Jan C. Scow Consulting Arborists, LLC

Disease and Pest Diagnosis, Hazard Evaluation, Restorative Pruning Advice, Value Assessment

3887 Woodcliff Rd.
Sherman Oaks, CA 91403
(818) 789-9127
FAX 789-9128

8/26/08

Betty Lou Young
Pacific Palisades Historical Society
550 Latimer Rd.
Santa Monica, CA 90402

SUBJECT: Report on Rustic Canyon *Eucalyptus* Trees

BACKGROUND: The historic grove of *Eucalyptus* trees located in the Rustic Canyon city park has been in a state of decline for several years. There has been a lot of debate and discussion over the years about what was the cause of the trees' decline and what could, or should, be done to stop the decline. Various authorities and experts have been consulted over the years, providing a number of theories and suggestions. Some of these have been contradictory in nature, adding to the confusion and causing institutional paralysis[1]. We were hired by the Pacific Palisades Historical Society to attempt to answer the questions and provide recommendations for long-term solutions.

EXECUTIVE SUMMARY: The grove has come under significant stress, leading to loss of trees and a general decline in the health of the remaining trees. The stress appears to be the result of insufficient water coupled with severe soil compaction. We were unable to confirm that the water table has fallen in this area, but that could also be a contributing factor. Because the trees are so stressed by drought and soil compaction, they are particularly vulnerable to attack by various insect pests such as *Eucalyptus* longhorned borer, leading to additional tree mortality.

In order to remedy these problems, soil conditions must be drastically improved. This can be accomplished by doing radial trenching and backfilling with a high-percentage-organics-mix of soil and compost. A permanent irrigation system, using large, high-volume impact heads should be installed, and watering must be increased and carefully monitored. The above steps are urgent to the survival of the grove and should be undertaken as soon as possible.

Once the grove begins to respond, and it is apparent that the improvements are successful, restoration can begin. This will include corrective pruning to repair

---

[1] Timeline for the Grove, Randy Young, 2007

past errors, and better management of irrigation, weed control, and mulching practices. Inappropriate trees that have no historical significance can be removed and the long process of selecting historically appropriate trees to plant and beginning to refurbish the grove can begin.

ON-SITE OBSERVATIONS: Our assignment included evaluating a number of features at the site, including soil conditions, soil-water relations, irrigation, and tree conditions. The grounds are covered with a thick layer of mulch, apparently first installed in the early 1980's and replenished periodically over the years.

June 2008

Mulch: On June 17, 2008 the mulch depth, moisture, and composition was sampled over the entire grove at twenty-eight randomly selected locations in a rough grid pattern. In general, the mulch was from zero to fourteen inches deep with most locations sampled having mulch at least six to eight inches deep. Slight moisture was found in the mulch/soil interface at two locations. The remaining twenty-six locations had no apparent residual moisture. Later in June when pits were dug (see below), mulch was found to be more decomposed as depth increased. Some holes revealed that mulch at depth was very dark in color and with abundant fungal activity, consistent with a long history of mulching on the site. Small "feeder" roots were common in the mulch and appeared to be *Eucalyptus* roots based on visual/olfactory inspection.

Soil: On June 24, 2008 pits were dug with a shovel at five random locations throughout the grove to examine the soil condition[2]. The soil below the mulch was hard to very hard and dry in all locations. Rock-hard soil compaction seemed to extend as deep as we were able to dig (6-12 inches). Physical properties of the soil (based on visual examination only) were consistent with a scarcity of soil pore space and extreme compaction. Soil appeared to be a silty-loam with a minor sand component in a few locations.

Irrigation: The only viable irrigation system present is a series of quick-couplers running across the center of the grove parallel to the parking lot. Other assets include an old irrigation controller (no longer in use and probably not functional) and a back-flow prevention device apparently connected to the main line that serves the quick-couplers. The only irrigation being done at this time, as per the on-site landscape maintenance man, was to manually fill small handmade basins around the trunks of selected trees with a hose connected to a quick-coupler.

Trees: In June we also examined the trees to ascertain what problems they were experiencing. We found signs and symptoms of several opportunistic insects known to attack *Eucalyptus* trees in southern California, as shown in the table below.

[2] In our original scope of work we discussed the possible use of a soil coring tool to sample soil. This was not possible due to the extreme soil compaction.

Pests Present in Grove

Pest	Importance
Tortoise beetle *Heavy infestation*	Common in many species, probably not a threat to vigorous trees. Can be a serious threat in stressed trees.
Red gum lerp psyllid (RGLP)	Common in certain species. Under good biological control now in soCal. Probably not a threat.
Spotted gum lerp psyllid (SGLP)	Common in certain species. Importance seems to be related to individual trees and may depend on overall vigor of tree
Lemon gum psyllid	Did not see this but it is usually present where SGLP is and may be symbiotic with SGLP. Impact unknown.
Eucalyptus longhorned beetle (ELB)	Common in certain species when drought stressed. Usually fatal in weakened trees. Very worrisome.
Unknown canker disease	Typically seen on *E. cladocalyx*. Impact unknown, but very common in nearby Will Rogers State Park[3].

Pruning has been very poor in the grove. A number of trees in the grove have been topped or otherwise drastically pruned. This type of pruning may lead to compromised safety over time, as well as contributing to the declining health of some trees. Since this work cannot be undone, there is little value in dwelling on it here.

July 2008

After mentioning that the trees were in extreme drought stress and suggesting that a controlled and carefully monitored test irrigation run could provide valuable information, the City began to run a large sprinkler in various locations across the grove in July. Unfortunately, what the City did was not made available to us until after this report was written. However, Randy Young did inform us of the City's efforts and we were able to at least draw a few tentative conclusions from our observations in late July, as discussed below.

Watering results: It was reported that the City had run a single large sprinkler in the grove, allowing it to run for four hours[4] at each location before moving it to another spot. We were able to see what areas had been watered by noting where new weeds had grown since our previous visit (when all weeds had been cleared by volunteers). It seemed evident that the City had moved the water around most of the grove at least once. However there was no way to determine

---

[3] Author's personal observation.
[4] After this report was completed, we received a map with watering times and locations but that information was received too late to be useful in our analysis.

the duration or frequency of irrigation at any given location, so empirical data was lacking.

We visited the grove on July 21, 2008. At this time, we dug ten randomly located test pits with a shovel, similar to what was done on June 24. We also performed fifteen penetration tests randomly throughout the grove, pushing a steel rod into the ground as far as possible and recording the depth of rod penetration. The purpose was to determine how far the water had penetrated into the soil and if the compaction had appreciably improved because of watering.

In the ten test pits, water had penetrated through the mulch in only two cases, to depths of one inch and four inches. In the remaining eight pits, water had only partially wetted the top of the mulch to various depths but had not reached the depth of the soil. The fifteen penetration tests revealed that the soil (beyond the depth of the overlying mulch) could not be penetrated to a depth beyond one inch in any case but one, as shown below.

Depth of soil probe penetration	Frequency
No soil penetration possible	10 tests
½ inch penetration	1 test
1 inch penetration	2 tests
8 ½ inch penetration	1 test

This data reveals that after a fairly thorough regimen of irrigation, the water had generally not penetrated the mulch nor had it significantly diminished the soil compaction/penetrability issues.

RESEARCH: Our assignment also included doing some research to try to uncover additional supporting information about the site conditions.

Water table data: We did on-line searches as well as phone calls and email queries to attempt to obtain localized information regarding the possibility that the water table may be significantly lower in recent years as a result of drought or other conditions in the area. We were unable to obtain any response from the various agencies contacted, but did discover some relevant information on-line.

According to recent studies done in the Rustic Canyon area[5] the water table is at approximately ten feet below the surface. Other sources confirm that the water table in this general area does fluctuate[6]. It is also well established that urban development now covers much of the land surface with structures and pavement, thus limiting groundwater recharge from precipitation sources throughout the city, and possibly leading to a drop in the groundwater table.

[5] [USGS] Seismic Hazard Zone Report 01, Seismic Hazard Zone Report For The, Topanga 7.5-Minute Quadrangle, Los Angeles County, California
[6] Castellammare Mesa Landslides – Geotechnical Maintenance of an Unstable Retreating Sea Cliff, Mark Oborne, Robert C. Hancock, and Craig Kunesh

Miscellaneous information: We also tried to obtain additional information on other aspects of the grove as well, including soil test results (none available), irrigation as-builts (none provided), etc. In retrospect, none of these items are necessary to determine a course of action.

DISCUSSION: The trees are clearly in drought stress. Soil and mulch conditions make it difficult to irrigate properly and, even if sufficient water was provided, the root zone of these trees is not in good condition. These highly compacted soil conditions limit root growth and cause the trees to be stressed. To further push the trees, the insect populations are taking advantage of the trees' weakened condition and gradually causing their decline. If these conditions are not improved quickly, more trees will be lost.

The mulch layer placed under the trees is too thick to allow for easy water penetration and has evidently become somewhat hydrophobic, making it difficult to get irrigation water through it and into the soil. This explains why tree roots are found in the mulch, and why the soil was still dry after extensive irrigation. Before any water can penetrate into the soil below, the mulch layer must become completely saturated. This could be overcome by watering more frequently and for longer durations. Once the mulch layer is saturated, the problem becomes less significant, but each time it is allowed to become bone-dry again, it will have to be thoroughly wetted before the soil can receive irrigation[7].

Soil compaction is a more serious problem. It is not clear why there is such severe compaction. It may be the result of heavy foot or vehicle traffic over the years, and/or poor maintenance procedures[8] in the years before the mulch was applied. The level of compaction, as well as the apparent depth of compaction are a major concern and cannot be corrected by watering adjustments. Soil in this condition cannot be penetrated by new root tip growth. This places severe limitations on root regeneration as well as water and nutrient uptake. Without correction the trees will not recover, and will gradually succumb to drought (caused by lack of functional small roots) and secondary insect attack.

The insects present provide us with additional evidence as to the trees' condition. This is especially true of *Eucalyptus* longhorned borer (ELB). Presence of this type of insect is evident in several of the smooth barked trees and has probably led to the death and removal of numerous trees in the past. Here is an excerpt from the UC Davis website about the ELB lifecycle.

> *Several nights after emerging and mating, the female beetles begin laying eggs under loose bark of eucalyptus trees. Females may live one or more months and lay up to 300 eggs, which hatch in about 1 to 2 weeks depending on temperature. Larvae may bore directly into the inner bark or they may mine short distances in the outer bark layers before turning*

[7] It has been suggested that surfactants might help with water penetration. That is correct to some degree, but it would not resolve the soil compaction, which is critical.
[8] Before 1980 it is reported that the grove was periodically disced by tractor. This may well have contributed to extreme soil compaction. (pers. communication Randy Young, 8/24/08).

> *inward to mine at the bark-cambium-xylem interface, leaving a dark stain on the wood surface. At the end of the feeding period, larvae excavate pupal chambers in the wood. They enter the chambers, packing the holes behind them with wood shavings and frass. Larvae require about 70 days to develop in fresh wood or logs during hot summer months, and up to 180 days in drier logs. Only relatively fresh logs sustain beetle larvae; old dry logs are too hard for larvae to feed on and then successfully develop.*
>
> *Following pupation, adult beetles emerge from the same holes by chewing through the plugs of frass. During spring and summer, the beetle requires 3 to 4 months to complete its life cycle, but starting in fall and winter it may require up to 9 months. There are two and possibly three poorly synchronized generations a year; adults can emerge anytime from April through October.*
>
> *In their native Australia, eucalyptus longhorned borers develop in broken limbs, pruned limbs, fallen trees, and highly stressed trees. They rarely kill healthy trees. Eucalyptus naturally growing in areas to which they are adapted appear more resistant to beetle attack, and beetles in Australia are preyed upon by many natural enemies[9].*

There are two species of ELB beetles, one of which appears to be under good biological control in the region, while the other is still not well controlled. ELBs have been found to be much more serious in drought stressed trees. Proper watering is generally considered the best treatment, as healthy trees are able to repel the insects with adequate sap-pressure, which is dependent on sufficient water. Of all the pests present, this is the only one will take out stressed trees with certainty.

REMEDIAL RECOMMENDATIONS: There are a number of steps outlined below to address the issues that are leading to the decline of the grove. These immediate, short-term needs should be addressed as soon as possible.

Soil improvement: The most effective method of correcting the soil compaction is likely to be radial trenching done under each tree. Many techniques and methods are utilized to accomplish this type of remedial work. The potential negative impact to the tree roots caused by trenching can be significant. In this case, it seems that the benefits far outweigh any potential damage, and that if adequate care is exercised, conventional trenching methods can probably be used. The alternative, using high velocity compressed air or high-pressure water jets, is likely to be more expensive and may not be warranted. In addition, the severity of the soil compaction might render these alternative techniques unavailable.

This technique involves digging radial trenches (think spokes of a wheel) starting about six to eight feet from the tree trunk and extending outward for ten to twenty

---

[9] From: www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7425.html

feet. Prior to trenching, all mulch should be pulled away from the area to be trenched and set aside. Trenches should be about two feet deep and one foot wide, oriented to avoid damaging large tree roots. Trenches should be separated by two to three feet at their initiation point nearest the tree. Additional trenches can be placed further out from the tree between the main trenches as the distance between them allows. Digging with a small backhoe may provide better control and allow less damage to large roots. After the trench is dug, backfill should be done with a mixture of equal parts well-composted organic matter and native soil. After backfilling, it may be beneficial to water-jet the trenches to maximize settling and avoid future voids in the ground surface. When the process is completed, and ditches are settled and leveled, mulch can be pushed back into place over the ditches.

Irrigation: The most important task cited in the original discussion with the Pacific Palisades Historical Society was to identify what type of irrigation would best serve the grove. Having the benefit of close examination of the conditions on the ground, irrigation alone will not solve the problem. However, once the soil improvement steps above are carried out, the irrigation will be much more effective and proper irrigation is essential to the successful regeneration of trees in the grove.

Irrigation will probably be most effective if it is applied by overhead sprinklers such as large, high-volume, impact heads[10]. This will require a minimum of heads, reducing the amount of irrigation laterals needed to supply them. Installation of underground pipes is often mandated to specific depths by standard codes[11], and this should not be a problem if particular attention is paid to tree location and damage to roots is avoided or kept at a minimum. No machine trenching should approach within ten to twelve feet of any tree. Closer to trees, hand digging may be necessary to avoid root damage to trees. Trench width and depth should not exceed the specified requirements. Wherever possible, lateral lines and main line(s) should be placed to be as distant as possible from trees. Sprinkler heads should be placed as far as possible from individual trees to avoid high-velocity water impact to trunks and to minimize irrigation pattern obstruction. If it is possible to utilize the existing mainline running through the center of the grove[12] it would reduce trenching requirements and limit tree damage. The system may be automated or manual. Either way, it will require a responsible management program. (See ***Grove maintenance*** below). Sprinkler heads may be "pop-up" below-ground type or above-ground on risers[13], depending on the City's requirements.

Quick-couplers should be left intact or re-installed to use for hand watering new plantings.

---

[10] For example, RainBird® 65PJADJ-TNT impact heads, with a radius of 58 feet at 60psi.
[11] 12" for non-pressurized laterals and 18" for pressurized main lines is common. (California Landscape Standards 1989).
[12] This mainline currently only supplies the quick-couplers as far as we know.
[13] Heads on risers are much easier to maintain but are subject to theft and may create unacceptable safety risks.

LONG TERM RESTORATION RECOMMENDATIONS: The recommendations below look to the future and assume that the immediate goals above have been accomplished.

Pruning: The grove needs better quality pruning in order to keep the trees safe without destroying them. Past work has created problems that will be difficult to correct. The best approach is probably to develop a long-range pruning and inspection schedule and then ensure that it is carried out by well-qualified personnel. Excessive or unnecessary pruning will further stress the trees and should be avoided. Below is an example that might be appropriate to the needs in the grove[14].

All pruning in Eucalyptus trees should include the immediate removal of all brush and wood, since the ELB is attracted by pruning and will use freshly cut wood to "nest". It is also important to limit pruning to December/January when the chance of ELB being active is lowest.

Pruning Schedule

Action	Schedule
Initial visual (ground level) safety inspection to establish any immediate failure risks, carried out by qualified professional[15] with experience in *Eucalyptus* risk assessment.	Within one year (by September 2009)
Pruning to alleviate immediate failure risks. Aerial inspection. To be carried out by well-trained crew under direct supervision of qualified professional.	Within one year (by September 2009)
General restorative pruning to improve the overall shape and structure of all trees and to correct previous damage from improper pruning.	Assuming the trees have regained vigor and are showing positive evidence of recovery, this should be done in December/January 2009-10[16]. If trees are not yet responding to corrective actions, delay until winter of 2010-11.
Routine safety inspection (and safety pruning only as needed).	Every 2-3 years thereafter

Grove maintenance and repair: There are several aspects to grove maintenance, and the City has expressed concerns about future maintenance. We have made some specific recommendations below.

---

[14] All pruning should conform to the standards of the International Society of Arboriculture "Best Management Practices-Tree Pruning" and ANSI A300-2001 "Standard Practices (pruning)."

[15] Qualified professional would be someone who is a Member of ASCA, an ISA Board Certified Master Arborist, or an ASCA Registered Consulting Arborist.

[16] Pruning in the dead of winter limits longhorned borer activity associated with wounded trees.

<u>Irrigation</u>- Future irrigation should be limited to infrequent, long-duration episodes, perhaps once every six to eight weeks for three or four hours on each valve[17]. This can be accomplished by utilizing an automatic irrigation controller or by scheduling human activation. There are disadvantages to either means of control, and these need to be carefully considered. Over-watering can do as much damage as not watering and is much more likely with an automated system. However, if irrigation depends on someone remembering to turn the water on (and off) there is also a good chance of trouble. Perhaps the best solution is an irrigation controller than can be activated manually but will shut off after the allotted amount of watering has been completed, eliminating the need for someone to remember to turn it off.

The system should be managed by a person (or persons) evaluating irrigation needs on a regular basis. It will be best for the trees if utilized in a semi-automatic manner, rather than watering on a set schedule. Irrigation evaluation needs should be scheduled for every month or two and watering adjusted as indicated by that evaluation.

<u>Weed control</u>- Weed control is a major concern regarding irrigation in the grove. However, if the grove is going to be preserved and brought back to health it will require more frequent irrigation than it has been receiving. This will cause an increase in weed growth, and a concurrent increase in maintenance requirements. The choices that exist are few. It is not particularly important to the health and survival of the grove that weeds are kept out, but it may be an issue for the neighborhood and/or for the City.

Weed control can be done manually by pulling the weeds or digging them out, or it can be done by application of chemical herbicides. Another alternative is to use a moveable plastic sheet to kill the weeds (“solarization”) but this has a number of drawbacks and it is unlikely to prove practical over time. It is beyond the scope of this report to make such a decision, but if sufficient volunteer labor exists, monthly hand weeding would seem a good choice. Adding new mulch is not an option at this time for weed control.

<u>Mulch</u>- Because there is such an excess of mulch at present, no additional mulch should be allowed in the grove. At some point in the future (5 years [perhaps) this can be reevaluated, but for now the mulch should be left in place and not replenished. There is no need to remove mulch as long as the irrigation and soil improvement steps discussed above are carried out.

<u>Erosion next to Hiltree Rd.</u>-The edge of the grove along the west side (Hilltree Rd.) is exposed and eroding, possibly leading to the loss of trees in the future if not remedied. This slope should be addressed or it may be necessary to remove some of those trees in the future.

---

[17] Exact duration cannot be determined in advance because it depends on how long it takes for water to pass through the mulch and penetrate into the soil to a sufficient depth (12-18 inches).

Removal of inappropriate plantings- Some of the trees and shrubs planted in the grove in recent decades are of no historical value, and little horticultural value. When the time comes to begin replanting *Eucalyptus* trees back into the grove, these plants should be removed to make room for more appropriate historical specimens. It will be much less expensive and more practical to take these out sooner, especially since one of them is dead and needs to be removed immediately for safety reasons. The *Cycads* do have significant value and should probably remain.

New tree establishment: The most appropriate time to begin planting new trees in the grove is after the remedial work has been completed and there is clear indication that it will succeed. Planting new trees will be in order when 1) the existing trees are stabile, 2) there is good evidence that the remedial steps are working as planned (i. e. recovery of vigor, abundant new growth, diminution of pest populations, etc.), and 3) it is clear who is going to manage the grove. At that time, we would suggest the following steps be taken.

Inventory the grove to establish remaining species and confirm or correct existing maps. If the existing maps are accurate, it may be possible to replant some of the historic species back into the grove approximately where they were originally. If this proves to be impractical, the next best alternative might be to determine which species were historically present that are no longer in the grove, and plant those trees in the best locations for their future survival. (It will require some research to locate the species needed and some may not be readily available. Propagating from seed might be one possibility, but that is beyond the scope of this report.)

Establish a clear responsibility for hand-watering the new trees until established. If everything else is in order, new trees can be planted in the fall, and will only require supplemental water through the first full year (winter if not sufficient rainfall, spring, summer and fall). After the first year, the new trees should be monitored, but they will most likely survive on the general watering regimen of the grove.

Trees should be planted and staked in accordance with currently accepted standards[18]. It may be necessary to correct soil compaction and possibly drainage issues at each new tree site. The best way to do this may be to dig radial trenches as described above, extending out 6-8 feet from the center of each hole to a depth sufficient to penetrate through the heavily compacted soil, and backfilled as previously described.

[18] Standards for planting are readily available but it is important to obtain current standards rather than the outdated materials still used by some landscape architects. The most important clue is that the depth of the hole dug should be “equal to or slightly less than the depth of” and “3-5 times the diameter of” the root ball.

Attraction of Monarch butterflies* (*Danaus plexippus*)*: It has been reported that Monarch butterflies used to congregate in the grove in the 1980's. Monarch butterflies use *Eucalyptus* trees because they provide shelter from the wind and bloom in the winter, providing them a food source on their long migration south. When decisions about which new *Eucalyptus* tree species should be planted are made, it may be appropriate to consider if certain species are more likely to provide good shelter and food for the butterflies. However, the most common species they roost in are *E. globulus*, probably because they are the most common species in California.

Although we have not spent a great deal of effort on this, those who we have spoken with did not feel confident that any action taken could attract or restore Monarch butterflies to the grove[19]. If you are seriously committed to researching this in depth, we can spend more time on it and come up with more information. Once the trees are in better condition, it seems likely that milkweed plants could be established on the site, although it may not result in Monarch butterflies coming to the site.

Please let us know if we can be of any further assistance or if you have any additional questions. Our goal is to satisfy our clients and help them to better care for their trees in the most effective way possible. We look forward to working with you toward that goal!

Sincerely,

Jan C. Scow
ASCA Registered Consulting Arborist #382
ISA Certified Arborist # WC1972

Attached : "Final Summation of Eucalyptus Grove Test Watering"

[19] Walt Sakai, Professor of Biology at Sta. Monica Col. who studies Monarch butterflies.