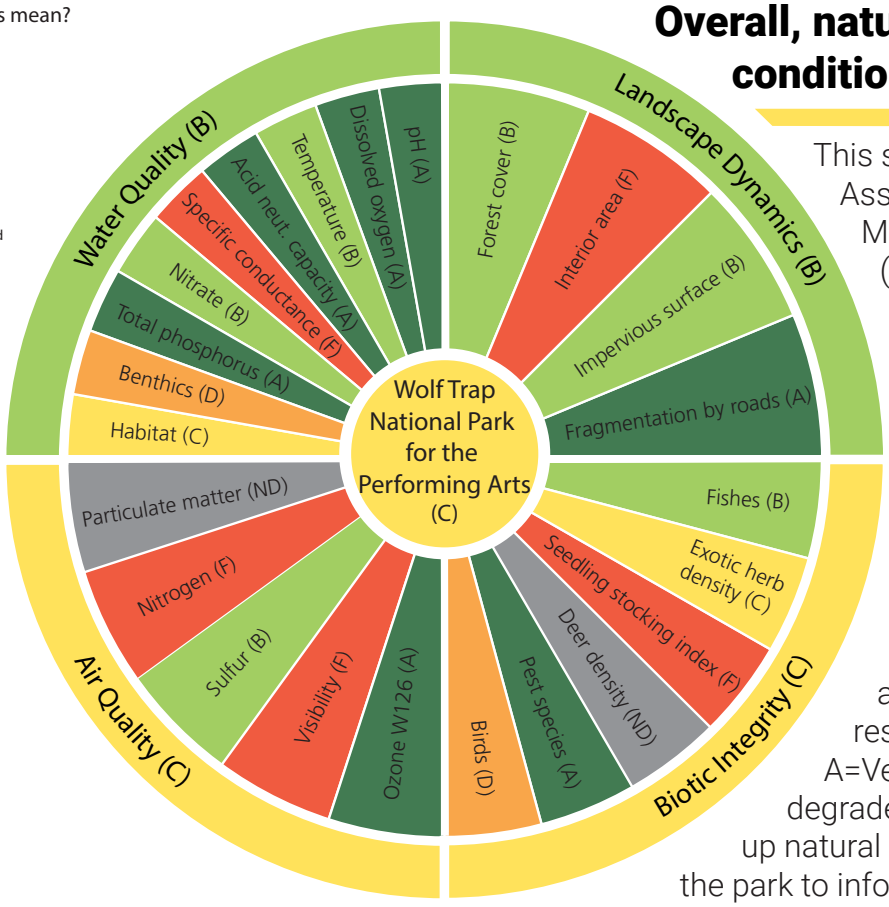
What is the status of Wolf Trap National Park for the Performing Arts natural resources?

What do the scores mean?

- **F** 0 - 20% Very degraded
- **D** 21 - 40% Degraded
- **C** 41 - 60% Moderately good
- **B** 61 - 80% Good
- **A** 81 - 100% Very good
- **ND** No data



Overall, natural resources condition is moderate.

This summary of Resource Assessments for Management Strategies (RAMS) presents the condition of indicators from the 4 Vital Signs Framework categories: Water Quality, Biotic Integrity, Air Quality, and Landscape Dynamics. Indicator scores are displayed in the summary wheel to the left, using stoplight colors and letter grades to indicate resource condition (Green—A=Very good and Red—F=Very degraded). This visual guide rolls up natural resource conditions within the park to inform management decisions moving forward.

Water Quality Generally, water quality is good. Several indicators, including pH and dissolved oxygen, score as very good or good. Stream habitat is only moderately good and benthic communities are degraded. Management to improve stream habitats should be considered.

Air Quality Although difficult to manage, air quality is important to monitor. Data are unavailable for particulate matter. Visibility is very degraded, and nitrogen deposition is occurring at levels harmful to plants. Ozone is at non-damaging levels for plants.

Biotic integrity Biotic Integrity is moderate. Seedling stocking index, which assesses forest regeneration ability, is very degraded. Data on deer, which browse on seedlings, are not available. Monitoring and continued management of deer is needed.

Landscape Dynamics Overall, landscape dynamics are in good condition. The forest cover score is good. Interior forest area is the core forest habitat and it is very degraded. Management to improve the core forest condition should be considered.

How are park resource conditions measured?

What do the scores tell us?

These scores provide a snapshot of resource condition based primarily on Inventory and Monitoring (I&M) data. It is important to track resource condition even if resources are difficult to manage. Resource conditions at the park and landscape level can be used to guide management strategies.

How is natural resource condition assessed?

The status of each indicator is monitored within National Capital Region (NCR) parks. A target threshold for the indicator is based on scientific peer-reviewed literature and/or consensus. We compare each natural resource condition to the target threshold value and assign a score. Indicators may be measured as a pass/fail score, as with deer density; on a graduated scale, as with the Bird Community Index; or may be the actual value of the data, as with interior forest area. For more detailed information on how scores are calculated, please see the RAMS methods document (currently in progress).

Monitoring protocols vary among indicators

The frequency and time of year sampled varies by indicator and category. Most Water Quality indicators are sampled monthly at multiple sampling locations within the park. Physical habitat and benthic communities are sampled less frequently at multiple sites. Many biotic integrity data are collected in rotating subsets of total plots each year, with each plot sampled once every four years. Birds are sampled at different locations, and deer density may be calculated from surveys. Air quality data are collected continuously by the Air Resources Division at monitoring sites within or near parks. Landscape dynamics data are from a national GIS database showing classes of land cover.

Monitoring helps park managers understand and assess resource condition. Photos clockwise from left: ruby-throated hummingbird with rattlesnake master (Eryginium yuccifolium), butterfly milkeweed (Asclepias tuberosa), painted lady (Vanessa cardui), and twinleaf (Jeffersonia diphylla).

Photos by NPS Staff

Air Quality monitoring and thresholds

Air Quality reference condition table

Metric	Reference condition	Park average	Overall score (%)	Condition
Particulate matter (PM2.5 µg/m³)	155 PM2.5 µg/m³ 54 — 0% score 100%	ND	ND	ND
Nitrogen (kg/ha/yr)	3 kg/ha/yr 1 — 0% score 100%	3.40	0%	Very degraded
Sulfur (kg/ha/yr)	3 kg/ha/yr 1 — 0% score 100%	1.50	75%	Good
Visibility (Haze index)	8 Haze index 2 — 0% score 100%	13.30	3%	Very degraded
Ozone (W126m ppm-hrs)	13 W126m ppm-hrs 7 — 0% score 100%	8.10	82%	Very good
Air Quality overall condition			**40%**	**Moderate**

Particulate matter (PM) is composed of extremely small droplets and solid particles suspended in air. PM is found in smoke, haze, and dust. It is not measured in every park.

Nitrogen deposited from the air in excess may have harmful effects on living organisms, especially herbaceous plants and water systems. Excess nitrogen may also enable nonnative plant species to outcompete native plants.

Sulfur deposition onto soil, plants, and water can increase acidity in park ecosystems, leading to changes in water and soil chemistry that impact ecosystem condition.

Visibility is reduced when tiny particles in the air scatter and absorb light. High values for visibility supports viewshed integrity. This indicator measures how well and far park visitors can see.

Ozone (W126) is monitored and scored against a high ozone concentration threshold, which are conditions that most likely will affect vegetation. When ozone is too high, it can burn plant tissues and reduce overall plant survival.

Body of water in Wolf Trap.

Photo by NPS Staff

Landscape Dynamics monitoring and thresholds

Landscape Dynamics reference condition table

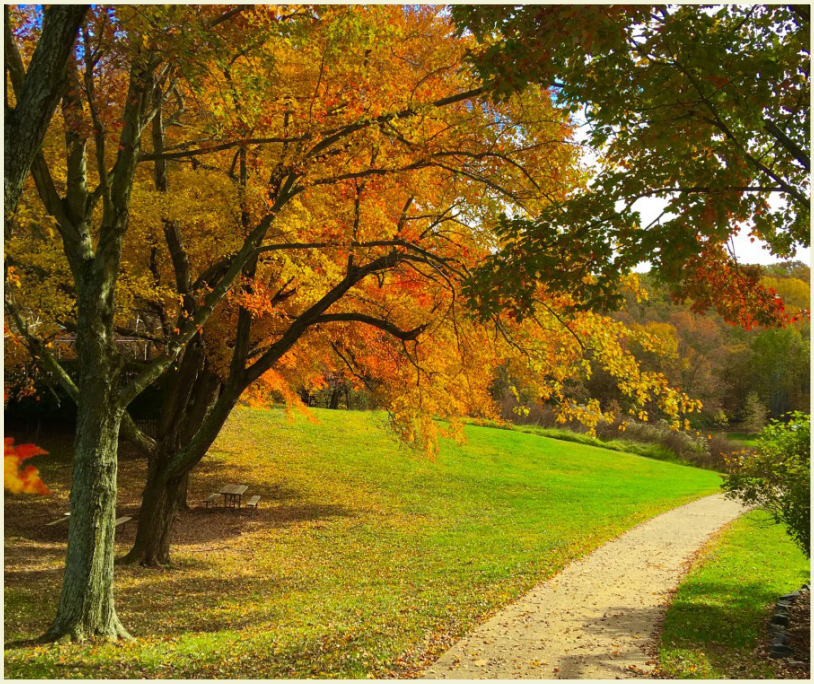
Metric	Reference condition	Park average	Overall score (%)	Condition
Fragmentation by roads (km/km²)	2 km/km² 1 (0% score 100%)	1.02	98%	Very good
Impervious surface (% area)	20 % area 10 (0% score 100%)	13.20	68%	Good
Interior forest area (% interior)	0 % interior 100 (0% score 100%)	0.00	0%	Very degraded
Forest cover (% cover)	0 % cover 59 (0% score 100%)	45.39	77%	Good
Landscape Dynamics overall condition			61%	Moderate

Fragmentation by roads decreases the quality of wildlife habitat, with high road densities fragmenting habitats and increasing the risk of wildlife mortality by collisions with vehicles.

Impervious surfaces negatively impact the condition of various ecological indicators, particularly stream invertebrates, due to increased stormwater runoff.

Interior forest area forms the core of a habitat, and increased interior area improves forest condition.

Forest cover provides habitat, wildlife corridors, and ecological value important to park natural resources and overall landscape condition.



Roads, paths, and trails all contribute to landscape dynamics. Photo by NPS

Water Quality monitoring and thresholds

Water Quality reference condition table

Metric	Reference condition	Park average	Overall score (%)	Condition
Habitat (PHI score)	0 PHI score 100; 0% score 100%	67.50	54%	Moderate
Benthics (BIBI Score)	1 BIBI Score 5; 0% score 100%	2.34	33%	Degraded
Total phosphorus (mg/L PO_4)	0.09 mg/L PO_4 0.01; 0% score 100%	0.02	87%	Very good
Nitrate (mg/L NO_3)	3.66 mg/L NO_3 0.64; 0% score 100%	1.48	76%	Good
Dissolved oxygen (mg/L)	3 mg/L 6; 0% score 100%	8.38	100%	Very good
Temperature (degrees C)	30.8 degrees C 19; 0% score 100%	23.28	66%	Good
Specific conductance (µS/cm)	230 µS/cm 171; 0% score 100%	824.07	0%	Very degraded
pH (pH value)	5 6.8–8.5 9; 0% 100% 0%	7.47	100%	Very good
Acid neutralizing capacity (µeq/L)	20 µeq/L 200; 0% score 100%	748	100%	Very good
Water Quality overall condition			68%	Good

Habitat is assessed using Physical Habitat Index indicators such as riffle quality, stream bank stability, and woody debris.

Benthic biota are scored based on the expected benthic faunal assemblage in an unimpaired site.

Total phosphorus is scored based on region-specific threshold categories.

Nitrate is scored based on region-specific threshold categories.

Dissolved oxygen in low concentrations can cause metabolic impacts and death of fishes, invertebrates, and aquatic plants.

Temperature thresholds reflect optimal living conditions for freshwater organisms.

Specific conductance is related to salinity and measures water's ability to conduct electricity

pH, when extreme, limits habitat suitability for aquatic plants and animals.

Acid neutralizing capacity indicates a waterbody's susceptibility to acid rain and runoff inputs.

Biotic Integrity monitoring and thresholds

Biotic Integrity reference condition table

Metric	Reference condition	Park average	Overall score (%)	Condition
Fishes (FIBI score)	1 FIBI score 5 (0% score 100%)	3.50	63%	Good
Seedling stocking index (% adequately stocked plots)	0 % plots 66 (0% score 100%)	0.00	0%	Very degraded
Exotic herb density (% plots with exotics)	100 % plots 8.33 (0% score 100%)	51.40	52%	Moderate
Birds (BCI score)	20 BCI score 77 (0% score 100%)	46.20	38%	Degraded
Deer density (density per sq acre)	20 density per sq acre 8 (0% score 100%)	ND	ND	No data
Pest species (% plots infested)	100 % plots infested 0 (0% score 100%)	83.30	83%	Very good
Biotic Integrity overall condition			47%	Moderate

Fish are an important part of the ecosystem. The condition of fish communities reflects the condition of overall aquatic habitat.

Seedling stocking index is assessed based on the minimum native tree seedlings needed to maintain a self-sustaining forest when deer densities are high.

Exotic herb density, when high, harms ecological communities by crowding out native species and reducing native biodiversity.

Birds are assessed with the Bird Community Index, which uses several characteristics to assess bird communities as ecological indicators.

Deer density can severely impact forest growth and regeneration through browsing. At high densities, deer damage the overall condition of a park.

Pest species infest and damage trees; therefore, any observed presence of certain pest species, such as emerald ash borer, is unacceptable for this indicator.

Mountain laurel found at Wolf Trap.
Photo by NPS Staff

Looking to the future

The Resource Assessment for Management Strategies provides a snapshot of natural resource conditions in individual parks, and places parks in a landscape context, allowing the assessment of conditions across the NCR. Understanding the value and relevance of park resources at a landscape level facilitates ecosystem-level management, benefiting the parks and neighboring lands. This allows for consideration of resources in a broader context when planning management actions by identifying resources that need improvement and highlighting gaps in data.

The RAMS interface is part of an ongoing NPS NCR-UMCES collaboration to assess and identify conservation needs for significant natural and cultural resources within the NCR parks.

Integrated and adaptive management in parks requires cultural and natural resource condition assessments. Preliminary efforts to incorporate cultural resources into RAMS yielded a list of indicators identified in collaboration with the regional cultural resource program managers. These indicators require refinement before final conditions are reported.

Photo by NPS Staff

Above photo by NPS Staff

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