

City of Carmel-by-the-Sea

List of Compatible Plants

Under and Around

Native Trees



June 2000

Compatible Plants Under and Around Native Trees

(D - Deer Resistant , CN - California Native)

SHRUBS

Arbutus unedo -- Strawberry Tree (D)
8-35 ft, red-yellow fruit in fall

Arctostaphylos densiflora -- Vine Hill Manzanita (D, CN)
low spreading growth except 'Sentinel' (6'), needs good drainage

Berberis darwinii -- Darwin Barberry (D)
hollylike leaves, 10' X 7' , orange flowers, blue berries liked by birds

Buddleia davidii -- Butterfly Bush (D)
sun or light shade, fast growth, fragrant flowers, good drainage

Carpenteria californica -- Carpenteria (D, CN)
slow to 6' , light shade, fragrant white flowers, oak root fungus resistant

Ceanothus spp. -- Wild Lilac (CN)
many varieties, blue-violet-white flowers, very drought tolerant

Cercis occidentalis -- Western Redbud (D, CN)
deciduous, 10'-18' tall, magenta flowers, oak root fungus resistant

Eriogonum spp. -- Buckwheat (D, CN)
full sun, well drained soil, summer flowering, several varieties

Fremontodendron spp. -- Flannel Bush (D, CN)
fast growth to 20', short lived, showy yellow flowers, no summer water

Galvezia speciosa -- Island Bush Snapdragon (CN)
spreading to 8', tubular scarlet flowers, good drainage

Garrya elliptica -- Coast Silktassel (D, CN)
evergreen shrub 8' to 20' tall, sun or light shade, 'James Roof ' good var.

Grevilla rosmarinifolia -- Rosemary Grevilla (D)

Australian shrub to 6', red flowers primarily in winter

SHRUBS (cont.)

Heteromeles arbutifolia -- Toyon (CN)

Shrub or small tree, takes extra water well, red berries loved by birds

Holodiscus discolor -- Ocean Spray (CN)

deciduous shrub to 20' in moist areas, cream colored flowers in spring

Mahonia aquifolium -- Oregon Grape (D, CN)

spiny leaves, yellow flowers, blue berries, oak root fungus resistant

Mimulus (Diplacus) spp. -- Monkey Flower (D, CN)

CA natives are drought tolerant, tubular orange-yellow flowers

Myrica californica -- Pacific Wax Myrtle (D, CN)

attractive evergreen shrub to 30', birds like fruit in the fall

Myrsine africanum -- African Boxwood

small glossy dark green foliage, sun or partial shade, good drainage

Myrtus communis -- Myrtle (D)

several varieties, aromatic leaves and flowers, needs good drainage

Philadelphus virginialis -- Mock Orange

6' to 8' deciduous shrub, full sun, fragrant flowers in summer

Pinus mugo -- Mugo Pine (D)

slow growing pine, prostrate to 10' tall

Plumbago auriculata -- Cape Plumbago

sprawling shrub to 6', white - blue flowers year round in coastal regions

Prunus illicifolia -- Holly Leaf Cherry (CN)

evergreen to 20', holly like leaf, white flower spikes, red fruit

Prunus lusitanica -- Portugal Laurel

shrub or small tree to 20', white flower spikes 5"-10" long in spring

Punica granatum -- Pomegranate

deciduous shrub or tree, showy flowers, can yield fruit, fall color

SHRUBS (cont.)

Rhamnus californica -- Coffeeberry (D, CN)
evergreen to 15', low varieties also, sun or half shade, red-black berries

Rhus integrifolia -- Lemonade Berry (D, CN)
evergreen to 15', clusters of pink flowers in the spring

Ribes sanguineum -- Red Flowering Current (D, CN)
deciduous shrub to 10', maple-like leaves, clusters of red-pink flowers

Ribes speciosum -- Fuchsia-Flowering Gooseberry (D, CN)
very spiny stems, drooping fuchsia-like red flowers in early spring

Rosa californica -- California Wild Rose (CN)
Deciduous spiny shrub, pink flowers followed by crimson hips

Salvia clevelandii -- Cleveland Sage (CN)
4' rounded shrub, aromatic foliage and blue flowers, good drainage

Salvia greggii -- Autumn Sage (CN)
4' shrub, full sun to light shade, red flowers in spikelike clusters

Teucrium fruticans -- Bush Germander (D)
loose gray-green shrub 4' to 8', lavender flowers all year, good drainage

Viburnum suspensum -- Sandankwa Viburnum
evergreen, clusters of white flowers in spring, sun to nearly full shade

Xylosma congestum -- Xylosma
loose spreading growth to 10', yellow-green leaves, bronzy new foliage

ANNUALS

Centaurea cyanus -- Cornflower, Bachelors' Button (D)
to 3', gray foliage, blue-pink-red-white flowers, sow all year with water

Clarkia amoena -- Farewell - to - Spring (D , CN)
sow in fall or spring, 2" pinkish flowers, full sun, good with other annuals

ANNUALS (cont.)

Eschscholzia californica -- California Poppy (CN)

2' tall with orange-yellow flowers, good to naturalize, sow in fall or winter

Linaria spp. -- Toadflax

multi-colored flowers to 2', full sun or light shade, sow in winter or spring

Lupinus spp. -- Lupine (CN)

many varieties, sow in fall or winter, all need good drainage

Nemophila menziesii -- Baby Blue Eyes (CN)

sow in fall or winter, to 1' tall, blue flowers with white centers 1" across

Scabiosa atropurpurea -- Pincushion Flower

sow in winter or spring, prefers sun, 2" red- rose-purple-white flowers

GRASSES

Deschampsia caespitosa -- Tufted Hairgrass (CN)

Elymus glaucus -- Blue Wild Rye (CN)

Festuca californica -- California Fescue (CN)

Festuca rubra -- Red Fescue (CN)

used in lawn blends, shade tolerant, tolerates drought and many soils

Helictotrichon sempervirens -- Blue Oat Grass

2'-3' fountains of blue-gray leaves, full sun, good drainage

Koeleria cristata -- Prairie Junegrass (CN)

Melica imperfecta -- Melic Grass (CN)

Muhlenbergia rigens -- Deergrass (CN)

Pennisetum setaceum -- Fountain Grass

perennial clump to 4', summer 3'-4' flower spikes, winter dormant

Stipa pulchra -- Purple Needlegrass (CN)

BULBS

Alstroemeria 'Ligtu' hybrids -- Peruvian Lily

leafy 3'-5' stems, many colors, spread by seed or roots, sow in fall

Amaryllis belladonna -- Naked Lady

2'-3' clumps in fall / winter, fragrant pink flowers during dormancy

Anemone blanda -- Windflower Anemone

tuberous roots with 2"-8" stems, blue flowers in spring, good drainage

Crococsmia crocosmiiflora -- Montbretia

corms with 3' stems, orange flowers on 4' stalks, full sun, spreads freely

Cyclamen hederifolium -- Cyclamen

plant tubers June-August, pink flowers on 3" to 4" stems, easy to grow

Freesia 'Tecolote' hybrids -- Freesia

fragrant flowers to 2' tall, many colors, will naturalize, good drainage

Muscari spp. -- Grape Hyacinth

4" to 8" stems with blue-white flowers in early spring, long lived

Narcissus -- Daffodil

many kinds and colors, plant bulbs in fall, full sun, divide infrequently

Any Native Bulbs

adapted to a wide variety of landscape situations, not readily available

GROUND COVERS

Arctostaphylos hookeri -- Monterey Manzanita (D, CN)

dense mounds to 4' tall x 6' wide, 'Monterey Carpet - 1' x 12', slow

Baccharis pilularis 'Twin Peaks' -- Coyote Brush (D, CN)

very adaptable, low mounds 2' tall x 6' wide, moderate growth rate

Ceanothus griseus horizontalis -- Carmel Creeper (CN)

several varieties, up to 5' tall x 15' wide, blue flowers, dark green leaves

GROUND COVERS (cont.)

Ceratostigma plumbaginoides -- Dwarf Plumbago

6"-12" tall, spreads by underground stems, intense blue flower

Cistus salviifolius -- Sageleaf Rockrose

2' tall x 6' wide, gray-green leaves, white and yellow flowers, rough areas

Coprosma kirkii -- Creeping Coprosma (D)

spreading, prostrate to 3' tall, small light green leaves, tough

Correa pulchella -- Australian Fuchsia (D)

low growing broad plant to 2' tall, deep red tubular flowers in winter

Cotoneaster spp. -- Cotoneaster (D)

many varieties, tolerates poor soil, red berries attract birds

Fragaria chiloensis -- Wild Strawberry (CN)

low compact mats, dark green leaves, 1" white flowers, small red fruit

Juniperus spp. -- Juniper (D)

variety of forms and colors, scale-like or needle-like foliage, wide range soils

Mahonia repens -- Creeping Mahonia (D, CN)

spreading, 3' tall, spiny blue-green leaves, yellow flowers, blue fruit

Polygonum capitatum -- Pink Knotweed

rugged, 6" x 20" , stems and flowers are pink, confined or waste areas

Ribes viburnifolium -- Evergreen Currant (CN)

spreading evergreen to 3' tall x 12' wide, fragrant foliage, pink flowers

Rosmarinus officinalis cultivars -- Rosemary (D)

several varieties, aromatic leaves, light blue flowers, good drainage

Sollya heterophylla -- Australian Bluebell Creeper

evergreen, loose spreading to 3' tall x 8' wide, blue bell shaped flowers

Symphoricarpos mollis -- Creeping Snowberry (D, CN)

spreading, to 18" tall, pink flowers, white fruit, takes neglect, partial shade

PERENNIALS

Acanthus mollis -- Bear's Breech (D)

fast growing, 2' long dark green leaves, 18" spikes of tubular flowers

Achillea tomentosa -- Woolly Yarrow (D)

spreading mat of fernlike hairy leaves, golden flowers in summer

Aloe spp. -- Aloe (D)

many varieties, clumps of fleshy pointed leaves, showy flowers

Artemesia pycnocephala -- Sandhill Sage (D, CN)

round spreading to 2' tall, soft gray leaves, very small yellow flowers

Bergenia crassifolia -- Winter Blooming Bergenia

dark green 8" wavy leaves, 20" tall, dense clusters of rose-purple flowers

Centranthus rubra -- Red Valerian

3' tall bush, clusters of red-pink flowers, naturalizes, can be invasive

Dudleya spp. -- (D, CN)

succulents, full sun, some native to coastal cliffs

Erigeron karvinskianus -- Fleabane, Mexican Daisy

trailing growth to 20" tall, numerous white-pink flowers, naturalizes

Hemerocallis hybrids -- Daylily

Deciduous or evergreen, 1' to 6' tall, many colors of 3" - 8" flowers

Heuchera spp. -- Coral Bells (CN)

several varieties, clumps of round leaves, reddish flowers on tall stems

Iris douglasiana and hybrids -- Douglas Iris (D, CN)

dark green leaves, 1' to 2' stems with lavender-white-yellow flowers

Kniphofia uvaria -- Red-Hot Poker (D)

coarse clumps of grass-like leaves, tall spikes of red tubular flowers

Limonium perezii -- Sea Lavender

leathery green leaves, clusters of purple and white flowers, beach areas

PERENNIALS (cont.)

Myosotis scorpiodes -- Forget-Me-Not (D)
bright green leaves, blue and yellow flowers, spreads by creeping roots

Oenothera berlandieri -- Mexican Evening Primrose
profuse summer bloom of rose-pink flowers, tough sites, invasive

Penstemon heterophyllus purdyi -- Beard Tongue (D, CN)
upright 2' stems, spikes of lavender-blue flowers in spring, full sun

Romneya coulteri -- Matilija Poppy (D, CN)
8' stems, gray-green leaves, fragrant white 9" flowers, invasive rhizomes

Salvia leucantha -- Mexican Bush Sage (D)
3' stems from roots, purple and white flowers enjoyed by hummingbirds

Sedum spp. -- Stonecrop
succulents, fleshy leaves in many shapes and sizes, star-like flowers

Sisyrinchium bellum -- Blue-eyed Grass (CN)
narrow grass-like leaves, 4" to 16" tall, bluish purple flowers in spring

Thymus vulgaris -- Common Thyme
erect shrubby plant, aromatic foliage, tiny lavender flowers

Tulbaghia violacae -- Society Garlic
broad clump of blue-green leaves, 1' to 2' stems of rosy-lavender flowers

Viola odorata -- Sweet Violet
fragrant blue and yellow flowers, 2" to 10" tall, runners root at joints

Zauchneria californica -- California Fuchsia (D, CN)
upright 1' to 2' stems, gray-green foliage, scarlet trumpet shaped flowers

VINES

Clematis spp. -- (CN)
deciduous, prefers cool root area, full sun or light shade, showy flowers

Hardenbergia violacea -- Happy Wanderer
Australian native to 10', purplish flowers, needs good drainage, hardy

Lonicera japonica 'Halliana' -- Hall's Honeysuckle

15' long, cut back to control, white-yellow flowers liked by bees and birds

Polygonum aubertii -- Silver Lace Vine

rapid growing evergreen, useful as a screen, white flowers, full sun

Vitis californica -- California Grape (CN)

deciduous vine

FERNS

Dryopteris arguta -- Coastal Wood Fern (CN)

dark green, finely cut fronds, 2'-3' tall, avoid overwatering

Nephrolepis cordifolia -- Southern Sword Fern

bright green upright fronds to 3', spreads by runners, very adaptable

Polystichum munitum -- Western Sword Fern (CN)

leathery dark green fronds to 4', good in shade, best in rich soil

TREE NOTES

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

Pete Wilson, Governor

Richard A. Wilson, Director

Douglas Wheeler, State of California Secretary for Resources, The Resources Agency

NUMBER: 1

APRIL 1989

Protecting Trees From Construction Impacts

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Why Should We Protect Trees

An important benefit of trees to society is their aesthetic value. Our parks, streets, homes and businesses would seem sterile without them. Trees also have monetary value. Residential and commercial properties with established trees have a greater market value than those without them. Trees provide other benefits which include: shade, noise abatement, wind breaks, erosion control and air pollution reduction. Like all green plants, trees convert carbon dioxide into oxygen during photosynthesis. This process contributes significantly to the recycling of the atmospheric gases we breath. Unfortunately trees are often irreversibly damaged or killed during construction and/or landscaping.

Understanding a Tree's Root System

The primary impact of construction around a tree is to the unseen portion, the root system. Activities which disturb or alter the soil in which roots grow can injure or kill a tree. To reduce or prevent adverse impacts, we must understand how roots function and how they develop in the soil.

The greatest proportion (90%) of tree roots is found within the first three feet of soil. Roots function to support and anchor the tree. In addition, specialized (absorbing) roots function to exchange gases and to absorb water and minerals. Most absorbing roots are found in the first 8-12 inches of soil where water and oxygen can readily penetrate. Roots require both water and oxygen to grow and function. A network of supporting roots and absorbing roots grows well beyond the trunk. Depending on soil conditions they may extend two to three times the radius of the crown.

The roots of most tree species are associated with beneficial fungi called mycorrhizae. These fungi increase the roots ability to absorb water and minerals. Soil disturbance during construction can permanently disrupt this association.

How Construction Affects Roots

By understanding where roots grow and how they function, we can begin to see how construction activities such as trenching, slope cuts, soil compaction, soil grade changes and paving can affect roots.

When trenching for utilities and foundations or where grade lowering is done close to a tree, there is a likelihood that roots will be cut. The closer the trench is to the trunk the greater the damage. Each root that is cut reduces the tree's capacity to supply water and nutrients to the leaves. Trenching within just a few feet of a trunk can reduce the functional root system by as much as 50%.

Soil is compacted during construction by heavy equipment which squeezes out the air spaces making it more dense and stable. Unfortunately, this process greatly reduces the infiltration of water and oxygen into the soil. As a result roots cease to function and eventually die. In addition, root penetration is decreased.

Soil grade changes alter the natural soil level around a tree. The addition of fill soil in particular, can have an effect similar to soil compaction. The depth and porosity of the fill soil are the most important factors affecting the tree. If the depth is significant or the porosity is low, root death can occur. For some tree species, a grade change of two inches can be significant. Soil fill that is compacted or has lower porosity than the native soil will restrict root activity. If roots cannot develop or grow into the fill, recovery by the tree after construction may be impaired or prevented.

Fill soil around the root collar (the flared part of the trunk at or just above soil grade) and trunk will result in death and decay of the bark tissue. This can cause the death of all or part of the root system including the supporting roots. Often this results in a "Hazardous" tree.

Grade changes that require the removal of soil often remove absorbing roots and expose and injure other roots.

Concrete or asphalt paved over soil where roots are present will seal the surface, reducing water availability and gas exchange to the roots beneath. Usually soils are compacted prior to installing pavement which compounds these problems.

Symptoms Of Construction Impacts

An injured tree may take several months to many years to exhibit symptoms of construction impacts. These can include: slow decline, insect or disease attack, sparse foliage, significant branch dieback and wilting or yellowing of leaves.

Reducing Construction Impacts

The following techniques can be used during construction to prevent or reduce tree injury:

- **Fence around the area within the dripline to protect it from construction activities. Because roots often grow beyond the dripline, enclosing a larger area is desirable.**
- **Place six inches of mulch over the root zone to reduce soil compaction where vehicular access is required.**

- **Dig trenches by hand or tunnel under the tree if underground utilities must be installed within the tree's drip line.**
- **Prune roots that must be removed, do not rip them out with a trencher or back hoe.**
- **Bridge over roots when trenches for new foundations will damage them.**
- **Construct wells around trunks and root collars to keep soil away and install aeration systems when the soil grade must be raised. Use a coarser fill soil than the soil being covered and do not compact. Add fill in the late fall or winter when roots are less active. Avoid working on wet soils.**

What To Do After The Damage Is Done

- **Soil aeration (vertical or hydrojet mulching) can be effective where soils have been compacted.**
- **Only remove dead, hazardous or obstructive branches. Never remove more than 20% of the foliage during a single year. Leaves produce carbohydrates and buds produce hormones - both are necessary for root growth.**
- **Where appropriate, apply pesticides to reduce attacks by insects or other pests until the tree's vigor is restored.**
- **Place organic mulch over bare soil.**
- **Restore soil grade by removing fill.**
- **Restore irrigation regime that existed before construction took place.**

Summary

Construction around trees can be done successfully. However, this requires planning before construction or landscaping. Not all trees on a site are worth saving. Each tree should be evaluated by a consulting arborist to determine its condition and value in the landscape. It may be more desirable in the long run to plant new trees after construction is completed. The value of a tree should be used as a guide to determining the measures used to save it from construction impacts. Where trees of high value are present the effort and expense to save them is worthwhile. Mature trees take years to grow and their beauty and aesthetics are irreplaceable.

Further Reading

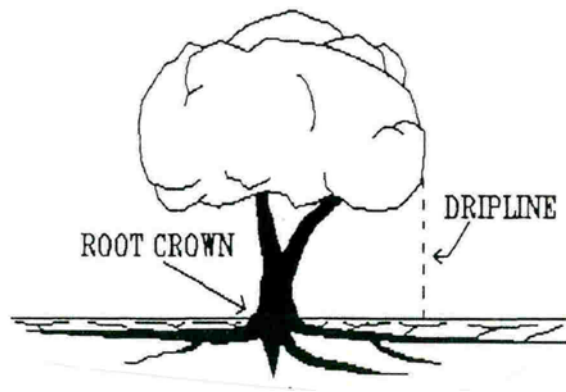
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Sherby Sanborn: Editor, Design, and Layout. CDF Resources Management. (707) 576-2275 ext. 367
Revised 12/13/90



Tree Notes

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

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NUMBER: 2

APRIL 1989

Tree Roots – Major Considerations For The Developer

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Roots support and anchor, absorb water and minerals, store energy and produce important compounds.

Roots grow where there is sufficient oxygen, water, minerals, and where the soil is not too hard to penetrate. 90% or more of tree roots grow in the upper three feet of soil. Up

to 70% are in the top one foot. The surface layer of undisturbed soils is generally quite porous, allowing oxygen, water and roots to penetrate. Minerals are also concentrated there. Soil becomes less porous and more difficult to penetrate as depth increases.

Oxygen availability affects mineral absorption, growth, health and root depth. Poor oxygen availability is associated with compacted, waterlogged, heavy clay, paved over and filled (raised) soils. The mixing of soil or the addition of off-site soil, greatly reduces oxygen availability and water drainage. Waterlogging of the surface layer and excessive dryness may result.

Roots do not normally grow deeper than three or four feet. Most grow radially outward and largely horizontal to the surface. Vertical growing roots are common close to and under trees. They may go down to five feet or more in sandy soil. These roots take up water during dry periods and provide support, especially if lateral roots are cut.

The large buttress roots which originate at a tree's base, rapidly decrease in diameter, one to three meters from the trunk to form a network of long, thin, rope-like roots, 8 – 12 inches below the surface. These roots branch and rebranch to form an extensive network of absorbing roots, extending outward one to two times the height of the tree. The greatest concentration of active roots is directly beneath the leaf canopy (drip zone).

Cutting large roots near the trunk is much more injurious than cutting smaller roots beyond the area of rapid taper. Few large roots are found beyond 10 feet of the trunk. Much of a tree's water absorbing roots are under and close to the tree's base. Because of their depth and location, These roots are less likely to be damaged by construction.

Root loss due to root pruning, trenching or grade changes, reduces tree growth, health, aesthetics and stability. The destruction of roots just outside the drip zone on one side of a tree represents about a 15% loss. If the roots are cut midway between the drip zone and the trunk on one side, about 40% of the roots will be lost. Severe root loss (50% or more) usually causes immediate water stress and reduces photosynthesis (food production). Growth is reduced, dieback and even death may result.

Young healthy, vigorous trees can survive severe root loss while large, old, or declining trees may not. Recovery following the shock of severe root loss depends on rapid root replacement.

The recovery of a tree sustaining severe root loss is influenced by:

- **Species, age, vigor and size**
- **Growing conditions**
- **Date of injury (season)**

- **Percent of root loss and distance from the trunk**
- **Other soil disturbances**
- **Treatment given**

Root growth requires adequate food reserves, growth stimulating hormones, water and minerals. If these are available, and there are no other restrictive influences or construction impacts, root growth and replacement will generally proceed rapidly. Low or depleted food reserves will delay root replacement. If the soil conditions have been seriously altered by construction, root development will be slowed or stopped. **A DELAY IN RECOVERY FROM ROOT LOSS WILL RESULT IN GROWTH LOSS, DIEBACK OR TREE DEATH.**

The worst time to cut roots is just prior to bud break in the spring because growth hormones are not present in the roots to stimulate root growth. Avoid cutting roots later in the spring when food reserves have been nearly depleted by leaf growth. Root growth proceeds most rapidly in the summer and fall when top growth has slowed, food reserves are high and growth hormones are present in the roots.

Top pruning to reduce demands on the damaged root system reduces the amount of food available to the roots, thus slowing recovery.

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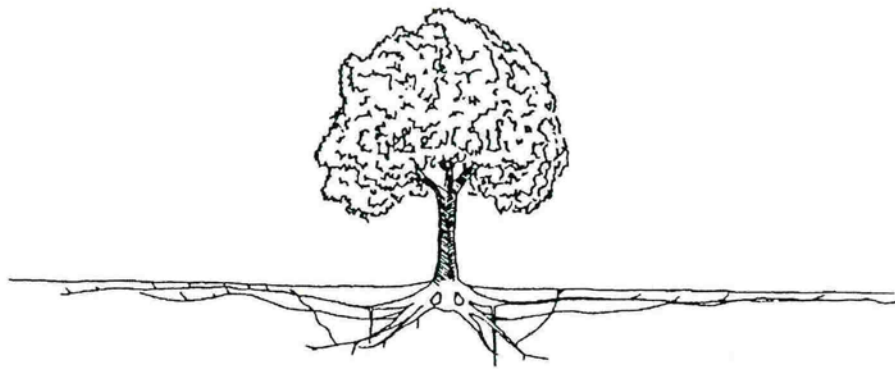
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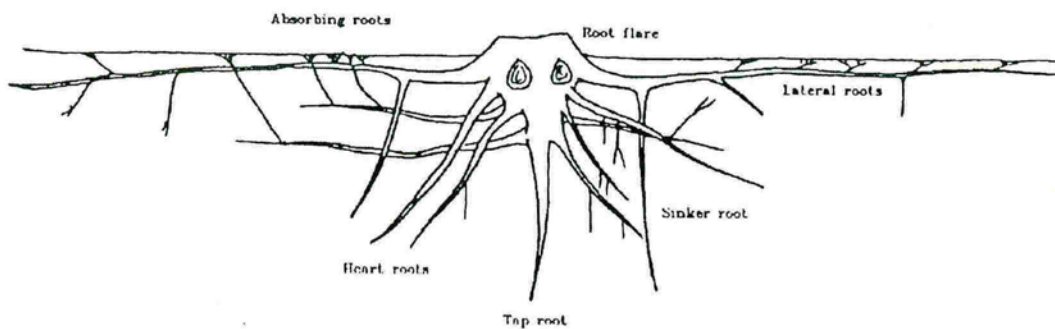
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Sherby Sanborn: Editor, Design, and Layout. CDF Forest Pest Management, (707) 576-2326. Revised 3/22/91



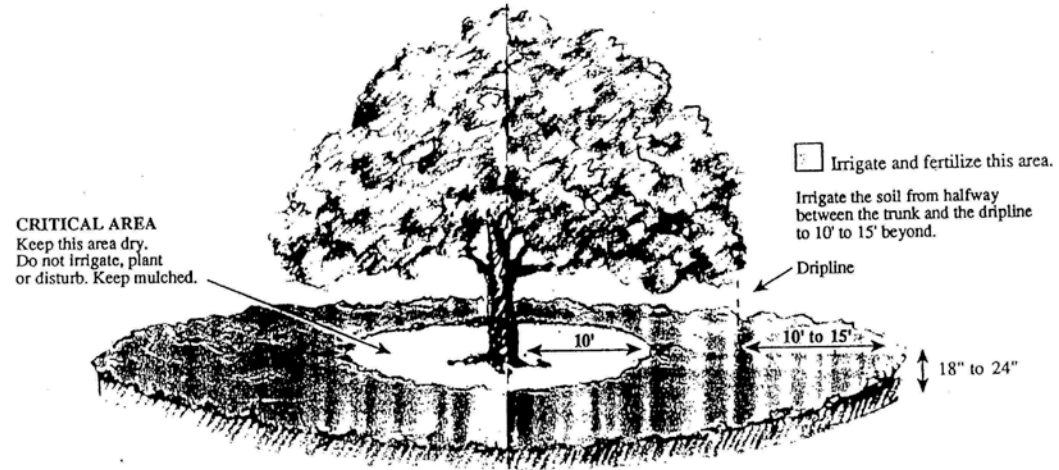
Schematic representation of root spread in a mature tree.



Schematic representation of the root system in a mature tree.

GUIDELINES FOR IRRIGATION AND FERTILIZATION

Figure 2



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IRRIGATION

Generally, native oaks do not require irrigation.

Additional water may be appropriate

- to minimize drought stress
- when natural water sources have been altered
- after root loss due to construction injury or transplanting
- to establish compatible plants
- when using fertilizer

Do not use sprinkler system, use dripline or soaker hose placed on surface and cover with mulch. Check water infiltration.

FERTILIZATION

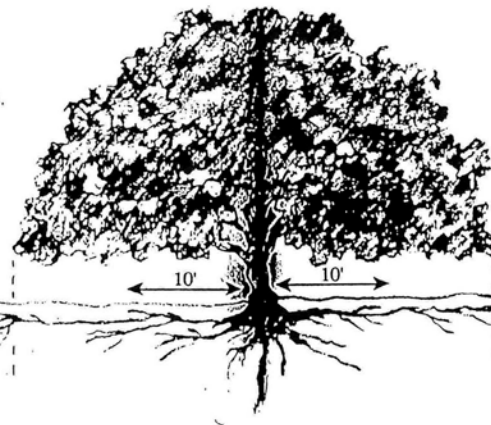
Healthy oaks growing in undisturbed conditions normally do not need supplemental fertilizer.

Stressed and weakened oaks should not be fertilized.

If needed, broadcast fertilizer in late winter or early spring when soil is moist and water in.

If fertilizer is applied in summer, irrigate soil before application then water in thoroughly (6" to 12" deep).

ROOT DISEASE CRITICAL ZONE
The most crucial area is within ten feet of the trunk. Do not irrigate, plant or disturb the soil in this area. Organic mulches are very beneficial in this zone.



ROOT PROTECTION ZONE
Adequate root protection is usually provided by preventing or limiting impacts within the dripline.

Roots may grow 2 to 3 times beyond drip line and near the surface.

DO

- Select appropriate plants
- Mulch with 2" to 4" of organic matter
- Protect from compaction
- Tunnel through soil for utility line installation
- If paving is required, use porous paving, such as brick on sand or gravel

DO NOT

- Compact soil with heavy machinery, vehicles, livestock, etc.
- Change drainage patterns
- Raise soil grade
- Lower soil grade
- Trench or otherwise cut roots
- Till