A thesis
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in Architecture
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Reviewed and approved* by the following:

Darla Lindberg
Professor of Architecture
Thesis Supervisor

Christine Gorby
Associate Professor of Architecture
Honors Adviser

* Signatures are on file in the Schreyer Honors College.
eco-easements
a case for ecosystem-based urban planning
The Sonoran Desert is disappearing. As the second most diverse ecosystem on our planet, the Sonoran Desert plays a critical role in floodwater detention, stabilizing water quality, providing homes to thousands of plant and animal species, and even regulating the temperature of the planet. Over the years, these crucial natural processes have been disrupted by the encroaching development of Phoenix.

Since the advent of air conditioning, the Sonoran Desert has been touted as a luxury, and sixty years of breakneck development have put the survivability of the city and the ecosystem at risk. There are no geographical boundaries in the basin that can keep the ever-spreading lattice of development at bay, and this poses a true global threat. We can no longer afford to build cities with a manifest destiny ethic, turning a blind eye to ecological context.

Considering that 43% of the landmass in metropolitan Phoenix is vacant lots, there is much room for a greater density in the city center, which opens up a possibility for the transformation of the outlying areas back into a desert of sorts. My thesis proposes a new code guiding development for the city of Phoenix. It is a different way of city-building—one that is derived from the ecosystem rather than defeating it.

The current system of city planning in Phoenix is being quickly exhausted. A new strategy of restraint and undoing is required. An urban planning strategy derived from the ecosystem itself should be implemented in Phoenix to restore a threatened environment, create resources within the city, and ensure a trajectory of responsible future growth.
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area of focus

The scope of research encompasses the philosophical and historical relationship between humankind and wilderness, the history of Phoenix, city planning, the ecology of the Sonoran Desert, and ecosystem restoration. It examines the current distribution of vacant land, parks, population, mass transit, and water sources in Phoenix to inform a new strategy for responsible urban growth and ecosystem restoration.

They have opened up the deserts, threaded and criss-crossed them with their freeways... They have not destroyed space; they have simply rendered it infinite by the destruction of its centre.
- Utopia Achieved, Jean Baudrillard
The pastoral ideal, manifest destiny, and the American Dream have all been key to the settling and expanding of the Phoenix metropolis. Though the pastoral ideal is a uniquely American theory, its origins predate the European discovery of America. The romanticism of a pastoral life in the wilderness is a common vein coursing through much of the collective literary imagination from Shakespearean times to the twentieth century. In *The Machine in the Garden*, Leo Marx asks his readers, “What possible bearing can the urge to idealize a simple, rural environment have upon the lives men lead in an intricately organized, urban, industrial, nuclear-armed society?” This question is particularly relevant to the development of the vast Sonoran landscape. Before the discovery of America, European thinkers dreamed of a utopian way of life.

Life in a garden is relaxed, quiet, and sweet, like the life of Virgil’s Tityrus, but survival in a howling desert demands action, the unceasing manipulation and mastery of the forces of nature, including, of course, human nature.

(Marx 43)

Wilderness instills in us a sense of admiration, fear, and awe. We assign religious meaning to it, paint it, and write about it. We want to immerse ourselves in it, and we want to isolate ourselves from it, sometimes simultaneously. There are two common, conflicting depictions of wilderness in popular culture – a lush, green garden, or a harsh wasteland. Historically, the desert is often associated with the latter. But ever since the advent of air conditioning, the Sonoran Desert has been touted as a luxury, an amenity, an escape from mundane reality. The concept of the pastoral ideal experienced a rebirth after WWII with the growth of the suburbs. Fueled by contempt for urban life and a longing for a more natural environment, people once again desired to be immersed in the wilderness—but this time from the comfort of an air-conditioned room.

But hark! there is the whistle of the locomotive - the long shriek, harsh, above all other harshness, for the space of a mile cannot mollify it into harmony. It tells a story of busy men, citizens, from the hot street... no wonder that it gives such a startling shriek, since it brings the noisy world into the midst of our slumbrous peace. – Nathaniel Hawthorne


Wilderness: philosophies & ideologies

Ideas of utopia were often associated with a pastoral lifestyle. Utopian writings had to feature fictionalized settings, as there was no place known on earth where this dream could become a reality. The European discovery of America changed all of this. America embodied the opportunity to make the pastoral ideal a reality. Believers in the pastoral ideal trusted that immersion in nature and a simple life could renew the human mind, body, and spirit (Marx). However harmonious this unity of man and nature may sound, there is an inherent contradiction in the relationship. In the quest to renew our spirits in wilderness, we inevitably destroy the very wilderness that we hold in such high regard. This contradiction is a symbol featured in countless works of art and literature as Europeans fulfilled their manifest destiny and began to develop infrastructure on the land.
The city of phoenix

The Valley of the Sun, also known as the Phoenix metropolitan area, is home to over 4.5 million people. 1.6 million of those live in the central city, and the rest inhabit the outlying areas, which comprise over 25 cities and towns. The Sonoran Desert landscape—which it is, by nature, inhospitable to human life—is ironically one of the main draws. The Sonoran Desert wilderness attracts more than 19 million visitors each year to the Phoenix metropolitan area. Phoenix is projected to be America’s fourth largest city by 2020. This sprawling metropolis strikes a stark contrast from Phoenix’s past as a quiet agricultural community (Lincoln Institute).

The first historically well-known inhabitants of the area that is now Phoenix were the Hohokam Indians. According to archaeologists, the Hohokam lived there nearly 2000 years, from 300 BCE to 1450 CE, and engineered a sophisticated canal system that drew from the Salt River to serve their agricultural needs. The ruins of the Hohokam canals can still be observed today (especially when flying into Sky Harbor International Airport). The Pima tribe believes that they are the descendants of the Hohokam, and together with the Maricopa tribe, they inhabited the same communally owned lands (Shaw). The tribes’ relation to the landscape began to transform once the Gadsden Purchase (1854) and Dawes Act (1911) were implemented. Their communal land was split into tracts which got smaller with every inheritance until the plots were so small that individuals no longer owned pieces of land, but had interest in it. Their sense of ownership, responsibility, and closeness to the land was altered, and consequently the sense of place was transformed because of it. Facing pressure to lease land for commercial use, the Pimas struggle with the moral dilemma to maintain the integrity of the land. Much of the Salt River Pima Maricopa Indian Community now blends into the surrounding city, golf courses, casinos, a landfill, and the highway loop 100 have encroached upon former tracks of open space. Even the Salt River was diverted away from this community whose name means “river people” in order to better serve the Phoenix metropolis (Schipper). Different cultures define and organize space in different ways. American culture views land as a commodity, and the clash of cultures between European settlers and native tribes makes this painfully clear.

In the 1860s, settlers founded Phoenix as a farming town and reconstructed the canals based on the Hohokam ruins. It was named Phoenix, after the mythological bird that rose from the ashes of its predecessor. Population growth didn’t take off until after WWII, when technological advancements like air conditioning, aviation, and cars allowed people to relocate and live anywhere with relative ease. The warm winters and cheap land were a powerful draw for many to relocate to the desert. The backbone of the Arizona economy during this time was still largely based on agriculture, or specifically the “five C’s” — cotton, copper, cattle, citrus, and climate (tourism). After the 70s, factories manufacturing electronics and aviation products increasingly fed population growth, and a commercial landscape gradually replaced the agricultural one. The Arizona climate was as good for tourism as it was for jobs; companies could maintain lower operating costs, and there was a lower risk of natural disasters. As a result, big urban-scale changes transformed downtown Phoenix in the 80s; the once walkable streets lined with locally-owned shops were snuffed out by large corporate buildings that required superblocks. Landowners faced no tax penalties for demolishing downtown historic buildings and warehouses. The human scale was lost, and the relative insensitivity of landbanking on the outskirts left little economic incentive to build downtown. The transformation also led to an increase in homelessness and urban deterioration (Talton). Increasing numbers of retirees in different ways relocated to the greater Phoenix area looking to settle outside of the city where developers sold the American dream of a single-family home in a uniform community. Developed in 1960, Sun City was one of the first master planned communities outside of Phoenix. It catered to retirees. The developers saw great success and opportunity in master planned communities, and from 1992-2002, Phoenix’s desert wilderness was developed at a rate of 226 acres per hour (Schipper) to make room for more. Development-friendly regulations have perpetuated the continuous outward growth of the city. Development of the desert creates pressure for more infrastructures to service the outlying areas. This takes money away from developing the inner city and continues urban deterioration as well as physical, social, and economic divides among populations. It also intensifies the effects and problems of climate change, creating an intense heat island effect, more frequent and heavy storms, poor stormwater management, and air pollution.
overdevelopment: the demise of the sonoran desert wilderness

The Sonoran desert wilderness covers much of the southern half of Arizona as well as Sonora, Mexico and parts of the Baja Peninsula. At approximately 120,000 square miles, it is the second most diverse ecosystem on the planet—second only to the Amazon rainforest (Lincoln Institute). However, it faces constant pressures from increasing development. Developers tend to see the desert as an opportunity for profit, a blank canvas for the latticed patterns of development. And development has already taken its toll on the ecosystem. After the Phoenix “housing bubble” of 2009 collapsed, many master planned communities and mansions built on mountainsides and desert land were left unfinished and abandoned. The exact figure of empty homes was estimated to be 100,000 (Karaim). But today, development is again on the rise, and for every hour of the day, one acre of desert wilderness is lost (Lincoln Institute).

Urbanization of the Sonoran Desert affects water quality protection and causes the already limited water supplies to be overused and polluted. Increased hardscape affects runoff and floodwater detention during times of monsoon. It destroys an important and diverse riparian habitat around the Salt River and increases the likelihood of plant and animal extinction (Lincoln Institute).

The saguaro cactus, perhaps the most iconic species in the Sonoran Desert, illustrates the intricate and fragile balance of the ecosystem. This cactus can only be found in the Sonoran Desert. Its existence relies on and provides for many other species of plants and animals. Countless birds depend on the saguaro for shelter, and a variety of animals use it as a source of food or water.

The saguaro is a very slow growing plant; by the time its first branch begins to grow, it is already between 50 and 70 years old. Scientists believe saguaros can reach up to 200 years of age, 6 tons in weight, and 50 feet in height. The spread of urban development into saguaro habitat has caused a tremendous loss of the species. Non-native plant species introduced by residents and new development out-compete native plants for already scarce water and nutrients. Development into the desert also increases the chance of wildfires, which are devastating to the desert ecosystem (U.S. Dept. of the Interior). Damaged desert ecosystems can take generations to recover and be restored to a natural state.

On a larger scale, land acts as a giant radiator for the earth, storing and releasing massive amounts of energy to regulate the temperature of the planet. Consequently, the destruction of the Sonoran Desert wilderness poses a severe global threat (Schipper). It is difficult to comprehend the immense ecological consequences of building houses, businesses, highways, and parking lots on such a fragile landscape, but it is ultimately our duty to protect this valuable ecosystem from further damage.
sonoran desert ecology

The Sonoran Desert is the second most diverse ecosystem in the world. It is home to approximately 60 species of mammals, 350 species of birds, 20 species of amphibians, 100 species of reptiles, 30 species of native fish, 1000 species of native bees, and over 2000 species of native plants alone! It is teeming with life that has evolved to thrive in the harsh environment of scarce rainfall and intense sun (Robichaux). Plants that have learned to adapt have long, furrowing characteristics – furrows that provide shade and places for wind and rain to go through. For example, the well-known saguaro cactus stores water during the rainy season to be used year round and has ridges and spines specially designed to harvest water and cool its surface.

Some other native plants with specially adapted characteristics (as seen on the next page) include:
- velvet mesquite: pinnate leaves minimize the area that is subject to direct sunlight
- ocotillo: leaves grow with long stems that turn into protective thorns when the leaf dies
- sacred datura: night-blooming flowers minimize water evaporation and energy spent
- jojoba: self-shading pairs of leaves with hairs to slow air movement and keep them cool
- barrel cactus: tubercles and ribs for water harvest/storage; stomae open at night to take in carbon dioxide without losing water
- cat claw acacia: set of shallow roots and set of deep roots to maximize the water it can collect
- prickly pear cactus: spine clusters for collecting moisture from the air, slowing air movement around the plant

These remarkable adaptations hold much potential for architectural study. Biomimicry of native Sonoran Desert species can help to generate systems that conserve energy and water and lessen the effects of the excessive hardscape, heat island effect, and summer temperatures. Using an architectural language of furrows derived from characteristics of native plants, there is potential to create resources, which can be used to bring life back to the city, and in turn, the desert ecosystem.
3.0 research
cellular automata

The desert wilderness that was destroyed will never again exist as it once was. But perhaps some semblance of desert can be restored by implementing an architecture of planned obsolescence. A framework which could guide this approach is the mathematical concept of cellular automata. Cellular automata are collections of cells on a grid that evolve through a number of time steps or phases according to a set of rules. With each time step, a new iteration of cells is created by activating or deactivating cells.

One of the most famous systems of cellular automata is Conway’s Game of Life (see image opposite). In the Game of Life, cells on an infinite two-dimensional grid are either alive or dead (“populated or unpopulated”) according to the states of each cell’s eight neighboring cells. At each time step, the following rules are applied:

- Any live cell with fewer than two live neighbors dies, as if caused by under-population.
- Any live cell with two or three live neighbors lives on to the next generation.
- Any live cell with more than three live neighbors dies, as if by over-population.
- Any dead cell with exactly three live neighbors becomes a live cell, as if by reproduction.

(Wikipedia, “Conway’s Game of Life”)

The grid of Phoenix provides a perfect opportunity to apply cellular automata as a planning strategy.

<table>
<thead>
<tr>
<th>t = 1</th>
<th>t = 2</th>
<th>t = 3</th>
<th>t = 4</th>
<th>t = 5 (pattern reverts to t = 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Pattern 1" /></td>
<td><img src="image2.png" alt="Pattern 2" /></td>
<td><img src="image3.png" alt="Pattern 3" /></td>
<td><img src="image4.png" alt="Pattern 4" /></td>
<td><img src="image5.png" alt="Pattern 5" /></td>
</tr>
</tbody>
</table>
questions/theoretical issues raised

Should certain already occupied parts of the Sonoran Desert be vacated?

What would a restored desert ecology look like? Though it would take generations to completely restore the ecology of the undeveloped desert, to what degree can humans reintroduce some semblance of wilderness?

Where is the boundary? At what point should the wilderness be off limits to humans?

How could a more ecologically-minded, fluid relationship to land be integrated into the current, rationalized, ownership-and-profit-based relationship?

architectural issues

What should be the anchoring point (or points) for future urban growth and development of Phoenix?

What is the most appropriate architecture for a language of liminality between civilization and wilderness? What scale is most appropriate to take on the problem?

What types of urban infrastructures would best enable a trajectory of smart growth for the future?

How can methods like biomimicry and off-grid infrastructure help revitalize and reorganize a desert-dwelling urban population?

What would stop developers from continuing to expand the boundaries of the metropolitan area, and how can developing central Phoenix be made a more attractive option?
architectural precedents

Mariposa Land Port of Entry, Jones Studio, Nogales, AZ

ASU Polytechnic Campus, Lake|Flato Architects + RSP Architects, Mesa, AZ

Sidewalks of New York (S of the 30 rules), Michael Sorkin, New York City, NY

Seaside, FL.

The Sidewalks of New York

1. The Streets belong to the people!
2. So do the Sidewalks.
3. A minimum of 50% of the Street space of New York City shall be taken out of the realm of high-speed and mechanical locomotion and assigned the status of Sidewalk.
4. This minimum shall apply on a block by block basis.
5. The entirety of a given street may be transferred to the status of Sidewalk with the consent of 75% of the membership of the block committee.
4.0 site & context analysis
The Sonoran desert wilderness has a basin-range geography. It covers much of the southern half of Arizona as well as Sonora, Mexico and parts of the Baja Peninsula. During the dry season, the Sonoran Desert expands to blend with the Chihuahua, Salt Lake, and Nevada deserts. During the wet season, the desert contracts to become a landscape of “desert enclaves” with steppe grassland in between. Because of the significant seasonal shifting of the desert ecosystem, it is difficult to assign a boundary to it because it is constantly changing. A boundary defined by botanical criteria is more reliable because vegetation is more intricately tied in to the overall climate and ecology of the region. The boundary shown above is a botanically based one (Dunbier 2).
Distribution studies of Phoenix and its municipalities lead to a greater understanding of the city and its vastness. The City of Phoenix contains enough area to fit Paris, Manhattan, San Francisco, and Rome inside its boundaries with plenty of room to spare (Lincoln Institute). The maps on the following pages show the spread of development into what was once pristine desert ecosystem and reveal the conditions of the struggling city center.

The thesis proposes a new code guiding development for the city of Phoenix and fostering the opportunity for urban density where it already exists — along the historic railroad route that runs diagonally across the grided streets. The grid of streets extends relentlessly through urban, mixed, and even natural areas.
site documentation, continued

parks, recreation areas, and preserves

concentrations of vacant lots in center city phoenix
FEASIBILITY STUDY

Two residential points, A and B, were chosen as sample starting places to find out whether or not life without a car in Phoenix is feasible. In most instances, any day-to-day needs could be met by either pedaling or walking a short distance. Public transit tended to take longer because of the lack of infrastructure.
This is a cell along the railroad swath, a blighted neighborhood called Nuestro Barrio. Over half of the neighborhood has been relocated by the city since the construction of the airport. The people that remain want to see the city reinvest in the neighborhood, beautify the now vacant lots, and create a development plan for the community, which is exactly what the code would do.
To generate an appropriate language and palette of materials for the code, I’ve looked to the plant life in the Sonoran Desert. The code prescribes small moves (furrows in material detailing) and large moves (furrows at the scale of the one-mile city grid). Furrows in material detailing: Materials like corrugated metal, steel mesh, concrete, ptfe (for its thermal properties), and polyethylene film (for its surface properties) are durable and perform well in the desert environment. Using these materials in designs inspired by the furrows, grooves, and layers of native plants, you can actually create shade and water in the desert. Polyethylene coated surfaces are similar to the bumps and grooves of cactus spines, making them ideal for water harvesting via radiative cooling at night, and shade structures can also be designed to create furrows or channels that would encourage natural wind flow.

The code, represented graphically at right, advocates for a more livable urban environment that is harmonious with its surrounding ecosystem. It addresses redesigning the inhospitable streets, lessening the pervasive heat island effect, and alleviating water-related issues. It aims to allow the city and the desert ecosystem to function as they should.
The code also prescribes large-scale moves, or furrows at the scale of the one-mile city grid: An overarching system of cellular automata (with four main phases) enables the planning strategy to operate at a larger scale. The process of cellular automata begins along the railroad swath, with the first active cells being the most densely populated ones, as shown here in color. The cellular automata are a preliminary device to identify how the code will be interpreted in each singular cell. Based on context, the code will be interpreted either as furrows to encourage urban density in the cell or furrows that will once again become desert. Once each cell’s needs have been addressed according to the code’s smaller scale moves (shown on previous page), the adjacent cells are activated, and cells are activated in a manner that spreads outward from the population density swath along the railroad. By the time the outer cells are activated, the inner cells will be equipped to host a greater population density, and those outer cells can return to a more natural desert state.
The code is applied in different ways depending on the context of the cell. For example, in a cell containing the Salt River, the code would be applied with the intent of restoring a more natural, riparian environment. In a cell along the railroad swath, the code would be applied with the intent of creating a more comfortable, lively, and community focused urban environment. The code’s application will result in furrows, or easements, of ecosystem-based interventions across the grided streets of Phoenix.

Easements would be implemented at different scales depending on their contexts in the grid. For example, if the activated cell features a prominent roadway, then that roadway would be altered to lessen the hardscape and bring life back to the street. Mid-size easements could come into play with xeriscaping and rain gardens in urban areas with many abandoned lots. Larger scale easements would include introducing/expanding parks or restoring riparian and desert habitats. For example, areas that would require this type of easement could be industrial areas along the river or foothills of mountains that have been damaged by the construction of mansions and subdivisions. These easements would help maintain biodiversity in the city and help in relieving the heat island effect as well.

The zoning of the project will require much action and cooperation across Phoenix and its municipalities. Each one will need to work together to accomplish change and act in ways that may not benefit each municipality individually, but will better the greater Phoenix area as a whole. A rezoning or reorganizing of the entire Phoenix metropolitan area would require us to question our most fundamental cultural norms, such as the ways we think of land division, settlements, and transportation. But in doing so, perhaps we can work to simplify and restore an overbuilt world.
Phoenix shall strive for a condition of controlled growth and self-sustenance. The city shall not have a negative impact on the surrounding natural ecosystem.

Once activated, all cells of the existing city grid shall be in one of 4 states:

**EDGE CELLS**
- Erasure [un-planning]
- Ecosystem rehabilitation
- Integration [back into nature, natural processes, habitats for wildlife]
- Desert reestablished

**URBAN CELLS**
- Planning
- Construction [urban rehabilitation]
- Integration [into community, urban fabric]
- Density reestablished [Climax]

No cell may deviate from its assigned state in a manner that threatens the surrounding ecosystem.
conceptual design studies

TAKING CUES FROM SURROUNDINGS: GOLF COURSES

Arizona and the Phoenix area in particular is known among golfers to have some of the best courses in the country. Many of the golf courses in the Phoenix area are unique in that the areas not covered in green were left in a seemingly natural desert state. Often, the design of the green follows the natural topography and geography of the area, creating an intriguing condition: a patchwork of long, curvilinear (artificial) green patches and desert groundcover interspersed over a vast area. The designs of Phoenix area golf courses present a unique condition of manmade furrows in the landscape.

TAKING CUES FROM SURROUNDINGS: BIOMIMICRY

The spiny clusters of needles on cacti provide a system of moisture harvesting. Each needle contains three integrated parts that have different roles in the water collection process according to their surface structural features.

By using solar power to pump a refrigerant into a structure to chill the surrounding air, there is potential to use the techniques of cactus spines to capture the resulting sweat or condensation. (This is feasible because even during the hottest month [June] at the most intense sunlit time of day [5 AM], relative humidity is 32%.) In doing this, you can generate water from the desert air. Once the water is captured, it could be stored and used on the site. Applied on a large scale, this would help to alleviate some of Phoenix’s water dependencies on faltering or unreliable sources.
The rendered diagrams below show the code at work in the context of a cell with a riparian edge context.
The rendered diagrams below show the code at work in the context of a cell with an urban/mixed residential context.

**01** Planning

- **a** Close, but disconnected from downtown
- **b** Existing park
- **c** Existing school
- **d** Vacant lots

**02** Urban Rehabilitation

- Efforts begin to restore this cell to a state of urban vitality. Areas with potential for future construction are identified. Other areas with more potential for outdoor programming begin to take form. Unnecessary hardscape is removed and replaced with natural aggregate groundcover.
- Native plant species are introduced in outdoor programming areas. This will also reduce flooding and improve water management in times of heavy rainfall.

**03** Restoring Culture, Community, Habitats, Comfort of Living

- As the cell densifies and becomes a more attractive place to live, the need for housing developments on the outskirts of the Phoenix metropolitan area decreases, and the desert begins to reclaim those areas. This cell increases its connections to the nearby downtown area. As more people move to the area, more houses and businesses move in. Once a certain density is achieved, the cell and its neighbors become more integrated.

**04** Functioning Mixed Urban-Residential Environment

- As the cell advances through the phases of the system, native plants continue to thrive in habitats and change per its inhabitants' input according to the code.
- Connectivity to downtown Phoenix is strengthened. The cell has reached a state of climax, but will continue to grow and change as it moves through the phases of the system.

**05** Final [Climax] Phase

- Native plants thrive in improved conditions.
- Remaining vacant lots' natural groundcover is maintained until ready for use.
- Urban orchard, native plants, natural groundcover reintroduced.

**06** Density Reestablished

- In increasing residential density is reestablished.
- Remaining vacant lots' natural groundcover is maintained until ready for use.
- Furrows of public landscape in the urban context continue to develop in this cell and adjacent cells, as they move through the phases of the system. Native plants continue to thrive in habitats and change per its inhabitants' input according to the code.
- Connection to downtown strengthened.
To show an example of how the code would be applied in cells with different contexts, I’ve designed several ways of interpreting the code in specific cells of the grid. This cell contains the southern edge of the central city, transitioning to the warehouse district, and then to residential.

Sections of road would be transformed into pedestrian and bicycle-only. It incorporates parks, performance spaces, open-air markets, community gardens, and other amenities that help to bring comfort and a sense of community back to the streets of Phoenix, as well as some relief from the intense heat.

The next diagonal cell in the swath is a blighted neighborhood called Nuestro Barrio. Over half of the neighborhood has been deserted since the construction of the airport east of the neighborhood. The people that remain want to see the city reinvest in Nuestro Barrio, beautify the lots, and create a development plan for the communities.

Interventions in Nuestro Barrio include uses that take advantage of the vacant lots, such as outdoor classrooms, water-harvesting structures, xeriscape gardens, rain gardens, and desert rehabilitation areas, until they become developed.
Many of Phoenix’s water management problems can be helped by incorporating permeable surfaces, and rain gardens, potentially made in the disturbed foundations of center city vacant lots. Reintroduced native plant species supplemented with small-scale infill that diverts or actually creates water generates a network of ecosystem-relieving furrows in the urban context.

This section through central city south shows how the code could be interpreted in an urban condition. For callouts, refer to the code on page 38.
This section of the Nuestro Barrio neighborhood shows how the code could be interpreted in a mixed condition. For callouts, refer to the code on page 38.
This section near the Superstition Mountains shows how the code could be interpreted in an edge condition.
For callouts, refer to the code on page 38.
7.0 conclusion
The photosynthetic veneer, the vegetal world, must not be overlaid by a man-caused opaque veneer.

- Paolo Soleri

Ideally, each community would employ the code using a different combination and proportion of materials from the given palette. Each cell will grow and evolve at different paces over time with input from its residents. The code aims to provide a stable set of parameters regarding things like scale, placement, materials, and general form which are critical to creating an environment that enables the ecosystem to function and fosters growth in central Phoenix.

Rather than dispersing ourselves throughout the desert in our own private homes, we need to reorganize the city in accordance to its ecosystem and invest in improving our collectively owned property. We need to implement planning strategies deriving from the ecosystem itself instead of defeating it. By bringing life back to central Phoenix, we can also bring life back to a valuable, threatened ecosystem.
8.0 bibliography


EDUCATION

pennsylvania state university  
architectural history
bachelor of architecture

Mens Environmental Inquiry, International Studies, Architectural History
Spring 2016: semester abroad at Pantheon Institute, Rome, Italy

WORK EXPERIENCE

summer architectural intern  
phoenix, az: 2016
Produced marketing documents & materials, prepared site analysis studies, created models, enhanced sketch drawings, and participated in client meetings for residential projects.

summer architectural intern  
pittsburgh, pa: 2015
Assisted in schematic design, producing drawings, and modeling for higher education buildings on various college campuses around the US.

summer intern  
saxonburg, pa: 2013 - 2014
Drafted construction drawings; prepared business documents; assisted in managing projects during the bidding process; created interior design color boards; selected interior finishes; performed pre-construction tasks on site.

EDUCATION

august 2012 - may 2017

Minors: Environmental Inquiry, International Studies, Architectural History
Spring 2016: semester abroad at Pantheon Institute, Rome, Italy

WORK EXPERIENCE

will bruder architects  
summer architectural intern  
phoenix, az: 2016
Produced marketing documents & materials, prepared site analysis studies, created models, enhanced sketch drawings, and participated in client meetings for residential projects.

bohlin cywinski jackson  
summer architectural intern  
pittsburgh, pa: 2015
Assisted in schematic design, producing drawings, and modeling for higher education buildings on various college campuses around the US.

etzel engineer & build  
summer intern  
saxonburg, pa: 2013 - 2014
Drafted construction drawings; prepared business documents; assisted in managing projects during the bidding process; created interior design color boards; selected interior finishes; performed pre-construction tasks on site.

SKILLS

digital
photoshop, illustrator, indesign, rhino, sketchup, revit, autocad

manual
sketching, modeling, copy-editing

languages
fluent proficiency in italian