

AFS Policy Statement #2:  
AFS Overview Policy on Man-Induced Ecological Problems  
Human Population Growth and Technology  
(Full Text)

### **A. Issue Definition**

Because of advances in technology that have increased survival and life span, world-wide human population growth has been exponential. As this increase has occurred the growing demand for life's necessities-food, minerals, space to live-has provided markets that serve as positive feedback loops for the development of technological and industrial growth, and hence that of human population. Through the demand for support of a growing population, increasing consumption per capita, and the growth of the means of satisfying the demand, power generation has caused a decline of the natural salmonid populations. The use of nitrogen and phosphorus fertilizers has contributed heavily to cultural eutrophication in Lake Erie, with resultant species shifts of fish and invertebrates. Eutrophication and resultant dissolved oxygen depression from sewage treatment effluents and fertilizer runoff have occurred in the Potomac and Escambia River estuaries, causing recurrent fish mortality.

In New Brunswick's Miramichi River system, aerial spraying of insecticides for spruce budworm control, copper-zinc mining runoff, wood preservative operations, and untreated municipal sewage have contributed to the decline of Atlantic salmon. A management effort to compensate for declines has taken the form of closure for commercial fishing in the Miramichi estuary and reduced sportfishing seasons and creel limits.

In certain lakes on the Manitoba-Saskatchewan border, and near Sudbury, Ontario, smelter-related acid- and metal-laden precipitation has led to declines of lake whitefish and walleye populations in one case, and to the disappearance of almost all species in another. In northwestern Ontario, mercury pollution resulting from chlorine manufacturing for woodpulp bleaching has led to the closure of fishing in the English Wabigoon River system.

The LaGrande hydroelectric power development near James Baby, Quebec, rearranges the drainage patterns of two major rivers. To date this has resulted in compensation payments of \$234 million dollars, and a territorial development pact covering some 400,000 square miles. According to a United States government summary of fish kills, municipal sewerage operations were considered the cause of mortality of over five million fish in one year. Feedlot operation wastes have killed hundreds of thousands of fish in Kansas. Food processing and kindred operations were indicted as the cause of death of over 6.5 million fish in one case in Iowa.

Acid mine drainage in the Potomac River is responsible for some 20 miles of virtually lifeless mainstream on a perennial basis. Reservoir construction for hydroelectric power and flood control has inundated many miles of streams, causing species shifts in the short

term and sediment-filled lakes in the long term. Accelerated sedimentation of estuaries and rivers has required extensive dredging to maintain waterborne commerce. The resultant dredge spoils have been deposited on wetlands, frequently causing losses of detritus essential to estuarine food chains.

Urbanization is perhaps the most permanent of all habitat modifications. It has caused miles of channelization, extreme changes in hydrologic regimes, and extensive non-point source pollution, as well as the filling of large inland and coastal wetland areas.

Excess fishing capacity and over-exploitation of stocks has greatly contributed to the long term decline of the American shad, and the Northwest Atlantic groundfish species such as haddock. Along with sedimentation, overfishing is probably responsible for the endangered species status of the shortnosed sturgeon.

Steam generation of electricity is estimated to have caused up to 179 million fish deaths annually through entrainment at one plant in Connecticut, and up to 20 million per day at another. Annual losses at a New Jersey plant have been estimated at 150 million eggs and 100 million larvae of 24 species.

Supersaturation of water by gases has been caused by thermal additions from steam electric stations and by the plunging of water through high dam discharges. It has been reported that in the Columbia River, supersaturation levels as high as 116% have been measured over 100 miles downstream from Bonneville Dam. A review of gas bubble disease literature revealed fish kills associated with both types of power generation, and predicted an intensification of the problem with expanded power generation in the future.

## **B. Needed Action**

The American Fisheries Society holds that continued human population growth and increasing dependence on technological modifications of the environment are dangerous to the maintenance of aquatic habitat. Limitations to these forces are necessary and desirable. The reasons for this posture are as follows:

1. With a few exceptions of artificially controlled subsystems, the results of millions of years of evolution of ecosystems cannot be improved upon. In the long run, aquatic resources are best served by maintaining unmodified habitat conditions.
2. Increased human population density, the resultant increased demands upon the life support system, and the increased modification of the biosphere through the use of technology create practicably unavoidable ecological problems. The greater the population density and the more of an ecosystem is altered, the more frequent, severe, complex are the ecological problems.
3. The more frequent and complex ecological problems are the more difficult it is to carry out wise ecosystem management. Short-run response to crisis becomes the rule. The necessary long-range perspective becomes less available, and it becomes less possible to

how to and carry out long-range efforts at problem solution. Increasingly restrictive regulation is a predictable result.

For the maintenance of healthy ecosystems, the mitigation of ecological problems, and the better management of aquatic habitat and resources, the American Fisheries Society recommends that an evaluative test be applied to proposals that would modify the environment. The test should clarify the potential for ecological problems embodied in environmental modifications.

By applying a test on a local level, preferably on a watershed basis, guidance can be obtained that can help protect aquatic habitat. Application on a watershed basis will help to maintain habitat types in an unmodified distribution. By carrying out conscientious examination on a local basis, the pressures for national scale regulation will be reduced.

The important elements of such a test are as follows:

With regard to any proposed environmental modification,

- (a) will it act to increase population density, intensify energy use and technological dependence, and generate further modification of the affected ecosystem?
- (b) if the modification will act to bring about the above phenomena, has it been decided- i.e., have goals been set which reflect human dependence on the ecosystem-how much modification is desirable or tolerable? Are cumulative changes being added up?
- (c) if a watershed, or part of one, is being given over to some short-run beneficial use, has there been a margin for error set aside among a jurisdiction's watersheds? That is, given that there is ignorance as to the amount of modification that is ecologically wise, has there been an adequate buffer reserved so that the larger ecosystem's integrity is assured?
- (d) after a short-run beneficial use has served its purpose, is it practicable or possible to restore the area to its original uses and functions?

The American Fisheries Society believes that a generalized evaluation procedure that has a sound ecological basis can be broadly applied. Adaptations suitable to localized situations and problems can be made part of such an evaluation. If similar evaluative approaches to modifications are utilized in several local area, rational and cohesive overview and management of the environment can be achieved.