

What a River Knows

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Shall I tell you what knowledge is? It is to know
both what one knows and what one does not know.
—Confucius (551-479 B.C.)

Those of us raised in this era and culture have received a clear message: natural phenomena such as torrential rains that result in widespread flooding operate independently of the human experience. In other words, natural processes—forces of nature—are devoid of attributes that we reserve for humans or, in some cases, animals: deductive reasoning, anger, compassion, empathy. Some “desert rats”—human aficionados of arid lands—have voiced the opinion that what draws them to the desert is the landscape’s stark reality, its indifference to human affairs. A foolish decision on their part, such as bringing insufficient water or failing to share one’s itinerary with family or friends, can invite calamity. However, most people believe that any harsh sentence inflicted upon the unprepared by the desert has nothing to do with revenge or retribution, but merely underscores the need for those who venture there to respect its power.

Writing about the natural world and the forces at work in it is a balancing act. We’re expected to observe, experience, and interpret what we see, hear, taste, and feel. We reflect upon and chronicle the behavior of the natural world. However, should nature writers segue into speculation as to what nature knows, the reader may grow leery. Our presumption, our lack of authority to serve as proxy for wild creatures or entities thought to lack sentience may prompt a charge—understandably—of “Anthropomorphism!” from the reader.

The assertion that rivers have feelings or are capable of memory is likely to be regarded as a stretch. Such skepticism extends to claims that natural phenomena such as rain, wind, and floods can exert their will. However, if they are incapable of such behavior, the scientific evidence is lacking. In fact, the story that follows suggests to me that a river just might have feelings... and is capable of retribution.

(Not Quite Yet)
Goodbye to a River

The Salt River is located in central Arizona, its drainage area lying northeast of Phoenix. According to geologists, the Salt River has flowed between Four Peaks and the Superstition Mountains for millions of years. *This is one way to know a river.* Along its floodplains, 2,500 years of crop history have been tracked by ethnobotanists and

archaeologists. Beginning around 300 B.C., a small group of native horticulturalists developed a set of technologies previously unknown in the region. Termed the Hohokam—"the vanished ones"—by anthropologists, this prehistoric culture built canals to divert water from the Salt River. A wide array of crops were grown: corn, beans, cotton, tepary and lima beans, barley, tobacco, and squash.

Analysis of tree-ring data indicates that floods between 1354 and 1358 A.D. most likely caused major damage to the Hohokam's canal intakes. By the time another devastating flood occurred in 1382, the tribe had abandoned much of the irrigation system on the Salt River. Archaeologists postulate that flood-caused silting in of their irrigation canals was a major factor leading to the decline of the Hohokam culture.

Some Pima people migrated to lands formerly occupied by the Hohokam. They called themselves *Akimel O'odham*, the Salt River People. Their traditional way of life—*himdagī*, sometimes rendered in English as Him-dak—was then and continues to be centered around the river, which they consider holy. They re-established a farming culture along the Gila and Salt Rivers, although anthropologists are uncertain if the Hohokam were ancestors of the Salt River People. Like the Hohokam, the Pima had to contend with flooding, which usually occurred in the spring, coinciding with either snow melt in the higher mountains or the summer monsoons.

European-American settlers later expanded the extensive system of irrigation weirs and canals, often building them on top of those originally constructed by the Hohokam. However, the settlers soon realized the vulnerability of the irrigation network—the washing out of weirs and silting in of canals—during floods.

The Salt River's suitability as a water source for agriculture was undermined by its capricious nature—a nearly dry channel one year with torrents the next. Then, during the late 1890s, a sustained, multi-year drought gripped the region. Without a dependable source of water, an exodus of farmers began to places like California. A reliable source of water meant building a dam; to do that required support of the federal government. Although initial attempts to convince Congress were unsuccessful, eventually, a small group of farmers found an ally: President Theodore Roosevelt. He backed the National Reclamation Act that would allow the valley's farmers and businessmen to secure a government loan to construct a water storage-and-delivery system.

The Reclamation Act of 1902 paved the way for formation of the Salt River Valley Water Users Association. Roosevelt Dam was one of the original five federal projects authorized. The site chosen for the dam was 80 miles northeast of Phoenix, just below the confluence of the Salt River and Tonto Creek. The dam site was 60 miles from the community of Mesa and 40 miles from the mining town of Globe.

Under the direction of Supervising Engineer Louis C. Hill, the project got under way in August 1903 with construction of a road to Tonto Basin, site of the proposed dam. The Mesa-to-Roosevelt Dam path followed an ancient Indian route known as the Apache Trail. In those early days of dam construction, burro teams pulled wagons on a two-rut road southeastward to Globe. In spring and summer 1904, construction resumed where

the terrain was more rugged and the weather hotter. Apache Indians were recruited to join the swelling ranks of almost 400 laborers to finish the last difficult miles. Once workers completed the 64-mile Apache Trail, freight and equipment first crossed it in December 1904. Hill's supervisors termed the road "almost as great a monument to his engineering ability as the Roosevelt Dam itself." Indeed, the road's cost, adjusted for inflation, would cost \$4.7 million today.

Initial steps in dam construction involved clearing the foundation so that masonry could be placed directly on solid bedrock. To accomplish this, water had to be diverted around the site. Temporary upstream and downstream cofferdams and a timber flume were constructed to route the Salt River past the dam site.

In spring and early fall 1905, heavy flooding—an estimated three million acre-feet of water—destroyed or damaged the cofferdams and flume on three occasions, severely disrupting progress. Surveying the damage, Hill wrote: "Flood followed flood, each succeeding one greater than that before it, with hardly enough time intervening to permit repairs to be made before work was again swept away."

Then, during November 27-30 of that year, an even more powerful flood swept down the Salt River. The Arizona Diversion Dam—the upstream cofferdam and timber flume—was destroyed as it disappeared under 11 feet of water. Reclamation Service officials agreed that reconstructing the flume yet again would be useless; they instead decided to use the sluicing tunnel already drilled through the south canyon wall as the exclusive means of diverting water around the dam site. Six long years later, the dam was completed.

The Akimel O'odham still live along the banks of the Salt River. It's worth noting that Him-dak has no English translation. The term encompasses more than the respect for the pulse of a river, for this liquid force of nature. The word recognizes that religion, morals, world view, and respect for a river and one's culture are interconnected. Today, the Salt River is managed as a series of four reservoirs rather than as a wild river. Electricity, water supply, flood protection, and recreation are deemed the river's priority benefits. Without the construction of Roosevelt Dam—which created the largest man-made lake located within the borders of Arizona—the megalopolis of Phoenix could never have reached its current size.

Now, back to my theory regarding the possibility that rivers have feelings and are capable of retribution. To this day, the rainfall for 1905—the year when Roosevelt Dam's temporary cofferdams and timber flume were destroyed—remains the wettest year on record for the Phoenix area. Precipitation records for this city have been kept for 119 years, since 1896. So, statistically speaking, any given year has a less than 1% chance (0.84%) of being the wettest on record. In addition, *two* all-time monthly precipitation records were set in 1905: February with 4.7 inches and November with 3.6 inches. I don't have a background in statistics, but this looks like more than coincidence to me. *These statistics are one way to know a river.*

The ethnographic record makes clear that the Pima feared flood as much as they did drought. The Pima have a shrine where it is said that, long ago, four children were sacrificed to prevent flooding. This respect—born of first-hand experience—for what a rampaging river can do to both humans and wildlife is embodied in the following Pima poem:

It will drown us,
 Earth everywhere floods.
 Just now the birds
 Their flapping forgotten,
 Pitiful feeling,
 Clingingly bunch.¹

The acute respect for a river's ability to impact a farming culture via flood and drought...
is another way to know a river.

The science of hydrology—the study of the movement, distribution, and quality of water—*is another way to know a river.* However, as someone who worked in this field, I readily acknowledge that rivers behave in ways that cannot be measured or quantified—for instance, their response to a vast array of interdependent, cumulative effects. Scientists devise models, but they're incapable of capturing the complexities of an immense, heterogeneous watershed. As Confucius cautions: *Shall I tell you what knowledge is? It is to know both what one knows and what one does not know.* By extension, it seems presumptuous of me to deny that a river could be capable of memory and intent—simply because I can't prove it.

All words about rivers ultimately fail us.
 listen to the sound of the water passing over the rocky bottom in
 the rills;
 isn't that the word that spoke us all into being?²

—David Holper

The completion of Roosevelt Dam in 1911 brought an end to an era, one in which the Salt, except for irrigation canals, had flowed unfettered for millennia. Hydrologists refer to a river's *response* to stimuli. We devise ways of measuring this response: how timber harvest, mining, or grazing affects the timing of runoff, the routing of sediment and wood, or water temperature. Might it be possible for a river to call upon the elements to deliver a series of last, great, floods before its waters were harnessed, yoked like a team of oxen to do humankind's bidding?

That this entity, this force of nature we call a river, is capable of responding to attempts to dam it doesn't seem that farfetched to me. *Nope. You can't have me. Not just yet...*

¹ Bahr, Donald M., Lloyd Paul, Vincent Joseph. *Ants and Orioles: Showing the Art of Pima Poetry.* The University of Utah Press, Salt Lake City, 1997.

² Holper, David. "Six Things a River Might Say If It Were to Speak," *64 Questions*, 2009.

the Supervisor of New Mexico's Carson National Forest. The agency he joined was deeply imbued with the utilitarian conservation—some might opine commodities extraction—philosophy espoused by the Service's first chief, Gifford Pinchot. Although he later realized the critical position that wolves occupy in the web of life, Leopold killed his fair share of wolves early in his career. In the early part of the 20th century, elimination of top-end predators was widely regarded as a cornerstone technique for improving range and wildlife productivity: the fewer predators, the more cattle or wild game.

Consider this: Leopold penned "Some Fundamentals of Conservation in the Southwest" exactly 50 years prior to the coining of the term "Deep Ecology" by Norwegian philosopher Arne Næss in 1973. Leopold's ecological world view—honed and refined from about 1920 until his death in 1948—was at odds with the prevailing utilitarian conservation perspective. That he was willing to march to the beat of a different drummer during that era makes his evolution all the more amazing.

Leopold's statement "[T]he evolution of a land ethic is an intellectual as well as an emotional process" is revealing, for scientists are trained to purge poetics and emotion from their writing. Well-practiced in data analysis *and* reflection, Leopold showed us a path where respect for the forces of nature *can* summon poetics and feelings of kinship with entities many consider non-sentient. Only a scientist with insight—and humble enough to acknowledge that not all aspects of nature can be quantified—would dare pen the following:

The song of the waters is audible to every ear, but there is other music in these hills, by no means audible to all. To hear even a few notes of it you must first live here for a long time, and you must know the speech of hills and rivers...⁵

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⁵ Leopold, Aldo. A Sand County Almanac And Sketches Here and There. *Song of the Gavilan* [Essay]. Oxford: Oxford, 1987 (1949).