Best Management Practices:
Sustainable Desert Community Parks

Figure 1 Image from Google Maps.

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CITY OF PEORIA

ASU SCHOOL of SUSTAINABILITY

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Context

The City of Peoria, Arizona is designing a new multi-use public park to complement their two large existing community parks and network of neighborhood parks. Because this new $30 million park is still in the early design stages, the city has a great opportunity to strategically implement sustainability principles in each phase of the planning process (Dryer, 2015). Additionally, there is growing support in the community for practices which conserve financial and environmental resources while promoting social connectivity. In this report, students from the Fall 2015 Sustainability Best Practices course at Arizona State University compiled relevant, sustainability-minded, and beautiful best management practices from across the world for inspiration in Peoria's design process.

"Our amazing quality of life is what attracts people to our city, and I want to make sure that all citizens can go have a picnic, walk the dog or play a ball game at a beautiful area close to home" said Mayor Carlat (Dryer, 2015).

Figure 2 The park will be located south of Loop 303 and east of Lake Pleasant Parkway. There are neighborhoods to the east and south with much room to grow. The park will be approximately 457.5 acres with around 80 acres dedicated to facilities.

Welcome to Peoria

The City of Peoria is 174.4 sq. mi. of suburbia located in the Phoenix Metropolitan area within the Sonoran Desert. Parts of the city were previously farmed and the rest was desert landscape before construction. Therefore, drought and high heat must be heavily considered in park design process. According to the US Census Bureau, the Peoria has over 166,900 residents and the population is continuing to grow. Of these residents, 26% are under 18 and only 14.3% are 65 or over (U.S. Census Bureau, 2015). Interestingly, citizens have a homeownership rate of 71%, which suggests they will be in the city for a long time. Understanding the current resident demographics helps inform design decisions for a highly used and valued public park. Additionally, it's important to analyze population projections when planning for future uses. For example, estimates suggest population will continue to grow in size and age (ADOA-EPS, 2015). Viewing the city in Google Maps, it is clear the city is planning for future growth, as roads have been built for new housing developments. Furthermore, the Spanish-speaking population is expected to increase (ADOA-EPA, 2015). In order to meet the needs of current and future residents, the park will need to be multi-generational, bilingual, and accessible by all.

"As these communities grow, the need grows for more parks and places to gather and play," said Mayor Carlat (Dryer, 2015).

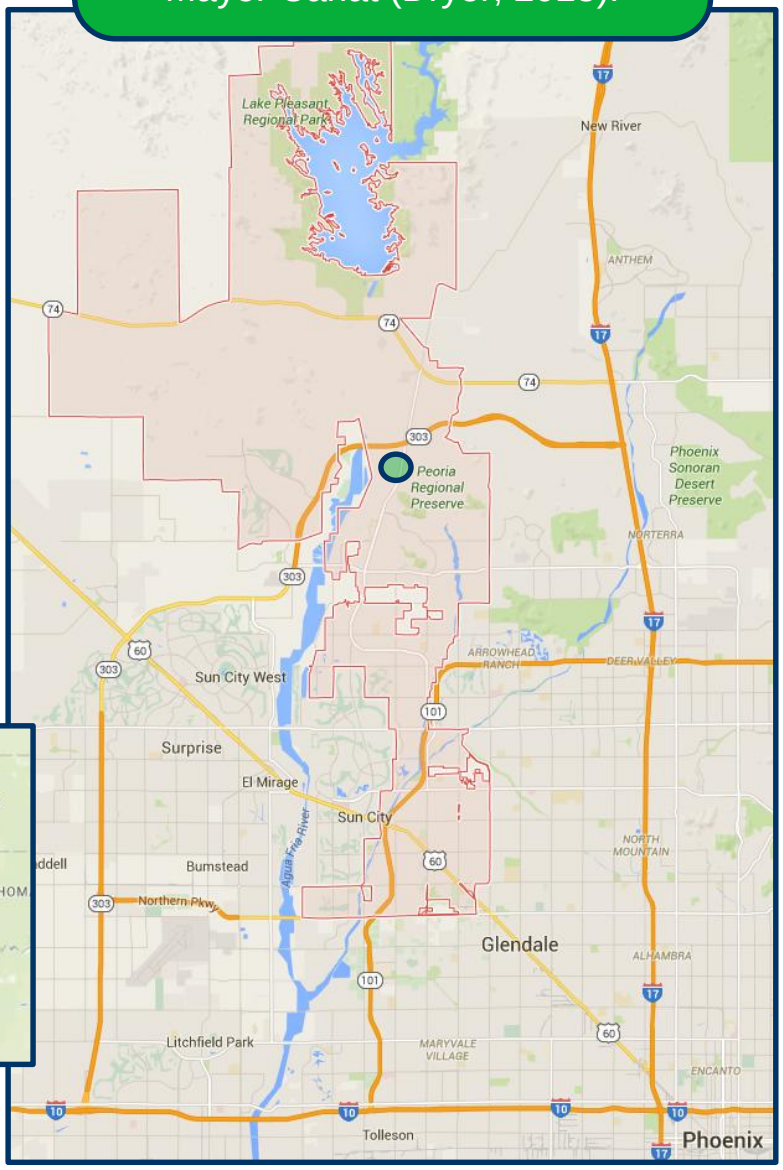


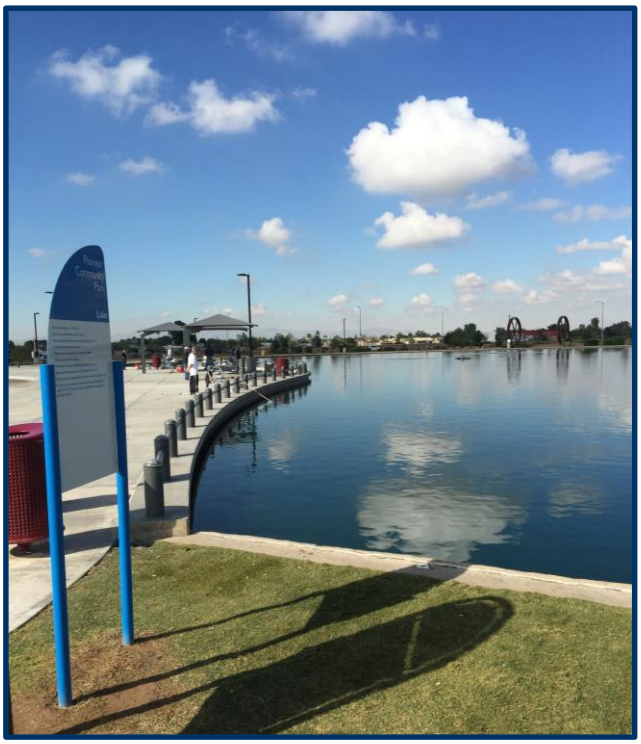
Figure 3 The map on the left provides perspective on Peoria's location within the USA. To the right, Peoria's unique borders are highlighted in light red. The Park will be located in the northern part of the city. All maps on page courtesy of Google.

Existing Parks Inform Potential Challenges

Peoria's existing parks already exemplify some important sustainability features. For example, recycling bins and flood retention basins can be found throughout the existing park system. Pioneer Park and Rio Vista Community Park utilize reclaimed water to support flourishing aquatic habitats and recreation areas. Rio Vista allows community members to rent bicycles at no cost for use around the park and its surrounding trails. Although these efforts reflect the city's commitment to sustainability, the creation of a new city park provides opportunities for the city to further promote its vision for a sustainable future.

Further, because of the Valley's extreme temperatures in the summer months, parks must provide ample shade in order to attract residents to use the park. The ramada system exemplified in the two parks previously mentioned is a good start, but much of the remainder of the park consists of wide-open grass areas with little natural shade. While some degree of openness is required for sports activities, planting trees to create natural refuges from the sun would make larger areas of the park usable in the hot months.

Perhaps the most challenging obstacle to overcome is to adequately integrate the park(s) into the existing transportation infrastructure. Peoria, like other Valley cities, has developed with the automobile in mind as the primary means of transportation. This has led to a spread-out community that often makes alternative transportation modes (walking, bicycling, etc.) impractical. Locating the park within the existing pedestrian infrastructure or augmenting the system surrounding the park ensures residents of varied capabilities and mobility have access. For example, Rio Vista Community Park connects to the 10.5 mile New River Trail (which also connects to the 36-mile Arizona Canal Trail). This allows visitors the ability to enter the park from a wide variety of locations within the Valley without a car. Although the accessibility of Pioneer Park is less pronounced, there are some pedestrian crosswalks and bike lane surround the park on 83rd Avenue. However, the northern boundary of the park at Olive Avenue lacks a crosswalk, and does not offer park-goers the ability to safely cross the street to Roundtree Ranch Park.



Best Management Practices

This section details a diverse array of creative ideas currently in use across the world selectively chosen to meet the needs of residents and others stakeholders in Peoria, Arizona. Some suggestions are conceptual - intended to inspire designers - while other components are more tangible.

Guiding Principles for Park Planning

- Design for all ages and capabilities.
- Plan for increased population, heat, and drought.
- Purchase with end of product life in mind.
- Utilize durable, local, recycled, and non-toxic materials.
- Create a park which will attract citizens, tourists, and media attention.

Park Design & Landscaping

Due to Peoria's setting within the Sonoran Desert, the city and its residents must continue to evaluate how they use water. This limiting natural resource is critical for the city to continue to grow and prosper. Designed with this in mind, desert parks within the city can not only serve as recreational areas but also as important flood control projects and educational tools. To this point, all plants that are selected should be native, drought tolerant, and easy to maintain. Also, no chemicals should be used on the park in order to protect children's health and waterways. Instead, compost from the valley should be utilized to safely fertilize vegetation. Another option is to compost tree and green waste on site to be reused on the premises.

Figure 4 Although not native, pomegranate trees produce unique fruit while tolerating the Sonoran Desert's climate.

Incorporating wetlands for water retention and other green infrastructure installations will benefit the community during heavy precipitation events. Furthermore, adding opportunities for community gardening, edible forests, and permaculture into the landscaping of the park would serve as an educational tool, provide food, and mitigate the urban heat island effect. Peoria's Scotland Yard Park includes a citrus grove where residents can pick lemons and tangerines, so this concept is not new (Kapp, 2010). These community agriculture options expand far beyond citrus to include pomegranates, figs, dates, and peaches. Edible landscapes could provide partnership opportunities with local Peoria schools and social services. Depending on the design, these food-producing areas may also provide shade - a requirement for life in the desert.

Building artistic structures out of recycled materials would provide creative useful shade with a low carbon footprint. Small structures over seating areas could be designed through local schools in the area or by a local artist. Another option would be for local artists to partner with different schools so each school could create an artistic shade structure. Larger shades may be needed for picnic tables and grilling areas as well as the playgrounds.

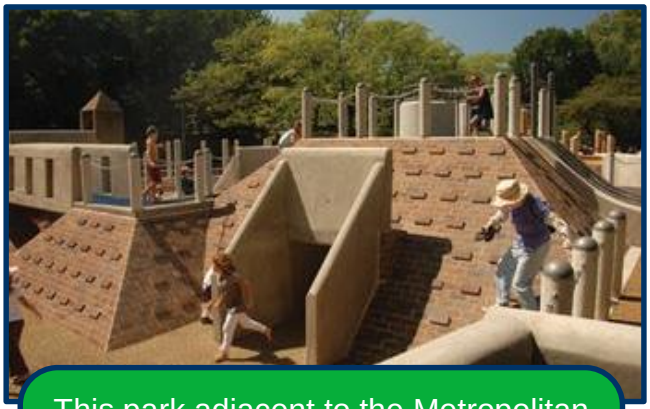
Gather

Select larger picnic areas should be reservable through an online portal to ensure big gatherings can reliably use the space. Furthermore, creating a stage area with access to electricity will encourage event planners to select the park for concerts and other events. Park design should enable community gatherings and events so the space becomes a destination. Since large events usually produce some materials which need disposed of, it's important to include recycling bins and quality signage on how to dispose of items in high traffic areas. Lastly, adding solar-powered water bottle filling stations will help encourage the use of reusable water bottles at events and everyday playground outings.

Play

Children, teens, adults, and elders enjoy play in their own way. Due to the mixed ages of citizens in Peoria, all groups must be considered when designing the park. Also, these areas should be separated to an extent so small children aren't walking out in front of a sprinting teenager. With all play facilities, shade and the reaction of material in high temperatures must be considered.

Play areas for children have the capacity to serve an important role in physical, social, and mental development if designed properly. Furthermore, designing a play area which is in tune with the surrounding desert landscape (mountains, vegetation, and sunsets) will help the playground establish a sense of place. Most parks have swings and a plastic playground. Although swings are a classic park necessity, options beyond standard plastic playgrounds should be explored to ensure Peoria's park is a unique destination. For each type of playground, the most heat-resistant and natural material should be selected to ensure recyclability at end-of-life. Utilizing natural materials like boulders and rammed earth for building unique playgrounds aligns with the closed loop philosophy of design and with the regional historical landscapes. Rammed earth may be formed in a manner to mimic short canyons and include a rock wall component. These types of materials may be used to create adventure playgrounds, a style of park which encourages creative play.



This park adjacent to the Metropolitan Museum of Art in New York City was designed to coordinate with Egyptian artifacts on display inside (NYC Parks, 2015).

A rock wall and rope combination playground can be created to provide children the opportunity to climb without a real threat of falling and hurting themselves (Belsize Landscapes, 2015). Local materials can be sourced for all components of a wood, rope, and rock play area. Natural fiber-based ropes are more desirable than synthetic ropes like nylon even if they need replaced every few years due to the biodegradable aspect of fibers. Mesa, Arizona's Riverview Park (depicted to the right) has net crawling structures which also safely allow children to reach exciting heights (Mungenast, 2014).

Made from recycled tires and metal, this interesting sculpture of an animal provides a charming photo opp (Museum of the City, 2015).

This park in British Columbia utilized mostly natural resources to create a unique play area for children (Johnson, 2011).

An adventure park in Camden, London utilizes natural and recycled materials for a play experience full of surprises and curiosities (Johnson, 2011).

This playground in Palo Alto, California uses recycled stumps of different heights, colors and widths (Johnson, 2011).

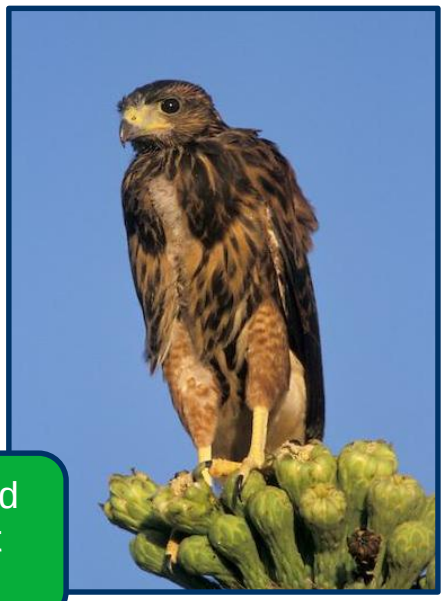
Physical exercise opportunities for teens and adults are also an important element to include. For example, creating a track which encircles the children's play area will ensure parents can jog or walk while watching their children play. This simple solution meets three separate needs: physical activity for both parents and children, as well as supervision capacity. Another more unique example of outdoor recreation is creating free obstacle courses out of common elements like logs, tires, twine, and metal bars. Many cities are starting to create these types of amenities for their citizens due to the increased interest in events like Mud Runs. One course in central Ohio includes a tire run, a tunnel crawl, a cargo climb, a balance beam, a belly crawl, monkey bars, an over/under, a climbing wall, and a log run (Evans, 2013). In an article highlighting this park the Executive director of Metro Parks states, "...active adults and teens now have another opportunity to enjoy the outdoors, challenge themselves while improving their health and, best of all, have a lot of fun" (Evans, 2013). Another opportunity for teenagers and young people to enjoy the park is the creation of a Skate Park. This should be designed with input from skaters in community.

Photos show an obstacle course in a city park outside Minneapolis, Minnesota (Ferraro, 2014). Even if a material other than wood is selected (i.e. recycled steel beams) due to heat impact concerns, similar conceptual designs are still usable.

Seniors need a place to stay active as well! Senior parks have been embraced by European and Asian cities; however American cities have been slow to catch on despite an aging population (Renzulli, 2012). Improving balance is very important for the elderly since a small fall can result in severe injury. A wide variety of equipment exist for the elderly and those in wheelchairs. Photos depict a mixture of individual and social equipment (Museum of the City, 2015).

Some activities that are fun for all ages or for a grandparent to do with their grandchildren include the following:

- Plant identification game for environmental learning: 'Can you name that plant?'
  - Turn cubes located in front of native plants to learn about them.
  - Include braille, English, and Spanish.
- Locate permanent chess tables under trees or shade structure.
- One adult-focused and one child-focused informational board describing sustainable features of park site and facilities
- Chandler, Arizona's Veterans Oasis Park provides excellent bird watching opportunities which attract enthusiasts from across the globe. The park utilizes shallow basins to allow reclaimed water to infiltrate into the aquifer as part of Peoria's water management plan. Also, the park includes walking trails, a solar system pathway, and butterfly/ hummingbird habitat (Chandler, 2015). Since a large portion of the site will be left as habitat with a few walking trails, this provides a great opportunity to further enhance the area's appeal to birds.



Birding is a great tourist attraction! Enhancing bird habitat in the park's 457.5 acres may help boost this industry in Peoria.

Heat-Resistant Materials

When designing seating, play areas, and other amenities for a desert climate, it's important to consider **durability to high heat.** In congruence with the Park Guiding Principles, these materials must also be **low maintenance** and **easily recyclable or biodegradable** at end of life.

- 'Stabilized decomposed granite' sourced from the site and used for parking lots and trails can decrease economic costs associated with transportation (Ninmann, 2014).
- Stone and adobe are common building materials in the southwest due to their cooling properties and durability. These materials can also be locally sourced (Seal, n.d.).
- Bright or dark colored shade covers will not only retain heat, but also fade over time. Light colored materials are preferred since they don't fade in the sun (Seal, n.d.).
- If wood it used it should be located under a shade since monsoons, haboobs, and heat may cause wood to warp (Seal, n.d.).
- Hammock style mesh seating provides a comfy experience while retaining very little heat.
- Rammed earth and stone-based playgrounds may prove more costly for the initial build compared to a 100% recycled content playground. However, these materials are very durable and complement the natural landscapes.

Figure 5 This play structure provides an example of how rammed earth can be manipulated to create play opportunities. Adding a 'rock wall' on one side may further enhance activities.

Seating

Benches created utilizing recycled or reused materials will provide seating and an opportunity to create signage educating citizens about the item they are sitting on. These dual function seating options will help residents realize the importance of recycling. For example, durable 100% post-consumer recycled plastic, steel, or concrete benches are readily available in a variety of designs (ECOGREEN, 2015). One innovative company, Trex, actually recycles plastic film into benches, porch swings, fencing, rails, and fake wood flooring (Trex, 2015). Benches and many other components of the park may be constructed with the recycled concrete known as urbanite (Kapp, 2010). However, these benches should be supplemented with more creative seating arrangements to ensure this is no average park.

Figure 6 Covered porch swings may be a simple yet charming addition to the park (Trex, 2015).

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These dynamic seating arrangements can be rearranged into a swing, hammock, seat, or couch. They are built with rejected fire hoses which provide a comfortable stretchy feel and built-in heat resistance (designboom, 2013).

Accessibility & Walkability

The development of a successful public park must view accessibility as a key goal of the planning and design process. Not only should the park's location be convenient for residents, but its design and amenities should reflect the wide range of resident mobility and ability.

One of the first things to consider in the park development process is how residents will get to the park. Since the location is already determined, strategic actions must be taken to ensure residents will be able to access it. Research has shown that "when the distance from a park doubles, the likelihood of park use decreases by almost 50 percent" (NRPA, 2015). This "friction of distance" can be intensified if the infrastructure discourages residents from walking or bicycling to the park. Most streets surrounding existing parks are disconnected, lacking amenities that foster utilization, including sidewalks, crosswalks, bike lanes, signs, maps, lighting, etc. Also, facilities on-site must be pass ADA standards and major paths within the park must be accessible by wheelchair. Since a growing portion of residents are elderly, it's vital for accessibility to be considered.

Therefore, it's highly recommended for the park design team to partner closely with their colleagues in the transportation department in order to ensure the following:

- shaded bus stops
- bike lanes on main roads to access park
- adequate street crosswalks nearby park
- adequate car parking
- bike racks
- handicapped parking

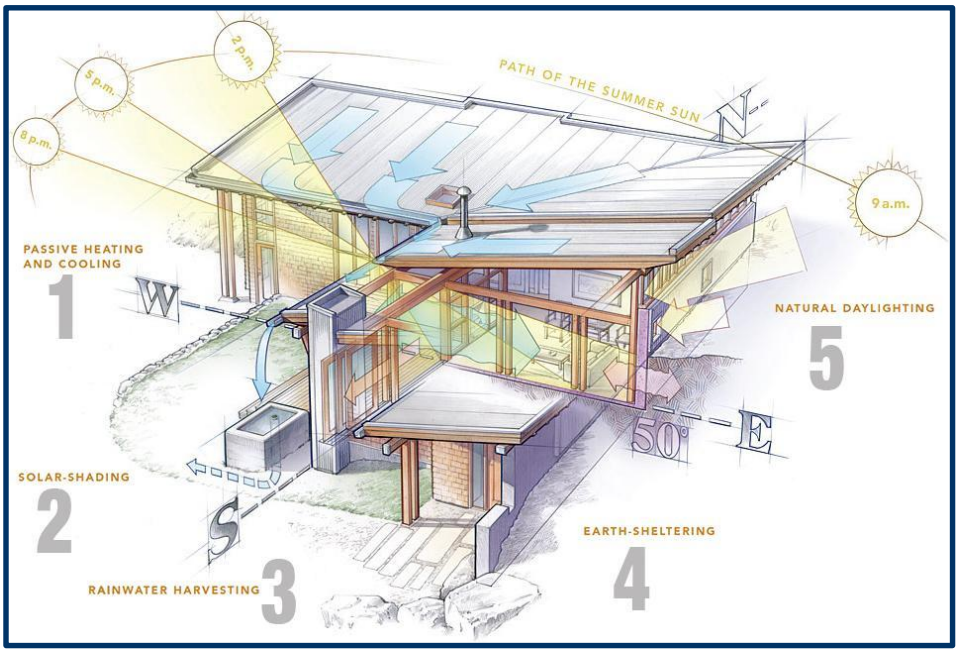
To ensure that the park's accessibility features are successful in creating a walk-friendly area, city employees should engage the local community before, during, and after the completion of the park.

When designing bike racks and shaded bus stops, there is an opportunity to incorporate artistic features. For example, asking an artist who handles metals to construct a bike rack which resembles saguaro cacti or different desert animals would help establish a sense of place and connection to the environment. Bus stop shelters may have solar panels on the roof and outlets for charging phones and computers, or a green roof to further reduce heat. The walls of the shelter could be a mural designed by local school children through a city-sponsored competition.

Creativity transformed a bus stop into a place-making piece of functional art in Baltimore, Maryland (Maher, 2014).

Facilities

There are several opportunities when sourcing building materials that will significantly reduce overall environmental impact. First, developers should seek out any recycled materials from older buildings or projects that they could use in new buildings (City of Fort Collins, 2011). There are numerous companies that create building materials from waste such as wood made from newspapers, bricks made from plastic bags/ bottles, asphalt made from plastics, and wall/floor tiles from wine corks. If recycled materials cannot be found for a specific product, sourcing it from a certified environmentally responsible company is another option, especially for wood. When purchasing paints, cleaners, stains, and other materials commonly injected with chemicals, it is important to consider the long-term health impacts on residents. Chemicals used in buildings should be free of volatile organic compounds (VOCs) due to their negative impacts on urban haze and indoor air quality (Uhde, Salthammer, 2007). Interface modular carpet tiles allow builders to make more unique decisions on how to design floors and tiles are more convenient to transport. Furthermore, Interface provides more flexibility for maintenance since damaged tiles can be easily replaced rather than changing out carpet for an entire room. The versatility of this design makes for simpler installation and maintenance. Additionally, stained or worn pieces can be reclaimed and recycled for new uses (Apartment Ratings, 2010).



When designing sustainable buildings and facilities, a few standard solutions are to invest in low flow toilets and LED lights equipped with motion sensors. Also, ensuring that doors and windows are properly sealed can create significant energy savings (Mattingly, 2014). Another simple design solution which reduces operating costs is to strategically place buildings and plants in particular patterns and directions. For example, the direction that windows in a building are facing will determine the sun exposure of those windows, and affect the costs of indoor climate control. Windows that are facing east or west will be more exposed to the sun which causes heat to escape through the glass. North-south facing windows can yield the benefits of natural lighting, but also limit the effects of the sun. In addition to window direction, the placement of plants on the exterior of the building can offer more insulation and promote a stable indoor climate. For instance, by planting vines at the base of a wall with a trellis to encourage upward growth the vines would eventually cover the wall completely. If this wall receives a lot of sunlight, the extra protection from the vines would better insulate the building. Many new buildings often incorporate these methods, so this park is an opportunity to innovate beyond these standard design elements.

Comprehensive approaches incorporate sustainable strategies much earlier in the construction process. A holistic building design will consider the deconstruction of the structure even before drawing up the blueprints. Instead of bringing materials together to create one solid structure, architects can plan buildings that are made up of several large pieces and can be assembled and disassembled relatively easily. By doing this, the buildings become easier to adapt, renovate, and should they need to be disassembled, the pieces can be reused in other buildings or new projects (Design for Deconstruction, N.D.). Forward-thinking life cycle considerations like this can help reduce the amount of raw materials that go into construction and mitigate the overall environmental impact of construction. Further, in the realm of architecture there is an entire Design for Destruction (DfD) movement underway that is revered for its innovation and environmental responsibility.

The Business Case for Green Building

Many of the benefits associated with integrating sustainable elements into the park design are intangible, and therefore not easily quantifiable, especially in terms of monetary value. However, creating a sustainable park does not necessarily mean higher costs; in fact, sustainable solutions can often lead to financial savings. In terms of building and landscape design, simple solutions can have significant impacts on construction and maintenance costs. Peoria's existing parks already utilize high-efficiency lighting systems, but passive design strategies such as building shape and orientation, the use of natural lighting, and passive solar design can also improve efficiency, leading to lower costs. It is also important to avoid structural overdesign, which can lead to unnecessary construction waste. Strategies that aim to minimize this waste (i.e. using standard-sized materials to avoid cutting pieces) will help keep labor and waste disposal costs down as well. Perhaps the significant way to lower costs is to minimize the size of the buildings. This can be done by fully utilizing indoor floor space, as well as designing functional outdoor structures to decrease the need for indoor spaces.

In addition, environmentally-friendly building materials can also prove cost-effective.

- Concrete with slag content or fly ash can be less expensive per ton than traditional concrete.
- Carpet made with recycled content can be up to $15 less per yard than traditional carpet
- Waterless urinals can cost $280 less than standard urinals and provide water cost savings.

Refer to link for more information: https://www1.eere.energy.gov/femp/pdfs/buscase_section2.pdf

A framework for building structures which align with these goals is called the Living Building Challenge (LBC). Living Buildings function like a flower- requiring zero energy or water input while educating users and minimizing negative impacts of building materials on human health (LBC, 2015). LBC also emphasizes the importance of beauty, health, and locally/ site sourced materials in building design. One building in the process of certification, the Vandusen Botanical Garden Visitor Center, utilizes a thermal chimney to naturally ventilate the space while providing a breath-taking design feature and source of natural light.

Although the facilities in this park may not be certified Living Buildings, principles from this framework can be utilized by the design team. Public and private sector buildings across the world are taking the LBC and Phoenix actually hosts a great example of a net zero office building which includes a gym. DPR Construction's Phoenix Regional Office is a great example of a more sustainable building including solar panels and natural ventilation. A holistic case study is available online: http://living-future.org/case-study/dpr-phoenix.

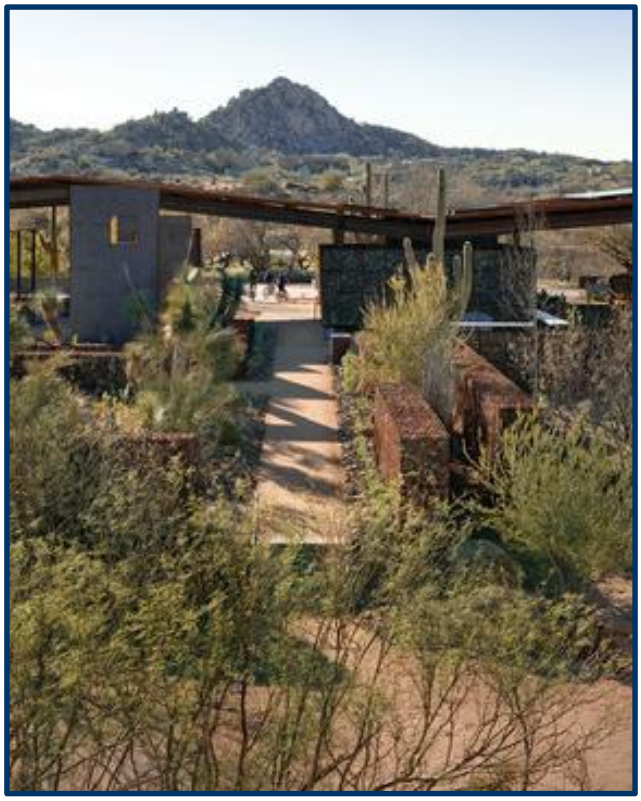
Maintenance

The key to keeping a park beautiful, healthy, and safe is keeping high cleanliness standards, and involving the community in park maintenance as much as possible. The ever present struggle with maintaining the shared resource of public space is getting those who use it to keep it clean.

Establishing and enforcing a zero tolerance policy towards litter and graffiti would discourage people from engaging in that sort of destructive behavior. Cleaning up litter and removing graffiti daily helps reinforce positive park image, and also shows respect toward the park and its visitors. Litter begets more litter, while a pristine park is far less likely to be contaminated. Although city staff will need to empty trash and do routine checks of the park for litter, the city should work closely with the community to establish an organization of citizens to help take ownership of the park before the park even opens. Asking different entities or businesses to 'adopt the park' for a week of the year is one creative way to broaden ownership of the park and its litter.

Scottsdale Park Case Study

If ideas presented thus far sound interesting but unrealistic, the following case study was added to prove it is possible to go above and beyond a standard park in the Valley! In 2012 the City of Scottsdale finished a sustainability-focused master planned and designed park, George “Doc” Cavalliere Park. This was not only a pilot for the city, but also for the Sustainable Sites Initiative (SITES) program due to its emphasis on sustainable landscapes as well as planning, design, construction and maintenance (Ninmann, 2014). SITES, a rating and accreditation system wanted a model of a beautiful public park for arid environments with responsibly sourced materials and design. At the price point of $4.3 million, the park was not cheap but it provides multiple long-term social and ecological benefits including stormwater control.



Other highlights include a 20,000 square-foot shade canopy and restroom facility which mimics the shapes of distant mountains while also providing central rain collection for watering plants (Ninmann, 2014). Furthermore, parking areas and path were created with ‘stabilized decomposed granite’ sourced from the site. This material decreased runoff and urban heat island effect while connecting to place (Ninmann, 2014). In another attempt to stay true to the local landscapes, park designers eliminated all unnecessary paints and finishes, instead opting for sleek steel, rock, and concrete appearances. On a more high-tech subject, the park includes LED lighting and solar panels which produce 100% of the park’s energy (Ninmann, 2014).

Further details about Scottsdale’s park can be accessed here: http://www.forconstructionpros.com/article/11308093/sustainable-sites-inititative-certifies-first-park-in-arizona

Seating area lights automatically turned on at dusk, and during the day observant visitors could look through framing pieces of material to see a distant geological formation (Ninmann, 2014).

Conclusion

Parks have historically been a popular location for little kid birthday parties, hang out spots for the young, and calm walks by the middle aged and elderly. However, parks can and should be much more than this. They should be places of exploration, creativity, and fitness. They should maximize utility to all residents no matter their abilities and create a hub of community interaction and connection.

Although impressive strategies utilized across the world are compiled in this report, the intended users of this park must be engaged before the city decides what to build. Public meetings scheduled for 2016 must not only ask for resident suggestions, but thoroughly engage them in the whole process. Community engagement should consist of a multi-faceted strategy since the target audience includes all citizens. For each group of people, city employees must ask what a perfect park in Peoria would look like for them. In order for this to be effective, city staff must listen to the residents with an open mind and bring ideas back to their office for consideration.

- Discuss ideal park design with the elderly in senior homes, libraries, and community centers.
- Ask children at local schools to draw and describe their ideal park.
- Create and market Facebook page to gather ideas for new park. Target teenagers with this form of engagement.
- Host visioning event with adult citizens to brainstorm ideal park opportunities and barriers.

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