
Playas: An Important Source of Water in the Great Plains

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As Great Plains communities struggle to deal with drought and declining aquifers, playas — a relatively unknown natural resource — are playing an important role in replenishing and improving the quality of the region's water supply. Playas, also called lagoons, buffalo wallows and mud holes by locals, are relatively small, round, shallow depressions that collect and hold water from rainfall and runoff, creating temporary wetlands. Some dry up within days. Others contain water for weeks or months. With more than 80,000 scattered across the western Great Plains — from Nebraska and Colorado south to Texas and New Mexico — these seasonal wetlands provide much-needed water for wildlife and people. In recent decades, many researchers, representing a variety of disciplines, have been studying playas to learn more about the benefits they provide.

“There’s a number of researchers who are focused on playas,” says University of Kansas geologist Bill Johnson. “What’s really important now, for a lot of people, relates to what everybody’s interest is rooted in — what’s their connection with the groundwater?” Johnson has been investigating playas for more than 30 years. He says scientists have evidence playas are a primary source of recharge to the Ogallala aquifer — that vast but diminishing source of groundwater so vital to life on the semi-arid plains. According to a USGS literature review (Gurdak and Roe, 2009) and a recent Kansas Geological Survey study (Johnson et al, 2019), recharge rates in playa basins are 10 to 1,000 times higher than under other areas, and groundwater recharge may exceed three inches per year in unaltered playas.

Aquifer recharge occurs through playa basins and along the perimeter of playas. According to Ken Rainwater, a professor in the Department of Civil, Environmental, and Construction Engineering at Texas Tech, “Even though soils in the playa bottoms are clay, they dry out and desiccate with big cracks between rainfall events. So when you have your first flush of water coming into the playa, it’s real easy for water to go down through those cracks and head down through the clay toward the aquifer below.” As the clay absorbs water, it expands, sealing the cracks, and filling the basin with water from rainfall and runoff. Recharge continues to occur along the playa’s perimeters as long as it is submerged in water, much like water running over a bowl’s lip.

Playas not only contribute up to 95 percent of water flowing into the aquifer, but they also improve the quality of that water. Research has shown that water reaching the aquifer through

healthy or unaltered playas is of higher quality than that going through other pathways. This happens in two ways: first, as rainfall and runoff travel toward the playa, the surrounding grasses trap sediments, which can carry contaminants into the playa; then, as the water moves through the clay floor of the playa, a second ‘cleaning’ process occurs as the soils beneath the playa remove nitrates and other dissolved contaminants.



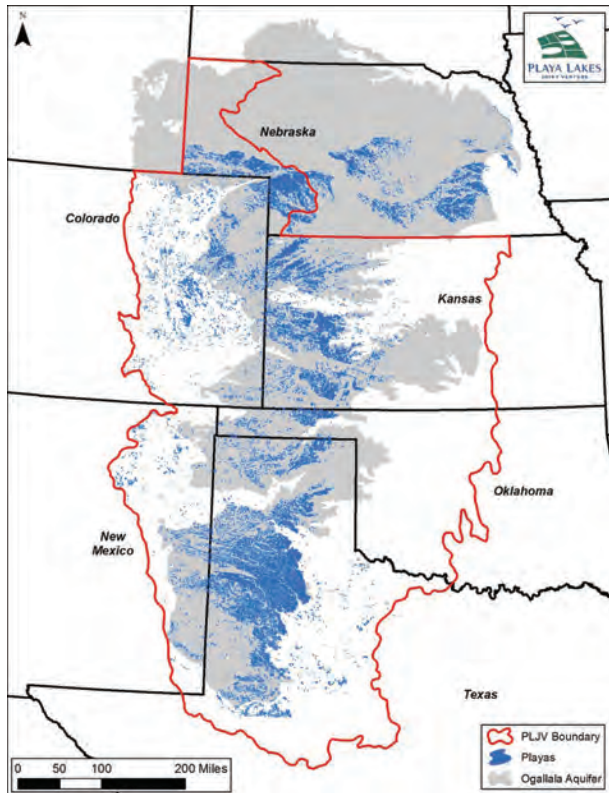
Kansas playas in cropland (PLJV)

Besides their role in recharging the aquifer, playas are the center of biodiversity on the plains — supporting 185 bird species, 450 plant species, 13 amphibian species, and 37 mammal species at some point in their life. When you talk to Tom Flowers — a retired district conservationist with the U.S. Department of Agriculture at Meade, Kansas, and an enthusiastic bird-watcher — his astonishment about the life-cycle of these playas becomes apparent. He says these ephemeral lakes are almost magical.

“They can be dry for 15 or 20 years, have a rainfall event, and immediately within days perennial plants show up. They lay dormant beneath the ground for all these years, but as soon as that soil becomes moist, they shoot up and produce bulrush, cattails, mud plantain, spikerush, and a host of plants.”

That explosion of plant life is just part of it. Flowers is fascinated by the small creatures that wake up, too. “They fall down in the cracks when it’s dry, and they just lay there as eggs. As soon as it gets wet, within just a few days, the eggs hatch, they grow, and they become small invertebrates such as fairy shrimp, tadpole shrimp, clam shrimp, and snails.” This bursting-forth of plant and animal life is irresistible to local and migrating birds. The grasses, plants, and those little invertebrates are all a ready feast for resident and migratory birds.

from JourneyNorth.org: Great Plains playas superimposed on map of Ogallala Aquifer



According to Susan Skagen, a retired research wildlife biologist with the U.S. Geological Survey, “There is a broad diversity of birds migrating north and south and using wetlands, including playas, for rest stops. You’ll see a lot of the shorebirds that are making very long-distance migrations: White-rumped Sandpiper, Semipalmated Sandpiper, Baird’s Sandpiper, and American Golden-Plover. They go right through the heart of the plains. It’s the shortest distance from Tierra del Fuego, which is how far some of them actually fly from, all the way up to the arctic.”

“Many of these birds eat the small little animals in playas,” explains Flowers. “So, even though playas don’t hold water very long, they’re absolutely critically important for migratory birds — and also our summer and resident birds for nesting and feeding.” To hear Flowers tell it, it’s as if playas are the town square for wildlife: “Not only birds, but bison, raccoons, coyotes, deer, everything comes to have a drink.”

But just as we’re learning more about their importance, so are we learning that playas are under stress. Playas work best when they are surrounded by a native grass buffer that filters out soil and agricultural contaminants and there are no pits or other modifications to the playa. Filling in pits is one of the easiest ways to restore a playa. In most cases, the spoil pile from the original excavation is present and used to refill the pit. Once the pits are filled, rainwater and runoff can reach the large cracks in a dry playa — which is essential for recharge to occur — rather than collecting in the pit. The shallow water that spreads across the playa also allows plants to flourish, which in turn provides

important food and habitat for migrating birds and other wildlife.

Johnson says many playas have lost capacity to not only recharge groundwater but also to filter and clean water going down into the aquifer because they’re clogged with sediment — sediment transported from cultivated fields by runoff. He recently studied sediment accumulation rates in several Kansas playas, from pre-agricultural times to now, and the research (Bowen and Johnson, 2019) showed that “conversion of watersheds to cropland has greatly accelerated sediment accumulation within playas, which is generally resulting in a decline in critical playa ecosystem functions.”

Due to their small size and the fact that they are often dry, many producers till through playas to plant crops. However, even if the playa is large enough to be avoided, the surrounding upland is often farmed to the edge of the playa, resulting in increased sediment accumulation in those playas. In one study of Kansas playas, those in cropland had approximately 10-15 cm (4-6 inches) of accumulated sediment compared to ~2 cm (<1 inch) in grassland playas. On average, playas within cropland watersheds that didn’t have buffers lost 30% volume of storage capacity, while those with grass buffers lost only 7% volume. The paper concludes that without grass buffers, accelerated sediment accumulation in playas will continue, which will greatly reduce ecosystem functions, “and, ultimately, many playas will disappear from the landscape.” According to Johnson, who co-authored the study, establishing native grass buffers around a playa is highly effective at reducing sediment accumulation and protecting playa functions.

“We’re not trying to get anybody in trouble; we’re not trying to tell people you are doing things that are wrong,” says Rainwater. “We’re just trying to understand how these complex processes on our planet work so that maybe we can have a better future.”

What we do know is that healthy (unaltered or restored) playas filter and clean the water going into the aquifer and that this is a continuous process. Water reaching the aquifer today started its journey during our parents’ and grandparents’ lifetimes; and the water recharging now will be available for today’s children and future generations.

For more information about playas, the benefits playas provide and programs to help conserve and restore playas, visit PlayasWorkForKansas.com and pljv.org.