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Nature of the Problem

The connection between rivers and their floodplains is essential for maintaining biological processes within these systems. The periodic inundation of the floodplain provides migration corridors and spawning habitat for adult fishes as well as rearing habitat for larvae and juveniles (Junk et al. 1989). During inundation nutrients are transferred from the terrestrial to the aquatic zone and flood waters aid in dispersing terrestrial vegetation (Schlosser, 1991) (Amoros and Bornette, 2002). Tropical river-floodplains have been studied extensively because there has been little or no alteration of the hydrology in these systems; however, North American systems have received little attention (Bayley, 1995). Many river-floodplain systems in North America have been subject to a variety of hydrologic alterations for navigation, irrigation, and flood control. These changes have led to a disconnection between the rivers and their floodplains which in turn have led to changes in fish production, distribution, and the extirpation of species at the local and regional level (Moyle and Light, 1996). The lower Brazos River provides a unique opportunity to study a North American river-floodplain system which still displays a natural hydrologic regime.

Previous studies by Winemiller et al. (2000) have shown that fish assemblages in floodplain oxbows and the river channel are significantly influenced by the unique physical and chemical attributes of each habitat with different species dominating under alternate conditions. This study inferred that spatial and temporal variation in flooding has a significant effect on assemblage structure and that connectivity of oxbow and channel habitats facilitates colonization of depleted habitats.

We propose to study the response of Brazos river fish assemblages to hydrologic variability and to examine the contribution of the floodplain to fish production and diversity in the river channel. Three oxbow lakes and one river channel site will be sampled monthly over a period of two years. Small fish and juveniles will be sampled using beach seines and large fish will be sampled with experimental gill nets. Additional sampling will include larval fish and zooplankton using conical tow nets and a suite of environmental variables including; temperature, conductivity, dissolved oxygen, and chlorophyll a.

Fish will be classified according to life history strategy after Winemiller and Rose (1992). Although all fish will be measured and enumerated; one species representing each life history strategy will be selected for further analysis. Key life history variables will be measured and related to the hydrologic regime and the physical and chemical characteristics of the habitat. Subsequent sampling of larvae and juveniles will examine differences in the success of different life histories in response to hydrology and environmental conditions. In addition the isotopic signatures of fish will be used to examine the sources of production for fish sampled in the river channel and oxbows.

With the demand on water resources continuing to increase it is imperative that we learn the importance of natural hydrological regimes to the organisms found in river floodplain systems. By understanding the importance and function of these systems we can manage our water resources more effectively. My study will add to the body of knowledge about North American flood-plain rivers and provide information that will be necessary to make future water use decisions on the Brazos compatible with fisheries, agriculture, and flood control.

References

Amoros C., G. Bornette. 2002. Connectivity and biocomplexity in waterbodies of riverine floodplains. Freshwater Biology. 47: 761-776

Bayley, P.B. 1995. Understanding Large River-Floodplain Ecosystems. BioScience. 45: 153-158.

Junk, W.J., P.B. Bayley, R.E. Sparks. 1989. The Flood Pulse Concept in River-Floodplain Systems. In D.P. Dodge (ed.) Proceedings of the International LargeRiver Symposium. Can. Spec. Publ. Fish. Aquat. Sci. 106.

Moyle, P.B., T. Light. 1996. Biological invasions of fresh water: Empirical rules and assembly theory. Biological Conservation. 78: 149-161.

Winemiller, K.O., S. Tarim, D. Shormann, J.B. Cotner. 2000. Fish assemblage structure in relation to environmental variation among Brazos River oxbow lakes. Transactions of the American Fisheries Society. 129: 451-468.

Winemiller, K.O., K.A. Rose. 1992. Patterns of life-history diversification in North American fishes: implications for population regulation. Canadian Journal of Fisheries and Aquatic Sciences. 49: 2196-2218.

Intended Career Path Statement

My goal for the future is to pursue a career in academia. I would like to continue researching river-floodplain systems and provide information that resource managers can use to make informed decisions about water use issues while understanding the consequences. I believe that understanding how hydrology is related to the biological processes of the river-floodplain is the key to developing water use policies that are compatible with the interests of fisheries and wildlife as well as agriculture and flood control.