

Rain to Roots Ambassador Program- *June Meeting*



Welcome!

- What is your name?
- What is your favorite pollinator?

Mayor's Monarch Pledge – May 2024



Green Stormwater Infrastructure (GSI)

Benefits of GSI:

- Supports tree canopy
- Reduces temperatures
- Reduces potable water use
- Mitigates flooding
- Promotes cleaner waterways
- Creates wildlife habitat

Learn more about GSI and its benefits at Sustainable Tempe – [Green Stormwater Infrastructure](#).

Rio Salado Pkwy. & Hardy Dr.



Lemon St. & Dorsey Ln.

Rain to Roots Master Plan

- **Project Purpose**

- Expand green infrastructure & urban cooling initiatives.
- Promote cross-departmental coordination & planning.
- Identify opportunities for long-term funding.

Green Stormwater Infrastructure helps us address...



Record-breaking
Extreme Heat



Severe Drought &
Water Use



Flooding & Water
Quality Concerns



Need for Climate-
Ready Vegetation

June Meeting Objectives

- *In this session, we will discuss...*
 - **Intro to Codes & Standards** (10 minutes)
 - **Current State of Codes & Standards in Tempe** (10 minutes)
 - **Best Practices for Advancing GSI through Codes & Standards** (10 minutes)
 - **Proposed Strategies for Advancing GSI in Tempe** (15 minutes)



Tempe Climate Action Plan Update

- Adopted by Tempe City Council in **March 2022**.
- Identifies **strategies** to address:
 - Extreme Heat
 - Drought & Water Use
 - Need for Climate-Ready Vegetation

Highlight Actions Update

The Sustainability and Resilience Commission identified immediate highlight actions in the first plan that still need policy adoption and investment:



Green Codes and Standards (Green Stormwater Infrastructure and International Green Construction Code adoption):
To establish resilience to extreme heat in new construction16

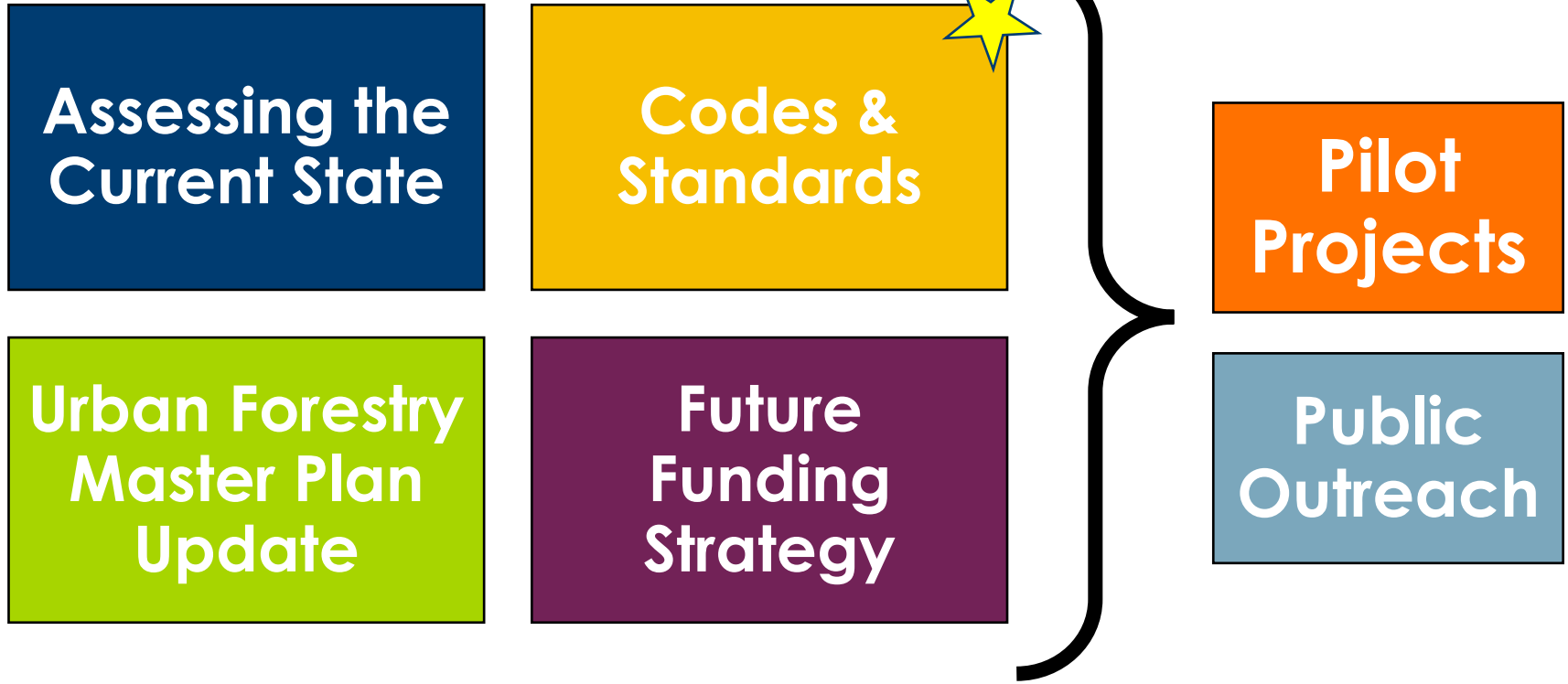


Transportation Demand Management and Mobility Hubs:
To increase convenience of low carbon transportations options19



Resilient Energy Hubs and Resilience Hubs:
To increase community connections and the ability to support survival during disasters21

Project Overview



Introduction to Codes & Standards in the City of Tempe



Codes & Standards Overview

Codes	Standards
<ul style="list-style-type: none">• Describe what needs to be done to protect health & safety.• Outline requirements, practices, and regulations.• Can be adopted into law (ex: Zoning & Development Code).	<ul style="list-style-type: none">• Describe how to implement a code to ensure compliance.• Outline technical definitions, specifications, and guidelines.• Are widely accepted and followed (ex: Engineering Design Standards).

Codes & Standards Overview – *Zoning & Development Code*

What is the Zoning & Development Code?

- Establishes **regulations, prohibitions, and restrictions** on land use and development to **protect health, safety, and public welfare**.
- Governs the use of land, regulates the height/bulk/location of buildings, and establishes standards of performance and design.
- Applies to both **residential and non-residential** properties.
- Facilitates **city development** & the provision of **necessary infrastructure** (e.g., roads, water, sewers, etc.).

Codes & Standards Overview – Codes Example

Excerpt from the COT Zoning & Development Code

Describes **what** needs to be done.

(ex: requiring adequate on-site storage & drainage infrastructure).

Sec. 12-86. - On-site storage and drainage infrastructure.



(a) On-site storage and drainage infrastructure may be provided in any of the following ways:

- (1) Individual storage and drainage infrastructure; or
- (2) Central storage and drainage infrastructure; or
- (3) Combination storage and drainage infrastructure.

(b) Individual storage and drainage infrastructure shall consist of providing and maintaining adequate storage volume and drainage infrastructure for the design storm on a lot, plot or parcel of land for all water falling on the lot, plot or parcel of land. Storage volume shall also be provided for adjacent streets and alleys, except for arterial streets. In single-family residential zones, the maximum depth of water in the storage area at design storm shall be eight (8) inches, unless otherwise approved by the Engineering and Transportation Director, Community Development Director or designee. In all other zoning categories, the maximum depth of water at design storm shall be three (3) feet.

Codes & Standards Overview – *Engineering Design Criteria*

What are the Engineering Design Criteria?

- **Guidelines and standards** that direct the planning, design, & construction of infrastructure to **ensure safety, consistency, & functionality**.
- Apply to **all new and redevelopment projects** that affect the existing lot grading or stormwater retention.
- Provide developers, contractors, and builders with **clear expectations**.
- Provide municipal engineers a **baseline** for assessing proposed designs.

Codes & Standards Overview – *Standards Example*

Excerpt from the COT Engineering Design Criteria

Describes **how** it needs to
be done.
*(ex: calculating volume
retention requirements).*

Drainage Design Criteria and Requirements: The following is the Drainage Design Criteria and Requirements for improvements or renovations on Existing Single-Family Residential lots. New Residential Subdivisions, New Single Family Lot Development, Commercial Developments and Industrial Developments shall be designed in accordance with the “Drainage Design Criteria and Requirements” section of this manual.

There are two methods accepted by the Engineering Division for calculating required retention volume for improvements to single-family homes. Both methods use the following formula:

$$V = (P \div 12) * A * C$$

V = Volume required to retain (cubic feet)

P = Precipitation Depth (in inches) of storm water required to be retained

A = Total area of lot (in square feet) plus any additionally required areas. For some subdivisions, the additionally required areas include one-half of the street fronting onto the lot.

C = Coefficient of Non-Absorption

METHOD 1: Tempe’s standard method of calculating onsite storm water retention uses the formula above with the following data:

Where,

P = 2.4 inches (based on the 100-year, 1-hour storm event)

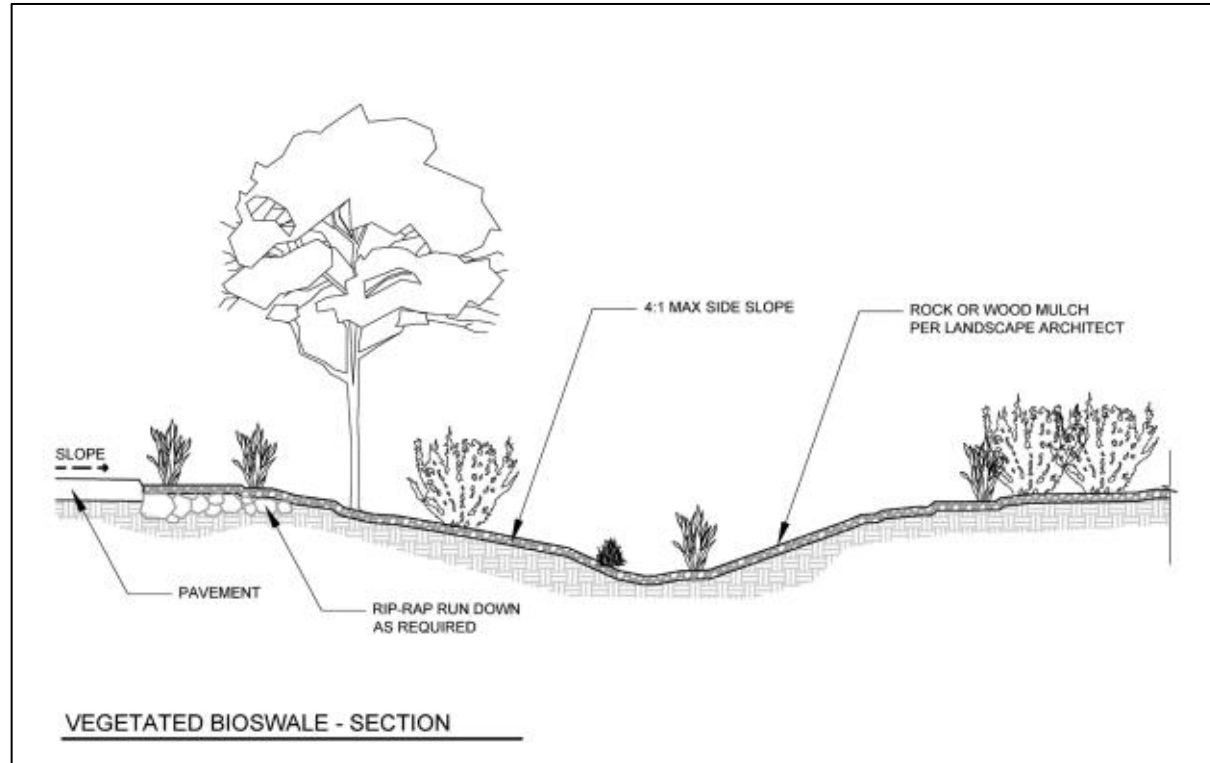
C = 0.95

$$V = (2.4 \div 12) * A * (0.95)$$

Codes & Standards Overview – *Detail Example*

Detail from the Low Impact Development Toolkit

Depicts **how** it needs to be done.
(ex: visual depiction of vegetation bioswale).



The Current State of Codes & Standards in the City of Tempe



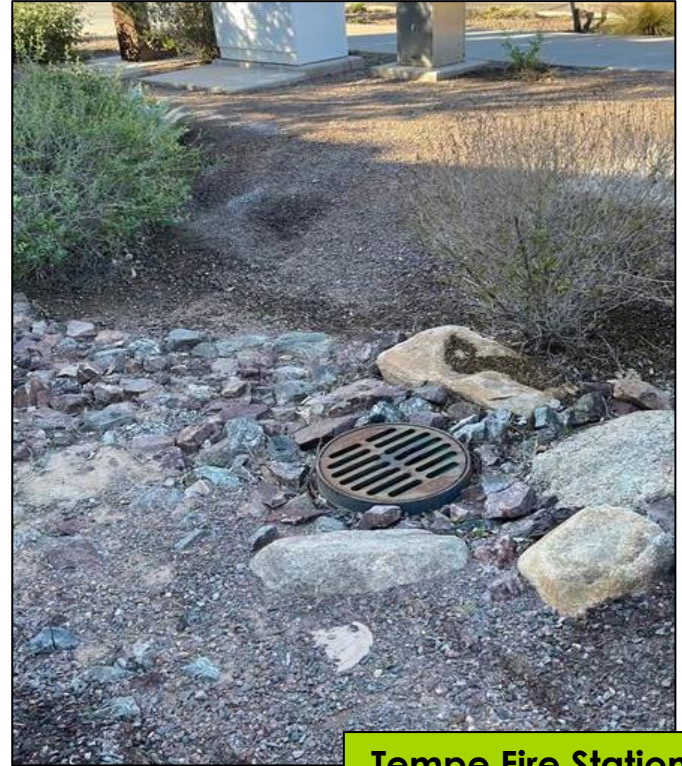
Current State Assessment – Codes & Standards

Assessment:

Conducted Staff Interviews
Reviewed **Engineering Design Criteria**
Review **Zoning & Development Code**

Goals:

Provide Guidance for Integrating GSI
Address Existing Maintenance & Utility Challenges
Streamline GSI Review Process



Tempe Fire Station #7

Codes & Standards Overview – *Zoning & Development Code*

What are the major findings?

- **Currently, there is no mention of GSI in the ZDC.**
- Shade is emphasized as a necessity, but the ZDC doesn't address challenges faced by urban street trees.
- Code requires that developments retain a 100-year, 1-hour storm on the property; stormwater must drain within 36 hours.

Why are these findings relevant?

- GSI can support the long-term health of trees, making it a key strategy for achieving outlined canopy goals.
- GSI could be used as an alternative to other stormwater retention methods, helping to meet on-site retention requirements.

Codes & Standards Overview – *Engineering Design Criteria*

Outlined Stormwater Management Guidelines:

- **GSI is mentioned, but not strongly encouraged.**
- Drywells are prescribed in most cases.
- Drainage Reports required for all commercial & multi-family.
- Prescribed basin depths & slopes (3ft water depth, 4:1 side slopes).

Why are these findings relevant?

- Drainage Reports could describe the retention provided by GSI features.
- Existing retention and infiltration calculations could be modified for GSI.
- Basin slopes and depths may need to be modified for GSI features.

Codes & Standards Overview – *Current Challenges*

Mountain Park Health Center

BIOSWALES

INTENT

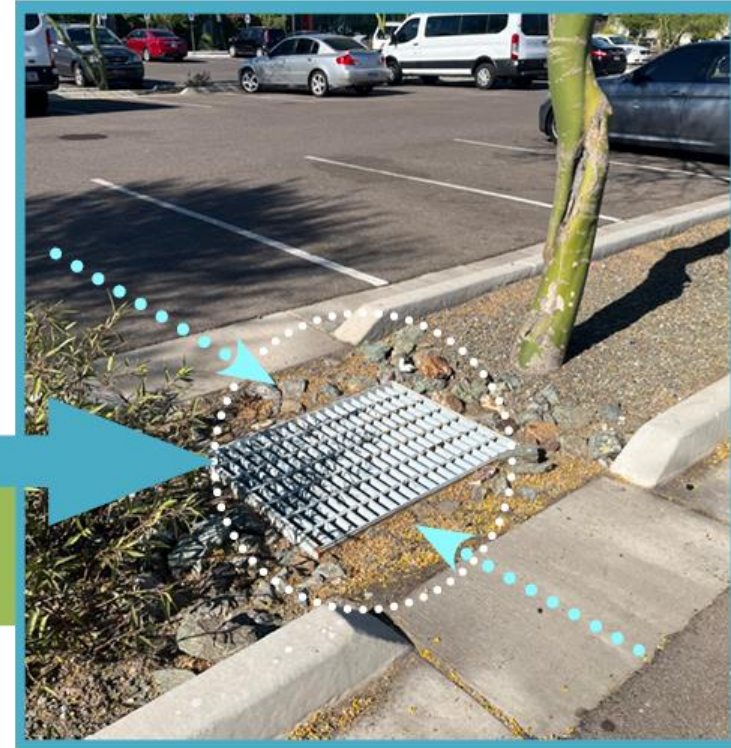
- Curb cuts will lead water from parking lot into planters
- Trees and landscape will mature with the additional water, providing more shade for the parking lot

APPLICATION

- Planting beds are higher than entry point of water
- Storm drain is at the lowest point of bioswale so no water is retained
- Parking lot grading is in conflict with GSI feature

GSI CHALLENGE

Water is not held in planters and instead fed into storm drain



Codes & Standards Overview – *Current Challenges*

Mountain Park Health Center

RIGHT TREE RIGHT PLACE

OPPORTUNITY

- Planting naturally upright trees in parking lots leads to less possibility for limb failure and breakage
- Leveraging other GSI tactics allows trees to reach their full canopy potential

APPLICATION

- Palo Verde trees have weak limbs and are prone to breakage
- Intense training and maintenance of Palo Verde trees is required for longevity



Codes & Standards Overview – Current Challenges

Mountain Park Health Center

SUSPENDED PAVEMENT



OPPORTUNITY

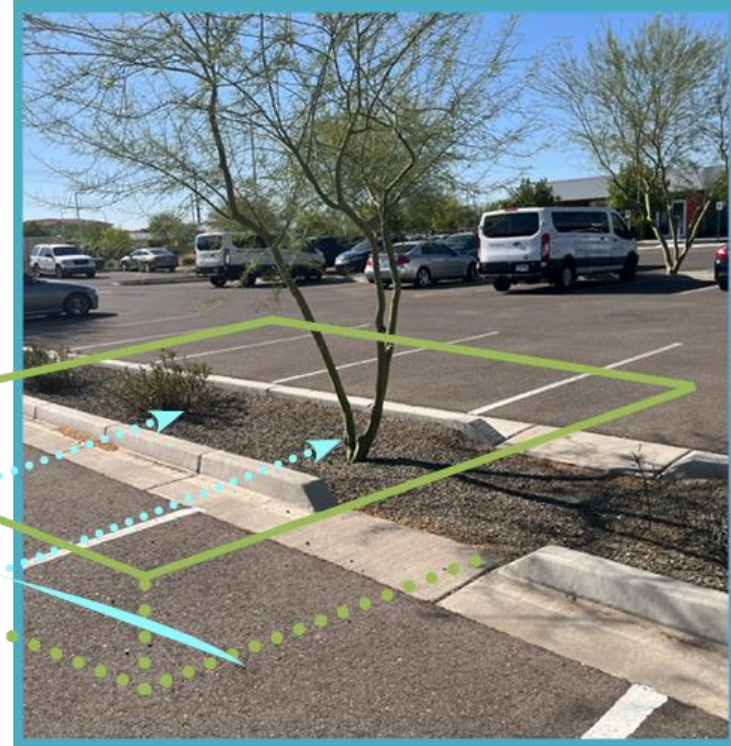
- Providing trees with enough rooting space will encourage a mature canopy size
- Using suspended pavement features like Silva Cells allows tree roots to expand below the parking lot

APPLICATION

- Trees will suffer from small planter space
- Roots will be compacted by cars on asphalt, stunting mature growth
- Trees will be weaker and more susceptible to limb breakage

GSI COMBINATION

Combine permeable and suspended pavement



Best Practices for Advancing GSI via Codes & Standards:

A Review of Tucson (AZ) & Washington D.C.



Best Practice Example #1: Tucson, AZ

Water Harvesting Guidance Manual (2005)	Commercial Rainwater Harvesting Code (2010)
<ul style="list-style-type: none">• Features water harvesting requirements for commercial, public buildings, subdivisions, & public ROW.• Water harvesting retention volumes can be credited towards onsite retention requirements.• Provides design examples for each site type.	<ul style="list-style-type: none">• Requires that 50% of a development's landscape water demand must be supplied via harvested rainwater.• Requires all commercial developments to have a rainwater harvesting plan.• Allows for passive & active water harvesting.

Best Practice Example #2: Washington, D.C.

Stormwater Management Guidebook (2013)	DDOT Green Infrastructure Standards (2014)
<ul style="list-style-type: none">• All sites must achieve at least 50% stormwater retention using active or passive water harvesting features.• Water harvesting features are subject to a 3-year inspection to ensure good condition.• Existing and proposed tree canopy counts toward retention requirements.	<ul style="list-style-type: none">• Establishes a minimum soil volume for street trees based on tree size.• Requires a minimum 6' x 9' rooting space for trees planting in sidewalks without suspended pavement.• Promotes the expansion of rooting space through suspended pavements & structural soils.

Feedback & Discussion

- **What do you think about the highlighted codes/standards?**
- **Which code/standard do you think is most impactful?**

Codes & Standards Proposed by the Rain to Roots Master Plan



Proposed Codes & Standards Amendments

Identified Areas of Intervention		
Promoting GSI	Tree Protection	Landscape Code & Maintenance
<p>PLANT LIST - 'A'</p> <p>FLOODATION ELEVATION</p> <p>PLANT LIST - 'B'</p> <p>12\" GRAVEL ENVELOPE (P97)</p> <p>6\" UNDERDRAIN (OPTIONAL)</p> <p>* PER LANDSCAPE PLAN</p>		

Codes & Standards - Summary

Promoting GSI	Tree Protection	Landscape Code & Maintenance
<ul style="list-style-type: none">• Onsite GSI Requirements• Construction Details• Drywells• Onsite Stormwater Credit	<ul style="list-style-type: none">• Required Tree Protection Plan• Tree Replacement Standards• Tree Removal Permit• Tree Protection Bond	<ul style="list-style-type: none">• Tree Root Zone Requirements• Landscape Maintenance Best Practices & Requirements• Landscape Code Amendments

Codes & Standards Area #1: Promoting GSI

Current Codes & Standards	Proposed Codes & Standards	Details
GSI is mentioned, but it is not required.	Onsite GSI Requirements	Require that sites utilize on-site GSI to achieve % of stormwater retention.
Standards reference Mesa's LID Toolkit (no Tempe-specific details).	Construction Details	Adapt existing details & develop new details (root zone requirements, mulch planting distance from utilities)
Drywells are prescribed in most cases.	Drywells	Don't require drywells; encourage other GSI methods.
GSI does not count toward onsite retention calculations.	Onsite Stormwater Credits	Give credit for the volume of stormwater captured through GSI toward retention calculations.

Codes & Standards Area #2: Tree Protection

Current Codes & Standards	Proposed Codes & Standards	Details
Required on COT parks projects, not other city or commercial projects.	Tree Protection Plan	Inventory existing trees on development site & develop strategy for preserving them during construction.
Commercial properties are required to replace dead trees; need to alter the landscape plan to plant a different species.	Tree Replacement Standards	Develop a standard replacement formula for removing existing trees (based on size, species, condition).
<i>No current codes/standards.</i>	Tree Removal Permit	Pay a permit fee (based on tree size) to remove an existing tree, with restrictions against removing large & significant trees.
<i>No current codes/standards.</i>	Tree Protection Bond	Developer pays bond for preserved and salvaged trees on a development site, with release dependent on tree success.

Codes & Standards Area #3: Landscape Code & Maintenance

Current Codes & Standards	Proposed Codes & Standards	Details
No current root zone requirements.	Tree Root Zone Requirements	Establish a minimum soil volume based on tree size and planting location.
Required maintenance practices for public landscapes.	Landscape Maintenance Best Practices	Promote national, arborist-approved best practices related to tree pruning and landscape care for public and private land.
Trees are spaced by a standard linear foot distance (<i>ex: 1 tree per 30 linear feet</i>).	Landscape Code Amendments	<ul style="list-style-type: none"> • Adjust tree spacing guidelines, focusing on shading pedestrian walkways. • Update the approved plant list. • Encourage the use of organic mulch.
Dead plants must be replaced; a lack of maintenance can result in a code violation.	Landscape Maintenance Requirements	Develop and enforce maintenance requirements that cite specific pruning & care practices. Apply a per-tree fee for incorrect tree maintenance via code enforcement.

Feedback & Discussion

- **What are your thoughts on the proposed codes/standards?**
- **Do the proposed codes/standards address the concerns identified in earlier sessions?**
- **Are there any codes/standards that you feel are missing?**

Upcoming Ambassador Program Meetings

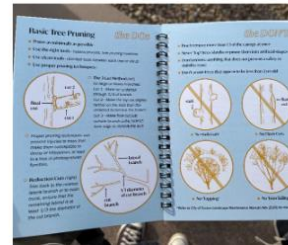
Meetings on the First Wednesday of the Month, 5:30-6:30 PM

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Upcoming Meetings:

July 2024 – NO MEETING

August 7, 2024 – Master Plan Deliverable Update



Questions?

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