwater forested/shrub wetland and the waterways themselves, as well as small areas of freshwater emergent wetlands and freshwater ponds. Managed to maintain historic scenes and land use patterns that existed at the time of the battle, Manassas National Battlefield Park contains approximately 870 ha (2,150 acres) of managed grasslands and fields, approximately 240 ha (600 acres) of which have recently been restored to native warm-season grasses. One of the park's goals is to promote better quality grassland habitat, for birds and other species that utilize grasslands, while still maintaining the agricultural heritage of the park. This is primarily achieved through the conversion of cool-season grasslands to warm-season grasslands.



Traffic in Manassas National Battlefield Park.

## THREATS TO MANASSAS NATIONAL BATTLEFIELD PARK

Manassas National Battlefield Park faces a number of resource management issues, many of which are related to surrounding land use. Encroaching development reduces the habitat available for native flora and fauna. Between 1990 and 2000, population density in the vicinity of the park has continued to increase. Not surprisingly, housing density also increased between 2000 and 2010, with increases occurring in all directions. Road density is also highest in these areas. The area surrounding Manassas also has a low proportion of protected areas. Excessive numbers of white-tailed deer use the park as a refuge, resulting in overgrazing of native flora, particularly tree seedlings. Exotic and invasive plants compete with native species, while insect and other pests cause damage to forest trees. On a regional scale, degraded air quality associated with vehicular traffic also affects aquatic habitats and sensitive species, and continued road development increases stormwater runoff of sediments and pollutants into the rivers.

Conceptual diagram illustrating the major resource values and stressors in Manassas National Battlefield Park.

**Resource values****Resource stressors**

Conceptual framework for desired and degraded condition of the three habitats managed for natural resource values present within Manassas National Battlefield Park, indicating metrics to track status of condition (at right and on facing page).

**FORESTS**

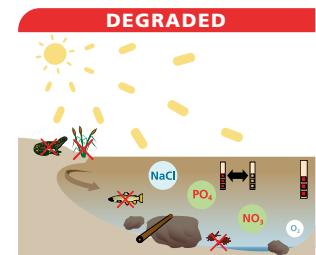
Degraded forest has high cover of exotic plants , large deer populations , and high % of impervious surface . Native seedling regeneration and diversity of forest-dwelling bird species are low in patchy forest with high occurrence of insect pests .

**DEGRADED**

INDICATORS	high	low
Cover of exotic plants		
Presence of insect pests		
Native tree seedling regeneration		
Forest dwelling bird diversity		
Deer density		
Impervious surface		
Forest interior area		
Forest connectivity		

**DESIRED**

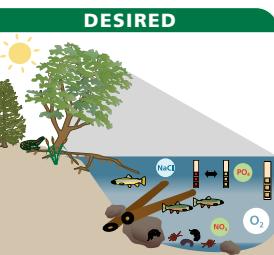
Desired forest has low cover of exotic plants , small deer populations , and low % of impervious surface . Native seedling regeneration and diversity of forest-dwelling bird species are high in contiguous forest with low occurrence of insect pests .

**WETLANDS & WATERWAYS**

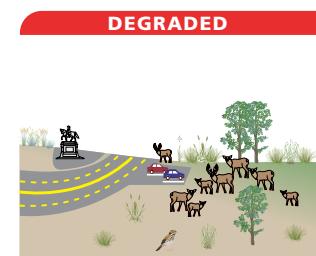
Degraded wetlands have eroded streambanks with no shade , little sheltering debris , and high nutrients and salinity , and acidic water with low buffering capacity , resulting in turbid water , low oxygen levels , and low populations of fish , amphibians , benthic invertebrates .

**DEGRADED**

INDICATORS	extreme	pH	neutral
Dissolved oxygen			
Water temperature			
Acid neutralizing capacity			
Salinity			
Nitrate			
Phosphate			
Benthos			
Fish			
Physical habitat			
Amphibians			



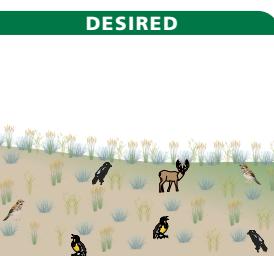
Desired wetlands have intact streambanks with shade and sheltering roots and debris , low nutrients and salinity , not acidic and with high buffering capacity , resulting in high oxygen , clear water , and high populations of fish , amphibians , benthic invertebrates .

**DESIRED****GRASSLANDS**

Degraded grasslands have high deer populations , high % of impervious surface , and low % of warm-season species . Grassland bird diversity is low in grasslands that are patchy and small in area .

**DEGRADED**

INDICATORS	high	low
Deer density		
Impervious surface		
Grassland bird diversity		
Grassland interior area		
Contiguous grassland area		
Warm-season species		

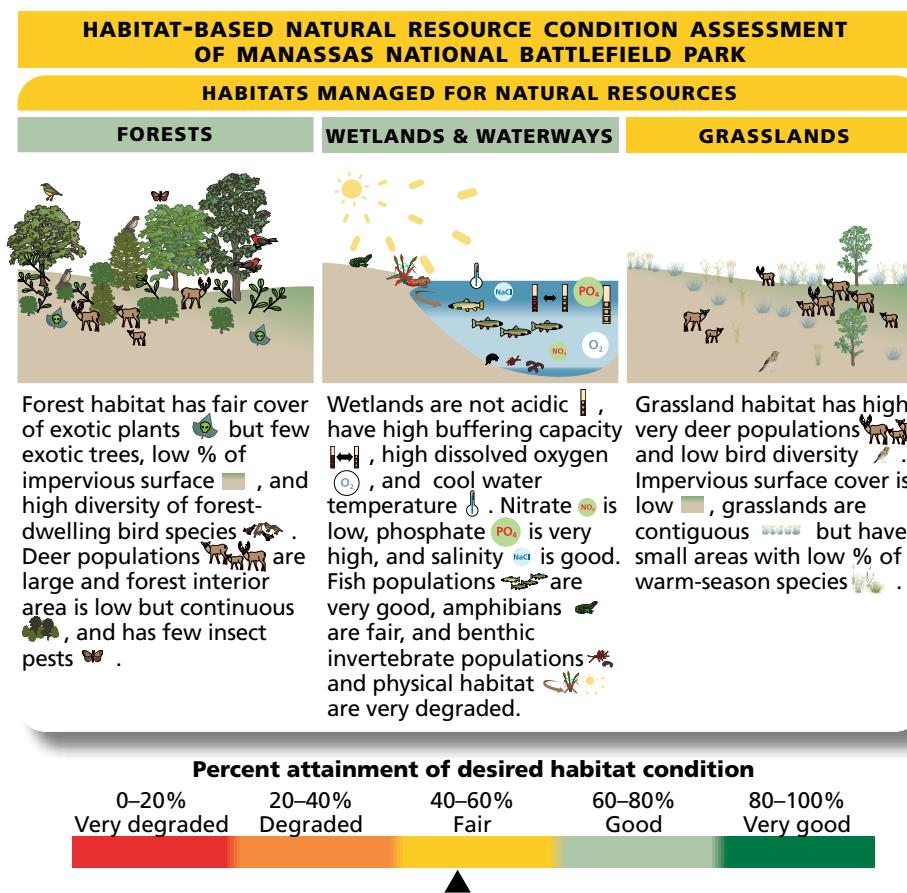


Desired grassland habitat has small deer populations and low % of impervious surface , and high % of warm-season species . Grassland bird diversity is high in grasslands that have a lot of interior area and are large in total size .

**DESIRED**

## CURRENT CONDITION OF NATURAL RESOURCES IN MANASSAS NATIONAL BATTLEFIELD PARK

Overall, the natural resources of Monocacy National Battlefield were assessed to be in good condition. Habitats managed for agricultural values were in good condition overall, with pasture lands in very good condition and croplands in good condition. Habitats managed for natural resource values were in fair condition overall, with forests and wetlands and waterways in fair condition and grasslands in degraded condition.



Results of habitat-based condition assessment of Manassas National Battlefield Park.

Habitat	Area (ha)	Score (%)	Current condition	Area-weighted score (%)
Forests	806	62	Good	
Wetlands and waterways	62	64	Good	
Warm-season grasslands	871	48	Fair	55 Fair

**Forests:** Key findings, management implications, and recommended next steps for forest habitat in Manassas National Battlefield Park.

Key findings	Management implications	Recommended next steps
<b>Forests</b>		
• Deer overpopulation reducing forest regeneration capacity	• Increased herbivory reducing desired plant and bird species • More road collisions	• Implement deer population control measures
• Presence of exotic plants	• Displacement of native species, reducing biodiversity	• Early detection • Exotic control measures (spraying and mechanical) • Prioritize control strategies
• Well-connected forest but with small patch sizes/limited interior area	• Acts as a refuge for some forest species, but limited habitat value for interior dwelling species of birds	• Minimize stressors • Minimize fragmentation (roads, structures, trails) • Maintain size, especially of larger patches

**Wetlands and waterways:** Key findings, management implications, and recommended next steps for wetland and waterway habitat in Manassas National Battlefield Park.

Key findings	Management implications	Recommended next steps
<b>Wetlands and waterways</b>		
• Bull Run and tributaries have degraded water quality (phosphate)	• Affects stream flora and fauna • Reduces quality of visitor experience	• Reduce non-point source nutrient inputs from watershed (partnership with agencies) • Continue riparian buffer establishment (woody or herbaceous, depending upon cultural resources/viewshed present) • Improve water quality
• Stream benthos (IBI) very poor	• Reduced biodiversity • Reduced support of higher trophic levels	
• Stream physical habitats vary from good to poor	• Affects riparian habitat and in-stream fauna (fish) • Affects park infrastructure via erosion	• Comprehensive assessment of stream Physical Habitat Condition

**Grasslands:** Key findings, management implications, and recommended next steps for grassland habitat in Manassas National Battlefield Park.

Key findings	Management implications	Recommended next steps
<b>Grasslands</b>		
• General lack of comprehensive data for grasslands	• Difficulties in assessing the health of grasslands	• Implement grassland monitoring, particularly diversity, invasive species, birds, mammals, and insects • Carry out a baseline grassland plant inventory
• Grassland areas are contiguous with poor interior area	• High potential habitat value for avian fauna and mammals (by decreasing potential predation)	• Remove tree lines where historically appropriate • Maintain size, especially of larger patches
• Poor cover of warm-season species	• Warm-season grasslands have higher habitat potential than cool-season species	• Increase proportion of warm-season grassland

**Air & Climate:** Data gaps, justification, and research needs for Air & Climate in Manassas National Battlefield Park.

Data gaps	Justification	Research needs
Air & Climate		
<ul style="list-style-type: none"> <li>Ecological thresholds (for atmospheric effects on water and grasslands—deposition of nitrogen, sulfur, and mercury)</li> </ul>	<ul style="list-style-type: none"> <li>Ecosystem impacts from deposition and human influence (acid rain and fertilization) unknown</li> </ul>	<ul style="list-style-type: none"> <li>Investigating habitat-specific effects</li> <li>Deposition impacts to wetlands and grasslands</li> <li>Prevailing wind patterns within the park</li> </ul>
<ul style="list-style-type: none"> <li>Park-scale air quality data</li> </ul>	<ul style="list-style-type: none"> <li>Need to implement park-specific management actions</li> </ul>	<ul style="list-style-type: none"> <li>Using transport and deposition models</li> <li>Calibrating with roadside data within the park</li> </ul>

**Water Resources:** Data gaps, justification, and research needs for Water Resources in Manassas National Battlefield Park.

Data gaps	Justification	Research needs
Water Resources		
<ul style="list-style-type: none"> <li>Stream channel morphology, and changes due to erosion</li> </ul>	<ul style="list-style-type: none"> <li>Biodiversity relies on maintenance of stable wetland morphology</li> </ul>	<ul style="list-style-type: none"> <li>Research engineering solutions to reduce water energy and erosion</li> </ul>
<ul style="list-style-type: none"> <li>Water quality, including groundwater</li> </ul>	<ul style="list-style-type: none"> <li>Degraded water quality reduces habitat value of wetlands for native flora and fauna</li> </ul>	<ul style="list-style-type: none"> <li>Identify nutrient sources, especially phosphate, as this nutrient is consistently high throughout the region and sources are non-point</li> </ul>
<ul style="list-style-type: none"> <li>Detailed wetland delineation</li> </ul>	<ul style="list-style-type: none"> <li>In this pervious karst landscape, all habitats are connected by water flows</li> </ul>	<ul style="list-style-type: none"> <li>Fine-scale mapping including surface and sub-surface flows</li> <li>'Groundwatershed' maps of flow throughout park</li> </ul>
<ul style="list-style-type: none"> <li>Nutrient and salt sources are poorly defined both within and outside the park</li> </ul>	<ul style="list-style-type: none"> <li>Need to know where to prioritize management actions</li> </ul>	<ul style="list-style-type: none"> <li>Tracers, models and budgets needed (inside and outside the park)</li> <li>Identify inputs (point and diffuse)</li> </ul>
<ul style="list-style-type: none"> <li>Comprehensive assessment of stream physical habitat condition</li> </ul>	<ul style="list-style-type: none"> <li>High spatial variability of condition</li> </ul>	<ul style="list-style-type: none"> <li>Mapping and assessing streambank condition</li> </ul>
<ul style="list-style-type: none"> <li>Watershed condition</li> </ul>	<ul style="list-style-type: none"> <li>Strong connectivity in water resources within the park to external stressors throughout the watershed</li> </ul>	<ul style="list-style-type: none"> <li>Work with watershed partners and agencies to assess watershed and stream condition</li> </ul>

**Biological Integrity:** Data gaps, justification, and research needs for Biological Integrity in Manassas National Battlefield Park.

Data gaps	Justification	Research needs
Biological Integrity		
<ul style="list-style-type: none"> <li>Bird community thresholds and management goals</li> </ul>	<ul style="list-style-type: none"> <li>The park contains increasingly rare habitat for neotropical and grassland birds</li> </ul>	<ul style="list-style-type: none"> <li>Inventory and monitor types of birds, particularly grassland birds, within the park</li> </ul>
<ul style="list-style-type: none"> <li>Acoustic and vibration monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Traffic vibrations and noise can impact bird populations</li> </ul>	<ul style="list-style-type: none"> <li>Monitor noise and vibrations and assess impacts to bird communities</li> </ul>
<ul style="list-style-type: none"> <li>Understanding grazing impacts on multiple habitats (grassland, cropland, pasture)</li> </ul>	<ul style="list-style-type: none"> <li>Intense herbivory impacts habitat structure and function</li> </ul>	<ul style="list-style-type: none"> <li>Impacts of different deer densities on different habitats, including establishing deer density thresholds</li> </ul>
<ul style="list-style-type: none"> <li>Importance of maintaining late successional warm-season grasslands</li> </ul>	<ul style="list-style-type: none"> <li>Grassland diversity can enhance diversity of birds, mammals and insect pollinators</li> </ul>	<ul style="list-style-type: none"> <li>Actively monitor effects of different grassland management actions, including burn strategy</li> </ul>
<ul style="list-style-type: none"> <li>Small mammal dynamics and populations in grasslands</li> </ul>	<ul style="list-style-type: none"> <li>Park contains increasingly rare grassland habitat important to declining populations of mammals dependent on early successional habitats</li> </ul>	<ul style="list-style-type: none"> <li>Inventory and monitor small mammals specific to grasslands</li> </ul>
<ul style="list-style-type: none"> <li>Grassland insect and pollinator populations and roles</li> </ul>	<ul style="list-style-type: none"> <li>Park contains increasingly rare grassland habitat</li> </ul>	<ul style="list-style-type: none"> <li>Inventory and monitor insects, particularly those that are important food sources for grassland birds</li> </ul>
<ul style="list-style-type: none"> <li>Sustainability of raptor populations and affects on grassland birds</li> </ul>	<ul style="list-style-type: none"> <li>Park contains increasingly rare grassland habitat</li> </ul>	<ul style="list-style-type: none"> <li>Inventory and monitor raptors that prey on neotropical and grassland birds</li> <li>Establish baseline for sound levels and types of sounds within park</li> </ul>

**Landscape Dynamics:** Data gaps, justification, and research needs for Landscape Dynamics in Manassas National Battlefield Park.

Data gaps	Justification	Research needs
Landscape Dynamics		
<ul style="list-style-type: none"> <li>Implications of external land use changes on park resources</li> </ul>	<ul style="list-style-type: none"> <li>Connectivity of ecological processes from park to watershed</li> </ul>	<ul style="list-style-type: none"> <li>Landscape analysis at multiple scales</li> </ul>
<ul style="list-style-type: none"> <li>Wetland corridor function</li> </ul>	<ul style="list-style-type: none"> <li>Needed for migration and movement of fauna</li> </ul>	<ul style="list-style-type: none"> <li>Assessment of current and potential use by fauna</li> </ul>
<ul style="list-style-type: none"> <li>Cultural requirements for tree heights</li> </ul>	<ul style="list-style-type: none"> <li>Vegetating streamsides needs to be carried out in a way that maintains cultural viewscapes</li> </ul>	<ul style="list-style-type: none"> <li>Assess maximum acceptable plant height and species</li> </ul>

