AFS Policy Statement #29:
Biodiversity
(Abbreviated)

Issue Definition

The Environmental Protection Agency's (EPA) Science Advisory Board has listed loss of biodiversity as one of the four greatest risks to natural ecology and human well-being. Current loss rates in global species diversity approximate those that define boundaries between geological eras when massive alterations in the Earth's biota occurred. Biological diversity, or biodiversity, can be defined as "the variety of life and its processes" and is generally recognized at four levels in a biological hierarchy: (1) genetic diversity is the amount of genetic information among and within individuals of a population, species, assemblage, or community; (2) species diversity is the number and frequency of species in a biological assemblage or community; (3) ecosystem diversity is the collection of assemblages, communities, and habitats within an area; and (4) landscape diversity is the spatial variation of the various ecosystems within a larger area ranging in size from 100 km2 to 10,000 km2. Other organizational levels of biodiversity include stocks, races, guilds, ecotones, ecoregions, and biomes. Biodiversity should not be likened to an often transitory increase in the variety or numbers of species through the introduction of nonnative plants and animals. Examples of reduced biodiversity in aquatic systems consistent with the above hierarchy can be found in Hughes and Noss (1992).

Because some degree of biodiversity is inherent in all biological systems and some of our least-disturbed systems have little biodiversity, resource managers tend to be more concerned with the loss of biodiversity than with biodiversity itself. For these reasons, many aquatic scientists have focused on biological integrity. Biological integrity is defined as the capacity to support and maintain an integrated, adaptive community with a biological composition and functional organization comparable to those of natural waters of the region. Implicit in this definition is the comparison of existing biological systems against some natural expectation or standard.

Natural conditions can be estimated from sediment cores, other historical information, or minimally disturbed waters. The degree of naturalness is evaluated by the amount the waterbody would be altered by the removal of humans, the quantity of societal energy needed to create or support the waterbody, and the present biota relative\ to that existing before Euro-American settlement. Integrated waters reflect the region's natural climate, geology, soil, and vegetation. A waterbody that supports biota adapted to the region can usually adjust to natural disturbances without human intervention or major disruption in species composition or biological processes. This concept of biointegrity is also incorporated with our discussion of biodiversity, although integrity is a much more normative term.

A common argument for maintaining biodiversity is the value of saving the vast storehouse of genetic material of plants and animals for future, often unknown, benefits. Humanity has already obtained tremendous benefits from the diversity of life forms, including medicines, foods, and industrial products, even though the "genetic library" has

barely been tapped. Biodiversity also is important to preserving ecosystems that provide, among other things, food, timber, maintenance of the gaseous composition of the atmosphere, regulation of global and local climates, and the production and maintenance of soils. It has also been argued, however, that biodiversity must be sustained simply because humans have a moral obligation to ensure the natural, evolutionary existence of species and ecosystems whose values do not depend on their human usefulness.