

Published by the City of Tucson
Storm to Shade Program

Green Stormwater Infrastructure (GSI) Maintenance

Second Edition: April 2025

A Pocket Guide



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- **Tree Care for GSI** / *basic tree pruning guidance*
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The Storm to Shade Program administered by Tucson Water funds and oversees the maintenance of GSI features located on public property in the City of Tucson. This manual provides an overview of best practices for maintaining GSI features and is a guide for landscape professionals and anyone else working in GSI.

Common GSI Features:



So what is green stormwater infrastructure (GSI) and why is it important?

GSI refers to landscape features designed to capture and use stormwater runoff from hardscape to support healthy soil, vegetation, and biodiversity. GSI includes inlets, outlets, and overflows as well as earthworks such as basins, berms, and swales to capture, contain, and direct the flow of water into vegetated areas. GSI provides a variety of benefits including...

- 💧 *Reducing stormwater pollution and improving water quality*
- 💧 *Shading and cooling streets, sidewalks, bikeways, and parking areas*
- 💧 *Mitigating minor flooding*
- 💧 *Creating wildlife habitat and supporting biodiversity*
- 💧 *Beautifying the urban environment*
- 💧 *Providing a nature based complement to gray infrastructure*
- 💧 *Decreasing reliance on potable water for landscape irrigation*



Traffic Circle



Right-of-Way Basin

The structural elements of GSI



INLETS/OUTLETS

Conveyance allowing stormwater to flow into or out of a GSI feature



SCUPPER

A structure that cuts through curbing and paving acting as an inlet or outlet



CURB CUT & CORE

Removed section of curbing /circular core drilled through curbing that serves as an inlet or outlet



SEDIMENT TRAP

Rough area at inlet that allows sediment to settle before water enters a basin



INFILTRATION BASIN

Depression within a GSI feature that allows stormwater to infiltrate the soil



PLANTING SHELF

An elevated planting area within a GSI feature



geologist
hammer



safety
glasses



gloves



trash
grabber

GSI Maintenance

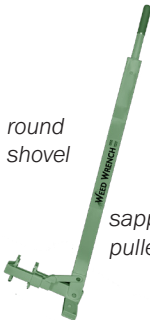
the tools of the trade



flat
shovel



round
shovel



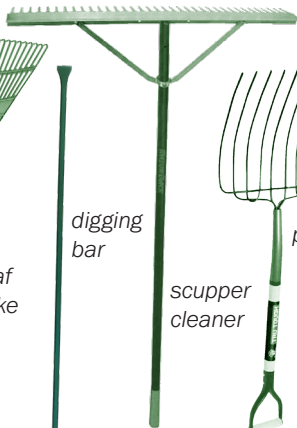
sapling
puller



leaf
rake



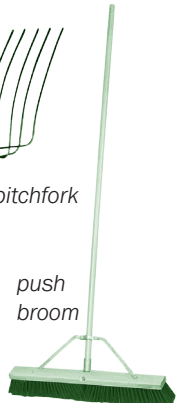
digging
bar



scupper
cleaner



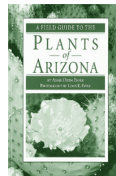
pitchfork



push
broom



tool
disinfectant



plant ID
guides



tree pruning
handsaw



bypass pruners



plant ID apps
i.e. Arizona Wildflowers and SEINet

Plant Care for GSI

Plants are an integral part of GSI and offer a number of services and benefits including:

- *providing evaporative cooling through transpiration*
- *filtering and breaking down contaminants in stormwater runoff*
- *improving soil structure to facilitate infiltration and percolation*
- *providing habitat for wildlife*
- *providing shade, screening, and natural beauty*

Plant health is crucial to the function of GSI features. Supporting plant health during routine GSI maintenance involves:

- *ensuring irrigation is functioning / plants can receive water*
- *replacing dead plants*
- *minimizing pruning*
- *maintaining a mulch layer to conserve soil moisture*



GSI Plant Care Checklist

- ✓ Remove invasive species and unwanted plant species or volunteer trees by pulling or digging them out (Remember to bag any species that are in seed and may spread!)
- ✓ Remove unnecessary tree stakes/nursery stakes, and girdling ties
- ✓ Assess irrigation during establishment phase
 - Check for and repair leaks
 - Plug lines where plants are missing but irrigation is still running
 - Move irrigation located near tree or shrub trunks out to the edge of the plant's canopy
- ✓ Clear rocks, sediment, and deep mulch away from the base of trunks to expose buried root flares
- ✓ “Chop and Drop” leaving leaf litter, seed-free invasive species, and trimmings < 1” in diameter and 3” length in basin bottom as mulch (if not in a flood zone).



Chop



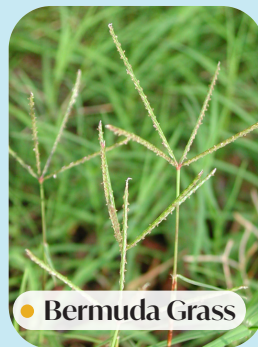
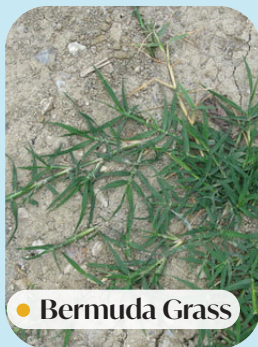
& Drop



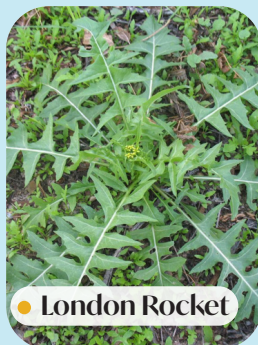
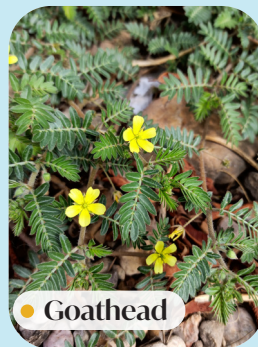
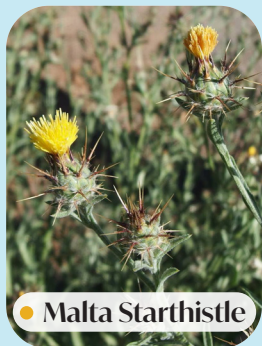
Free Mulch!

- ✓ Trim back shrubs and other low-lying vegetation from walkways/roadways
 - Prune only for visibility and clearance
 - Do not prune to artificially shape the plant !!!

Priority Invasive Plants to Remove:



See Seasonal Checklist for When to Treat or Pull



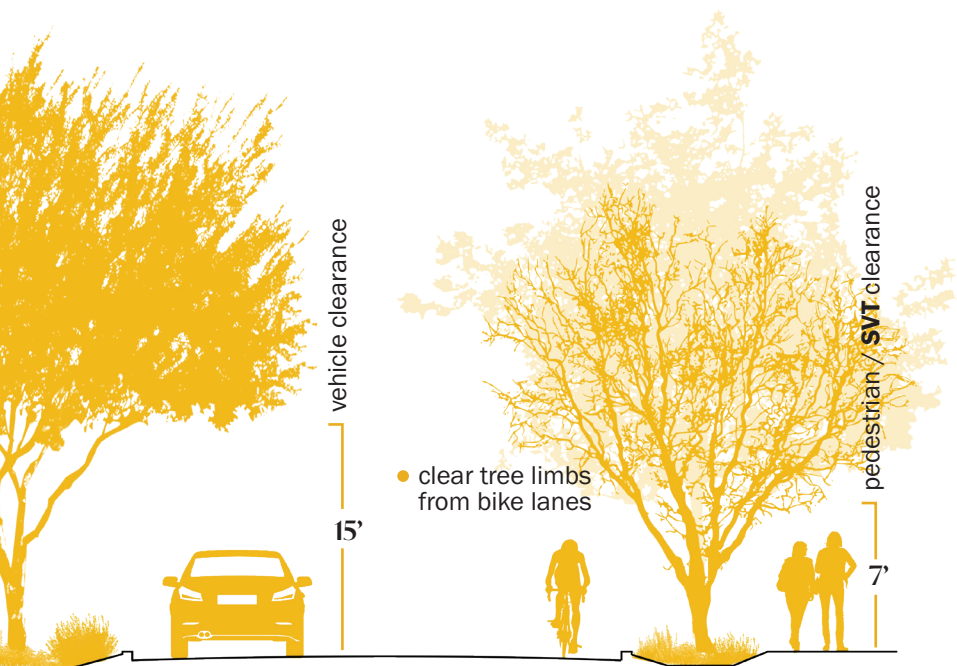
When to Prune and When NOT to Prune Trees



Tree Pruning should only be done if there is a safety concern, clearance issue, or if the health of the tree is at stake. **A certified arborist should perform any significant pruning.** Every pruning cut is a wound the tree must seal and improper cuts or too many cuts endanger the life of the tree.

Sight Visibility Triangle (SVT) Clearance - At crosswalks and intersections, an unobstructed and continuous view of both the intersection and the intersecting roadway helps pedestrians, cyclists, and drivers avoid conflicts. Trees should be pruned to 7' for SVT clearance and shrubs should not exceed 30" in height.

Right Tree Right Place - When planting or replacing trees, consider the tree's mature size and growth form as it relates to the planting location. Selecting an appropriate tree can help to minimize pruning needs, clearance concerns, and damage to adjacent infrastructure.



Pruning for Safety

- *pedestrian clearance*
- *vehicle clearance*
- *visibility of roadway signage*
- *site visibility triangles*
- *to remove broken or hazardous limbs*

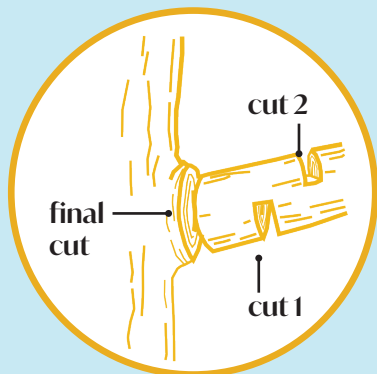
Pruning for Tree Health

- *removing dead wood*
- *removing rubbing or crossing branches*
- *removing codominant branching*
- *remedial pruning for improper pruning such as stub cuts*

Basic Tree Pruning

the DOs

- **Prune as minimally as possible**
- **Use the right tools** - *bypass pruners, tree pruning handsaw*
- **Use clean tools** - *disinfect tools between each tree or shrub*
- **Use proper pruning techniques :**

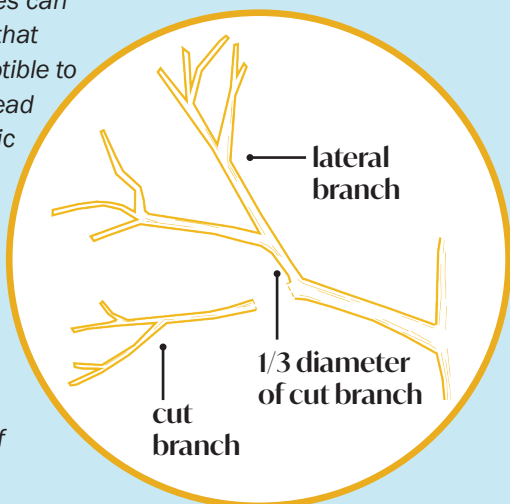


- **The 3 Cut Method (left)**
for large or heavy branches:
Cut 1 - Make an undercut through 1/3 of branch
Cut 2 - Make the top cut slightly farther on the limb than the undercut to remove the branch
Cut 3 - Make final cut just outside branch collar/branch bark ridge to remove the stub

- Proper pruning techniques can prevent injuries to trees that would make them susceptible to decay or infestation, or lead to a loss of photosynthetic function.

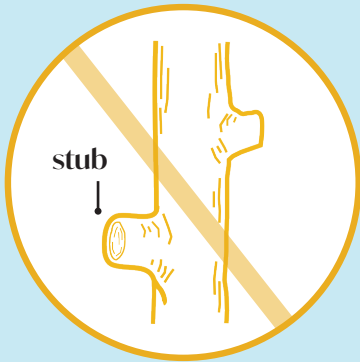
- **Lifting (right)**

Trim back to the nearest lateral branch or to main trunk, ensure that the remaining lateral is at least 1/3 the diameter of the cut branch.

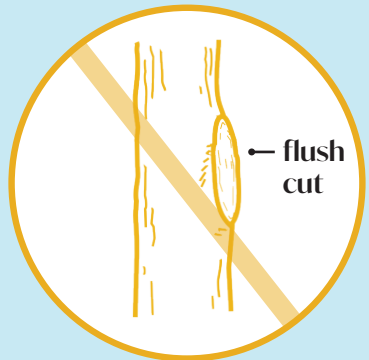


the DON'Ts

- Don't perform significant pruning without a certified arborist
- Don't prune trees that appear to be less than 2 yrs old without a certified arborist's guidance
- Don't remove anything that does not present a safety or visibility issue
- Never 'Top' trees/shrubs or prune them into artificial shapes



● No Stub Cuts



● No Flush Cuts



● No 'Topping'



● No 'Lion Tailing'

**Refer to City of Tucson Landscape Maintenance Manual (Nov 2020) for more detail*

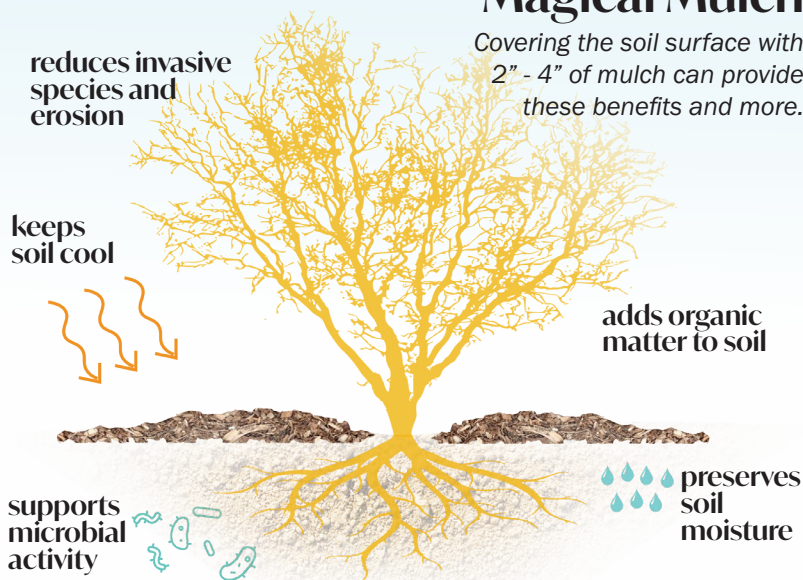
Sustaining Soil

Maintaining healthy soil is also crucial to plant health and GSI feature functionality. Consider the following best practices while performing GSI maintenance:

- minimize soil disturbance, avoid raking for aesthetic purposes
- keep soil mulched (wood chips, leaves, trimmings, other aggregates)
- avoid activities that can lead to soil compaction - i.e. driving, parking, walking in or on GSI features or plant root zones
- minimize erosion - ensure earthworks, rockwork and other grade controls are in place and functioning
- avoid the use of herbicides and pesticides*

Magical Mulch

Covering the soil surface with 2" - 4" of mulch can provide these benefits and more.



* Herbicides/pesticides may be applied by AZ State Certified Applicators with formal approval from program maintenance leadership.

GSI Maintenance... *a seasonal checklist*

All Seasons

- ☐ Clear inlets and outlets; Remove excess sediment
- ☐ Treat or pull Stinknet, Smallflower stock/Matthiola, London Rocket, Cheeseweed, as well as Buffel, Fountain, & Bermuda Grasses
- ☐ Remove Trash

SPRING / PRE-MONSOON **mar 1 - may 31**

- ☐ Leave native annuals
- ☐ Trim bunch grasses to no shorter than 4"
- ☐ Remove frost damage from plants
- ☐ Prune for safety

SUMMER / MONSOON **jun 1 - aug 31**

- ☐ Leave native annuals
- ☐ Light pruning as necessary
- ☐ Treat or pull all plants shown on the "Priority Invasive Plants to remove" pages of this manual

FALL / POST-MONSOON **sept 1 - nov 30**

- ☐ Leave native annuals
- ☐ Light pruning as necessary
- ☐ Treat or pull Stinknet, Goathead, Russian Thistle, as well as Tick grass

WINTER **dec 1 - feb 28/29**

- ☐ Deadhead spent wildflowers and disperse seeds
- ☐ Light or structural tree pruning if necessary

Cues to Care... *quick GSI maintenance guide*



1.



Can stormwater easily enter and collect in the GSI?

YES no action required

NO Are there obstructions to the inlet (including scuppers) and/or sediment trap?

YES Remove obstructions (debris, rocks, sediment, vegetation) and dispose of or redistribute appropriately*.

NO Is the ground/soil level at the bottom of the infiltration basin lower than the level of the inlet?

YES no action required

NO Remove sediment from the bottom of the infiltration basin. Dispose of /redistribute removed material appropriately. Mulch exposed soil whenever possible.



2.



Is vegetation obstructing signage or visibility or impeding pedestrian or vehicle traffic?

NO no action required

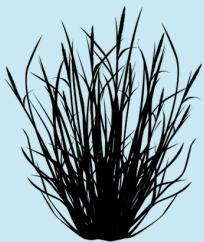
YES STEP 1: Check for active bird nests and/or eggs before pruning. **It is illegal to harm any bird species, eggs, or active nests per the Migratory Bird Treaty Agreement. Refer to Tree Care for Birds website.**

STEP 2: Perform the minimum pruning necessary to remove obstructive or dangerous vegetation. **Do not perform significant pruning or tree removal** without consulting an ISA certified arborist.

See GSI Pruning Guide

* **Redistribute excess sediment to high points of GSI or carry off site.**
(Check with management first if GSI is located in the street)

3.



**Is the GSI feature
free of invasive plants
and unwanted volunteer
trees?**

YES *no action required*

NO *Remove invasive or unwanted
plants and volunteer trees**
See Plant Care for GSI*

UNSURE *Reference Priority Invasive
Plants to Remove*

4.



**Is the GSI feature free
of trash?**

YES *no action required*

NO *Remove trash
and dispose of it
appropriately.*

Less is More: GSI uses natural processes to perform ecosystem services. Minimal interventions that ensure the function of the feature are often most appropriate for routine maintenance. Routine maintenance of GSI features includes:

- *Removing obstructions from inlets and outlets*
- *Removing accumulated sediment*
- *Removing invasive or unwanted plants and trash*
- *Pruning for safety*
- *Minor rockwork repair, securing/replacing loose rock*
- *Leaving organic material onsite (no raking for aesthetic purposes)*
- *Do NOT prune to artificially shape any plant.*

**** Volunteer trees that do not obstruct inlets or site visibility & are > 10' away from sewer lines may remain**



**No Tree
'Lion Tailing'!**



**No Shrub
'Hedging'!**



**No Succulent
'Pineapples'!**

GSI Contacts :



City of Tucson Storm to Shade Program

www.climateaction.tucsonaz.gov/pages/gsi

www.tucsonaz.gov/gsi

Other GSI Partners:

Tucson Clean & Beautiful: GSI Mini-Grants/RAINworks Program

tucsoncleanandbeautiful.org/programs/rainworks/

Pima County Regional Flood Control District

webcms.pima.gov/government/flood_control/