Eucalyptus Grove Management Plan

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Aviara
Eucalyptus Grove
Management Plan

Charles E. Morgan II
ISA Certified Arborist # WE5587A
Consulting Arborist

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Alden V. Pedersen
ISA Certified Arborist # WE-0607A
President, Western Tree Service

Bob Squibb
ISA Certified Arborist #WE-1787A
ISA Certified Tree Worker #1058; QAL #124452
Sr. Supervisor, Western Tree Service

DISCLOSURE

Trees inherently pose a certain degree of hazard and risk from breakage, failure, or other causes and conditions. Because structural defects, decay, and pests are often hidden within trees and below ground, there can be no guarantee or certainty that all hazardous conditions will be detected by visual inspection. Arborists cannot detect or anticipate every circumstance that could possibly lead to a tree's decline and/or failure, especially in the event of a storm or other Act of God.

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AVIARA REGIONAL MAP

AVIARA NEIGHBORHOOD MAP

1. Introduction

1.1. Historical Overview

The story of Aviara is the story of Batiquitos Lagoon. It begins with the Swamp Lands Grant Act of 1850 in Arkansas in which States were granted the right to sell swamplands as real estate parcels to developers for agricultural or other uses as they saw fit. Selling swamps for development allowed for revenue to States and the obvious filling of swamps and lagoons and cutting of swamp trees.

In approximately 1885, Thomas and Alfred Metcalf and a partner, Jacob Gruendike, purchased Batiquitos Lagoon along with all acreage on its shore, including part of present Leucadia, La Costa, and all acreage south of Poinsettia. The area totaled nearly 4,000 acres.

These developers had founded the Escondido Land and Town Company and were involved in the purchase and development of Coronado Island. The Batiquitos Lagoon area was planned to be developed as a City by these men, but due to lack of adequate freshwater the development stalled. Over the following decades most of the land was given to relatives of the Metcalfs, and some land sold for taxes.

In 1953, The Ayers family of developers from Los Angeles bought the Aviara area and named the area "The Ranch," but found that development was too difficult. So in 1977, the land was sold to the Hunt Brothers of Texas for potential development.

A critical factor impacting development of the area was the formation in 1982 of the Batiquitos Lagoon Foundation, a group whose goal was preservation of the Lagoon. Coincidentally, the City of Carlsbad annexed the Lagoon and the surrounding area in 1983 with the City agreeing to apply mitigation funds as well as water to aid in development of the area.

In 1988, the Hunt Brothers sold the land to the Hillman Company of Pittsburgh, and development of Aviara began in 1989.

The eucalyptus groves were no doubt planted by the Metcalf family, but there is no historical record of this large endeavor of planting 20,000 (or more) eucalyptus trees. The development of the golf course resulted in the removal of numerous portions of the groves by Davey Tree under contract, and what remains today is thought to be approximately 50% of the original grove inventories.

The developers of Aviara boxed and relocated 20+ specimens of the native Coast live oak to be maintained as monument trees. Several of those trees still exist although many did not survive transplanting.

Western Tree Service began working with Management and the Homeowners Association in 1991 to address the declining health of the oak trees which were transplanted to monument areas. As part of this effort, Western Tree Service worked with several horticulturists to help stabilize and improve the health of the trees. Despite these best efforts, a number of the trees had developed root decay and ultimately died and they were replaced with several species of pines including Torrey pine, Canary Island pine, and Mondale pine.

For over twenty years, grove tree pruning was mostly performed to create walking path hazard reduction and residential yard overhang clearance. During the late 1990's, red gum lerp psyllid infestation took a toll on several groves which were heavily planted with red gum eucalyptus, especially Groves 103 and 96. The psyllid infestation was moderated by extra irrigation performed by landscape crew and by the successful release of predatory wasps by State agencies.

Beginning in 2019, the Aviara Board authorized an aggressive project to remove dead, dying, and hazardous trees in a number of the groves, and this project is ongoing with four groves successfully completed in spring of 2020.

1.2. Statement of Purpose.

The Aviara Eucalyptus Grove Management Plan establishes a protocol to address the techniques required to blend the unique characteristics for the preservation of an urban forest and open space corridors and the mitigation of hazardous conditions.

2. Tree Resource Description

2.1. Aviara Eucalyptus Grove Structure

Aviara's eucalyptus groves include several hundred acres of approximately 4600 trees. The tree population primarily comprises red gum (*Eucalyptus camaldulensis*) and sugar gum (*Eucalyptus cladocalyx*).

2.1.1. Red gum

Red gum (commonly known as river red gum) is a tree that is endemic to Australia. It has smooth white or cream-colored bark, lance-shaped or curved adult leaves, flower buds in groups of seven or nine, white flowers and hemispherical fruit with the valves extending beyond the rim. A familiar and iconic tree, it is seen along many watercourses across inland Australia, providing shade in the extreme temperatures of central Australia. (Brooker & Slee, 1996)

Eucalyptus camaldulensis is a tree that typically grows to a height of 66 feet but sometimes to 148 feet, and often does not develop a lignotuber. The bark is smooth white or cream-colored with patches of yellow, pink or brown. There are often loose, rough slabs of rough bark near the base. The juvenile leaves are lance-shaped, 3.1–7.1 inches long and 0.51–0.98 inches wide. Adult leaves are lance-shaped to curved, the same dull green or greyish green color on both sides, 2.0–11.8 inches long and 0.28–1.26 inches wide on a petiole 0.31–1.30 inches long. The flower buds are arranged in groups of seven, nine or sometimes eleven, in leaf axils on a peduncle 0.20–1.10 inches long, the individual flowers on pedicels 0.079–0.394 inch long. Mature buds are oval to more or less spherical, green to creamy yellow, 0.24–0.35 inch long and 0.16–0.24 inch wide with a prominently beaked operculum 0.12–0.28 inch long. Flowering mainly occurs in summer and the flowers are white. The fruit is a woody, hemispherical capsule 0.079–0.197 inch long and 0.16–0.39 inch wide on a pedicel 0.12–0.47 inch long with the valves raised above the rim. (Brooker & Kleinig, 1994)

2.1.2. Sugar gum

Sugar gum is a species of eucalypt tree found in the Australian state of South Australia. It is found naturally in three distinct populations - in the Flinders Ranges, Eyre Peninsula, and on Kangaroo Island.

Eucalyptus cladocalyx is notable for its mottled colorful yellow to orange bark, strongly incomparable leaves and inflorescences grouped on leafless branchlets inside the tree crown. The old bark is smooth and grey, shedding in irregular patches to expose the fresh yellowy-brown bark. Flowers are creamy-white in summer. The capsules are barrel to urn shaped.

Sugar gums from the Flinders Ranges reach up to 115 feet in height and have the classic "gum" habit - with a straight trunk having a dbh (diameter at breast height) of 3 feet 3 inches to 4 feet 11 inches and steep branches occurring about halfway up the trunk. Each main branch ends with its own little canopy. These trees are commonly cultivated as farm windbreaks and for timber. However, Eyre Peninsula and Kangaroo Island trees are much shorter, typically between 26 to 49 feet in height and often have crooked trunks and a dbh of 1 foot 4 inches. The tree's crown has an open spreading habit with a typical spread of 39 to 49 feet.

The strongly unique, glossy adult leaves are arranged alternately, supported on a petiole that is 0.35 to 1.06 inch in length. The leaf blade is darker green on the upper side and paler below, with slightly falcate to lanceolate shape and a length of 3.1 to 6.7 inches and a width of 0.47 to 1.26 inches, with a base usually tapering to the petiole. The side-veins in the leaf are at an acute or wider angle and densely reticulate. The intra-marginal vein is parallel to but removed from the margin with small and obscure oil glands.

Sugar gum flowers in the summer, producing white-cream-yellow flowers. The axillary unbranched inflorescence occurs in groups of 7, 9 or 11 buds per umbel. The oblong pale green, yellow to creamy mature buds have a length of 0.31 to 0.43 inch and a width of 0.16 to 0.20 inch. The buds are often longitudinally striated and scarred with a rounded operculum, inflexed stamens and cuboid to oblong anthers. The urceolate (or barrel-shaped) longitudinally ribbed fruits that form after flowering are 0.28 to 0.59 inch in length and 0.20 to 0.39 inch wide with a descending disc and three or four enclosed valves. The light grey to brown seeds within the fruit have a flattened-ovoid shape that can be pointed at one end and are 0.059 to 0.118 inch long.

2.2. Aviara Eucalyptus Grove Stocking

Thinning of Aviara's eucalyptus groves started in late 2019 to achieve a desired spacing of 20 to 25 feet. Dead and declining trees were removed. Questions regarding actual tree population, species composition, tree health condition, available space for reforestation, and the resources available to support a thriving urban forest are all begging for answers. A forest inventory will provide the information needed to make the right grove management decisions.

2.2.1. Tree inventory

By its very nature and approach, a tree inventory spotlights individual trees rather than whole stands. The system is a method of obtaining and organizing information about the number, condition (of health), and

distribution of urban trees. Information that is accurate, accessible, and simple is one of the best tools for making planning and management decisions.

With tree inventory information, program resources can be allocated appropriately among the various tree management functions, work can be scheduled for maximum efficiency, and financial decision-makers can evaluate various work plan proposals by comparing expected results with budgets. (Oludunfe, 2011)

2.3. Aviara Eucalyptus Grove and Condition

Safety is rightly of a large concern at Aviara, taking cognizance of the considerable population of residents, workers, and visitors who live, work, and play in Aviara. Proactive urban forest management that minimizes risks to life and damage to property as well as optimizes benefits is, therefore, crucial.

2.3.1. Synopsis of Benefits from Aviara's Eucalyptus Grove

The USDA's Center for Urban Forest Research sited in the University of California at Davis has discovered that 100 mature trees intercept 210,000 gallons of rainwater per year. This translates to: (a) less storm water runoff and, consequently, less money spent on storm water control, (b) reduced soil erosion and water pollution, and (c) cleaner (forest-soil-filtered) storm water discharges. All the foregoing are of immense importance to Aviara.

Furthermore, from the standpoint of human health, the proper management of Aviara's eucalyptus grove enormously benefits both the City of Carlsbad and the region with the removal, by its estimated 4600 trees, of 1,279 tons of carbon dioxide and 26,924 pounds of pollutants from the atmosphere annually.

Moreover, according to a study conducted by the Human-Environment Laboratory of the University of Illinois at Urbana-Champaign, a tree-filled community, vis-à-vis one that is less forested, records a lower incidence of violence and vandalism, enjoys a safer and more sociable ambience, records lower stress levels in residents as well as affording them speedy recovery from ill-health.

Economically speaking, judicious forest management which employs the right tree in the right place saves up to 34% of annual air conditioning costs, makes parking lots 3 degrees Fahrenheit cooler in summer months, prolongs the life of parking lots, makes the interior of parked cars 30 degrees Fahrenheit cooler, and saves 25% of winter heating costs.

2.3.2. Safeguard of Life and Property at Aviara

The implementation of this eucalyptus grove management plan is expected to resolve and keep in abeyance the varied forest management issues that commonly afflict urban landscape trees. There is usually inadequate tree care coupled with the twin problems of disease and pest infestation; there are also problems of improper irrigation, allocation of inadequate tree growing space around homes and golf course, improper tree removal by unqualified people, and insufficient consideration for matters affecting tree resource improvement in land development planning.

Consequent to the foregoing forest management issues, incidence of tree failure is not uncommon in the urban forest, and this is a serious safety concern to the entire community. It is not an overstatement, therefore, to say that proper management of the urban forest at Aviara will reduce the presence of danger to life, reduce the incidence of damage to valuable property, minimize the probability of costly litigation, and prevent the wholesale loss of the myriad benefits accruable to Aviara from its urban forest.

2.3.3. Tree risk assessment

Tree risk is not unlike the everyday risk to which people are exposed. Tree risk is a combination of the probability of an event and the severity of its consequences. For tree owners, there are methods available to assess risk and make decisions accordingly. With all the tremendous benefits trees provide, no one wants them to hurt people or damage property. Tree risk assessment provides a way to minimize the chances that community or privately owned trees will cause harm. (Arbor Day Foundation, 2020)

3. Program Management

3.1. Related Plans and Guidelines

A significant portion of Aviara Eucalyptus Grove is designated as a deed restricted open space subject to applicable resource management criteria contained in the following documents:

1. The City of Carlsbad Hosp Grove Management Plan;
2. Aviara Fire Suppression Landscape Guidelines; and
3. The City of Carlsbad's *When Nature Is Your Neighbor* document.

The Eucalyptus Grove Management Plan's primary objectives include –

a. Grove planting density guidelines;

b. Grove maintenance procedures (care, pruning, retrenchment, removal); and

c. Grove diversity and replanting/replacement/reforestation methodology.

3.1.1. Carlsbad's Hosp Grove Management Plan

The City of Carlsbad Hosp Grove Management plans call for, in part, ongoing monitoring of trees in high -occupancy public areas, with a view to continuing tree maintenance practices such as thinning heavy branches and removal of diseased trees. These practices will improve the health of the grove while providing shaded recreation areas for the public to enjoy.

Consideration of tree density allows for proper maintenance, promotes vigor in the healthiest trees, and allows for timely fire response in the event of an emergency.

Forest inventory provides tracking services (location, type, condition of health, and maintenance history) for specific trees near property boundaries and high-use zones of urban forest areas. Since forest tree inventory provides the framework for tree risk assessment and management, it is important that data collection efforts should not be limited to interface areas – i.e., property boundaries, common areas, and high-use zones.

3.1.2. Compliance with Master Plan and Coastal Permit

Aviara's Master Plan and Coastal Permit provide for the creation of fire suppression zones wherever eucalyptus groves are located adjacent to development sites. These include areas within deed-restricted open spaces.

While providing fire suppression measures that meet the approval of local fire agencies, Aviara also strives to maintain the structural integrity and visual appeal of the groves. The intent of Aviara's fire suppression landscape guidelines is to meet both criteria to the satisfaction of the City of Carlsbad and the California Coastal Commission.

3.1.2.1. Landscape Zones

Fire control landscaping is divided into 3 Zones:

Zone1, Domestic landscape:

- Width varies with the setback of the structures from the edge of the development pad
- Avoid dense planting of tall plants

- Limit plantings against the structure
- Avoid highly flammable shrubs
- Thin dead branches and foliage
- Adhere to setbacks and architectural requirements

Zone 2, Fire retardant and low-fuel landscape:
- 20 feet in width from the edge of slope adjacent to pad to grove

Zone 3, Modified native landscape:
- 20 feet in width between Zone 2 and undisturbed existing grove

Zone 1 landscape standards include structural and landscape controls. Please refer to the Aviara Fire Suppression Guidelines and City Landscape Manual for guidelines and standards.

Zones 2 and 3 standards include thinning of dead and overly dense trees, clearing of selected understory plants presenting fire hazards, and removal of excessive tree litter from the ground.

3.1.2.2. Tree thinning

Zones 2 and 3
- Remove branches to the greater of 4 feet in height or three understory heights from ground
- New trees and saplings will be exempt from pruning until established
- Remove all dead and diseased trees
- Canopies of excessively dense trees shall be thinned
- Not more than 25% of live material should be removed from a tree during pruning

Brush management

Zone 2
- Clear high and moderate flammable species
- Maintain existing plants in random groupings not exceeding 400 square feet; maintain space between adjacent plant clusters
- Retain at least 30% native plant cover over area

Zone 3, Modified native landscape
- Clear highly flammable species
- Maintain existing plants in random groupings not to exceed 650 square feet; maintain space between adjacent plant clusters
- Remaining native plant coverage shall vary from 40% adjacent to Zone 2 to 60% adjacent at the outer edge of the fire suppression zone

Zones 2 and 3

- Retain and prune oaks and other indigenous native tree species
- Do not grub or remove plant rootstocks

Understory clearing

- Cut grasses and weeds over 3 feet tall
- Remove accumulations of weeds, grass, dead foliage, fallen limbs, forest floor litter, and debris

3.1.2.3. Scheduling

- Complete tree thinning, brush management, and understory cleaning before May 15
- Landscape Contractor to provide additional periodic pruning throughout the year as needed
- Promptly remove all debris from the site

3.1.2.4. Monitoring and Maintenance

Eucalyptus grove monitoring and maintenance are the responsibility of the Aviara Master Homeowner's Association.

- Monitor every year for conformance with guidelines
- Maintain control of activities within the native spaces
- Control invasive plants and exotic weeds

Inspections shall be made annually, prior to May 15, to ensure compliance with these guidelines:

- Plant regrowth is in conformance with approved guidelines
- In native open spaces, maintain control over fires, occupancy by transients, and other activities
- Control invasive plants and exotic weeds
- Photo-documentation of fire suppression zones is recommended

3.1.3. City of Carlsbad's When Nature Is Your Neighbor Document.

City of Carlsbad's *When Nature Is Your Neighbor* program recommends creating a 60-foot safety zone around a residence.

Zone 1: 0-20 feet
Plant fire-resistant, irrigated landscaping in this area

Keep residential landscaping watered and healthy. Remove dry and dead flammable plants located within 6 feet of your residence

Prune Trees back away from the eave line so they don't overlap with the roof of the house

Zone 2: 20-40 feet
Native plants and shrubs should be thinned in a mosaic pattern (with space between plant clusters). Grass and weeds should be cut back to no higher than four inches above the ground

Zone 3: 40-60 feet
Thinning and regular maintenance of plants (removal of dead plants and tree branches). Thin and separate trees and shrubs

3.1.4. Tree Work in the Groves

3.1.4.1 Annual Tree Inspections

Under Aviara Landscape Committee's direction, an ISA-Certified Arborist will be responsible for the regularly scheduled grove inspections to determine the scope of maintenance for each grove area. Annual inspection reports and detailed bid estimates to complete recommended annual maintenance will be provided to the Association Landscape Committee for appropriate action.

Inspection criteria include the following:

1. Evaluate tree removals in compliance with established criteria for potential hazards, dead or dying trees, diseased trees, structurally unsound trees, and overly dense tree canopies.
2. Assess tree pruning needs according to observable damage, extreme tree lean, and branch structure and attachment. Furthermore, assess the need for crown thinning to promote light penetration to the forest floor. Evaluate the need for forest floor litter reduction and removal of potential fuel ladder.
3. Identify suckers posing as large trees, with excessive trunk heights and weights, which may not be structurally sound and make a recommendation for pruning or removal.
4. Determine the status of trees with multiple break-outs caused by included bark and recommend maintenance options.
5. Evaluate removal of trash, debris, excessive native plant materials, and flammable vegetation.

3.1.4.2. Tree Pruning Cycles

Aviara's eucalyptus groves will be pruned on a 3-5-year cycle. The findings during the annual grove inspections will determine the tree pruning cycle length - 3-year or 5-year - for each grove.

It is necessary to establish a timeline to complete annual maintenance in each of the 31 grove areas. The scope of maintenance required in each grove will be determined by Aviara Master Association Board of Directors and its Landscape Committee based on the annual inspection reports for each grove and the approved maintenance guidelines.

3.1.4.3. Pest and Disease Control

The eucalyptus groves will be monitored annually for disease and pest infestation. Lerp psyllid, the long-horned borer, and other common eucalyptus pests and diseases can be controlled using integrated pest management strategies.

3.1.4.4. Wildlife Protection

Prior to a scheduled grove maintenance which falls in the prime nesting season, March 15 to May 30, a wildlife inspector shall survey the designated grove area to determine if there are active nests that may be disturbed. If in the opinion of the wildlife inspector documented active nests exist, the scheduled grove maintenance must be rescheduled. Maintenance crews must avoid grove access through designated native habitat areas. *During the secondary "song bird" nesting period, including June 1 through August 31, a review by a wildlife inspector is recommended prior to the commencement of grove maintenance.*

To protect wildlife, work in the groves will be conducted from September through January.

Tailgate safety and environmental awareness training will be performed prior to tree work in grove areas.

Tailgate Attendance Record

Foreman/Crew Leader:_____

Name	Signature	Date
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

Tree Care For Birds and Other Wildlife - treecareforbirds.com
Thank you to the primary project funders: The Britton Fund and CAL FIRE Urban and Community Forestry

QUIZ TREE CARE FOR WILDLIFE

Complete the following:

NAME:_____DATE:_____SIGNATURE:_____

Multiple choice instructions: Select one or more answers that best suit the question:

Federal and state regulations prohibit tree care providers and others from:

1. Destroying only nests with young wildlife
2. Disturbing or destroying the nests of native wildlife if they contain eggs or young, or if the young still rely on their parents.
3. Destroying all abandoned nests

Before starting work it is best to:

1. Determine if it is the nesting season

2. Consider the habitat value of the work site and the risk of wildlife presence.

3. Turn off all noisy equipment.

4. Do a pre-work survey for wildlife

5. Come prepared with contact information for a Wildlife Biologist or Wildlife-Trained Arborist, and a Wildlife Rehabilitator.

5. All of the above.

Most wildlife nest at this time of the year:

1. January-July
2. February-August
3. March-October

Which type of habitat has the highest chance of wildlife presence:

1. Riparian

2. A small recreational park with some trees and vegetation.

If unsure of whether to continue work in a tree when it has an active nest, the first best thing to do is:

1. Stop work in the tree and return when the young no longer use the nest and rely on their parents.
2. Call a supervisor, Wildlife Biologist or the CA Department of Fish and Wildlife.

It is permitted to take a native injured or young bird home if you want to adopt it:

Yes No

If you find an injured or immature bird, the best thing to do is:

1. Catch it, put it in a safe place and call a Wildlife Rehabilitator

2. Leave it alone, watch to see if its parents are looking after it, and then call a Wildlife Rehabilitator or Wildlife Biologist for guidance if you are not sure what to do.

Tree Care For Birds and Other Wildlife - treecareforbirds.com
Thank you to the primary project funders: The Britton Fund and CAL FIRE Urban and Community Forestry

Pre-work site inspection will be conducted in the days prior to starting work but not more than a week before field work begins.

Site inspectors must look for signs of wildlife and nesting birds in likely locations. Nests which have eggs or immature birds in them (active nests) must not be disturbed. Stick nests are protected by law all year round.

If an active nest is present, work must be delayed until the immature wildlife have left the nest. (Wildlife continue to rely on parents in the first few weeks after they have left the nest.) If work must proceed for safety considerations, an arborist trained in wildlife management or a wildlife inspector must be consulted for instructions before the continuation of field work.

If a nest or wildlife is accidentally injured, a Wildlife Rehabilitation Center or Wildlife Inspector must be contacted for help with wildlife handling. Workers on the site must keep the bird in view but keep away from it. Onsite workers must avoid handling or relocating injured wildlife unless directed to do so by qualified biologists. It is against the law to take a bird home. It is illegal for anyone to keep a nest, or any part of a native bird (including feathers), without a permit from the U.S. Fish and Wildlife Service.

Wildlife Monitoring Form

Inspector:_____ Certification Level:_____ Date:_____
Time:_____ Weather conditions:_____
Description of work:_____ When is work: _____
Wildlife Biologist:_____ Wildlife Rehabilitator:_____

Habitat Value

Low
- ☐ High human use
- ☐ High impervious surfaces
- ☐ Low plant species diversity
- ☐ Low plant structural diversity
- ☐ Far from water bodies
- ☐ Few mature, dead and dying trees
- ☐ Few/no wildlife present

High
- ☐ Low human use
- ☐ Low impervious surfaces
- ☐ High plant species diversity
- ☐ High plant structural diversity
- ☐ Close to water bodies
- ☐ Many mature, dead and dying trees
- ☐ Abundant wildlife present

Riparian
- ☐ Within or adjacent to water bodies
- ☐ Within or adjacent to dry water channels
- ☐ Riparian vegetation present

Breeding Season
- ☐ Breeding Season (Feb. 1 – Aug. 31)
- ☐ Non-breeding Season (Sep. 1 – Jan. 31)

Category

☐ Category 1 ☐ Category 2 ☐ Category 3

Recommended level of training: _____

Inspection
- ☐ Scan the sky, trees, ground, shrubs, and branches.
- ☐ Check trunk or branch cavities and holes in the ground.
- ☐ Listen for wildlife sounds.
- ☐ Look for wildlife flying or running away.

Signs of Nesting Wildlife
- ☐ Nests that may have eggs or young
- ☐ Concentrations of white colored droppings
- ☐ Wildlife exhibiting breeding behavior
- ☐ Wildlife carrying nesting materials
- ☐ Repeated wildlife visits to area

Nest Found
- ☐ Location_____
- ☐ Species_____
- ☐ Type_____
- ☐ Buffer Distance _____

Active Nest? (Y / N)
- ☐ Nest contains eggs or young wildlife

Health and Human Emergency

Risks _____
Actions _____

Wildlife Emergency

Situation _____
Contacted _____
Advice given _____
Actions _____

Wildlife Monitoring Form (Page 54, **Tree Care for Birds & Other Wildlife**, www.treecareforbirds.com, February 2018)

3.2. Forest Conservation Policies

The following policies and operation plans provide direction for the maintenance and enhancement of the eucalyptus groves at Aviara.

3.2.1. Grove Resource Inventory

The following attributes, at a minimum, will be collected during the inventory of grove trees:

- **Mapping coordinates.** X and Y coordinate locations (latitude and longitude). Each tree and planting site will be located using GIS maps and/or GPS equipment.

- **Facility Vicinity.** The location of each grove tree and planting site so that they can easily be identified for future work. Grove trees and planting sites will be located using a Grove area number, side of lot, tree number, and facility vicinity information (on street, from street, and to street).

- **Area.** Tree locations will be identified by Grove number.

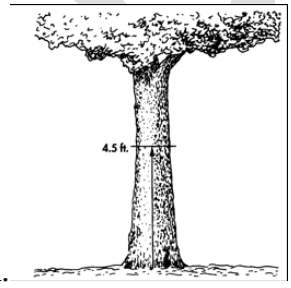
- **Location.** The tree's physical location in relation to public Right of Way, important facilities, and/or public space will be recorded.

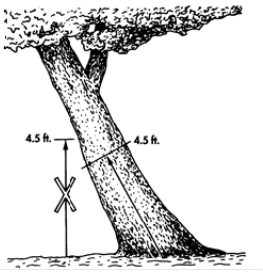
- **Species.** Trees will be identified by *genus* and *species,* and by common name.

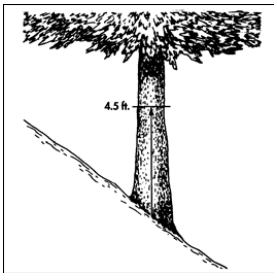
- **Diameter (trunk diameter at breast height, or dbh).** Tree trunk diameter will be recorded. This shall be to the nearest 1 inch.

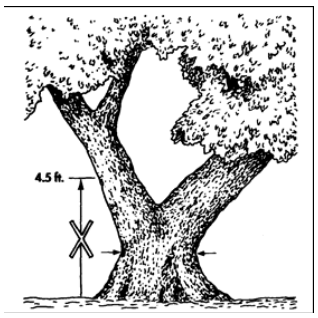
Illustration of Tree Measurement

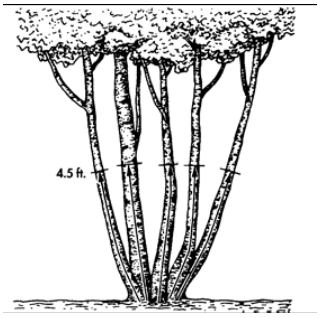
(From: Guide for Plant Appraisals, 9th Ed).

A. 

B. 

C. 

D. 

E. 

a). Straight trunk: Trees with fairly straight, upright trunks should be measured four and a half (4.5) feet above the ground (See illustration A).

b). Trunk on an angle or on a slope: The trunk is measured at right angles to the trunk four and a half (4.5) feet along the center of the trunk axis, so the height is the average of the shortest and the longest sides of the trunk (see Illustrations B and C).

c). Trunk branching lower than four and a half (4.5) feet from the ground: When branching begins less than four and a half (4.5) feet from the ground, measure the smallest circumference below the lowest branch. In this example, an alternative would be to add the sum of the cross-sectional areas of the two stems measured about 12 inches above the crotch. Then average the sum of these two branch areas and the smallest cross-sectional area below the branches. This may give a better estimate of the tree size (see Illustration D).

d). Multi-stemmed tree: To determine the diameter of a multi-trunk tree, measure all the trunks; add the total diameter of the largest trunk to one-half (1/2) the diameter of each additional trunk (see Illustration E). A multi-trunked tree is differentiated from individual trees growing from a common root stock if there is a visible connection between the trunks above ground.

- **Stems.** The number of stems a tree has will be recorded.

- **Observations.** General observations referring to a tree's health, structure, and location will be made.

- **Clearance Requirement.** Trees, which are causing or may cause visibility or clearance difficulties for pedestrians or vehicles, will be identified, as well as those trees blocking clear visibility of signs or traffic signals.

- **Hardscape Damage.** Damage to sidewalks and curbs by tree roots are noted. Notes on potential fixes for the problem are encouraged (redesign options, etc).

- **Overhead Utilities.** The inventory indicates whether overhead conductors or other utilities are present at the tree site that could result in conflicts with the tree.

- **Grow space.** The area within the growing space is categorized as:

T	Tree Lawn
W	Well/Pit
M	Median
P	Parking Lot
R	Raised Planter
O	Open/Unrestricted
I	Island
U	Unmaintained Area

- **Space Size.** The narrowest dimension of the Grow Space, in feet (i.e. 3'x3' cutout, 4' street planting strip, open parkland, etc).

- **Notes.** Additional information regarding disease, insect, mechanical damage, etc can be included in this field.

  Condition. In general, the condition of each tree will be recorded in one of the following categories adapted from the rating system established by the International Society of Arboriculture:

Excellent	100%
Very Good	90%
Good	80%
Fair	60%
Poor	40%
Critical	20%
Dead	0%

- **Required maintenance.** A summary of scheduled maintenance works and time frames.

- **Maintenance history.** Provision shall be made for recording maintenance history of each tree.

Tree Inventory Field Data Sheet

Date: _____ Location: _____

Surveyor: _____ Weather: _____

ID#	Coordinates	Species	DBH	Height	Grow space/ Space size	Condition	Comments	Required Mtce	Hazard

Condition Rating:

4: Excellent (textbook perfect)
3: Good (good but a few defects)
2: Fair (OK, but some defects)
1: Poor (decline, many defects)
0: Dead

Comment Key:

TG: Existing Target
LN: Lean
MT: Multiple Trunks
CD: Co-dominant Trunk
CA: Cavities & Decay
CR: Cracks
HA: Hangers
DB: Dead Branches/Dieback
IN: Included Attachments
PS: Pests
DS: Disease
SP: Sap/Gum Flow
CK: Cankers/Galls
HV: Heaving Soil
RT: Root Problem/Girdling
TR: Wetted Trunk
OTH: Other (please indicate as clearly as possible)

Hazard Key:

NH: No Hazard
LH: Low Hazard
MH: Moderate Hazard
SH: Severe Hazard

NOTE: Data recorded on this form consists of purely subjective delineations based on external indicators only; additional observation and analysis will be required to produce more accurate conclusions and better-informed recommendations on management and/or abatement.

3.2.2. Tree Pruning and Tree Removal

All tree pruning and removal works shall be in total conformity with ANSI A300 Pruning Standards and shall be handled by a tree care industry contractor approved by the Aviara Landscape Committee. The tree pruning and removal works shall be supervised by an International Society of Arboriculture-Certified Arborist.

The following service priority gradations shall be observed in determining trees to be pruned or removed:

1. <u>Priority 1 Prune (Trees ≥6" DBH, ≥12' Height).</u> Trees that require Priority 1 Pruning are recommended for pruning to remove hazardous deadwood, hangers, or broken branches. These trees have broken or hanging limbs, hazardous deadwood, and dead, dying, or diseased limbs or leaders greater than four inches in diameter.
2. <u>Priority 2 Prune (Trees ≥6" DBH, ≥12' Height).</u> These trees have dead, dying, diseased, or weakened branches between two and four inches in diameter and are potential safety hazards.
3. <u>Large Tree Routine Prune (Trees ≥20" DBH, ≥50' Height).</u> These trees require routine horticultural pruning to correct structural problems or growth patterns, which would eventually obstruct traffic or interfere with utility wires or buildings. Trees in this category are large enough to require bucket truck access or manual climbing.
4. <u>Small Tree Routine Prune (Trees 2"-6" DBH, ≤12' Height).</u> These trees require routine horticultural pruning to correct structural problems or growth patterns, which would eventually obstruct traffic or interfere with utility wires or buildings. These trees are small growing, mature trees that can be evaluated and pruned from the ground.
5. <u>Training Prune (Trees 1"-2" DBH, ≤8' Height).</u> Young, large-growing trees that are still small must be pruned to correct or eliminate weak, interfering, or objectionable branches in order to minimize future maintenance requirements. These trees, up to 20 feet in height, can be worked with a pole saw by a person standing on the ground.

6. **Priority 1 Removal.** Trees designated for removal have defects that cannot be cost-effectively or practically treated. The majority of the trees in this category has a large percentage of dead crowns and poses an elevated level of risk for failure. Any hazards that could be seen as potential dangers to persons or property and seen as potential liabilities would be in this category. Large dead and dying trees that are high liability risks are included in this category. These trees are the first ones that should be removed, and they should be removed as soon as possible.
7. **Priority 2 Removal.** Trees that should be removed but do not pose a liability as great as the first priority will be identified here. This category would need attention as soon as "Priority One" trees are removed.
8. **Priority 3 Removal.** Trees that should be removed, but that pose minimal liability to persons or property, will be identified in this category.
9. **Tree Removal Adjacent to Protected Trees.** When trees are removed and adjacent trees must be protected, then the following tree removal practices apply:

    a. ***Tree Removal*** - Removal of trees that extend into the branches or roots of protected trees shall not be attempted by grading or other heavy equipment. A certified arborist or tree worker shall remove the tree carefully in a manner that causes no damage above or below ground to trees that remain.

    b. ***Stump Removal*** – Before commencing stump removal, all underground utilities within the vicinity of the tree stump, allowing one foot for every inch of stump diameter, must be identified and clearly marked out. Proper precautions must be taken to prevent damage to utilities within tree stump removal areas.

Regular work requests are for all tree maintenance works that do not fall under the **Tree Emergencies** category. These types of requests include pruning of trees not posing an immediate hazard to human life or property or for large-scale projects (for example, trees blocking light fixtures, signs, or impeding walkway/road clearance), and require a written request submitted to the Aviara Landscape Committee. Written requests will be reviewed and prioritized by the Aviara Landscape Committee or his representative.

Trees that pose immediate danger to life and property have a pride of place over all else; such trees are to be dealt with as soon as feasible after the presence of a qualifying hazardous condition has been ascertained.

3.3. Grove Resource Enhancement

During the Grove Resource Inventory exercise, vacant planting sites, in addition to other apparent sites whence numerous trees have been lost, will be identified by nearby facilities. The size of the site is designated as small, medium, or large (indicating the ultimate size that the tree will attain), depending on the growing space available and the presence of overhead utility lines. It is recommended that trees be planted in all the vacant sites in any grove.

3.3.1. Choice of Trees

In all cases of tree planting, the guiding principle shall be to install the right tree, in form and for function, in the right place. **When specifying trees for planting at Aviara, consideration shall be given to tree species recommended for eucalyptus groves in Southern California.** All proposed trees shall be in compliance with established Aviara design guidelines.

3.3.2. Tree Species Diversity Planting Requirements

The Aviara Landscape Committee will review tree planting plans to ensure species diversity (i.e., to avoid creating monocultures, or areas of plantings made up of only one species of trees). Monocultures are undesirable because if a certain species is prone to a particular disease or is more susceptible to storm damage or temperature extremes, then it is likely the entire stand could die or be destroyed by a single disease or weather event. Creating planting areas of several species creates a more diverse, and therefore more resilient, urban forest.

Factors to be considered in acceptable and successful tree planting include the long term health of the tree in its location and its compatibility with adjacent uses as well as the area's landscape design intent.

In consideration of the financial impact realized by Aviara, it is important that long term maintenance of proposed trees be considered prior to their selection.

Any tree species known to have an aggressive or rampant root system shall not be planted along Aviara streets to avoid damage to roadways, sidewalks, utilities, curbs, and gutters.

3.3.2.1. Replanting methodology

Reforestation of Aviara Groves includes replacement planting of dead and dying trees. Following management plan compliant designated tree removals,

selective replacement plantings will be evaluated. Replacement tree protocol will employ a dual objective of density and age diversity. The density factor institutes the established spacing guidelines while age diversity element encourages a timed program of planting adjacent trees at five year intervals.

Planting replacement trees in one-gallon size is recommended rather than 5 gallon size or larger. The smaller trees typically surpass the larger size stock in size, trunk diameter, and vigor within a relatively short growth period. Healthy root structure development is also superior in the smaller-sized nursery stock.

Site and soil preparations, drainage, nutrient amendments, and staking should be completed according to accepted reforestation practices.

All newly planted trees will require supplemental irrigation and light structural pruning to train and develop their basic framework.

The recommended eucalyptus species that have greater drought tolerance with proven resistance to pests and similar in character to the existing trees include the following:

E. leucoxylon – white-iron bark
E. polyanthemos – silver dollar gum
E. sideroxylon – Red-iron bark
E. ficifolia (*Corymbia ficifolia*) – red-flowering gum
E. erythrocorys – red-capped gum*
E. pulverulenta – silver-leaved mountain gum*
E. leucoxylon ssp. *megalocarpa* – large-fruited yellow gum*

*Smaller trees recommended for replanting near residential fence lines and pathways.

3.3.3. Planting Distances/Spacing Requirements

No large- or medium-maturing tree species shall be planted within any power or utility easements or under overhead utility distribution lines if the average mature height of the tree is greater than the lowest overhead wire.

Tree selection shall take into consideration requirements for future height clearances. As they grow, trees will need to be pruned to provide pedestrian clearance of at least 8 feet over sidewalks, and vehicular clearance of 14 feet over roads.

3.3.4. Supply of Tree Planting Stock

Since the first step in avoiding *future* problem trees is to plant high quality stock, poor stock trees will not be approved for planting in any part of Aviara

regardless of whether the trees are meant to complete in-house projects or supplied by contractors in association with facility development.

All trees delivered to Aviara for planting shall be inspected and approved by the Aviara Landscape Committee or his/her representative *before* installation. It is required that contractors or tree suppliers provide a minimum of two working days' notice to the Aviara Landscape Committee for all inspections. For the reason that poor planting stock will end up costing much more money in the long run because of increased maintenance requirement and shorter life span, Aviara shall reject poor quality trees upon delivery. The supplier(s)/contractor(s) shall bear the cost of evacuating such rejected tree stock from Aviara.

Furthermore, all trees supplied by contractors in association with facility development shall be guaranteed for 1 year from acceptance after planting.

While inspecting trees delivered to Aviara for planting, the Aviara Landscape Committee or his/her representative shall look for the following:

PROPER IDENTIFICATION

All trees shall be true to name as ordered or shown on the planting plans and shall be labeled individually or in groups by species and cultivar (where appropriate).

TREE HEALTH

As typical for the species/cultivar, trees shall be healthy and vigorous, as indicated by:

- foliar crown density
- length of shoot growth (throughout crown)
- size, color, and appearance of leaves
- uniform distribution of roots in the container media
- appearance of roots
- absence of twig- and/or branch-dieback
- relative freedom from insects and diseases

Note: some of these characteristics cannot be used to determine the health of deciduous trees during the dormant season.

CROWN

Form: Trees shall have a symmetrical form as typical for the species/cultivar and growth form.

Central Leader: Trees shall have a single, relatively straight central leader and tapered trunk, free of co-dominant stems and vigorous, upright branches

that compete with the central leader. Preferably, the central leader should not have been headed. However, in cases where the original leader has been removed, an upright branch at least ½ (one-half) the diameter of the original leader just below the pruning point shall be present.

Note: This section applies to single trunk trees grown with normal straightness, as typically used for street or landscape planting. This specification does not apply to plants that have been specifically cultured in the nursery or selected for unusual or unique shape, such as contorted forms, topiary forms, espalier forms, multi-stem, or clump forms.

Evaluating trunk and branch structure

Trunk structure: Shade trees that are large at maturity, and most evergreen trees, with the best quality have a dominant or central leader or trunk up to the top of the canopy. There should be small branches distributed radially along the trunk, so that the crown accounts for about ⅔ of the tree's height. Shade trees of lesser quality have two or more leaders or trunks; they could split apart as they grow older. Small ornamental trees can have several trunks.

1. Trunk diameter and taper shall be sufficient so that the tree will remain vertical without the support of a nursery stake.

2. The trunk shall be free of wounds (except properly-made pruning cuts), sunburned areas, conks (fungal fruiting-bodies), wood cracks, bleeding areas, signs of boring insects, galls, cankers and/or lesions.

3. Trunk diameter at 6" (six inches) above the soil surface shall be within the diameter range shown for each container size below:

Container Size	Soil Volume in Gallons (approx)	Trunk Diameter (inches)	Soil Level from Container Top (inches)
# 5	0.6	0.5 to 0.75	1.25 to 2
# 15	3.3	0.75 to 1.5	1.75 to 2.75
24-inch box	10.5	1.5 to 2.5	2.25 to 3

Branch structure: The better quality, large-maturing shade trees have all branches less than about two-thirds of the trunk diameter. Poor quality shade trees have larger upright branches. Trees such as crape myrtle and other small-maturing trees can have several trunks.

Trees with extensive defects in branches such as cracks and included bark represent lesser quality than trees free of these potential problems. Branches with bark inclusions are weakly attached to the tree and can split easily.

Potential Main Branches: Branches shall be distributed radially around and vertically along the trunk, forming a generally symmetrical crown typical for the species.

1. Potential main branches shall be evenly spaced and have appropriate space between them.

2. Branches shall be no larger than 2/3 (two thirds) the diameter of the trunk, measured 1" (one inch) above the branch.

3. The attachment of scaffold branches shall be free of included bark.

Temporary branches: Unless otherwise specified, small "temporary" branches should be present along the lower trunk below the first potential permanent branch, particularly for trees less than 1½" (one and one-half inches) in trunk diameter. Temporary branches should be distributed around and vertically along the lower trunk. They should be no greater than ⅜" (three-eighths inch) in diameter and no greater than ½ (one-half) the diameter of the trunk at the point of attachment. Heading of temporary branches is usually necessary to limit their growth.

ROOTS

1. The trunk, root collar (root crown) and large roots shall be free of circling or kinked roots. Soil removal near the root collar may be necessary in order to verify that circling or kinked roots are not present.

2. The tree shall be well rooted in the container. When the trunk is carefully lifted both the trunk and root system shall move as one.

3. The uppermost roots or root collar shall be within 1" (one inch) above or below the soil surface. The soil level should be within 2' (two inches) of the top of the container (see table above, under "Trunk Structure").

4. When the container is removed, the root ball shall remain intact.

5. The root ball periphery should be free of large circling and bottom-matted roots. There should be a well developed root system, but not a dense mass from being pot-bound.

6. The root ball size should be suitable to the height of the tree (see *American Standard for Nursery Stock*).

7. On grafted or budded trees, there shall be no suckers from the root stock.

8. If balled and burlapped, only natural burlap or wire baskets are allowed.

All plants must conform to the current edition of the *American Standard for Nursery Stock ANSI Z60.1*.

MOISTURE STATUS
At time of inspection and delivery, the root ball shall be moist throughout, and the tree crown shall show no signs of moisture stress, as indicated by wilt. Roots shall show no signs of being subjected to excess soil moisture conditions, as indicated by root discoloration, distortion, death, or foul odor.

3.3.5. Planting Site Preparation
Soil preparation and conditioning: All debris, wood chips, pavement, concrete, and rocks over 2 inches in diameter shall be removed from the planting pit to a minimum of 24-inch depth, unless specified otherwise.

Planter pit preparation:

a). Mark out a planting area 2 to 3 times wider than the root ball diameter (the wider the better). Loosen this area to about 8 inches deep. This will enable the tree to extend a dense mat of tiny roots well out into the soil in the first one to ten weeks in the ground.
b). Excavate the hole's width a minimum of two times the diameter of the container, and deep enough to allow the root ball of the container to rest on firm soil with the top of the root ball even with the grade. Scarify the sides and the bottom of the pit.

Drainage: Adequate drainage must be provided to the surrounding soil for the planting of new trees. If the trees are to be planted in impermeable or infertile soil and water infiltration rates are less than two (2) inches an hour, then one of the following drainage systems or other approved measures must be implemented:

- French drain, a minimum of three feet in depth
- Drain tiles or lines beneath the trees
- Auger six drain holes at the bottom perimeter of the planting pit, at a minimum of four (4) inches in diameter, twenty-four (24) inches deep and filled with medium sand or fine gravel.

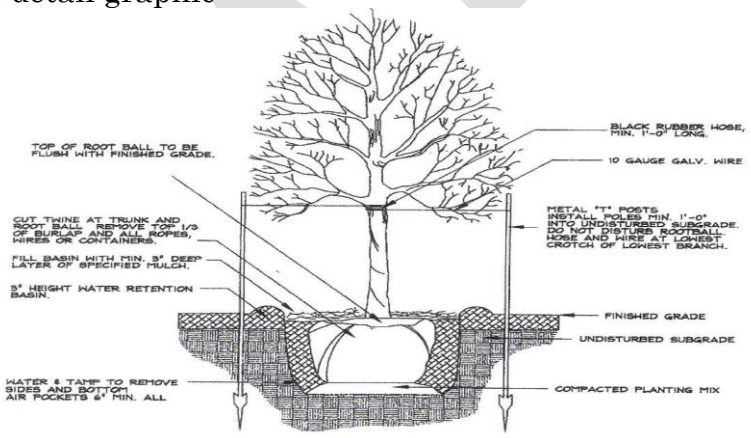
3.3.6. Planting the Tree

After the hole has been prepared as described above, the tree is ready to be planted.

Container grown tree: Pull the container away from the root ball. Don't pull the tree out by its trunk. Container grown trees often have circling or girdling roots running along the edge of the rootball. If they exist in this area, cut them and spread them apart. Place the root ball in the center of the hole and adjust the tree so it is straight and at the proper level. Make any adjustments prior to filling the hole with dirt.

Ball and burlapped tree: Rest the root ball in the center of the hole, and reshape the hole so the tree will be straight and at the proper level. After adjusting the tree, pull the burlap and any other material away from the sides and top of the root ball. Do not remove the burlap from the bottom. If you adjust or lift the tree after the burlap has been removed, you run the risk of damaging the root system.

Tree planting detail graphic:



Backfill soil, amended soil: Backfill with the original soil unless the original soil has been removed or the soil is poor. If soil must be amended, it shall be the most appropriate soil mix as directed by a Landscape Architect or a Certified Arborist, and in consultation with the Aviara Landscape Committee.

Filling the hole: Fill the tree hole until it is half full. Flood the hole with a slow hose or tamp gently with your foot to firm the soil. Repeat until the hole is full. Do not press the soil too firmly, only firm enough to hold the tree upright. Backfilling with soil and water or gently tamping will remove large air pockets.

Construction of a berm or dam: Construct a small berm or dam three (3) feet in diameter around the tree. The berm should be approximately three (3) inches high.

Mulching: Cover the entire loosened area of soil with 2 to 4 inches of mulch composed of shredded wood or bark in the entire planting area. Mulch will be placed one to two inches away from the trunk of the tree.

Staking or Guying
Bamboo/nursery stakes, if any, will be removed. Staking or guying is to prevent movement of the lower trunk and root system until the new tree establishes strong anchorage. Movement of the top is desirable and will strengthen the tree. The stakes will be installed 12-18 inches in undisturbed soil outside of the planting hole. Depending on height and size of the tree, stakes shall be six, eight, or ten feet tall. Trees shall be staked with 3 lodge pole stakes. Stakes shall not be taller than the first main branches of the tree nor rub against tree trunks.

Tree ties will be located near the lowest main branch on the tree. Check a staked or guyed tree monthly during the growing season and after storms or strong wind. The system will be snug, but not to the point of making an impression on the stem or trunk. If that happens, the tie or wire around the trunk shall be loosened. No tree shall be staked any longer than absolutely necessary. One or two growing seasons is all that is needed.

Pruning Newly Planted Trees
Young trees are pruned to allow for proper growth through the years. If the tree is of high quality stock, it should need little pruning. It is no longer common practice to automatically prune a certain percentage of limbs from a newly planted tree. The tree needs as much foliage as can be available to assure rapid growth and desirable leaf structure. This includes refraining from "limbing up" and topping.
Pruning Guidelines

All tree pruning operations must be in full conformity with ANSI A300 Standards for Tree Care Operations.

Scaffolding/permanent branches: Identify the scaffolding/permanent branches. The lowest permanent branch should have a diameter of one-half or less of the trunk diameter where the branch attaches to the trunk. The vertical spacing of permanent scaffold branches should equal a distance 3% of the tree's eventual height. Thus, a tree that will be 50 feet tall should have permanent scaffold branches spaced about 18 inches apart along the trunk. Avoid allowing two scaffold branches to arise one above the other on the same

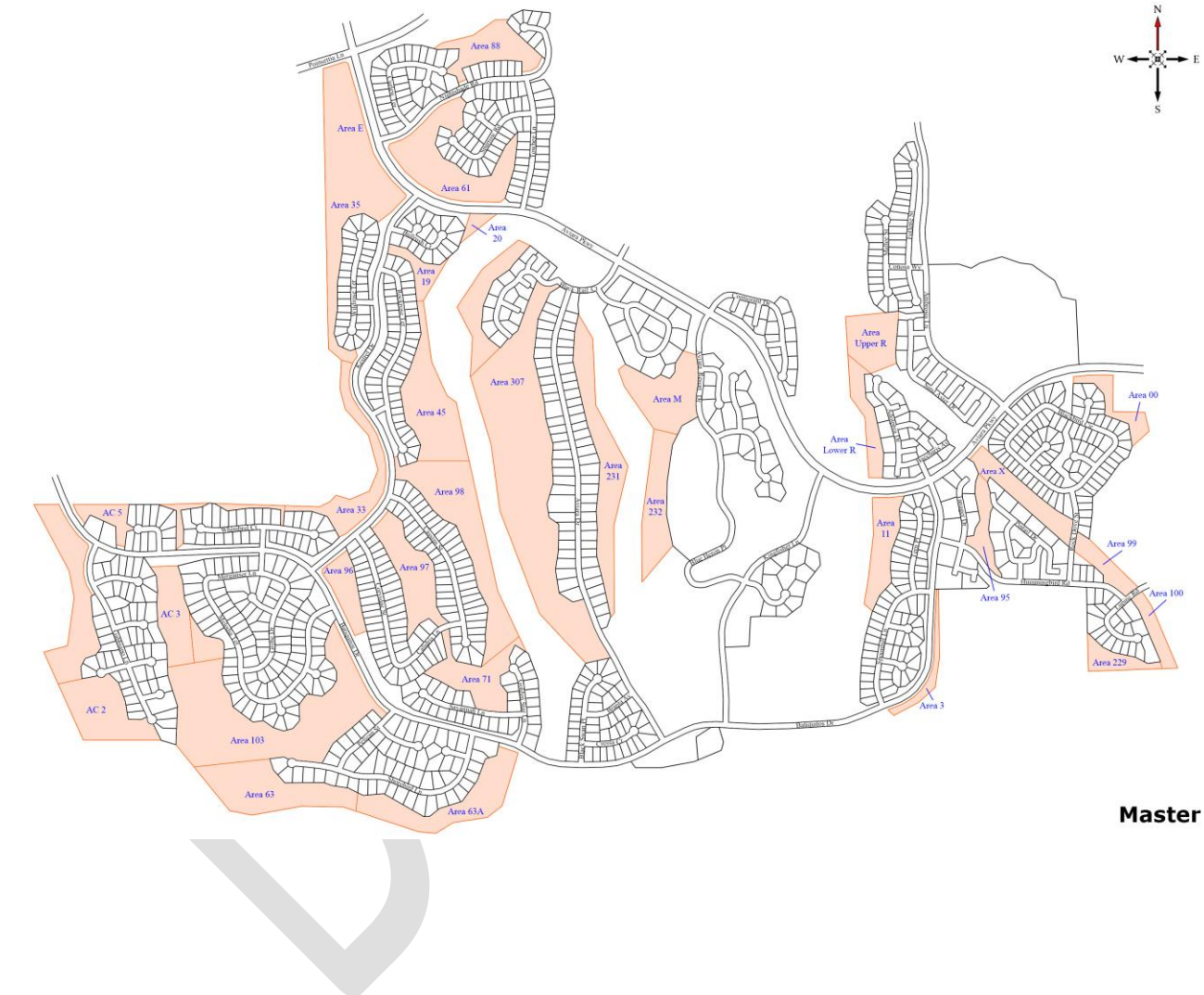
side of the tree. Maintain radial balance with branches growing outward in each direction.

Appendix A.

Grove Maps

Aviara

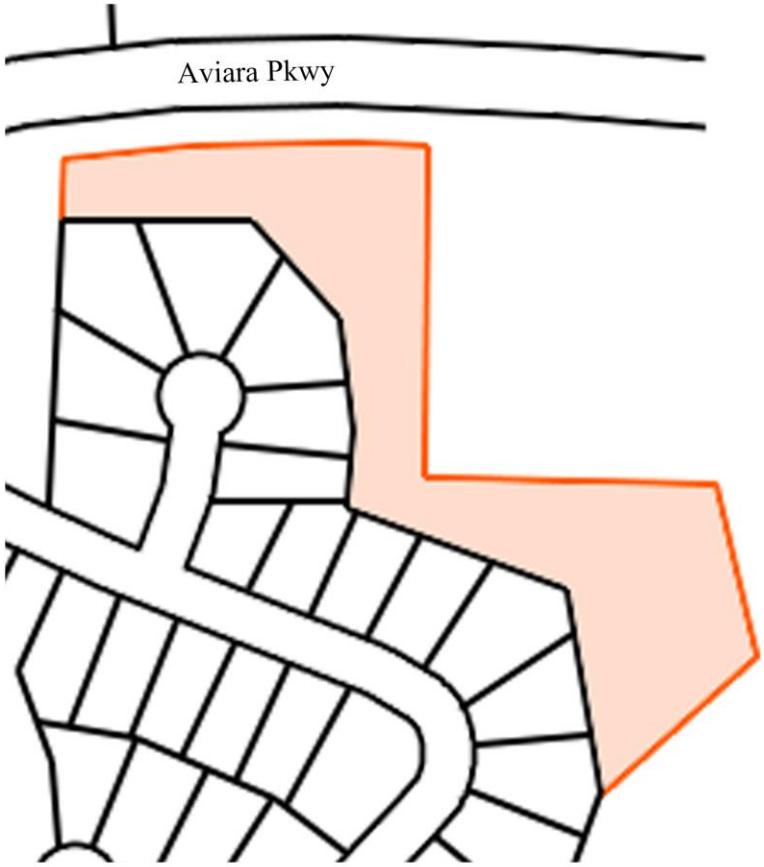
Grove Management



Master

Aviara - Area 00

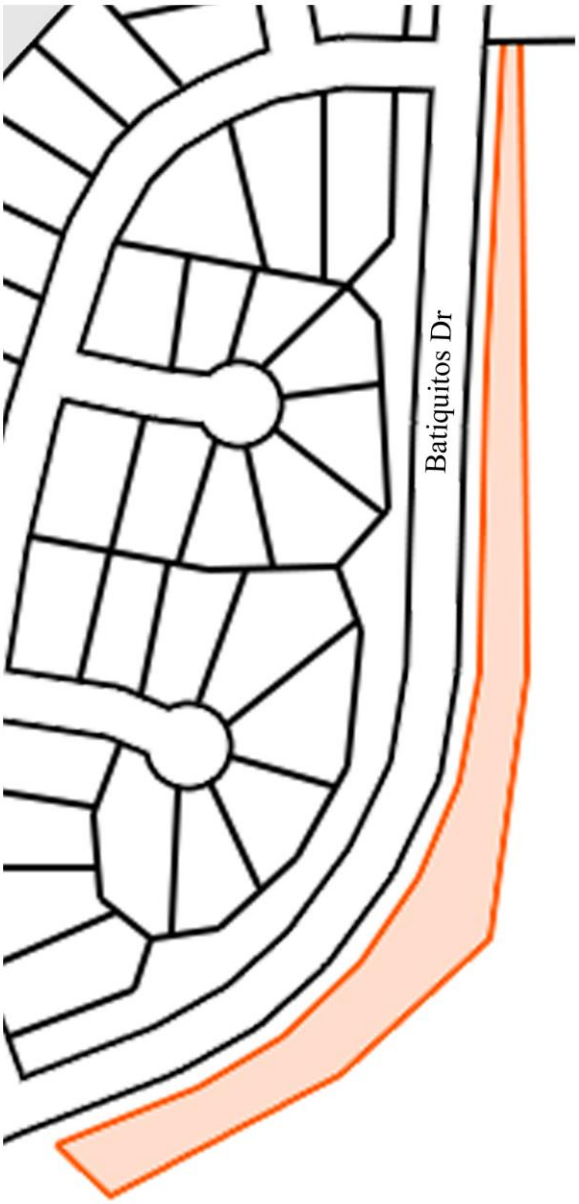
Grove Management

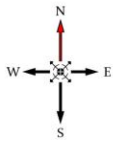


Area 00

Aviara - Area 3

Grove Management

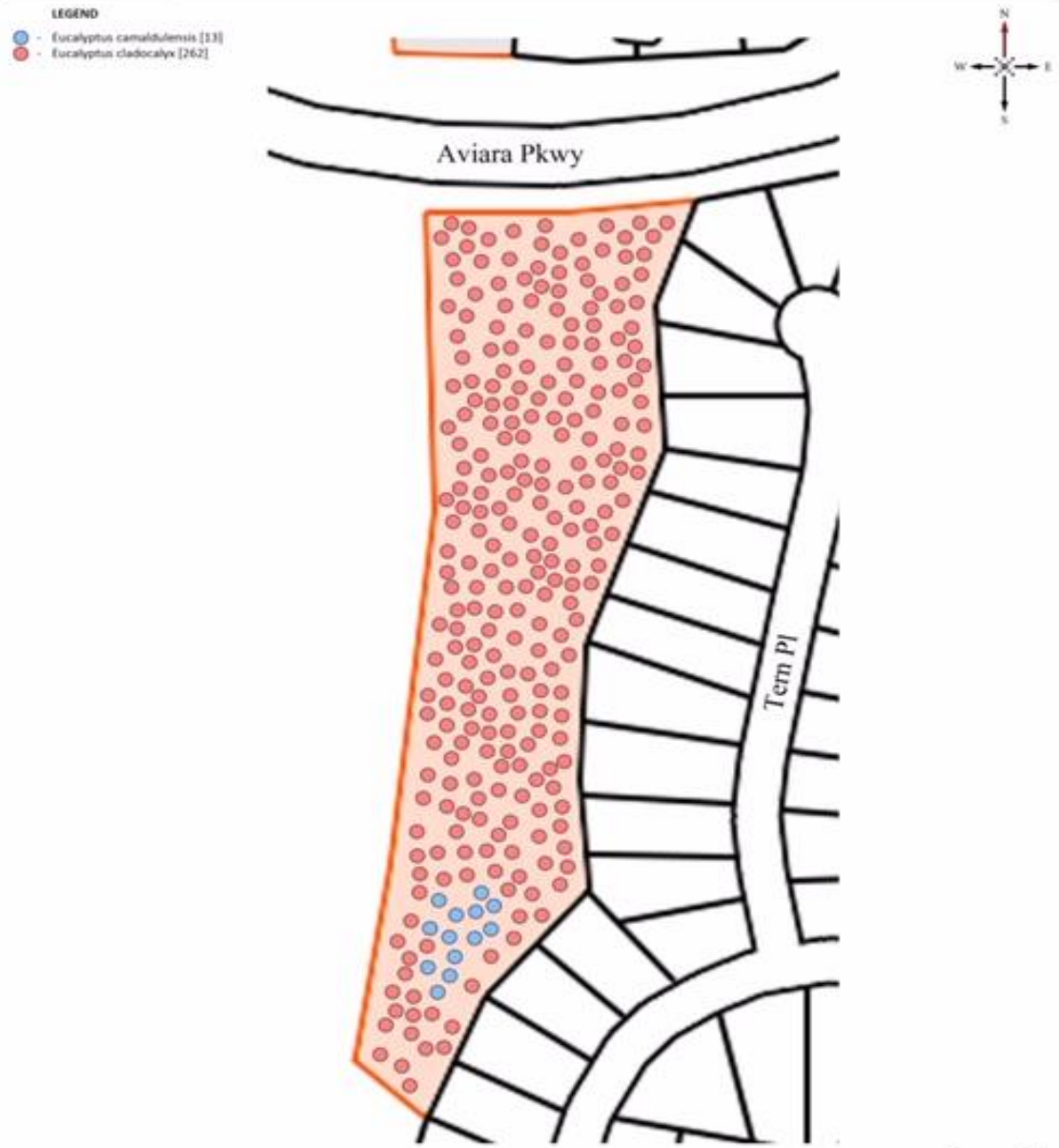




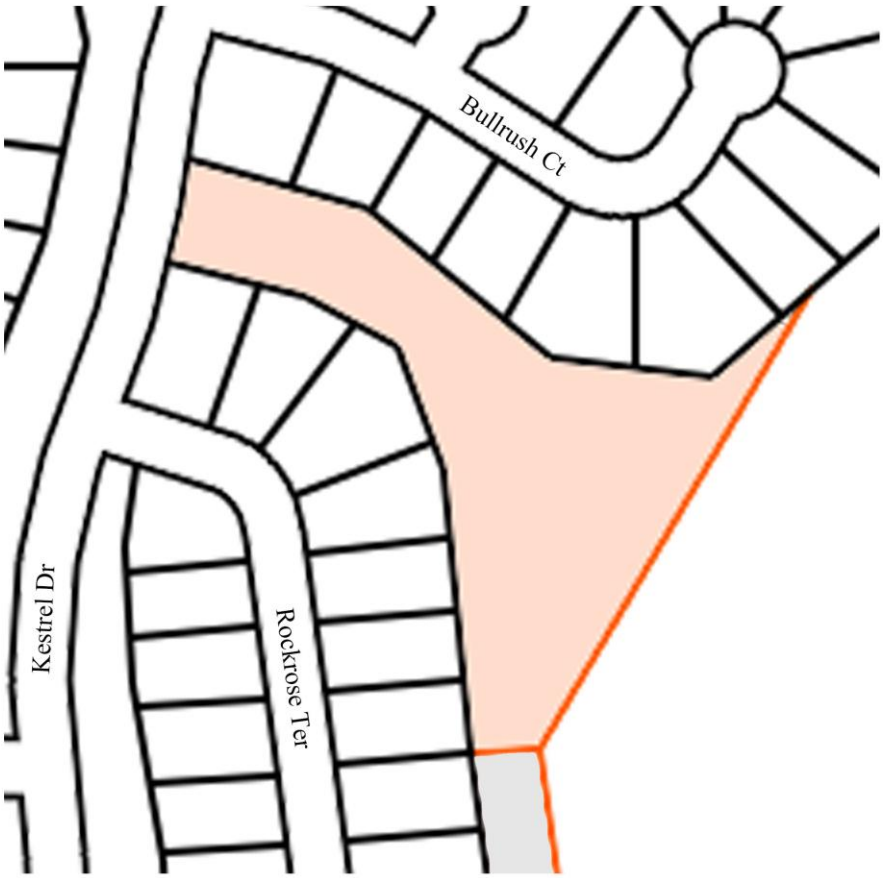
Area 3

Aviara - Area 11

Grove Management



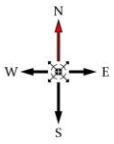
Area 11

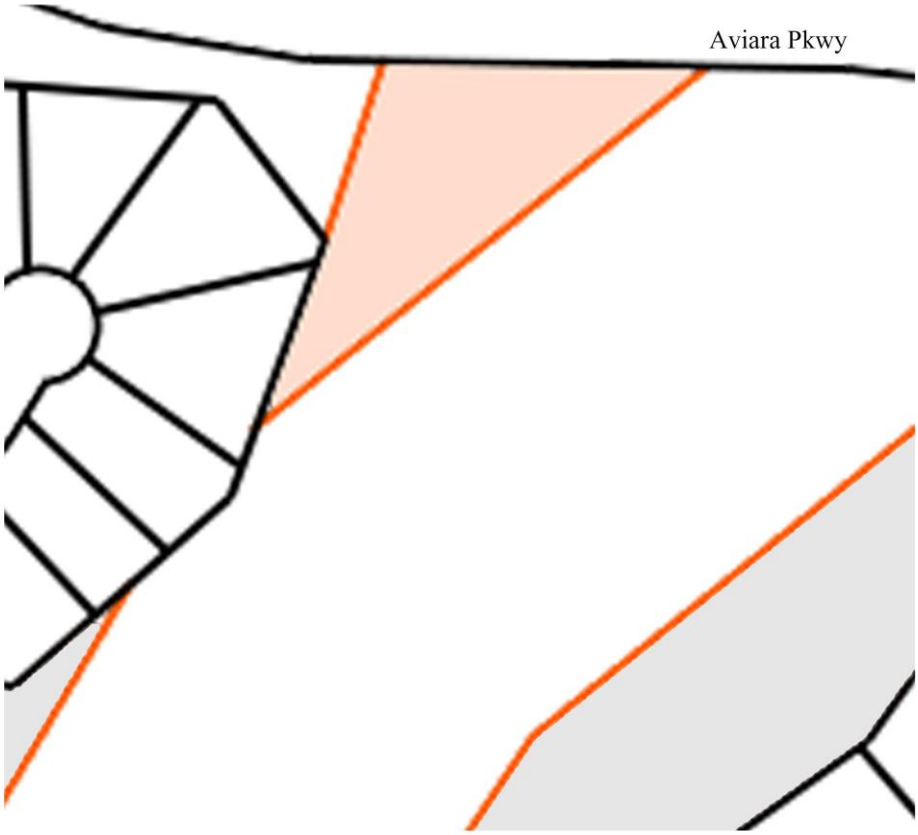


Area 19

Aviara - Area 20

Grove Management

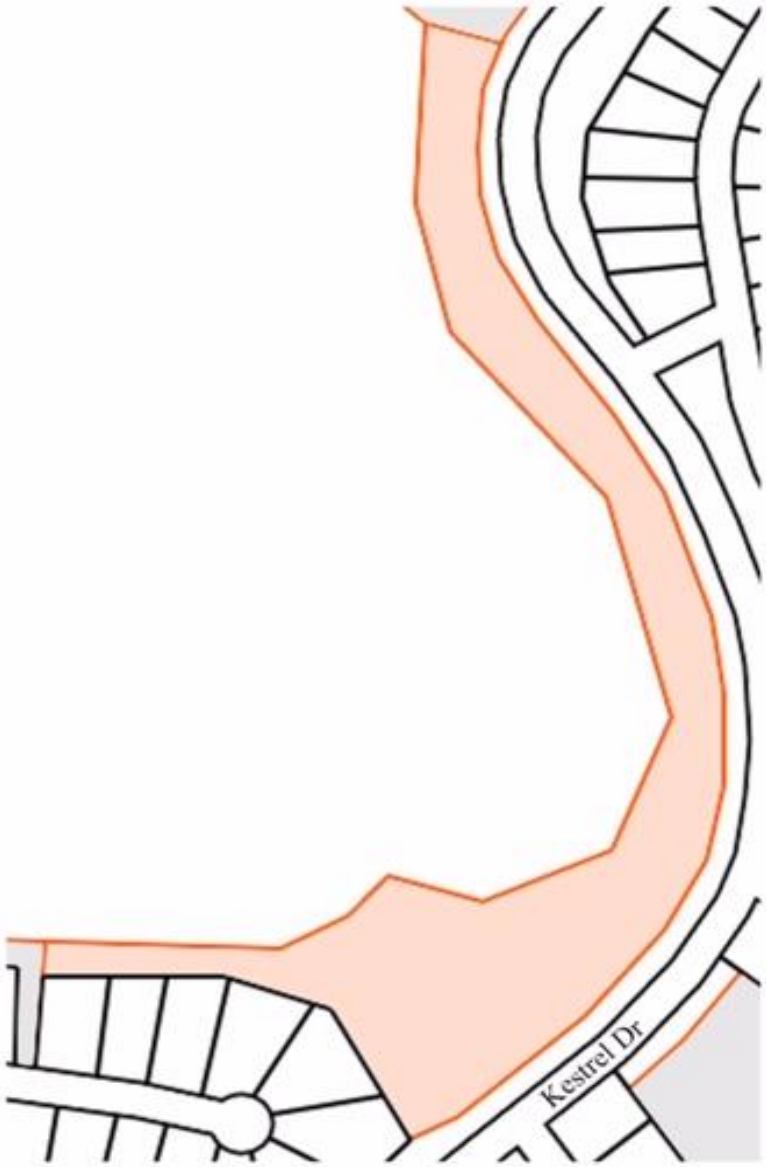




Area 20

Aviara - Area 33

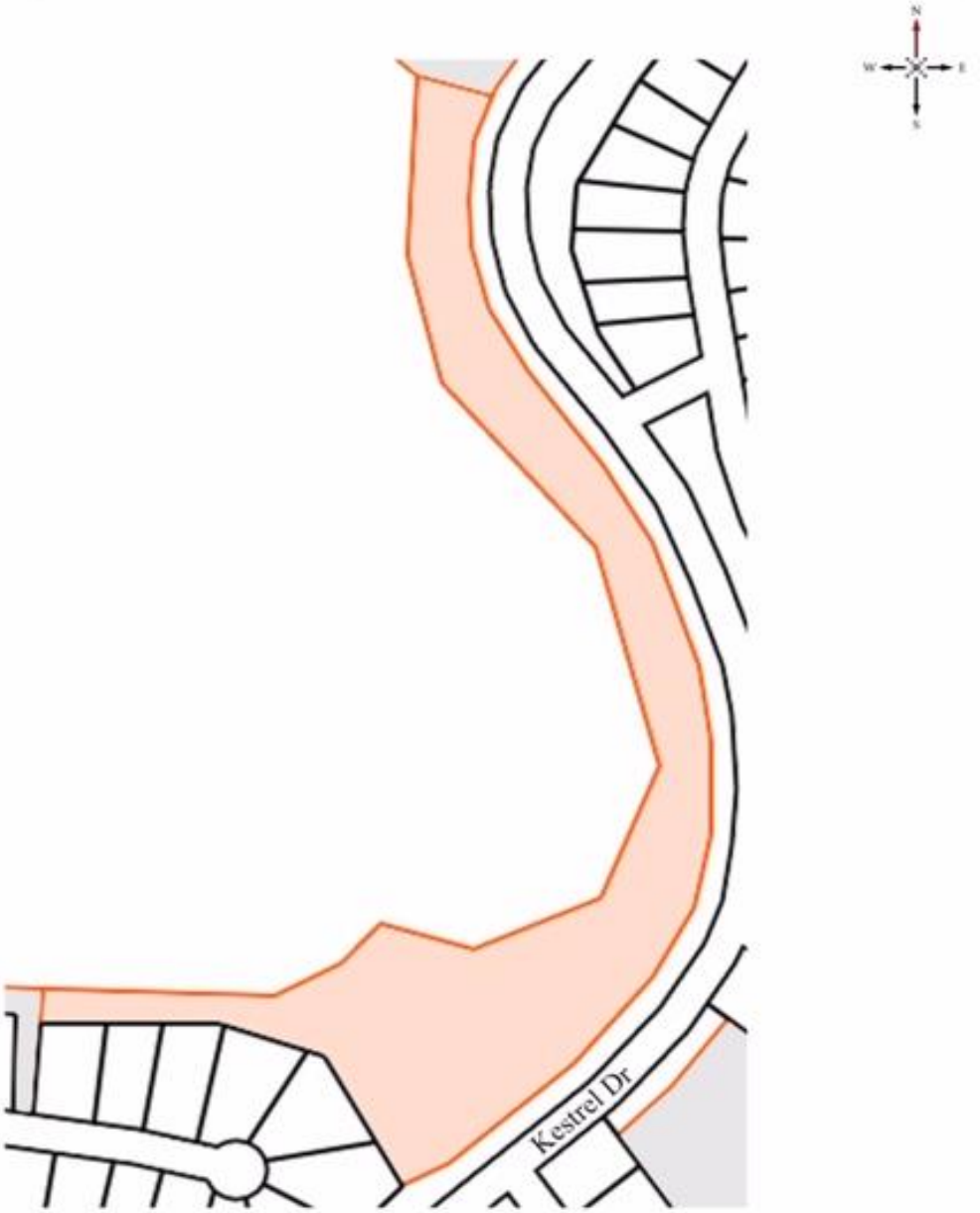
Grove Management



Area 33

Aviara - Area 33

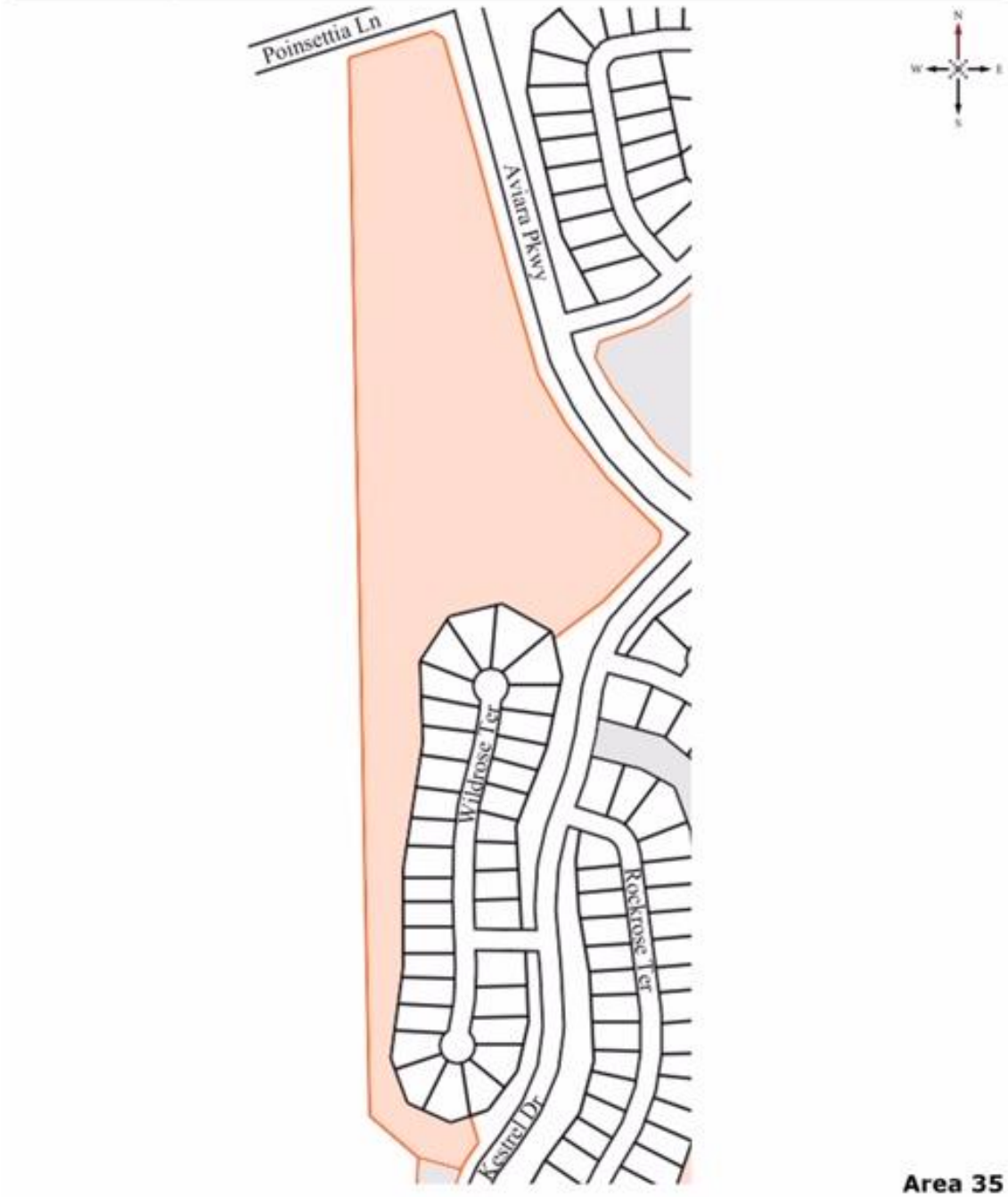
Grove Management



Area 33

Aviara - Area 35

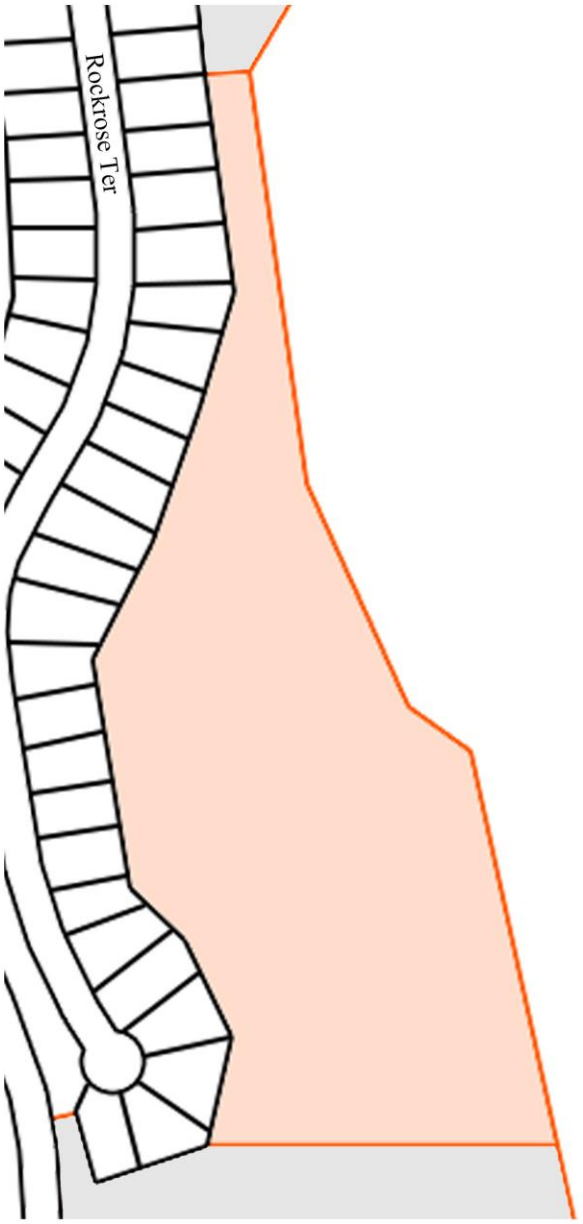
Grove Management



Area 35

Aviara - Area 45

Grove Management

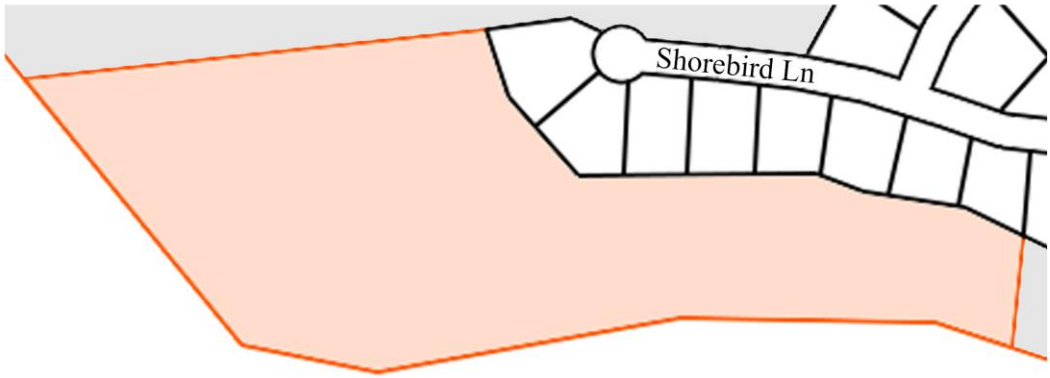


Area 45

Area 61

Aviara - Area 63

Grove Management

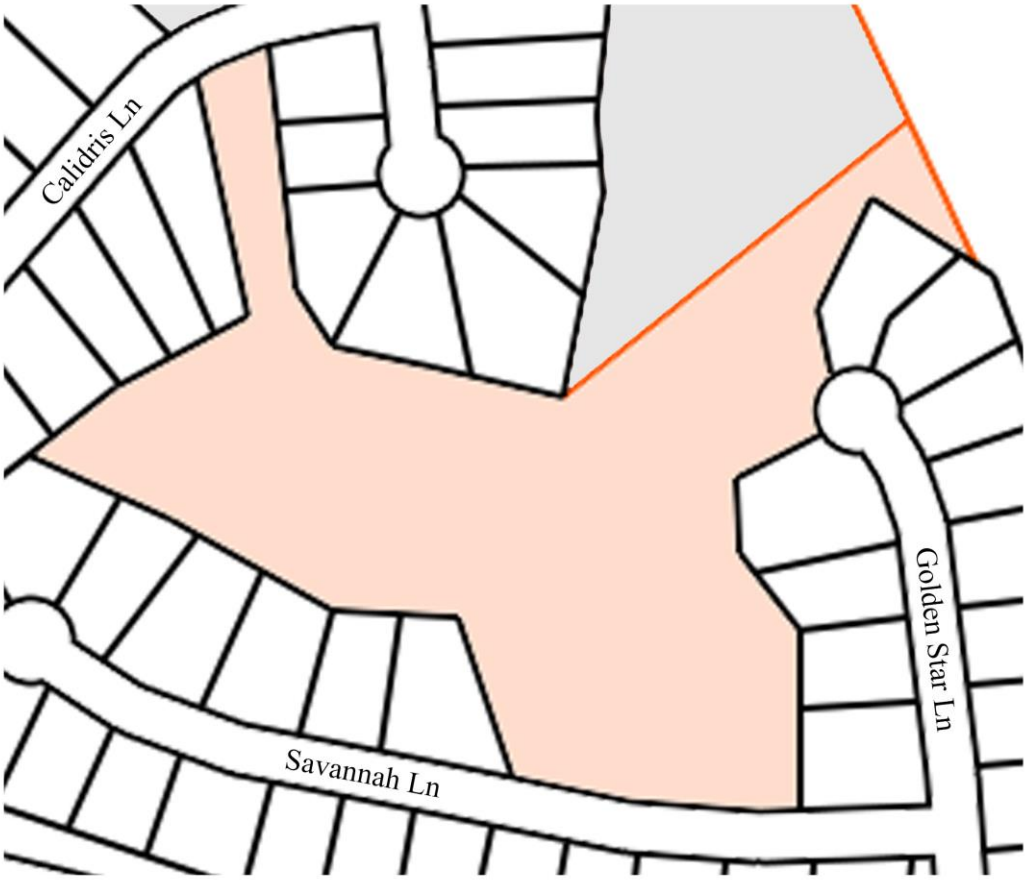


Area 63

Aviara - Area 63A

Grove Management

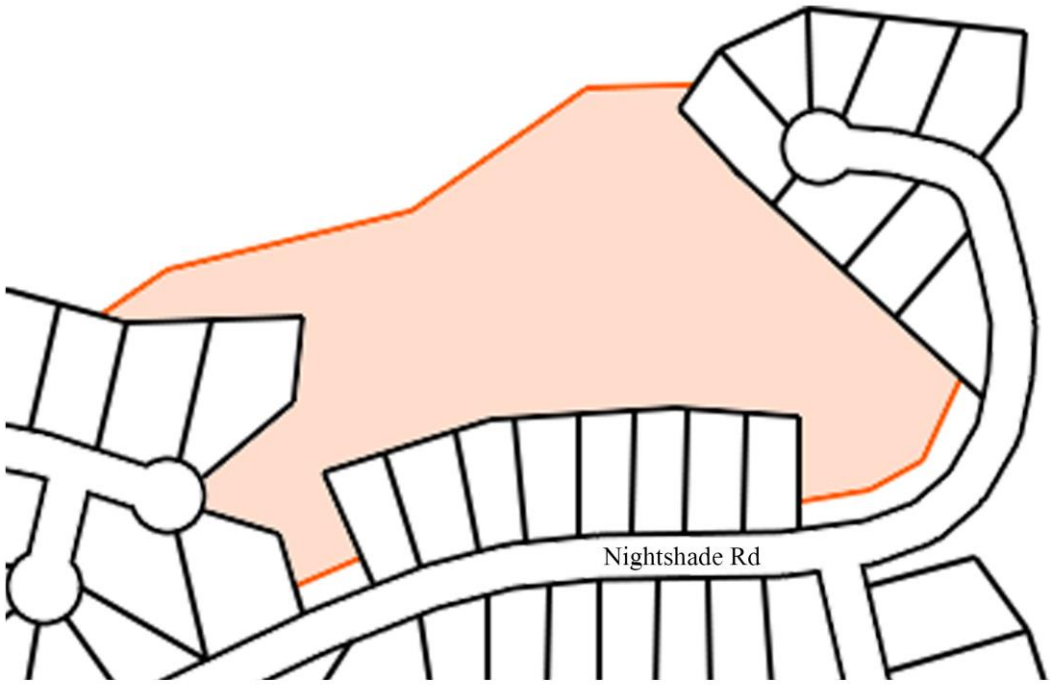
Area 63A



Area 71

Aviara - Area 88

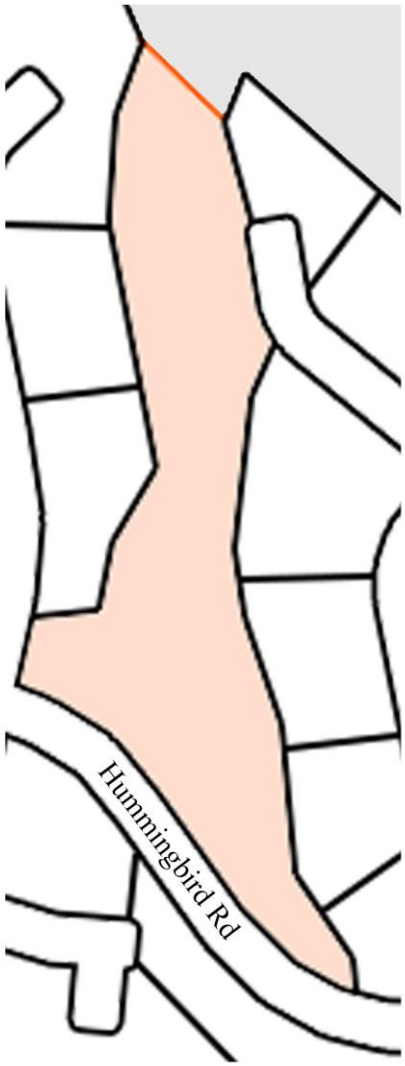
Grove Management



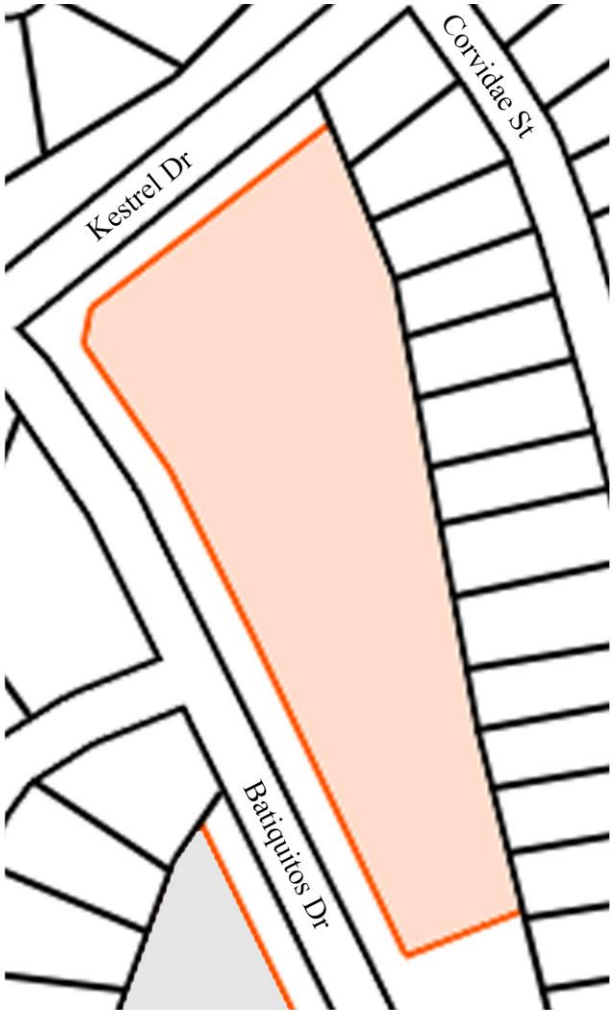
Area 88

Aviara - Area 95

Grove Management



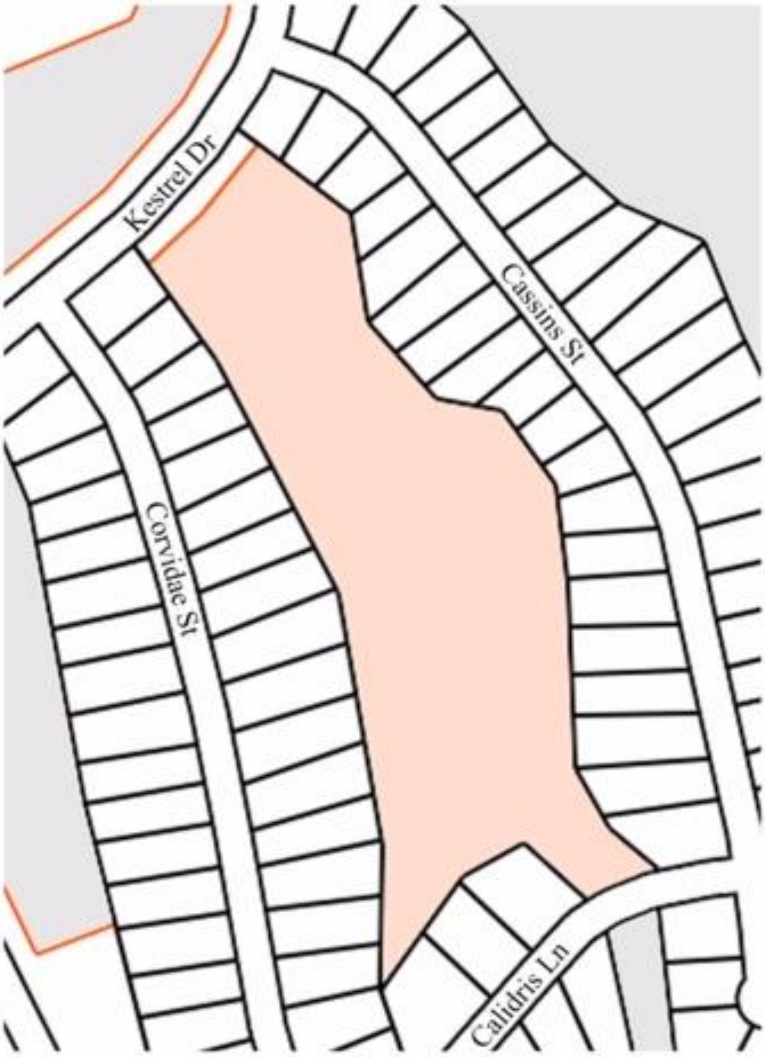
Area 95



Area 96

Aviara - Area 97

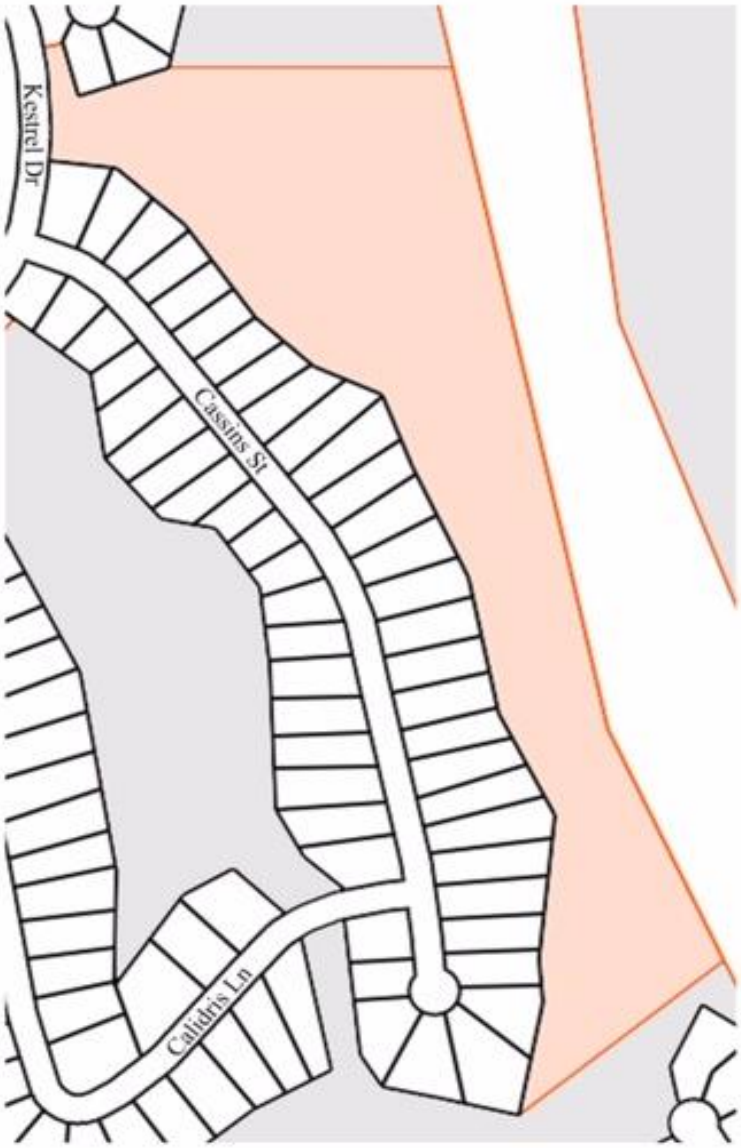
Grove Management



Area 97

Aviara - Area 98

Grove Management



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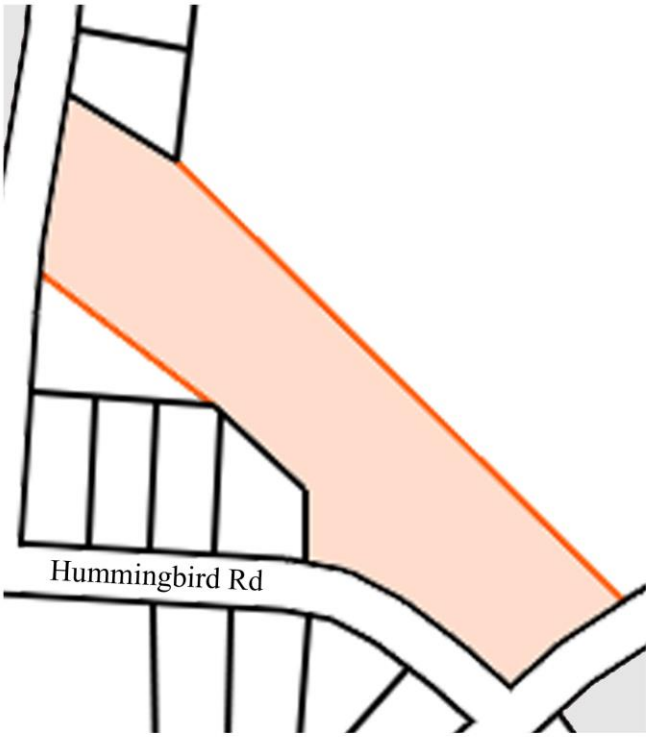
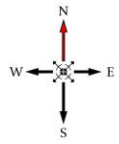
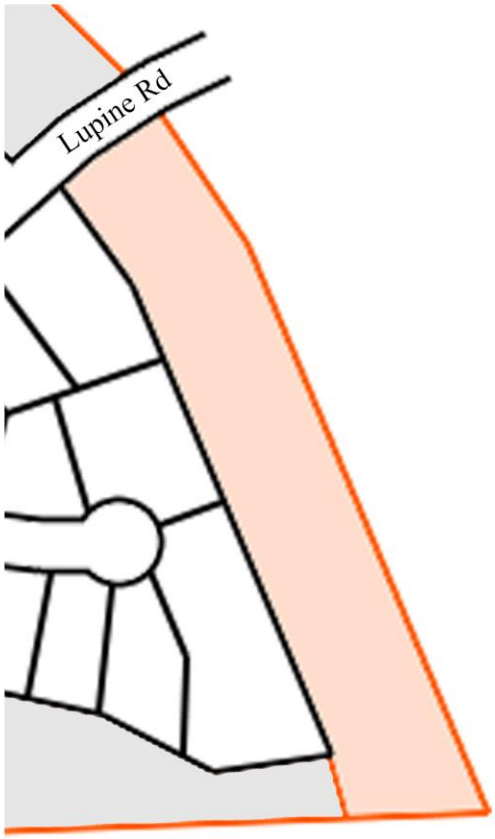


Area 99

Aviara - Area 100

Grove Management

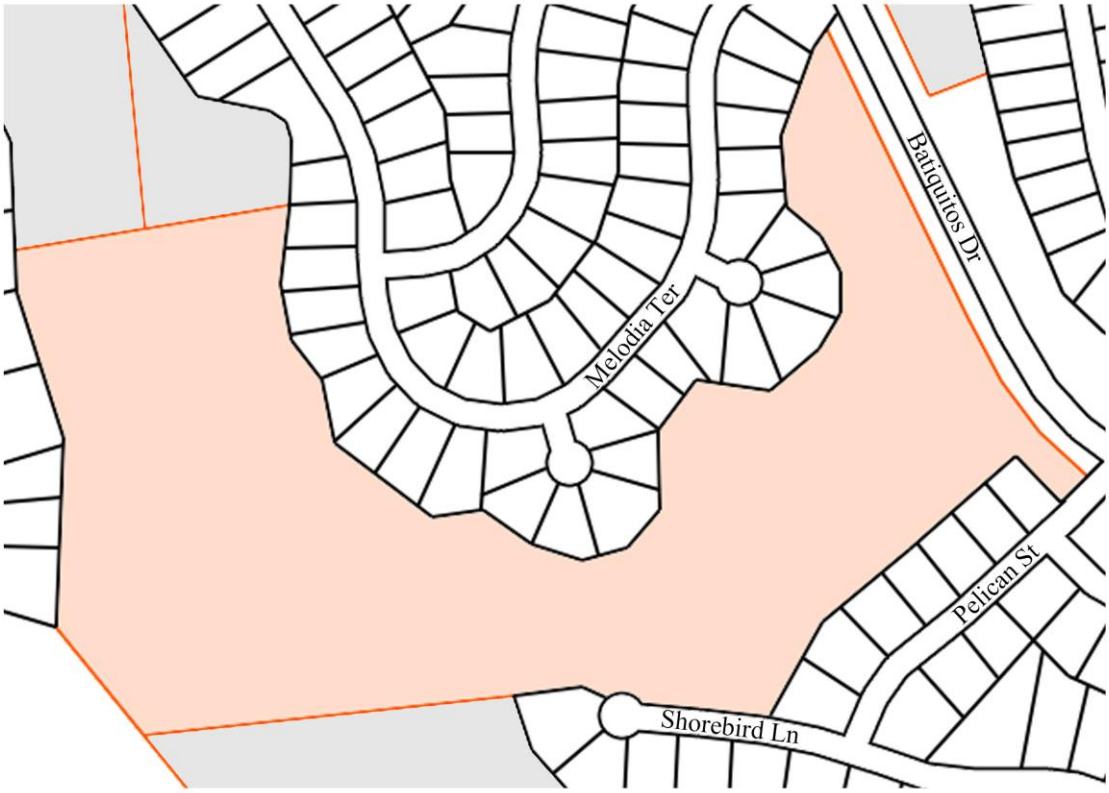




Area 100

Aviara - Area 103

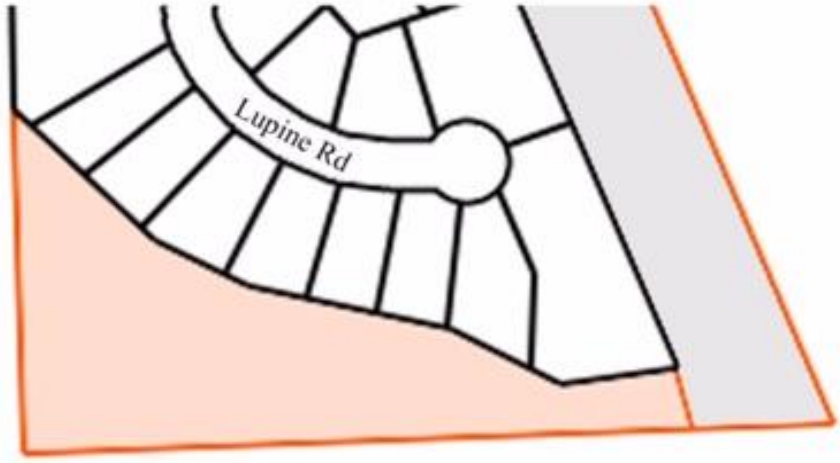
Grove Management



Area 103

Aviara - Area 229

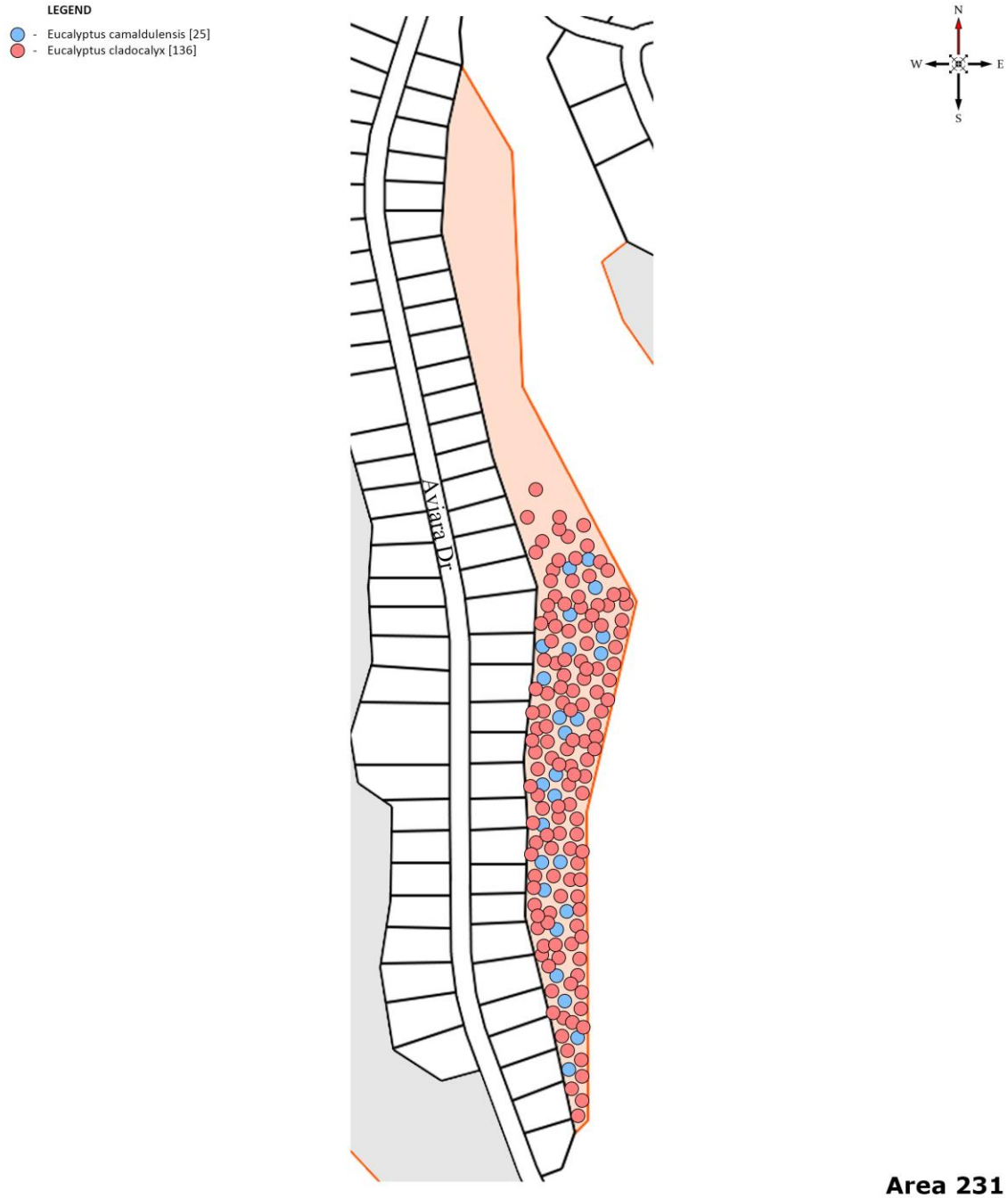
Grove Management



Area 229

Aviara - Area 231

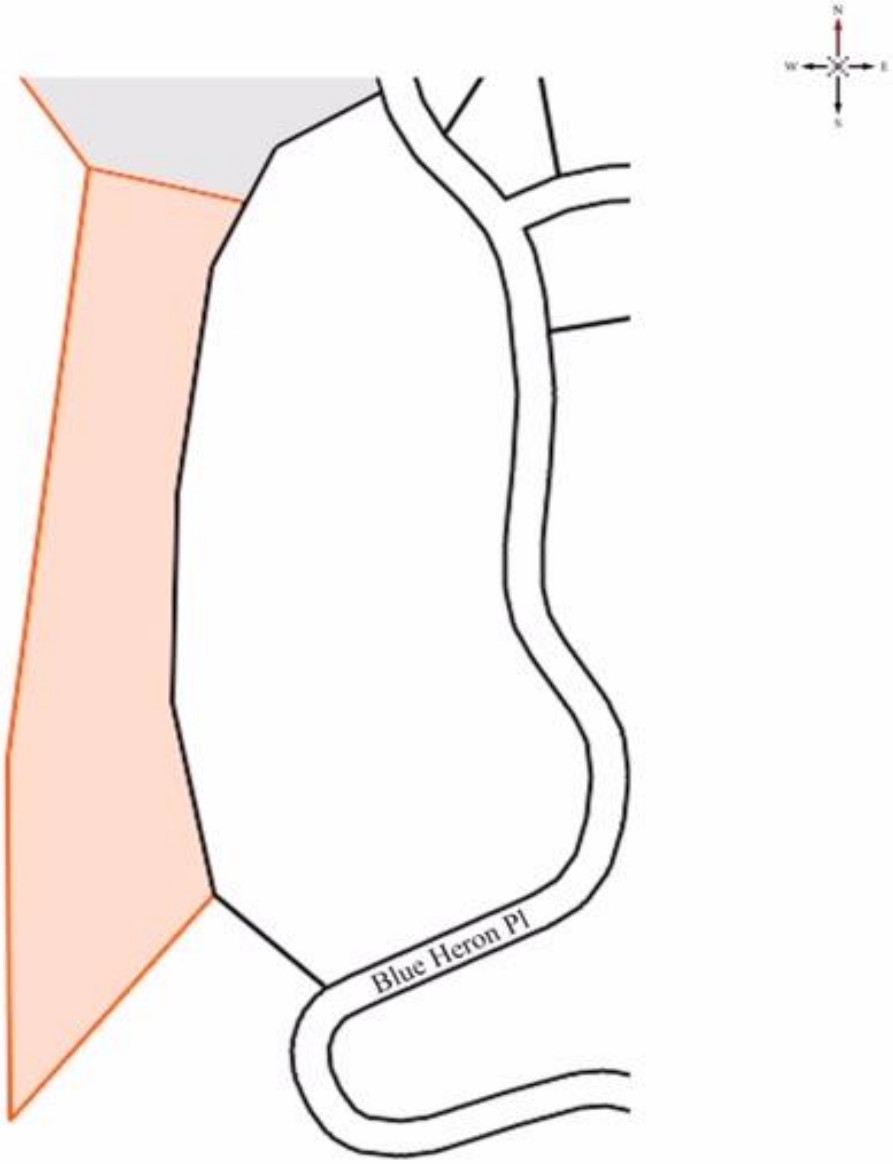
Grove Management



Area 231

Aviara - Area 232

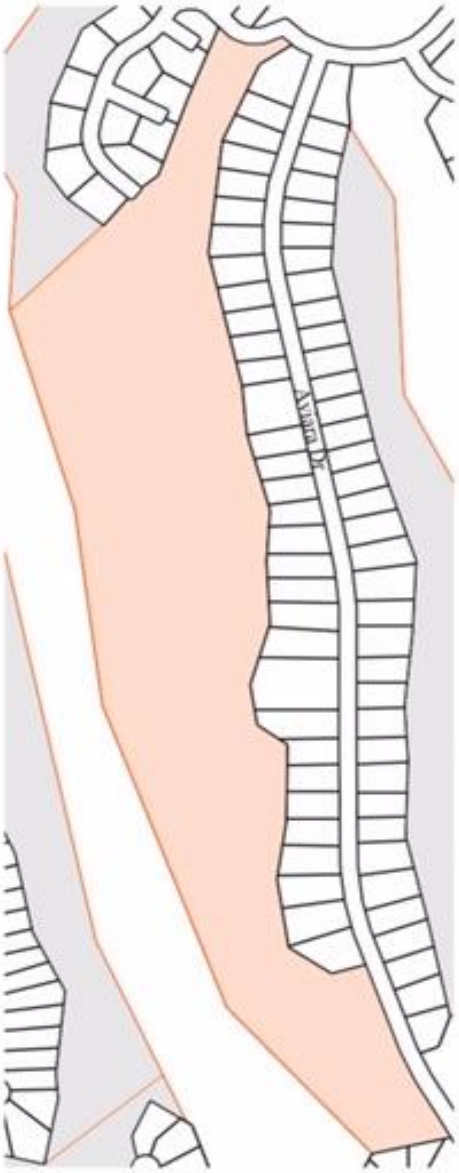
Grove Management



Area 232

Aviara - Area 307

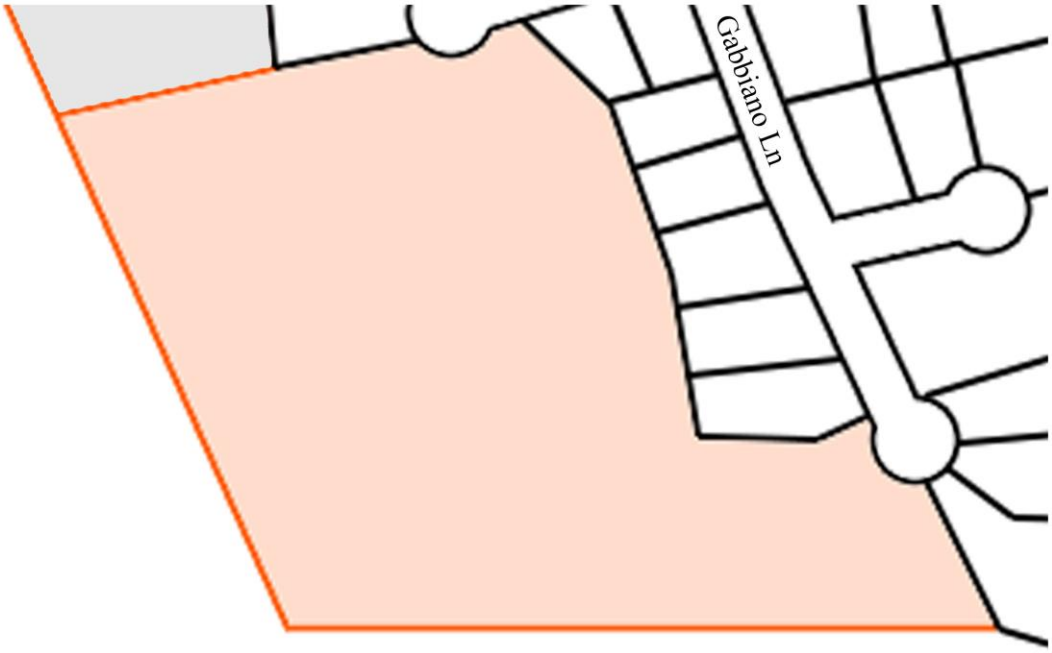
Grove Management



Area 307

Aviara - AC 2

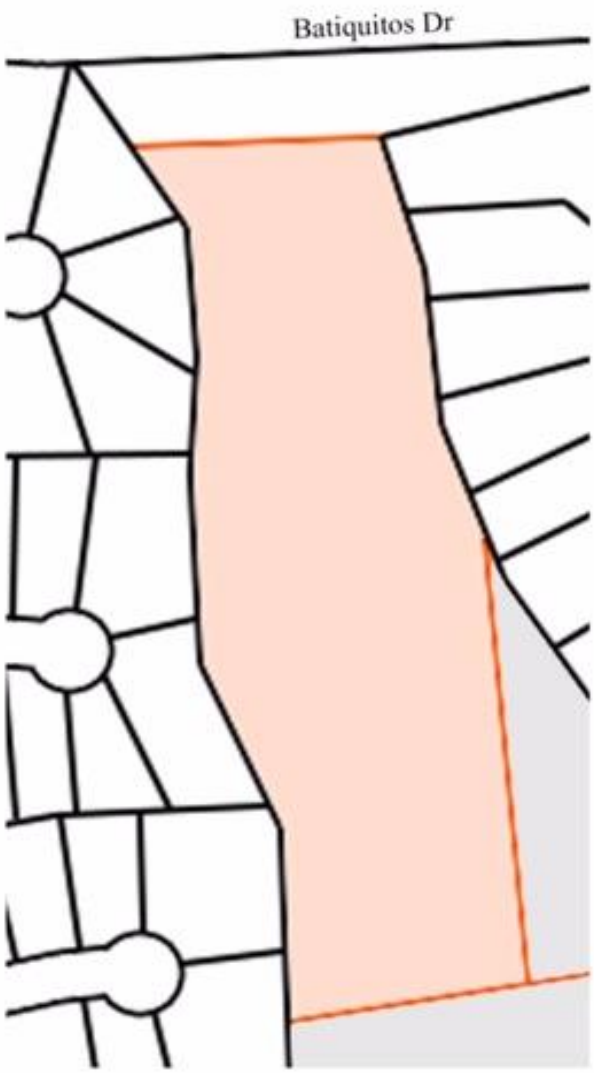
Grove Management



AC 2

Aviara - AC 3

Grove Management



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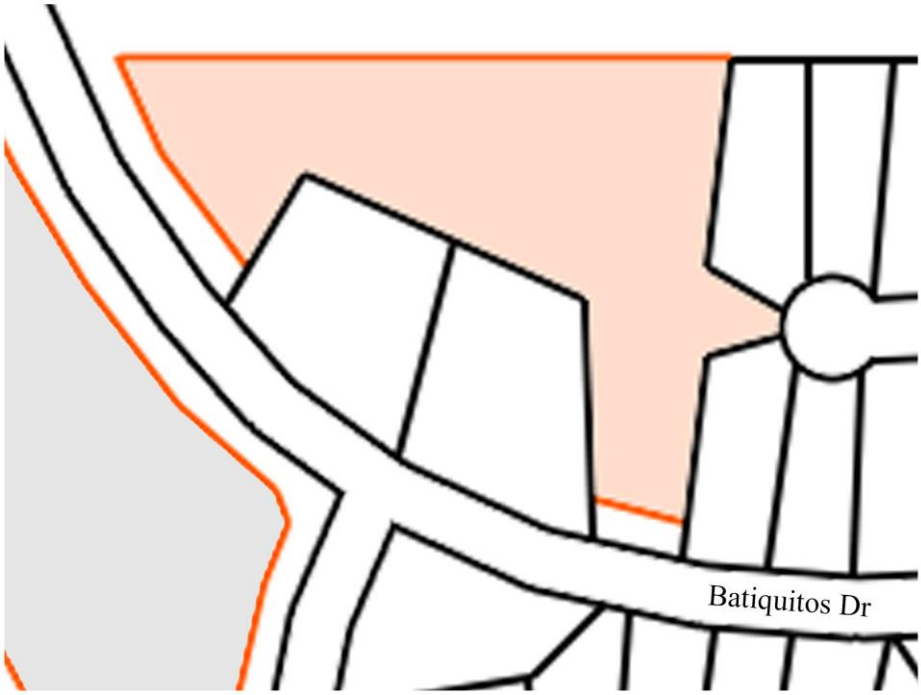
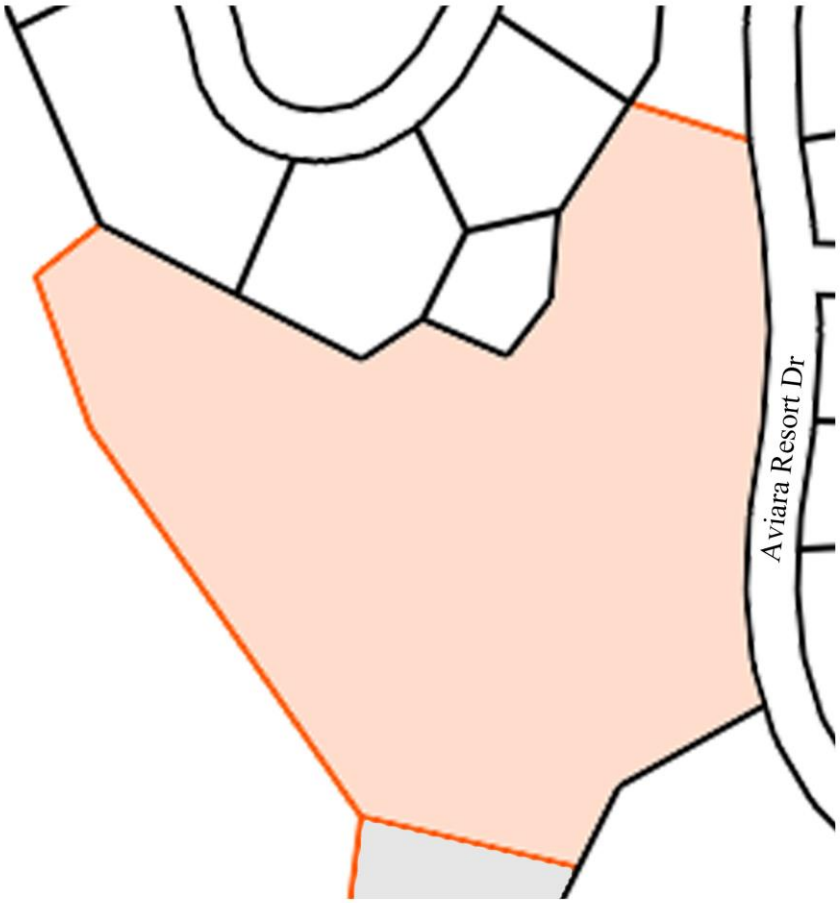


AC 5

Aviara - Area M

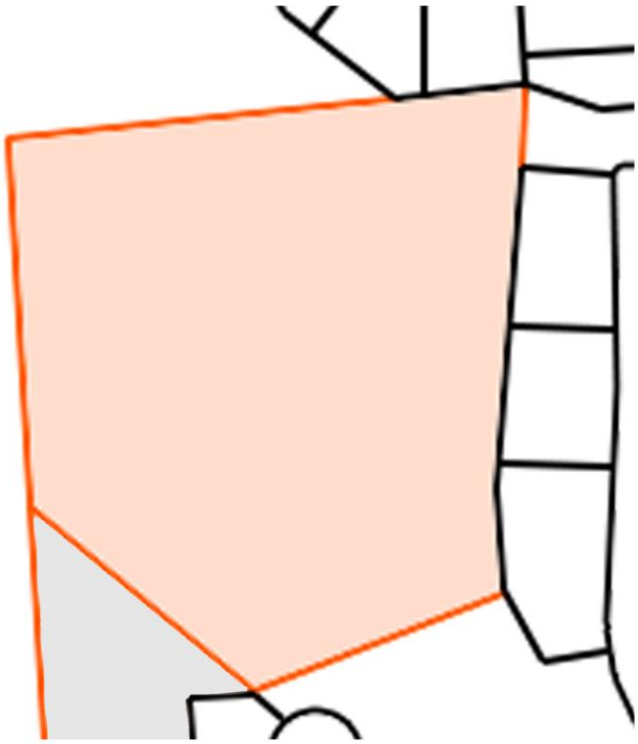
Grove Management



Area M

Aviara - Area Upper R

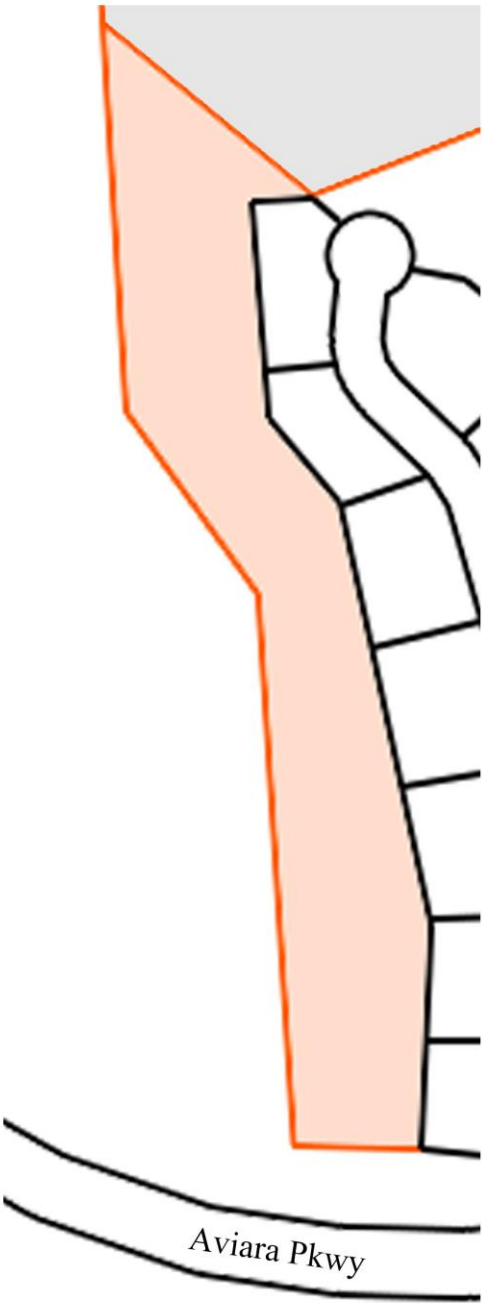
Grove Management

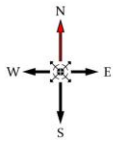


Area Upper R

Aviara - Area Lower R

Grove Management





Area Lower R

Area X

Appendix B.

Eucalyptus Stories: Facts or Myths?

Native Plants are Flammable Too

January 5, 2019

Three of the most flammable plants in California landscapes are bay laurels, coyote brush, and chamise – all native. An evenhanded presentation of fire hazard ratings for all plants that does not downplay the danger of native plants or exaggerate the danger of non-native plants would better serve people working to address fire hazards. So we wrote this letter to the California Native Plant Society, which is updating its Fire Recovery Guide. (You can see it here as a 64-page PDF document: cnps-fire-recovery-guide-lr-040618)

To: Daniel Gluesenkamp, Executive Director of the California Native Plant Society

Dear Mr. Gluesenkamp,

We have read the CNPS Fire Recovery Guide. Property owners will undoubtedly find it useful advice to prevent post-fire erosion and unnecessary destruction of trees and plants that are likely to survive in the long term. The specific advice about creating defensible space also seems helpful.

We understand that your organization is working on an update of this Guide. We are therefore writing to make a few suggestions for improving its accuracy and therefore its credibility.

If the Guide is going to suggest that home owners avoid planting specific plants within their defensible space, we would suggest a more neutral approach that would focus more on fire hazard and less on nativity. The Guide cites eucalyptus and non-native pines as presenting severe fire hazard. See pages 5, 30 and 52. However, the evidence from the recent fires does not implicate non-native trees. The documents cited in your guide (pages 44-45) show that the acreage of non-native tree species that burned in the recent fires was insignificant compared to the overwhelmingly native vegetation that burned. Two papers are cited to support the claim that non-native trees are more hazardous than native trees, Lambert and Landis. Neither paper presents and analyzes data to support the claim. Each paper contains a table of non-native plants considered to be fire hazards, but no information is presented to support them. There is a large quote about the fire hazard of eucalyptus on page 30, but with no indication who made the statement.

There are many available lists of flammable plants that should be avoided within defensible space. Marin Fire Safe lists both native and non-native plants on its list of flammable plants:
http://www.firesafemarin.org/plants/fire-prone

The Oakland Firesafe Council also provides a link to that list on their website. Three of the most flammable plants in California landscapes are are bay laurels, coyote brush, and chamise. An evenhanded presentation of fire hazard ratings for all plants that does not downplay the danger of native plants or exaggerate the danger of non-native plants would better serve people working to address fire hazards.

Page 56 of the Guide dismisses the role SOD may have played in the fires. The Big Basin fires are discussed in support of this, but there is no analysis of the Napa, Sonoma and Mendocino fires. Matteo Garbelotto, the scientist at UC Berkeley who conducts the annual survey of SOD infections reports that

"A dramatic increase this year in the number of oaks, manzanita and native plants infected by the tree-killing disease known as sudden oak death likely helped spread the massive fires that raged through the North Bay… http://digital.olivesoftware.com/Olive/ODN/SanFranciscoChronicle/shared/ShowArticle.aspx?doc=HSFC%2F2017%2F10%2F20&entity=Ar00101&sk=FE15FEB2&mode=text

It seems likely the vegetation killed by SOD did play a role in fires. Why downplay the possibility?

SOD is a terrible thing. We should not ignore its consequences.

When recommending that property owners plant oaks on their land (page 21), it might be wise to steer them toward other tree choices if the SOD pathogen is known to exist at their location. A detailed map of where SOD infections have been found is available here: https://nature.berkeley.edu/matteolab/?page_id=4262

There is some confusion in the guide between plants that are flammable versus fire intolerant. Bay Laurels are flammable, but fire tolerant. See page 56.

We hope you will take our comments into account,

San Francisco Forest Alliance

Natural Areas Plan: SFFA comments on the DEIR (Pt 7: False 'Fire Hazard' Assumptions) https://sfforest.org/tag/flammability/

June 14, 2012 2 Comments

One of the most problematic assumptions in the Significant Natural Resource Area Management Plan (SNRAMP – Sin-ramp) is that the eucalyptus forests are a fire hazard, and that thinning/ felling them, removing the existing understory, and substituting native plants will reduce the danger.

It won't.

First, in San Francisco's foggy climate, the eucalyptus trees actually harvest moisture, and the dense naturalized understory traps this moisture. These are some of the wettest areas in the city through the peak fire season. Second, eucalyptus is actually less flammable than most native plants. Finally, the tall trees act as an effective wind-break, thus reducing the risk of wind-driven fires.

Read on for details.

The Draft Environmental Impact Report (DEIR) for the Significant Natural Resource Areas Management Plan (SNRAMP) makes assumptions regarding fire hazards in San Francisco for which it provides no scientific or experiential evidence:

1. That native vegetation is less flammable than non-native vegetation

2. That thinning trees will reduce fire hazard

These assumptions are false and we will provide scientific and experiential evidence that they are false. Unless the final EIR can provide scientific evidence and/or actual experience to support these assumptions in the DEIR, these statements regarding fire hazards must be revised to be consistent with available evidence.

1. NON-NATIVE VEGETATION, INCLUDING EUCALYPTUS, IS NOT INHERENTLY MORE FLAMMABLE THAN NATIVE VEGETATION

The DEIR makes the following claims:
- "…maximize indigenous vegetation for fire control." (DEIR, page 78)
- "…vegetation with high fire hazard ratings such as broom and eucalyptus." (DEIR, page 111,396)
- "…replacing highly flammable eucalyptus trees with more fire resistant species." (DEIR, page 410)

Fear of fire has fueled the heated debate about native plant restorations in the Bay Area. Native plant advocates want the public to believe that the non-native forest is highly flammable, that its destruction and replacement with native landscapes would make us safer. Nothing could be further from the truth. The fact is that the forest—whether it is native or non-native—is generally less flammable than the landscape that is native to California. In the specific case of the Sutro Forest in San Francisco, this general principal is particularly true: the existing forest is significantly less flammable than the landscape that is native to that location.

The "Mount Sutro Management Plan" was written by UCSF and is available on their website. It describes "native" Mount Sutro as follows: "In the 1800s, like most of San Francisco's hills, Mount Parnassus [now known as Mount Sutro] was covered predominantly with coastal scrub chapparal [sic], consisting of native grasses, wildflowers, and shrubs…" (page 4) (emphasis added)

A Natural History of California [Ref: Allan Schoenherr, UC Press, 1992, page 341] tells us that chaparral is not only highly flammable, but is in fact dependent upon fire to sustain itself:

"Chaparral…is…most likely to burn. The community has evolved over millions of years in association with fires, and in fact requires fire for proper health and vigor. Thus it is not surprising that most chaparral plants exhibit adaptations enabling them to recover after a burn…Not only do chaparral plants feature adaptations that help them recover after a fire, but some characteristics of these plants, such as fibrous or ribbonlike shreds on the bark, seem to encourage fire. Other species contain volatile oils. In the absence of fire, a mature chaparral stand may become senile, in which case growth and reproduction are reduced. " (emphasis added)

The local chapter (Yerba Buena) of the California Native Plant Society acknowledges the value of fire to restore and maintain native plant populations. A wildfire fire on San Bruno Mountain in native grassland and coastal scrub "consumed about 300 acres" in June 2008, according to an article on their website. The article reports that

"Fire is an adaptive management tool that, along with natural grazing and browsing, has been missing in promoting healthy grasslands that once covered much of the lower elevations of California…The threats to native grasslands are invasions of non-native grasses and forbs, and succession by native and invasive shrubs. Fortunately the fire scrubbed the canyons pretty clean of just about everything. This gives the land a shot of nutrients to recharge the soil and awaken the seedbanks that have long been lying dormant."

The fire on Angel Island in October 2008, demonstrates that native grassland is more flammable than the non-native forest. According to an "environmental scientist" from the California state park system, 80 acres of eucalyptus were removed from Angel Island 12 years ago in order to restore native grassland. Only 6 acres of eucalyptus remain. [Ref:"Rains expected to help heal Angel Island," SF Chronicle, October 14, 2008] The fire that burned 400 acres of the 740 acres of Angel Island in 2008 stopped at the forest edge: "At the edge of the burn belt lie strips of intact tree groves…a torched swath intercut with untouched forest." [Ref: "After fire, Angel Island is a park of contrasts," SF Chronicle, October 15, 2008] It was the native grassland and brush that burned on Angel Island and the park rangers were ecstatic about the beneficial effects of the fire: "The shrubs—coyote bush, monkey flower and California sage—should green up with the first storms…The grasses will grow up quickly and will look like a golf course." Ironically, the "environmental scientist" continues to claim that the

eucalyptus forest was highly flammable, though it played no part in this fire and there was no history of there ever having been a fire in the eucalyptus during the 100 years prior to their removal.

Unfortunately, the 1991 fire in the Oakland hills has enabled native plant advocates to maintain the fiction that eucalyptus is highly flammable. And in that case there is no doubt that they were involved in that devastating fire. However, there were factors in that fire that are not applicable to San Francisco. The climate in San Francisco is milder than the climate in the East Bay because of the moderating influence of the ocean. It is cooler in the summer and warmer in the winter. There are never prolonged, hard freezes in San Francisco that cause the eucalyptus to die back, creating dead, flammable leaf litter. The 1991 fire in the Oakland hills occurred in the fall, following a hard winter freeze that produced large amounts of flammable leaf litter. In fact, there were several wildfires in the Oakland hills in the 20th century. Each followed a hard winter causing vegetation to die back.

According to the FEMA Technical Report, the 1991 Oakland hills fire started in grass, spread to dry brush, and was then driven by the wind to burn everything in its path. The fire burned native plants and trees as readily as eucalyptus.

When it is hot and dry in the Oakland hills, as it was at the time of the 1991 fire, it is cool and damp in San Francisco. Fogs from the ocean drift over the eucalyptus forests, condensing on the leaves of the trees, falling to the ground, moistening the leaf litter. [Ref: Gilliam, Harold, The Weather of the San Francisco Bay Area, UC Press, 2002] When the heat from the land meets the cool ocean air, the result is the fog that blankets San Francisco during the summer. These are not the conditions for fire ignition that exist in the Oakland hills.

UCSF applied for a FEMA grant to fund its project to destroy the eucalyptus forest and restore native chaparral, based on its claim that the eucalyptus forest is highly flammable. In its letter of October 1, 2009 (obtained by FOIA request), FEMA raised questions about UCSF's claim of fire hazard. (See Attachment VII-A.) FEMA asked UCSF to explain how fire hazard would be reduced by eliminating most of the existing forest, given that reducing moisture on the forest floor by eliminating the tall trees that condense the fog from the air could increase the potential for ignition. FEMA also asked UCSF to provide "scientific evidence" to support its response to this question. Rather than answer this and other questions, UCSF chose to withdraw its FEMA application.

The reputation of eucalyptus as a fire hazard is also based on the assumption that oils in its leaves are flammable. The National Park Service reports on its website that the leaves are, in fact, fire resistant: "The live foliage [of the eucalyptus] proved fire resistant, so a potentially catastrophic crown fire was avoided."

The predominant species of eucalyptus in California, the blue gum eucalyptus (E. globulus) is native to Tasmania. Scientists at the University of Tasmania conducted laboratory experiments on the plants and trees in the Tasmanian forest to determine the relative flammability of their native species. The blue gum eucalyptus (E. globulus) is included in this study. The study reports that, "E. globulus leaves, both juvenile and adult, presented the greatest resistance [to ignition] of all the eucalypts studied. In this case, leaf thickness was important as well as the presence of a waxy cuticle." Also, in a table entitled "Rate of flame front movement," the comment for E. globulus leaves is "resistant to combustion." [Ref: Dickinson, K.J.M. and Kirkpatrick, J.B., "The flammability and energy content of some important plant species and fuel components in the forests of southeastern Tasmania," Journal of Biogeography, 1985, 12: 121-134.] In other words, despite the oil content in the leaf, its physical properties protect the leaf from ignition.

Even if oils were a factor in flammability, there are many native plants that are equally oily, such as the ubiquitous coyote brush and bays. According to Cornell University studies, essential/volatile oils in blue gum eucalyptus leaves range from less than 1.5 to over 3.5%. The leaves of native California bay laurel trees contain 7.5% of essential/volatile oils, more than twice the amount of oil in leaves of blue gums.

These principles are best illustrated by a photograph of an actual fire in San Diego in 2003 in which all the homes burned to the ground, but the eucalyptus forest surrounding those homes did not ignite.

Source: New York Times

Likewise, non-native broom is not more flammable than its native counterpart in the chaparral plant community, coyote brush. The leaves of both shrubs are small, the fine fuel that ignites more readily than larger leaves and branches. But the leaves of native coyote brush contain oil not found in non-native broom. And the branches of broom are green to the ground, unlike the branches of coyote brush which become woody thickets with age. Broom therefore contains more moisture than coyote brush, which reduces its combustibility.

Fire is an essential feature of the landscape that is native to California. [Ref: Sugihara, Neil, Fire in California's Ecosystems, UC Press, 2006] Destroying a non-native forest in order to create a native landscape of grassland and scrub will not reduce fire hazard.

2. THINNING THE NON-NATIVE FOREST WILL NOT REDUCE FIRE HAZARD

The DEIR makes the following claim:

"…timber thinning would increase the space between trees, reducing the ability of a fire to rapidly spread." (DEIR, page 396)

Most fires in California are hot, wind-driven fires in which everything burns. The composition of the fuel load in a wind-driven fire is irrelevant. Everything in its path will burn. [Ref: Keeley, J, and Fotheringham, "Impact of past, present, and future fire regimes on North American Mediterranean shrublands, pages 218-262 in Veblen, et al., editors, Fire and climate change in temperate ecosystems of the Western Americas, 2003.] The 1991 fire in the Oakland hills was an example of such a fire. According to the FEMA technical report on that fire, both native and non-native vegetation, as well as about 3,800 homes burned in that fire.

Windbreaks are therefore one of the few defenses in a wind-driven fire. For that reason, in its letter of October 1, 2009 (see attachment VII-A), FEMA asked UCSF to explain how the destruction of the tall trees on Mount Sutro would reduce fire hazard. FEMA noted that eliminating the windbreak that the tall trees provide has the potential to enable a wind-driven fire to sweep through the forest unobstructed. FEMA also asked UCSF to provide "scientific evidence" to support its answer to this question. We repeat, UCSF chose to withdraw its application for FEMA funding of its project rather than answer this question.

In 1987, 20,000 hectares burned in a wildfire in the Shasta-Trinity National Forest. The effects of that fire on the forest were studied by Weatherspoon and Skinner of the USDA Forest Service. They reported the results of their study in Forest Science. [Ref: Weatherspoon, C.P. and Skinner, C.N., "An Assessment of Factors Associated with Damage to Tree Crowns from the 1987 Wildfires in Northern California," Forest Science, Vol. 41, No 3, pages 430-453] They found the least amount of fire damage in those sections of the forest that had not been thinned or clear-cut. In other words, the more trees there were, the less damage was done by the fire. They explained that finding:
"The occurrence of lower Fire Damage Classes in uncut stands [of trees] probably is attributable largely to the absence of activity fuels [e.g., grasses] and to the relatively closed canopy, which reduces insolation [exposure to the sun], wind movement near the surface, and associated drying of fuels. Conversely, opening the stand by partial cutting adds fuels and creates a microclimate conducive to increased fire intensities." (emphasis added)

In other words the denser the forest,
The less wind on the forest floor, thereby slowing the spread of fire
The more shade on the forest floor. The less flammable vegetation on the forest floor
The more moist the forest floor

All of these factors combine to reduce fire hazard in dense forest. Likewise, in a study of fire behavior in eucalyptus forest in Australia, based on a series of experimental controlled burns, wind speed and fire spread were significantly reduced on the forest floor. [Ref: Gould, J.S., et. al., Project Vesta: Fire in Dry Eucalyptus Forests, Commonwealth Scientific and Industrial Research Organization and Department of Environment and Conservation, Western Australia, November 2007]

Furthermore, a recently published study corroborates that thinning the forest does not significantly reduce fire risk, nor does it increase carbon storage in the forest. [Ref: John L. Campbell, Mark E. Harmon, Stephen R. Mitchell, "Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions? Frontiers in Ecology and Environment, 2011, 10,1890/110057.]

"It has been suggested that thinning trees and other fuel-reduction practices aimed at reducing the probability of high-severity forest fire are consistent with efforts to keep carbon (C) sequestered in terrestrial pools, and that such practices should therefore be rewarded rather than penalized in C-accounting schemes. By evaluating how fuel treatments, wildfire, and their interactions affect forest C stocks across a wide range of spatial and temporal scales, we conclude that this is extremely unlikely. Our review reveals high C losses associated with fuel treatment, only modest differences in the combustive losses associated with high-severity fire and the low-severity fire that fuel treatment is meant to encourage, and a low likelihood that treated forests will be exposed to fire. Although fuel-reduction treatments may be necessary to restore historical functionality to fire-suppressed ecosystems, we found little credible evidence that such efforts have the added benefit of increasing terrestrial C stocks." (emphasis added)

Thinning the forest will not reduce fire hazard. In fact, it will increase fire hazard.

The DEIR also says that fire hazard will be reduced by removing dead trees:

"Removed trees would include those that are diseased and dying, thereby reducing easily combustible fuel loads." (DEIR, page 396)

We do not dispute that dead trees are more flammable than living trees because they contain less moisture, one of the key variables in combustibility. However, we have established in another comment (Part I) that the claim that only dead and dying trees will be removed is contradicted by the SNRAMP which the DEIR is supposedly evaluating. There is no evidence that the trees that will be removed are dead or dying. Furthermore, if the predictions of experts on Sudden Oak Death prove to be true, 90% of the native oak woodland which SNRAMP proposes to expand will be dead and highly flammable within 25 years. [Ref: Fimrite, Peter, "Sudden oak death cases jump, spread in the Bay Areas," San Francisco Chronicle, October 2, 2011]

Conclusion

Unless scientific evidence can be provided to support statements in the DEIR regarding fire hazard, the final EIR must be corrected to reflect the scientific and experiential evidence that refutes it:

- Native vegetation is not inherently less flammable than non-native vegetation, including eucalyptus

- Thinning the forest will not reduce fire hazards.

Natural Areas Plan: SFFA comments on the DEIR (Pt 7: False "Fire Hazard" Assumptions)

http://sfforest.org/tag/flammability/

Western Tree Failure Database/California Tree Failure Report Program

https://ucanr.edu/sites/treefail/CTFRP_Statistics/50_or_more_753/

There are 50 or more reports for the following species as of January 2, 2020.

Report numbers for species do not provide an assessment of the frequency of failure for the species (i.e., how often a species fails relative to its occurrence in a population of trees). Rather, it is likely the data reflect the relative abundance of a species in the areas from which reports are being received. See **CTFRP Statistics/Origin of Reports**. Also, see **Failure Photos** for examples of root, trunk and branch failures of the 50 or more group.

Quercus agrifolia	coast live oak	725

Pinus radiata	Monterey pine	554
Cupressus macrocarpa (Hesperocyparis)	Monterey cypress	495
Eucalyptus globulus	blue gum	349
Quercus lobata	valley oak	329
Pinus pinea	Italian stone pine	179
Liquidambar styraciflua	sweet gum	162
Fraxnus velutina	Modesto ash	143
Quercus kelloggii	CA black oak	141
Sequoia sempervirens	coast redwood	128
Eucalyptus sideroxylon	red ironbark	109
Acacia melanoxylon	blackwood acacia	114
Pinus halepensis	Aleppo pine	107
Quercus wislizeni	interior live oak	92
Pyrus calleryana	callery pear	102
Cedrus deodara	deodar cedar	92
Ulmus parvifolia	evergreen elm	87
Quercus chrysolepis	canyon live oak	87
Pseudotsuga menziesii	Douglas fir	77
Umbellularia californica	CA bay	69
Calocedrus decurrens	incense cedar	70
Pinus attenuata	knobcone pine	64
Quercus douglasii	blue oak	51

Appendix C.

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