Project Title: **Great Basin Ecosystem Management Project for Maintaining and Restoring Riparian Ecosystem Integrity**

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Introduction and Background: Riparian corridors within upland watersheds in the Great Basin physiographic province of central Nevada encompass less than 2 % of the total land area. Nonetheless, they contain a disporportionally large percentage of the region's biodiversity, providing habitat for neotropical migrants, numerous endemics, and a large number of endangered species. Many of these upland watersheds fall within the Toiyabe-Humbolt National Forest, and in recent years, there has been a growing need to determine the instream flows required to maintain the riparian vegetation within these basins as well as within other watersheds of mountainous environments of the western U.S. Of particular importance are mesic and wet meadow ecosystems which locally occur along the alluvial valley floors.

Stream incision is a major threat to existing mesic and wet meadow ecosystems. Rapid stream downcutting, due to natural (climate change) and anthropogenic (mining, grazing, recreation) disturbances in these upland watersheds produces a corresponding decrease in ground-water levels. As the water table drops, vegetative zones requiring a shallow water table are eliminated and ecosystem biodiversity is reduced. Other stream reaches are impacted by streambed agradation, sediment deposition (the most prolific non-point source pollutant in the U.S.) due to changes in the downstream hydrologic regime. Identifying and maintaining the minimum instream flows necessary to support the riparian corridors and mesic/wet meadow ecosystems also is an important concern.

Objectives: The overall goal of the Great Basin Ecosystem Management (GBEM) Project is to achieve a better understanding of the structure and functioning of riparian ecosystems within the Great Basin and develop guidelines for maintaining or restoring the integrity of these systems. Specific objectives for the GBEM project are to: 1) determine the effects of both climate change and natural and anthropogenic disturbance on ecosystem processes at the scale of the watershed, riparian corridor, and stream reach, 2) determine the successional trajectories and recovery potentials of key riparian ecosystems exhibiting varying levels of degradation, 3) develop a classification system for categorizing watersheds according to their sensitivity to natural and anthropogenic disturbance, and 4) evaluate restoration techniques for severely degraded riparian areas.

Approach: During the past five years, three wet meadow ecosystems within the Toiyabe, Toquima and Shoshone Ranges have been intensively instrumented to gain a preliminary understanding of the relations between the surface and ground-water flow systems and the vegetational communities. The results from these studies have led to a generalized model of the interactions between geomorphic, hydrologic and biotic processes associated with wet meadows. However, a number of questions remain that must be answered at both local and watershed scales before sound restoration programs can be developed. The applicability of the model, developed using just three sites, to the region as a whole is unclear. Current research efforts address the most important questions that remain, including the applicability of the previously collected data to other systems in central Nevada: 1) factors controlling meadow distribution, 2) processes related to meadow dissection and headcut migration, 3) geomorphic and vegetational evolution of the riparian corridors, 4) spatial and temporal variations in meadow hydrology, and 5) rate of loss of meadow ecosystems and consequences for hydrologic regimes and riparian vegetation.

Accomplishments to date (February 2004): Hydrologic, geomorphic, and ecologic monitoring has been conducted at the Big Creek, Corral Canyon, and Indian Creek field sites over the past five years. Results from this monitoring program indicate that riparian meadow complexes occur along hydrologic gradients that are influenced by the rates and magnitudes of incision along axial channels. At one end of the hydrologic gradient, wet meadow vegetation exists with water tables at or near the ground surface, and shallow overland flow predominates during spring snowmelt and periods of high runoff. At the other end of the hydrologic gradient, dry graminoid meadows exist that have water tables from 150 to 250 cm below the ground surface and that seldom experience overland flows. As stream incision progresses and water tables drop, wetter meadow community types are progressively converted to drier meadow types. The ongoing stream incision and loss of the meadow complexes provides a unique opportunity to examine the evolution in the geomorphology, hydrology, and plant communities of the meadow complexes in relation to the linked incision and integration of the axial channel network.

Near future tasks: A recent stream restoration proposal by the Humboldt-Toiyabe National Forest has accelerated the project towards this ultimate goal of providing resource managers with information on restoration alternatives and their effectiveness. Kingston Creek, in the Toiyabe Range of central Nevada, is undergoing active incision through a large meadow ecosystem. The Humboldt-Toiyabe National Forest has proposed a phased approach to the restoration of Kingston Creek which may include grade control and head-cut stabilization structures, stream bed and channel armoring, streambank reshaping, a "plug and pond" technique, and road relocation. Implementation of these restoration alternatives, which are still under review, is slated for FY04-05. A portion of the FY04 GBEM project efforts (including resources from a proposed IAG between the USEPA and the USDA Forest Service utilizing ecosystem restoration funds) are being redirected to the Kingston Creek site to collect pre-restoration geomorphic, hydrologic, and ecologic data. Data also will be collected during and after restoration in order to evaluate the effectiveness of restoration alternatives. Results from this research will provide resource managers with information needed to successfully manage and restore threatened riparian ecosystems throughout the Great Basin.