Aquatic Resources Monitoring

Aquatic Resource Monitoring - Terminology

In order to facilitate communication and achieve compatible and comparable designs and analyses the following terms are defined for use by the Design & Analysis Teams and Clients.

Skip to A-C, D-F, G-I, J-N, O-R, S-T, U-Z

305(b): Refers to section 305 subsection (b) of the Clean Water Act. 305(b) generally describes a report of each states water quality, and is the principle means by which EPA, Congress, and the public evaluate whether US waters meet water quality standards, the progress made in maintaining and restoring water quality, and the extent of the remaining problems.

Assessment: Evaluation and interpretation of scientific results for the purpose of assisting policy development and establishing management plans for aquatic resources. This often includes the description of the fraction of the target population that meets or exceeds a quality criteria, characterization of the aquatic resource conditions and description of the association between indicators of resource conditions and environmental stressors.

Base Samples: The number of sites (sample size) that will fulfill the monitoring program requirements for precision and uncertainty (generally, +\- 10% precision at 90% confidence). See Sample size FAQ

Continuous Population: Continuous populations or resources generally can be thought of as resources that cover an geographical area. As an example assume that a study of one of the Great Lakes, e.g., Lake Ontario, requires an estimate of the percent of the lake area with an unacceptable concentration of dissolved oxygen. In this case the target population is the entire surface area of Lake Ontario and the elements of the target population are all points within the lake. Conceptually, dissolved oxygen can be measured everywhere on the lake (an infinite number of points). See: Target Population FAQ

Change: Providing information on change requires the ability to compare the resource status at two different time intervals, e.g., the current number of stream kilometers that meet their designated uses compared to a 1990 estimate.
   Go To Top

Discrete Population: Discrete (from the Latin discretus, meaning to separate) is an adjective meaning separate and individually distinct. In a discrete population, features can be spatially distinguish one from another (i.e., number of lakes within a State) and contain a finite number of units. See: Target Population FAQ

Ecological indicator: A characteristic of an ecosystem that is related to, or derived from, a measure of a biotic or abiotic attributes that can provide quantitative information on

ecological condition, structure and function. An indicator can contribute to a measure of integrity and sustainability.

Ecoregions: Ecoregions is a term used to denote regions with general similarity in ecosystem characteristics. This includes types, quality and quantity of natural resources. The classification is designated to serve as a spatial framework for researchers to conduct monitoring, assessment and management programs.

EMAP: Environmental Monitoring and Assessment Program - an EPA Office of Research and Development long term research program. EMAP was developed to establish the scientific basis for monitoring programs that measure the current and changing conditions of the nation's ecological resources. See: EMAP Background

Frame Materials: Maps, GIS files, Ecoregions, Political Boundaries (State, county), watershed boundaries, RF3, NHD, DEM's are examples of frame materials that may be relevant to development of the Sample Frame. The frame materials provide a spatial representation for all units of the target population and associated auxiliary information within the study area. Generally, several frame materials are combined to develop the Sample Frame during the design process for a monitoring program.
    Go To Top

Inclusion Probability: The probability that a unit of the target population has of being selected (included) during a random draw from the population. For example, in a normal deck of cards, each card has a 1/52 probability of being drawn from the deck.

Index Period: The time period within a year selected for measurement (ecologically based). Measurements may be taken once or more often during the time period, with the response design providing the protocol for obtaining a single value for each indicator. Indicator variability within Index period contributes to non-survey sampling error.
    Go To Top

Known Confidence: Refers to the estimate of uncertainty or confidence limits associated with a survey result. Usually the 90% confidence limits are estimated and presented along with the survey results. See: Known Confidence FAQ

N**on-Target Population**: Sample Frame may contain non-target elements, e.g., misidentified sample units.

Probability Sample: A probability sample is a sample where every element of the target population has a known, non-zero probability of being selected. That is, it is possible for every element of the target population to be in the sample. Two important features of a probability sample are that the probability selection mechanism (1) guards against site selection bias and (2) is the basis for scientific inference to characteristics of the entire target population. See: Probability Sample FAQ
    Go To Top

Over Samples: When known or suspected circumstances are likely to prevent sampling at some base sample sites, e.g., frame errors, denied access, hazardous site conditions, etc. prior additional sample sites can be identified. These Over-Sample sites are sampled whenever a Base-Sample site cannot be sampled. Alternate terminology: Replacement Samples

Response Design: The process of obtaining a response at a site. Can be in a single index

period during a year, or multiple periods during a year. Detailed guidance and protocols to be followed when measuring the response at a site.

Rotating Basin: A survey or monitoring strategy that identifies panels or subsets of basins within an area that are sampled on a periodic frequency. Usually one panel is sampled each year, after 4 or 5 years all panels have been sampled, and then the sampling sequence is repeated. Each year estimates are available for the Basins surveyed. See: Rotating Basins FAQ
   Go To Top

Sample Frame: Refers to the list or map that identifies every unit within the target population of interest, a physical representation of the target population. Such a list is needed so that every individual member of the population can be identified unambiguously. The individual members of the target population whose characteristics are to be measured are the sampling units. See: Sampling Frame FAQ

Sampled Population: A conceptual population that is a subset of the intersection of the Target Population and the Sample Frame.

- It excludes portion of the Target Population within the Sample Frame that could not be sampled (conceptually) due to access problems, lost samples, or other reasons a sample could not be collected.
- It doesn't include part of the Sample Frame that is determined to not include elements of the Target Population.
   Go To Top

Status: often seen as a "snapshot" of resource conditions, e.g., the number of stream kilometers in Region III that meet their designated uses.

Strahler Order: Hierarchical ordering of streams based on the degree of branching. A first-order stream is an unforked or unbranched stream. Two first-order streams flow together to form a second-order stream, two second-order streams combine to make a third-order stream, etc. (Strahler 1957). This ordering method starts at zero at each terminal segment, and proceeds towards the root stream. Each time a bifurcation node is encountered, if both daughter branches have the same order, then the order is increased by one, otherwise the largest order is used.

Subpopulation: A subset of the target population that has been identified for a specific purpose, usually requires the ability to estimate an attribute of the subpopulation (i.e., a fish IBI for all lotic streams with a Strahler order of < 4).

Survey Design: The process of selecting sites at which a response will be determined. Includes a probability model for inference based on the randomized selection process.

Target Population: Target population denotes the aquatic resource about which information is wanted. Requires a clear, precise definition of the resource. This includes definition of the elements that make up, or are associated with, the target population (i.e., perennial streams and rivers, lakes or estuaries). Usually includes a description of the area of interest or study area (i.e., State, conterminous States of EPA Regions 8, 9, and 10). See: What is a Target Population?

Trend: Trend evaluations require several estimates of conditions often over longer time periods, e.g., the trend in nitrate concentration in the Santiam River at its confluence with

the Willamette River during the last 4 decades.
   Go To Top

Unequal Probability: Often it is desirable to select units from the target population with different (unequal) inclusion probabilities. For example, a random sample of lakes within a State might well select more small lakes (more numerous in the target population) compared to large lakes than desired to meet program objectives. One strategy for addressing this is to select large and small lakes with unequal probabilities during the random selection process.

USGS Hydrologic Units (HUCs):

- Hierarchical subdivision of *land area* of United States based on hydrology
- "Provide a standardized base for use by water-resource organizations in locating, storing, retrieving, and exchanging hydrologic data, in indexing and inventorying hydrologic data and information, in cataloging water-data acquisition activities, and in a variety of other applications" (USGS Water-Supply Paper 2294, 1987)
- A cataloging unit is a geographic area representing part or all of a surface drainage basin, a combination of drainage basins, or a distinct hydrologic feature.
- Almost all cataloging units are larger than 1800 sq km except in special circumstances.
- National maps available for 1, 2, 3, and 4th fields: regions (21), subregions (222), accounting units (352), cataloging units (2150).
- Being extended to 5th and 6th fields.
- Approximately 50% of units at any level correspond to "true" watersheds.
- See: USGS NHD

Watershed Definitions for Streams:

- "A region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water." [Webster's]
- Common to apply definition at confluences.
- Definition is hydrologic but typical to use terrain elevation to define watershed boundaries.
- Definition applies to any point on a stream network.
- See: Selecting a Watershed

   Go To Top