

Arizona's Prehistoric Hanging Canals

A highly remarkable series of exceptionally engineered late classic **prehistoric** (est. 1250 to 1450 CE) mountain stream fed water management structures found in the **Safford** Basin of Arizona's upper **Gila Valley**. These canal systems can be uniquely characterized by portions of them being literally "hung" on the edges of steep sided, gently sloping **mesas** formed from remnant **Quaternary** age **bajadas**.

At places, the hanging structures are as much as 60 meters above their adjacent drainage basins. It appears **the highest feasible points on mesas were carefully selected** for canal routes. It also seems clear that **extreme energy efficiency** was a major goal during the canal construction.

Two credible reasons for these unique hanging routes is that **their slope could be made largely independent of their surrounding terrain**. And that much of the construction effort could be efficiently made **across**, rather than **along** the canal routes. Thus minimizing any energy loss or water robbing cuts and fills.

Twenty six or more hanging canal systems or fragments have been identified to date. The longest canals exceed 9.5 kilometers (6 miles) and the total system length is currently estimated beyond 75 kilometers (40 miles).

These canal systems are unique 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, 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.

Canal cross-sections vary from 0.30 to one meter, with **atypical examples** up to two meters in width, and 20 to 40 centimeters in depth. Their use seems to be primarily long distance water delivery to fields, but the canals also apparently supplied water to small habitation sites and complexes. When assisted by historic rebuilds, several reaches of the canals still flow to this day. Portions of most of

the systems remain largely pristine, and many 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.

While the canals have been dated primarily by **stratigraphy** and **association**, other age evidence does include: Being run over by roads, **SCS** dams, fences, and even cemeteries roughshod without accomodation; uniform **patina**, **lichens**, and **caliche**; mature trees and shrubs mid-channel; extreme purposefullness and well directed energy efficiency; and a lack of any apparent use of pioneer or **CCC** tools except in places of obvious refurb or adaptation.

No **survey instruments** are known to survive, but it is possible that careful pilot extensions of the canals themselves served as static **water levels**. The construction effort is variously believed to be fifty man years or more. Portions of the system give a rather strong "water flowing uphill" illusion, owing to the controlled gentle slopes and the nature of the adjacent terrain.

Additional associated structures that also show exceptionally creative **engineering** include a long **aqueduct** crossing a saddle, an extremely deep and long cut, and a spectacular upcanyon routed "counterflow" canal segment.

Tradeware from contemporary habitation sites imply a major trading activity with **Hohokam**, **Mimbres**, **Salado**, **Mongollon** and **Ancient Pueblo** regional cultures.

These hanging canals are in **association** with other possibly older management schemes that include conventional lowland riverine canals, extensive **dry farming grids** that number in the tens of thousands, numerous aproned **check dams**, and grouped arrays of mulch rings.

The canals suggest that the basin was a prehistoric population center and a major supplier of cultivated crops. They also provide evidence in the form of agricultural intensification and settlement that points to a socio-political organization based on the **collaboration** and collective action of small corporate groups rather than more complex social stratification and socio-political organization.

In summary, the Safford Basin hanging **bajada** canal systems represent a quite sophisticated innovation that was both 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 any agricultural fields distant from a once apparently abundant water source.

References:

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2013 The Bajada Canals of the Safford Basin

In press at **Glyphs**; also see <http://www.tinaja.com/tinsamp1.shtml>.

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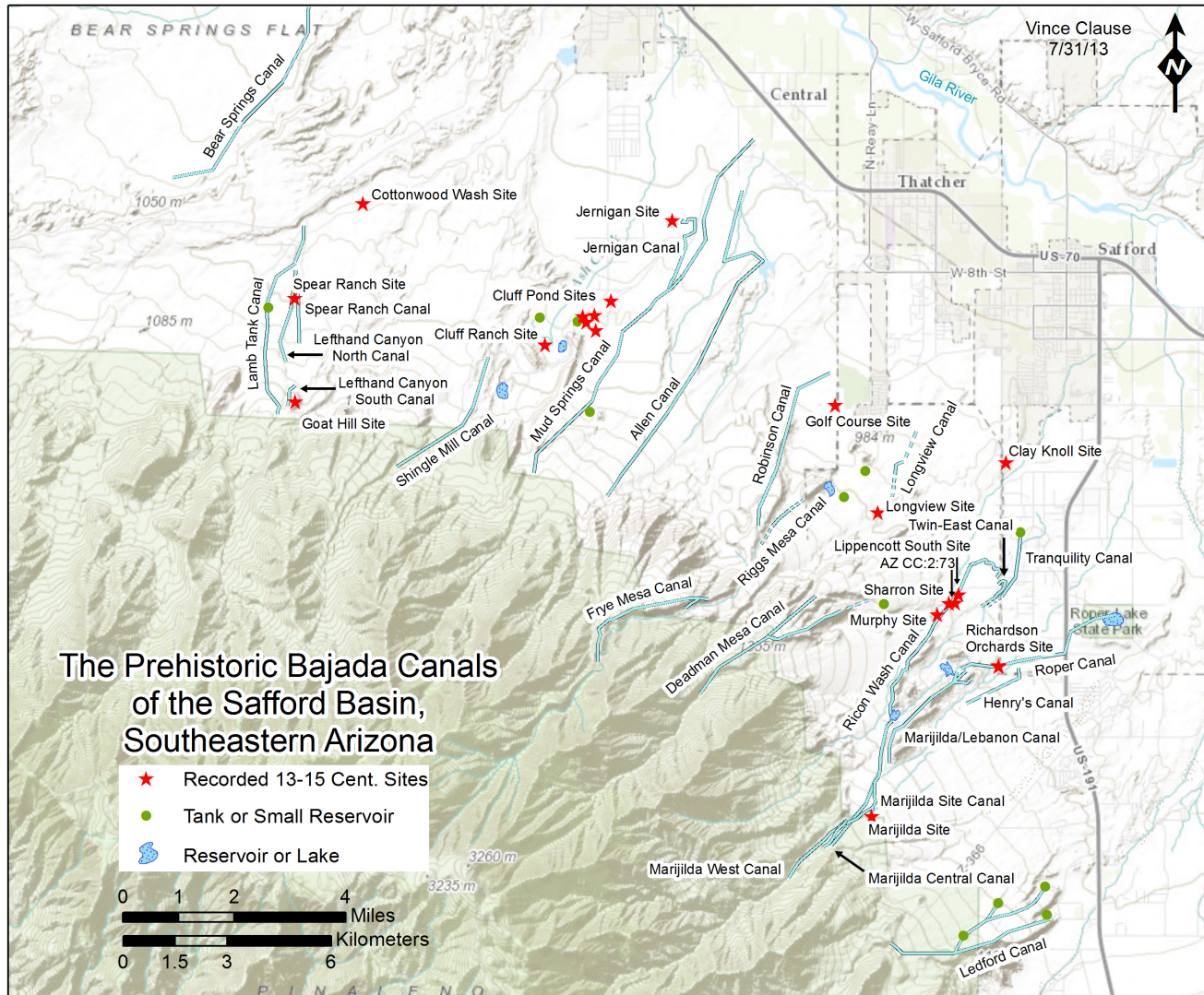
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Map of Pinalino Mountain stream fed hanging canals under present study.



One of the more spectacular hanging canal reaches.



Hanging canal cross sections often show a "water flows uphill" illusion.