

Summary of the most common indicators of natural resource condition (and examples of specific measures) that are being monitored by the U.S. National Park Service long-term ecological monitoring program (from Fancy and Bennetts 2012).

| Indicator Category                                | Example Measures (varies by network)  | Number of Parks |
|---|---|-----------------|
| Weather and climate                               | Temperature, precipitation, wind speed, ice on/off dates  | 246             |
| Water chemistry                                   | pH, temperature, dissolved oxygen, conductivity   | 211             |
| Land cover and use                                | Area in each land cover and use type; patch size and pattern  | 203             |
| Invasive/exotic plants                            | Early detection, presence/absence, area   | 200             |
| Birds   | Species composition, distribution, abundance  | 189             |
| Surface water dynamics                            | Discharge/flow rates, gauge/stage height, lake elevation, spring/seep volume, sea level rise                          | 158             |
| Ozone   | Ozone concentration, damage to sensitive vegetation   | 140             |
| Wet and dry deposition                            | Wet deposition chemistry, sulfur dioxide concentrations   | 114             |
| Visibility and particulate matter                 | IMPROVE network; visibility and fine particles  | 113             |
| Fire and fuel dynamics                            | Long-term trend of fire frequency, average fire size, average burn severity, total area affected by fire              | 105             |
| Vegetation complexes                              | Plant community diversity, relative species/guild abundance, structure/age class, incidence of disease                | 101             |
| Mammals   | Species composition, distribution, abundance  | 93              |
| Forest/woodland communities                       | Community diversity, coverage and abundance, condition and vigor classes, regeneration                                | 93              |
| Soil function and dynamics                        | Soil nutrients, cover and composition of biological soil crust communities, soil aggregate stability                  | 91              |
| Stream/river channel characteristics              | Channel width, depth, and gradient, sinuosity, channel cross-section, pool frequency and depth, particle size         | 89              |
| Aquatic macroinvertebrates                        | Species composition and abundance   | 86              |
| Threatened and endangered species and communities | Population estimates, distribution, sex and age ratios  | 85              |
| Air contaminants                                  | Concentrations of SOCs, PCBs, DDT, Hg   | 71              |
| Groundwater dynamics                              | Flow rate, depth to ground water, withdrawal rates, recharge rates, volume in aquifer                                 | 69              |
| Amphibians and reptiles                           | Species distribution and abundance, population age/size structure, species diversity, percent area occupied           | 54              |
| Grassland/herb communities                        | Composition, structure, abundance, changes in treeline  | 51              |
| Fishes  | Community composition, abundance, distribution, age classes, occupancy, invasive species                              | 50              |
| Insect pests                                      | Extent of insect-related mortality, distribution and extent of standing dead/stressed/diseased trees, early detection | 50              |
| Riparian communities                              | Species composition and percent cover, distribution and density of selected plants, canopy height                     | 45              |
| Nutrient dynamics                                 | Nitrate, ammonia, DON, nitrite, orthophosphate, total K   | 45              |
| Primary production                                | Normalized differential vegetation index (NDVI), change in length of growing season, carbon fixation                  | 41              |
| Wetland communities                               | Species composition and percent cover, distribution and density of selected plants, canopy height, aerial extent      | 40              |
| Microorganisms                                    | Fecal coliform, <i>E. coli</i> , cyanobacteria  | 30              |
| Water toxics                                      | Organic and inorganic toxics, heavy metals  | 30              |
| Invasive/exotic animals                           | Invasive species present, distribution, vegetation types invaded, early detection at invasion points                  | 29              |
| Coastal/oceanographic features and processes      | Rate of shoreline change, sea surface elevations, area and degree of subsidence through relative elevation data       | 29              |