# Dryad, LLC

21045-40027

January 18, 2022

Bonnie Lipscomb, Economic Development Director
City of Santa Cruz
337 Locust St.
Santa Cruz CA 95060

Re.: Tree inventory and evaluations.
Project/Site: Downtown Library Project

Ms. Lipscomb;

I am writing in response to your request for an inventory and evaluations[1] of trees relative to pending construction for the Downtown Library Project. We[A] inspected[2], tagged, measured[3], photographed[B], GPS-located[4] , and evaluated[5] twelve trees on December 20, 2021. While on site, I also met and discussed the project with Leslie Keedy, Santy Cruz Urban Forester. Ms. Keedy emphasized that preserving trees was desirable and that the feasibility of relocating trees should be addressed.

**SUMMARY:** Nine of the twelve trees inspected qualify as protected, Heritage Trees[C]. All twelve trees are exotic (non-native) and adapted to different environments. All twelve trees exhibit myriad detrimental conditions and although all twelve could be retained on site, I only judged two (nos. 7 & 9 ) as viable candidates for relocation based upon their existing condition and longevity potential. I judged five trees (nos. 4, 7, 9, 10 & 11) as worthy of preservation. The remaining seven trees could be retained on site if extensive preservation and site improvements are implemented, but their existing condition renders such efforts questionable.

The detrimental conditions I observed include the effects of severely restricted growing areas, severe pruning[6], structural[7] weaknesses and evidence of past failures, limb and stem[8] decay, and buried root collars[9], which may disguise root disease and resulting decay.

**RECOMMENDATIONS:**

1. Before deciding to relocate any trees, judiciously remove surrounding hardscape, excavate buried root collars to determine if the roots are sufficient, structurally and architecturally[10] sound, and absent of disease and/or decay.
2. For trees to be retained, expand and enhance rooting areas to at least the driplines[11] or preferably, the fall zones[12].
3. Install fencing or other deterrents to pedestrians and traffic surrounding the trees at the driplines or preferably the fall zones, to reduce risk from failures[13].
4. Consider removing and replacing all twelve trees with sound specimens that will not achieve large size, and provide sufficient growing spaces.

**DISCUSSION:** Tree protection and long-term planning is not included in this report, as per the scope of work[D], and I have not reviewed construction plans. The included tree protection guidelines (page 20) are for reference only. The physiological condition of these trees is typical for mature trees in restricted growing spaces surrounded by hardscape and capable of attaining very large size. Inherent structural and architectural weaknesses have not been addressed and/or were enhanced by pruning. These trees will continue to increase in size, exacerbating current conditions. Many of the conditions observed can be expected to worsen over time.

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[A] Assistant Arborist: I was assisted in the field work by Jennifer Tso, Consulting Arborist; ISA Certified Arborist no. WE- 10270A, ISA Tree Risk Assessment Qualified. J. Tso is an employee pf Traverso Tree Care, Inc., under contract with, and not an employee of, *Dryad,* LLC.
[B] The photographs in this report are intended to illustrate an overview of each tree. Additional photographs are on file at the office of Dryad, LLC.
[C] City of Santa Cruz Municipal Code, Title 9 Peace, Safety and Morals, Chapter 9.56 Preservation of Heritage Trees and Heritage Shrubs.
[D] Dryad, LLC proposal dated 11/18/2021.


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Significant issues are as follows:

- Decline (thin canopy, chlorotic foliage with tip dieback)[14]
- Insufficient rooting area and encroaching hardscape
- Absence of organic mulch[15] soil cover
- Excess soil over root collars
- Weak, generally irreparable structure
- Poor architecture[10]
- Poor pruning technique (e.g., overpruning, lion-tail pruning[16] , excessive raising[17] ,thinning[18], inattention to structure, etc.)[6]

In my opinion, it is ill advised to retain these trees on site unless extensive design accommodation can be undertaken to both enhance their growing conditions and reduce risk. Increasing the rooting areas, free of hardscape and with an organic mulch cover, is critical to improving physiological condition. Fencing trees at least at the driplines or preferably, at the perimeters of fall zones, can reduce the risk of failures and resulting injury or damage. Judicious pruning may improve structure and can reduce but not eliminate the risk of future failures.

**Pruning:** Pruning is not a health treatment and trees and shrubs do not need to be pruned to thrive. Excessive, inappropriate and/or unnecessary pruning is detrimental to plant health. Foliage density is critical to tree/plant health. While acknowledging that aesthetic preferences or practical needs (clearance, structural improvement, etc.) may necessitate pruning, it is critical that the minimum pruning be performed that is necessary to achieve the goal. Unnecessary and/or excessive pruning (e.g., thinning, raising) results in tree stress and structural weaknesses. Lion-tailing and raising for clearance can result in poor stem and branch taper and eventually, failures (refer to images, page 7). In all cases, pruning should target improving tree structure. Removal of significant branches should be avoided, with the preference being multiple small cuts or branch reduction over removal of an entire branch.

**Rooting area:** Many trees appear to thrive in planters or when surrounded with hardscape to within a few feet of their trunks. However, as trees grow, an increasing rooting area is required to provide sufficient moisture, nutrients, and to allow for physiological processes. Hardscape precludes percolation of rainfall into the soil, interferes with root aeration and the often compacted base material inhibits root development. Soil compaction[19] also results from pedestrian and vehicular traffic. While adequate mulching provides some protection, fencing or other barriers protecting root zones is preferable. Dense groundcovers and turf are heavy competitors for trees, and often require maintenance (e.g., mowing) that results in tree damage.

**Mulch:** If planting spaces can be enlarged and/or trees are relocated, a layer of organic mulch, whether natural or installed, is critical to maintain soil moisture, moderate soil temperatures, enhance soil biology and reduce erosion. I strongly recommend installing and maintaining mulch to a settled depth of 3-4". Allowing natural mulch to accumulate over the years will reduce the need to maintain the mulch cover.

**Excess soil over root collars :** This condition likely resulted from planting nursery stock too deeply. The soil may cover root structural issues or disease that may in some cases, prove irreparable. It is critical that root collar exposure and inspection[20] be performed both to discover rooting structural problems, and to discover or prevent root disease. I recommend that buried root collars of any trees to be retained or transplanted first be excavated and inspected.

**Transplanting (relocating):** It is my opinion that mature trees proposed for relocation should exhibit high vigor, desirable architecture, strong structure, and be free of significant disease and decay. Under the best of circumstances, transplanting is severely traumatic on tree physiology and weak trees are likely to decline over time. Trees at risk of decline or structural failure are poor candidates for relocation. I also do not recommend relocation where operations would result in either an undersized rootball or damage to adjacent trees.



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**SUMMARIES OF TREE DATA AND EVALUATIONS:**

| **Data Summaries** | **Quantity** | **Ratio** | **Descriptions/Comments** |
|---|---|---|---|
| Total trees inventoried | 12 | 100% | All trees within the construction zone |
| Heritage trees | 9 | 75% | As defined by City of Santa Cruz[3] (≥14"" dia.) (nos. 1-4, 6, 9-12) |
| Trees not protected | 3 | 25% | As defined by City of Santa Cruz (<14" dia.) |
| Trees to retain & protect | 5 | 42% | Management codes A & B (nos. 4, 7, 9-11) |
| Trees that are of poor condition but can be retained | 7 | 67% | Management code C (nos. 1-3, 5, 6, 8, 12) |
| Trees that are transplant viable | 2 | 17% | Tree nos. 7 & 9 |
| Trees recommended for removal | 0 | 0% | Management code D |
| | | | |
| **Management Codes** | **Quantity** | **Ratio** | **Definitions/Comments** |
| **A** | 0 | 0% | Preserve, condition warrants long-term preservation. |
| **B** | 5 | 42% | Preserve, specific maintenance recommended. |
| **C** | 7 | 58% | Preservable, but not worthy of extensive effort or design accommodation. |
| **D** | 0 | 0% | Remove due to existing condition. |
| | | | |
| **Species Variation & Ratio** | 4 | - - - | Species variation on site. |
| **Common Name** | **Quantity** | **Ratio** | **Botanical Name (Genus-species)** |
| Chinese pistache | 4 | 33% | *Pistache chinensis* |
| Maidenhair tree | 1 | 8% | *Ginkgo biloba* |
| Southern magnolia | 5 | 42% | *Magnolia grandiflora* |
| Sweetgum | 2 | 17% | *Liquidambar styraciflua* |



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## TREE INVENTORY DATA & EVALUATIONS:

| No. | Common name | Genus-species | Trunk diameter | | | Canopy | | | | Hgt. | Heritage status | Mgt. code | Transplant viable | Observations/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | N | E | S | W | | | | | |
| 1 | Southern magnolia | *Magnolia grandiflora* | 20.5 | | | 17 | 18 | 19 | 14 | 27 | Yes | C | No | Codominant stems and major limbs<br>Many weak acute-angle attachments[21]<br>Evidence of previous limb failures<br>Bacterial exudant[22] present<br>Twig growth stunted[23] and tip dieback<br>Pruning: raised and lion-tailed; many large pruning cuts<br>Restricted rooting area<br>(Diameter measured at ~30" above grade) |
| 2 | Southern magnolia | *Magnolia grandiflora* | 20.5 | | | 20 | 22 | 0 | 0 | 30 | Yes | C | No | Codominant stems and major limbs<br>Many weak acute-angle attachments<br>Evidence of previous limb failures<br>Twig growth stunted and tip dieback<br>Pruning: raised and lion-tailed; many large pruning cuts<br>(Diameter measured at ~36" above grade) |
| 3 | Southern magnolia | *Magnolia grandiflora* | 21.5 | 17.5 | | 13 | 14 | 23 | 18 | 41 | Yes | C | No | Codominant stems and major limbs<br>Cable installed between primary stems<br>Some weak acute-angle attachments<br>Evidence of previous limb failures<br>Bacterial exudant present<br>Twig growth stunted<br>Pruning: raised and lion-tailed; many large pruning cuts<br>Root pruning apparent<br>(Diameter measured at ~36" above grade) |
| 4 | Southern magnolia | *Magnolia grandiflora* | 33.0 | 21.5 | | 27 | 23 | 22 | 29 | 42 | Yes | B | No | Good architecture other than codominant stems<br>Canopy thin, stunted and chlorotic with tip dieback<br>Pruning: raised and lion-tailed; many large pruning cuts with decay<br>Root pruning apparent<br>(Low codominant limb measured 16" diameter) |



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| No. | Common name | Genus-species | Trunk diameter | | | Canopy | | | | Hgt. | Heritage status | Mgt. code | Transplant viable | Observations/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | N | E | S | W | | | | | |
| 5 | Southern magnolia | *Magnolia grandiflora* | 13.5 | 12.5 | 12.0 | 19 | 18 | 15 | 16 | 26 | No | C | No | Codominant stems and major limbs<br>Many weak acute-angle attachments<br>Evidence of previous limb failures and one currently splitting<br>Bacterial exudant present<br>Twig growth stunted<br>One stem has a large, decaying necrotic[24] area near the base<br>Pruning: raised and lion-tailed; many large pruning cuts<br>Surface roots damaged (bark missing)<br>(Diameter of stem 1 measured at ~48" above grade) |
| 6 | Chinese pistache | *Pistachia chinensis* | 14.0 | | | 13 | 5 | 9 | 14 | 28 | Yes | C | No | Foliage dense and twig growth vigorous<br>Poor architecture (few lateral limbs/top-heavy)<br>Evidence of major branch failures<br>Pruning: raised<br>Extremely small rooting space |
| 7 | Chinese pistache | *Pistachia chinensis* | 8.0 | | | 11 | 13 | 13 | 11 | 21 | No | B | Yes | Foliage dense and twig growth vigorous<br>Pruning: raised and lion-tailed<br>Extremely small rooting space |
| 8 | Chinese pistache | *Pistachia chinensis* | 12.5 | | | 9 | 11 | 10 | 14 | 29 | No | C | No | Foliage dense and twig growth vigorous<br>Poor architecture (few lateral limbs/top-heavy)<br>Pruning: raised and lion-tailed, topped<br>Buried root collar, extremely small rooting space |
| 9 | Chinese pistache | *Pistachia chinensis* | 17.5 | | | 13 | 16 | 17 | 17 | 28 | Yes | B | Yes | Foliage dense and twig growth vigorous<br>Poor architecture (few lateral limbs/top-heavy)<br>Pruning: raised and lion-tailed<br>Buried root collar, extremely small rooting space |
| 10 | Sweetgum | *Liquidambar styraciflua* | 34.0 | | | 20 | 20 | 17 | 16 | 66 | Yes | B | No | Foliage dense and twig growth vigorous<br>Poor architecture (few lateral limbs/top-heavy)<br>Evidence of a major branch failures<br>Pruning: raised, lion-tailed and thinned<br>Small rooting space |
| 11 | Sweetgum | *Liquidambar styraciflua* | 28.0 | | | 19 | 17 | 16 | 18 | 68 | Yes | B | No | Numerous codominant stems and limbs, many with weak, acute-angle attachments<br>Pruning: raised, lion-tailed and thinned<br>Small rooting space<br>(Diameter measured at ~36" above grade) |
| 12 | Maidenhair tree | Ginkgo biloba | 17.0 | | | 3 | 0 | 8 | 8 | 22 | Yes | C | No | Poor architecture<br>Topped<br>Entire canopy headed (stubbed)<br>Buried root collar, extremely small rooting space |

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**TREE IMAGES:** Numbers refer to tree identification tags.


**Above right:** Codominant stems with weak, acute-angle attachments.
**Below left:** Restricted rooting area.

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**Left:** Profuse acute-angle attachments, codominant limbs, lion-tail pruning, excessive thinning.
**Below right:** Large decaying wound from limb failure.
**Below left:** Decaying wound from past limb failure and bacterial exudate.






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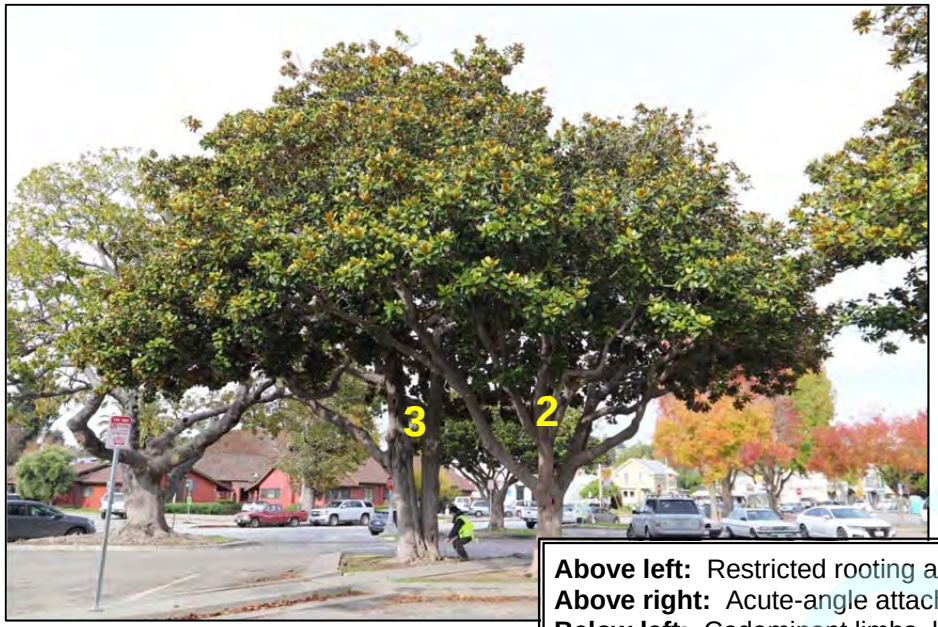
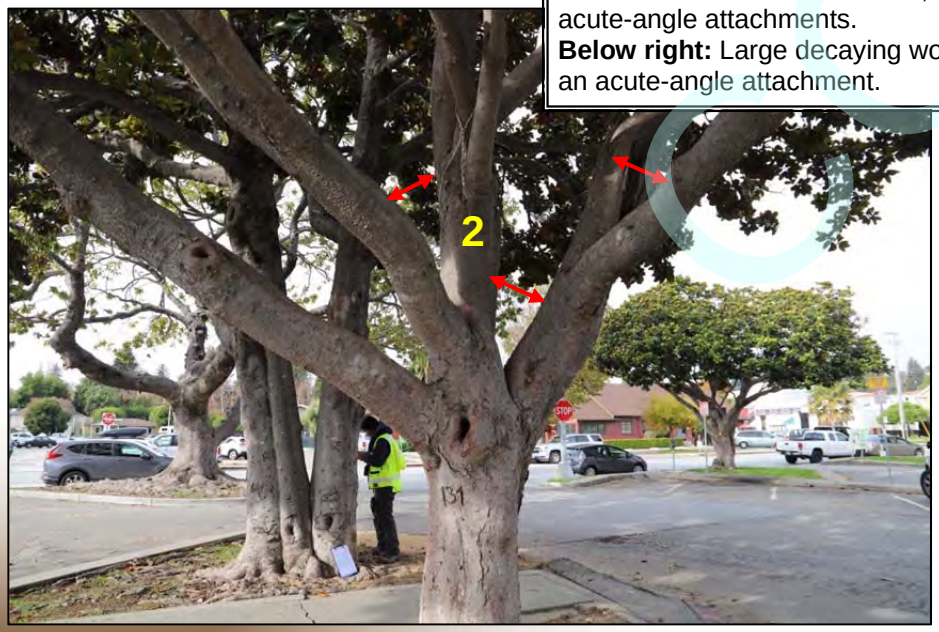
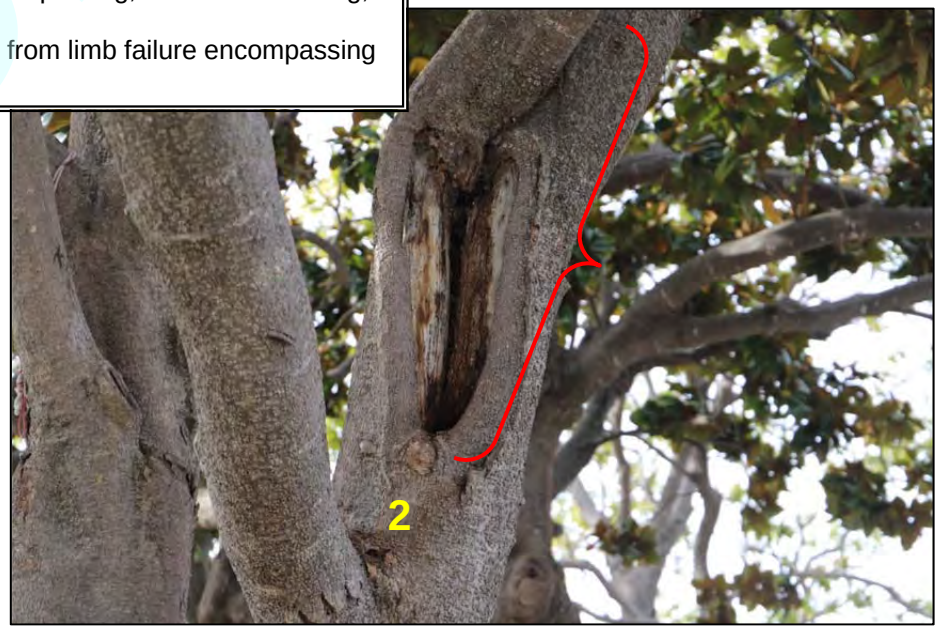




**Above left:** Restricted rooting area and close proximity.
**Above right:** Acute-angle attachments and lion-tail pruning.
**Below left:** Codominant limbs, lion-tail pruning, excessive thinning, acute-angle attachments.
**Below right:** Large decaying wound from limb failure encompassing an acute-angle attachment.

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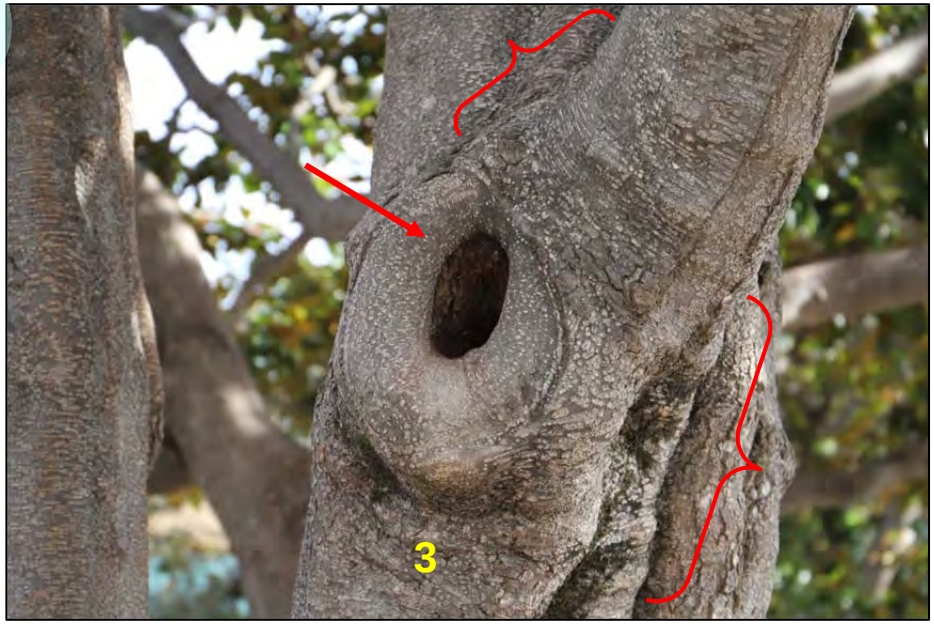
**Below and above right:** Codominant stems with acute-angle attachment.
**Below right:** Decayed flush cut and acute-angle attachments.



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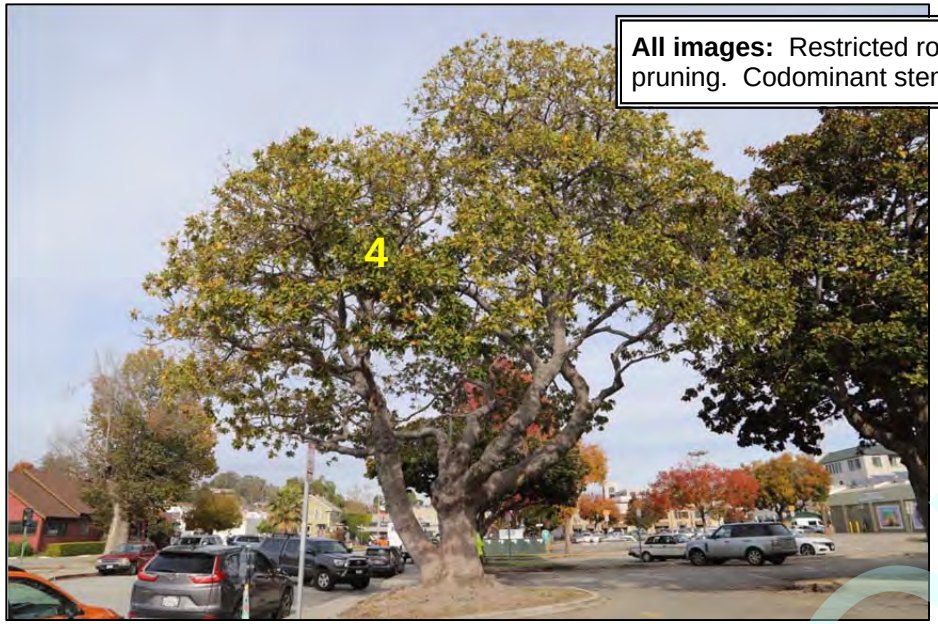
**All images:** Restricted rooting area and extensive root pruning. Codominant stems and major limbs.







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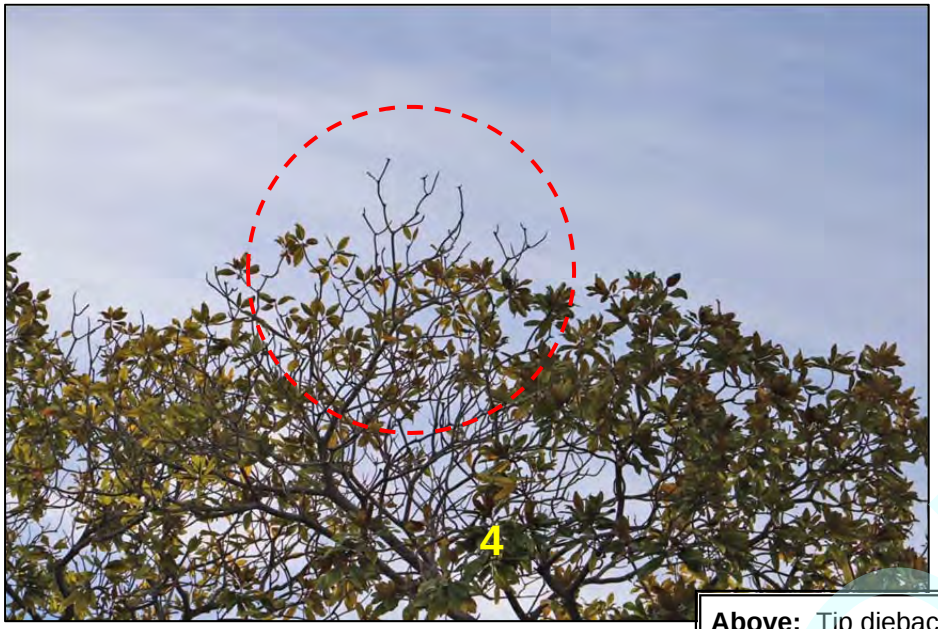
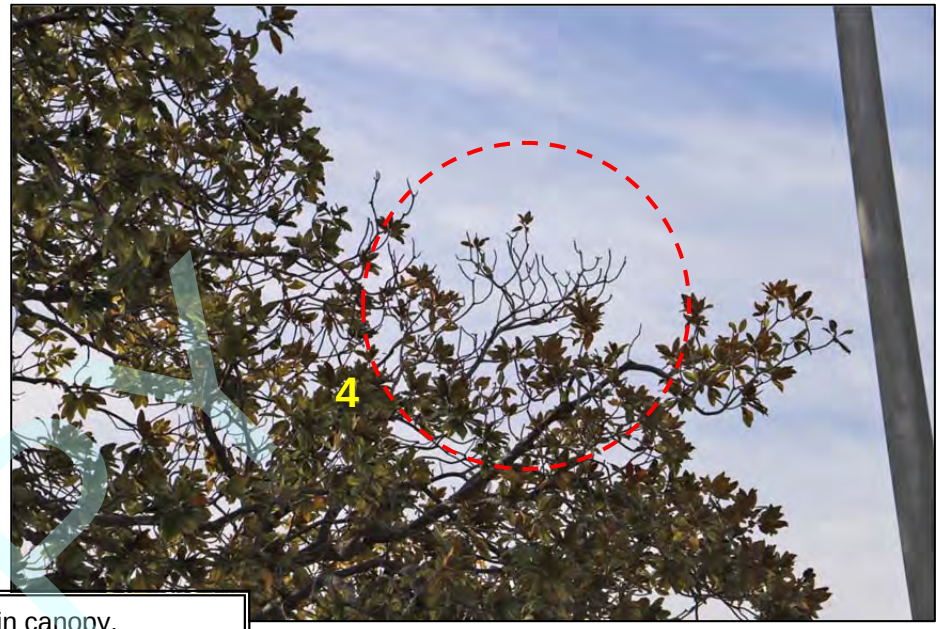
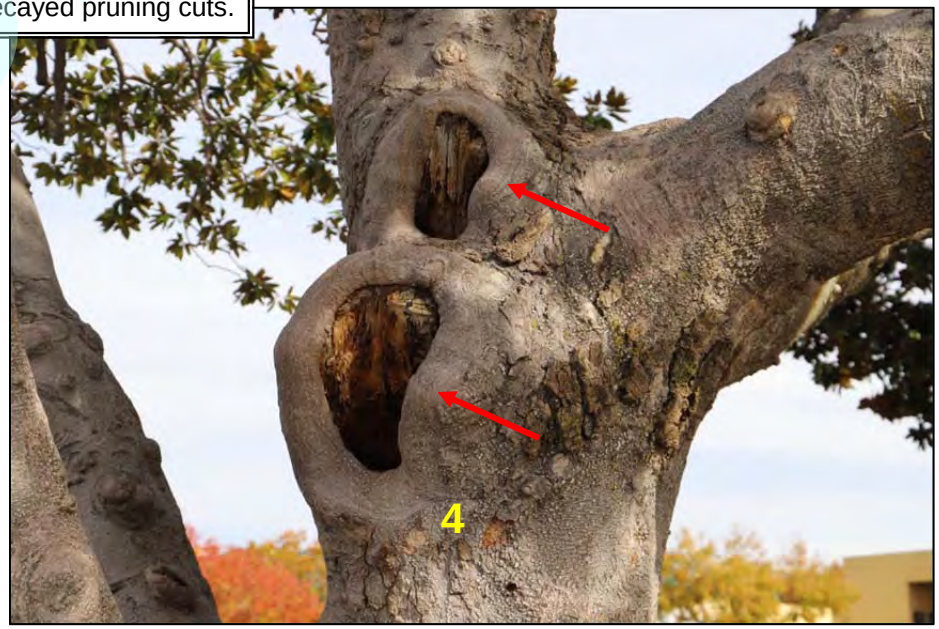



**Above:** Tip dieback, thin canopy.
**Below right:** Large, decayed pruning cuts.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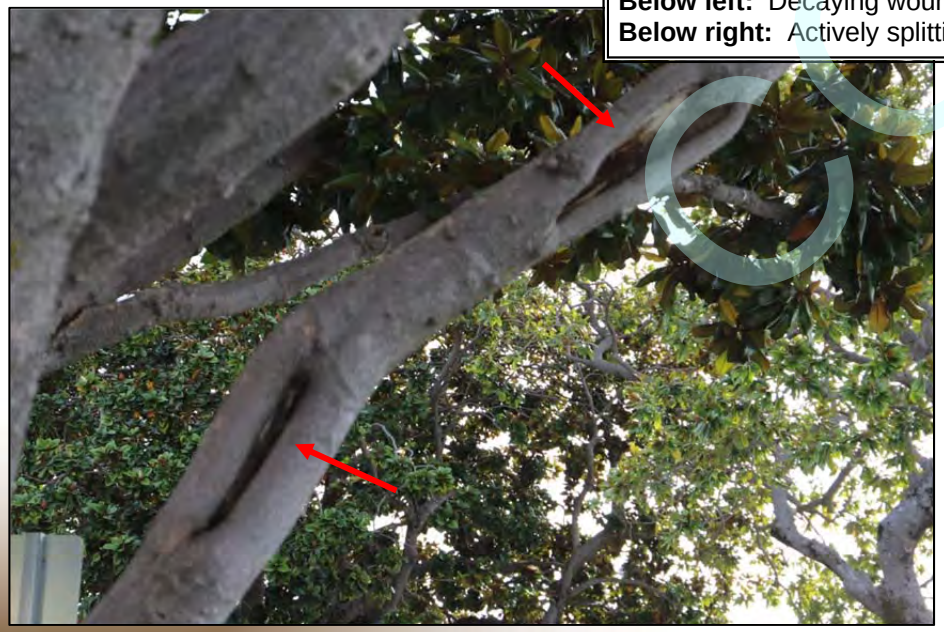
**Above middle:** Codominant stems with weak attachments.
**Above right:** Large decaying wound on stem.
**Below left:** Decaying wounds from past limb failures.
**Below right:** Actively splitting acute-angle attachment.



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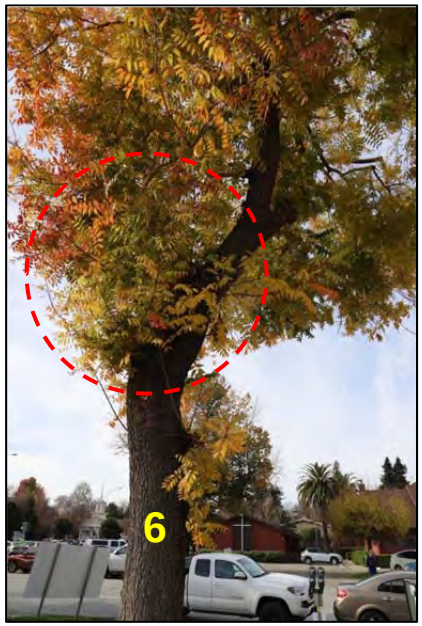


**Above:** Buried root collar and restricted growing space.
**Above right:** Area of two major limb failures, i.e., poor remaining architecture.
**Below left:** Poor but manageable architecture; excessive pruning.
**Below right:** Buried root collar and restricted growing space.



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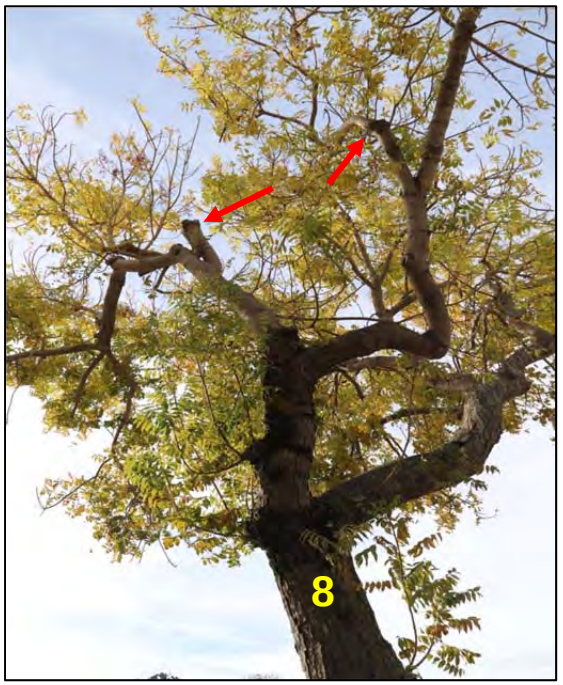



**Above:** Poor architecture, overpruning and restricted growing space.
**Above right:** Poor architecture, heading (topping) cuts.
**Below right:** Buried root collar and restricted growing space.





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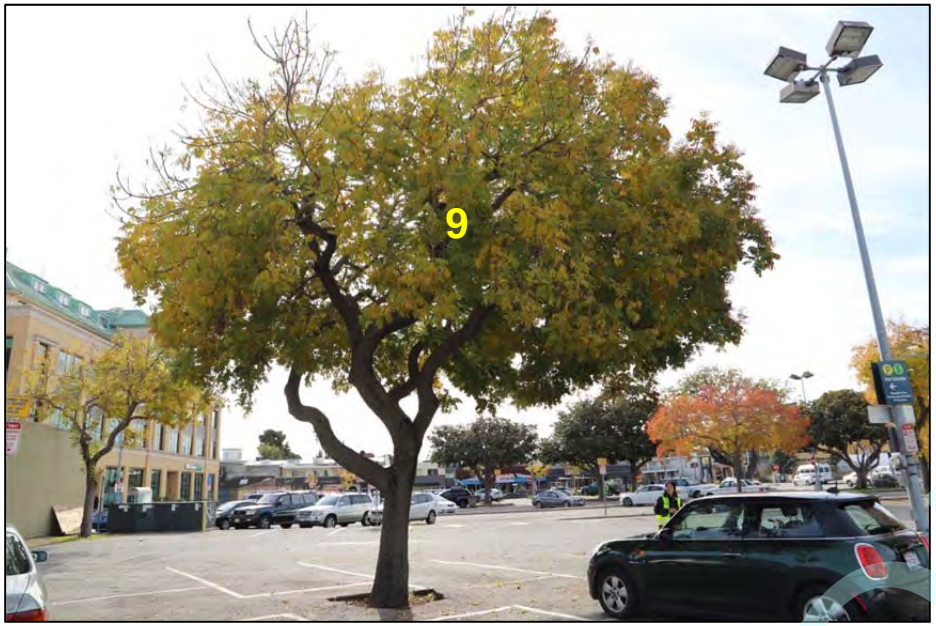




**Above:** Poor architecture, overpruning and restricted growing space.
**Left:** Buried root collar and restricted growing space.

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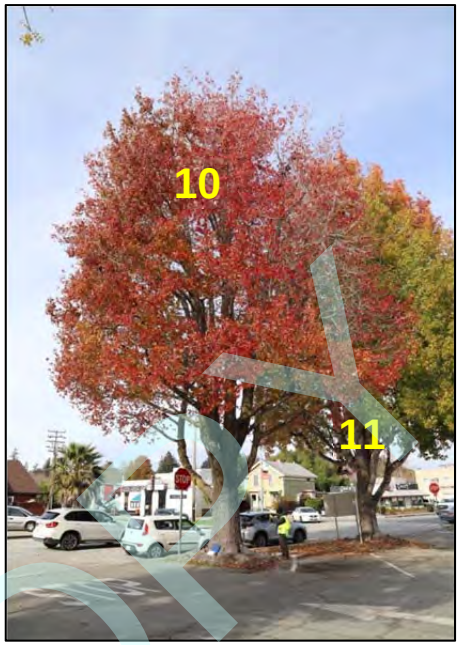



**Upper right:** Profuse acute-angle attachments, codominant limbs, lion-tail pruning, excessive thinning.
**Below:** Restricted growing space.



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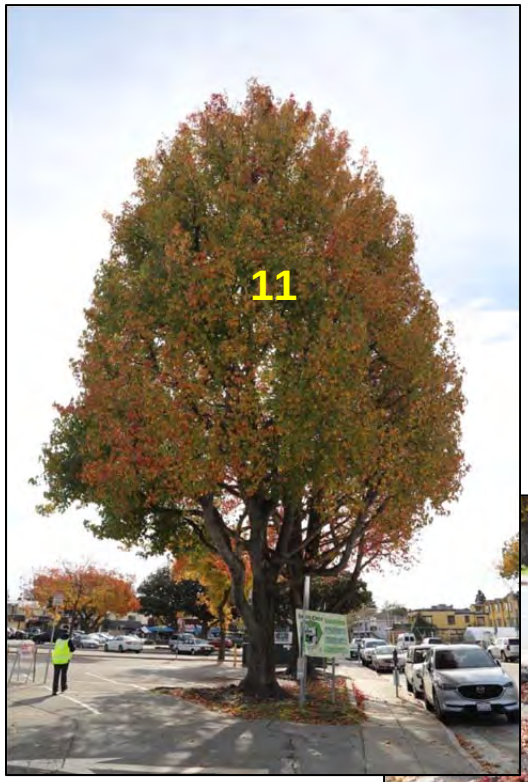


**Right:** Profuse acute-angle attachments, codominant limbs, lion-tail pruning, excessive thinning.
**Below:** Restricted growing space.



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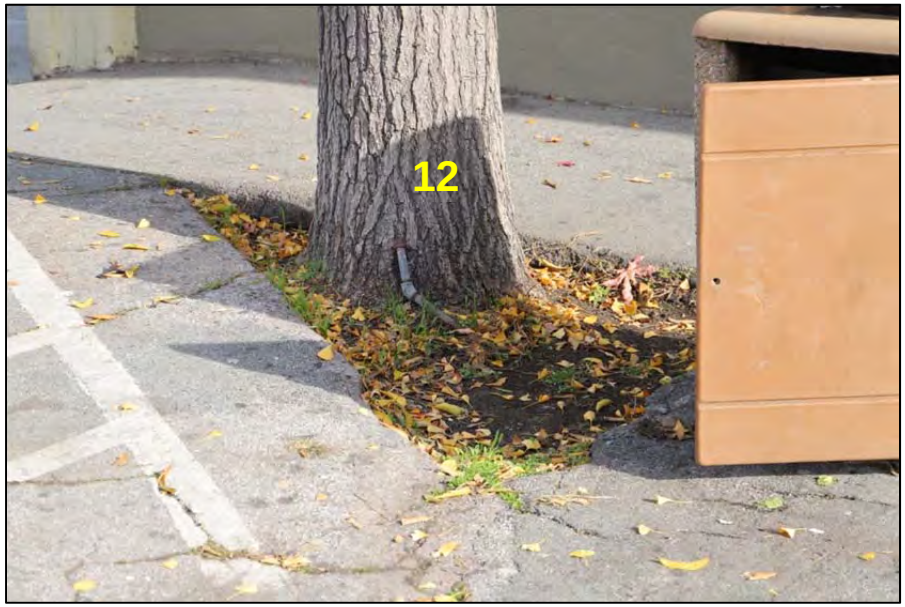


**Above:** Topped and headed throughout the canopy, all limbs removed on building side. Severe pruning has destroyed the structure and architecture of this tree.
**Right:** Restricted growing space.



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## GENERAL CONSTRUCTION SITE TREE PRESERVATION GUIDELINES

(Not site or entity-specific)

1. **Tree Protection Zone[25]:**
   a. The Tree Protection Zone (TPZ) should consist of the largest possible area surrounding trees to be preserved that can remain undisturbed. Ideally, an area of 1.5 times the longest dripline radius (measured from the trunk). Alternatively, follow the TPZ guidelines as described in the most recent version of current industry standards and best management practices publications[26]. The TPZ can be continuous for trees with overlapping driplines.
   b. Surround the TPZ with protective fencing.
      i. Fencing should consist of chain link, at least 6 feet in height, surrounding the perimeter of the TPZ designated distance or beyond.
      ii. Anchor fence posts into the soil (i.e., do not use portable footings).
      iii. Protective fencing should remain in place until all grading and construction is complete.
   c. Do not allow vehicles, equipment, pedestrian traffic, building materials, debris storage, or disposal of phytotoxic[27] materials inside of the fenced-off areas (TPZ).
2. **Mulching and irrigation:**
   a. Soil moisture:
      i. Determine the status of soil moisture to a depth of 18-24" below grade within the dripline of all (each) trees to be preserved, via tensiometer, granular matrix sensor or manual soil probing.
      ii. Irrigate as/if necessary, via slow-application (drip) irrigation, to achieve approximately field capacity[28] to a depth of 12-18".
   b. Mulch: Cover exposed soil within all TPZ's with an organic mulch to a settled depth of no less than 3-4 inches.
3. **Excavation, root pruning & repair:**
   a. Excavation and root pruning should be performed by a Tree Worker currently certified by the International Society of Arboriculture (ISA Excavation and root pruning should be directly supervised by an arborist currently credentialed as at least one of the following:
      i. Certified Arborist by the ISA,
      ii. Board Certified Master Arborist by the ISA,
      iii. Registered Consulting Arborist by the American Society of Consulting Arborists (ASCA).
   b. Determine and mark (marking paint and stakes) the outside edge (towards trees) of required excavation, and adjacent to/surrounding any excavations within an area 1.5 times the dripline radius of trees to be preserved (or at large an area as feasible).
   c. Excavate a trench approximately 6-12" beyond the area to be disturbed (towards tree), or where roots have been damaged, to a depth of at least 18", by hand excavation[29] or with specialized hydraulic[30] or pneumatic[31] equipment.
      i. Wherever possible, relocate excavations or tunnel beneath encountered roots >1" in diameter.
      ii. Cut encountered roots cleanly with hand pruners or power saw. Avoid tearing, dislodging of bark (or epidermis) or otherwise disturbing that portion of the root(s) to remain.
      iii. Immediately back-fill with soil to cover, and moisten.
      iv. If backfilling cannot be completed immediately, cover exposed roots with several layers of untreated burlap (or other similar absorbent material) or sand, mulch or soil and keep moist until permanent backfilling can be completed.
   d. Future excavations within the TPZ:
      i. If possible, relocate any future excavations (irrigation, landscape features, etc.) outside the TPZ and perimeter of previously pruned roots.
      ii. If encroachment is required within the TPZ, endeavor to avoid pruning roots by tunneling beneath.
      iii. If relocation or tunneling is not possible, handle any required root pruning as previously described.
4. **Tree care and maintenance work:** (pruning, cabling/bracing[32], root pruning, etc.)
   a. All tree care or maintenance work:
      i. All tree care work should be performed by a Tree Worker currently certified by the International Society of Arboriculture (ISA) or a current ISA Certified Arborist.
      ii. All tree care work should be directly supervised by an arborist currently credentialed as at least one of the following:


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(1) Certified Arborist by the ISA,
(2) Board Certified Master Arborist by the ISA,
(3) Registered Consulting Arborist by the American Society of Consulting Arborists (ASCA)

b. All tree care or maintenance work should be performed in accordance with current industry standards[33].
c. Tree pruning:
   i. Avoid pruning that removes green foliage or live wood immediately before, during or within 2-3 years after construction.
   ii. Prune to remove large deadwood only, or the minimum required for clearance purposes, in accordance with current pruning standards[34].

5. **Post-construction:**
   a. Avoid pruning that removes live foliage for several years after construction. Perform only that pruning that is necessary for clearance purposes.
   b. Arrange for periodic (biannual) inspection of the condition of the trees by a competent Consulting Arborist, and treatment of damaging conditions (insects, diseases, nutrient deficiencies, soil moisture, etc.), as they occur, or as deemed appropriate by the consultant for effective management.



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Please feel free to contact me with questions or comments.

Respectfully,

Torrey Young
Registered Consulting Arborist

ASCA Registered Consulting Arborist, no. 282
ISA Board Certified Master Arborist, no. WE-0131BM
CUFC Certified Urban Forester, no. 121
ISA Tree Risk Assessment Qualified (TRAQ)
ASCA Tree & Plant Appraisal Qualified (TPAQ)
CA Contractors License no. 363372 (C-27 & D-49; inactive)


✦ ✦ ✦





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## ENDNOTES:

[1] This project and report does not include a tree protection plan, as it was not included in the scope of work (Dryad, LLC proposal dated 11.18.21). Construction plans were neither reviewed nor provided.

[2] **Inspection limitations**: The inspection of these trees consisted solely of a visual inspection from the ground. While more thorough techniques are available for inspection and evaluation, they were not requested and/or not considered necessary or appropriate at the time.

[3] **Height, distance and/or diameter measurements**: Diameters were measured via calculating diameter tape measurement of circumference. Height and distance (canopy) measurements were taken with a laser rangefinder/hypsometer (TruPulse 360R or OptiLogic LH400). If measured, the reported height was averaged from several sets of measurements. Where tree trunks or views were obstructed or inaccessible, either or both heights and diameters may have been estimated.

[4] **GPS data:** GPS (Global Positioning System) data was collected with a Garmin 64 or 64st GPS device, described by the manufacturers as accurate to within 9 meters. Accuracy may vary because of weather, canopy cover, etc. This data is intended only to assist with tree location and is not intended to be of survey precision.

[5] **Arborist Disclosure Statement:** Arborists are tree specialists who use their education, knowledge training and experience to examine trees, recommend measures to enhance their health and beauty and to attempt to reduce the risk of living near trees. Clients may choose to accept or disregard the recommendations of the arborist or to seek additional advice. Trees and other plantlife are living, changing organisms affected by innumerable factors beyond our control. Trees fail in ways and because of conditions we do not fully understand. Arborists cannot detect or anticipate every condition or event that could possibly lead to the structural failure of a tree. Conditions are often hidden within the trees and below ground. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, for any specific period or when a tree or its parts may fail. Further, remedial treatments, as with any treatment or therapy, cannot be guaranteed. Treatment, pruning, bracing and removal of trees may involve considerations beyond the scope of the arborists skills and usual services such as the boundaries of properties, property ownership, site lines, neighbor disputes and agreements and other issues. Therefore, arborists cannot consider such issues unless complete and accurate information is disclosed in a timely fashion. Then, the arborist can be expected, reasonably, to rely upon the completeness and accuracy of the information provided. Trees can be managed but not controlled. To live near trees, regardless of their condition, is to accept some degree of risk. Tree removal is the only way to eliminate the risks associated with trees.

[6] **Pruning**: Proper pruning is performed in a manner intended to achieve a specific objective while minimizing the negative effects on the plant (tree). Improper pruning is that which may not be coupled with a specific objective, may not employ techniques consistent with the identified objective, or may result in significant negative physiological and/or structural impacts on the plant.
Pruning standards: The most current revisions of the following standards, developed by a consensus of representatives from various industry professional organizations; American National Standards Institute,. *Standard Practices for Tree, Shrub and other Woody Plant Maintenance (Pruning)*, American National Standards Institute (ANSI A300 Part 1) and International Society of Arboriculture, *Best Management Practices, Tree Pruning,* International Society of Arboriculture.

[7] **Structure**: The nature, character, physical integrity and attachments of tree; primarily refers to the wood in limbs, branches, stems (trunks) and roots.

[8] **Stem**: The primary portion of a plant's supportive and transportive architecture (synonymous with 'trunk').

[9] **Root collar (trunk flare, root flare, root crown):** One of several accepted terms describing the junction of trunk and buttress roots at the original soil grade. Synonymous terms: root crown, root collar, root flare, trunk flare.

[10] **Architecture**: For the purposes of this evaluation and/report, the arrangement of the (external) parts of a tree; primarily refers to the foliage crown including major (scaffold) limbs, lateral branches and trunks.

[11] **Dripline area**: The soil area surrounding the tree trunk whose outer perimeter is defined by the unaltered length of the outermost branch tips.

[12] **Fall zone/target zone:** The area where a tree or tree part is likely to land if the tree or parts were to fail.

[13] **Tree risk**: For the purposes of this evaluation and/report, a tree or tree part that presents a threat to humans, livestock, vehicles, structures, landscape features or other entity of civilization from uprooting, falling, breaking or growth development (e.g., roots). While all large landscape trees in proximity to such targets present some degree of risk regardless of their condition, such inherent risk is not intended as within this definition and its usage in this evaluation and report.

[14] **Decline (in trees):** The deteriorating condition of trees manifested most notably in chlorotic, thinning foliage and dying branch tips and entire twigs, branches and/or limbs. Decline is the deficit condition of various plant cells and tissues (roots, foliage, wood) becoming inactive at a faster rate than new tissue can be formed. Plant/tree decline can be indicative of pending plant death.

[15] **Mulch**: Organic materials (e.g., brush chips, compost, processed wood chips, etc.) spread upon the soil for a variety of benefits: aesthetics, retains soil moisture, moderates soil temperatures, improves soil structure and increases fertility, protects against compaction, suppresses weeds, etc. Torrey Young, *Dryad, LLC* highly recommends fresh, brush chip mulch in lieu of processed materials. (Note: elsewhere, the definition of *mulch* may include non-organic materials).

[16] **Lion-tail pruning**: An extremely damaging pruning practice that consists of removing the interior lateral branches from individual limbs. This practice displaces the distribution of weight to the tips of branches, interferes with the dissipation of energy from wind-stress, redistributes (suddenly) the character of limb movement, and changes areas of stress. It reduces the development of appropriate branch taper, interferes with the balance of foliage/wood, and can contribute to the development of watersprouts and sunburned limbs and stems. Foliage, limb and branch distribution determines the degree of individual limb and stem (trunk) taper. A lack of sufficient taper results in concentration of stress from movement towards the base of the limb or stem and to areas not adapted for such stress, resulting in a greatly increased potential for breakage or uprooting. A lack of symmetry increases movement and resulting stress due to unequal wind resistance.

[17] **Raising:** Arboricultural term referring to pruning of branches to provide vertical clearance below the crown. (ANSI A300 Standards Part 1 – Pruning, 2017)



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[18] **Thinning pruning (crown thinning):** An antiquated pruning term that refers to the removal of live branches throughout the tree foliage crown (canopy). Not included as a viable pruning method in current industry standards.

[19] **Compaction (soil):** An increase in soil bulk density through a process by which the porosity is decreased because of its mineral grains being squeezed together. Compaction can occur intentionally for engineering purposes, or through natural or normal processes such as traffic, rainfall, sedimentation, etc. Insufficient soil porosity is detrimental to plantlife, reducing soil and root aeration and affecting soil moisture drainage and retention.

[20] **Root collar excavation and inspection:** Excavation of the junction of trunk and buttress roots and immediate vicinity below grade for the purpose of inspection for biological and structural condition and/or to restore the original grade. In a mature tree, root collar excavation should include clearing excess soil, rocks, planting containers and other debris within at least 24" of the tree base. Sufficient soil should be removed from the tree's root collar region to expose at least 50-75% of the upper circumference of each buttress root, within at least 12-24" of the tree trunk. Soil should be graded in a manner that directs drainage away from the tree base (where possible). All such excavation should be performed by hand, with only the aid of hand tools, or via appropriate pneumatic or hydraulic excavation equipment, in such a fashion as to avoid traumatic damage to roots and trunk. Where indicated, root collar excavations should be performed prior to any other required maintenance work. In the event of discovery of significant root defects (root disease, girdling roots, concave trunk areas, etc.) in sizable trees, other maintenance work shall be postponed and such defects reported to the property owner or other proper authority.

[21] **Acute-angle attachments**: Branch/limb, limb/trunk, or codominant trunks originating at acute angles from each other. Bark often remains between such attachment, preventing the development of a branch-bark ridge (branch collar) or grafting of the parts. The inherent weakness of such attachments increases with time, through the pressure of opposing growth and increasing weight of wood and foliage, frequently resulting in failure.

[22] **Bacterial infection exudates:** Often exhibited as dark liquids or staining of the trunk or limbs along trunks limb and/or from wounds. While generally not significantly damaging, continuous fluxing can be indicative of wetwood, which can result in significant necrosis and decay.

[23] **Twig growth**: The length of annual growth of a twig (smallest branch), measured between the twig tip and the last bud scar; also may include measuring previous years' growth by measuring between bud scars; often used as a generalized measure of tree vigor based upon expectations for the species, and also as a rough guide to schedule of impacts or events affecting vigor.

[24] **Necrosis:** The death of most or all of the cells in tissue of a circumscribed area due to disease, injury, or physiological failures.

[25] **Tree Protection Zone (TPZ):** A delineated area of the rooting zone of a tree or group of trees to be protected from encroachment by construction activities. Such activities may include excavation or grading, vehicle, equipment and pedestrian traffic; storage of vehicles, building materials, soil or debris; or disposal of phytotoxic materials.

[26] American National Standards Institute, 2012. *Standard Practices for Tree Care Operations - Management of Trees and Shrubs During Site Planning, Site Development and Construction* (ANSI A300, Part 5, current revision); International Society of Arboriculture, Best Management Practices, *Managing Trees During Site Planning, Site Development and Construction* (current revision).

[27] **Phytotoxic (phytotoxin):** Any substance or material capable of killing plant cells, parts or plants in their entirety.

[28] **Field capacity:** The maximum volume of moisture a soil can hold after drainage has occurred. An expression of the water-holding capacity and moisture status of soils.

[29] **Hand excavation:** Manual soil excavation via the use of hand tools only. Use of hand tools for initial excavation should be avoided. Hand tools shall not be used in a manner that results in breakage of roots, bark penetration or separation of bark from roots. Hand tool use should be limited to small tools (e.g., spade, trowel) for minor excavations or in restricted spaces. Picks, mattocks, digging bars or similar implements requiring striking the earth shall not be used for excavation. Hand shovels may be used for minor excavations, or where access is limited for vacuum equipment, or hydraulic slurry cannot be flushed out of the excavation. Such usage shall not result in breakage of roots, bark penetration or separation of bark from roots.

[30] **Hydraulic excavation:** Soil excavation performed using pressurized, focused water via 1) pressure washer, portable fire pump, or similar equipment or 2) hydraulic truck-mounted equipment (Hydra-vac). Equipment should be used at the minimum pressure required to remove the soil from around roots and out of the resulting excavation void, without causing breakage of roots, bark penetration or separation of bark from roots.

[31] **Pneumatic excavation:** Soil excavation performed via supersonic compressed air excavation with a tool called an air spade. This tool removes soil from roots (or pipes, wires, etc.) with little or no damage to the roots (or utilities). Soil is separated and blown away via highly focused, supersonic velocity compressed air, which separates the soil particles without penetrating roots.

[32] **Cabling & Bracing:** The installation of hardware in and/or about trees for the purpose of providing supplemental support of weak, defective or otherwise suspect limbs and/or stems; supporting of newly planted trees; bracing cracks; propping trees or limbs, or otherwise providing support. The installation of cables, bolts and other hardware in trees is intended to reduce the potential for failure (breakage/uprooting). Such bracing does not permanently remedy structural weaknesses, and is not a guarantee against failure. The trees and hardware must be inspected periodically for hardware deterioration, adequacy and changes in the tree's and site's condition.

[33] **Current industry standards:** The most current and applicable publications of 1) B*est Management Practices,* International Society of Arboriculture; 2) American National Standards Institute*,* A300 and Z133 (all parts).

[34] **Pruning standards:** The following standards were developed by a consensus of representatives from various industry professional organizations; ✦ American National Standards Institute*, Standard Practices for Tree, Shrub and other Woody Plant Maintenance (Pruning)*, American National Standards Institute (ANSI A300 Part 1-current revision) ✦ International Society of Arboriculture, *Best Management Practices, Tree Pruning,* International Society of Arboriculture (current revision) ✦