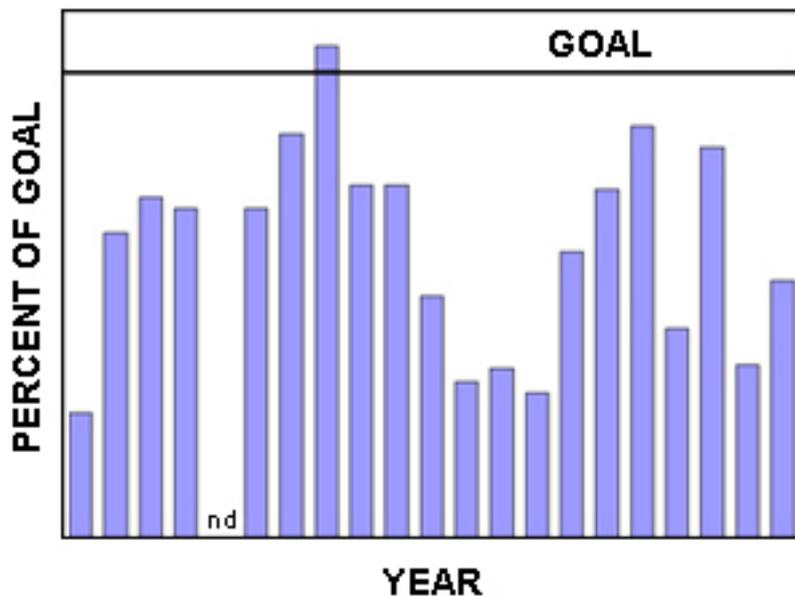


## Ecosystem Indicators

Written by Administrator - Last Updated Friday, 27 June 2008 11:49

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The best indicators of ecosystem health are measurable features of animal and plant communities and their habitats. Periodic comparisons of these features to restoration goals or values found at “reference” sites tell resource managers how much their actions have accomplished – and how much more needs to be done. Integration of several tiers of indicators gives us insight into how an ecosystem as a whole may respond to future management actions. Some questions we’re trying to answer are:



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- [How do we measure aquatic health ?](#)
- [How good is good enough ?](#)
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### What is a healthy Potomac River?

Pre-Jamestown conditions in the Potomac River basin are a thing of the past. Characterizing healthy Potomac River ecosystems is now challenging because the entire watershed is impacted by human activities in one way or another. Quantitative descriptions of habitats and biotic communities that are minimally impaired by human activities give us valuable insights into how a rehabilitated Potomac River could look and function in the 21st century. These “reference” habitats and biological communities are some of the best representations of the “chemical, physical and [biological integrity](#)” called for in Water Pollution Control Act Amendments of 1972 (Pub. L. 92- 500), commonly known as the Clean Water Act. A healthy Potomac River can provide many ecological services valuable to the basin’s human inhabitants - it can breakdown and recycle nutrients and pollutants, provide safe drinking water and seafood, reduce water-borne diseases and climate change impacts, provide cultural and recreational opportunities, and resist new or unexpected stresses.

ICPRB staff have worked to characterize reference habitats and biological communities basin-wide for several Potomac River environments, including [non-tidal wadeable streams and rivers](#) and [tidal open waters](#) .

By characterizing reference habitats and communities on a basin-wide rather than a state-by-state basis, the Commission (i) has a larger pool of data to work with, leading to more accurate criteria for judging river health, and (ii) it can evaluate river health on the same scale across state boundaries.

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### How do we measure aquatic health?

An array of tools is used to sample aquatic ecosystems, including nets, bottles, buckets, corers, [Secchi disks](#), thermometers and other sensors, and satellites. Physical, chemical, and biological measurements, or parameters, collected with these tools are processed through analytical steps to make information useful. The terminology used in sharing and presenting the information indicates different levels of analysis and regulation.

#### Parameter

is a chemical, physical, or biological characteristic of a sample or population measured in the field or laboratory, e.g. temperature, dissolved oxygen concentration, count of organisms, number of species.

#### Indicator

is a measurable parameter whose numeric value reflects a range of conditions or some aspect of ecosystem structure and function that is of interest to scientists and resource managers (e.g., pH, incidence of fish lesions, species diversity, reproductive success).

#### Metric

is an indicator whose numeric value has been shown to respond in significant, predictable ways to increasing human, climatic, or other environmental stress.

#### Indexes (Indices)

are numerical scales used to score ecosystem indicator, metric, or multi-metric values so their relative status can be directly compared. Typically, values at the high end of the scale are characteristic of some reference condition or criterion. Multiple metrics that are scored and then combined into a single score can integrate different aspects of a population or ecosystem response and sometimes provide a more sensitive measure of status than the individual metrics. Numerical values on the scale are often assigned qualitative values (e.g., Good, Fair, Poor) and can be linked to management objectives and restoration goals.

### Numeric Criteria

are limits, thresholds, or critical values that, if met, are presumed to support and maintain (i) specific ecosystem structures and functions, and/or (ii) specific human use or uses of the ecosystem.

### Standards

are state-adopted and EPA-approved criteria for certain chemical, physical, and biological parameters in a water body. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect the designated uses. (See also US EPA)

The ICPRB has worked individually and with colleagues to develop basin-wide indicators, metrics, and multi-metric indexes for several biological communities and their habitats. These variables quantitatively express the biotic integrity and habitat suitability of ecosystems. An basin-wide, or interstate, approach is not new in the Chesapeake region and sound numeric criteria have been established for other tidal ecosystem components, including [submerged aquatic vegetation](#)

,  
[estuarine benthic invertebrates](#)

,  
[dissolved oxygen, and water clarity](#)

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These basin-wide indicators, metrics, and indexes can be used by resource managers in several ways. They can be used to establish common restoration goals, give direction to rehabilitation efforts, and provide quantitative measures of the effectiveness of different management actions. They are also good communication tools. ICPRB staff participate in CBP efforts to establish a communications framework for indicators and publish [assessment reports](#)

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### How good is good enough?

The answer to this question is political, but the underlying choices can be based on sound science. Society has qualitatively described restoration goals for the region's rivers, including the Potomac River, and Chesapeake Bay in the [Chesapeake Bay 2000 Agreement](#). The Potomac is, and will continue to be, a heavily used ecosystem. The basin's 5.5 million (and

growing) human population use the Potomac River as a source of food and water, a place for recreation and aesthetic beauty, a transportation route, and a waste receptacle. On the other hand, robust, resilient natural communities require sufficient food, adequate space, and suitable water quality from the river and estuary environments. Society must quantitatively weigh the capacity of the ecosystem to support ecological services valued by humans against the needs of the plants, animals, and their habitats to maintain a balanced, integrated, adaptive natural system.

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### Who collects the data?

Local, state, and federal entities regularly collect, or monitor, data on aquatic habitats and biological communities in the Potomac basin. ICPRB relies primarily on these monitoring data to perform many of its data analysis functions, including calculation of ecosystem indicators. Some of the agencies that provide data to the ICPRB are

- US Environmental Protection Agency, Chesapeake Bay Program (CBP)
- US Environmental Protection Agency, Environmental Analysis Division, Mid-Atlantic Integrated Assessment (MAIA)
- US Geological Survey (USGS)
- US National Oceanographic and Atmospheric Administration (NOAA)
- Pennsylvania Department of Environmental Protection (PaDEP)
- Maryland Department of Natural Resources (MDDNR)
- Maryland Department of the Environment (MDE)
- District of Columbia Department of Health (DCDOH)
- West Virginia Department of Environmental Protection (WVDEP)
- Virginia Department of Environmental Quality (VaDEQ)
- Montgomery County MD Department of Environmental Protection (DEP)
- Prince George's County MD Department of Environmental Resources (DER)
- Fairfax County VA Dept. of Public Works and Environmental Services (PWES)
- Arlington County VA Department of Environmental Services (DES)
- Virginia Institute of Marine Science (VIMS)

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