Visit of a Redwood Expert

by Curt Oldenburg

Before county-paid work crews could cut up and remove the leaning redwood that fell across Laverne Avenue at Stolte Grove last July (7/28/06), Homestead residents observing the action were thinking about how they could keep some of the history of that tree alive in the community. Quickly the idea spread that a large section of the tree could be preserved in Stolte Grove to serve as a monument to the tree, and at the same time to maintain the possibility of learning something about the old tree's history and the history of Homestead Valley as recorded in the growth rings. Since that time, the rings have been looked at and roughly counted, but lacking expertise in the field of dendrochronology, local residents have been unable to make definitive statements about how old the tree was, when the fire was that scarred it so badly, and how the climate has varied in Homestead Valley over the last 500+ years.

In an effort to answer some of these questions, I looked around on the web for experts who might be able to help. Luck was on my side when I came across Christopher Earle's Gymnosperm Database website (http://www.conifers.org/). Earle is a world expert on conifers and has a particular interest in redwoods and dendrochronology. I sent a detailed email describing our leaning tree, its demise, and our desire to gain whatever knowledge possible from the section we saved. To my surprise and delight, Earle emailed back expressing interest in the tree. A few weeks later, he told me he would be in the area in February, and could stop by and meet with us to share his observations.

On the warm and sunny afternoon of February 4th, 2007, Earle detoured to Stolte Grove on his journey by motorcycle from Seattle to Oaxaca (Mexico) where he would be spending three weeks looking at tree species that he had not yet studied extensively. Several of us from the Land Trust Board along with Stolte Grove neighbors met him in the Grove for a two-hour discussion on Coast Redwoods (Sequoia Sempervirens) in general and the leaning tree log and other nearby large redwoods in particular.

Earle's first comments after brief introductions were to say how wonderful the Grove is, and how the atoll-like arrangements (circular bunches of trees) are so well expressed here in the Grove. He explained that the southern extent of Coast Redwoods is in the Santa Lucia mountains just south of Monterey, and even here in Marin, the climate is only tolerable for natural redwoods near the coast in the bottoms of moist valleys such as Homestead Valley. The dense growth of redwoods in the Grove is described as high basal area. High basal area results in growth being suppressed because the forest is mature and there is not a lot of light available for younger trees. In such areas, where shade is extreme, younger trees can sometimes be larger than older trees, the idea being that young trees need to grow fast and tall to get to the light that is being used by older slower-growing trees. He explained that competition for light is what leads to the record-setting tallest trees. In fact, the tallest trees of a species are often found within forests of a different tall-tree species.

The preserved log of the leaning tree was the main focus of the discussion. Earle observed it to be around 5 feet maximum in radius with around 10 rings/inch, making 600 years a plausible rough estimate of its age. To do a good job on ring counting, Earle suggests using a belt-sander with progressively finer grit to make a smooth surface for unambiguously identifying rings. Complications arise in dating redwoods by counting rings. Earle explained that every ring represents a year, but the tree does not necessarily add a ring every year, and the rings it does add do not necessarily extend all the way around the tree. While redwood is naturally highly resistant to rot, if we want to preserve the entire log for decades, we will need to keep it dry and preferably up off of the ground. The rotten wood in the log still has fungus in it and will cause the log to continue to rot from within. As for why the tree was leaning, Earle says something must have disturbed it and caused it to lean. Currently there is an undercut of the stream bank across Laverne from the stump of the leaning tree, and this undercut is causing a younger redwood to lean drastically to the northeast. It is possible that undercutting of an older stream bank in pre-Laverne centuries caused the leaning tree to tilt eastward, or perhaps it was hit by another falling tree.

As for why the tree fell when it did, Earle says it is very common for trees to fall during hot weather. The period prior to July 26, 2006 was a prolonged hot spell. July 26th itself was of course a foggy day. Chuck Oldenburg's theory is that during the hot spell, the tree had to increase the amount of water it brought up into its trunk and leaves to avoid drying out, and then when the fog rolled in that water could not exit the tree by evapotranspiration. In addition, fog may have condensed on the leaves adding to the water mass. The result was excess weight that was too much for the leaning tree to bear. This theory arose from the observation of the incredibly wet wood in the cambium just inside the bark right after the tree fell. Earle was not convinced of this theory, and mentioned the possibility that water within the tree provided strength because of its incompressibility. During hot and dry weather, the wood became drier and thereby weaker. In short, it is not known exactly what caused the old leaning tree to fall when it did. Earle explained that beyond the trunk strength, the support for a tall redwood tree comes from the roots, of which there are two main types: (1) the large underground roots that provide structural support for the tree, and (2) the very fine roots that provide nutrients (mostly nitrogen) for the growth of the tree. The average lifespan of the fine roots is only around five years, and they exist largely within the first six inches of the soil. As a rule of thumb, redwood roots usually extend in diameter to around one-quarter to one-third the height of the tree.

Just inside the stone gates of Tamalpais Canyon on the left-hand side is another large burned-out tree known as Jumbo. Earle remarked that Jumbo appears to have recorded a long history of repeated fire events. The tree has multiple trunks above around 30 feet. He speculated the trunk could have broken off around 150 years ago at which point the larger of the two new trunks began growing upward. Unlike redwood trunks, redwood branches do not live longer than around 500 years; branches die due to excessive shade, breakage, or fungus and rot. Even on an ancient redwood 2000 years old, all of the branches will be younger than 500 years. Earle explained that branches are of two types on redwood trees: (1) originally formed at a bud along the trunk, and (2) epicormic, in

which long-dormant buds burst through the bark forming a new branch later in the life of the tree.

Near the end of the paved part of Tamalpais Drive, up Log Arch Trail around 50 feet and off to the right 30 feet, is a double-trunked burned-out tree known as The Twins. This tree appears to be formed from the trunks of two separate trees growing together. But Earle explained that redwoods are largely intermingled in their roots and so by definition it is hard to call the two trunks separate trees. Evidence of intermingling arises in redwoods dramatically in the white redwood, of which none are known in Homestead, but which apparently exist in Samuel P. Taylor State Park. A white redwood typically grows in old-growth forests that are very dark. The tree does not carry out photosynthesis but instead lives off its neighbors who are tall enough to find light to carry out photosynthesis. The many burls on The Twins are composed of callus tissue, and probably caused by a virus, but this is just prevailing theory and not all that well founded.

We then walked back to the Grove and into Three Groves where we looked at a large rotted stump just east of the Wedding "Lawn." This stump had been considered a possible cut stump, presumed evidence of logging by the Spaniards long ago. Earle suggested it was probably not a cut stump because of the lack of axe marks, the cross-cut saw having not come into wide use until after the Civil War. Earle favors the idea that recurring wildfires were more likely the main natural cause of stress and mortality for redwoods in this area. In theory, redwoods can live essentially forever. Climate has been relatively stable for approximately the last 4000 years, making this the maximum age for most living trees on earth. Pollen studies of ancient redwoods are hampered by the small size of redwood pollen and its similarity to that of common grasses. In general, redwoods have been around North America for around 2 Myr, but again, the changing climate did not allow any to live to today from longer than 4000 years ago or so.

Coast Redwoods drop leaves especially in the fall, much like a deciduous tree. The litter scattered about on the ground below redwoods consists of little branches containing multiple leaves—they are not needles. This morphology is referred to as cladoptosic. At the top of a tall redwood tree, the environment can be quite harsh, as the hot sun beats down and it is windy. The tree must provide water from its roots upward sometimes hundreds of feet into the tree, with the top of the tree the driest. The highest tops of trees often break off and fall as they dry up and winds whip them around. We found many smaller sized waxy branches in the litter in Three Groves that had fallen recently from the tops of the trees in the dry months of late 2006-early 2007, possibly aided by the windstorm of late December 2006.

After around two hours of discussion and question and answer, we took a group photo and said our thank you's and goodbye's to Earle and wished him a good trip to Mexico. With all that we learned from this expert, none of us will be able to look at redwood trees quite the same way again.