**Natural Resource Stewardship and Science** 



# Antietam National Battlefield Natural Resource Condition Assessment—SUMMARY

National Capital Region



# Antietam National Battlefield Natural Resource Condition Assessment

National Capital Region

Jane Thomas, Tim Carruthers, Bill Dennison Integration & Application Network University of Maryland Center for Environmental Science PO Box 775 Cambridge, MD 21613

Mark Lehman, Megan Nortrup, Patrick Campbell National Capital Region Inventory & Monitoring National Park Service 4598 MacArthur Blvd NW, Washington, DC 20007

Ed Wenschhof, Joe Calzarette, Debbie Cohen, Lindsay Donaldson, Andrew Landsman Antietam National Battlefield National Park Service PO Box 158 Sharpsburg, MD 21782

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 Antietam National Battlefield and the National Capital Region Network Inventory & Monitoring Program.

The full 160-page report can be accessed via *https://irma.nps.gov/App/Reference/Profile/2172109* and *http://www.ian.umces.edu/press*.

#### ACKNOWLEDGEMENTS

Marian Norris, Geoff Sanders, John Paul Schmit, and NPS National Capital Region Inventory & Monitoring, who provided data support. John Howard, Superintendent at Antietam National Battlefield. Holly Salazer, Air Resources Coordinator, Northeast Region for advice on air quality metrics. Jeff Runde, Crater Lake National Park, for assistance with spatial metrics. Staff at the Center for Urban Ecology who assisted with data sourcing, scoping, and proofing.

#### ON THE COVER

Burnside Bridge in Antietam National Battlefield. NPS NCRN I&M.

June 2011

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

#### **BACKGROUND AND CONTEXT**

Antietam National Battlefield was established by Act of Congress on August 30, 1890 to commemorate the Battle of Antietam fought on September 17, 1862. The battle is considered by many historians to be one of the most crucial battles of the Civil War and the turning point against the Confederacy. The scene at Antietam today is essentially as it was in 1862—a collection of farms and farmlands in a rural setting. The park is charged with maintaining the property in historical land use to preserve the view of the battle. Antietam National Battlefield covers 1,320 ha (3,263 acres) and is located in southern Washington County in western Maryland. Visitation to Antietam has been increasing over the past decade, with nearly 353,000 visitors recorded 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 Antietam National Battlefield 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.



Antietam National Battlefield has a rich assembly of cultural resources.

#### **APPROACH**

A habitat framework was used to assess natural resource condition within Antietam National Battlefield. 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 Antietam National Battlefield.



#### FEATURES OF ANTIETAM NATIONAL BATTLEFIELD

Antietam consists primarily of broad, rolling valleys. Limestone underlying most of the park's forests and fields results in a karst topography of springs, intermittent streams, and sinkholes. The soils of the battlefield are generally acidic, strongly leached, and highly or potentially highly erodible. Much of the battlefield has been used as farmland for well over a century.

Agriculture is the most prominent land use within the park boundary and a variety of farming activities take place. The farms range in size and are a mix of federally owned lands leased to private farmers, privately owned farmed lands, and privately owned farmed lands with easements held by the federal government. Forest and woodlands management at Antietam National Battlefield is guided by the General Management Plan. This involves restoring and re-establishing the approximately 140 ha (345 acres) of woods that existed at the time of the battle in 1862 that had since been cleared. There are several types of wetlands within Antietam National Battlefield. 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, Antietam National Battlefield contains approximately 23 ha (58 acres) of managed warm-season grasslands, as well as 131 ha (323 acres) of cool-season grasslands.

#### **THREATS TO ANTIETAM NATIONAL** BATTLEFIELD

Antietam National Battlefield faces a number of resource management issues, many of which are related to the 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 Antietam National Battlefield also has a low proportion of protected areas. Protection of 10-60% of suitable habitat is necessary to sustain long-term populations of area-sensitive and rare species. 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.



The famous Burnside Bridge in Antietam National Battlefield



Antietam staff regularly monitor water quality.

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





Native species

Replanting



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

#### FORESTS



Degraded forest has high cover of exotic plants 🦺 , high % of impervious surface 🏝 and large deer populations 🛲 . Nati seedling regeneration and diversity of forest-dwelling bird species  $\measuredangle$  are low in patchy forest 45 with high occurrence of insect pests 🐲 .

				DESIRED
		INDICATORS		
	high	Cover of exotic plants	low 樽	
	high	Presence of insect pests	low ₩	
	low \$	Native tree seedling regeneration	high 談	
	low ¢	Forest dwelling bird diversity	high	Desired forest has low cover of exotic plants 4, low % of impervious
•, ive	high	Deer density	low	surface, and small deer populations 💏 . Native seedling
	high	Impervious surface	low	regeneration 💥 and diversity of
h	high	Forest interior area	low	species 🖘 are high in contiguous forest 🦛
	low	Forest connectivity	high	with low occurrence of insect pests <b>W</b> .



### **GRASSLANDS (WARM-SEASON)**



Degraded grasslands have high deer populations and high % of impervious surface 🙇 . Grassland bird diversity is low 🖉 in 📑 grasslands that are patchy and small in area .

R	bird diversity
low	Grassland interior area
low	Contiguous grassland area

#### **Desired and Degraded Conditions**



intact streambanks 🕷 with shade 🔭 and sheltering roots and debris 🗼 , low nutrients 💀 💀 and salinity 🔤 , not acidic and with high buffering capacity  $\leftrightarrow$ , resulting in high oxygen (), clear water \_\_\_\_\_, and high populations of fish and benthic invertebrates 🕵.



INDICATORS

Deer density

Grassland





low





Desired grassland habitat has small deer populations 🕷 and low % of impervious surface 🔲 . Grassland bird diversity is high 🦅 in grasslands that have a lot of interior area and are large in total size www.

Conceptual framework for desired and degraded condition of habitats managed for agricultural values present within Antietam National Battlefield, indicating metrics to track status of condition.



## PASTURES



#### Results of habitat-based condition assessment of Antietam National Battlefield.

Habitat	Area (ha)	Score (%)	Current condition	Area- weighted score (%)
Forests	149	57	Fair	
Wetlands and waterways	18	43	Fair	
Warm-season grasslands	23	36	Degraded	65 Good
Croplands	387	65	Good	Good
Pastures	131	81	Very good	

### **CURRENT CONDITION OF NATURAL RESOURCES IN ANTIETAM NATIONAL BATTLEFIELD**

Overall, the natural resources of Antietam National Battlefield were assessed to be in good condition. Habitats managed for agricultural values were good 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.



Forest habitat has high cover of exotic plants . low % of impervious surface 🔳 , and high diversity of forest-dwelling and forest interior area is low but continuous , with few insect pests



Percent attainment of desired				
0–20% /ery degraded	20–40% Degraded	40–60% Fair		

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

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

**Croplands:** Key findings, management implications, and recommended next steps for cropland habitat in Antietam National Battlefield.

Key findings	Management implications	Recommended next steps	
	Croplands		
Deer overpopulation	<ul> <li>Reduced productivity and viability of cropland</li> </ul>	<ul> <li>Implement deer population control measures</li> </ul>	
<ul> <li>Croplands are in high compliance with best management practice</li> </ul>	<ul> <li>Suggests that croplands are being managed sustainably</li> </ul>	<ul> <li>Organize and document compliance monitoring</li> <li>Research new techniques in sustainable agriculture</li> </ul>	
<ul> <li>Nutrient management plan is in place but implementation and effectiveness not documented</li> </ul>	• While compliant with regulations, nutrient impacts on surrounding habitats managed for natural resource values are unknown	<ul> <li>Park-wide agricultural best management practice effectiveness survey</li> <li>Monitor and enforce Nutrient Management Plans and required soil testing.</li> </ul>	

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

Key findings	Management implications	Recommended next steps			
Wetlands and waterways					
<ul> <li>Antietam Creek and tributaries have degraded water quality (nitrate, phosphate, salinity)</li> </ul>	<ul> <li>Affects stream flora and fauna</li> <li>Reduces quality of visitor experience</li> </ul>	<ul> <li>Reduce non-point source nutrient inputs from watershed (partnership with agencies)</li> <li>Continue riparian buffer establishment (woody or herbaceous, depending upon cultural resources/viewshed present)</li> </ul>			
Stream benthos (IBI) very poor	<ul> <li>Reduced biodiversity</li> <li>Reduced support of higher trophic levels</li> </ul>	<ul><li> Revise thresholds to be relevant for karst streams</li><li> Improve water quality</li></ul>			

**Pastures:** Key findings, management implications, and recommended next steps for pasture habitat in Antietam National Battlefield.

Key findings	Management implications	Recommended next steps
	Pastures	
Deer overpopulation	<ul> <li>Degrading value of pasture, impacting surrounding habitats</li> </ul>	<ul> <li>Implement deer population control measures</li> </ul>
• Nutrient management plan is in place but implementation and effectiveness not documented	<ul> <li>While compliant with regulations, nutrient impacts on surrounding habitats managed for natural resource values are unknown</li> </ul>	<ul> <li>Park-wide agricultural best management practices effectiveness survey</li> <li>Comprehensive soil nutrient assessment and monitoring</li> </ul>

Warm-season grasslands: Key findings, management implications, and recommended next steps for warm-season grassland habitat in Antietam National Battlefield.

Key findings	Management implications	Recommended next steps				
	Grasslands (warm-season)					
<ul> <li>General lack of comprehensive data for grasslands</li> </ul>	<ul> <li>Difficulties in assessing the health of grasslands</li> </ul>	<ul> <li>Implement grassland monitoring, particularly diversity, invasive species, birds, mammals, and insects</li> <li>Carry out a baseline grassland plant inventory</li> </ul>				
<ul> <li>Grassland areas are not contiguous and are limited in interior area</li> </ul>	<ul> <li>Decreases habitat value for avian fauna and mammals (by increasing potential predation)</li> </ul>	<ul><li>Remove tree lines where historically appropriate</li><li>Expand area of native grasses</li></ul>				

National Park Service U.S. Department of the Interior



