THE UNIVERSITY OF ARIZONA
Sustainability & Climate Action Plan

Mitigate Urban Heat Island Through Shading

SUSTAINABLE COMMITMENT(S) THIS INITIATIVE SUPPORTS

- **4 - Transportation Mode Shift**
- 5 - Energy Efficiency

INITIATIVE ALIGNMENT WITH THE CHARGE

- Eliminate Emissions: Shading leads to cooling and therefore reduction in energy use.
- Build Community: Shaded spaces with lower temperatures are more conducive to use by people, thereby supporting community use of common areas.
- Inspire Adaptive Management: Creating shade to mitigate overheating surfaces is a means of adapting to the current climate conditions in a way that is measurable for demonstrating accountable results.

INITIATIVE DETAILS

Initiative Summary

This initiative proposes to mitigate the urban heat island effect on campus through increased shading of heat-absorbing surfaces and by removing these surface types where possible. Implementing a variety of shading techniques will reduce cooling costs and improve walkability, particularly benefiting heat-vulnerable populations. Actionable items include:

- Conduct an existing benchmark analysis of current shade and set a goal to increase shade by a specific percentage within a defined timeline.
- Increase the number of shade trees on campus, focusing on south-facing walls and building apertures for energy savings, and on benches, tables, and walkways for people.
- Strategically plant shade trees in high-traffic areas, prioritizing locations with communal gatherings and group activities.
- Implement green roof and cool-roof technologies in new building designs and retrofits to reduce building and surrounding air temperatures and lower energy consumption.
- Transition ground-level surface materials to those that absorb less heat, even when unshaded.

Proposed Initiative & Background

Shading of heat-absorbing surfaces is a well-documented strategy for mitigating urban heat island effects. The City of Tucson's Million Trees Initiative in particular attempts to reduce the urban heat island effect, reduce cooling costs, provide shade, and improve walkability simultaneously. On campus, various locations and corridors such as the Mall and surface parking lots lack adequate shading, which

increases the urban heat island effect and creates a more hostile environment. Disabled and/or older populations are particularly negatively impacted by higher temperatures. The University of Arizona is an existing resource that should be involved through all stages of this initiative: https://heat.arizona.edu/.

The campus is one of the most densely developed areas of the city, with extensive impervious, heat-absorbing surfaces. While much more heat mitigation should occur through shading, the current situation would be much worse without the current amount of shading and cooling from vegetation.

Implement practices to mitigate the urban heat island effect through a variety of shading techniques. Among the practices to be implemented and to be referenced in supporting policies, plans, and practices are:

- Establish an existing benchmark analysis of current shade and then establish a goal to increase shade to a particular benchmark on a defined timeline.
- Increase shade trees on campus to cool buildings, save energy, and provide shade to people in outdoor spaces. For buildings, focus on south-facing walls and building apertures to maximize the effect of shading, using climate-adapted trees. Implement requirements on all new buildings' landscaping and most importantly retroactively implement changes to already built structures' landscaping. For people, focus on benches, tables, and concrete-heavy spaces/walkways without current shade options.
- Strategically plant shade trees in areas that cater to diverse communities (e.g., racial and ethnic minorities, LGBTQ+ individuals, students with disabilities, first-generation, low-income), on campus. Prioritize areas with higher foot traffic, communal gathering spaces, and locations used by various groups.
- Implement green roof and other cool-roof technology in building design and in building retrofits to support decarbonization. Green roofs can reduce the temperatures of buildings and surrounding air by 30-40F and reduce energy consumption.
- Ground-level surface materials could be transitioned to those that have properties that absorb less heat even when unshaded.
- These steps are supportive of developing a Green Infrastructure Master Plan and more implementation details for this topic could be an element of initiative BE 7, "Develop a Green Infrastructure and Landscaping Master Plan." These initiatives are also supportive of those initiatives addressing reduction in single occupancy vehicle travel and in creating cool corridors by shading walkways/bikeways across campus and even beyond.

Feasibility and Anticipated Challenges: Will require alignment of many factors and units to move in a common direction.

Data Analyses to Support Initiative

The campus is one of the most densely developed areas of the city, with extensive impervious, heat-absorbing surfaces. While much more heat mitigation should occur through shading, the current situation would be much worse without the current amount of shading and cooling from vegetation. " "A good resource for this subject from the University of Arizona is here: https://heat.arizona.edu/

See the Pima Association of Government's resiliency mapping resources: https://pagregion.com/info-center/news/pags-heat-map-helps-regional-climate-resiliency-planning/

See the City of Tucson's Climate Action Hub website for many related resources and activities occurring in the larger community: https://climateaction.tucsonaz.gov/ "

Resource Requirements & Return on Investment

Resource Requirements

- A comprehensive Green Infrastructure and Landscaping Master Plan that can align with related infrastructure related plans that can guide the priority locations for tree plantings
- Funds for purchasing and planting of trees
- Funds for infrastructure for watering trees
- Employee resources for planting and maintaining trees

Return on Investment

- The return on investment of this initiative is unclear due to the highly qualitative nature of its proposed activities; however, it is unlikely that this initiative will result in a direct return on any investments made.

Potential Funding Sources

- Same funds that are used for existing landscape needs through UFS

Accountable Division(s) & Department(s)

- Campus Arboretum
- University Facility Services
- Parking & Transportation Services

Partners & Collaborators

- Arizona Extreme Heat Network
- University Enterprise GIS
- Pima County
- Pima Association of Governments
- City of Tucson

Implementation

Length of Time to Implement

- Less than one year
- One to five years
- More than five years

Difficulty of Implementation

- Low
- Medium
- High
- Extremely High

Relative Timing

- Begin within two years
- Begin in three to five years
- Begin in six years or later

Metrics for Success

- Number of trees total on campus
- GIS data utilizing shade data and known walking and bike paths