

Summary of priority vital signs for the NCRN from Tables 3.4, 5.1, 5.3, and 5.4 in the Draft Monitoring Plan.

Network Vital Sign Name	Justification	Objectives	Protocol Lead	Vital Sign Measures	Parks
Ozone	Ozone damages human health, vegetation, and is a key component of urban smog.	Ozone concentrations in region	EPA Air Status and Trends	Atmospheric ozone concentration	All
Air Chemistry-Nitrogen/Sulfur Deposition	Sulfur (S) and Nitrogen (N) deposition cause both acidification in poorly buffered upland streams, and eutrophication at the bottom of watersheds.	Track trends in nitrate (NO ₃ ⁻), ammonium (NH ₄ ⁺) and sulfate (SO ₄ ²⁻)	National Atmospheric Deposition Program	Wet deposition chemistry (pH, NO ₃ ⁻ , SO ₄ ²⁻), NADP	All
Visibility	Atmospheric fine particles with diameter of less than 2.5 μm (PM _{2.5}) influence visibility and human health.	Determine long-term trends in visibility and concentrations of fine particles based on weekly PM _{2.5} and hourly nephelometer data.	IMPROVE	Visibility (PM 2.5 mass fraction)	All
Air Chemistry Mercury	Mercury is a persistent, toxic, and volatile heavy metal that is globally distributed via the atmosphere and can bioaccumulate in wildlife/people.	Track changes in mercury deposition (wet deposition). Track fish tissue concentrations.	Mercury Deposition Network	Amount of mercury deposition	All
Weather	Temperature and precipitation are the basic components that determine plant and animal survival and drive the basic ecosystem processes.	Determine long-term trends in daily temperature and precipitation	National Oceanic and Atmospheric Administration – National Weather Service	Ambient temperature, precipitation, wind speed, wind direction	All
Physical Habitat Index (PHI)	Physical habitat affects water quality and biological diversity.	Determine annual changes in the Physical Habitat Index for selected streams.	Maryland Biological Stream Survey (MBSS) Protocol	Stream habitat structure, river depth, vegetation composition on adjacent lands	All
Surface water dynamics	Surface water dynamics (flow) characterizes all stream ecosystems.	Determine flow, stage, and discharge of surface water in priority streams of the NCRN Parks.	USGS Protocol	Flow, discharge (CFS), gauge/stage height	All
Water chemistry	Freshwater quality has indirect impacts on all plant and animal life	Track core water quality parameters including temperature, specific conductance, pH, dissolved oxygen, and Acid Neutralizing Capacity.	USGS Protocol	Core parameters (pH, DO, conductance, temp), acid neutralizing capacity)	All
Nutrient dynamics	Freshwater quality has indirect impacts on all plant and animal life.	Track nutrient levels,	USGS Protocol	Nitrate, Ammonia, DON, Nitrite, Orthophosphate concentrations	All

Network Vital Sign Name	Justification	Objectives	Protocol Lead	Vital Sign Measures	Parks
Macroinvertebrate Index of Biotic Integrity	Aquatic macro invertebrates are a significant, diverse biological and functional component of most eastern stream ecosystems.	Detect trends in aquatic macro invertebrate species diversity and abundance in priority streams of NCRN.	MBSS Protocol	Species composition and abundance	All
Fish Index of Biological Integrity (FIBI)	Fish constitute a significant functional component of the river ecosystem. Trends in fish diversity may serve as a useful indicator of shifts in the condition of a stream ecosystem as it responds to anthropogenic actions.	Detect trends in fish species diversity and abundance in priority streams of NCRN.	MBSS Protocol	Species composition and abundance	All
Forest Health Monitoring	Vegetation communities constitute an important resource to park visitors and provide habitat for many important species.	Determine status and trends in forest composition and structure for the natural areas of NCRN.	Forest Inventory Analysis (FIA)	Species diversity, age and size classes, standing and dead wood, ratio of browsed to unbrowsed shrubs	All
Occurrence of selected invasive plant species	Alien species are considered to be one of the most critical threats to vegetation and other resources in the parks.	Detect presence of target invasive exotic plants in sensitive areas throughout the region.	TBA	Early detection of new species in sensitive areas	All
Amphibians	Amphibians represent important indicators on a world-wide scale.	Detect trends in amphibian species diversity and proportion of area occupied.	USGS Amphibian Research and Monitoring Initiative (ARMI)	Species composition and proportion of area occupied, malformations	All
Grassland and Forest Bird Communities	Birds are protected by legal mandates and represent important resources to park visitors.	Determine annual changes in species composition and abundance of birds in grassland and forested communities.	Area surveys; Variable Circular Plot being developed by USGS.	Species composition and abundance	Grassland Birds: ANTI, MANA, MONO, NACE, ROCR; Forest Birds: All
White-tailed Deer	Deer have significant ecological effects such as aiding the spread of exotic species, prevention of tree regeneration.	Determine annual changes in deer abundance at each NCRN Park.	Distance Sampling methodology being adapted.	Deer density	All
Rare, Threatened, and Endangered (RTE) Species	Rare, threatened and endangered species are protected by state and federal laws.	Species specific population trends	Species specific monitoring protocols being developed by Virginia Tech.	Species abundance, presence and absence, status, threats	All
Pests	Gypsy moths have the potential to do major damage to regional forest communities	Determine annual egg mass abundance at potential infestation sites. Map areas of infestation, annually.	National Park Service – Integrated Pest Management Program National Capital Region in conjunction with USDA Forest Service	Gypsy moth egg mass counts	All

Network Vital Sign Name	Justification	Objectives	Protocol Lead	Vital Sign Measures	Parks
Shoreline features	Shorelines changes will be one indicator of climate change.	Determine amount of land area being lost or gained in the tidal portions of the Potomac and Anacostia Rivers	Scale and protocols need to be developed by UMCES	Rate of shoreline change	CHOH GWMP NACE
Land cover/Land use	Habitat loss/conversion is primary threat to biodiversity	Composition, and conversion of dominant communities	Scale and protocols need to be developed by UMCES	Area of dominant land cover types, connectivity, core/edge ratio of dominant forest communities, weighted average patch size	All
Landscape condition	Altered habitat quality impacts biodiversity	Quantify changes in habitat conversion and transformation	Scale and protocols need to be developed by UMCES	Spectral analysis	All