The Bajada Canals of the Safford Basin: Small Corporate Group Collaboration in Southeastern Arizona

by James A. Neely
University of Texas at Austin

Don Lancaster
P.O. Box 809
Thatcher, AZ 85552

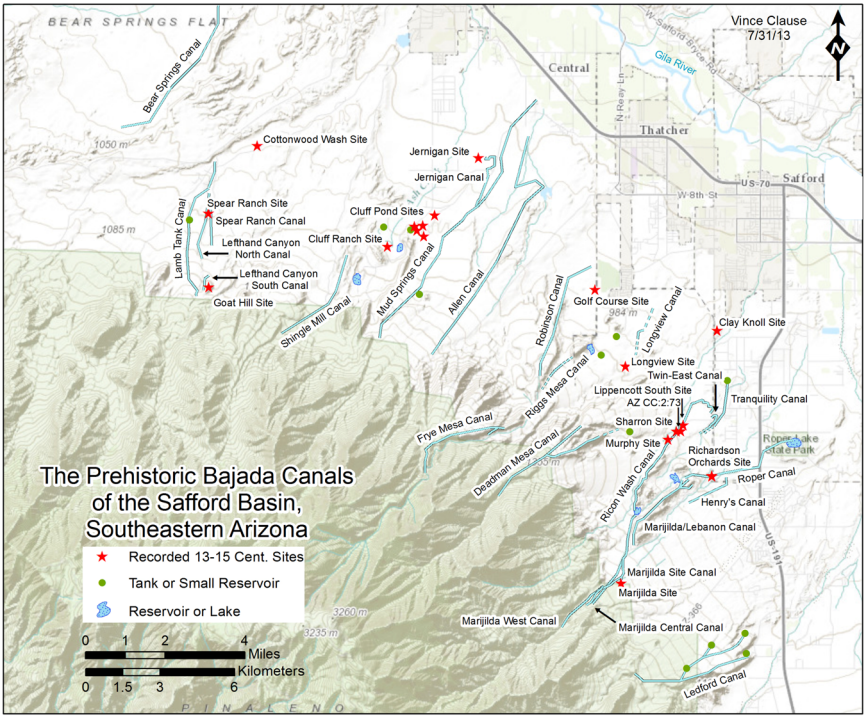
The Safford Basin is known archaeologically as an area cultivated extensively in prehistoric times. Both dry and irrigation farming, principally by means of elaborate canal systems on the floodplain and lower terraces of the Gila River, are well documented. Not appreciated, due principally to their recent discovery, are the canal systems south of the river that took flows out of washes heading in the Pinaleño Mountains to fields on the tops of Pleistocene terraces.

Presently, 26 canal systems and segments of systems have been identified, some beginning in the bajada, while others branch from drainages originating in the bajada. Because some of these features appear downstream from another, it is likely that they were once joined as a single system. The two longest systems (Frye Mesa/Robinson canal and the Ash Creek/Mud Springs canal) are about 9.5 km (circa 6 miles) in length and course northeastward to relic fields atop the terrace just above and south of the Gila River floodplain. The total length of all of these canals is estimated at about 75 km (circa 46 miles).

Systems were identified by a combination of pedestrian field survey and using the satellite function of Acme Mapper 2.0. Additional field verification and hand-held GPS units recorded canal channel coordinates that were transferred to Acme Mapper 2.0 to generate initial location maps.

These canals have been difficult to date since our study has been based solely on surface survey. We have depended on surface artifact finds and associated prehistoric sites to provide temporal parameters. While a few of these canals may date as early as circa A.D. 800, the vast majority appear to have originated after circa A.D. 1250, and persisted until circa 1450. As with many of the Gila River bottomland canals of the area, some of these prehistoric canals were refurbished by the historic inhabitants of the greater Safford area, but retain enough integrity to be recognized as having a prehistoric origin. Unfortunately, both historic and modern constructions and land modifications have negatively affected these systems.

These canal systems differ from those found in the vicinity of Phoenix and elsewhere in the Southwest in that they obtained their water from mountain drainages fed by runoff,



Locations of the bajada drainage sourced canals recorded to date in the Safford Basin.

springs, and artesian sources, rather than from rivers. They are also unusual in that they traverse the vertically undulating to severely erratic uplands of basin and range topography rather than being restricted to a nearly level riverine floodplain. Some carry their water load from more than 1,650 m (circa 5,400 ft) down to just above the floodplain of the Gila River at about 900 m (circa 2,950 ft). In places, the canals are of the traditional type—narrow, linear excavations into the ground surface that follow the contours of the landscape. In other locations within the same canal system, they appear as "perched" or "hanging" canals traversing sheer sides of mesas—with some about 60 m above the basin floor.

The canals often create the illusion of water flowing uphill in that the mesa top slope is usually somewhat steeper than the rate of fall of the canal itself. In these latter cases, the perched or hanging segments are essentially independent of their surrounding terrain, thus reducing energy input resulting from the need to excavate additional canal segments to cut and fill to follow the irregularities of the topography.

After reaching a mesa top through a long, gentle, and an apparently

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carefully calculated optimal grade, and then continuing as far as possible along the characteristically flat but gently sloped ground surface, the canals will typically "fall off" the far end of the mesa in steep but apparently highly controlled and nondestructive cascades descending in nearly vertical French Drain-like constructs.

Canal cross-sections at the ground surface vary from 0.30 m to 1.00 m, with atypical examples up to 2.00 m in width, and 20-40 cm in depth. Their use seems to be primarily long distance water delivery to fields, but canals also apparently supplied water to small habitation sites and complexes. Assisted by historic rebuilds, several reaches of the canals still flow to this day. Portions of most of the systems remain largely pristine, and are currently filled with fine-grained sediments. These systems are located mostly on Arizona State and Coronado National Forest lands that remain largely undeveloped. While often of difficult access, major canal portions are usually easily traced. There are few access roads and fewer mesa top trails.

To be continued in the October issue of *Glyphs*...

Suggested Readings:

Lancaster, Don

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2005 Prehistoric Agricultural and Settlement Systems in Lefthand Canyon, Safford Valley, Southeastern Arizona. In *Inscriptions: Papers in Honor of Richard and Nathalie Woodbury*, edited by R. N. Wiseman, T. O'Laughlin, and C. T. Snow, pp. 145-169. Papers of the Archaeological Society of New Mexico No. 31. Albuquerque.

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A number of unusual constructions were incorporated into some of these canal systems; two examples are: an aqueduct, about 1.5 m in height and 100 m long, was constructed to bridge a "saddle" in the topography associated with prehistoric segment of the Lebanon Canal. At a point where the primary Frye Mesa Canal is situated near the top edge of the mesa, a branching "counterflow" canal was excavated down the mesa slope at an acute angle, apparently to irrigate fields lying below and behind the point of branching.

Looking down canal at the narrow, nearly completely filled channel of the Robinson Canal as it courses along the steep side of a mesa on its way to fields on Robinson Flat. Note the illusion of the canal coursing upslope.

Several canal systems illustrate elaborate methods of purposeful switching of the water routes between major delivery drainages. In sum, these systems appear to represent a major understanding and a very careful exploitation of both hydraulic fundamentals as well as extreme energy and use efficiency.

Engineering can be defined as a sense of the fitness of things. Aptly meeting these criteria, the Safford Basin bajada canal systems are a sophisticated innovation that is superbly energy optimal and a brilliant engineering solution for reliable water transport and delivery over the basin and range topography of the area. They are a phenomenal adaptation to an arid environment

to irrigate agricultural fields distant from a once apparently abundant water source.

The discovery of these canals and our continuing survey in the Safford Basin suggests the basin was a prehistoric population center and a major supplier of cultivated crops. Survey in Lefthand Canyon (near the western boundary of our survey) and Marijilda Canyon (near the eastern boundary of our survey) has recorded a rather heavy population concentrated along the canals, but the sites are nearly all small and scattered. Survey along many of the other canals recorded only a few small sites. These findings provide evidence in the form of agricultural intensification and settlement that points to a sociopolitical organization based on the collaboration and collective action of small corporate groups rather than a more complex social stratification and sociopolitical structure. These finding parallel those reported by Hunt et al. (2005) on the Hohokam area. As a Hohokam presence has been noted for the Safford Basin, we might suggest that Hohokam migrants may have, at least in part, engineered the sophisticated canal constructions.

Canal (middle ground) going around a contour on the western side of the long, narrow mesa landform near the mouth of Marijilda Canyon. At this point, the canal is approximately 50 m above the basin to the west. Again, the canal coursing upslope illusion is discernible.

Suggested Reading:

Hunt, R. C., D. Guillet, D. R. Abbott, J. Bayman, P. Fish, S. Fish, K. Kintigh, and J. A. Neely
2005 Plausible Ethnographic Analogies for the Social Organization of Hohokam Canal Irrigation. *American Antiquity* 70:433–456.

***GLYPHS*:** Information and articles to be included in *Glyphs* must be received by the 10th of each month for inclusion in the next month's issue. Contact me, Emilee Mead, at emilee@desert.com or 520.881.2244.