

# APPENDIX I

Additional notes on the Spanish discovery of coast redwood.

The exact location of Portola's discovery appears to have been Pinto Lake in Santa Cruz County (Bolton, 1927; Griffin and Critchfield, 1976). Crespi's journal recounts heading "northwest. We could not make the march as long as intended, because the sick men were worse, and each day their number increased, so we must have traveled but little more than a league (Bolton, 1927)" from their camp upon the Pajaro River (near Watsonville) before reaching the first sequoias, "...near a lagoon which has much pasture about it and a heavy growth of the redwoods (Bolton, 1927)." The quotation embraced by the text is from Bolton (1927).

The earliest recorded measurement of coast redwood was conducted by another Franciscan missionary, Fray Pedro Font, who chronicled d'Anza's expedition to San Francisco Bay in 1776 (Shirley, 1937). On March 26, the expedition crossed "the arroyo of San Francisco (Bolton, 1933)" where Font noted "a few spruce trees which they call redwood, a tree that is certainly beautiful; and I believe that it is very useful for its timber, for it is very straight and tall, as I shall show later on (Bolton, 1933)." The party continued northward, reaching the tip of the San Francisco Peninsula within two days, whereupon Font proclaimed, "The port of San Francisco... is a marvel of nature, and might well be called the harbor of harbors (Bolton, 1933)." On March 29, their return journey brought them to a small promontory near Dolores Creek overlooking "a very high redwood, which stands on the bank of the arroyo of San Francisco, visible from a long distance, rising like a great tower... and whose height I afterward measured (Bolton, 1933)." The following day, Font "found it to be, according to the calculation which I made, some fifty varas high (137.5 feet), a little more or less. The trunk at the foot was five and a half varas in circumference (15.125 feet), and the soldiers

said that they had seen even larger ones in the sierras. The method by which I measured the tree was as follows: I set up the graphometer thirty-six varas from the foot of the tree (99 feet) and a vara and a half above the ground (4.125 feet), and, pointing at its top through the sights of the alidade, it showed 52.5 degrees. Then, with the graduated semicircle, forming the triangle of those degrees, and adding to it the height of the base of the graphometer, which was a vara and a half, it gave as a result the altitude stated. Present at all this performance were the Indians who live in the village here. They came to see us and were very attentive and quiet, and appeared surprised to see what I was doing (Bolton, 1933)." One vara is equal to 33 inches (Shirley, 1937) .

The trade in redwood lumber began only two months later, when Don Diego Choquet arrived at Monterey Bay to procure building materials for Fray Junipero Serra and his Mission San Diego de Alcalá (Carranco, 1982; Cox, 1974). Between May 21 and June 30, 1776, Choquet took aboard a cargo of pit-sawn timbers before returning south on the ship that had earlier supported Portola's expedition, the *San Antonio*.

Font's tall tree, or "palo alto," still stands on San Francisquito Creek within the city of Palo Alto (Bolton, 1933; Campbell, 1946), and is prominently featured on the seal of Stanford University (Peattie, 1980).

## Transcript of the video documentary, "On the edge: nature's last stand for coast redwoods"

In all the world, can there be a more grand and ancient forest? Sown on the edge of the New World, coast redwoods stand as nature's tabernacle, loftier and more exalted than any built by man.

As the great American author, John Steinbeck, wrote, "The redwoods, once seen, leave a mark, or create a vision that stays with you always... They are not like any trees we know, they are ambassadors from another time."

I'm Jim Snyder and for the next two quarters of an hour, we shall probe the edge of coastal fogs to find these redwood ambassadors. And we shall see, that from a geological standpoint, nature has not only poised the coast redwood on the edge of California, but on the edge of survival.

At first encounter, many people are impressed by the redwood's size. Standing more than 350 feet high, coast redwoods can grow 20 feet in diameter and can yield 360,000 board feet of lumber; enough board feet to build 22 average-sized houses!

Yet to others, a redwood sojourn might summon a more primeval scene, when dinosaurs roamed the ancient redwood forests of North America. One hundred and thirty million years ago, gazelle-like hypsilophodontids nested in colonies along the forest's edge. Elsewhere, herds of *Diplodocus* reared their 85-foot long bodies to browse on uppermost cones and needles or repel attacks from allosaurs. By the end of the Age of Reptiles, nocturnal predators were common and *Dromiceiomimus* stalked ancestral redwoods in search of lizards and small mammals.

When the long reign of dinosaurs collapsed, 65 million years ago, the world was ravaged by a great dying of all land animals larger than 55 pounds. Yet for ancient redwoods, the thread of life was not extinguished and they endured for 650,000 centuries more.

Their prehistoric ranges can be traced to nearly all the northern continents. From 12 or more ancestral species of redwood, three persist into the present. The uniquely deciduous dawn redwood was only recently known to science when relict stands were discovered in central China in 1944. Forebears of the giant sequoia, largest of all living things, appear to have been restricted to Greenland, Europe and North America; while those of the coast redwood were more widespread.

We know the range of these ancient forests from the fossils they left behind, and from those rare and magnificent occasions when the

trees were preserved beneath ash, mud and volcanic debris from some primal eruption. These petrified monarchs are found near California's Napa Valley. Three million years ago, a volcanic eruption leveled and buried this redwood forest to preserve even the soft, fibrous bark in astonishing detail.

It was nearly 55 million years ago that the earth began a prolonged cooling trend. Increasingly severe northern winters slowly diminished the range of ancient redwoods. Like the coast redwood today, their roots may not have tolerated the ground freezing. And with the building of western continental mountains, inland droughts became more frequent far from coastal storms. And thus, 20 million years ago, the redwoods retreated south and west, establishing their claim to the moist, temperate regions of California.

Then within the last two million years, the trend in global cooling climaxed four times in the Ice Ages. Massive ice fields, two miles thick, buried the continent as far south as the Ohio and Missouri Rivers. But in California, the low, coastal mountains were largely glacier-free. And here, extending 500 miles from Monterey County to the southwestern tip of Oregon, coast redwoods found safe refuge.

Mark Twain once quipped, "The coldest winter I ever spent was a summer in San Francisco!" Indeed, many visitors would agree. But it is the summer fogs of the Pacific Coast that breathe life into the redwood forest.

One tree requires prodigious amounts of moisture. As much as 500 gallons per day are required to replace the amount released by the leaves as water vapor. When the vapor condenses with coastal fog, light rains bathe the forest to help maintain a cool and damp microclimate during the dry summer months. Redwoods flourish only where summer fogs pervade, below 3000 feet and less than 40 miles from the sea.

The trees are renowned for their great height. Three hundred feet is common among stands of old-growth redwood. The task of supplying

water to their uppermost branches is formidable and spike-tops result from times of moisture stress. Most astonishing is the comparatively small size of their winged seed: 60 seeds to a cone, 123,000 to a pound. A redwood may produce five million seeds per year, but less than one in a million may survive to become the tallest of all living things at more than 367 feet high. Such colossal height suggests profound longevity; and countless human milestones have lapsed in just one redwood's 2200 year lifespan.

When we consider the great age of the redwood forest, human activity among the trees has been a very recent event. For example, it is only within the last 150 years that redwoods have fallen on the cutting edge of the lumber industry. But the human chapter in redwood chronology begins with California's first inhabitants.

At least 15 Native American tribes came to occupy parts of their range, yet the most intimate associations evolved among northwestern cultures as late as 900 A.D.. To people of the northern forest, redwoods embodied the eternal spirit found in all things which live as equals.

"What remains of our ancient, ancient history, is recorded here among the ancient creatures, who have seen civilizations come and go. It's like our people. We have seen many flags fly over this land. And the creatures around us, they commit no wrong against us. They are in state of grace. So in the name of progress, we've seen much death and destruction, and how insensitive man is to the natural world. So it behooves us, then, all of us, to make corrections within the educational system where little children will be taught the truth about resources. So that when it comes their turn to accept the responsibilities of managing or helping manage a natural area, they will know how (Coyote, West Coast Representative, Council of Elders)."

Rituals, such as the Jumping Dance of the Yuroks, celebrated the renewal of life and the sanctity of the natural world.

Their settlements clustered along rivers or on the coast near streams, lagoons and bays. Houses were gabled and semi-terranean, built of redwood planks split by elk horn wedges and stone mauls. Footpaths connected neighboring villages, but for riverine fishermen like the Hupa and Yurok, canoes were indispensable. Shallow, 18-foot dugouts were hewn from redwood logs using fire and mussel-shell adzes. Although living redwoods were sometimes felled by burning, most tribal needs were met by the abundant supply of fallen wood.

If the Native American experience could be weighed in terms of impact upon the redwood forest, it would be measured by fire. Open meadows, or prairies, may have been maintained by periodic burning to enhance the availability of game and valued species of plants that thrive in fire-disturbed areas.

The charred trunks of many old redwoods can attest to the natural part that fire plays in a mature forest ecosystem. Periodic, low-intensity fires benefit the forest by recycling nutrients to the soil and burning ground vegetation that competes with redwood seedlings for water, nutrients and sunlight.

Unlike most trees, redwoods contain very little pitch that might fuel prolonged burns. Their bark is also one-foot thick at the base and a poor conductor of heat, thus insulating their life-supporting tissues from fire.

All the tissues responsible for transporting water and nutrients from the soil to the leaves in exchange for photosynthetic sugars lie just beneath the bark. As redwoods grow from seedling to giant, the innermost tissues die and become heartwood. Fires do sometimes penetrate the bark and burn the heartwood from within. Yet the burning of these cavernous scars, known as "goose pens" to early settlers, seldom kills mature redwoods. The vast reservoir of water stored within their tissues can resist most heartwood burns.

Centuries later, scars from major fires may no longer be seen. Redwoods not only conceal the damage with an accelerated growth of tis-

sue, but they can buttress gradual leans of 40 feet or more to restore their balance in unstable soils.

Even when fires succeed in destroying a redwood trunk, root collar burls at the base of the stump survive. New growth sprouts from dormant buds within the collar to form concentric stands of trees which, in turn, mature and die to propagate further circles of redwood. In this way, a parent tree may never truly die because its roots and genetic code live on.

It was this flirtation with immortality that impressed English botanist A.B. Lambert when he first described the coast redwood in 1828. Their rounded cones and branchlets of needles forming flat sprays were very similar to the bald cypress and suggested the genus *Taxodium*. But unlike the deciduous cypress, coast redwoods were evergreen, retaining their branchlets for three or four years. And the redwood's ability to regenerate from the root collar was extremely rare among conifers. Lambert chose to name the species *sempervirens*, or "ever-living."

Another botanist, Stephen Endlicher, challenged Lambert's designation of *Taxodium*. He noted that redwoods produce a second type of needle unlike bald cypress, with smaller needles bristling about the stem on leading shoots and juvenile growth. In 1847, he proposed a new genus, *Sequoia*, most likely in honor of the great American Indian scholar who invented the Cherokee alphabet.

*Sequoia sempervirens* had first been described by the Spanish in 1769, when Portola's expedition explored Monterey Bay "over plains and low hills, well forested with very high trees of a red color, not known to us... they are named redwood from their color."

The dark, rich hues of the heartwood, bark and swollen knobs of burl are due to the presence of tannic acids, or tannin. Not only is tannin a potent fire-retardant used in fire extinguishers, but the astringent nature of the acid makes the wood unpalatable to nearly all

fungi and insects, especially termites. Fallen logs decay very slowly, a quality not unnoticed by early loggers.

Although the Spanish colonization of California was largely built of adobe, the subsequent flood of emigrants during the Gold Rush of 1849 increased the demand for lumber. Within six years, California swelled from 15,000 to more than 223,000 people. Many came by sail, choking San Francisco's harbor with ships abandoned by their crews for the Motherlode. While few found fortune in the gold fields, many struck it rich supplying the miners with lumber. By 1850, the rush for redwood was on.

Pioneer steam, wind and water-powered mills were built near Albion and Mendocino, or wherever coastal headlands would permit the loading of schooners. Humboldt Bay championed the boom in spite of hazardous sandbars. Within three years, Eureka boasted six sawmills and 3000 people. No less than 143 ships and 20 million board feet of lumber left Humboldt Bay for San Francisco in 1853.

Although many of the mills soon failed due to over-production and an unstable market, survivors, like William Carson, made Eureka the jewel of the redwood empire. When his mansion was completed in 1886, citizens hailed Eureka for having "no cyclones, few tramps, little poverty, and never lost a dollar by dishonest officials."

The wealth of the lumber barons was enriched by the tremendous productivity of the redwood forest. While reports of one and a half million board feet per acre may have been exaggerated, they are not surprising. When we consider the biomass, or living weight, of the trunks alone, old-growth redwoods contain as much as 1540 tons per acre, or more than eight times the amount produced by a mature tropical rain forest!

Harvesting such wealth was difficult for early loggers. Armed with little more than an axe atop springboards to clear the root collar burls, two men might spend a week felling one redwood giant. Their inverted undercut reduced

breakage by allowing the tree to slide off the stump when toppled. In 1852, before the tree was sawed into logs, the bark was stripped and burned to facilitate hauling and avoid clogging the mill's machinery. Often, logs cut from the largest redwoods had to be split with dynamite before they could be "dogged" together in trains.

Teams of oxen dragged the trains over an elaborate network of trestles and cross-timbered skidroads. At nearly \$5000 per mile, skidroad construction was the most costly aspect of early logging until the coming of the railroads in 1875. Steam locomotives not only opened up more remote sections of forest to logging, they inspired the creation of the first steam-powered winch, seven years later. Known to loggers as bull donkeys, they soon replaced the oxen teams just as rails replaced the skidroads.

The revolution in logging afforded by machines increased production dramatically. By the time caterpillars became commonplace in the 1930's, more than one third of the redwood forest had been logged. Six hundred million board feet were cut each year. The postwar housing boom saw 398 mills work the redwood coast by 1948, and for 24 years, production topped one billion board feet! Few privately owned stands of old-growth timber survived. By 1989, more than 1,900,000 acres of virgin redwood, 95% of the original forest, had been cut down.

Ninety-five percent! It is both remarkable and sobering to tally the cost of America's growth this last century. And had it not been for the crusades of early conservationists, many more redwoods would have fallen.

As early as 1852, the California state legislature wrestled with attempts to place redwood forest lands into public ownership. But public support was neither widespread nor persistent enough to enact legislation until Andrew P. Hill rose to champion the cause in 1899.

"Andrew Hill, who was a very famous painter and photographer from San Jose, California,

was commissioned to take pictures in the redwoods; and this particular park was where he wanted to take the pictures. The people who Hill gathered around him, who happened to be very noted people (David Starr Jordan of Stanford University was president of Stanford, Benjamin I. Wheeler of Berkeley and Father Kenna of Santa Clara, and the noted journalist by the name of Josephine McCracken), formed a group to look into how the redwoods that we know today could be preserved (Tony Look, Co-Founder of the Sempervirens Fund)."

In 1900, McCracken described the peril menacing Big Basin: "Greed, rapacity and vandalism will hack and cut and mutilate the grandest and most magnificent forest that can be found on the face of the globe."

In May of that year, Hill led a party of eight conservationists to explore Big Basin's redwoods. So profound was their experience that they rallied together near Sempervirens Falls to form the Sempervirens Club, dedicated to the preservation of Big Basin as a public park.

"They passed the hat for a contribution from each of the people who went. They had the grand total of \$36 to start this movement which, today, has been so successful with many millions of dollars contributed and bought. It then went to the state legislature again and this time, Father Kenna, of the University of Santa Clara, was the prime mover of the legislators in Sacramento. And between Mr. Hill and himself, they were able to persuade the legislature to appropriate \$250,000 to buy 3600 acres of redwoods in the Basin itself (Tony Look)."

As Reverend Kenna addressed the legislature, "Senators... these redwoods are predominantly Californian, unique in their species and situation, and as a forty-niner, I beg you to stay the hand that would harm those that still remain, to recall the glories of those vast virgin forests now no more." On March 16th, Governor Gage signed the bill appropriating funds for the purchase of Big Basin as California's first redwood park. Unfortunately, Big Basin's char-

ter did not extend protection to north coast redwoods.

It is in the northwest regions of California that the largest sequoias grow in pure stands atop alluvial flats. Redwoods thrive along river banks in areas prone to flooding. When excessive amounts of silt smother the roots of other conifers, redwoods keep pace with the rise in soil by producing new roots from their root collar burls. As many as seven successive root systems have been counted on fallen trees. Although redwoods lack taproots, they remain extremely wind firm by interlocking their six-foot deep roots with those of neighboring trees.

Efforts to preserve the northern redwoods coincided with the construction of the state highway from Eureka to San Francisco in 1917. When the road passed through the remote Dyerville-Bull Creek Flat area of Humboldt County, it opened up the most spectacular pure stands of old-growth redwood to logging. Since virtually all lands adjacent to the highway were owned by timbermen, three prominent conservationists were compelled to take action.

“And they are credited with being the founders of the Save-the-Redwoods League. They were Madison Grant, Henry Fairfield Osborn and John C. Merriam. John C. Merriam was a paleontologist at the University of California, and he interested his good friend, Stephen Mather, who was the first director of national parks, to join the group along with Franklin K. Lane, who was the Secretary of the Interior at the time. For a short time, Mr. Lane served as the President of Save-the-Redwoods League during its founding. And then, John C. Merriam followed. And the Save-the-Redwoods League, from a \$100 contribution, began to start buying up groves in 1919 and 1920 which would eventually be protected for their great antiquity and their beauty. Save-the-Redwoods League grew from a handful of people to an organization which, today, has 50,000 people throughout the United States that contribute to help save these parks. The League deter-

mined that it was necessary to actually buy it with donated funds, buy these groves with donated funds, and then combine that, hopefully, with some state monies eventually to create a whole system of groves that could be protected. There was no unified California state park system. So the Save-the-Redwoods League, in 1926 and 27, began a campaign to urge that a bond issue be voted by the voters of California to establish a California State Park System. And that state park system came into being in 1928 with the establishment of the first parks; and the redwood parks became the core of that California state park system (John Dewitt, Executive Director of the Save-the-Redwoods League).”

“Well, I think that the California state park system, of course, was ahead of most everyone in thinking in terms of the future, and in setting aside areas in California that were unique to California in its culture and in its natural history. So that I think California was recognized for the kind of far-sighted thinking that was involved. Now, they’re beginning to recognize how important tourism is toward their economic welfare; so that there was always that conflict between the economics and the intrinsic values of the redwoods. People that are coming out of our big metropolitan centers really have little or no understanding of what it’s like to be in the out-of-doors and what their responsibility is (William Penn Mott, Jr., former Director of the National Park Service).”

“It’s very important that when people visit parks that they realize that they are actually the caretakers. They are the ones who are determining whether that park and whether those redwood trees will be as nice tomorrow as when they found them today (John Mott, California State Park Ranger).”

“I took a bunch of kids from inner Oakland on a hike once through a state park. These were kids who were on their last chance. They were in a continuation school and it was their last shot at education before they were kicked out of the system, totally. And it really wasn’t anything I did. It was the park itself. The

weather was perfect. The day was perfect. And all of a sudden, these kids saw a snake that happens to be on the endangered species list. And one little boy looked up at me and said, 'You know, this place ain't been trashed yet!' And he figured it out. There was something special about having places that haven't been trashed yet and keeping them that way (Mimi Guiney, California State Park Ranger)."

"The future of redwood forests has a lot to do with the future of the human race. And that the future of this redwood tree is your future and my future as well. What this means is, as we come to this consciousness of the significance of the 'sempervirens sequoia,' we're coming to realize that, literally, the very future of this lovely little planet we call Earth is intertwined with the reality of the future of these redwood forests (Verl Clausen, Executive Director of the Sempervirens Fund)."

Although nature has been responsible for placing the coast redwood on the edge of a continent and, geologically, on the edge of survival, the forces that have brought economic prosperity to the redwood coast have also brought the old-growth forest to the edge of extinction. The value of preserving the last remaining stands of old-growth is not merely a question of economics. It is a choice between a rich or an impoverished existence for man. Perhaps the IUCN, the International Union for the Conservation of Nature, explains it best when they state, "We have not inherited the Earth from our parents, we have borrowed it from our children."

Jim Snyder  
28th May 1989

"We, of Sempervirens Fund, simply invite you to join with us in the continuation of caring about our relationship to the coastal redwoods, and realizing that that relationship is one that touches our own lives as well. So that, standing together, we can be assured of renewing, each generation, the reality that they, and we, will, in the full sense of the phrase, be 'sempervirens,' always-living (Verl Clausen)."