Hydrologic Analysis for River Ecosystem Management

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Abstract. Rivers in the western United States, and particularly those of the Colorado River Basin, have experienced widespread ecological degradation and loss of biological diversity. This evolution, from natural and pristine rivers, to diversion for single purpose use, followed by reservoir development and multiple use, then over use coupled with competing use in time and space, ultimately led to the elimination of a dynamic hydrologic regime. These and other watershed influences have altered the physical, chemical, and biological elements of the river system. Water demands continue to increase as a result of population growth, dwindling ground water supplies, industrial or energy development, snowmaking, and recreation based instream flow needs. Since the 1960's a growth in the public's environmental ethics, federal species preservation, water quality protection, and interest in free flowing rivers has evolved to the present day twenty first century with a renewed emphasis on ecosystems. This heightened environmental awareness creates a desire for data, models, information management, and systematic analysis of multiple scientific disciplines. A good example of this information and analysis need resides in the Green and Yampa Rivers in the Upper Colorado River Basin. These rivers are home to endangered native fish species including the pikeminnow and razorback sucker. In addition, the headwaters of the Green River are impounded by Fontenelle and Flaming Gorge Dams. These reservoirs store water supplies as well as generate hydropower. Conversely, the Yampa River is considered unregulated and encompasses most of Dinosaur National Monument. Recreation is highly regarded on both rivers including fishing, whitewater rafting, and aesthetic values. Vast areas of irrigated agriculture, forestry, and mineral extraction also surround these rivers. Balancing the existing needs for water resources, while attempting to restore endangered fish populations creates tension among individuals and river interest groups. To address this information need, we have developed a prototype Environmental Resources Analysis System (ERAS) spreadsheet based computer package. ERAS provides access to historic data sets, scientific information, statistical analysis, model outputs, and comparative methods all in a familiar and user-friendly format. The emphasis of this poster presentation is to highlight the hydrologic analysis incorporated in this decision support system. This detailed hydrologic data analysis is based on a software package and methodology, Indicators of Hydrologic Alteration (IHA), that compares 33 parameters within five statistical groupings. An assessment of impairment, change, or alteration from either natural flow regimes or from pre-development hydrology id provided. In addition, an overview is presented of a simplified decision support system for use by a diverse mix of water or resource managers, special interest groups, and individuals all with concerns for sustainability of the Green and Yampa River ecosystem.