



City of Pacific Grove

Urban Forestry Standards

Growth and Development of the Pacific Grove Urban Forest

In order to develop trees that grow, reach maturity and provide maximum benefits, a comprehensive growing plan is necessary. The following sections provide guidance for site selection, species selection, nursery stock selection, tree planting, and addressing conflicts between trees and infrastructure.

All tree growing elements in the City of Pacific Grove should adhere to the most current versions of *ANSI A-300 Standards and Landscape Trees for Pacific Grove, A Guide to Selection, Planting and Care*.

Site Selection

A thorough site analysis should be performed for all proposed plantings on public and private lands.

1. Adequate below and above-ground space should be required for the space to be identified as an appropriate planting site. If there is insufficient space to allow the tree to grow to full size, a different site or a smaller growing tree species should be chosen.
2. Tree planting sites should allow adequate distance between the tree trunk and hardscape elements that may be damaged by root development. A general distance to maintain is 10 to 20 feet for mature trees.
3. Tree planting sites should contain adequate soil volumes to allow tree root growth. Below ground space requirements should be twice the area of the above ground canopy coverage extents.
4. Soils shall have sufficient drainage capabilities as verified by a simple percolation test; dig a hole 24 inches in depth, fill with water, and monitor the time it takes for the water to drain. If water moves from the hole into the surrounding soil at a rate less than two inches per hour or pools at the bottom of the whole, drainage capabilities are poor.
5. Trees planting sites in poorly draining soils shall be dug shallow, to a depth that equals two-thirds to one-half the height of the container. This results in a "mounded" type-planting site.
6. Irrigation water supply should be tested to ensure there are no toxic elements or high salt concentrations.

Species Selection

Species planted in the City of Pacific Grove shall be selected from the list of appropriate landscape trees for Pacific Grove.

The Natural Resources Commission in partnership with the City Arborist, and knowledgeable community members shall update the list of appropriate landscape trees for Pacific Grove as needed.

Tree species selected shall respect land use and rebuild native systems where space allows. Native Monterey pine shall be the species of choice for reforesting Rip Van Winkle Open Space and some sections of George Washington Park.

Nursery Stock Selection

The selection and procurement of high quality, nursery grown trees is of paramount importance in Growing the Urban Forest.

All nursery grown trees planted in the City of Pacific Grove shall adhere to criteria defined in *Guideline Specifications for Nursery Tree Quality* authored by The Urban Tree Foundation.

Tree Planting

Trees planted in the City shall adhere to the most current version of *American National Standards Institute (ANSI) A-300 (Part 6) Transplanting* (Tree Planting Cue card by the Urban Tree Foundation) and the list of appropriate landscape trees for Pacific Grove.

1 – Selecting quality trees

Planting quality trees begins by choosing vigorous, structurally sound trees from the nursery. Strong trees have straight roots, a thick trunk, and one central dominant leader growing straight to the top. The root collar (the uppermost roots) should be in the top 2 inches of the root ball.

2 – Digging the hole

A firm flat-bottomed hole will prevent trees from sinking. Dig the hole only deep enough to position the root collar even with the landscape soil surface. Use the rototiller or shovel to loosen soil in an area three times the size of the root ball. This loose soil promotes rapid root growth and quick establishment.

3 – Installing the tree

Remove soil and roots from the top of the root ball to expose the root collar; cut away any roots that grow over the collar (see Appendix C, Figure 3). Also cut any roots that circle or mat along the sides and bottom of the root ball (see Appendix C, Figure 4). The root collar should be even with the landscape soil after planting (see Appendix C, Figure 3). Backfill with soil removed from the hole. Minimize air pockets by applying water and packing gently. Build a berm 4 inches tall around the planting hole to help force water through the root ball.

4 – Staking

Staking holds trees erect and allows the root ball to anchor. Secure the trunk at the point where the tree stands straight. A second stake tied directly to the trunk made of bamboo may be required to straighten the upper trunk.

5 – Mulching

A layer of organic mulch, such as leaf litter, shredded bark, or wood chips, helps protect tree roots from temperature extremes and conserves soil moisture. Mulch also helps prevent grass from competing with the tree for water and nutrients. The mulched area makes it easier to operate mowers and weed eaters without hitting the trunk and compacting soil. Apply mulch to a depth of 3 to 4 inches (slightly thinner on top of the root ball).

6 – Irrigating

Consistent irrigation is critical for establishment. 1. Apply about 3 gallons irrigation per inch of trunk diameter to the root ball 2 or 3 times a week for the first growing season. 2. Increase volume and decrease frequency as the tree becomes established. 3. Weekly irrigation the second year and

bimonthly irrigation the third year should be sufficient for establishment. 4. Once established irrigation requirements depend on species, climate and soil conditions. 5. Irrigation devices should be regularly checked for breaks and leaks.

7 – After Planting Care

Aftercare is essential to ensure new plantings succeed and grow. Newly planted trees shall be monitored weekly for the first three months, monthly during the next year's growth and then at six (6) month intervals for a period of five years or until they acclimate to their new environment.

8 – Pruning

Training young trees promotes structurally sound growth and overall tree health. Cut back or remove codominant stems (stems that compete with the central leader) to encourage growth in the central leader (below).

9 – Early Training Pruning

1. Directing the growth of young trees is essential if mature trees are to perform properly in the landscape. Early training pruning will establish proper structure and form.
2. Shade trees that grow to be large should have one relatively straight central leader. Heading the tree is acceptable provided the central lead is retrained.
3. Main branches should be well distributed along the central leader, not clustered together. They should form a balance crown appropriate for the cultivar or species.
4. The diameter of branches that grow from the central leader, or trunk, should be no larger than two-thirds (one-half is preferred) the diameter of the trunk measured just above the branch.
5. The largest branches should be free of bark that extends into the branch union, known as included bark (see A and B).
6. Temporary branches should be present along the lower trunk below the lowest main branch. These branches should be no larger than 3/8 inch in diameter. The trunk should be free of wounds, sunburned areas, conks (fungal fruiting bodies), wood cracks, bleeding areas, signs of boring insects, cankers, or lesions. Properly made recent pruning cuts are acceptable.
7. The trunk caliper (thickness) and taper should be sufficient so that the tree remains vertical without a stake.
8. The root collar (the uppermost roots) should be within the upper 2 inches of the solid media (substrate). The root collar and the inside portion of the root ball should be free of defects, including circling, kinked, and stem grinding roots. You may need to remove soil near the root collar to inspect for root defects.
9. The tree should be well rooted in the soil media. Roots should be uniformly distributed throughout the container. The tree's structure and growth should be appropriate for the species or cultivar. When the container is removed, the root ball should remain intact. When the trunk is lifted, both the trunk and root system should move as one.
10. The root ball should be moist throughout at the time of inspection and delivery. The roots should show no signs of excess soil moisture as indicated by poor root growth, root discoloration, distortion, death, or foul odor. The crown should show no signs of moisture stressed as indicated by wilted, shriveled, or dead leaves or branch dieback.

Tree Maintenance

Tree Maintenance in the City of Pacific Grove shall be performed to specifications written in accordance with American National Standards Institute (ANSI) A300 (Part 1) Tree Management Standards in accordance with International Society of Arboriculture Best management Practices.

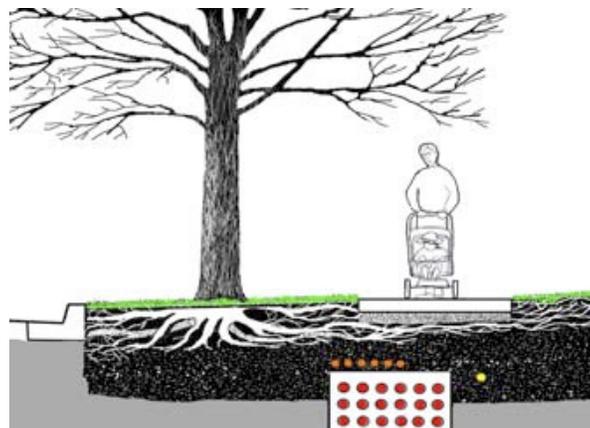
Trees on Public Property and within the city right-of-way shall be pruned by the Urban Forestry Department to maintain a Due Standard of Care. Vertical clearance shall be maintained at a minimum height of 13'6" for all roads, streets throughways etc. Tree with a Risk Rating of 6 or greater shall be managed.

Trees on Private Property shall be pruned to maintain a Due Standard of Care at the expense of the Property owner.

Trees and Infrastructure¹

1 – Introduction

Trees and hardscape/infrastructure elements are often in conflict when tree roots damage curbs, gutters, sidewalks, utility/drainage lines, foundations and retaining walls on both public and private properties. The most effective long-term planning strategy to avoid these conflicts is to dedicate larger planting sites for tree planting. Since a mature tree requires a minimum distance of 10 to 20 feet between the trunk and hardscape elements, this distance is impossible to maintain in streetscape settings and near structural foundations. Soil conditions affect tree root trajectory and depth. The required compaction and site stabilization beneath roads and sidewalks creates a perfect environment for small roots to penetrate the concrete/asphalt and base material interface and grow to cause damage.



2 – Locating Trees

Large scale trees planted on private property, public rights of way, in public parks and open space shall be positioned a proper distance from hardscape elements in order to decrease damage potential from root development.

A standard detail, depicted at the right will result in significant damage to the sidewalk, curb/gutter and street as the tree grows.

As the tree develops, roots grow toward and beneath the sidewalk and street.

Street tree and right-of-way plantings near infrastructure shall be placed in locations where root /soil volumes can be expanded below or to the side of infrastructure elements. Some of the methodologies available include planting in the easiest places first. Make use of the spaces that currently have the largest soil volumes.

Expand "root paths" by extending and deepening the soil trench, creating more soil volume or root growth. This increases soil volume from 115 cubic feet to 365 cubic feet, two and one half times the volume

Soil trenches can be extended and connect street trees to further develop "root paths."

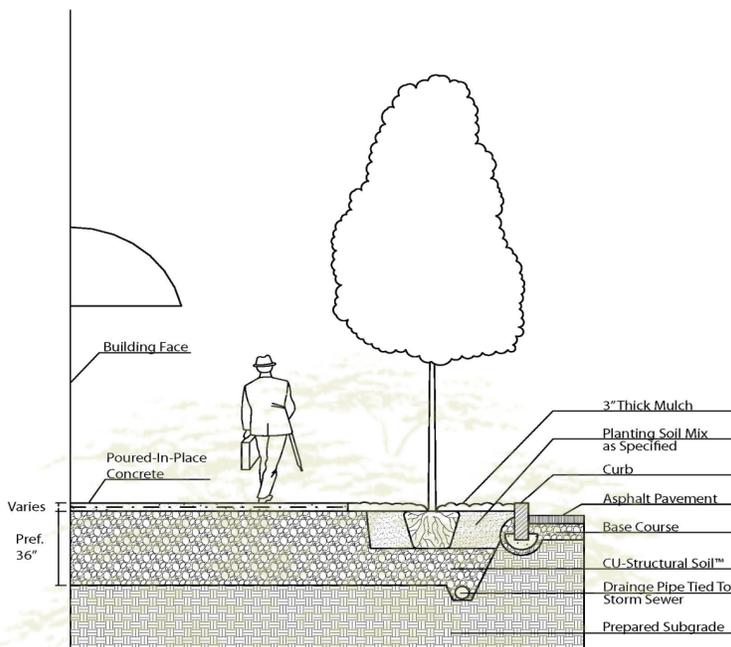
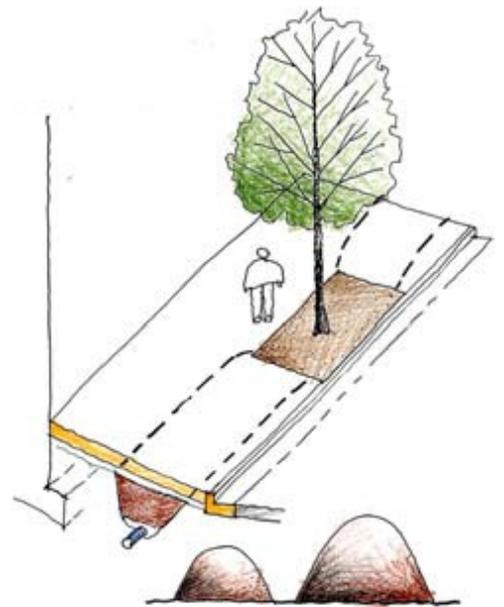
¹ Adapted from work by Jim Urban, Nina Bassuk and Jason Grabowsky.

3 – Structural Soils

CU-Structural Soil is a load-bearing soil under pavement that can be compacted to 100% dry density (proctor density or modified proctor density) to bear the load of a pavement while allowing tree roots to grow through it. Previously, soils compacted to meet engineering specifications for load bearing restricted tree root growth.

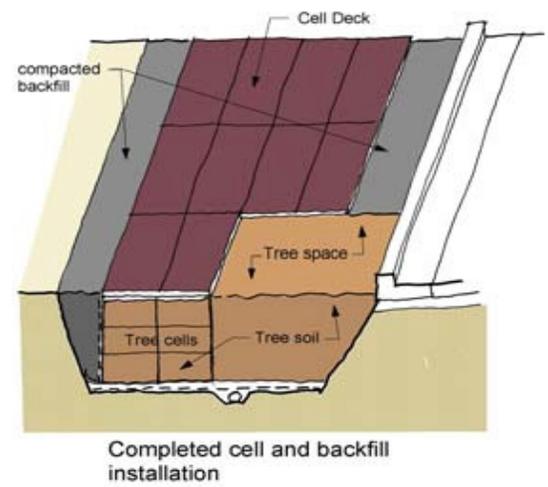
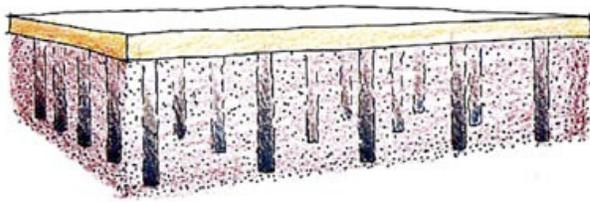
CU-Structural Soil is a mixture of crushed gravel and soil with a small amount of hydrogel to prevent the soil and stone from separating during the mixing and installation process. The keys to its success are the following: the gravel should consist of crushed stone approximately one inch in diameter, with no finer particles, to provide the greatest porosity. The soil needed to make structural soil should be loam to clay loam containing at least 20% clay to maximize water and nutrient holding capacity. The proportion of soil to stone is approximately 80% stone to 20% soil by dry weight, with a small amount of hydrogel aiding in the uniform blending of the two materials. This proportion insures that each stone touches another stone, creating a rigid lattice or skeleton, while the soil fills the large pore spaces that are created between the stone. This way, when compacted, any compactive load would be borne from stone to stone, and the soil in between the stones would remain uncompacted.

CU- Structural Soil requires, approximately 2 cubic feet of soil for every square foot of envisioned crown diameter. A 36" soil depth is recommended although several projects have been successful using as shallow as 24". We would not recommend any less than 24". CU-Structural Soil has an available water holding capacity between 7% and 12% depending on the level of compaction. This is equivalent to a loamy sand or sandy loam. (See the table below for soil volume recommendations). Because of its well-drained nature, trees that prefer well-drained soils do best in CU- Structural Soil. Depending on the stone type used to make it, the pH of the soil may be affected (e.g. limestone vs. granite). Good tree selection practices and establishment procedures should be used with CU- Structural Soil as would be done with any tree installation. It is important to maximize the water infiltration through the pavement to replenish CU-Soil as with any soil. This feature serves a dual purpose to expand stormwater infiltration functions and decrease hardscape damage.



elements while increasing soil volume by 80%.

Another system is a structural cell configuration that is engineered to support above ground



4 – Strategies to Reduce Infrastructure Damage Potential²

Alternative design methods to reduce tree/infrastructure conflicts include:

1. Curving sidewalks
2. Pop-outs
3. Reconfigured sidewalk alignment
4. Monolithic sidewalks
5. Increasing Right of Way
6. Build root paths, narrow trenches installed in compacted sub-grade material filled with root friendly material to encourage rooting
7. Root channels, directing root growth to areas of larger soil volume
8. Elimination of Sidewalks
9. Narrower Streets
10. Tree Islands
11. Bridges and Ramps
12. Lowered sites
13. Gravel layer between roots and concrete
14. Concrete with extra reinforcement/Thicker slabs
15. Pervious concrete promotes deeper rooting
16. Recycled rubber sidewalk panels
17. Root control diversion barriers

5 – Trees and Infrastructure, Remedial Treatments

Once damage to infrastructure elements occurs, there are alternatives to tree removal including:

1. Grinding pavement to eliminate uplifted that cause trip hazards
2. Root pruning and the installation of root control diversion barriers
3. Mudjacking, lifting and resetting concrete slabs

Alternative materials for walkways that are either: thinner, modular, re-usable, easily replaced, and don't require complete root removal beneath the material.

² Adapted from Strategies to Reduce Infrastructure Damage Potential, Costello and Jones.