J. N. Am. Benthol. Soc., 1990, 9(1):77–88

A perspective on America's vanishing streams[1]

ARTHUR C. BENKE

Department of Biology, University of Alabama, Tuscaloosa, Alabama 35487-0344 USA

Abstract. The free-flowing nature of streams in the U.S. has been dramatically altered over the past century, especially through construction of dams. The Nationwide Rivers Inventory (NRI) estimated a total of 5,200,000 km of streams in the contiguous 48 states, but only 2% (<100,000 km) have sufficient high quality features to be worthy of federal protection status. The future of this dwindling number of high-quality streams is in doubt as proponents of development compete with conservation interests. Hydropower projects are projected to be built well into the future with a large increase in small projects (55% more than in 1988) even though the total generating capacity of the U.S. would increase only 0.3%. On the other hand, conservation efforts have resulted in increasing levels of federal protection of streams since the 1960s. "National River" or "Wild and Scenic River" status now provides protection for almost 16,000 km of streams, but only about 10% are found east of the Mississippi River. Analysis of the NRI database showed that the greatest quantity and density of high-quality streams are found in the south-Atlantic states, where streams have the least protection. The greatest number of NRI streams are found in the Coastal Plain and Central Lowland physiographic provinces. The NRI analysis showed only 42 high-quality, free-flowing (no major dams) rivers >200 km remaining in the 48 contiguous states. With continuing threats of exploitation, major conservation efforts are required to preserve these last free-flowing streams.

Key words: stream, river, dam, stream conservation, stream exploitation, Wild and Scenic Rivers, National Rivers.

For the past several years, considerable attention has focused on world-wide losses of biodiversity, particularly due to man's activities in tropical terrestrial ecosystems (e.g., Shen 1987). In contrast, the extent of biotic impoverishment among freshwater organisms, even in temperate regions, has received little attention. This is at least partially due to the fact that extensive biological inventories of freshwaters have never been launched, and subsequently the degree of biotic impoverishment is largely unknown (Schindler 1989). Yet these biotic losses must be great because the physical impact of man on freshwaters (especially streams and rivers) has been unprecedented, particularly in developed countries such as the U.S.

Although mankind has been modifying streams and rivers throughout the world for centuries, major modifications of North American rivers did not begin until the early 19th century (e.g., Mrowka 1974, Baxter 1977, Petts 1984). A period of accelerated growth in water development projects began in the 1930s to provide for flood control, water supply, navigation, and electricity. In spite of centuries of such changes, major advances in our knowledge of the ecological impacts of stream modification, particularly with regard to hydropower dams, have only occurred in the past two decades (e.g., Ward and Stanford 1979, Lillehammer and Saltveit 1984, Petts 1984, Craig and Kemper 1987). We have found that flow regulation can be particularly devastating for invertebrates and fishes below dams, and may reduce or eliminate critical interactions between a river and its floodplain (e.g., Petts 1984, Ward and Stanford 1989).

While our knowledge of ecological impacts from hydropower dams on specific streams has grown rapidly (e.g., Stanford and Ward 1989, Hauer et al. 1989), broad-scale trends of habitat loss and ecosystem dysfunction are not well-documented. We know that physical modifications of streams and rivers in North America are extensive (e.g., Mrowka 1974, Stanford and Ward 1979), but we do not know how the quantity of degraded systems compares with that of the natural lotic systems remaining. One of the major developments in stream ecology in the last decade is the river continuum concept (Van-

[1] Presidential Address to the 37th annual meeting of the North American Benthological Society, 16–20 May 1989, Guelph, Ontario.