Introduction

Walker Lake is one of three desert terminus lakes in the United States that support a fishery. Over the past 100 years, lake levels have declined about 140 feet and the volume of the lake has decreased from, about 10 million to less than 2 million acre feet. During this decline the total dissolved solids (TDS) of the lake have increased from about 2,500 mg/l to greater than 15,000 mg/l. These changes have had far reaching impacts on the health of the lake and its associated ecosystems. High TDS values have resulted in significant population declines of threatened Lahontan cutthroat trout (LCT), a subspecies that is receiving significant conservation and restoration attention.

Walker Lake is located in a watershed that supports significant agriculture activity. The source of the lake's water comes primarily from snowmelt runoff from the Sierra Nevada, which flows through several agricultural valleys before reaching the lake. There are currently no water rights for the lake, so during low water years the lake receives little or no inflow from the Walker River.

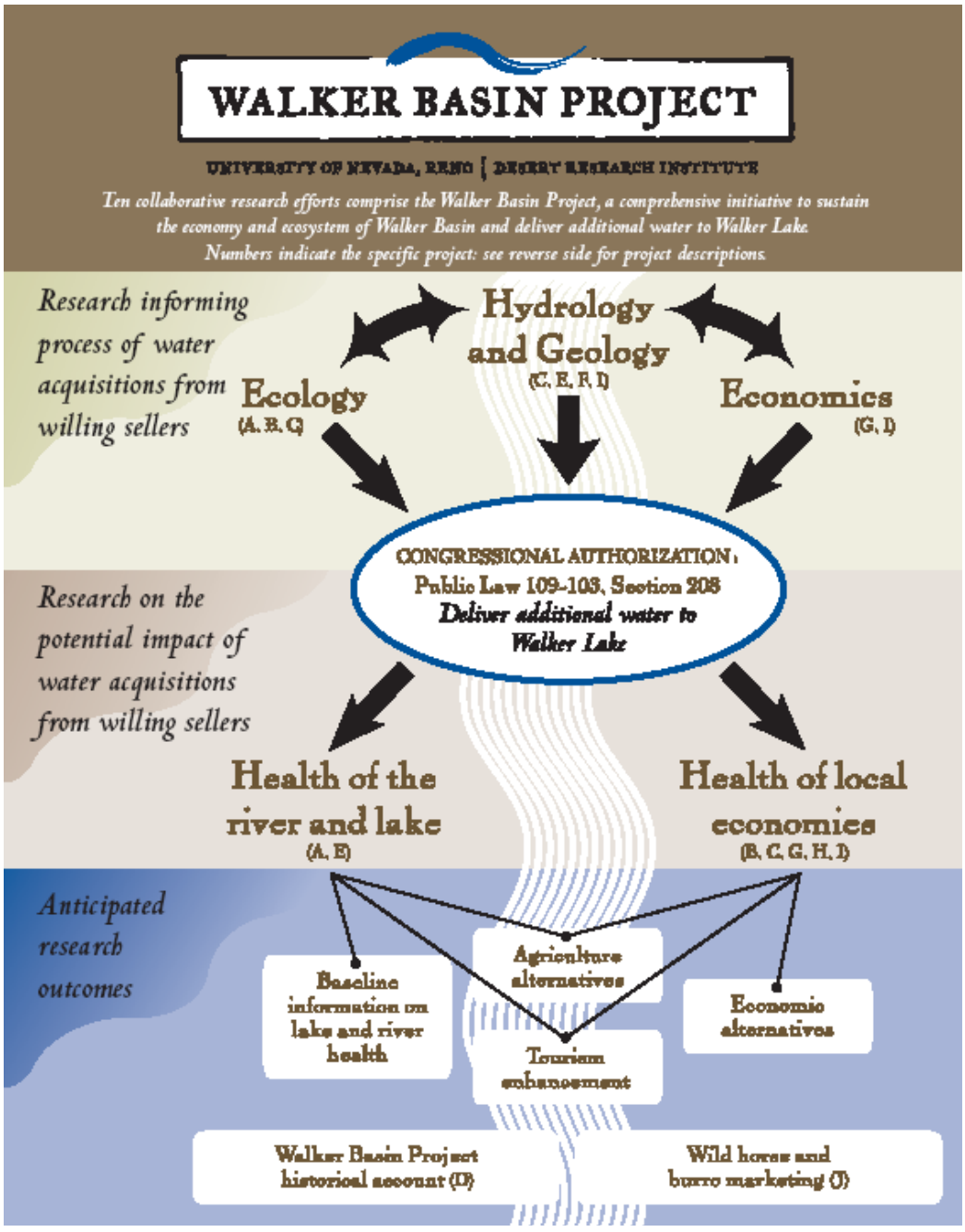
In an effort to save Walker Lake, Congress enacted a law in 2005 (i.e., H.R. 2419 Energy and Water Development Appropriations Act, 2006, Section 208), that created a program to acquire water rights from willing sellers in the Walker Basin. In order to enact an ecologically and economically sustainable program of water acquisitions, a large-scale integrated research program was established. The goal of the Walker Basin Project was to provide the hydrologic, ecologic, economic, and agricultural data needed to inform decisions related to water acquisitions. This report is the product of the research program that was developed in response to direction provided in this federal legislation Specifically, Desert Research Institute and University of Nevada, Reno faculty were funded to: (1) develop a method to optimize the purchase of water rights in the Walker River Basin, (2) evaluate options for practicing alternative agricultural practices, and (3) evaluate the impacts that water removal from crop-irrigated lands will have on the spread of invasive plants, aquatic and terrestrial ecosystems, and the local economy.

This document is divided into 10 sections, each representing a major research component of the overall project. Throughout the study period, project leaders met monthly to share updates, coordinate logistics, and ensure ongoing integration of the overall research effort. The relationships between these component studies are depicted below, along with a brief description of the activities of each study component.

Once the draft reports were completed by the component study leads, the project co-directors (M. Collopy and J. Thomas) obtained independent external peer reviews from subject matter experts for each of the completed report sections. Then report authors revised their respective documents, based on the review comments provided, and documented how they responded to each of the review comments. The peer reviewer comments and the authors' responses to those comments are compiled in a chapter at the end of this document. The Bureau of Reclamation (BOR) granted two of the studies (Alternative Agriculture; Plant, Soil and Water Interactions) no-cost extensions through December 2009, so data for a second growing season could be obtained prior to finalizing their reports. While a preliminary report for each of these two studies is included in this report, they were not externally peer reviewed. That review will take place in the fall of 2009, in advance of submitting the final

reports for these two studies to BOR. It is our intention to submit those documents as an Addendum to this final report.

The component studies of the overall project were developed as standalone reports, thus many of the component study reports contain similar background and introductory material. This material was included so that the individual reports could be read as standalone sections without having to read other parts of the overall report.



PROJECT DESCRIPTIONS

A. HEALTH OF WALKER RIVER AND LAKE. This project will evaluate and establish a benchmark for the environmental and ecological health of Walker Lake and Walker River. Decision tools will be developed to analyze the efficacy of different water acquisitions for improving future ecological integrity of Walker Lake and Walker River.

B. ALTERNATIVE AGRICULTURE AND VEGETATION MANAGEMENT. This project will identify the economic potential and cultural practices necessary for low-water-use crops with the aim of minimizing water use, soil erosion and evaporation from soil surfaces. In addition, the research will evaluate methods to re-establish desirable vegetation in areas that may be affected by changing agricultural practices and to anticipate vegetation responses under scenarios identified through modeling efforts.

C. PLANT, SOIL AND WATER INTERACTIONS. This project will assess likely responses by soils and vegetation to changes in water application and use. Information on the impacts of changes in water table and stream elevation on soil physical and chemical properties, including wind erosion, nutrient cycling and salt accumulation, will aid managers in the preservation of air and water quality adjacent to and within the river and lake itself.

D. PROJECT HISTORICAL ACCOUNT. This project will provide an overview of the political and historical context in which the acquisition of land and associated water rights for ecosystem restoration in the Walker River system occurs. Key components include arid land agriculture, multi-state involvement and urban/rural interface issues.

E. HEALTH OF RIVER CHANNEL AND LAKE WATER WITH INCREASED FLOWS. This project will develop a set of recommendations to minimize further sediment and salt loading to Walker Lake and degradation to the lower Walker River under increased water flows. These recommendations will be made available to land and water managers to assess potential impacts resulting from variations in flow, water quality and channel geometry on the transport of sediments and on the flow capacity of the Walker River.

F. WATER FLOW MODEL. This project will develop a decision-support tool to evaluate the effectiveness of proposed acquisitions of water rights from willing sellers to increase water delivery to Walker Lake. The tool's water flow model will include aspects of climate and evaporation from different water sources.

G. WATER CONSERVATION PRACTICES FOR AGRICULTURE PRODUCERS. The project will determine the most economically effective use of water on agricultural lands and provide producers with an estimate of the potential amount of water rights they may be able to offer to the market for lease or sale.

H. ECONOMIC IMPACT AND STRATEGIES. This project will develop estimates of the economic impacts projected to occur from the acquisition of water rights and changes in agricultural production and land use. The project will also formulate economic development actions to mitigate the projected economic and fiscal dislocations. One benefit of this research will be to identify appropriate sustainable economic development actions and related public policy alternatives.

I. GIS DATABASE DEVELOPMENT. This project will develop a geographic information systems (GIS) framework for linking water rights with water distribution networks and points of diversion for the Walker Basin. The resulting GIS database may be used to assess how water and land acquisitions will affect the entire Walker Basin system. The economic component of this project will develop a GIS database of properties, businesses and local demographics in close proximity to the Walker River and its tributaries.

J. WILD HORSE AND BURRO MARKETING. The project will determine which characteristics of wild horses and burros increase adoption rates. It will also investigate alternative auction procedures which could increase adoption rates and simultaneously increase revenues to support wild horse and burro programs.

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