

Field reconnaissance of Spud Rock Spring, July 24-26 2018

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Overview

On July 24 and 26, 2018, we excavated a spring box approximately 20 yards south of the current Spud Rock Spring in Saguaro National Park, based on historic evidence that it may be the source for the current spring. We traced a pipe from the box to a location next to the current “spring”, where the pipe had been cut. This evidence suggests that the spring box represents the true spring. The box has not been maintained in many decades, which probably explains why Spud Rock Spring has poor water quality and is often dry. We discuss management options for Spud Rock Spring.

Background

Spud Rock Spring (Figure 1) is the major water source for Spud Rock Campground. The Spud Rock area has been occupied for >100 years, and the spring has long been a water source for farming and human and stock use. During the past 10-20 years, Spud Rock Spring has become very unreliable. It often goes dry and for most of the year is simply a mud hole. At least two groups of hikers have become sick from drinking water from the spring in the past few years, despite having claimed to filter it.



The current Spud Rock Spring as it appeared on July 27, 2018, when contained approximately 15 gallons of water. Note absence of riparian vegetation characteristics of natural springs.

High elevation springs in Sky Islands like the Rincon Mountains have received a great deal of attention in recent years because it is believed they may dry up due to climate change. In the past two years, Saguaro National Park staff have become interested in understanding why Spud Rock and other park springs have become unreliable, and have used hydrogeology interns to explore the area and seek historic records that might provide helpful information.

In 2016 hydrologist Greg Goodwin with the NPS Inventory and Monitoring program (SODN) and intern Janelle Gaun observed evidence of a large, circular foundation located a few meters north of the current spring. In 2017, DS and JG discovered photographs in the park's archives at the Western Archaeological and Conservation Center that suggested that Spud Rock Spring had been significantly altered in the past, and that these alterations may be impacting the spring today. We found records of a construction project on the spring in the 1950s. We also found photos (Figure 2) of a spring box and water tank. It seemed possible that the water tank originally sat on the large foundation found by SODN, which was located some distance downhill from the spring box. This photo made us consider the possibility that the current spring was in fact not Spud Rock Spring, but a catchment basin located in an upland area at the end of a pipe from the spring box.



Spud Rock Spring, Saguaro National Park. Dated 1953. Note concrete spring box in foreground, corral to protect spring area, and water tank in background.

Re-discovery of spring box and pipe to current spring

In early June 2018, Don Swann and Eleanor Ludkey searched the area around Spud Rock Spring in an effort to locate the historic spring box, if it still existed. We found a wet, spongy area approximately 20 m uphill of the spring that seemed it may be a likely spot because it was approximately the size and shape of the spring box. We also cleaned some of the mud out of the current spring, which was dry, to see if it had a hard bottom or water deeper in the ground. It did not have water at depth, but did appear to have a black clay bottom with the capacity to retain water.

When we returned to Tucson from Manning Camp, we obtained permission from park archaeologist Ron Beckwith to dig into the wet spot to confirm it was the spring box location, and to dig the debris out of box if it was. Ron also said that we could also dig a trench near the current spring to see if we could locate a pipe, since the area was probably greatly disturbed, but asked us to stop digging if we found any evidence of cultural artifacts.

On June 24 we returned to the location and dug into the soggy area. We immediately encountered a concrete wall and discovered a spring box approximately 6" below ground level (Figure 3). We removed the sod and partially excavated the box, which was 93 cm² and about 95 cm deep. The spring box was full of mud, and debris that included a few rocks, some large pieces of concrete, a sheet of corrugated metal, some screening material (as from a screen door) and a number of logs (Figure 4). Some of the logs had spikes in them, suggesting they had been part of the fence. After removing some of the material, we located a metal pipe that entered the box at approximately 2' in depth. Then we re-filled the hole.



Figure 3. Initial excavation of spring box, June 24, showing some of the materials removed from the box that were apparently used to fill it when the spring was buried in the 1980s.

On June 26 we returned and completely excavated the spring box. To confirm that the pipe actually exited the box and had not been cut off there, we dug along the north side of the box. We found a fiberglass sheet in this hole, and confirmed that the pipe exited the box (Figure 5).



Figure 4. Left: objects removed from spring. Right: EL with partially excavated spring box showing pipe at approximately 2 ft depth.



Figure 5. Pipe shown exiting spring box on north side; EL is in interior of box, re-excavating it on July 26.

Following the straight line of the pipe to the current spring, we dug a trench on the uphill side of the spring a few feet SW of it. At a depth of about 6" we came across the pipe again (Figure 5). We excavated the pipe to the north until it dead-ended at the foundation. There we discovered it had been cut (Figure 6).

Based on the cut pipe we surmised that the water in the spring was from the pipe that came from the spring box. To confirm that water was not entering the mud hole from the ground, we excavated the ~15 gallons of water in the spring to see if it would re-fill. It did not, and replaced the water. After two hours, it had still not drained into the soil, confirming there is some type of clay bottom in the hole.

We re-filled the spring box and area on the north side using the original contents, as well as some additional rocks, pieces of wood, and pine needles on the surface from the surrounding area. We inserted a section of PVC pipe with holes drilled into it to the bottom of the spring box, level with the ground surface, in hopes of using it in the future to monitor water levels in the spring box. We also refilled the trench where the pipe is near the current spring, re-shaped the spring to its original configuration, and improved the existing rock wall around the spring (Figure 1).



Figure 6. Left: arrows indicate location of pipe running just uphill of current Spud Rock Spring, approximately 20 m north of spring box. Right: pipe where it has been cut and lies at base of foundation of former water tank, also indicated by right-hand arrow in left figure.

Past management of Spud Rock Spring

Spud Rock Spring was intensively managed in the past. We are uncertain as to what the spring was like historically, but it certainly was productive enough to support a farm operation and later a US Forest Service and US Park Service ranger station. We plan to do additional historical research at WACC in the coming months to learn more about the NPS history and past construction projects.

In 1958 the NPS worked on the spring, constructing a “concrete sump” and adding a water tank, probably to ensure a more reliable water supply (SNP records at WACC). We presume the tank was filled during wet periods, and then the water in it was utilized when the spring went dry during dry periods.

When the Wilderness Act was implemented in the park in the 1980s, NPS removed most of the infrastructure from the back-country, with a few exceptions such as Manning Cabin and Happy Valley Lookout. Rangers were sent to Spud Rock to remove evidence of the water infrastructure there. They dismantled and buried the water tank (Rich Hayes, former SNP ranger, pers. communication). They presumably removed the fence around the spring box, then filled in the spring box with debris and buried it. The rangers apparently cut the pipe from the spring box to the tank at the tank. It is not yet known if they created the current hole where the spring is, but at one point a hole was excavated and rocks were placed along the edges. There may have been better flow through the mud hole in the past, and some development of riparian plant species below the current spring, based on informal reports and photos in Resource Management files.



Figure 7. Spud Rock meadow. This meadow immediately upslope of the spring box presumably contains an alluvial aquifer that provides seasonal water to the spring box.

Management recommendations

Numerous reports suggest that Spud Rock Spring is probably no longer a viable water source for Spud Rock Campground. In addition to campers getting sick, in the past few years a number of campers have had to hike to Manning Camp to obtain water (Manning Camp ranger reports). Although the park is very careful to make campers aware that they cannot rely on water sources in the back-country, there is a potential safety issue in having a mapped spring that was reliable in the past, but no longer is.

We could think 4 general alternatives for future management of Spud Rock Spring, each with advantages and disadvantages. Note that there is some uncertainty associated with each alternative, and we believe further research would be useful before making a final decision.

1. No action alternative. At this time the spring box and pipe are essentially as we found them on June 24, and so no further action would be required. One outcome is that water at the campsite would still be unreliable.
2. Restoration of natural spring. This alternative would involve the removal of the spring box and re-filling of current spring. This action would not technically restore the natural spring, since we don't know what it was like prior to alteration by Native Americans or historical farmers, or other infrastructure may exist underground. It would create a more natural appearance and improve habitat for riparian plants, although it could result in the loss of surface water for humans and wildlife at the site.
3. Restoration of spring box system. This alternative would involve excavation of the spring box and other that would lead to a system that is similar to the original system (without the tank). The pipe may need to be replaced; some new gravel may be needed on the upslope side of the spring box; and the current mud hole should be replaced with a catchment of some kind. Similar sites in the Sky Islands have two-sided troughs (one covered side for humans, and one open side for wildlife), old bathtubs, stone structures with underliners, or similar catchments. This restored system would require some minimal maintenance, such as clearing every few years. In a Wilderness setting, it would not be "natural" but would be "cultural" in that it would reflect historic spring catchment systems. Run-off from the renovated spring could potentially improve conditions for plants downstream.
4. Restoration of spring box only. This alternative would involve excavation of the spring box only. The pipe would be removed, and people could access water by lifting an animal-proof cover on the spring box and dipping into it with a simple dip provided by NPS. This would be the simplest solution to implement, but has some downsides that would need to be further mitigated, such as potential contamination. This alternative would involve careful construction of a run-off pipe and similar accessories. However, the run-off could potentially improve riparian conditions for plants.

Future actions

With the park's permission, we propose to monitor water levels in the spring box for the next year, using either manual methods or a data logger that estimates water depth through water pressure (pressure transducer) and then records it for downloading later. This information would be useful in helping park management determine what to do with the spring.