1 INTRODUCTION

The hydrologic and sediment regime of the Middle Rio Grande, New Mexico has been altered in the last century through construction of several dams and channelization. The quantity and quality of habitat for native species, such as the silvery minnow (*Hybognathus amarus*), the southwestern willow flycatcher (*Empidonax traillii extimus*) and the southwestern cottonwood-willow riparian habitat, has been significantly reduced.

The Rio Grande silvery minnow occurs only in less than 10% of its original range (Bestgen 1996) and reaches its most upstream distribution in the Cochiti Reach (Platania 1999). Remaining populations of this species continue to decline primarily due to the lack of warm, slow-moving, silt-sand substrate pools, dewatering of the river and abundance of non-native and exotic fish species (Platania 1991, Bestgen et. al 1991, Burton 1997, Robinson 1995, Arritt 1996). The silvery minnow became a federally listed endangered species in July 1999, after the US Fish and Wildlife Service (USFWS) designated the Middle Rio Grande, New Mexico from just downstream of Cochiti Dam to the railroad bridge at San Marcial as critical habitat for this species.

In addition, deterioration of riparian bosque habitat has occurred (Taylor et. al 2001). The USFWS listed the southwestern willow flycatcher (*Empidonax traillii extimus*) as an endangered species in February 27, 1995. This species is a small, grayish-green migratory songbird found primarily in riparian habitats characterized by dense growths of willows, arrowweed and other species that provide foraging and nesting habitat (USFWS 2000). The loss of southwestern cottonwood-willow riparian habitat has been the main reason for the decline of the population of the southwestern willow flycatcher (USFWS 2000).

The Bernalillo Bridge reach (Figure 1-1) in the Middle Rio Grande is included in both critical habitat designations. This reach begins at the Highway 44 Bridge in Bernalillo and ends 5.10 miles downstream from the bridge at cross section CO-33. Bernalillo Bridge reach is the next downstream reach from the Santa Ana Restoration Project.

The objective of this work is to analyze historical data and estimate potential conditions of the river channel. Prediction of future equilibrium conditions of the Bernalillo Bridge reach will facilitate the identification of sites that are more conducive to restoration efforts.

In order to achieve this objective, the following analyses were performed:

- Identification of spatial and temporal trends in channel geometry through the analysis of cross-section survey data.
- Planform classification through analysis of aerial photos and channel geometry data.
- Analysis of temporal trends in water and sediment discharge and sediment concentration using USGS gaging station data.
- Evaluation of the equilibrium state of the river through the application of hydraulic geometry methods, empirical width-time relationships and sediment transport analysis.

This work consists of eight sections. The introduction is included in section 1. Description and background of the study site is in section 2. Geomorphic characterization of the reach, including planform classification, sinuosity computations, longitudinal profiles, channel geometry and bed material sediment characterizations are presented in section 3. Section 4 presents the sediment continuity analysis of the reach, including single and double discharge and suspended sediment mass curves. Section 5 contains the predicted equilibrium states of the channel based on sediment transport analyses, hydraulic geometry equations and minimum stream power methods. Section 6 presents the discussion of the results. Summary of the results is included in section 7 and finally the list of cited references is presented in section 8.

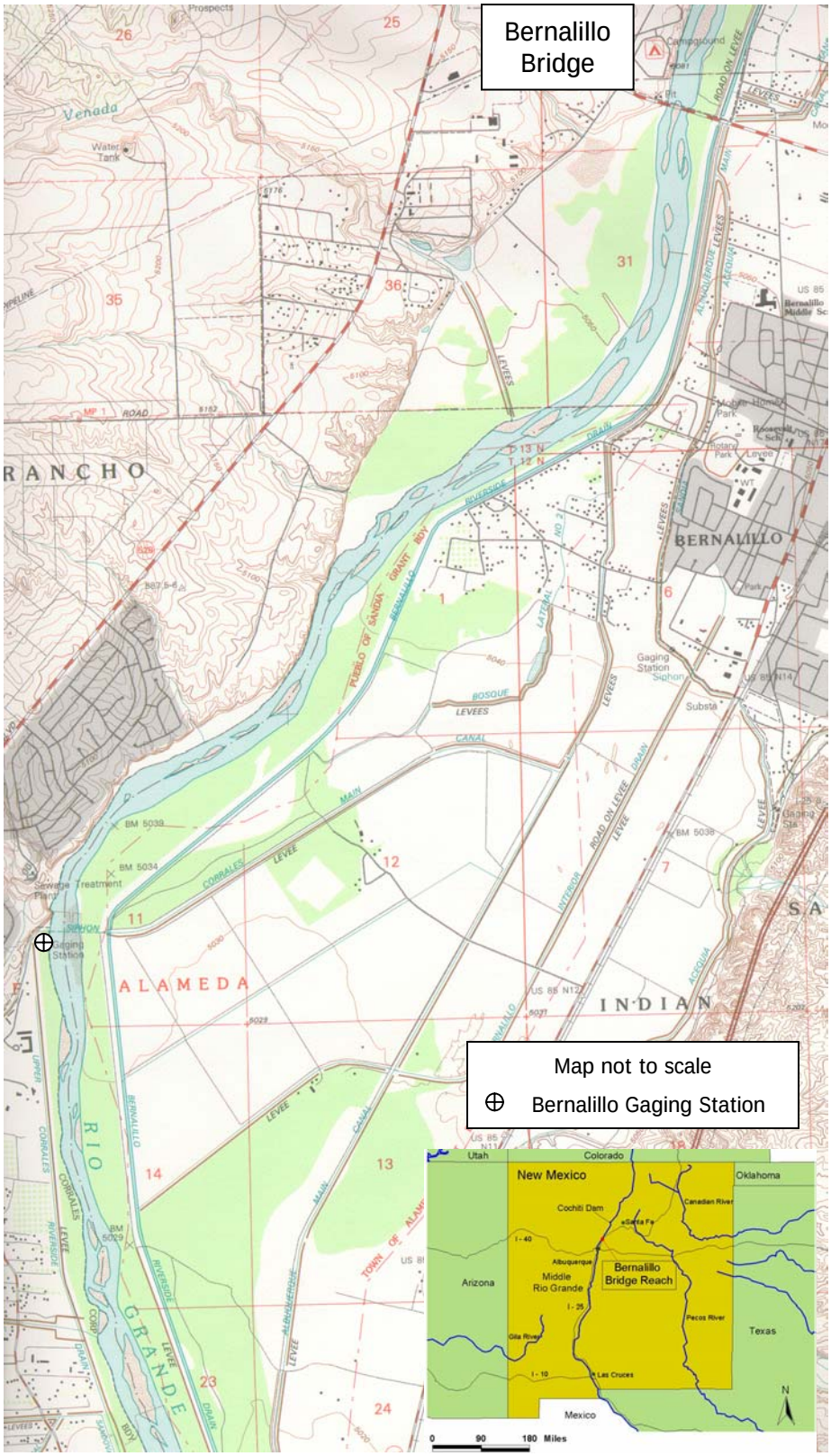

Figure 1-1 Bernalillo Bridge reach location map