

2016 ICMA
Program
Excellence Award
Nomination -
Community
Sustainability

Centennial Plaza – A
Demonstration of Water
Sustainability in Clarkdale, AZ



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Centennial Plaza – A Demonstration of Water Sustainability in Clarkdale, AZ

Problem Assessment – The water of Clarkdale and the surrounding Verde Valley is vital to the humans, plants, and animals living in the midst of its arid Arizona landscape. Maintaining dependable water supplies into the future is critical to the vitality of the robust local ecosystems on which the region’s residents depend for their livelihoods and quality of life.

The Town of Clarkdale lies on high ground about 200 feet (ft) above the Verde River, at an elevation of 3,560 ft. Clarkdale’s immediate environment is arid, averaging only 12 inches of rain each year, but it is surrounded by mountainous areas that receive considerably more precipitation and are considered semi-arid. Thirty to forty percent of Clarkdale’s precipitation occurs during the summer monsoon season. The majority of the remaining precipitation falls during winter, with fairly extended dry periods between summer and winter. The iconic Verde River (a rare perennially flowing river in the arid lands of Arizona) flows south out of the Verde Canyon, emerging from the narrow canyon just a few miles north of Clarkdale. The Verde River is fed by the same groundwater that the Town of Clarkdale depends completely upon for its water supply.

In 2011, the Town of Clarkdale launched the Sustainable Clarkdale initiative, whose goal is “to provide an entrepreneurial environment rich in innovation, multi-disciplinary solutions, and educational and economic opportunities, resulting in a vibrant and viable future.” With more and more data accumulating that pointed to the certainty that the Verde Valley region was overdrafting its groundwater supplies, the Town of Clarkdale sought to develop a water resource management plan that would position its community for water sustainability in the future. Notably, the Town recognized that educating its citizenry about the water issues at hand would be critical to providing enough political will and political capital to enable examination and problem solving in this arena.

As part of the Clarkdale’s initiative, the Town applied for and received a multi-faceted grant from the Walton Family Foundation to address water resource issues in the community. To address citizen engagement and education, the grant included funding to develop “Centennial Plaza”, a demonstration permaculture garden, to model the use of native and adaptive plants and rainwater collection and create beautifully landscaped places which use little to no potable water on maturity. On completion in 2014, the project transformed an area in front of the historic Clark Memorial Clubhouse (which was built in 1925 and is listed on the National Register of Historic Places) into a community gathering place that demonstrates water sustainable landscaping for our residents, businesses and visitors.

The Centennial Plaza project utilized permaculture as a design principle, which is a creative design process based on whole-systems thinking. This process guides project designers to mimic the patterns and relationships we can find in nature and apply those patterns to aspects of human habitation from agriculture to ecological building, from appropriate technology to education and

even to economics. In order to further the Town's goal to instill a culture of sustainability in our community, the Centennial Plaza project used permaculture principals to focus on all three pillars of sustainability.

Economic Sustainability – For the first 90 years of its existence, the Town of Clarkdale was served with water by private companies. Those companies priced water on a flat rate basis, leaving no financial incentive for water conservation. When the Town purchased the local water company in 2006 and converted it to municipal ownership, we adopted a tiered-rate structure that incentivized water conservation with steep increases in costs for high water users.

The acre of land that was converted to Centennial Plaza was once covered in a lush, green lawn. Water use demand for that acre of grass averaged approximately 100,000 gallons per month, which, under today's tiered rates costs approximately \$960 per month. The high financial cost of watering grass, and the cost to our dwindling groundwater supply, made the conversion to low water use landscaping not only environmentally responsible, but also fiscally responsible.

An additional economic sustainability principle of the project was our desire to support local businesses in the creation of the project. Understanding that each dollar spent locally supports many members of our community, not only did a local landscape architect (Chris Anderson of Eden on Earth Landscaping) design the project, but also every team on the project was sourced from the north-central Arizona region from our surveyors to our cistern and irrigation system installers to the plants and nursery workers (Arizona Botanical Gardens) to the engraving of our memorial bricks in our legacy area in the Plaza.

Social Sustainability - The Clark Memorial Clubhouse, which was built in 1925, is a historic treasure of the Town and, through its listing on the National Register of Historic Places, has been recognized for its historic significance to the nation. Originally serving as a social gathering place and recreation center for the mining families of Clarkdale, the use of the Clubhouse has evolved to include not only community activities and celebrations, but as the central location for all the Town's Council, Board and Commission meetings. From dances, art shows, and weddings, to acting as the host for some of the Town's most important policy decisions, the Clubhouse takes center stage in the social and political life of the community. The addition of Centennial Plaza to the Clubhouse facility created a new and inviting community gathering place used for social, cultural and educational purposes.

Environmental Sustainability – Because the Town believes in the necessity of curbing outdoor water use thereby reducing groundwater pumping and has implemented a plants list specific to using native and adaptive plants, it was essential to lead by example. The plants on our approved plants list feature an array of textures, flowers, berries, and heights making them suitable for many installations. Using permaculture principles, we chose to use primarily native plants (in a few cases, non-native, but low-water use adaptive plants) for the project. The use of native plants, those that occur naturally in our

region, was important to help ensure that the plants could thrive without direct or indirect human actions (i.e. on maturity, they should be able to thrive in this climate without the addition of potable water).

In using low-water use plants, our desire was to wean all plants from the support of irrigation systems within 2 years of installation. Further, by planting an array of different plants, a variety of birds and butterflies are supported by the blooms and are attracted by the fragrance. Not only did we increase the plants but also the diversity of birds and butterflies in the garden. Of special note is one agave featured prominently in Centennial Plaza, *Agave delamateri*.

Tonto Basin Agave, (*Agave delamateri*) is a medium-sized Agave or Century Plant. It is a plant that looks like a cactus, due to its large spines and thick, succulent-type leaves, but is actually more closely related to the Lily and Amaryllis. This Agave is different from most, though, because it is a hybrid—a plant cultivated by the ancient Sinagua Indians that lived in the area until about 600 years ago. Like most hybrids, this Agave cannot reproduce by flowers and seeds, like other natural plants do. Instead it produces miniature clones, or “pups” to propagate itself. Since each of these clones has the same genetic makeup as the “parent,” it can be said that each is actually the same plant as the original one grown by the Sinagua, more than a thousand years ago! Tonto Basin Agave is listed a species of concern in Arizona, as there are only approximately 90 patches living today. It would rightly be listed as an endangered species if it were not a cultivated hybrid plant. Today, Tonto Basin Agave can be found at Tuzigoot National Monument, at the Arizona Desert Botanical Garden, and some are now thriving within the Centennial Plaza garden in Clarkdale.



Program Implementation and Costs – The Centennial Plaza project spanned a two-year time frame. Originally installed in 2012 in coordination with the Town of Clarkdale’s (and Arizona’s) centennial celebration, the goal was to have mature landscaping with water needs sustained from non-potable sources within two years (by Summer, 2014). The total installation cost of the Centennial Plaza project was approximately \$90,000 (not including the staff time provided in-kind by the Community Development, Public Works, Sustainability and Utilities Departments).

Rainwater harvesting is a critical component of the project design. Rain is harvested from 3,893 square feet of the roof of the Clark Memorial Clubhouse and drains to 3 buried cisterns (totaling 5,100 gallons of below-ground water storage) located in the front of the Clark Memorial Clubhouse and buried eight feet underground. Water enters through a modified gutter system from the building roof into a sand and gravel filter and fills the first cistern. Once the first cistern fills, water

flows into the second and third cisterns via a gravity feed. Installed in the cisterns are float valves which are used to control whether or not water is sourced from the cisterns (when they have water) or alternatively from the potable system.

In addition to the 5,100 gallons of rainwater storage, nine catchment basins were created to capture runoff from the eighty-eight spaces in the Town's public parking lot and from an additional 845 square feet of the Clubhouse roof. These basins are lined with rocks and gravel to facilitate the recharge of water into the ground beneath the basins. Trees were strategically planted adjacent to the basins to avail of the deeper water from the catchment basins.

Tangible Results/Measurable Outcomes – The acre of land that was converted to Centennial Plaza was once covered in a lush, green lawn. Water use demand for that acre of grass averaged approximately 100,000 gallons per month, which, under today's tiered rates costs approximately \$960 per month. During the drought that occurred in the mid-2000's, the Town quit watering the grass, and the space was overtaken by unsightly weeds. Though residents longed for the days of the lush green grass, the Town sought ways to beautify the space without going back to the water intensive and expensive uses of the past.

During its first month of operation, Centennial Plaza used 15,171 gallons of potable water at a cost of \$177.93. Throughout the critical establishment period (the first two years), as plants started to become more established, water use averaged 5,000 gallons per month with monthly cost of water ranging from \$100.00 to \$310.00. Total potable water use for this project was 223,812 gallons over the two year establishment time with a cost of \$3,325, resulting in a savings of over 2.1 million gallons of water in the first two years, and over \$19,000 in water bills.

Following the initial 2 year establishment period, we began weaning back water usage further. For the next six months, from August, 2014 – January, 2015, monthly water use averaged 3,600 gallons. Beginning February 1, 2015, approximately 30 months after project inception, we were able to discontinue use of all potable water on the project, relying only on natural rainfall and the rainwater we are able to store onsite for later use. Since that time, the vegetation has not been watered with potable water, and today Centennial Plaza continues to flourish as a prime example of creating beautiful landscaping without impact on our potable water supply.

The success in water use was not our only tangible result. Since creation of Centennial Plaza as a demonstration garden, volunteers have created additional cactus gardens in the front of the Town Hall Complex resulting in the receipt of a Spirit of Clarkdale award. Further, xeriscape gardens of all shapes and sizes have sprung up in Clarkdale including the landscaping in the Mountain Gate subdivision which features native and adaptive plants throughout their site.

Lessons Learned – The initial project design featured a system that was meant to ensure that rainwater collected in the underground cisterns would be the primary source of water used for landscape irrigation. Switches were installed between the rainwater harvesting system and the potable water system which would convert the system over to using potable water if there was not enough rainwater in the cisterns to meet the irrigation watering schedule. In the second year of the project, we determined that we were actually overwatering as a result of this system design.

The overwatering occurred because the stored water in the cisterns would actually be used immediately following storm events, when the ground was already saturated from stormwater. Although this watering schedule led to the faster growth of landscaping, it wasn't a good demonstration of how these plants would grow naturally.

To counter this flaw in our design, we installed rain sensors to modify the amount of watering in total. The addition of rain sensors gave a second layer of accountability. This allowed us to store rainwater in the cisterns longer, and use the stored water only when the moisture content in the ground showed that irrigation was necessary. While it was important to get the plants and roots established with a more-frequent watering schedule in the beginning of the project, water use is now modified through the use of rain sensors to better adapt to what water is available naturally. In fact, potable water irrigation of Centennial Plaza is now turned off completely.

Another lesson learned is that some of the flowering perennials that were originally planted have died over time. Instead of replacing those perennials in-kind, they have been replaced with agave and other native cactus, resulting in a reduction of the colorful flowering varieties in the garden. On recent discovery of this practice, we've work with the Public Works team to institute a plan to reinforce the diverse nature of the project as plants are replaced in the future, and add back more of the flowering perennials over time.

Centennial Plaza reinforced our desire to use tangible projects to demonstrate the importance of the Sustainable Clarkdale Initiative. Our first project, a geothermal energy project, gave a very public face to the initiative and captured the public's attention. Clarkdale citizens soon gave their support to the Sustainable Clarkdale Initiative by adopting the Town's 2012 General Plan (with a theme of "Instilling a Culture of Sustainability") by a wide margin in the Town's 2012 General Election. The Centennial Plaza project carried forward our goal of providing tangible demonstration projects that our citizens could connect with in the heart of their community.