Tree and Shade
Portal Document

The Tree and Shade Master Plan is a roadmap for creating a healthier, more livable and prosperous 21st Century desert city. Implementing the plan will help the City and its residents save millions of dollars, while tackling important environmental and social challenges.

The Plan is an electronic portal that provides links to numerous other studies and resources; hyperlinks are embedded throughout the plan, allowing the user's experience to be completely unique and customized. Clicking on underlined green text (Click to see www.phoenix.gov) will immediately connect the reader to a wealth of further information about the issues being presented.

There are also internal navigational tools within the plan that allow the reader to easily explore different sections of the document.

The green plant will link the reader back to the table of contents.

These icons link the reader to the corresponding sections of the plan.

Additionally, the table of contents allows the reader to navigate to any section by clicking on the page number.

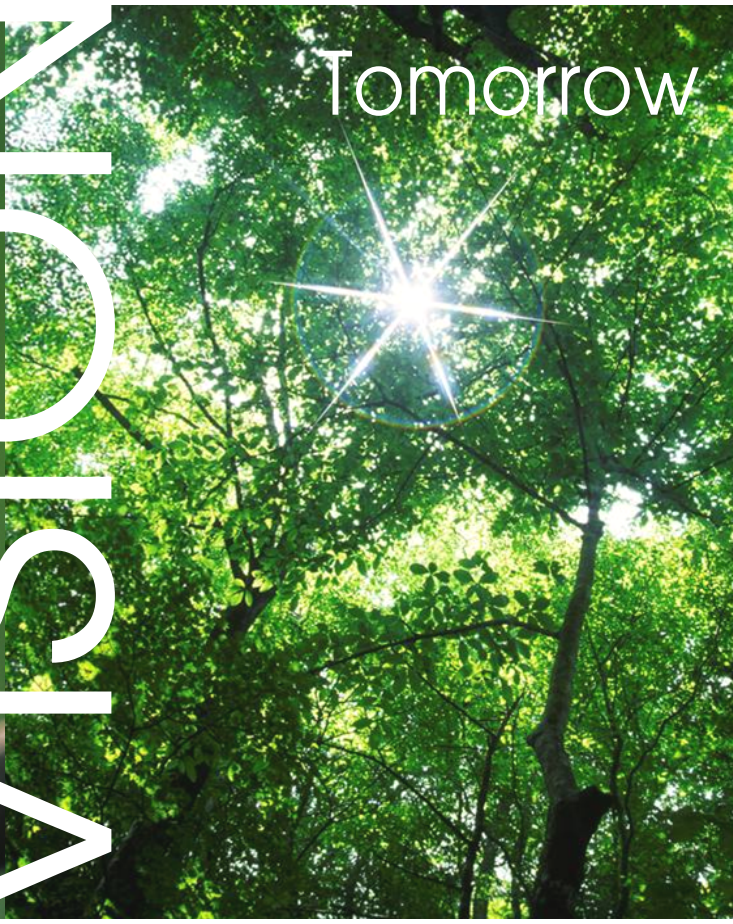
Please save a tree and read the plan online!

City of Phoenix

Tree and Shade

Master Plan

VISION



"An investment strategy for creating a healthier, more livable and prosperous Phoenix"

2010

Phoenix City Council

Phil Gordon, Mayor

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Peggy Neely, District 2

Bill Gates, District 3

Tom Simplot, District 4

Claude Mattox, District 5

Sal DiCiccio, District 6

Michael Nowakowski, District 7

Michael Johnson, District 8

Friends,

It gives me great pleasure to present the *Tree and Shade Master Plan*, which describes the important role trees play in creating a healthier, more livable and prosperous Phoenix. This nation and this state are at an economic crossroad. We can cut and run, or we can work our way through these challenges, by letting cities make the smart investments and good choices that will make the biggest difference and have the most immediate impact.

Planting trees and caring for them are two of the smartest investments we can make -- providing shade, reducing energy costs, cleaning the air, reducing greenhouse gases that cause global warming, capturing polluted urban runoff, improving water quality and adding beauty to our neighborhoods. The urban forest is a critical component of our infrastructure – one that increases in value over time.

The *Tree and Shade Master Plan* provides a vehicle in which we can move toward achieving the Green Phoenix Initiative, and will help us become the first carbon neutral city in the country. Phoenix will become a national and global leader in living infrastructure.

This will require more than just planting trees; this will require hard work and cooperation among City government, residents, and businesses in our community. It will require commitment from each of us. We all have an important role to play in this effort.

I thank the members of the Task Force for the leadership and hard work to bring together this plan.

Sincerely,

Phil Gordon

Mayor

"Someone's sitting in the shade today because someone planted a tree a long time ago."
- Warren Buffett

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Creating a Healthier, More Livable and Prosperous Phoenix

Phoenix is poised to become the next great American City. The Tree and Shade Master Plan presents Phoenix's leaders and residents a roadmap to creating a 21st Century desert city. The urban forest is a keystone to creating a sustainable city because it solves many problems with one single solution. By investing in trees and the urban forest, the city can reduce its carbon footprint, decrease energy costs, reduce storm water runoff, increase biodiversity, address the urban heat island effect, clean the air, and increase property values. In addition, trees can help to create walkable streets and vibrant pedestrian places. More trees will not solve all the problems, but it is known that for every dollar invested in the urban forest results in an impressive return of $2.23 in benefits.

Phoenix has a strong foundation on which to build the future. Phoenix residents value natural resources and have voted repeatedly to invest in the living infrastructure. For instance, the Phoenix Parks and Preserve Initiative was passed twice with over 75 percent voter approval. This modest sales tax has purchased land for the Sonoran Preserve, funded habitat restoration efforts along Rio Salado, built new parks and planted hundreds of new trees. These projects and others like it provide the base for a healthy urban forest. Trees and engineered shade have the potential to be one of the city's greatest assets and the Tree and Shade Master Plan provides the framework for creating a healthier, more livable and prosperous Phoenix.

The Urban Forest - Trees for People

The urban forest is a critical component of the living infrastructure. It benefits and attracts residents and tourists alike to live, work, shop and play in the city. Phoenix's urban forest is a diverse ecosystem of soils, vegetation, trees, associated organisms, air, water, wildlife and people. The urban forest is found not only in parks, mountain preserves and native desert areas, but also in neighborhoods, commercial corridors, industrial parks and along streets. The urban forest is made up of a rich mosaic of private and public property that surrounds the city and provides many environmental, economic, and social benefits.

A Cause for Concern

Phoenix, like many other cities, has deferred the care of the living infrastructure. Trees are being lost at a faster rate than they are being replaced, and the budget has not been able to support the City's forestry efforts and urban forestry maintenance staff. For several decades the coordination, care and management of the forest has been under funded. This has created increased environmental, economic and social costs for the city and its residents.

In order for the urban forest to be a profitable investment, Phoenix must do more than just plant trees. The entire lifecycle of the tree must be addressed because the current planting, maintenance, and irrigation practices are preventing many trees from providing their maximum return on investment. The Tree and Shade Master Plan provides a detailed roadmap to address these issues, as well as many others, with realistic and incremental steps. To succeed, this plan requires a long-term investment from the residents and leaders of Phoenix.

Trees are Solution Multipliers

Solution multipliers solve numerous problems simultaneously. Trees are a perfect example of a solution multiplier because when planted and maintained correctly, they can provide many economic, environmental, and social benefits. According to the US Forest Service, trees benefit the community by: providing a cooling effect that reduces energy costs; improving air quality; strengthening quality of place and the local economy; reducing storm water runoff; improving social connections; promoting smart growth and compact development; and creating walkable communities (US Forest Service and Urban & Community Forestry). Trees are high-yield assets; for example, the City of Chicago values its trees at $2.3 billion dollars. Trees have a documented return on investment (ROI) in Arizona of $2.23 for every $1 invested (US Department of Agriculture Forest Service). This demonstrates the important role that trees have within the city's economy. This is why it is critical to manage and invest in the urban forest; the health of the urban forest is closely linked to the economic health of the city.

Maintainable Infrastructure

Phoenix is a desert city that has a history of several decades of drought. In order to achieve a healthy urban forest we must use water wisely. Currently, 60 percent of Phoenix's water is used outdoors, mainly for landscape irrigation. According to the City of Phoenix's Water Services Department, Phoenix has an adequate sustainable water supply to meet the State of Arizona's 100-year assured water supply standard. This includes growth in Phoenix's system water demand over the next 20 years or more. Nonetheless, to achieve a maintainable urban forest, water must be used more efficiently. This is done with high-efficiency irrigation systems, use of drought-tolerant plant material, strategic placement of shade corridors and continued education. In order for a healthy urban forest to exist, it must be coupled with strong water management.

Challenges

- Low overall shade canopy
- More trees removed than planted
- Limited water resources
- Inadequate budget for forestry division
- Phoenix Urban Forestry Education program eliminated
- Out of date and inadequate tree standards in zoning ordinances
- Regulatory hurdles that disincentivize structural shade
- General public has a limited understanding of the importance of trees
- Poor planting, maintenance and irrigation practices
- Limited community and business partnerships
- Incomplete tree inventory, no GIS information

Goals of the Tree and Shade Master Plan

The following goals and recommendations apply to all areas of the urban forest. Actions for each recommendation are provided in further detail within the plan.

Raise Awareness (Educate)

- Recommendations
  - Establish Partnerships.
  - Educate the Public and Staff through Programs, Publicity and Media
  - Lead By Example

Preserve, Protect and Increase

- Recommendations
  - Create an Urban Forest Infrastructure Team
  - Conduct a Tree Inventory
  - Develop and Adopt Best Management Practices
  - Research and Develop Dedicated Revenue Streams

Sustainable Maintainable Infrastructure

- Recommendations
  - Revise City Ordinances
    - Items for further review and possible inclusion:
      - Engineered Shade Standards
      - Streamlined Permitting for Engineered Shade
      - Tree Permitting
      - Tree Protection on Construction Sites
      - Incentives and Alternatives
      - Planting and Irrigation Standards
      - Landscape Standards based on the concepts of Right Tree, Right Place

Implementation

The Urban Forest Infrastructure Team and the Parks and Recreation Department are charged with coordinating and maintaining the Tree and Shade Master Plan. Many City departments will implement the plan as they work to fulfill their own missions. The Tree and Shade Master Plan will not only provide a framework to achieve an average 25 percent tree canopy coverage by 2030 but will also help to achieve many goals and policies from the Green Phoenix Initiative and the voter ratified General Plan.

The plan proposes incremental steps to achieve the 2030 vision and canopy goal. The City of Phoenix is beginning to put a process in place to preserve, maintain, and redevelop the urban forest. This plan intends to increase the quality of life and economic vitality of the city by recommending ways to create a sustainable urban forest for future generations.

2030 VISION

Achieve an average 25% canopy coverage in Phoenix.

By 2030, the view from the northern ridgelines of South Mountain to the desert washes of the Sonoran Preserve reveals the urban forest as a healthy, diverse and cohesive ecosystem. Saguaros cover the hillsides, shade trees define streets, and residential neighborhoods are tree groves that are cool and comfortable. The urban forest lowers the temperature during the summer months, and characterizes the city as a connected oasis that radiates out from Downtown. The urban forest identifies this place as a unique desert city. Phoenix reflects and preserves the beauty of the Sonoran Desert.

Elected officials, citizens, city staff, and developers value the diverse mix of flora and fauna that make up the urban forest. Citizens are educated about the benefits of the urban forest and view it as a critical component of the infrastructure that must have regular investment and maintenance.

By 2030, Phoenix has laid the foundation for a healthy and sustainable urban forest that is carefully cared for and managed. The urban forest contributes to the economic, environmental and social well-being of our city, as well as furthers the goals and policies of the city. Phoenix has made the urban forest a priority.

Phoenix encompasses **519 square miles** of land that is shared by **1.5 million citizens**—a number that grows daily. The City of Phoenix averages **92 days** of temperatures over one hundred degrees annually. These numbers are more than simple statistics; they are contributing factors to the increasing intensity of the city's urban heat island (UHI). The UHI effect equates to increased energy and water consumption and leads to increased costs and strained resources. The good news is that there is **1 simple solution: TREES**. By implementing the Tree and Shade Master Plan, the City of Phoenix will fight the effects of the urban heat island while enriching the city and lives of the residents.

BLUEPRINT

From the Past

As Phoenix moves into the 21st Century, it is important to look back at the past and learn from previous successes and mistakes. The blueprint used to build Phoenix at the turn of the 20th Century created a walkable oasis, where trees were considered essential infrastructure for a livable community. But as air conditioning and cars became more prevalent, trees became less important. Many street trees were removed to make room for the wider streets needed for cars. Today, the City once again realizes the importance of trees to its well-being.

However, the past cannot be just repeated: the city founders left an unsustainable blueprint, due to the high volume of water required. They ignored the extraordinary desert plant palette, a critical element in the creation of a unique desert city. As Phoenix moves forward, it is important to adapt the sustainable features of the past to current needs and constraints. In order for the urban forest to be sustainable, it must be built on a foundation of efficient water use.

The past provides many important lessons that must be learned from as we build the future.

Did You Know Phoenix Was Once Called

A City of Gardens and Trees

In the early days of modern settlement, trees were considered essential to the success of both farms and towns. As early as 1879 – eleven short years after Jack Swilling cut the Valley's first modern canal along the alignment of an ancient Hohokam canal just below Pueblo Grande – a Phoenix newspaper advised, "The tree planting season is now at hand and we expect to see it taken advantage of by almost everyone in the valley. In this city let every person who owns a lot see that shade trees are set out. If nothing better can be obtained, set out cottonwoods. They cost nothing, (are) easy to plant, require no care, and are of quick growth."

In an era when progress was marked by the quantity and variety of things that could be grown, people tried growing just about every kind of tree. Each new experiment was reported as news. In 1882 one farmer was said to be trying olive trees. The next year, there were reports of another farmer who had "received a lot of maple and butternut trees…from his old home in the East, and proposes to see how they will grow…"

Such experiments stemmed less from idle curiosity than from the urge to secure a foothold on untried land. To farmers and ranchers who had migrated here, trees were a proven commodity. They protected fields from wind and livestock from the blistering sun. And more trees meant more firewood.

By the early 1900s, lemon, orange, and a small variety of nut trees had taken hold as paying crops in Valley orchards. Along the ditches lining most fields and roads, the growth of large cottonwoods (often sprouted from fence poles), eucalyptus, and ash trees had made the landscape as lush as the early scenes of the ditches and canals in Mesa. "Everywhere there is shade and plenty of it," observed a visitor in 1905. "The entire valley, from Mesa into Phoenix, is one solid mass of green, and every road is a perfect avenue. Chinaberry trees, palm, and cottonwoods line the driveway, or lanes as they call them, and the entire distance from Mesa to Phoenix can be driven under an almost unbroken arch of shade."

Edward Lebow. *Following the Water: A Century of Change.*
"Historical and Contemporary Photographs of Sal River Valley Canals."
Scottsdale Center for the Arts, 1997

Images provided by:
McClintock Collection, Arizona Room,
Phoenix Public Library

Phoenix's Urban Forest

Founded in 1881, Phoenix, Arizona is situated in the Sonoran Desert at an elevation of 1100 feet. It is the fifth largest city in the United States and spans over 519 square miles. Native vegetation ranges from creosote and bursage communities on the desert floor to upper Sonoran deserts with palo verde, ironwood, and mesquite trees. With extreme temperatures in the summer months and an annual rainfall of just over seven inches, the native plant palette is very diverse and has adapted to this environment.

Early residents imported other local species and trees from similar climates. Historically, large trees (eucalyptus, elm, pine, ash, pecan, and others) were planted for their shade value and natural cooling qualities. Other trees such as olives, palms, and citrus were incorporated into neighborhoods, establishing unique streetscapes. Often watered by flood irrigation, these landscapes created vast amounts of shade that still exist in the older portions of the city. Today, Phoenix has an urban forest that is a rich mosaic of native and introduced tree species found on both public and private properties.

A Cause for Concern

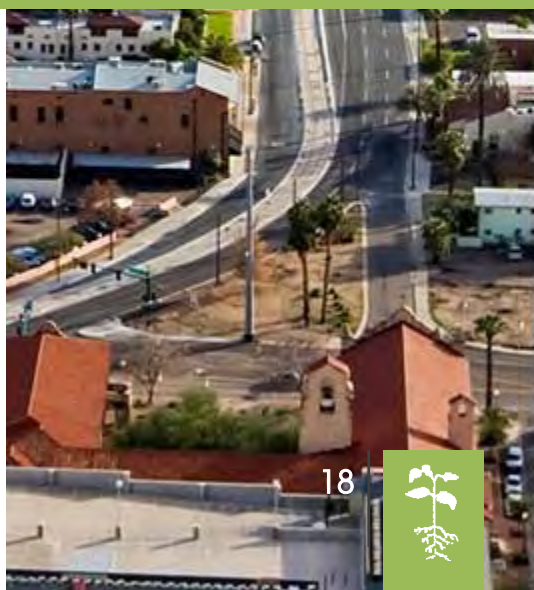
The current condition of the urban forest is of immediate concern because the percentage of urban forest coverage (total vegetation covering the ground) in the Phoenix area is low compared to regional standards (American Forests). According to Arizona State University, the Phoenix area has an estimated 11 to 13 percent vegetative cover (Stabler). Currently, trees are not being replanted at the same rate as they are being removed. Also, there is no official planning mechanism to sustain the urban forest by replacing lost trees. In 2008, the city removed approximately 3,900 trees that were dead, dying or had safety issues, and only planted about 3,700 trees. The Parks and Recreation Department also anticipates that numerous large mature trees will be removed within the next five years due to past design and maintenance practices.

National Average $$$$$$$$$ $7.65 Per Capita

Phoenix $$$$ $3.48 Per Capita

The City has maintained the Tree City USA status from the National Arbor Day Foundation for the last 23 years, and received growth awards for the last 12 years. However, this status will most likely be lost in 2010, due to reductions in per capita spending, the elimination of the Urban Forestry Program and reduced number of overall tree plantings. In 2008 other cities spent on average $7.65 per capita on tree plantings, whereas Phoenix spent $3.48 per capita—less than half (Tree City USA 2008 Summary Report).

The urban forest is enormously valuable. "Trees are the only part of infrastructure that actually appreciates in value while the rest depreciates. Dollar for dollar, there is no better investment in the local environment" (Arbor Day Foundation) Phoenix is not making that investment. If this trend continues the urban forest resource will continue to decline, which will have serious economic, environmental and social costs for the city.

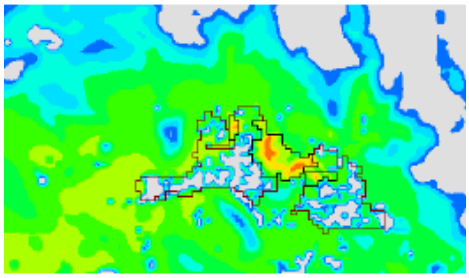


Phoenix's URBAN HEAT ISLAND

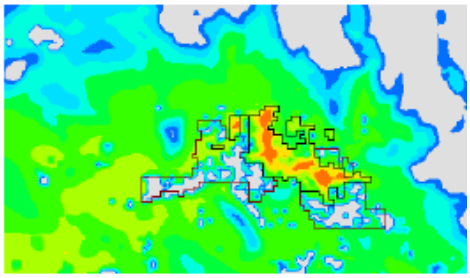
As Phoenix has developed, significant changes have been made to the natural landscape. Buildings, roads, and other infrastructure replaced natural desert and farmland. Surfaces that were once permeable and moist have become impermeable and dry.

These changes have caused Phoenix to become warmer than the surrounding rural and desert areas, forming an "island" of higher temperatures in the landscape (Environmental Protection Agency). Phoenix's urban heat island (UHI) typically occurs after sundown as heat built up in cement, asphalt and other material during the day is slowly released back into the environment (Brazel). The Phoenix area has seen its nighttime temperatures rise dramatically, resulting in Phoenix being up to 15 degrees warmer than the adjacent desert and farmland (Golden and Kaloush).

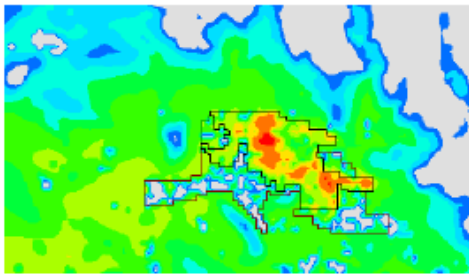
1973



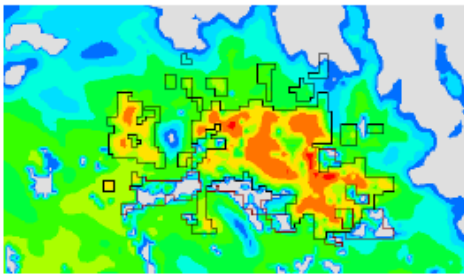
1985

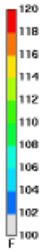


1998



2006



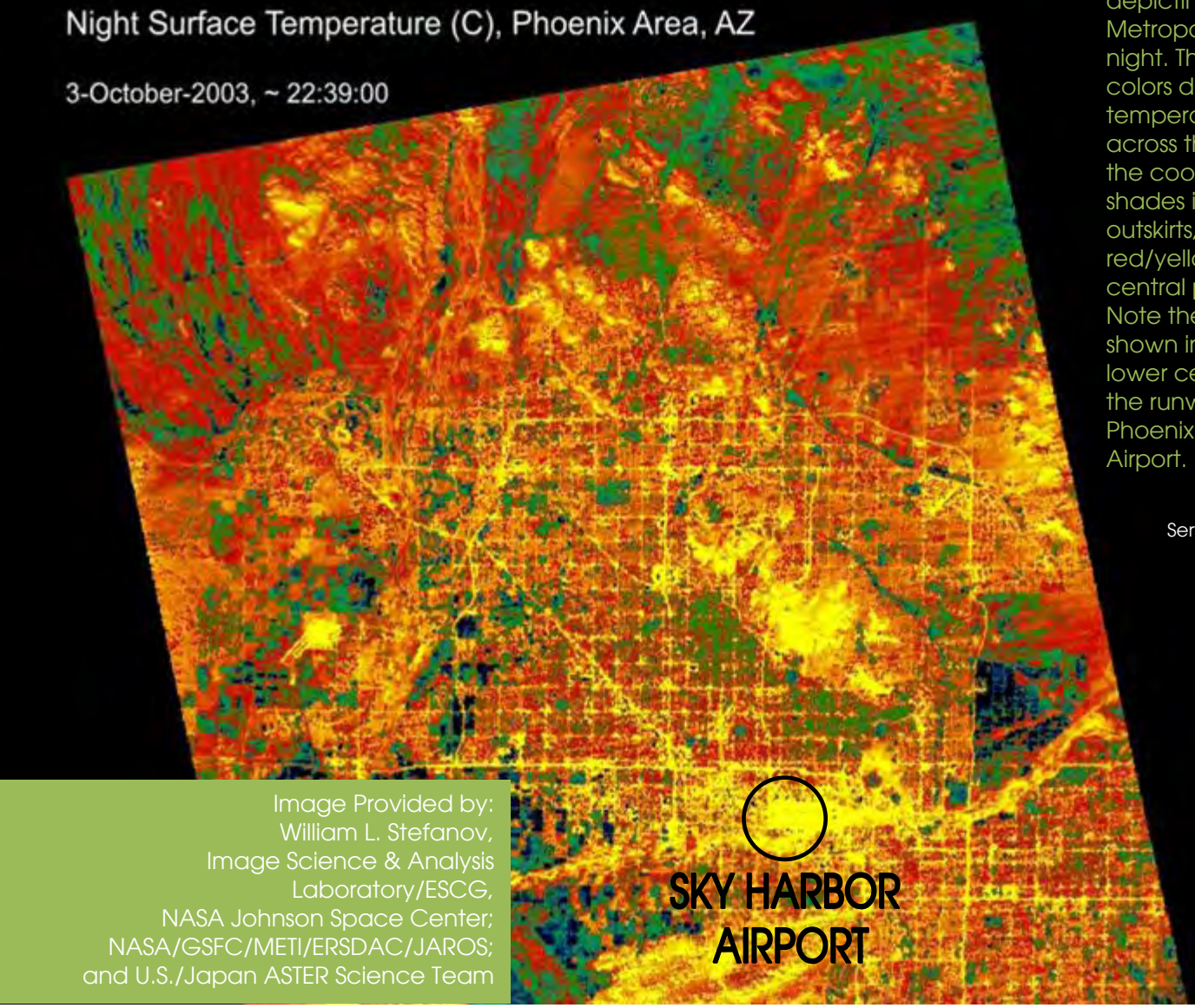


Phoenix Heat Island

These images show how the expansion of the urban environment has contributed to an increase in air temperatures. The images demonstrate that if the City does not change its current course, temperatures will continue to increase. The images were generated using computer model simulations based on weather conditions on July 14, 2003, during a heat wave period.

Each plot presents simulated 2 mile air temperatures using land use data from 1973, 1985, 1998 and 2006, respectively.

Images provided by: Susanne Grossman-Clarke from the Global Institute of Sustainability, Arizona State University.



The image to the left is an infrared image depicting the Phoenix Metropolitan area at night. The different colors depict the temperature variations across the valley, from the cool blue/green shades in the valley outskirts, to the hot red/yellow hues in the central part of the city. Note the city hot spot shown in yellow in the lower center, which is the runway complex at Phoenix Sky Harbor Airport.

-National Weather Service Forecast Office

Image Provided by:
William L. Stefanov,
Image Science & Analysis Laboratory/ESCG,
NASA Johnson Space Center;
NASA/GSFC/METI/ERSDAC/JAROS;
and U.S./Japan ASTER Science Team

The elevated temperatures that are created by the Urban Heat Island effect have significant impacts on the health and well-being of the city. These impacts include increased energy consumption, elevated levels of air pollutants and greenhouse gasses, compromised human health and comfort, impaired water quality and increased water use (Environmental Protection Agency pg. 3) According to a study published in Journal of the American Planning Association, "a 1° F increase in temperature resulted in a 290 gallon increase in water use per single-family house in the month of June" (Guhathakurta and Gober). The Urban Heat Island is a serious issue that has to be addressed. One strategy to mitigate the Urban Heat Island, recommended by the United States Environmental Protection Agency, is to increase the urban forest canopy coverage.

Trees are Solution Multipliers

Solution multipliers solve numerous problems simultaneously. Trees are the perfect example of a solution multiplier because when planted and maintained, they provide many economic, environmental, and social benefits. According to a United States Department of Energy report, strategically planted trees can reduce heating and cooling costs an average of 25 percent annually (Cutler pg. 2). If done at a regional scale, this should have a significant impact on the demand for electricity. It was shown in a 2003 study by the USDA Forest Service's Center for Urban Forest Research that adding 50 million trees in carefully planned areas across California would eliminate the need for seven new 100-megawatt power plants (Cutler pg. 2). Trees are high yield investments; for example, for every dollar New York invests in the urban forest, there is a return on investment of $5.80 (Peper pg. 1). Austin's urban forest, with canopy coverage of 34 percent, provides the city $15 million annually in air quality benefits and $883 million annually in storm water benefits (Cutler (2005), pg. 1). "Community trees leverage the social, economic, and environmental value of cities, with forestry and related industries providing employment for over 1.6 million people and contributing $231.5 billion to the U.S. economy" (The United States Conference of Mayors, pg. I). These are just a few of the benefits that carefully planted and maintained trees can provide to Phoenix and the nation.

Just as an increase in the urban forest can create many benefits for a city, the decline of the urban forest can also have significant economic, environmental and social costs. A clear illustration of this is found in Atlanta's metropolitan areas: the urban forest canopy coverage decreased 48 percent from 1974 to 1996. This has resulted in a 33 percent increase in storm water, which required an investment of $1.18 billion in stormwater retention facilities (Cutler pg. 2). In addition, cities with decreasing urban forests have increased air pollution, which can result in the classification of a city as a non-attainment city for air quality, resulting in fines and the loss of federal funding for capital improvement projects (Funders' Network for Livable Communties). Increased air pollution also results in human health problems like asthma. Not investing and managing the urban forest creates higher costs for cities. This is why it is important to treat the urban forest as a critical component of the infrastructure.

Benefits of Trees

Economic

Increase Property Values
Reduce Cooling Costs
Increase Economic Stability
Increase Community and Business District Appeal
Reduce Expenditures on Gray Infrastructure
Long Pavement Life

Environmental

Reduce Greenhouse Gasses/Combat Global Warming
Improve Air and Water Quality
Reduce Urban Heat Island Effect
Reduce Energy Consumption
Reduce Stormwater Runoff and Erosion
Provide Wildlife Habitat

Equitable (Social)

Improve Human Health
Provide Shade
Create Visual and Sound Buffers
Improve Neighborhoods
Create Walkable Streets

THE BIG 5

HOW THE BIG 5 U.S. CITIES ARE MAKING TREES AND SHADE A PRIORITY

In 2007, Mayor Michael Bloomberg unveiled PlaNYC, a plan to make New York City a sustainable city. One component of the plan is the MillionTreesNYC initiative; a city-wide, public-private effort to plant and care for one million trees. New York sees their urban forest as their most valuable environmental assets and a critical component of making New York a 21st Century city.
http://www.milliontreesnyc.org/html/home/home.shtml

In 2006, Los Angeles' Mayor, Antonio Villaraigosa launched the Million Trees LA Initiative. This is a city-wide, public-private effort to plant a million trees over the next few years with the goal of transforming Los Angeles into a green, sustainable city. Los Angeles sees their urban forest as natural utility and critical component of making LA a sustainable and livable city in the 21st Century.
http://www.milliontreesla.org/

Chicago is a national leader in the care, maintenance and development of their urban forest. It is also the largest employer of arborists in the country and has developed a variety of innovative programs that promote the stewardship of their forest. The most recent program is the Chicago Trees Initiative which a city-wide, public-private effort to significantly expand their tree canopy over the next 30 years. This Initiative is part of Chicago's Climate Action Plan and is seen as an important strategy for addressing Global Climate Change.
http://egov.cityofchicago.org/chicagotrees/

Million Trees + Houston is a city-wide, public-private initiative designed to increase the amount of trees within the city. The initiative is a five year plan that began in 2008. The initiative is part of the mayor's framework for creating a sustainable city. Over the past year Houston has planted over 120,000 trees.
http://www.greenhoustontx.gov/tree.html#strategic

Creating a Sustainable 21st Century

PHOENIX

Phoenix has an unprecedented opportunity to create the next great American city, joining the ranks of New York, Los Angeles and Chicago. However, this will take coordination, planning and implementation. The Tree and Shade Master Plan presents Phoenix's leaders and residents a roadmap to create a healthier, more livable and prosperous 21st Century desert city. The urban forest is the keystone to creating sustainable infrastructure because it achieves many goals of the city with one single investment. Nevertheless, it will require more than just planting trees. The current planting, maintenance and irrigation practices are killing many valuable trees; additionally, these practices waste hundreds of thousands of gallons of water annually. In order to maximize the investment, these practices and many others will have to be addressed. For this reason the plan focuses on a canopy goal instead of a numerical planting goal. Often, numerical planting goals lead to the wrong tree species being planted in an inappropriate location, resulting in higher maintenance cost and the eventual loss of the tree.

Phoenix's geographical location in the Sonoran Desert makes the urban forest very different from the urban forests of New York, Los Angeles or Chicago. Phoenix receives 7 inches of rainfall annually, compared to Chicago's 32 inches. Water is a major constraint, and in order for the urban forest to be maintainable, it must be coupled with strong water management. The geographic location is also an opportunity. Phoenix is located in a breathtakingly beautiful environment with a diverse plant palette that is well adapted to the soils and environment. These plants, however, do not provide significant shade in an urban setting. This is why it is important that the city is creative and thoughtful about the design of its living and mechanical infrastructure. This will require time and resources, but if done right the urban forest will be an extremely valuable asset that can be leveraged to create the next great American city.

The Role the Urban Forest Plays in Phoenix's Sustainable Future

Solution multipliers are critical to creating a prosperous and sustainable future. Humanity is facing unprecedented challenges directly related to climate change. "Warming of the climate system is unequivocal, as is now evident from observations of an increase in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level" (Intergovernmental Panel on Climate Change). In order to prevent the worst consequences of climate change, carbon dioxide levels must be cut 60 to 80 percent below 1990 levels (Urban Land Institute). This is not an easy task when American has become so dependent on fossil fuels. However, a small investment in the urban forest can have tremendous impacts on the City's carbon footprint. According to the U.S. Department of Agriculture Forest Service, "10,000 trees in a given municipality typically stored 500 tons of carbon dioxide, removed 50 tons of pollutants, and reduce stormwater runoff by nearly 10 million gallons". Street trees also increase pedestrian and motorized traffic safety, creating walkable places (Burden), which help to further reduce our carbon footprint (Urban Land Institute). In a world of limited resources, it is critical that resources are used wisely, as well as efficiently. Cities from New York to Albuquerque are making investments in the urban forest because trees are solution multipliers that leverage a small investment into a much larger economic, environmental and social return.

Several goals and policies of the voter approved General Plan are achieved by investing in the urban forest. For example, in the Environmental Planning Element of the General Plan, the goals of improved air quality, energy efficient planning and design, reduced heat island, noise mitigation, pollution prevention and waste minimization, natural resource conservation, flooding protection, erosion protection, vegetation protection and wildlife protection are achieved by investing in the protection, preservation and the growth of the urban forest. Many more goals and policies of the General Plan will also be achieved by investing in the urban forest. Additionally, the recent Green Phoenix Initiative is also furthered by the Tree and Shade Master Plan. Investing in the Urban Forest will help Phoenix create a sustainable and prosperous future.

Phoenix has made significant investments into its urban forest. The Rio Salado Habitat Restoration Project is a perfect example of that investment. The first five miles of the project converted a landfill and 595 acres of deteriorated river bottom and adjacent land into a lush riparian corridor with miles of paved and dirt trails. Trees are an integral component of the restoration efforts, with approximately 3,000 trees planted. Not only has the Project restored important riparian habitats, it also leveraged approximately half a billion dollars of private investment on private property surrounding the project. Another excellent example of the City's investment in the urban forest is the development of Civic Space Park in Downtown Phoenix. The site was primarily used as surface parking and had very few trees. The city block was transformed into a city park with 111 trees, resulting in 40 trees per acre. When these trees mature, the park will have a total 71% canopy cover, making it a green oasis in the heart of Downtown Phoenix.

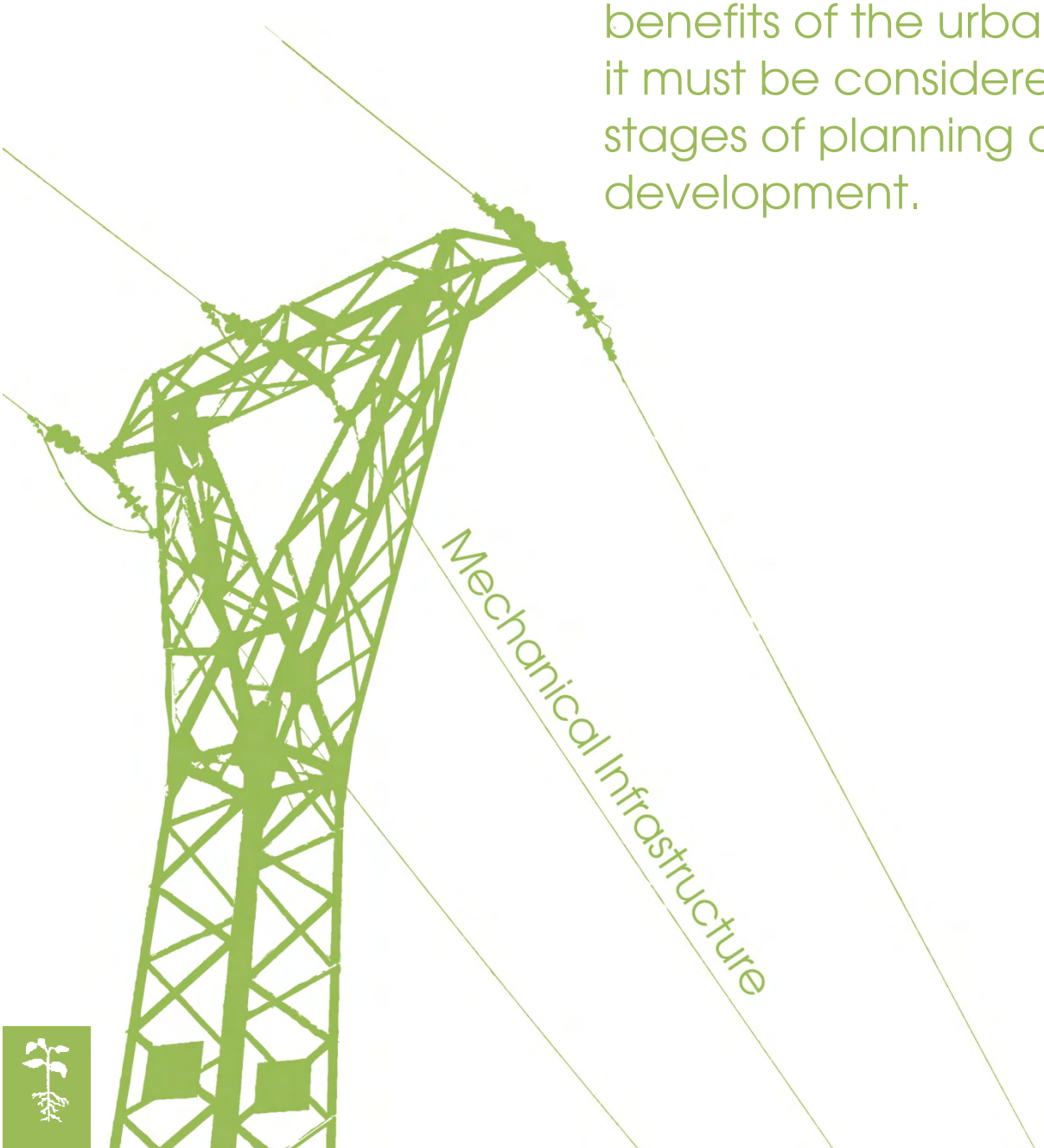
These city projects, plans and initiatives are a great foundation for a sustainable city, but in order to maximize the City's return on its investment, the urban forest must be given priority in all stages of planning and development.

Sustainable Infrastructure

Phoenix is a desert city that has a history of several decades of drought. In order to achieve a healthy urban forest Phoenix must be wise about water use. *Currently 60 percent of Phoenix's water is used outdoors, mainly for the irrigation of landscapes*. According to the City of Phoenix's *Water Services Department*, Phoenix has an adequate sustainable water supply to meet the State of Arizona's 100-year assured water supply standard. This includes growth in Phoenix's system water demand over the next 20 years or more. Nonetheless, to achieve a maintainable urban forest, water must be used efficiently. This is done with high efficiency irrigation systems, use of drought-tolerant plant material, strategic placement of shade corridors and continued education. In order for a healthy urban forest to exist, it must be coupled with strong water management.

GUIDING PRINCIPLE

Phoenix's urban forest is as much a part of the city's infrastructure as roads, stormwater retention basins, and water lines. In order to maximize the economic, environmental, and social benefits of the urban forest, it must be considered at all stages of planning and development.

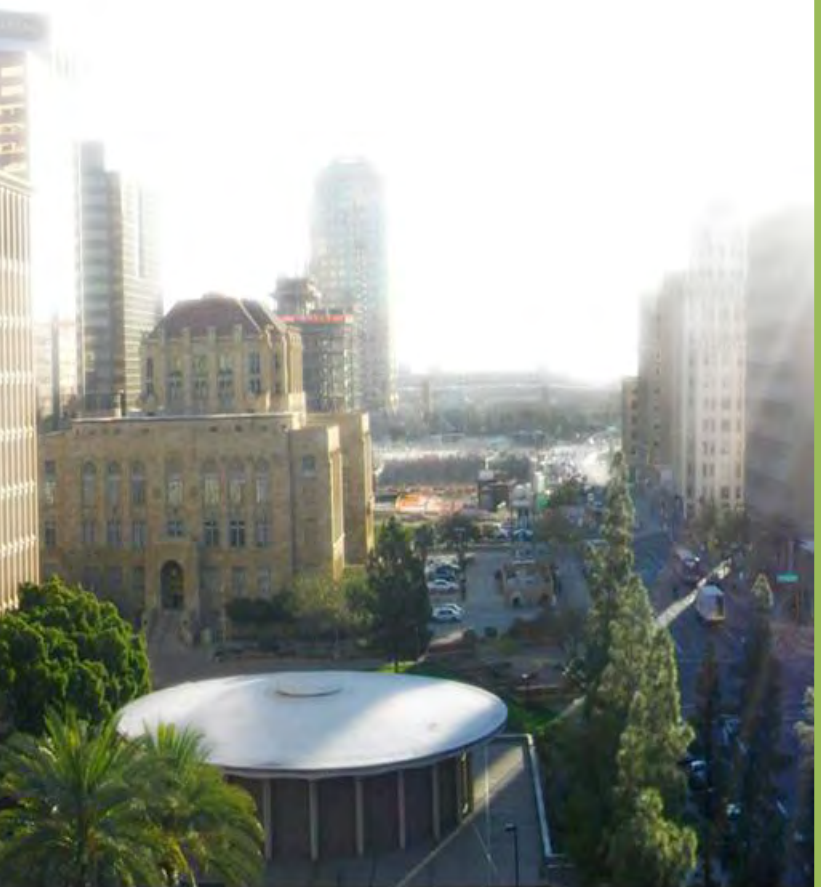


Organization of the Plan

The current state of Phoenix's urban forest is of immediate concern. In order to see the full benefits of the urban forest, a significant long-term investment must be made into its enhancement and maintenance. This plan provides a detailed roadmap to improve and increase the current health of the urban forest resource. The plan is organized into three sections: one section for each goal with recommendations and action items for each.

ACHIEVING THE VISION

TRAJECTORY TO CHANGE



Section 1

Raise Awareness (Educate)

Section 2

Preserve Protect Increase

Section 3

Sustainable Maintainable Infrastructure

15

ACHIEVING THE VISION

section 1

Raise Awareness (Educate)

Goal: Raise awareness about the condition and benefits of the urban forest by educating staff and the public. Build demonstration projects. Establish partnerships that promote stewardship and investment in trees.

In a future of limited resources the City must do more with less. One of the easiest ways to accomplish this is to establish partnerships with business, property owners, public agencies, non-profit groups, and community groups. This helps to eliminate duplications of services, reduce costs, and create a strong foundation on which the urban forest can be built. Without community support the city will not be able to accomplish its goals.

Education about the urban forest is just as vital to the creation of a cohesive, healthy and diverse urban forest as regulations. By raising community awareness of and educating residents about the urban forest; stewards and champions can be created that will help to preserve, protect and increase the urban forest. The City of Phoenix should be a resource and a partner, as well as a leader. One way Phoenix can show leadership is to build demonstration projects to stimulate interest and to show the possibilities.

A Recommendations

1 / Partnerships

In order to have a cohesive, healthy and diverse urban forest it is necessary for the City of Phoenix to develop partnerships with businesses, non-profit organizations, public agencies and the community. The City of Phoenix currently partners with the Arizona Public Service, Arizona State Forestry Division, Arizona Community Tree Council, Arizona Municipal Water Users Association (AMWUA) and the National Arbor Day Foundation for tree planting activities and educational seminars and events. Another successful partnership is the City of Phoenix's collaboration with Arizona State University (ASU). ASU's School of Sustainability, Urban Horticulture program, School of Design and Del Webb's School of Construction are helpful resources that can help achieve the goals of this plan. Phoenix should continue to cultivate its relationship with ASU and other organizations because these types of partnerships are pivotal in bringing together groups with similar interests and goals, as well as creating economies of scale.

Budget reductions have created a need to establish new partnerships and expand existing relationships to meet the goals of the Tree and Shade Master Plan. Funding strategies for the design and development, maintenance, and replacement of tree and shade projects is critical to the long term sustainability effort of this plan. Phoenix needs to examine ways to work with outside organizations to accomplish the goals established in this plan.

2 / Provide Training and Education

Education is just as important to the health of the urban forest resource as regulations. In recognition of this, the City of Phoenix has established a tree care academy for city staff to learn critical information on the planning, selection, planting and care of trees. Budget reductions have seriously affected the city's ability to provide tree and shade training to city staff, schools, and the general public. Opportunities for additional training resources should be explored and developed.

3 / Establish Shade Demonstration Projects

In order to stimulate citizen interest, test designs and materials, as well as create functional shade elements, it is imperative to pursue shade demonstration projects throughout the city. Potential project sites have been identified by several city departments. The Office of Arts and Culture has issued a Request for Proposal (RFP) for "Gimme Shelter," a shade design project. This RFP requests artists and designers to create shade structures that could be used in city-wide applications for streets, downtown, parks, and other city facilities. This is just the first of many new projects to be developed.

4 / Start with Downtown

Downtown Phoenix is the perfect place to start because it will help to maximize existing investments and build the Connected Oasis. The Connected Oasis is the keystone of the Downtown Phoenix Plan and Code. The idea of the Connected Oasis is to create shaded streets and walkways that help to establish a unique urban environment. Creating a connected network of shaded corridors is an important part of the city and a priority of the Tree and Shade Master Plan. Downtown Phoenix can become an incubator for innovative uses of trees and engineered shade in an urban environment.

PARTNER.EDUCATE.DEMONSTRATE.DOWNTOWN.

B Policy:

Establish partnerships and outreach programs to raise awareness about the benefits of the urban forest.

i. Actions:

1. Create a Council-approved Citizen Tree and Shade Committee to oversee urban forest issues.

2. Provide information to the public about on-going efforts and long-term strategies.
   a) Update Urban Forest Website
   b) Make presentations
   c) Send out information via Water Notes
   d) Present information at conferences

3. Develop and Establish Education and Outreach Programs
   a) The Value of the Urban Forest
   b) Landscaping in the Southwest
   c) Creating Sustainable Landscapes
   d) How to Maintain an Efficient Irrigation System

4. Create Channel 11 Programs, Streaming Web Videos and DVDs
   a) What is an Urban Forest?
   b) How to Plant Trees
   c) How to Maintain Trees
   d) How to Create a Sustainable Landscape
   e) Irrigation 101

5. Hold Urban Forest and Shade Symposium

6. Develop Shade and Urban Forest Excellence Award

7. Research grant opportunities

8. Establish and Maintain Partnerships
    - American Institute of Architects
    - American Nursery and Landscape Association
    - American Society of Civil Engineers
    - American Society of Landscape Architects
    - Arizona Public Services
    - Arizona Community Tree Council
    - Arizona Cooperative Extension
    - Arizona Municipal Water Users Association
    - Arizona Nursery Association
    - Arizona State University
    - Desert Botanical Garden
    - Downtown Phoenix Partnership
    - Downtown Phoenix Voices
    - Home Builder Association of Central Arizona
    - Home Owner Association Boards
    - Local Initiatives Support Corporation
    - Local non-profits
    - Maricopa Association of Governments
    - Maricopa Community Colleges
    - Maricopa County
    - Nature Conservancy
    - Northern Arizona University
    - Other Municipalities
    - Phoenix Community Alliance
    - Salt River Project
    - Society of Municipal Arborists
    - Sonoran Institute
    - University of Arizona
    - Urban Land Institute
    - Valley Forward
    - Western Chapter of International Society of Arboriculture

9. Develop and Complete Shade Demonstration Projects

ACHIEVING THE VISION

section 2

Preserve Protect Increase

Goal: Preserve, protect and increase the quality and quantity of trees and vegetation, especially large shade trees in appropriate areas.

The current condition of Phoenix's urban forest is of immediate concern because trees are being lost at a faster rate than they are being replaced, which results in significant economic, environmental, and social costs for the city. Arizona State University estimates the vegetative cover for the Phoenix area to be less than 13 percent (Stabler). This percentage is concerning because it includes all vegetation coverage, not just tree coverage. This means the tree canopy coverage is significantly lower than what American Forest recommends for southwestern cities (American Forest recommends an average tree coverage of 25%). At this current rate, canopy coverage will decline further, creating significant costs for the city and its residents.

In order to achieve the vision of increasing the tree canopy coverage to 25 percent, a baseline tree inventory must be performed, and then best management practices for the planting and care of all trees and vegetation ought to be adopted. It is also critical that additional revenue streams are researched and developed to support the efforts of this plan.

Section 2
Preserve
Protect
Increase

A Recommendations

1 / Create an Urban Forest Infrastructure Team

To make the Tree and Shade Vision a reality, the current course has to be changed; this will require many small adaptations from several city departments over a prolonged period of time. In order for this evolution to occur, an interdepartmental team needs to be created to coordinate, implement, and regularly assess the progress of the Master Plan. The team should provide direction and resources (i.e. education and people) to city departments as they work to implement the Tree and Shade Master Plan. The team is also responsible for updating Action Items. The Team is composed of various city departments including representatives from the Planning, Development Services, Water Services, Neighborhood Services, Community & Economic Development, Engineering and Architectural Services, Street Transportation, and Parks and Recreation Departments. The team should meet bimonthly and report results to the City Manager's Office.

2 / Conduct a Tree Inventory

The most important aspect of a tree and shade management plan is a current, accurate, and serviceable tree and shade inventory. In order to measure the progress it is critical that the City knows the existing canopy coverage, species of trees, and the conditions and age of those species in the urban forest. The tree inventory will also be reassessed on a predetermined cyclical basis to measure improvement.

3 / Develop and Adopt Best Management Practices

The Phoenix metro area is a challenging environment for the growth of trees. Climate, soils, irrigation, and improper maintenance practices lead to high mortality rates among trees. In order to ensure Phoenix's investment is maximized trees need to thrive. The larger the tree, the larger the benefit it provides. Current planting and maintenance practices are causing the death and removal of many trees before they can provide their maximum benefit (United States Department of Agriculture Forest Service). Best management practices need to be developed and adopted to ensure the urban forest resource is kept healthy. Tree replacement criteria, tree planting specifications, tree selection criteria based on the concept of Right Tree, Right Place, as well as tree canopy and stocking rates need to be developed and implemented. Maximizing the investment of the urban forest requires more than just planting trees; it requires active maintenance and care. When this investment is managed properly it provides a return on investment of $2.23 or greater (United States Department of Agriculture Forest Service).

4 / Research and Develop Dedicated Revenue Sources for the Urban Forest

The City of Phoenix's landscape maintenance budget has been reduced over the last three budget cycles. The Urban Forestry Program, which was started in 1992 to provide educational programs and administer community planting efforts, was eliminated. The Horticulture section, which provided technical resources for the maintenance and installation of trees and plants, was also eliminated. Additionally, there has been a 60-plus percent reduction in staffing for street landscape maintenance, which has led to a 47-day maintenance cycle for street landscaping. These cuts show the need for a dedicated funding stream for the care, education and maintenance of the urban forest and engineered shade assets. Otherwise the vision will not be achieved.

Cities across the United States are starting to look at their trees as public utilities, and are finding creative ways to fund the development and care of their urban forest. One example of how cities are raising revenue for the care of their urban forest is Garland, Texas. It has started assessing maintenance fees based on amount of impervious surfaces on each property. The assessed fees are set up as a stormwater utility fund that supports flood control measures, improved groundwater recharge, and encourages ecological preservation projects. The fee system created incentives to reduce impervious surfaces, and to promote the planting of more trees (Funders' Network for Livable Communities).

5/ Develop and Adopt Tree Banking/In-Lieu Fees

Project sites will sometimes be too confined or difficult for successful tree planting. When live green shade is unfeasible, tree banking can serve as a method to increase the city's overall tree canopy percentage. Projects deemed unacceptable for live shade would be required to contribute funds to a tree bank so trees can be planted at other sites as directed by the City. Potential sites would include parks, streetscapes, public spaces, or nearby city right-of-way

Tree Banking is described as the process of contracting with a developer or builder to plant trees or to contribute funds to a Tree Fund as an alternative to meeting the required canopy and shade goals associated with the zoning category being developed. Tree Banking is accomplished by contributing funds to a Tree Bank.

The City will establish a dedicated budget category called the "Tree Bank." Monies received by the city for tree mitigation will be deposited into the dedicated Tree Bank fund. Tree Bank funds shall only be used to purchase, plant, prune, or maintain trees. Tree Bank funds will be used to plant appropriate-sized species of trees in the street right of way, parks, public areas, riparian areas or other areas identified by the Urban Forest Infrastructure Team. The city may also develop other tree funds to accept donations, grants or other sources for specific tree related activities. The Parks and Recreation Department shall have authority on behalf of the city to seek grants and alternative funding for tree projects. Funds from mitigation, grants, or awards shall be administered by the city pursuant to this section.

Tree Inventory | Best Practices | Revenue Sources | Tree Banking In-Lieu Fees

B Policy:

Increase the canopy coverage of the entire city to an average of 25 percent.

i. Actions:

1. Conduct a baseline tree inventory that will assess canopy coverage for the entire city.
   a) Issue a Request for Proposals (RFP)
   b) Remove potential tree hazards on public rights-of-way (ROW), parks and facilities maintained by the City of Phoenix that were identified in the inventory
   c) Perform a Strengths, Weaknesses, Opportunities and Threats analysis on the urban forest
   d) Research total percentages of private property versus public property to better understand the role of the private property owner in reaching an average 25 percent canopy coverage
   Identify opportunities where the urban forest can be increased.
   e) Develop and implement a tree planting campaign
   f) Refine canopy coverage goals based on zoning categories

2. Develop a Tree and Shade Management Plan.
   a) Complete a comprehensive City-Wide Tree Inventory
   b) Develop an urban forest Infrastructure layer in GIS-that tracks all trees and engineered shade within the city
   c) Update and monitor the urban forest Infrastructure layer regularly to ensure information is current and reliable

3. Research and develop additional sources of revenue for the care and maintenance of our urban forest.
   a) Develop and fund a Street Tree Replacement Plan. Establish a tree planting schedule to replace removed trees. Plant new drought-tolerant trees that increase canopy, shade and diversity percentages
   b) Develop and adopt Tree Banking and tree in-lieu fee programs.
   c) Research carbon offsets as possible source of revenue
   d) Research public utilities fees and incentives programs

4. Incrementally restore budget for street trees, landscape and park maintenance as well as community tree outreach programs.

5. Establish Best Management Practices (BMP) based upon national arboriculture specifications, and adopt them into the Parks and Recreation Department's Field Operation Procedures.
   a) Train all maintenance staff on BMPs. Monitor staff performance to ensure that they are following BMPs.
   b) Identify positions that should require an arborist certification and revise employment qualifications. Increase amount of certified arborists employed by the City of Phoenix
   c) Incorporate Urban Forest training and certification goals in Performance Management Guides and performance evaluations for staff that are responsible for the care and maintenance the urban forest

6. Establish an Urban Forest Infrastructure Team to oversee implementation of the Master Plan

7. Update Tree and Shade Master Plan biannually to ensure action items are being completed.

ACHIEVING THE VISION

Section 3

Sustainable Maintainable Infrastructure

Goal: Treat the urban forest as infrastructure to ensure that trees and engineered shade are an integral part of the city's planning and development process

In order for Phoenix to establish a sustainable urban forest, it is vital that it uses water efficiently. This is done with high efficiency irrigation systems, use of drought-tolerant plant material, strategic placement of shade corridors, and continued education. In order for a healthy urban forest to exist it must be coupled with strong water management. Currently, there are few standards relating to irrigation in the City of Phoenix Zoning Ordinance. Due to poor design, installation and maintenance, many trees are lost and hundreds of thousands of gallons of water are wasted annually. It is imperative that irrigation standards and incentives that help conserve water and keep trees healthy are developed and adopted.

Currently, regulations in the City Code and Zoning Ordinance pertaining to vegetation maintenance in city right-of-way are difficult to enforce, and do not have any tree protection/preservation requirements following Certification of Occupancy. The city also has generic tree inventory and salvage standards that are unclear and difficult to implement. There is also a lack of consistent maintenance standards, as well as new tree planting specifications. Several valuable mature trees are lost each year due to improper planting and maintenance. In order for the urban forest to be treated like infrastructure it is critical to develop regulations that preserve, protect and increase. However, regulations alone will not achieve the vision; it also requires incentives and coordination.

Section 3 Sustainable Maintainable Infrastructure

A Recommendations

1 / Revise City Ordinances

Management and care of the urban forest is a joint public and private responsibility. The City of Phoenix is responsible for maintaining trees and landscape along major arterials, parks, and city-owned facilities. The remaining areas are to be maintained by the private property owners. Currently, there is no city oversight after the initial certification of occupancy, nor are there enough enforcement staff available to follow up on properties where trees have died or been removed. The City Code and Zoning Ordinance need to be reviewed and updated to facilitate the protection, preservation and increase of the urban forest on both public and private property.

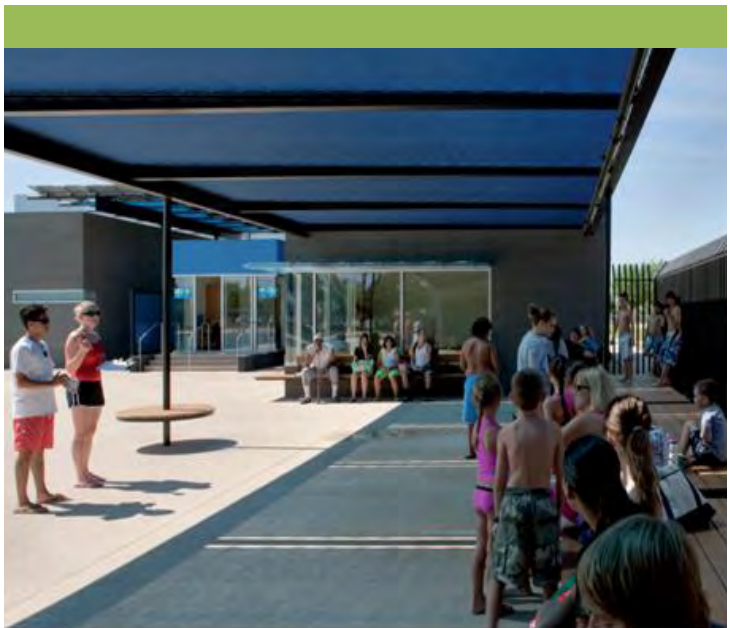
Items for further review and possible inclusion into the city ordinance:

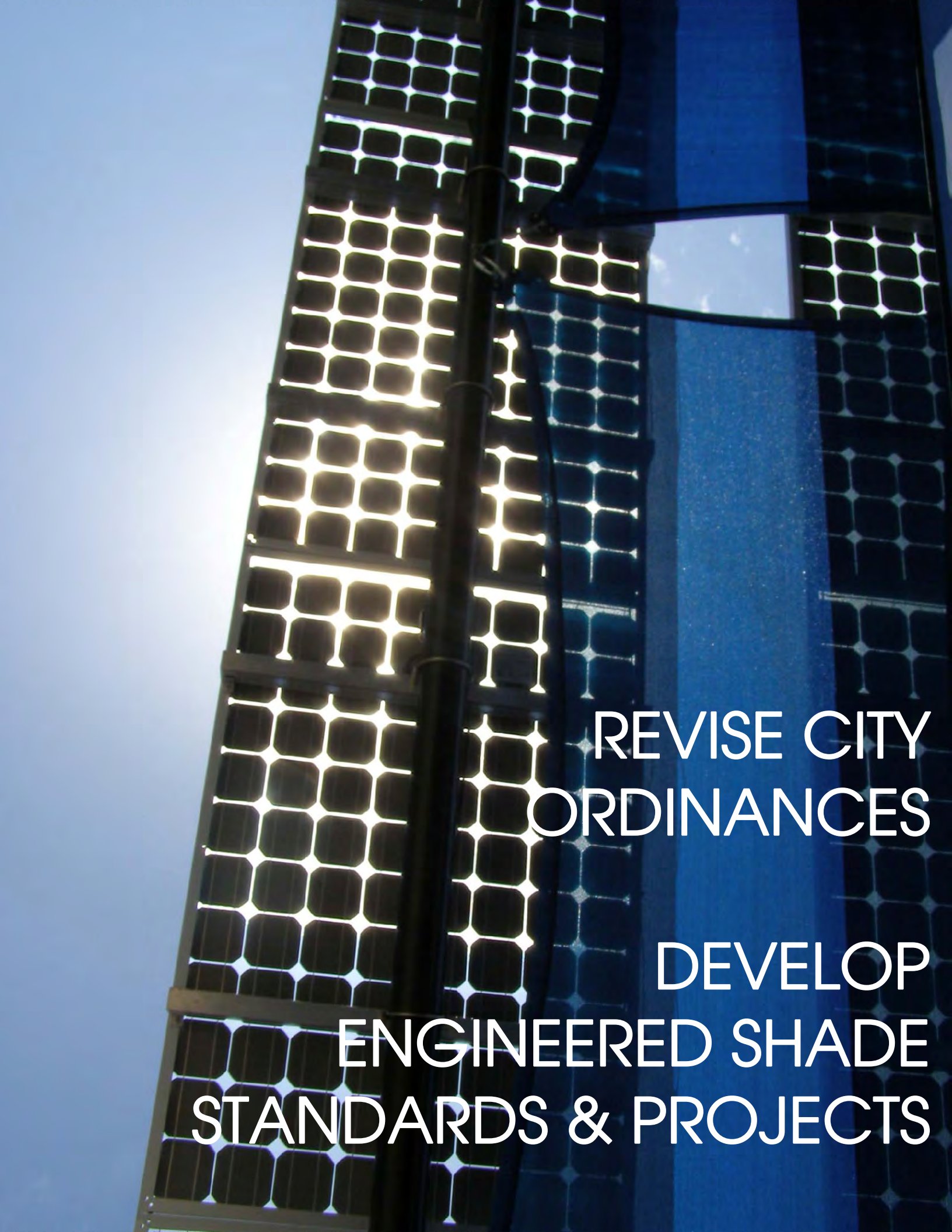
a. Tree permitting
b. Tree protection on construction sites
c. Heritage or historic trees
d. Incentives and alternatives
e. Planting and irrigation standards
f. Landscape standards based on concepts of Right Tree, Right Place

2 / Develop Engineered Shade Standards and Projects

Engineered shade does not provide the economic, environmental, and social benefits that trees do. However, many areas in the city right-of-way have little or no space to establish significant live shade. In other areas, such as public gathering spaces, city parks, and transit stops, large engineered shade structures can provide shade and shelter from the sun, as well as provide a usable space for picnics, events, and other outdoor activities. Engineered shade standards should be incorporated in the current zoning ordinance to require structures to be designed with non-heat loading construction materials, and if underlighting is required, photovoltaic panels should be encouraged to be incorporated into the design to eliminate the need for electrical service to the structure.

Another issue that needs to be addressed is the requirement of a revocable permit for construction of engineered shade over city right-of-way. This separate process disincentivizes the construction of engineered shade in urban areas, where it is most needed and appropriate. The current process needs to be reviewed and streamlined to help incentivize the development of engineered shade Downtown.




REVISE CITY
ORDINANCES
DEVELOP
ENGINEERED SHADE
STANDARDS & PROJECTS

B Policy:

Develop regulations and incentives for the preservation, protection and increase of the urban forest and shade resources.

i. Actions:

1. Integrate goals of the Tree and Shade Master Plan into the General Plan.
   a) Research transportation corridors that can be converted into strategic shade corridors that incorporate the concepts of complete **streets** (i.e. streets with bicycle lanes, trees and detached sidewalks).

2. Develop and establish a comprehensive tree, shade and landscape ordinance.
   a) Review and revise citywide design standards, plan review protocol and planting specifications to achieve the goal of "Right Plant, Right Place"
   b) Strengthen existing inventory and salvage standards in the zoning ordinance
   c) Research and develop new streetscape standards
   d) Research and develop Maricopa Association of Governments (MAG) details for tree planting and irrigation
   e) Create interdepartmental working relationships to design and develop sustainable landscapes
   f) Develop and adopt irrigation standards
   g) Develop maintenance standards
   h) Develop a one year warranty inspection for landscape and trees
   i) Research tree permitting and heritage/historic tree protections
   j) Develop and adopt tree protection standards for construction sites
   k) Develop and adopt engineered shade standards
   l) Review and streamline revocable permits for engineered shade in the right-of-way

3. Further develop a green waste program, and look for ways to improve efficiencies.

4. Research and complete shade demonstration projects

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Section 1 — Raise Awareness (Educate)

Section 2 — Preserve Protect Increase

Section 3 — Sustainable Maintainable Infrastructure

CONCLUSION

Phoenix's urban forest has the potential to be one of the city's greatest assets and the foundation for a healthier, more livable and prosperous Phoenix. If the tree canopy coverage could be increased to an average of twenty-five percent, the urban forest can save the city hundreds of millions of dollars (Funders' Network for Livable Communities). However, Phoenix's urban forest must be viewed as a critical component of the city's infrastructure and considered at all stages of planning and development. The urban forest is a solution multiplier that can help Phoenix achieve many of its goals, policies and initiatives. The Tree and Shade Master Plan provides a framework and action steps to achieving these goals.

APPENDIX

ACTION ITEM CHECKLIST

#	Action Description	Lead Dept.	Time Frame
A.1.	Create a council-approved Citizen Tree and Shade Committee to oversee Urban Forest issues.	PRD	Mid
A.2.	Provide information to the public about on-going efforts and long-term strategies.	PRD	Short
A.2.a	Update Urban Forest Website	PRD	Short
A.2.b	Make presentation to Village Planning Committees	PRD/PLN	Short
A.2.c	Send out information via Water Notes bill insert	PRD/WSD	Short
A.2.d	Present information at conferences	PRD	Short
A.2.f	Present information to community groups and organizations	UFIT	Short
A.3.	Develop and Establish Education and Outreach Programs	PRD/WSD	Ongoing
A.3.a	The Value of the Urban Forest	PRD/WSD	Mid
A.3.b	Landscaping in the Southwest	PRD/WSD	Mid
A.3.c	Creating Sustainable Landscapes	PRD/WSD	Mid
A.3.e	How to Maintain an Efficient Irrigation System	PRD/WSD	Mid
A.4.	Create Channel 11 Programs, Streaming Web Videos and DVDs	PRD	Ongoing
A.4.a	What is an Urban Forest?	PRD	Short
A.4.b	How to Plant Trees	PRD	Short
A.4.c	How to Maintain Trees	PRD	Short
A.4.d	How to Create a Sustainable Landscape	PRD/WSD	Short
A.4.f.	Irrigation 101	PRD/WSD	Short
A.5.	Hold Urban Forest and Shade Symposium	UFIT	Short
A.6.	Develop Shade and Urban Forest Excellence Award	UFIT	Mid
A.7.	Research grant opportunities	PRD	Ongoing
A.8.	Develop and Maintain Partnerships	UFIT	Ongoing
A.9.	Research and Complete Shade Demonstration Projects	PRD/ARTS	Short

Department Acronyms

ARTS	Arts and Culture Office
DSD	Development Services Department
PLN	Planning Department
PRD	Parks and Recreation Department
PWD	Public Works Department
STD	Street Transportation Department
UFIT	Urban Forest Infrastructure Team
WSD	Water Services Department

Time Frame Definitions

Short-Term: 0-5 years

Mid-Term: 5-10 years

Long-Term: 10-20 years

ACTION ITEM CHECKLIST

#	Action Description	Lead Dept.	Time Frame
B.1.	Prepare a baseline tree inventory that will assess canopy coverage for the entire city	PRD	Short
B.1.a.	Issue a Request for Proposal (RFP) for the assessment and inventory of the urban forest	PRD	Short
B.1.b	Remove potential tree hazards on public rights-of-way (ROW), parks and facilities maintained by the City of Phoenix that were identified in the inventory	PRD	Short
B.1.c	Perform a Strengths, Weaknesses, Opportunities and Threats analysis for urban forest	PRD	Short
B.1.d	Research total percentages of private property versus public property to better understand the role of the private property owner in reaching an average 25 percent canopy coverage	UFIT	Short
B.1.e	Identify opportunities where the urban forest can be increased	UFIT	Mid
B.1.f	Develop and implement a tree planting campaign	UFIT	Short
B.1.g	Refine canopy coverage goals based on zoning category	UFIT	Short
B.2.	Develop a Tree and Shade Management Plan	UFIT	Mid
B.2.a	Complete a comprehensive city-wide tree inventory	STD/PRD	Mid
B.2.b	Develop a Urban Forest Infrastructure layer in GIS-that tracks all trees within the city	PRD/STD/DSD	Mid
B.2.c.	Update and monitor the Urban Forest Infrastructure layer regularly to ensure information is current and reliable	PRD/STD/DSD	Long
B.3.	Research and develop additional sources of revenue for the care and maintenance of our urban forest.	UFIT	Mid
B.3.a.	Develop and fund a Street Tree Replacement Plan. Establish a tree planting schedule to replace removed trees. Plant new drought-tolerant trees that increase canopy, shade and diversity percentages	STD	Mid
B.3.b.	Develop and adopt tree banking and tree in-lieu fee programs	UFIT	Mid
B.3.c	Research carbon offsets as possible source of revenue	UFIT	Short
B.3.e.	Research public utilities fees and incentives programs	UFIT	Short
B.4.	Incrementally restore fiscal budget for street trees, landscape and park maintenance and community tree outreach programs	City Council	Mid
B.4.a	Establish a long-term funding stream for the maintenance and care of the urban forest	UFIT	Long
B.5	Establish Best Management Practices (BMP) based upon national arboriculture specifications, and adopt them into the Parks and Recreation Department's Field Operation Procedures	PRD	Short
B.5.a.	Train all maintenance staff on BMPs. Monitor staff performance to ensure that they are following BMPs	PRD	Short
B.5.b.	Identify positions that should require an arborist certification and revise employment qualifications Increase amount of certified arborists employed by the City of Phoenix	UFIT	Short
B.5.c	Incorporate Urban Forest training and certification goals in Performance Management Guides and Performance Evaluations for staff that are responsible for the care and maintenance the urban forest	PRD	Mid
B.6.	Establish Urban Forest Infrastructure Team to oversee implementation of the Master Plan	UFIT	Short
B.7	Update Tree and Shade Master Plan biannually to ensure action items are being completed	UFIT	Short

Department Acronyms

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Time Frame Definitions

Short-Term: 0-5 years

Mid-Term: 5-10 years

Long-Term: 10-20 years

ACTION ITEM CHECKLIST

#	Action Description	Lead Dept.	Time Frame
C.1	Integrate goals of the Shade and Tree Master Plan into the General Plan Update	PLN	Short
C.1.a.	Research transportation corridors that can be converted into strategic shade corridors that incorporate the concepts of complete streets	PLN	Short
C.2.	Develop and establish a comprehensive tree, shade and landscape ordinance	UFIT	Mid
C.2.a.	Review and revise citywide design standards, plan review protocol and planting specifications to achieve the goal of "Right Tree, Right Place"	UFIT	Short
C.2.b.	Strengthen existing inventory and salvage standards in zoning ordinance	UFIT	Mid
C.2.c.	Research developing new streetscape standards	STD	Short
C.2.d.	Research and develop Maricopa Association of Governments (MAG) details for tree planting and irrigation	UFIT	Mid
C.2.e.	Create interdepartmental working relationships to design and develop sustainable landscapes	UFIT	Mid
C.2.f.	Develop and adopt irrigation standards	UFIT	Mid
C.2.g.	Develop maintenance standards	UFIT	Mid
C.2.h	Develop a one year warranty inspection for landscape and trees	UFIT	Mid
C.2.i	Research tree permitting and heritage/historic tree protections	UFIT	Mid
C.2.j	Develop and adopt tree protection standards for construction sites	UFIT	Short
C.2.k	Develop and adopt engineered shade standards	UFIT	Mid
C.2.l	Review and streamline revocable permits for engineered shade in the Right-Of-Way	STD	Mid
C.3.	Further develop a green waste program, and look for ways to improve efficiencies	PW	Mid
C.4	Research and Complete Shade Demonstration Projects	ARTS	Short

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Time Frame Definitions

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Mid-Term: 5-10 years

Long-Term: 10-20 years

List of Links:

American Forests: http://www.americanforests.org/

Arbor Day Foundation: http://www.arborday.org/

Arizona Community Tree Council: http://aztrees.org/

Arizona Municipal Water Users Association: http://www.amwua.org/

Arizona State Forestry Division: http://www.azsf.az.gov/

Central Arizona—Phoenix Long-Term Ecological Research (CAP LTER): http://caplter.asu.edu/

Chicago Trees Initiative: http://egov.cityofchicago.org/chicagotrees/

City of Phoenix Parks and Recreation Department: http://phoenix.gov/PARKS/

City of Phoenix Water Services Department: http://phoenix.gov/waterservices/

Environmental Protection Agency: http://www.epa.gov

Funders' Network for Smart Growth and Livable Communities: http://www.fundersnetwork.org/

Intergovernmental Panel on Climate Change: http://www.ipcc.ch/

International Society of Arboriculture: http://www.isa-arbor.com

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MillionTreesNYC: http://www.milliontreesnyc.org

National Arbor Day Foundation: http://www.arborday.org/

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Tree City USA: http://www.arborday.org/programs/treeCityUSA/index.cfm

Tree People: http://www.treepeople.org/

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