

Prehistoric Hanging Canals of the Safford Basin (Update III)

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Some recent studies have investigated the scale and scope of a remarkable series of late classic prehistoric (est. 1350 CE) water management structures found in the **Safford** Basin of Arizona's upper **Gila Valley**. These canal systems are uniquely characterized by their being literally "hung" on the edges of steep sided, gently sloping **mesas** formed from remnant **Quaternary** age **bajadas**. The mesas today are characteristically rocky, sparsely vegetated, thinly soiled, mostly undeveloped, rather impermeable, and largely infertile.

At places, the hanging structures can be located as much as 60 meters above their surrounding drainage basins. It is clear that **the highest feasible points on mesas were carefully selected** for canal routes "on purpose". In several cases, any more direct routes seem to have been clearly avoided.

It is also quite clear that **extreme energy efficiency** was a major goal during the canal construction. Owing largely to an absence of beasts of burden or means of transporting heavy materials significant distances. 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 robbing cuts and fills.

Twenty or more distinct hanging canal systems have recently been identified. Many of which trend from southwest to northeast. Eventually leading northward to the Gila River valley proper...

Click for an interactive Google Earth hanging canal map.

Re-click for more detail on the individual canals.

The total system length is estimated at more than sixty kilometers. The canals seem to totally exploit adjacent **Mount Graham** perennial streams which include Jacobson, Marijilda, Deadman, Frye, Spring, Shingle Mill, Ash, and Lefthand. And whose present **stream flow rates** are often in the fractional CFS range. All these systems are clearly distinct from the Gila River bottomland canals.

Associated with the hanging canals is at least one above-grade solid **aqueduct** of significant height and length. Along with some apparent 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 and extreme energy efficiency.

Typical cross sections are one meter wide by twenty centimeters deep with maxima in the two meter range. Use seems to be primarily associated with long distance water delivery to conventional northerly fields. Most mesas reveal little other ag activity.

Assisted by historic rebuilds, **several reaches of the canals still flow to this day.** Other portions of most of the systems remain largely pristine. Although currently filled with fine grained and **loess-like** or sedimentary depositional sands.

Ownership is often **Arizona State Lands** that remain undeveloped to date. While often of difficult access, **major canal portions are usually easily traced.** There are few access roads and fewer mesa top trails. 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 system itself...**



After reaching a mesa top through a long, gentle, and an apparently carefully calculated optimal grade and then continuing as far as seems possible along the characteristically flat but gently sloped mesa top, the canal systems will typically "fall off" the far end of their mesa in steep but apparently highly controlled and nondestructive cascades. Some are reminiscent of **French Drain** constructs.

The canals are known or presumed to eventually end up in areas characterized by habitation sites and ag structures such as **grids**, mulch rings, field houses, linear features, or field areas.

Most systems seem to have a "breakaway" initial diversion point. At which major flood damage would appear to be easily and quickly repaired without significantly impacting the main structural portions of the canals themselves.

Site Considerations

A reasonable question might be **"Why the apparent prehistoric manic obsession with hanging canals purposely built on the edges of steep sided mesas?"**

Engineering can be defined as **a sense of the fitness of things**. The following arguments, if accurate and relevant, suggest that "hung" canals could be a superbly energy optimal and engineeringly brilliant solution to reliable long distance water transport with minimal construction energy...

- **On a hanging canal, slope is largely independent of terrain.** This infers that optimal flow rates can be set over long distances without much in the way of local topographic restrictions.
- **On a hanging canal, cuts and fills can be minimized.** Simply by following the contours or crossing them at an intentionally predetermined flow delivery rate.
- **On a hanging canal, one canal wall is often "free"** The rising portion of the mesa can form most, if not all, of the canal's inside wall. Which implies that significantly less effort, less construction, and less energy might end up being needed.
- **On a hanging canal, long term catastrophic flood damage can be minimal.** Any washouts are likely to be both short and easily repaired. As verified by most portions of most hanging canals surviving to this day.
- **Mesa Top Slopes are usually gentle and nearly optimal.** They also often range for long distances at near constant slope. Thus maximizing delivery for minimum construction effort. The mesa tops often include usually **impermeable** rocky soils which might minimize delivery losses.

- **Construction can be mostly across, rather than along the canal.** Far less material often needs moved far shorter distances. This can allow spectacularly impressive energy efficiencies.
- **Mesa Top use conflicts are less likely.** Fields, grids, mulch rings, and habitation sites are often more favorably located elsewhere.

Survey Instruments

At present, there are no known surviving instruments that might have been used during the prehistoric canal construction. However; **a case can be made that the canals themselves served as self-measuring water levels.** A small, low energy, and a shallow "pilot route" could get extended from the end of any canal under construction and static filled with water just to the point of far end overflow. By noting the depth of the placid water surface below the entry point, the canal slope could be evaluated and then adjusted to be within acceptable bounds.

Whether or not this was in fact done remains highly speculative.

Evidence of Age

Beyond the mainstays of **stratigraphy** and **association**, few methods are known to accurately date a long range prehistoric delivery canal. Especially one with scant related artifacts. Or one that may have had significant pioneer, **CCC**, and/or modern rebuilds and adoptions. Instead, these combined factors all working in concert tend to establish a late classic (1350 BP) age for many portions of many of the canals in this study...

- **Energy Efficiency** – Prehistoric area cultures typically lacked beasts of burden, scrapers, or any other tools to ease the medium or longer distance transport of heavy materials. Thus, an **extreme energy efficiency would likely be a major consideration for any longer distance canal delivery project.** A strong argument can be made that the primary purpose of a hanging canal routing is to make its slope independent of terrain. In many instances, the rock and dirt movement was primarily **across**, rather than **along**, the canal routing. There are numerous cases where a major "S" or "U" routing was used to studiously avoid a more extensive cut and/or fill. And instances where very long lengths of parallel canals were specifically used to gain only a very few meters of elevation.
- **Purposefulness** – The canals clearly met several prehistoric needs to transport mountain stream water to limited sized and sporadic fields. A major advantage of a small mountain canal over a large lowland one is that catastrophic flooding would be much faster and easier to repair.

Similar modern needs would appear to be lacking since most of the mesas chosen remain mostly unexploited and underused to this day. Thus, the canal routings appear far more attuned to prehistoric.

- **Dam Overruns** – There are at least two 1930's era **Soil Conservation Service** dams that ran roughshod over major canal routes without any accommodation. The most prominent of these was the spectacularly failed **Allen Reservoir**. A similar overrun did take place midway along the Mud Springs canal. Several other dam candidates exist, including Layton Reservoir. These dams seemed to make no attempt whatsoever to preserve the route, to add or remove water, or to respect in any manner any historic or pioneer memories of their constructors. There are also many instances of overruns by modern roads, tanks, fences, and even cemeteries without any accommodation whatsoever.
- **Mid Channel Mature Plants** – There are several examples of larger Mesquite trees, mature barrel cactus, associated older parasitic brush, and similar plants mid channel in many of the canals. These would tend to exclude modern or **CCC** uses and might place much of any pioneer use or reuse into question.
- **Patina, Caliche, and Lichens** – When a long stable rock is moved, its surface defining line between **patina** and **caliche** usually will become disoriented. Any **lichens** will also delineate to a non-horizontal border. Over centuries of time span, these markings tend to fade. Most locations of most of the canals surveyed do show a remarkably uniform patina and lichen distribution. Suggesting a long term lack of disturbance.
- **Lack of any apparent use of pioneer tools** – Historic pioneers would have ready access to mules or horses, concrete, picks, shovels, blasting powders, rebar, scrapers, block and tackle, heavy lifting aides, and such. All of these would leave distinctive construction signatures. There seems to be very little evidence of any use of such tools and resources over the majority of the canal reaches.
- **Easier to "Steal the Plans" and "Dig out an Old Ditch"**– There are numerous instances of apparent pioneer historic reuse of portions of these canals. It is significantly easier and cheaper to "steal the plans" and "dig out an old ditch" than it is to fully engineer and construct a properly functioning canal from scratch. And no point whatsoever in continuing the canal far beyond its intended end use area.
- **High Prehistoric Population** – Early historic pioneers to the Gila Valley likely numbered only a few hundred at most. For a number of reasons, the prehistoric population is assumed to be much higher and possibly as high as today. Thus, historic pioneers would simply not have the manpower available for such major area constructs.

- **Lack of characteristic CCC** signatures– Despite its presumably noble cause, many local **CCC** (Civilian Conservation Core) projects did end up as totally worthless busywork **boondoggles**. The tendencies included long linear and precisely surveyed high rock alignments that usually went across rather than along drainages. There is also a more distinct "newness" and "completeness" and the aerial imagery tends to be much better defined and more obvious. Much of the rockwork ended up related to precision European origin stone masonry. Some is compass oriented. In short, the anal **CCC** and purposeful prehistoric styles are conspicuously different and often can be easily distinguished.
- **Forensics** – Fingerprints or glove fragments might still partially survive in some limited form on the rock undersides of **CCC** era construction projects. Such survival would be enormously unlikely on a prehistoric construct. To our knowledge, modern "**CSI**" techniques have not yet been applied to this or similar problems. But we have located a deeply incised "Alberto Signature" on one of the known **CCC** projects at **<N 32 47.695' W 109 45.304'>**

And finally...

- **Archaeologists say so** – Some reasonable and competent studies done by presumably qualified individuals who supposedly know what they are doing have pronounced most of these canals to have a high probability of being late classic prehistoric.

The Hanging Canals

At present, some twenty or more canal candidates have been investigated and somewhat arbitrarily named as...

SOME HANGING CANALS IN THE STUDY	
P Ranch	Riggs Area
Ledford*	Frye Mesa*
Henry's*	Robinson*
Marijilda*	Allen*
Roper*	Mud Springs*
Tranquility*	Jernigan*
Twin East*	Shingle Mill
Rincon*	Lefthand*
Deadman*	Bear Springs
Longview	Bandolier

Those marked with asterisks (*) are presently deemed more significant. What follows is a review summary of some of the discoveries to date...

The P Ranch Area

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The P Ranch area would seem to be a suitable candidate for the Southernmost prehistoric hanging canal system. There are persistent local rumors of such canals, but several area studies to date have failed to reveal any obvious results.

There is apparently a short run of a deep Vee ditch from **<N 32 37.004' W 109 43.669'>** to **<N 32 37.096' W 109 43.621'>** whose origins are suspect. There appears to be large diversion channels at **<N 32 39.244' W 109 43.123'>**, again with presumed more modern origins but showing definite signs of older age. Stockton wash at **<N 32 35.701' W 109 44.338'>** could be a likely source of perennial water, as could the seasonal sources in Veech and Spring Canyons. Rumored candidates suggest resources somewhere in the **<N 32 39.126' W 109 44.044'>** area.

The region deserves further study albeit at a somewhat lower priority.

The Ledford Canal System

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The Ledford system starts at the John's Dam in Jacobson Canyon **<N 32 41.090' W 109 45.712'>** and climbs "up" onto the remnant **bajada** mesa just north of Metate Peak. It splits **<N 32 40.954' W 109 45.519'>** into several channels and then passes Goat Tank, Ledford Tank, and similar impoundments still apparently in use for modern stock raising. Several of the switching arrangements can be noted that provide steep cascading descents to valley floor tanks.

Presently studied length exceeds 5 kilometers.

There does appear to be considerable modern use of this resource. Some of the "dropoff" points (such as **<N 32 41.347' W 109 43.250'>**) are quite obvious from US Route 191 owing to rather extensive parasitic vegetation. The Ledford canal system appears to be the least well explored and interpreted of the significant hanging canals and remains difficult of access.

End usage has yet to be defined, but is believed to involve off mesa fields to the south and east.

Primary access is quite difficult and mostly limited to smaller 4WD vehicles or foot. The hanging portion is relatively minor where the canal "climbs" up the mesa from Jacobson Canyon wash. This is one of the more complex canal routes and certainly deserves extensive further study.

Associated Metate Peak to the South has been the site of numerous artifact discoveries.

Henry's Canal

[Click for the Henry's hanging canal field notes](#)

Henry's Canal appears to be the southernmost of the Marijilda Creek derived prehistoric canals. The present studied length is 1.6 kilometers or 1.0 mile.

The study area begins at **< N 32 44.226' W 109 44.535' >** where the well-defined canal suddenly appears, assumes a minor hanging portion, and leaves a wash. Some ambiguous evidence of the canal has been noted upstream and westerly from this point. Elsewhere, there are other "vanishes at a wash" situations at **< N 32 45.774' W 109 44.053' >** and **< N 32 50.525' W 109 48.884' >** in which their respective canals ended up clearly making a sudden "U" turn. Presumably done to maintain a uniform wash-crossing grade.

Once out of the wash at **< N 32 44.327' W 109 44.297' >**, the canal assumes a somewhat wider and shallower stance than typical...



The Henry's Canal then crosses a power line 4WD track at < **N 32 44.386' W 109 44.137'** >, and then trends somewhat more northerly at < **N 32 44.563' W 109 43.702'** >, and disappears under a cattle tank at < **N 32 44.689' W 109 43.717'** >.

The modern Roper Canal can be found just north of this now tank-buried canal portion. Suggesting that the almost certainly linked Henry's Canal is either the original routing or a secondary feeder to the present Roper Canal alignment. This also would strongly reinforce a prehistoric origin for at least some portion of the Roper Canal.

Several smaller canal fragments of lower quality workmanship have been noted near < **N32 44.224' W 109 44.575'** >. It is not yet clear what their relationship is to the Henry's source of supply.

Many thanks to Henry Schneiker and Phyllis Farenga for their survey and ground truth assistance on this canal.

The Marijilda Canal

Click for the Marijilda hanging canal field notes

The Marijilda Canal is perhaps the easiest to view and has the most spectacular hanging portion. One image was previously shown on page **122.2** and can be separately viewed at < <http://www.tinaja.com/images/hangcan1.jpg> >. The canal sources in Marijilda Canyon < **N 32 42.363' W 109 46.673'** > at the lowest normal perennial water location of Marijilda Creek and its current study area is approximately 3.2 kilometers or 2 miles long.

The initial reach along < **N 32 42.895' W 109 46.135'** > is shared by the historic puddled concrete Lebanon Ditch, which serves both modern ag sites and as a primary feeder to Roper Lake. The Lebanon access road is an extremely rough 4WD track, making through trips problematic. Upcanal access is best done via the Marijilda road, and downcanal off of Cactus Road. This portion flows year round.

A strong case can be made that both "Steal the plans" and "Dig out an old ditch" seem to end up as the defining hallmarks of many of the pioneer and modern adaptations of these prehistoric hanging canal systems. In many cases, very little technological improvement appears to have been made to most routings.

There are numerous habitation sites, field houses, and ag related features in the area, perhaps suggesting the densest occupation in the region. The prehistoric and the historic canals separate near < **N 32 43.304' W 109 45.864'** > with the historic Lebanon Canal briefly continuing down Rincon Wash and emptying into Lebanon Reservoir #1. The prehistoric Marijilda Canal begins its spectacular mesa "climb" at this point. There are numerous artifacts in this area.

A unique feature of the Marijilda Canal is an apparently solid **aqueduct** that starts at **< N 32 43.415' W 109 45.751' >** and continues on to **< N 32 43.451' W 109 45.742' >** The aqueduct is a meter high by over a hundred long and apparently provides some needed additional height to the canal base route. The aqueduct lies on a natural saddle. It seems to be solid with no ability or provision for cross flow. This feature is likely unique as additional aqueducts in the entire hanging canal system remain quite rare and largely unproven.

The long linear "climb" up the western face of Lebanon Mesa is quite impressive, at times ending up over ninety meters above the base terrain. There seems to be no significant ag use of the mesa top itself, suggesting that the primary purpose of this canal reach was to deliver water to field sites further to the east. The fine grained loess or aeolian fill of this portion of the canal often makes hiking the route quite pleasant, despite its length.

There is an apparent steep falloff from the mesa top itself that has not yet been fully studied. It ends at a more easily traced and viewable portion near **< N 32 44.554' W 109 44.719' >** just above and south of the Lebanon Reservoir #2 spillway. There is a distinct possibility that the Marijilda Canal prehistorically continued as the separately studied Roper Canal.

Occasional brush directly along the canal route suggests a minimum of fifty or more years of disuse. In many places, the mesa slope forms the upcanyon wall, while a constructed rock barrier takes care of the downcanyon side. Construction consistently shows an extreme economy of energy, with the fewest possible rocks and the least amount of dirt moved in a minimalist manner. Nonetheless, one credible estimate of total system construction time might be in the fifty man year range.

The Roper Canal

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Roper Lake is currently supplied by a modern cement lined deep vee canal that sources from Lebanon Reservoir #2. Sourcing is literally a few meters from where the prehistoric Marijilda Canal drops off Lebanon Mesa to the east. The reservoir water is derived from a previous reach adaptation of the prehistoric Marijilda Canal. The Roper Canal follows a flat and rather highly obvious topographically favorable route. A reasonable assumption might be that the modern canal exactly follows that of the prehistoric original. And that Roper Lake itself once served as a fields area. This route also is near the center of the known hanging canals.

The last visible evidence of the "high route" of Marijilda Canal "up" and along Lebanon Mesa is found at **< N 32 44.583' W 109 44.700' >** and is adjacent to Lebanon Reservoir #2 and only a few meters above.

The Roper Canal takein point is found nearby < **N 32 44.641' W 109 44.714** > at the base of the Lebanon Reservoir #2 retaining dam. The modern canal continues from < **N 32 44.744' W 109 44.451'** > through < **N 32 44.837' W 109 43.366'** >, crosses US 191 at < **N 32 44.882' W 109 43.005'** > and delivers water to Roper Lake proper near < **N 32 45.338' W 109 42.529'** >.

The Tranquility Canal

[Click for the Tranquility hanging canal field notes](#)

The Tranquility Canal would seem somewhat atypical as it appears to be artesian sourced, is only 1.6 kilometers or one mile long, is "urban" subdivision located, and remains very much in need of stronger proof of verifiable prehistoric origins. The canal seems to start at an artesian source of < **N 32 45.599' W 109 43.964'** > and ends in the Cooks Reservoir at < **N 32 46.445' W 109 43.678'** >.

There remains considerable evidence of historic artesian building/rebuilding at < **N 32 45.599' W 109 43.964'** > , primarily in the form of iron or steel pipes, headgates, and diversionary channels. This is presently the presumed location of a prehistoric canal takein as well. All development seems to be presently long abandoned. Presumably because of a dropping water table.

The canal shows a curious mix of prehistoric and historic features...



The channel is modestly "hung" in the normal prehistoric manner and appears to be of minimum energy construction. But there also is an access trail and a thin puddled aggregate concrete lining remarkably similar to those Marijilda Canal historic improvements. Unlike virtually all of the prehistoric canals, the routing goes through a modern "urban" housing development and often crosses posted private property.

At < **N 32 45.599' W 109 43.964'** >, the Tranquility Canal comes amazingly close to the Twin East prehistoric hanging canal feeder. Approaching within 250 feet or 75 meters horizontally and perhaps only 25 feet or a mere 8 meters vertically. But the Twin East feeder is at a distinctly higher elevation and the two appear totally unrelated. There is a significant cliff between the two water channels.

The Annes Ranch Road at < **N 32 45.881' W 109 43.769'** > runs roughshod over the canal, completely obliterating it without any regard whatsoever for continued use. The road construction date is presumably in the 1960's.

Just north of this point, the puddled large aggregate concrete lining appears to be taking a parallel "short cut"...



Should this rerouting in fact be verifiable, it would strongly support a "steal the plans" historic modification of a prehistoric origin. Note also the "dead flowers" that seasonally tend to verify canal routes. A likely cause is improved water retention in any wind blown fill.

The canal becomes indistinct where it crosses West Lebanon Road but shortly becomes obvious on **Acme Mapper** further to the north.

When the canal crosses the Schmoller property yet further north near **< N 32 45.599' W 109 43.964' >**, it no longer has any concrete lining or access trail. And very much appears exactly like any of the other prehistoric hanging canals in the Safford Basin system. Locals in this area even call it "the old indian canal". This reach is rather obvious and fairly easily explored with landowner permission.

The Tranquility Canal presumably ended in fields lying under the present Cooks Reservoir. This reservoir presently appears empty and unused.

The Twin East Canal

[Click for the Twin East hanging canal field notes](#)

There is a curious prehistoric water related alignment between **< N 32 45.862' W 109 44.041' >** and **< N 32 46.031' W 109 44.312' >**. One interpretation of which is that it forms an end use ponding area that appears to be fed by **two** distinct major hanging canals. Evidence for an end use area includes highly atypical single walled retaining structures...



Note the mature cacti in the ponding area. Which gives reinforcing evidence of non-recent use.

Other ponding area evidence includes multiple routes, and contour-following aerial imagery far beyond and considerably more distinctly obvious than any normal reach of any other hanging canal in the series...



Unlike most reaches of most of the long range delivery canals, there are also numerous cultural associations in the immediate area. These include field houses, grids, mulch rings, and various other apparently ag-related rock alignments. The slope of much of the ponding area also approaches zero and appears to be the lowest point in either feeder canal elevation. Very preliminary negative slope measurements on the feeder canals show them to in fact be feeders. But further careful measurements might be required for a more convincing proof.

A possible eastern feeder water source might be the branch of the Marijilda Canal where it comes off the south end of Lebanon Mesa. Land in this area has been extensively modified by historic and modern agriculture. There presently is a 1.6 kilometer or 1.0 mile gap in this presumed and topographically favorable reach. While an artesian source might also be possible, this alternate is presently deemed unlikely. The adjacent and presumed artesian fed Tranquility Canal does lie at a significantly lower elevation.

The first southern extreme definitive Twin East Canal evidence is presently located at **< N 32 45.633' W 109 44.091' >**. The canal assumes a classic hanging construct that has a fairly strong "water flows uphill" illusion and is easily followed. As is often typical, the channel is one meter wide by 30 centimeters deep. The canal crosses the cemetery road and swings eastward. It is rather obvious and easy to follow at this point. Shortly afterward, the canal vanishes under the cemetery service dwellings.

Once north of the cemetery at **< N 32 45.760' W 109 43.955' >**, the canal briefly resumes a short but easily followed routing. At this point, the Twin East and the Tranquility canals end up amazingly close to each other. They approach within 75

meters or 250 feet horizontally and perhaps a scant 25 feet or a mere 8 meters vertically. However, the Twin East feeder is at a distinctly higher elevation and the two appear totally unrelated. A cliff literally separates the two. Once again, Twin East is felt to be mountain stream fed, while Tranquility may have had an artesian derived source.

Once past an indistinct portion, the canal assumes a large sweeping "S" in an apparent attempt at maintaining grade with a minimum energy use. The canal crosses a rough 4WD track at **< N 32 45.794' W 109 44.022' >** and briefly routes to the southwest. This is followed near **< N 32 45.776' W 109 44.051' >** by a sudden and a fairly easily traced "U" turn that approaches the ponding area to the northwest. The canal is distinctly counterslope at this point.

There are some curious rock alignments yet to be interpreted at **< N 32 45.854' W 109 43.898' >**. Their near constant width suggests a more modern origin, possibly by a bulldozer or scraper blade. Which may or may not overlay earlier constructs.

The Rincon (or Twin West) Canal

[Click for the Rincon hanging canal field notes](#)

As previously noted, the Twin East and Twin West canals do appear to share a common ponding destination. The source of the Twin West feeder is likely the Rincon Canal believed to route directly down Rincon Wash as a branch of the Marijilda Canal and appears to service numerous small habitation sites. Although an as yet undetermined contribution from the Deadman Canal cannot yet be completely ruled out.

Sourcing from the Deadman Canal, possibly near the upcoming projected three way switch would clearly provide redundancy. Major effort obviously did go into the Deadman Canal construction, and a credible destination for this major energy expenditure has yet to be verified. No direct link has yet been found, although there are some curious rock alignments at **< N 32 45.564' W 109 45.864' >** along a potential and reasonably viable route.

The southernmost contiguous evidence of the Twin West Canal to date appears to be near **< N 32 45.913' W 109 44.519' >** in the eastern canyon bottom south of the Rincon Access road.

This area lies off mesa from an older habitation. There are a field house and other cultural artifacts nearby. From here, the canal begins its hanging "climb" towards the mesa top. There is a medium sized "S" routing apparently used to maintain the slope with minimum construction energy. After its well defined climbing portion, the easily followed canal reaches the flat mesa top somewhere around **< N 32 46.031' W 109 44.312' >** to become part of the Twin Ponding area.

The Deadman Canal

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The Deadman Canal is presumed to be a 6.4 kilometer long partial historic rebuild and reuse of a prehistoric original. This routing is well marked on the topo maps and originates in Deadman Creek near its perennial flow limit. The reach of the canal from **< N 32 44.354' W 109 48.687' >** to **< N 32 44.697' W 109 48.394' >** seems consistent with significant hanging portions of nearby canals. This reach has been completely buried by a City of Safford water pipeline project. There is no present use of this resource, owing to a chlorinator issue.

After its one kilometer "climb", the optimally graded system reaches a small modern collection pond at **< N 32 44.697' W 109 48.394' >** which marks the diversion limit of extensive modern rework. The canal continues eastward along the **highest** portions of Deadman Mesa still in its apparent original prehistoric form. The presumed prehistoric continuance seems absolutely devoid of modern materials and techniques.

Along this reach, the canal largely consists of two rows of guide rocks half a meter to a meter apart. This portion of the canal flows year round to this day. Several diversions into modern cattle tanks seem to have been done. Some of these now appear to be in current disuse. No apparent use of modern tools and techniques can be found below the collection pond.

Following a two kilometer run, at **< N 32 45.640' W 109 46.877' >**, the mesa top is literally two meters wide, with a one meter canal centered on it...



While centering a canal on the **highest** point on a narrow mesa would appear unique, similar instances occur on Frye Mesa and elsewhere in this astonishing canal complex.

At this "narrows" point, any diversion of the canal into three routes would seem to be easily done, thus forming a "three way switch". Switching water routes could consist of just moving rocks around. No headgates or diversion structures seem to be involved. Such switching remains speculative.

One route could lead to Porter Springs tank and eventually to a well established Longview prehistoric habitation area. As we will see, only very limited hints of any canal structures have been found in this area, which is otherwise characterized by numerous apron enhanced check dams.

The center diversion now routes to an apparently abandoned Lower Deadman Tank. It is usually dry and unused at present. Fields or prehistoric evidence in this area have yet to be extensively studied, although there are several hints of a few possible canal routes to the northwest.

The southern Deadman switching currently routes water to Upper Deadman Tank. Significant prehistoric cultural resources are present in the Rincon Canyon area below this tank.

Once again, as considerable time, energy, and engineering obviously went into the Deadman Canal, use questions arise if Twin West is not a credible destination.

Some enigmatic constructs near **< N 32 45.564' W 109 45.864' >** have yet to be field verified and evaluated.

The Longview Area

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The northwesterly area below the possible Deadman three way switch and the Porter Springs tank is rich in habitation sites, includes an astounding variety of tradeware shards, grids, checkdams with and without aprons, and has numerous other cultural artifacts. Plus quite a few **CCC** projects.

While no major canal system has yet been observed serving this area, such a system would appear highly conspicuous by its absence.

What seems to be a retaining wall of a smaller delivery canal can be located near **< N 32 47.377' W 109 45.596' >** with the canal itself largely traceable from **< N 32 47.365' W 109 45.626' >** to **< N 32 47.387' W 109 45.523' >**. A series of highly visible sequential retainer rock alignments can be noted somewhat to the south and forms a credible field delivery area. A possible route for a proposed canal can be found at **< N 32 47.237' W 109 45.661' >**.

The Riggs Area

[Click for the Riggs Area field notes](#)

There seems to be a minor assemblage of artifacts in a rocky area of Frye Canyon just south of Riggs Mesa that suggest braided prehistoric water channels. Their age remains somewhat indeterminate but they would appear to serve no obvious historic or more recent purpose. The workmanship and the quality of construction seems to be low. The terrain is extremely rocky **Holocene** valley fill.

Channels at **< N 32 46.633' W 109 47.472' >**, **< N 32 46.699' W 109 47.399' >**, and **< N 32 46.760' W 109 47.290' >** are typical. These seem to end in sudden drops into modern wash erosion. There are also a few minor **CCC** water spreader projects and several unknown age check dams in the area. No linkup with the Robinson Canal or Frye Mesa water further south and upcanyon by 0.3 kilometers or 0.5 a mile has yet been determined.

Frye Mesa Region

[Click for the Frye Mesa field notes](#)

No major canal development has been noted in upper Frye Creek, likely owing to its extreme topography. But significant artifacts definitely appear present at the southernmost and highest reaches of adjacent Frye Mesa. These include many large and complex braided water channels...



The apparent water source was the spring in Spring Canyon at < **N 32.73895 W 109.85221** >. As noted below, this same source was also used much further downstream for the Allen Canal taken in at < **N 32.78243 W 109.83566** >.

A modern forest service PVC gravity water system appears to exactly follow the believed Frye Mesa route, in yet another apparent "borrow the blueprints" ploy.

The mesa route likely started with a diversion dam and presently is believed to lie **underneath** the Frye Falls road at < **N 32.75144 W 109.83826** >. Exact routing remains undetermined.

The braided channels at < **N 32.75998 W 109.81532** > and elsewhere consistently follow the **highest** mesa elevations at uniform and canal reasonable slopes.

A possible reason for the braiding might be different delivery ages or use dates. As one channel silts up, an alternate might be chosen.

Curiously, a few of the braided channels do appear to have modern **CCC** rework in the form of cross channel dams. Such dams are of distinctly different architecture. They would clearly prevent any channel use. There are other more traditional **CCC** water spreader constructs in the area.

The braided channels all seem to lead to a small ponding or switching area at < **N 32.76001 W 109.81109** >. At this point, two spectacularly large hanging canal segments can be noted. These are tentatively named the **HS canal** to the west and the **Upper Robinson Canal** to the east.

The HS canal is clearly counterflow as it heads **upcanyon** apparently to combine with the waters of Frye Creek...



It is interesting to note the obvious interest in differences between prehistoric Spring Canyon water and modern Frye Creek water. Possibly the Spring Canyon flow rate was much higher and certainly more accessible at the time.

Adding a dam and pipelines would dramatically affect the Frye Creek flow rates and its reliability. The pipelines also may have had a much lower end elevation delivery point. They were also somewhat less sensitive to strict elevation and terrain following rules.

Frye Canyon proper widens and flattens below the HS canal delivery point, so one possible use might have been local field delivery. There are a few small checkdams and field structures in this area, which has not yet been fully explored.

Although unproven, this combined water channel is also believed to deliver to the modern Blue Ponds area. Possibly via structures at [< N 32.77720 W 109.77527 >](#) and a reworked modern headgate switch at [< N 32.77720 W 109.77527 >](#).

The Upper Robinson canal is quite similar to the HS Canal, except for it heading in the normal downcanyon and downslope manner. Both canals appear built from the largest size rocks that can be hand carried. As with system examples found elsewhere, the Upper Robinson often trends its way along the **highest** possible of mesa elevations.

There is presently a mile wide gap between the known portions of the Upper Robinson channel and the Robinson Ditch. This obvious route is expected to be closed with further field work. Any connection to the Riggs Area braided channels has yet to be determined.

The Robinson Canal

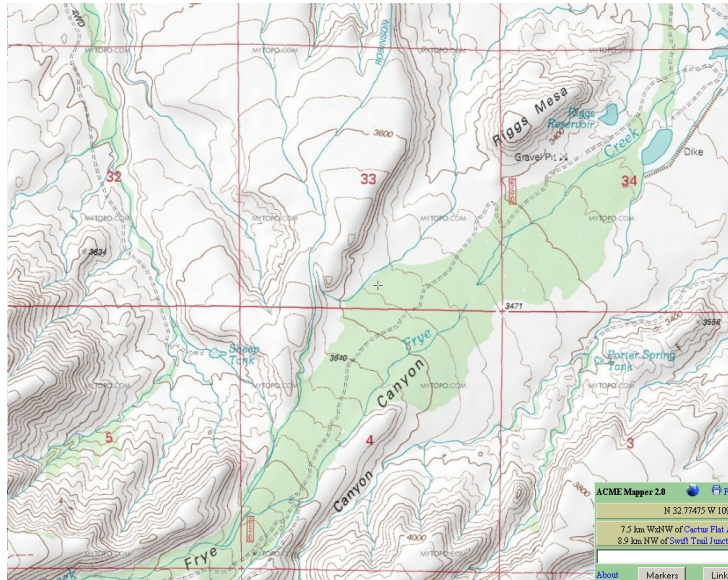
[Click for the Robinson Canal field notes](#)

This ag structure was named for a historic Mormon pioneer who apparently had restored, maintained, and improved the canal system. This is presumed to be a historic rebuild and reuse of a prehistoric original.

This canal is believed to originate from the Upper Robinson canal dropping off Frye Mesa. Its possible original destination might have been to deliver water to fields in the Robinson Flat area. Partial modern use apparently delivered water to the Thorpe and Stowe stock tanks, as well as one or more top-of-mesa tanks. Long dead but still extant remnants of parasitic trees suggest fairly late continued use. This reach includes a quite convincing "water flows uphill" segment.

The "lower" section of the Robinson Canal difficult access is largely by foot only. Via an obscure cattle trail that passes several [CCC](#) constructs.

The route is well marked on the topo maps...



Just north of the Sheep Canyon branch at **< N 32 45.996' W 109 47.919' >**, the canal enters a significant hanging portion that includes a rather strong "water flows uphill" optical illusion...



The canal appearance in the < **N 32 46.394' W 109 47.785'**> area is fairly typical of similar canals in their higher hung areas...



Once on the mesa top, appearance seems largely as expected...



As in the other presumed rebuilds, there seems to be no obvious evidence of any modern tool use along the main delivery reaches of this canal. Thus supporting a "stole the plans and dug out an old ditch" premise.

A catastrophic and apparently never repaired "sluffing off" failure occurred at the mesa edge near < **N 32 47.297' W 109 47.494'** >.

As we have seen, arguments that the structure was initially prehistoric include (A) Its astonishing similarities to known prehistory in adjacent canyons; (B) The mesa top **bajada** routing more consistent with prehistoric needs and goals; (C) A total absence of concrete, iron, headgates, or more modern techniques; (D) Much lower pioneer historic populations; and (E) The size, depth, rock relocations, and energy levels required appear totally consistent with stone age technology.

Once north of and off the mesa, more recent cattle ranch related construction makes tracing the canal difficult.

Once again, many thanks to Henry Schneiker and Phyllis Farenga for their survey and ground truth assistance.

The Allen Canal

[Click for the Allen Canal field notes](#)

The Allen Canal sources from Spring Canyon and presumably delivered water to fields under the present Layton flood control dam. It is potentially 9.6 kilometers or 6 miles long and has an average slope of 4.1 percent. However, this rather high figure includes a significant drop over a mesa edge. Most Allen slopes are comparable to the other hanging canals in the series. Canal portions have been converted into modern cattle tanks and **failed flood control dams**.

There is a rather spectacular **Culebra Cut** that is far and away the deepest and longest known excavation in the entire hanging canal series, approximating some two meters deep, three meters wide, and over a hundred meters long. Thus, this construct is felt to be world class. There are also more modest hanging portions and less deep cuts used to maintain grade independently of terrain.

Almost all of the known portions of this canal lie on Arizona State lands. Access is generally difficult and often limited to foot or small recreational vehicles.

The Allen Canal has apparently been historically modified to create the seemingly misnamed Hawk Hollow cattle tank and has also seen nearby **CCC** style water spreader construction features. Two segments of the canal remain unexplored and its ultimate destination remains presumed but unknown. Evidence of antiquity includes the spectacularly failed **SCS Allen Dam** running roughshod over the canal

without any apparent accommodation whatsoever. There are also quite a few mature barrel cacti midchannel on the mesa. Plus the fill and spoil areas all show highly consistent patina, desert varnish, lichens, and caliche.

The canal Spring Canyon takein point is rather obvious at **< N 32 46.943' W 109 50.130' >** . Erosion has rendered its present use nonfunctional. This takein point seems to correspond to a modern seasonal stream flow limit and is close to the expected contact between the **Precambrian** Mountain Schist and the **Holocene** Valley Floor fill. While the canal has obviously been diverted to meet historic needs, the reaches themselves appear to be largely devoid of any evidence of modern tool use.

This image near the takein shows the typical size and construction characteristic of most portions of most of the hanging canals. The image also exhibits a rather strong "water flows uphill" illusion...



The Hawk Hollow tank (which is really in the Central Wash branch of Spring Canyon) represents a modern adaptation with obvious tool use and European style precision coursed masonry construction in its overflow channel. At present, the region south of the tank remains unexplored but is expected to yield no real surprises. Similarly, the reach north of the tank remains unexplored. The satellite imagery in this area reveals numerous **CCC** water spreader projects. Rock cobbles in this area are generally larger and less uniform, leading to apparently cruder construction methods. There is also a modest hanging portion where the canal "climbs" out of a wash. The canal tracing can be resumed further North where a rather long but fairly shallow cut was made to retain grade.

From here northward, the canal is usually quite easily followed. Especially near **< N 32 48.652' W 109 48.717' >** Typical size might be a meter wide by 20 CM deep. There are numerous mature Barrel Cacti mid channel, suggesting a total lack of recent use beyond the Hawk Hollow tank. None of the mesa reach seems to show the slightest evidence of modern tool rework.

Only scant hints of possible canal routes have been found between the mesa edge at **< N 32 49.732' W 109 48.094' >** and the Allen Reservoir at **< N 32 50.022' W 109 47.702' >** to date. Leaving a definite gap still to be resolved. The Allen reservoir clearly ran over the canal routing without regard to any diversion or accommodation whatsoever. Giving yet another argument in support of the prototype canal being prehistoric. This reservoir was built by the Soil Conservation Service in the 1930's and its overflow was possibly intentionally blocked in the 1950's. Which resulted in its **spectacular failure** two decades later.

The watershed of the Allen Reservoir is quite small and significantly lacking in any mountain runoff, major springs or artesian sources. It is possible that the Allen Canal itself served as an early primary or auxiliary water supply source. However, the midchannel Barrel Cacti would seem to pose contrary evidence.

There are **anecdotal claims** that the reservoir once supported water ski recreation.

The canal is easily traced below the dam, leading to this moderately hanging image just above the Culebra Cut at **< N 32 50.133' W 109 47.870' >...**



The white channel color is likely based on caliche related dissolved solids. The few washouts in this area seem surprisingly minor.

The Culebra Cut near < **N 32 50.133' W 109 47.870'** > represents an amazing commitment of both manual labor and transport resources. With the exceptions of the Marijilda aqueduct, the HS Canal, and the Upper Robinson Canal, no other known local hanging canal artifacts remotely approach its scope or grandeur. In retrospect, this Culebra Cut seems to be much larger than the rest of the Allen system and of different architecture from the higher mesa canal areas. Reasons for this discrepancy are not entirely clear. Although there seems to be no evidence whatsoever of any modern use of this essential canal reach.

The canal continues westward beyond Culebra and remains fairly easily traced. There is a rather complex double "**S**" where the canal crosses the dual tracked north south fence. The canal suddenly loops northward when it crosses Central Wash near < **N 32 50.133' W 109 47.870'** > . Just north of here, the previously obvious canal track vanishes entirely. Possibly caused by sheet flooding, major wash rework, or other erosional activities.

While the Mud Springs canal is a reasonable distance further west, the presence of a few minor hillocks and a somewhat rolling terrain largely seems to preclude any connection. Instead, the canal is presumed to continue northward. With a logical but unverified termination in fields presumed presently under the modern Layton Flood Control Dam.

The Mud Springs Canal

[Click for the Mud Springs Canal field notes](#)

The **Mud Springs Canal** is one of the more significant features of the prehistoric mountain stream fed hanging canal systems. It sources in Ash Creek, crosses over into the Mud Springs **bajada** and ultimately delivers water both to the Jernigan Canal and to apparently fulfill yet unresolved needs in the Central Cemetery area or even within the Gila basin flatlands themselves. Total primary canal length is projected to be 9.6 kilometers or 6.0 miles. Of which two thirds have now been reasonably field verified.

A case can be made that Mud Springs could have been the initial or prototype on which many of the other hanging canals were based. The reasoning being that from location < **N 32 47.492' W 109 51.228'** >, the **entire length of the canal can be viewed at once**, planned, and possibly surveyed. No other known hanging canals seem to permit a one point total viewing.

The Ash Creek takein is believed to be just within the Coronado National Forest near < **N 32 47.247' W 109 51.272'** >. The takein is not yet explored and likely has been obliterated by long term flood damage. A significant hanging canal can be anticipated in heavy brush on the east canyon wall between the takein and the crossover saddle. This reach has not yet been located.

The saddle point < **N 32 47.492' W 109 51.228** > at which the canal crosses from the Ash Creek drainage to the Mud Springs **bajada** watershed seems remarkably well chosen from both a minimum energy expenditure and from a hydraulic engineering standpoint. The crossover also appears to be topographically unique with no reasonable route alternative. The canal at this point is one meter wide by 30 centimeters deep. The channel is reasonably and uniquely defined by its rock borders but is not exceptionally obvious here.

The 1.4 kilometer reach northward between the saddle point and the Mud Springs Corral at < **N 32 48.191' W 109 50.360'** > has not yet been located. No significant surprises are expected. This routing is projected to be reasonably findable over much of its length and to include minor hanging portions. The route is presently expected to be largely along the western periphery of the Mud Springs **bajada**. A resumption of the well defined canal is easily viewed somewhat west of the corral access road, again at < **N 32 48.191' W 109 50.360'** > and is easily traced a significant distance to the north.

The canal crosses the Mud Springs access road at < **N 32 48.417' W 109 50.274'** >. Which, coincidentally, was the initial rediscovery point of the Mud Springs Canal route. A west trending side diversion channel appears to be located at this point. Whose apparent goal may have been to dump excess water into a nearby wash, to adjust flow, or to aid in silt control. There are also hints of apparently not well developed grids, rock alignments, and possible smaller and poorly defined water channels somewhat north of this point and east of the access road. Perhaps in or around the < **N 32 48.836' W 109 50.350'** > area.

From the road crossing, the canal is easily traced northward, eventually ending up in association with some rather obvious **CCC** water spreading projects. The **CCC** architecture is distinctly unique and almost always is routed across, rather than along any canal or wash channels. There seem to be many dozens of **CCC** project examples in the area.

Eventually, the canal ends up in a brushy wash bottom and becomes difficult to trace. But somewhere near < **N 32 48.793' W 109 49.969'** > , the canal begins its rather significant, distinctly obvious, and superbly spectacular "climb" out of the eastern wash terrace face. The engineering involved in this task would seem most impressive. Once back "up" in the flats, the canal becomes indistinct and difficult to trace. At a significant east-west fence, the canal is believed to continue a short distance west of a unique triply "rock weighted" wire reach. Access to this point is a not overly difficult southwesterly hike from the end-of-track flood control barrier near < **N 32 49.049' W 109 49.664'** >. Besides the GPS locations, a useful process would be to "find the fence" to the southwest, and then "find the weights". The significant hanging portion will then be a short distance to the southeast.

North of the major east-west fence, the canal does become rather indistinct. But eventually makes a sweeping "**S**" turn to maintain grade. The canal then resumes

obviousness near **< N 32 49.098' W 109 49.887' >**. Here there is a 25 centimeter diameter mesquite tree squarely mid channel. The tree has not been cored, owing to augers being easily damaged by desert hardwoods.

From the tree, the canal is easily traced northwards to the largest flood control dam in the area at **<N 32 49.415' W 109 49.459'>** . There is a short meter deep cut where the canal exits a ridge. The canal goes through several architectural variations in this area, owing to topography and grade. There are also extensive **CCC** works present near here. Whose apparent purpose was to route flood waters into the dam. These are presumed modern and date from the 1930's. The canal itself routes somewhat west of the 4WD access trail. The canal at this point seems somewhat smaller than its other reaches. And might in fact end up diversionary to separate fields with the main channel buried or modified.

The dam ran roughshod over the canal, obliterating its route under itself and making no accommodation whatsoever to preservation or use. There is a major unrepaired blowout in the lower dam wall. Exploration of this blowout would appear to be extremely unsafe.

The canal is easily traced from the dam face southward and eastward. It initially begins yet another hanging wall climb "up" the north wash wall. In reality, all of the "water flows uphill" portions strictly maintain an optimal **downward** slope in the one percent range. The sheer brilliance of using a hanging canal for extreme energy efficiency and to force its slope to be largely independent of terrain can not be overemphasized.

Here is an image near the mid point of the Mud Springs Canal...



This location is somewhat atypical in that it is wider and shallower than most portions. The **SCS** flood control dam dating from the 1930's can be clearly seen in the background, along with its failure blowout. The dam does cross the Mud Springs canal somewhat north or right of the blowout. And does so without any regard or accommodation whatsoever. Neither adding to, removing from, or preserving any flow possibilities. Also viewable is the Mud Springs **bajada**, appearing as a large triangle "pointing" to the also visible upper Ash Creek drainage. About three miles or 4.8 kilometers of the canal are more or less visible.

The scope and magnitude of the hydraulic engineering can be appreciated by noting that this is one half of one of something like twenty hanging canals in the total system. It seems that a consistent attempt was made to totally exploit every possible drop of Northeastern draining Mount Graham stream water.

Note that the canal goes **uphill** into the picture. Despite the illusion of climbing "up" out of the wash from the base of the dam. Such "water flows uphill" illusions are quite common elsewhere in the local hanging canal systems. For in reality, a carefully controlled slope often approximating one percent is consistently made.

Note further that mid-channel brush strongly suggests no recent use. Note also the exceptionally uniform patina, desert varnish, and even the sometime lichen patterns. Strongly suggesting no recent canal wall or spoil bank modifications. At this point, the canal appears to have a moderate fill that could be water borne silt or aeolian dust based.

A rare and curious structure that appears intimately associated with the canal lies just South of the 4WD track crossing at **< N 32 49.522' W 109 49.368' >...**



The structure can be variously ascribed to being a field house or a "wading pool". It is circular, three meters in diameter, and presently half a meter deep. Its basal elevation is apparently flush with and one meter from the canal proper. Its use or purpose remains enigmatic. Tentative name is the "troll house".

The Mud Springs Canal continues eastward, just north of the 4WD track until it reaches an apparent "Tee" junction that is possibly the initial diversion point for the Jernigan Canal. There are a few small rocks buried in the otherwise southern dirt sidewall at this point that suggest a headgate structure. "Dead flowers" are sometimes a fairly unique but highly seasonal marker for canal routes in this area.

After crossing a larger 4WD track to the east, there is a split that appears to provide a short feeder to a more modern small cattle tank. This tank has a surprisingly dense brush content. The tank's origin and its actual water supply presently remains unexplained. The Mud Springs Canal tends northward and eastward from here and remains somewhat dim and rather small but reasonably traceable for the better part of a kilometer.

In general, there are very few artifacts associated with any of the hanging canals. But in this area, very rare and quite sparse potsherds can occasionally be found. Although not in direct association. These are typically late classic tradeware, often corrugated or red slipped. As is typical for the entire Safford Basin, the varieties suggest exceptionally strong trading patterns between most of the dominant Southwestern cultures.

The canal seems to totally disappear between **< N 32 49.826' W 109 48.955' >** and **< N 32 50.296' W 109 48.597' >**. Possibly because of sheet flooding or simply looking in the wrong place. There also seems to be a possible short canal segment at a totally unreasonable **< N 32 49.735' W 109 48.932' >** that presently has no explanation. Further east, the Allen Canal does approach within a kilometer but appears "blocked" by small rolling hillocks. No evidence of a more southerly direct canal route down Hawk Hollow has yet been observed and is presently deemed rather unlikely.

Once relocated northerly, the canal remains fairly traceable, although a portion of it has clearly been trashed by an offroad bike track. Things get somewhat dim near the major east west fence but renew themselves nicely further north. Near **< N 32 50.556' W 109 48.631' >**, the canal goes into a hanging mode and is remarkably white. Most likely owing to caliche deposits. The canal crossing of the main West Layton road is fairly obvious but heavily eroded. There is a distinctive ocotillo on a small slope to the east.

Curiously, the Mud Springs canal and the Jernigan canal do remain quite close together in this region. Despite their apparent intentional separation a full two kilometers earlier.

Near **< N 32 50.556' W 109 48.631' >**, the Mud Springs canal becomes wider and quite easily traced...



Nearly the entire route of the canal can also be viewed from this point. Patina and desert varnish here would seem to strongly support a prehistoric canal origin.

Frustratingly, the canal seems to vanish directly to the north. With the most likely explanation being its lying **under** the obvious 4WD tracks. Terrain further north is highly disturbed, including flood control structures, a cemetery, spread out trash dumps, offroading, and power lines. While there are no obvious field candidates, the canal route at this point is remarkably close to ultimately merging with the lowland Gila River based canal systems.

Considering the stupendous effort that went into all the canal construction and maintenance, a well defined and obvious purpose must surely have existed.

As noted, there is a distinct possibility that the Mud Springs canal was an early prototype, because nearly its entire route can be viewed from certain locations simultaneously. And thus would have significantly lower risk factors involved in its development and construction.

The Jernigan Canal

[Click for the Jernigan Canal field notes](#)

The Jernigan Canal is a western branch of the Mud Springs Canal. It likely is 2 kilometers or 1.2 miles long. It terminates in a French Drain cascade and routes to an apparent prehistoric field area in the vicinity of the old Central dump and near

CC:1:38 (ASM) and other sites previously studied as **EAC** field projects. The canal includes sweeping "double S" curves used to maintain a slope independent of terrain. It has two moderately hanging sections. A fairly deep (90 cm) and long (100 m) cut is present near its northern extreme. One 18 cm Mesquite tree is present mid channel. The canal mid route returns remarkably close to the Mud Springs Canal, with a kilometer or more of converging dual channels apparently were used to gain only a seemingly modest elevation difference.

Two large gaps remain in the exploration, possibly explained by sheet flooding or alternate routes. An associated "solid aqueduct" structure has yet to be dated and remains possibly historic. Significant portions of the canal are well defined, while other areas are only suggestive or missing entirely.

The Jernigan Canal apparently branches off of the Mud Springs Canal in a "T" structure near **< N 32 49.659' W 109 49.170' >**. Several smaller rocks in the otherwise uniformly coarse **Holocene** valley fill soils do seem to suggest a possible but unexcavated "headgate" or similar diversionary structure. Both canals in this area are not well defined. However, seasonal dead wildflowers at times rather strongly reinforce this likely routing.

The canal becomes better defined just west of the 4WD track at **< N 32 49.751' W 109 49.132' >** and may even have a second parallel channel at this point. Size is the typical one meter wide by 30 cm deep. After crossing the track near **< N 32 49.806' W 109 49.086' >**, the canal route seems to vanish entirely without a trace. Considerable time and effort have been spent trying to find the projected missing 600 meters or 2000 feet of route without positive results.

The most credible canal crossing of the West Layton Road would appear to be the modern waterbar at **< N 32 50.215' W 109 48.898' >**. The potential canal route between here and **< N 32 50.347' W 109 48.926' >** is rather vague but seems to be the only somewhat reasonable **Ockham's Razor** choice.

There is a possible western canal branch at **< N 32 50.364' W 109 48.850' >** leading to a potential aqueduct near **< N 32 50.347' W 109 48.926' >** However, this structure is highly enigmatic and could in fact be a historic wash wagon crossing.

At **< N 32 50.410' W 109 48.763' >**, the canal is very close to West Layton Road and amazingly near the adjacent Mud Springs Canal. It is only slightly higher in elevation. Extreme measures were apparently taken to achieve this exceptionally modest height gain.

The Jernigan canal continues north in a well defined manner and then suddenly disappears near **< N 32 50.574' W 109 48.760' >**. A large "S" turn is anticipated at this point and sheet flooding is a possible reason for the dearth of on-ground evidence. There is no obvious connection between this point and the continuing northerly Mud Springs canal after its road crossing.

The Jernigan Canal resumes at **< N 32 50.570' W 109 48.869' >** in a distinctly counterslope segment. There is a possible west trending cutout at this point. This may go to minor fields, flow regulation or desilting, or may not exist at all. The main canal is well defined south of here and includes a large Mesquite tree mid channel. Finding this portion of the canal proved quite difficult because of a non-obvious and unexpected counterslope "U" turn western wash crossing.

The canal makes another "U" turn in an obvious well hung portion that includes a fairly long and deep cut at **< N 32 50.564' W 109 48.927' >** It then routes to the south and drops into an apparent French Drain type of structure that feeds some well defined prehistoric field candidates.

This east viewing image...



...shows a hanging portion of the canal just above the fields with the tentative French Drain structure just off image to the right. This, along with the upcoming Lefthand Canal is one of few known examples of canal end delivery usage.

The Shingle Mill Area

[Click for the Shingle Mill Area field notes](#)

If the premise that virtually every drop of Northeastern Mount Graham stream water was totally exploited by the hanging canal systems is valid, then some prehistoric canal rather likely existed in the Shingle Mill Canyon or Merrill Wash

areas. And might otherwise be conspicuous by its absence. There is in fact a rather obvious abandoned historic canal called the **Minor Webster Ditch System** present. Although of a somewhat deeper vee construction, having evidence of modern tool use, and having an atypical access road, a reasonable case can be made for adaptation from a prehistoric prototype. The total length would be approximately 3.2 kilometers or 2.0 miles. While presently largely unexplored, the canal could reasonably be expected to deliver water from the Shingle Mill and Merrill Wash transition area to fields near the present Cluff Ranch headquarters of **Arizona Game and Fish**. Approximately one-half of the historic canal is obvious and easily traced and followed from the satellite images.

Few hints of a canal, historic or prehistoric, have yet been found south and west of the **Mceniry Road** crossing at **< N 32 47.869' W 109 52.384' >**. But there are, however, numerous **CCC** diversion structures in the immediate area. This area is a floodplain and a case can be made for major and possible disruptive flooding over time. A reasonable input point might be at the transition between Shingle Mill Canyon and Merrill Wash, perhaps at **< N 32 47.327' W 109 53.401' >**.

The historic canal becomes rather obvious just east of the **Mceniry Road** at **< N 32 47.869' W 109 52.384' >** and is easily traced northward. The present exploration ended near **< N 32 47.869' W 109 52.384' >**, with the canal continuing to be readily extended northward. A modest hanging portion of the canal can be reasonably expected further north, but this has not yet been field verified. The projected end use area was likely around **< N 32 48.769' W 109 51.988' >**. Terrain in this area has been extensively and repeatedly modified by farming activities and **AGF** projects.

Many thanks to historian George Hayes of **Arizona Game and Fish** for his highly useful research input to this topic.

The Lefthand Canal

[Click for the Lefthand Canal field notes](#)

The **Goat Hill/Lefthand/Spear Ranch** area is well known archaeologically and has been studied in depth by **Neely** and others.

At present, the canal appears to directly source from an intermittent Lefthand Canyon stream. While clearly mountain based, any extended distance delivery channels or hanging portions have yet to be identified. Although quite culturally significant, the canal purpose thus presently appears to differ from others in this study. Many of the hanging mountain stream delivery canals in this study do not at present have clearly defined end use destinations. Assuming some reasonable contemporaneity, the Lefthand studies clearly show potential end use solutions.

Possible canal delivery systems also apparently do exist in the Lamb Tank area somewhat to the West. These certainly also deserve further study. Area problems have been compounded by CCC overwork.

Bear Springs Area

[Click for the Bear Springs Area field notes](#)

The Bear Springs Canal was not originally included in this study, but deserves a possible **En Passant** mention. Bear Springs and its nearby Bigler Ponds were once major artesian water sources that once hosted a long abandoned hippy commune and a few acres of leveled and irrigated fields. A long dry and now apparently abandoned and hugely oversized obviously modern canal routed from the Bear Springs area 3.2 kilometers or 2 miles north to a dirt distribution tank. Several additional smaller canals apparently delivered water even further north.

Bear Springs is found at **< N 32 51.212' W 109 56.277' >** and Bigler ponds near **< N 32 51.116' W 109 56.900' >**. The oversize modern canal is routed through **< N 32 51.828' W 109 55.819' >**, **< N 32 52.367' W 109 55.190' >**, and **< N 32 53.006' W 109 54.790' >** to its small distribution tank near **< N 32 53.344' W 109 54.784' >**. While there seem to be no obvious prehistoric cultural associations in the area, a water resource of this magnitude would be highly unlikely to remain ignored by a canal literate prehistoric culture. The overwhelming majority of Gila Valley pioneer and historic canals clearly show evidence of both "steal the plans" and "dig out an old ditch" as well. It is not yet clear if the Bear Springs canal was such a candidate. The Tranquility Canal was a likely known example of artesian sourcing. Further study is warranted.

The artesian flow rates are sharply down from their historical values and the area appears to be under private and access restricted development.

The Bandolier Canal

[Click for the Bandolier Canal field notes](#)

What appears to be a surviving prehistoric canal fragment can be found between **< N 32 56.692' W 109 54.709' >** and **< N 32 56.735' W 109 54.691' >**. This seems likely to be a river sourced lowland canal, owing to its larger size and its being on the "wrong" or Eastern side of the modern Dodge Nevada Canal. Were this to be related to other mountain stream or artesian fed canals in this study, a source would likely be required in the Bear Springs or the Tripp Canyon areas. After limited exploration, no credible evidence of such sourcing has yet been found.

Current work

As with most Southwestern Archaeology, any funding is sorely limited. As is the manpower needed for further study and interpretation. **Dr. James Neely**, professor emeritus at the **University of Texas** at Austin, is a long term researcher here. One of his many earlier papers appears [here](#), and a second [here](#). Several additional publications are in process. Studies are ongoing. Additional champions and more support are urgently needed.

A crucial present issue is **an accurate mapping of the entire area to acceptable resolutions** far better than what is readily web available. It is possible that one or more **Dragonfly** Drones might be suitable for this task.

A web published and open sourced detailed master index of all prehistoric ag features in the area would also seem to be highly useful. There are serious problems, outrageous costs, poor maintenance, and sharply limited availability involving the existing directory systems. The web has fully guaranteed that their attempts at extreme secrecy simply no longer work and are clearly no longer applicable. It is also only a matter of time for useful web based general aerial photography to make the needed 10:1 further resolution increase required for nothing to remain either hidden or hideable.

Needing addressing are successful methods of precisely dating and isolating differences between prehistoric, early pioneer, **CCC** (Civilian Conservation Core) and modern constructs.

Perhaps CSI forensic techniques may emerge of use here. For instance, "would any **CCC** fingerprints survive on the undersides of rocks?" Resolution of that question should be a sure fire winner for a Master's Thesis in any of a dozen of fields.

Many of these hanging canals appear endangered. Several recent water tank constructions have run roughshod over the Rincon area hanging canals. They also have totally trashed numerous grids and mulch rings. Without even the most cursory questioning that clearly could have dramatically eased their impact at minimal costs.

Extensive **ADOT** studies are also underway that would realign US 70 well south of its existing urban route. **This might clearly endanger virtually all of the hanging canals!** Present studies do not so much as even mention any prehistoric cultural considerations. With the apparent presumption that they do not exist.

Today, the Gila Valley is well noted for its many examples of outstanding high technology. Most obviously involving **telescopes**, cotton drip irrigation, and new significantly "greener" energy efficient **mining** techniques.

When taken within the context of available stone age tools, techniques, and energetics, these prehistoric grids and hanging canals clearly illustrate many examples of comparably superb and exceptionally world class engineering.