NON-IMPACT ORIGIN FOR NEVADA'S ELKO CRATER FIELD. John F. McHone[1], Marvin Killgore[2], Robert S. Verish[3], and David J. Roddy[4]. [1]Geology Dept. Arizona State University, Tempe AZ 85287-1404 jmchone@hotmail.com, [2]Southwest Meteorite Laboratory, P.O. Box 130, Payson AZ 85545 meteoritelab@cybertrails.com, [3]P.O. Box 237, Sunland CA 91041 bolidechaser@yahoo.com. [4]USGS , 2255 N. Gemini Dr. Flagstaff, AZ 86002 (deceased).

Introduction: In northern Elko County, Nevada there are nearly 300 rimmed craterlike depressions scattered among the valley floors and walls of McClellan, Susie, and Dorsey Creeks. The best developed and most numerous of these craters lie along the eastern margins of Dorsey Creek's flood plain, locally known as Wieland Flat, in the vicinity of a former stagecoach stopover at Dinner Station. During the 1970's, one of the authors (DJR) flew repeated aerial surveys over a roughly 25 km by 10 km ground area, producing more than 200 overlapping 9-inch format aerial photos of the craters and their surrounding terrain. Flights were reinforced with brief field visits in order to determined general morphology and surface composition. Rim-to-rim diameters vary from less than 5 m to more than 250 m and a maximum depth of about 6 m. Central bowls contain wind-blown silt and mud, and rims are lightly armored with deflation gravels. In 1980, Ketner and Roddy produced a US Geological Survey map [1] suggesting multiple impacts from a meteorite shower as a possible origin for the Elko craters. Since that time, although they were occasionally featured in the popular literature, the craters have remained relatively obscure to public and scientific attention.

Recent Observations: Field expeditions into the craters were successfully conducted in spring 2001 and again in summer 2002. Craters are typically situated on, or immediately above, sloping valley walls and within a widespread volcanoclastic unit [1. 2]. At several locations landslides and soil slumps appear in close proximity to older rimmed depressions. Crater rims consist of slightly elevated, well-drained homogeneous gravel rich colluvium and lack signs of ruptured or overturned stratigraphy. Subrounded pebbles and cobbles are not commonly shattered nor fractured. On the 1970's aerial photos, elevated ground and crater rims often display small white dots which are ringed with darker material. These proved to be active ant hills, up to 50 cm high and surrounded by forage zones, still colonized after more than two decades. Poorly drained crater interiors are floored with mud-cracked silts and clays but tend to appear darker [Fig. 1] with more vigorous desert vegetation. Systematic sweeps with metal detectors and magnetometers have failed to reveal any meteoritic materials or magnetic anomalies. However, within the widespread gravels, a few isolated pebbles contain mineral inclusions (eg. hematite) capable of triggering a sensitive metal detector.

Figure 1. Portion of Elko Crater Field located about 3.5 km NNW from Dinner Station, Nevada. Photo is 0.8 km wide, north is up. Diagonal line is the trace of a pipeline road. Upper right area is an elevated plateau; lower left is a flat flood plain. Rimmed craters are best developed in sloping valley wall.

Conclusions: As of this writing, the craters in northeastern Nevada still lack conclusive impact criteria. Their preferred occurrences along valley slopes and their association with volcanic ash units hint of endogenic processes. We suggest the craters were formed by groundwater sapping followed by surface subsidence and slump failure within the sloping valley walls of Elko County.

References: [1] Ketner, Kieth B., and Roddy, David J. (1980) Map Showing the Elko Crater Field, Elko County, Nevada. *USGS Map Sheet MF-1168*. [2] Verish, R.S. (2002). "Elko Crater Field" revisited - reconnaissance report (abstr). Geological Society of. America Annual Meeting, *Denver 2002, Paper No. 239-14.*