

DIABLO WINDS, WILDFIRES, AND FLAMMABLE VEGETATION IN THE EAST BAY HILLS

By Jerry Kent, September 2017

I. Introduction

The East Bay Hills flank the eastern side of San Francisco Bay. Cities along the hills include, among others, San Leandro, Oakland, Berkeley, Kensington, El Cerrito, and Richmond. Wildland fire has been an important part of the environment of the hills since the last Ice Age. More recently, urban development in the 19th and 20th centuries created an urban interface zone where fire could spread from wildland areas into the cities and from the cities into the wildlands. Although measures have been taken to manage wildland fuels in the interface zone and to improve equipment and develop cooperation among city and wildland fire fighting agencies, the threat of destructive fires continues. Currently available science about wildland fire, natural resource management, and urban intermix fire hazards have yet to resolve the controversies associated with fire in the East Bay Hills. The public, media, and political leaders seem confused and reluctant to support the necessary fire hazard mitigation work required to protect homes and residents in the hills.

II. History of vegetation and land-use in the East Bay

The Spanish colonists initiated cattle grazing in the East Bay shortly after their establishment of Mission Dolores and the Presidio on the San Francisco Peninsula in 1776. A land grant was deeded to Luis Maria Peralta in the early 19th century for a ranch (Rancho San Antonio) that covered an extensive area of the East Bay including portions of the East Bay Hills. Urban development began on portions of the Rancho San Antonio with a small settlement by Horace Carpenter, Edson Adams, and Andrew Moon in an area that eventually became Oakland. The first colonial settlement in what is now the city of Berkeley was incorporated in 1878 following the spread of housing around the University of California campus established in 1868. Similar towns sprang up along the eastern edge of San Francisco Bay following the Gold Rush and the Civil War: San Leandro (first settled in 1849 and incorporated in 1872), El Cerrito (first settled in 1906 by refugees from the 1906 earthquake and incorporated in 1917), Richmond (first settled in 1899 and incorporated in 1905).

A mosaic of vegetation types occurred over the East Bay Hills at the time of Spanish colonization consisting of extensive areas of perennial grasslands, coastal scrub, oak/bay woodlands, riparian woodlands, and more limited areas of chaparral, knobcone woodland and redwood forest (Clarke, 1959). Perennial grasslands dominated south facing slopes and oak/bay woodlands were common on north facing slopes. Scrub and chaparral communities tended to occur on shallow, rocky soils. The extensive grassland areas were in large part the result of Native American burning to expand the areas of grasslands at the expense of coastal scrub (Hopkinson and Huntsinger, 2005). An almost complete conversion of the native perennial grasslands to annual grasslands occurred in the late 18th and early 19th centuries due to the inadvertent introduction of Mediterranean annual grass seeds during the Spanish/Mexican period (Barry et al, 2006).

The population of the cities in the East Bay grew steadily in the 19th century and the first half of the 20th century as land was readily available for development and various enterprises attracted employees. Several cities reached their peak in population in the decade following the World War II. Other cities continued to grow after the 1950s, but at a reduced pace due in part to the build out of land within the city limits. The initial settlement of these towns was nearer to the San Francisco Bay than the East Bay Hills. However, development turned toward the East Bay Hills as the flat lands near to the Bay were developed. Developers purchased land in the hills for housing development which spread into the East Bay Hills in the first decades of the 20th century. These developments placed housing in close approximation with the hazardous fuel conditions of the grassland and coastal scrub vegetation types. In some areas the fuel situation was exacerbated by developers planting lots that could be developed with trees such as Monterey pine, Monterey cypress, and eucalyptus.

The established eucalyptus, Monterey pine, and Monterey cypress plantations on land within or adjacent to housing areas increased the fire danger of the developing urban interface zone. By the later part of the 20th century the fuels in developed sections of the East Bay Hills had shifted from a dominance of grassland and scrub vegetation to tree plantations and residential housing. Beginning in the late 19th century and extending into the early 20th century plantations of eucalyptus (primarily *Eucalyptus globulus*), Monterey pine (*Pinus radiata*) and Monterey cypress (*Hesperocyparis macrocarpa*) were established in the area in relation to local concerns over soil erosion and for the potential production of forest products (Farmer, 2013). The anticipated development of markets for eucalyptus did not develop, but the plantations remained. Areas of 110-year old unmanaged eucalyptus and Monterey pine plantations now represent a significant fire hazard in the hills. Greater fuel loading, vegetation structure, and the common presence of flammable oils and resins in the foliage and bark of these species can result in higher rates of spread, higher fire-line intensities, and average flame lengths. For example, Cheney (1990) reported rate of spread of 17 m/min, fire-line intensity of 7500 kW/m, and average flame length of 20m for a eucalyptus fire in Australia.

The establishment of the East Bay Regional Park system in the East Bay Hills in the 1930s led to a reduction of grazing and an expansion of coastal scrub into the grassland areas along the east side of the Hills. In Tilden Park, Chabot, and Redwood Regional Parks grasslands areas decreased by an average of 69 percent from 1939 to 1997, while an average increase in the area of coastal scrub amounted to 272% (Russell and McBride, 2003). This change not only meant a change in habitat conditions for wildlife, but a change in the fire hazard of the overall landscape.

A second major change occurred after the 1972 freeze and eleven straight days of night temperatures below 30 degrees. Thousands of high elevation eucalyptus trees were dead and standing, yet some trees began sprouting new leaves from epicormic buds. Local agencies and forestry experts felt they were dealing with a major increase in eucalyptus tree fire hazard, and appealed to State and Federal agencies for funding to remove the hazard. In response, Governor Ronald Reagan declared a State of Emergency to make federal funds available for fire hazard reduction work. Expenditures by local public agencies dealing with this emergency exceeded \$7 million.

A federal grant provided \$1.3 million to create a 25-mile-long fuel break on public land between Anthony Chabot Regional Park and Tilden Regional Park, and the new fuelbreak was quickly installed. The Park District, EBMUD, and University also used no-cost logging contractors to remove dead or damaged trees along with branches, bark, leaves, and other flammable debris that fell to the ground. The University cleared 400 acres of freeze-damaged trees in Strawberry and Claremont Canyons. The Park District cleared 400 acres of freeze-damaged trees in Tilden, Sibley, and Chabot Regional Parks. EBMUD cleared eucalyptus trees in Siesta Valley and along Grizzly Ridge above Claremont Canyon. Usable tree material was transported to Crown Zellerback Corporation in Antioch where it was chipped and used in paper production.

Unfortunately, stumps were not treatable after the no-cost contracts, and suckers began to sprout vigorously sending up new fast-growing multiple stems. Within a few years the new stems, typically four to ten per stump grew into very tall, dense canopies. Coppiced groves were also full of leaves, branches, and long strands of bark, and are a more dangerous fire hazard than ever before.

III. A Summary of wildfire history in the East Bay Hills

The East Bay's largest wildfires have occurred while the hills were changing from grazed grasslands to a haphazard mixture of native and "exotic" vegetation. We currently face increasing exposure because of extreme one-day Diablo winds, steep slopes, and 60-years of hillside residential developments that were constructed when the public and permitting agencies

were unaware of the areas increasing wildfire risks. Today, any fire that might reach hill ridgetops or leeward slopes (west facing) during extreme Diablo winds have the potential for quickly sprinting into residential areas before control can be established. However, we might reasonably anticipate that fire departments will extinguish something like 99% of all fires that start in the hills before significant damage can occur, while accepting the possibility that a few extreme Diablo wind wildfires may not be stoppable until the winds slow. Fortunately, there are reasonable steps that agencies can implement to reduce fire risks at the wildland/urban interface. Homeowners can also take appropriate steps to be safe with good family emergency planning, appropriate home and property preparation, and defensible space landscape maintenance.

Fire records for the East Bay Hills are sketchy, yet newspaper clips and old fire planning studies document an active and dangerous fire history that are summarized below:

July 14, 1901- Thornburg Castle Burns

The history of The Claremont Hotel dates back to the early days of the Gold Rush, when a Kansas farmer by the name of Bill Thornburg "struck it rich." He soon came to the Bay Area with his daughter and his wife who dreamed of living in an English Castle. Thornburg purchased 13,000 acres (part of the old Peralta and Vicente Spanish grants), and built his castle at the foot of Claremont Canyon to fulfill his wife's dream.

Thornburg subsequently sold the castle to a family by the name of Ballard. While the Ballard family was out, tragedy struck on a dry and windy day when the castle burned to the ground. The private water supply was not well regulated, and the volunteer fire department was helpless when the hot, dry summer winds blew flames across the Berkeley Hills destroying many other homes in the area. Frank Havens (of water company and eucalyptus fame) won the destroyed property and most of Claremont Canyon in a checkers game with Borax Smith. The Claremont Hotel was eventually constructed and opened in 1915

October 9, 1905- Fire on the Hills

"On the morning of October ninth, about nine o'clock, the loungers on North Hall steps saw a light cloud of smoke floating over Grizzly Ridge. The wind, however, was so strong that the cloud faded away before it got over the campus. But it kept on coming, and about eleven o'clock, in spite of the wind, the smoke settled down about the University buildings.

President Wheeler had noticed the fire and sent word to the men students to relinquish the pleasures of drill for that day and to go and help put it out. As soon as the word got around, men began to stream out of all the buildings. Stopping to get pieces of wet sacking and old carpet, they ran through the eucalyptus grove and up Charter Hill. Up there the wind was blowing a gale and it forced the smoke down the throats of the climbers and filled their eyes with bits of grass that stung.

Meanwhile the fire was raging around the Such ranch (Strawberry Canyon) and the University dairy. The fight to save them was hard, and half choked, half blinded by the smoke, the students worked desperately. Two thousand men defied the advance of the flames. The fire crept into the canyons, and finding the dry underbrush better fuel than even the hillside grass, shot triumphant tongues of flame in all directions. Bushes were cut away and trees felled by the firefighters. Finally a stand was taken at the Fish Ranch road (top of Claremont Canyon). Here, it was thought, was a chasm that the fire could not leap across. It did cross it, but made no more advance towards Berkeley, yet burned along the ridges in the direction of Oakland. The fire fighters were still working at six o'clock, but by this time the fire was checked. After that it spread back into the hills and burnt itself out about midnight.

The next day the havoc that had been wrought showed plainly. It was a scene of utmost desolation. No one who was in college in October 1905 will ever forget the day when fire from Grizzly Peak threatened the University and its neighbors with destruction.”

Fires of 1921 and the Winter of 1922- the heaviest snows in 30 years had fallen in the Berkeley Hills. This event and fires in Claremont and Tunnel Canyons are described in the following OAKLAND TRIBUNE MAGAZINE article entitled “Peril of the Oakland Hills” by Louis Allen.

“THOUSANDS of acres of splendid eucalyptus groves, much of it crowning the range of hills at the rear of Berkeley and Oakland, await almost, certain destruction this summer unless the cities of Oakland and Berkeley, or hiking or civic clubs come to the rescue.

Fire, that bugaboo of the Berkeley hills last summer, promises greater conquests than ever this summer. Never within the memory of early day residents of the Eastbay cities have the conditions in the hills been so propitious for disastrous fires.

Last January the heaviest snows in thirty years visited this region. Over the hills to the eastward Jack Frost draped a beautiful snow mantle, and the weather so conspired as to keep the hills snow clad for almost a week, causing tremendous' damage.

At the summit of Grizzly Peak the snow lay from one to three feet deep. The great groves of eucalyptus trees, all set out within the past thirty years, carried heavy loads of snow for days, the weight gradually bearing the young braches earthward, and finally breaking them. In many cases the slender, fast-growing eucalyptus trees snapped of halfway between root and top, but in the majority of instances the broken limbs were those near the ground

The consequence has been that the ground surrounding these trees has been literally strewn with broken off or almost severed branches.

Devastation widespread Wherever the hiker penetrates the higher reaches of the Berkeley and Contra Costa- hills there he finds evidence of devastation. Even in the grove just south of the Berkeley Country Club the destruction is noticeable and the need urgent to clear away the 'fallen branches. But the most destructive work of the snow occurred in the higher portions of the hills.

It makes the hiker who loves trees sick at heart to see the destruction wrought in the grove at the northwest base of Little Grizzly Peak, the trees in all stages of destruction lining the north side of the regular trail leading from the Big C to Grizzly Peak. Here a side trail to the north and leading down into Wildcat Canyon is so strewn with broken off: branches as to be almost obliterated.

Farther south along Chaparral Peak, which is the slight hillock about a half mile southeast of Grizzly Peak, the same evidence of broken down eucalyptus trees prevails. Everywhere is the clutter of snapped-off dead limbs and drying leaves, all waiting the moment when a spark lands among them to precipitate a fire that will sweep acres of valuable timber.

Practically all the eucalyptus trees now gracing the Berkeley and Contra Costa hills were set out within the past thirty years. Hence none of these swift-growing and none too hardy trees ever underwent such trial as that of last January.

There have been, of course, in other year snows in our hills to the eastward, but never before such heavy and long continuing snows as last winter's. So never before have our eucalyptus trees been forced to face such damaging weather conditions as during the past year. Because the eucalyptus is not built to stand the heavy weight of snow that bore many branches to the ground and even broke off slender trunks, we find tons of debris strewn the ground in all

directions in these groves.

Heavy fires predicted unless these broken off or partly broken off limbs are cleared away before the active forest fire season of mid-summer arrives, there will be fire losses that will make the fires that devastated Claremont canyon and hillsides along the Tunnel road last year seem puny indeed.

So, severe, indeed, was last winter's snow visitation that even the hardy pine trees always pictured in connection with snow and potent deifiers of wintry blasts succumbed to the onslaught, as witness many a limb wrenched from evergreens on the slopes of the Berkeley Alps.

In all likelihood, the appreciable rains have ceased for the summer. From now on the hills will assume their summer tan under the merciless rays of the sun. The forests similarly will feel the drought, the ground around the tree boles will dry out and crack open, the grass will yellow, the bark of the trees will become dry, and the leaves parched. When fire enters under such conditions there can be but one result. Eucalyptus trees surrounded by dead branches must soon become a torch scattering infinitesimal sparks in all directions, if a tiny match or ember happens to fall in the dry grass or leaves at its base.

There is only one safeguard for these groves- removals of every contributing factor to the spread of fire. Underbrush that makes a funeral pyre for trees must not be tolerated. Hundreds of acres of valuable eucalyptus groves, set out to conserve the rainwater in the hills, will be burned over this summer just as sure as campers are careless and a spark or two falls into dead brush at the base of these trees-unless remedial action taken, and at once.

Will Oakland and Berkeley permit repetition of the Tunnel road fires of last summer on a larger and grander scale on the high roaches of the ridge at our back door?

Every tourist who is driven over the Skyline boulevard and who passes along the Tunnel road can, not help but view the charred skeletons of what once were eucalyptus and pines dotting the hillsides of Claremont canyon. Many acres of blackened pines, complete except for their needles, remain on the sides of the main divide at the head of the canyon, but none of those fire-blasted trees will ever again be green.

They stand as mute protests against utter failure of the Eastbay cities to cope with brush fires last summer.

Will history repeat? The first fire last summer that caused the great destruction of trees in Claremont Canyon could have been pinched out before it ever reached the tree-covered portions of the hillsides. But our city governments have no adequate means of coping with hillside fires.

The sense of co-operation among citizens has not reached the degree that recognizes that destruction of our hill coverings by fire means the undoing of years of effort to reforest the hills, to say nothing of the esthetic considerations involved by preservation of eucalyptus and pines in order to keep our hills attractive to our citizens and to our visitors.

This is the situation in our hills at the end of June 1922. The solution of the difficulty rests with the two cities of Oakland and Berkeley, aided by various civic organizations and possibly individuals. Conceivably, my duty as a hiker and inveterate lover of the hills has been done in drawing attention of the entire Eastbay country to the situation along the main ridge of hills at our back door.

In order to silence those who would be inclined to scoff at one who merely points out conditions

without offering remedies, I will close with the suggestion that the cities of Oakland and Berkeley employ a small group of workers for a few days cleaning out the eucalyptus groves along the main divide; that fire-building be absolutely prohibited in these hills constituting the main ridge, and the imposition of a heavy fine and imprisonment for those found guilty of building fires in such a zone.

Finally, I would suggest the setting a part of a Sunday early in July in which every able-bodied man and boy in the Eastbay region should be invited to climb the main ridge and remove all broken eucalyptus and pine limbs to piles from which the debris could later be trucked out of the hills, or burned in open spaces under supervision of firemen, or others qualified in such work."

In later years, freezing weather will again damage and in some locations, kill eucalyptus trees during the winters of 1931, 1949, 1972, and 1990/91.

September 17, 1923 Berkeley- The fire began on San Pablo Ridge at 12 noon near a P.G.&E. power line on private East Bay Water Company land close to what is today's inspiration point in Tilden Park. The fire passed through grasslands and eucalyptus plantations above Berkeley to then, in two hours, blow down steep slopes destroying 60 square blocks and 130 acres of homes, apartments, student housing, hotels, schools, a fire station, and a church. The fire was reported to be ¼ mile wide as it came over the ridge consuming hillside homes and planted landscapes until the fire could be stopped near the campus. The fire also spread southward to include an additional 3,000 acres along ridge and hillside grasslands before reaching Tunnel Road where it was controlled around 4:30 PM. Fire fighting forces were overwhelmed, water supplies ran out, and it was not possible to control the fire until the winds slowed. Fortunately, no lives were lost. "No conflagration was ever more out of control. None ever demonstrated more vividly its power to defy all defensive resources once it gained headway. It was extinguished only by an act of providence."

May 20, 1931 Leona Hillside- Five homes were lost and 1,800 acres burned by a fire that started at 7 a.m. The fire charred a three square-mile area bounded by Redwood and Burnell Roads, and Mountain Boulevard at the head of 35th Avenue in Leona Heights. The fire split into two huge infernos leaving hundreds of fire fighters almost helpless to combat the double conflagration. It imperiled scores of homes and drove hundreds to safety.

November 13, 1933 Redwood/Joaquin Miller- On Monday morning one person died, five homes were destroyed, and seven homes were partially burned when a 1,000-acre fire spread quickly from Redwood Peak down Shepard and Diamond Canyons into the Pinehaven and Thorn Road districts. The fire was started on the ridge at 7 a.m. by a careless smoker and was controlled by firefighters around 2:00 PM. The fire, pushed by 36 mile per hour Diablo winds, threatened the old Oakland Zoo, scores of homes and businesses in the Diamond area as it raced down heavily wooded Canyons along a two-mile front. "The fire traveled along the tops of the thick groves of pine trees for great distances, never reaching the ground until after the main blaze had passed." The wind constantly shifted and blew ashes as far away as Alameda. Many smaller fires were ignited throughout the Diamond and Allendale area.

September 25, 1937 Broadway Terrace to Skyline Boulevard- On a Saturday afternoon, a backyard fire escaped and raged for 24 hours to burn 1,000 acres, destroy 4 homes and menace at least 50 other homes in the hills near the Broadway Tunnel. "Scores of residents left their homes empty-handed, too excited to gather up any of their belongings; others snatched up pet animals, blankets and cash." Lack of water caused by exhaustion of reservoirs in the hills hampered fire fighters. This West wind fire at times crept slowly through the brush and at other times leaped from treetop to treetop. Acre upon acre of brush and trees, including eucalyptus and pine sent a pungent pall of smoke pouring over much of Oakland.

1946 Buckingham/Norfolk- 1,000 acres in Claremont and Tunnel Canyons were burned by a rekindled ridge top Diablo wind fire at 5 a.m. on a Monday morning in September. "Sheer-walled canyons were quickly raging infernos. Flames raced so fast in the stiff wind they formed a fiery canopy over stands of pine and eucalyptus." By noon, the fire had blackened an area three miles, long and two miles wide. This was a steep, craggy, heavily wooded area bounded by Claremont Avenue, Fish Ranch Road, and old Tunnel Road.

"Though many homes were threatened and several scorched, none was seriously damaged. Many residents were ready to evacuate their homes. Berkeley firemen, who were recalled about noon yesterday were called out twice again, once when logs near Grand View Drive and Vicente flared up and the second time to extinguish a new outbreak in the brush behind the Stanley Hiller mansion at 277 Tunnel Road which was one of the homes threatened in the early stages. Fog that rolled in during the night and raised the humidity was credited with preventing more outbreaks of the fire and helping the firefighters".

1960 Leona Hillside- Two homes were lost and 1200 acres were charred by a Diablo wind fire that started at 11 a.m. on a Saturday morning on October 15th. The blaze threatened hundreds of homes, and for at least two hours was in danger of spreading throughout the entire hill area. As it was, the fire burned a swath 2 1/2 miles long that was parallel to and just above Mountain Blvd. "The 84-degree temperature and low humidity aided the flames which roared with express train speed up steep slopes. Flames roared 50 ft. into the air."

September 22, 1970 Tunnel, Vicente, and Claremont Canyons- The fire started in the dry grass on Fish Ranch Road around 10 am. The fire swept over the ridge and hillsides into residential areas where 37 homes were destroyed and 36 damaged by a 204-acre Diablo wind fire. "I watched my neighbor's homes burn to the ground. It was a stunning, sickening, tragic spectacle. As I stood in the center of the intersection, buffeted by strong winds, hot ashes and searing heat-laden smoke, five houses were flaming around me. Each was a gigantic bonfire with sheets of fire reaching high into the surrounding trees, torching the pine and spreading the blaze."

This fire was the first fire in a siege of fires that spread across California when 733 individual fires burned over the next 13 days. 722 homes were destroyed; 500,000 acres burned, and 16 lives were lost in what was called "California Aflame". Since the Fish Ranch Fire was first fire during this siege of fires, 11 CDF aircraft were available to respond to support firefighters on the ground in controlling the fire before it could do even more damage. We would not have been so lucky, had the fire started midway in the siege of statewide fires. California has now experienced similar multiple fire sieges in 1985, 2003, and 2007.

1980 Berkeley Hills above the Tilden Merry-Go-Round - Five ridge top homes, above Wildcat Canyon Road, were lost in a December Diablo wind fire that started around 2 PM under powerlines. "The blaze, fed by thick underbrush and eucalyptus tree debris, was so hot and fast that homes literally exploded."

October 19th and 20th, 1991 Oakland/Berkeley Hills- On a Saturday afternoon around 12 noon, a fire started in grass and brush behind a house on private land and burned uphill across the steep slopes of the city's Grizzly Peak Open Space. The fire area turned out to be relatively small, but this fire was certainly not routine because it was burning up a very steep hillside that was 60% or greater in slope. It quickly went to five alarms for Oakland, and included mutual aid responses from Berkeley, California Department of Forestry, and Regional Parks. It took, what seemed like a long time for units to actually get water on the fire, but the saving grace was the absence of wind, enabling the fire to be controlled around 1:40 PM before it could reach homes on the ridge. It took several hours to mop up and soak the burned area with helicopter water drops, water from fire engines with long hose lays, and to construct a cleared break around the entire fire area. Hand crews worked the burned area until 6:40 when darkness made it too

dangerous to work on the hillside's steep slopes. Before leaving, an Oakland Battalion Chief checked the area for any visible signs of hot spots, and directed responding units to leave their fire hose in place for use in the morning. During the night, Oakland fire units returned to the scene to look for hot spots, and no signs of smoke or flames were observed.

Fire crews returned early Sunday morning to monitor the area, deal with any embers and smoke that developed, and collect hose left on the hill. As they were taking the hose lays apart, winds began to stir up hot spots in several locations. Between 10 and 11 in the morning, Diablo winds, that had developed overnight, reached an estimated 30 to 40 mph and began to fan and then blow burning embers down steep hillsides into unburned areas. The fire was rekindled at 10:45 a.m. when a series of small flare-ups occurred that seemed controllable, until too many embers blew into dry brush and pine trees overwhelming the eleven firefighters and three engines that were working the hill.

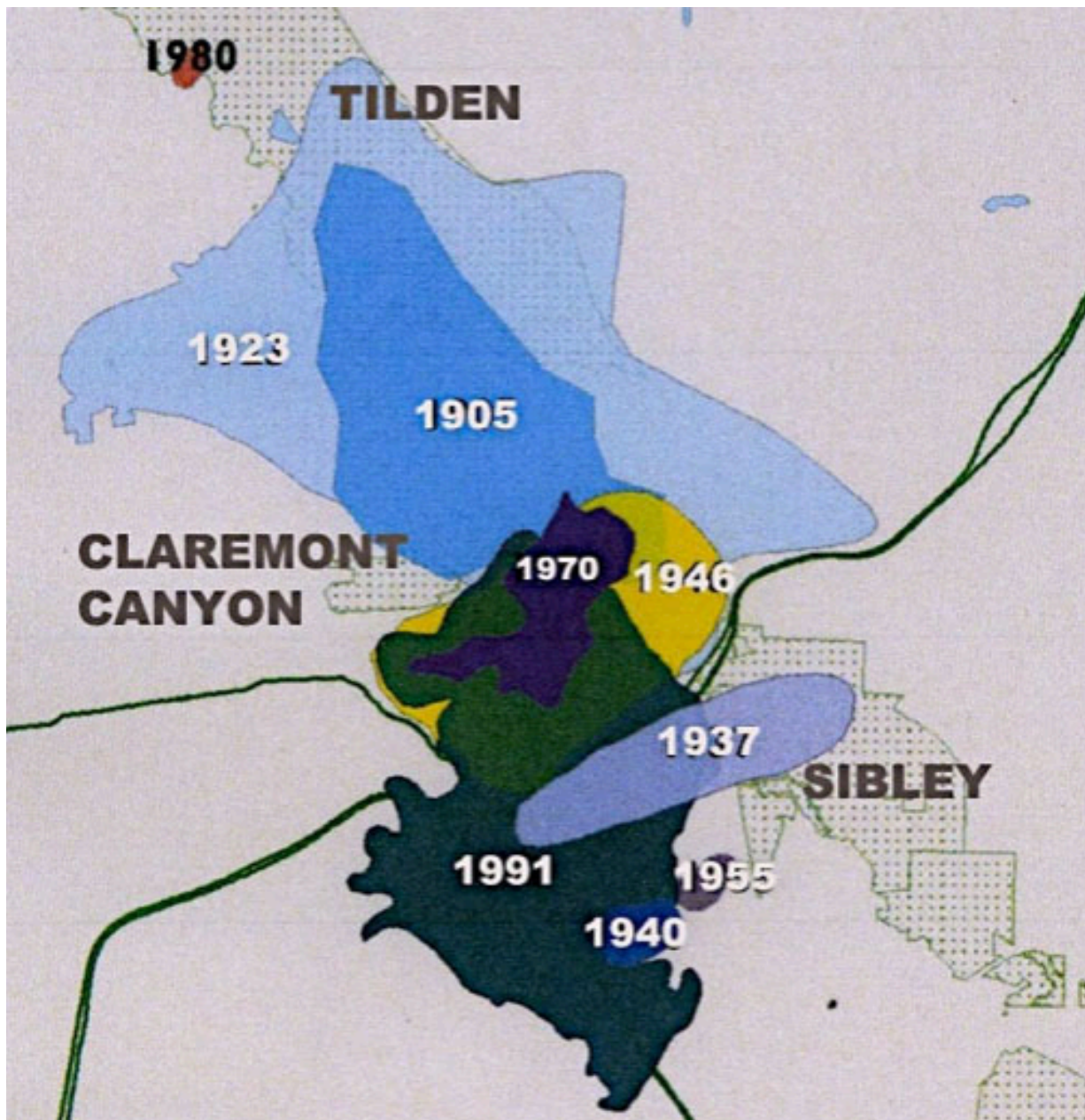
The fire then blew down the steep slopes along Buckingham Road through unsuspecting homes with dense residential landscapes under pine trees and a scattering of eucalyptus trees. At the same time the fire ran up the ridge through homes and then toward Hiller Highlands. Firefighters who were actually present and involved as the fire began on Sunday morning tell of the valiant efforts made by firefighters and citizens who attempted to contain a fire that turned out to be unstoppable. Forty mile per hour Diablo winds were blowing embers into flammable grass, brush, trees, and unprepared homes creating a wildfire that could not be controlled until the winds slowed and a mutual aid response of 440 engine companies with more than 1,500 firefighters were amassed to surround the fire in the late afternoon.

Among the most difficult lessons learned during the 1991 Sunday fire was just how dangerous the wildland/urban interface had become and how unprepared both our community and our emergency services were to deal with a major wind driven conflagration. While there were multiple failures and successes at all levels during each stage in the fire, the media and many individuals focused their blame on the embers left from the Saturday fire. Of course, the embers were a key factor but not the entire story. Accurate fire behavior, firefighting detail, and the rest of the story for both the Saturday and Sunday fires can be found on pages 22 through 37 in the FEMA, J. Gordon Routley, and United States Fire Administration Report that is available on the Internet.

The 1923 Berkeley fire held the awkward record for the most homes destroyed in a California wildfire for 67 years. The 1991 Oakland/Berkeley fire has regained the record for the past 26-years for the most homes and lives lost in a single wildfire. The East Bay Hills have held the state's record for 86 of the past 87 years for having the most homes and structures lost in single wildfires. We have every reason to learn how to live with the possibility of wildfire, and to be better prepared for the fires that are to come.

IV. "Normal" fires that would be followed by unimaginable fire

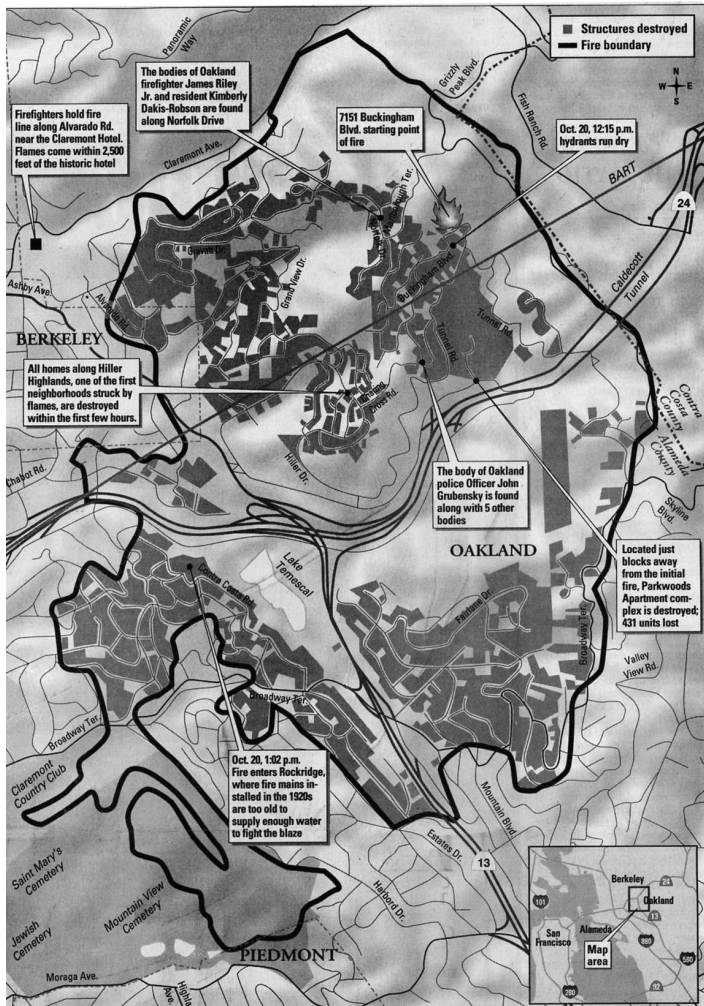
Newspaper clips and old fire planning studies for the Hills document an active and increasingly dangerous fire history. In the sixty years between 1901 and 1961, there were more than 200 fires reported in rural areas with notable fires in 1901, 1905, 1921, 1931, 1933, 1937, 1940, 1946, 1953, 1955, 1960, and 1961. [2]



Grazed ranchlands burned regularly with little damage even while developers were planting 13,000 acres of eucalyptus, pine, and homes on the Hills. A serious fire problem seemingly didn't exist until the 1923 Berkeley Fire [3]. The Berkeley fire caught everyone by surprise when it burned for two hours through a young eucalyptus plantation on private watershed land in Wildcat Canyon until the fire reached the main ridge where it was blown downhill by Northeasterly (Diablo) winds toward the UC Campus destroying 580 homes in another two hours. Berkeley held the unenviable record for the most homes lost in a wildfire in California for the next 67 years until the honor was transferred to the Painted Cave Sundowner Fire in Santa Barbara in 1990.

Then came the fire of the century. On Saturday October 19, 1991, the Oakland Fire Department knocked down a small fire on a day with no wind that started as a cooking fire amid pine trees near Buckingham Road in Tunnel Canyon. Crews soaked the perimeter lines along the sides and the top of the fire until darkness prevented further mop-up.

Then the next day, crews returned for further mop-up until Diablo winds blowing downhill into residential areas found a few embers near where the Saturday fire began, and the Sunday October 20 fire blew up with 790 homes on fire during the first hour and one home ignited every 11 seconds. Forty-mile per hour Diablo winds were blowing pine, eucalyptus, and shingle embers into flammable grass, brush, trees, and unprepared homes creating a wildfire that could not be controlled until the winds slowed in the late afternoon.



Of the 11,055-people living in the 1,520 acres that burned, 25 were killed, 150 were injured, and at least 5,000 left homeless. 3,000 homes and 2,000 automobiles were destroyed by nightfall. 50,000 trees were burned with many cleared to make way for new homes. 10,000 people were evacuated from the area, the Red Cross answered 3,000 inquiries from concerned family members, and non-profit groups served 100,000 meals. 4,407 families registered for assistance, 1,221 temporary housing grants were issued, 842 individual family grants were issued, and 3,921 Small Business Administration loan applications were filed.

The total estimated cost of the fire was more than 2 billion dollars, then the most expensive urban/wildland wildfire disaster in the history of this State and the Nation.

Among the most difficult lessons learned during the 1991 fire was just how dangerous the Tunnel Canyon wildland/urban intermix had become and how unprepared residents and emergency services were for dealing with a major wind driven conflagration in dense fuels, including homes along narrow roads on steep hillsides.

Clusters of flammable homes (dark areas) intermixed with flammable unmaintained vegetation (light areas) together burned in a one-day intermix fire.

Some argued that it was really an urban fire or an interface fire. But, the fuel that burned in the 1991 fire included an intermix of 608 acres of homes with pine, eucalyptus, and dense landscapes on lots, 466 acres of eucalyptus and Monterey pine forests, and 446 acres of unmanaged grass, shrubs, and natural woodlands [4].

Arguments about what not to manage in this and other intermix areas are counter-productive. All flammable fuel, including homes, must be managed to prevent uncontrollable intermix fire.

1991 FIRE ENCLOSED 615.2 hectares or 1,520 acres			
Category	Area (ha)	Area (acres)	%
Eucalyptus	132.1	326.4	21%
Monterey pine	56.3	139.1	9%
Norther Ca. coastal scrub	109.7	271.1	18%
Grassland	2.9	7.2	0.5%
Coastal scrub and grassland mosaic	28.5	70.4	5%
Monterey pine and coastal scrub mosaic	2.3	5.7	0.4%
Coast live oak and coastal scrub mosaic	19.2	47.4	3%
Structures (and residential landscape and trees)	246.2	608.4	40%
Highways and road side vegetation	18	44.5	3%
Totals	615.2	1,520	100%

The reasons why the 1991 fire could not be stopped until the winds slowed still exist today in many locations throughout the Hills.

- Wind driven fires that occur during periods of low humidity and high temperatures, can move so quickly that positioning fire crews and obtaining air support for rapid containment and control may not be possible given the current level of fuel available for fire in the hills.
- The Hills are covered by flammable vegetation (fuel) that continues to be a significant problem because residents like living in their “mountain forests”. Unmaintained eucalyptus and pine, on both private and public lands, represent a serious crown fire and spotting ember threat to residential areas. And, flammable natural brush and invasive exotics are freely intermixed with residential neighborhoods throughout the hills.
- The Hills residential neighborhoods currently exist with many flammable homes that have wood shingle roofs, wood siding, wood decks, with eucalyptus, pine, and other flammable vegetation on the lot. Some homes have been placed on steep hillside slopes in locations that are un-defendable given historic downhill wildfire behavior.
- The Hills will always have areas of steep topography, narrow roads, powerlines on poles, with questionable multi-agency preparedness for large scale fire suppression under extreme conditions. Yet fire fighters, police, first responders, and volunteers can be expected to preform heroically as they have in all past fires.



The south side of Thornhill Canyon was spared when winds reversed in 1991. The most northerly side burned.

- The Hill’s Mediterranean climate provides wet cool winters, hot dry summers, and periodically extreme fall winds with high temperatures and low humidity. The Hills supply perfect conditions for growing vegetation and for fire weather similar to conditions in Australia, Chile, South Africa, and the countries around the Mediterranean Sea. It is not uncommon to hear that “More than 100 fires were burning earlier this year when Australian officials said the conditions were worse than during the Black Saturday fires that killed 173 people. Chile lost 11 lives and 1,500 homes in fires already this year, nine are dead as 26 fires currently burn in South Africa, and Portugal just lost 64 lives in pine and eucalyptus forest fires.”

IV. 32 Reports and Fire Hazard Mitigation Plans

The East Bay Hills may also hold the record for the most fire hazard mitigation plans and reports in the state, indicating that fire hazards are officially recognized, but not that the plans will be implemented. The fire hazard plight for both wildlands and urban areas has been repeatedly documented with amazingly consistent fire hazard mitigation projects recommended for wildland areas. Recommendations for residential areas have been made in the 1982 Blue Ribbon Fire Prevention Report, the 1995 East Bay Hills Fire Hazard Mitigation Program and Fuel Management Plan, and more recently by Cal Fire for homes that need to be made ember resistant with adequate defensible space maintained in very high fire hazard areas. The following plans and reports document both the history and need for fire hazard mitigation in the hills:

1923 Berkeley Fire and National Underwriters Report. 1936 Tilley, General Fire Plan for the Proposed East Bay Hills Park. 1970 Fish Fire and California Aflame Report. 1973 Eucalyptus fuel dynamics and fire hazard in the Oakland Hills. 1980 Fenwick Fire Management Plan for the Chabot Eucalyptus Plantation. 1982 Blue Ribbon Urban Interface Fire Prevention Committee Report. 1983 EBRPD Fuelbreak Plan. 1986 UC Hill Fire Plan. 1989 EBRPD Fuelbreak Plan. 1991 Oakland/Berkeley Fire (seven separate reports). 1993 Historic Changes to Oakland's Urban Forests. 1994 McBride Plan for Chabot Eucalyptus Fuelbreak and Thinning Plan. 1995 East Bay Hills Fire Hazard Mitigation Program and Fuel Management Plan. 1995 UC Berkeley Hills Fire Prevention Program. 2000 EBMUD Fire Management Plan. 2001 Caldecott Corridor Resource Management Plan. 2003 FEMA Environmental Assessment for EBRPD Grant Projects. 2005 FEMA Environmental Assessment for Strawberry and Claremont Canyon Grant Projects. 2010 EBRPD Fire Hazard Mitigation Program and EIR. 2012 SB 1241 revised safety element requirements for state responsibility areas and very high fire hazard severity zones. 2013 USFWS Biological Opinion for UC, Oakland, and EBRPD Grant Projects. 2014 Berkeley Local Hazard Mitigation Plan. 2014 Contra Costa County Wildfire Protection Plan. 2015 Alameda County Wildfire Protection Plan. 2015 California Fire Safety Planning Report. 2016 FEMA East Bay Hills Hazardous Fire Risk Reduction EIS. 2016 Oakland Local Hazard Mitigation Plan. 2016 Draft UC Berkeley Hills Fire Plan and EIR. 2107 EBRPD Hazard Mitigation Plan. 2017 National Fire Protection Association Report on Wildland Urban Fires.

V. The Dilemma of Costly Plans that are Not to be Changed by Feisty Opposition

During the past 40-years, East Bay Agencies have prepared plan after plan with each major plan evolving in greater complexity and increasing conflict. Plans currently take so long and cost so much to prepare that agencies do not want to make significant changes at the end that are not consistent with official releases during plan preparation or circulated draft documents. Changes at the end of a long process can require a costly redraft and recirculation of a "new" plan, a process that is even resisted in litigation. Descriptions of the four most significant East Bay Hill fire hazard mitigation plans are contained in the following summaries.

A. Work on the 106-page Blue Ribbon Fire Prevention Committee Report for the East Bay Hill Area Urban-wildland Interface Zone began in 1981 and was completed in 1982 [5]

The 1982 plan was in response to a fire that consumed five houses in the hills above Berkeley in November of 1980. The report analyzed the 1923, 1970, and the 1980 fires and described the increasing wildland and residential fire hazards then existing in the East Bay Hills. There was little reaction and no opposition to the report because it accurately described the hill wildfire problem based on the best fire-science then available. The report recommended completion of the 1973 ridgetop fuel break project were work had been halted after Proposition #13 in 1987, significantly reducing funding for the Park District and other agencies.

The report also recommended the formation of a joint powers agency, listed specific tasks for all involved agencies, and noted that "on the urbanized side of the interface zone, many of the homes which have been built along the crest of the west facing slopes have shingle roofs and are surrounded by brushy vegetation which has been allowed, in many cases, to grow up to the homes and under decks. Where clearing around homes occurs, it is rarely the thirty feet minimum clearance required by State law, and even more rarely, the hundred-foot clearance which should

be maintained in fire risk hillside area. Additionally, many of the streets in the area are narrow and-winding, hampering access for fire apparatus and escape routes for residents”.

Agencies did not take the Blue Ribbon Report warnings seriously, and little was done by most agencies other than work was continued on the Park District’s fuelbreak. Nine years later, everyone was surprised by the 1991 Oakland/Berkeley Tunnel Fire [6]. Five significant federal, state, and local investigations were launched following the fire. Why did it happen, and how can we make sure it never happens again? One of the 186 recommendations made after the 1991 fire, involved the formation of the East Bay Hills Emergency Forum (HEF). The HEF was created in October of 1992 by a letter of intent to coordinate firefighting, emergency planning, and to develop a new Fire Hazard Mitigation Plan and Program for the East Bay Hills. HEF membership included Oakland, Berkeley, East Bay Regional Park District, East Bay Municipal Utility District, University of California, and the Lawrence Berkeley Labs. El Cerrito, Moraga Orinda Fire, and Cal Fire were added later. [7]

- The Hills Emergency Forum Board is made up of the CEOs of the above agencies.
- Their staff land management representatives formed the Vegetation Management Consortium (VMC).
- The East Bay Hills Fire Chiefs’ Consortium was made up of 30 Fire Chiefs from 30 Fire Departments in the two-county region.

B. Work on the HEF 430-page East Bay Hills Fire Hazard Mitigation Program and Fuel Management Plan began in 1992 and was completed in 1995

The 1995 Plan was a response to the 1991 Oakland/Berkeley Tunnel Fire. The Plan [8] was based on up-to-date fire science concepts and recommended a unified approach that public agencies and homeowners should use to reduce fire risks present in hill residential areas, and in wildlands where fire could threaten homes and other "values at risk."

The Western 50% of the Oakland/Berkeley Hills planning area was residential. A geographic information system was used to inventory every hill residential street to rate residential areas by structural roofing and siding, vegetation fuels, defensible space, wildland threat, and road condition. These ratings classified residential areas of similar characteristics in the following manner:

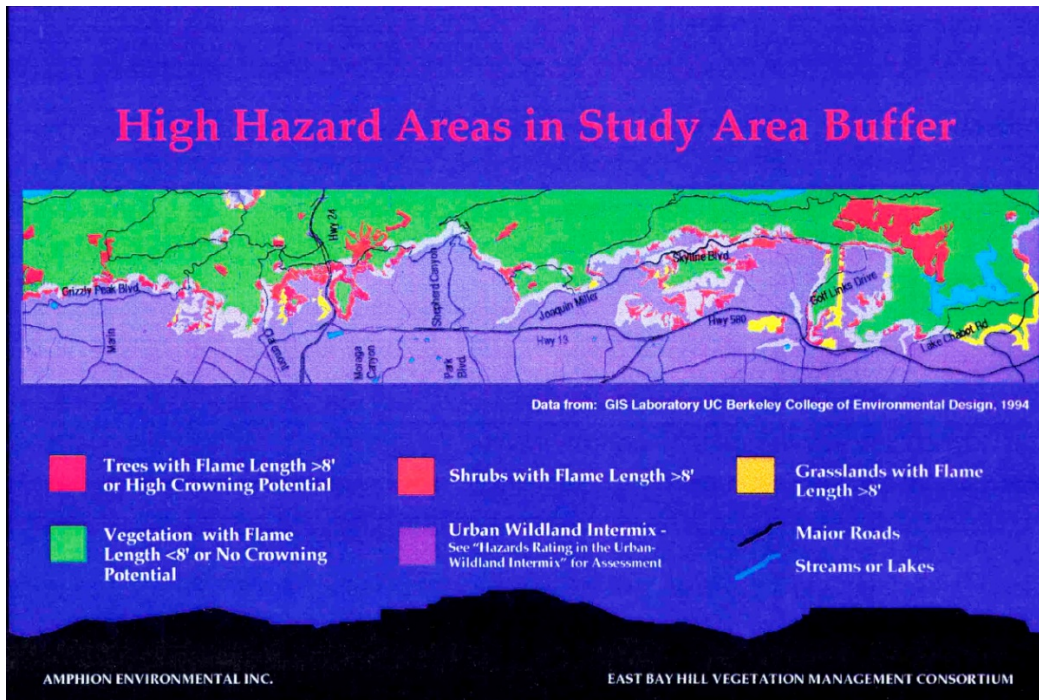
- 4,747 acres (33%) as having extreme fire hazard potential,
- 6,158 acres (43%) as having high hazard potential,
- 3,024 acres (21%) as having moderate hazard potential, and
- 359 acres (3%) as having low hazard potential.

The Eastern 50% of the Oakland/Berkeley Hills planning area involved wildland vegetation (mostly in regional parks) and was modeled for fire conditions set at a 95% worst-case condition under a Diablo Wind. Flame lengths greater than 8’ are possible on 10,500 acres of wildland areas where traditional firefighting would not likely be possible with 8,000 acres having less than 8’ flame lengths where traditional firefighting would likely be successful.

Wildfire hazard mitigation strategies in the 1995 Plan included:

- a recommendation for cities to require new buildings and retrofitted homes to be ember resistant and surrounded by defensible space,
- management and thinning of mature eucalyptus and pine groves, and the removal of seedling and suckers (then 20-years old and 20’ tall) from 1972 logged stumps to convert these areas to lower growing native vegetation,
- a system of ridge top and residential edge fuelbreaks located at predetermined locations along the residential interface where firefighters would attempt to control wildland fire before it could move into residential areas in page 27 of the Plan.

Page 27, of the 1995 HEF East Bay Hills Fire Hazard Mitigation Program and Fuel Management Plan



Map of 500' wide Study Area Buffer (gray zone and hazardous vegetation) where agencies were to locate fuelbreaks. The Park District, EBMUD, and UC proceeded with fuelbreak projects, but Oakland's fuelbreak work was sporadic.

See the Jeffery Kahn article [[LBL: Project Shields Lab as well as Berkeley Neighbors from Wildfire](#)] about how the Lab handled its intermix wildfire problem. The Frowning Ridge Fuelbreak, and Tilden RTA's along Grizzly Peak Boulevard, will hopefully allow firefighters to contain a fire within Tilden, but downwind intermix areas whether campus or residential must also be made fire-safe as recommended in the 1995 HEF Plan and by this paper.

The 1995 Plan was discussed and debated for the next four years. The Environmental Community understood and accepted the fact that fire-risks in the hills were significant, but opposed the 1995 Plan based on concerns about eucalyptus management, wildlife impacts, the concept of a 500' wide fuel break planning zone along the residential interface, and the lack of a legally required environmental document. HEF representatives approached the state for help with grant funding for a \$600,000 EIR, and for legislation that would both streamline the multi-agency CEQA process and solve the lead agency question. However, appeals in Sacramento were unsuccessful. With no help from the State, no funding, and no agreement about who would be the lead.... each agency would need to proceed on their own.

To break the stalemate, the Park District, Tom Bates, California State Assemblyman, and Leo Levinson FEMA's Urban/Wildland grants manager invited key pro and con stakeholders to spend a year in what became known as the "Temescal" East Bay Hills Ecology and Fire Safety Working Group [9]. The Group was able to prepare background material and a draft Request for Proposal (RFP) to serve as the outline for a consensus Fire Safety Plan and EIR for the East Bay Hills. Funding for the EIR would eventually be included in the Park Districts Measure K in November of 2002. Unfortunately, Measure K did not pass, but Measure CC did pass in 2004 with \$1,000,000 for the Hills Fire Plan/EIR and \$9,000,000 for listed park fire hazard reduction projects [10].

FEMA also offered \$2 million in grant funds, to local agencies who would add matching funds for specific fire hazard mitigation projects that could be covered in a FEMA Environmental Assessment (EA). Other HEF agencies were not prepared to undertake project work, but the Park District did have several hill parks with completed Plan/EIRs and agreed to provide a

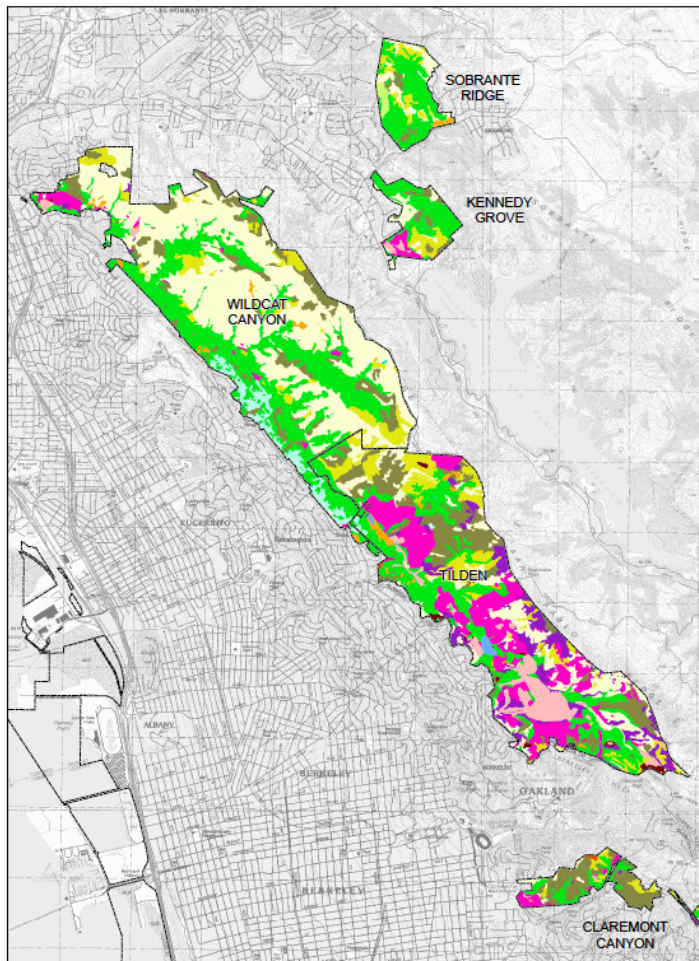
match of \$500,000 and began a four-year federal environmental process with FEMA for \$1,000,000 in Park District vegetation management projects with a completed EA approved in 2003.

The Park District's Fire Hazard Mitigation Planning effort would eventually apply the overall concepts of the 1995 HEF Plan, as well as the details and RFP process developed by the 'Temescal' Ecology and Fire Safety Working Group.

C. Work on the Measure CC funded 1,300-page Park District Fire Hazard Mitigation Program and EIR (Plan) began in 2004 and was completed in 2010

During 2004, The Park District completed a detailed survey of regional park vegetation to be used by the consultant team retained to prepare the final hill park plan and environmental document. The stated reason for the Plan was to "provide sound, long-term strategies for managing vegetation within parks to minimize the risk of Diablo wind-driven catastrophic wildfire along the wildland urban interface while ensuring the protection and enhancement of ecological values and resources." The survey only covered regional parks, but the type of vegetation and percentages are representative for the 18,000 acres of wildland owned by all public agencies in the east bay hills study area.

Vegetation map for five regional parks: Sobrante, Kennedy, Wildcat, Tilden, and Claremont Canyon



The wildland vegetation (with detailed plant locations mapped and described on GIS files) for 13 Hill Regional Parks, included the following general communities:
 4,657 acres of oak/bay woodlands (36%)
 3,334 acres of scrub and brush lands (25%)
 2,405 acres of grasslands [grazed] (18%)
 1,697 acres of eucalyptus forest (13%)
 473 acres of pine and conifer forest (4%)
 415 acres of redwood forest (3%)
102 acres of riparian wetlands (1%)
 13,083 acres

The 2010 Park District Plan/EIR included policies and recommendations that would allow the Park District to manage vegetation in 144 polygons (Recommended Treatment Areas) [11] to reduce wildfire hazards, while protecting and enhancing biodiversity, providing defensible space near structures, managing invasive plant species, and for managing plant and animal communities in each polygon with inherently low fuel loads.

The primary focus for reducing wildfire hazards involved a wildfire hazard assessment process to identify and treat vegetation that would produce a flame length over 8

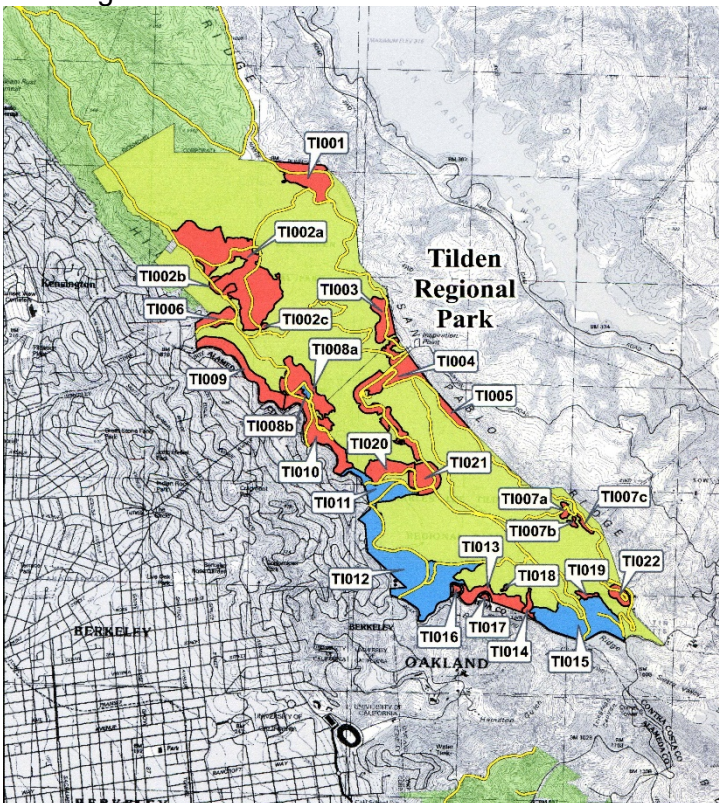
feet in height near homes, or that would generate a large number of embers and firebrands that would threaten neighboring homes and property. The Plan stated that vegetation management was essential for maintaining native plant communities and reducing wildfire risks for homes within the wildland-urban interface that could quickly become overwhelmed by wildfire.

The Plan stated that “the main premise of the Plan is that ecologically stable habitats are ultimately more economically sustainable. In effect, managing vegetation to achieve plant and animal communities and habitats with high levels of bio-diversity but inherently low fire hazards are more effective over the long term than the occasional treatment and/or ongoing maintenance of high fire hazard vegetation including areas infested by invasive weed species (e.g., broom) and thick groves of re-sprouting young eucalyptus trees.”

The Plan included, guidelines, and best management practices (BMPs) designed to assist the Park District in achieving four key goals to:

- Reduce fire hazards on District-owned lands in the East Bay’s wildland-urban interface to an acceptable level
- Maintain and enhance ecological values for plant and wildlife habitat consistent with fire reduction goals
- Preserve aesthetic landscape values for park users and neighboring communities
- Provide a vegetation management plan which is cost-effective and both financially and environmentally sustainable to EBRPD on an ongoing basis.”

Approximately 3,600 acres of park lands are to be treated for various levels of hazardous fuel conditions and to maintained in a low hazard condition using Measure CC and other sources of funding. Stands of blue gum eucalyptus trees and Monterey pines were included in polygons for treatment “due to their fuel characteristics, high ember production, tendency to re-sprout vigorously if not controlled, and to manage growth of understory vegetation to reduce ladder and ground fuels.”



Tilden park Map showing 26 polygons (RTA's) with unique prescriptions detailed for each polygon in the Plan

The Plan included recommended treatment areas (RTA's) along the residential edge, which are referred to as fuelbreaks in this paper, within 200' of homes along the 25-mile-long Lake Chabot to Wildcat Canyon ridge. The Plan also recommended thinning of eucalyptus and pine forests, and managing evacuation roadside vegetation.

Thinned groves then required ongoing pruning and removal of sprouts, ribbon bark, ground fuel, and understory trees, shrubs and seedlings every 3 to 5 years to create a maintained forest with little understory.

The Plan also recommended removal of eucalyptus and pine on high ridges and above homes to convert to lower native understory vegetation with less ember production.

The Park District awarded a contract for Tilden eucalyptus projects for \$377,000 to thin 34 acres and remove 29 hazardous blue gums at \$3,000 per tree. The estimated cost projection for all of Tilden is \$15 million for the next 20-years. The estimated cost for all Park District projects is \$48 million.

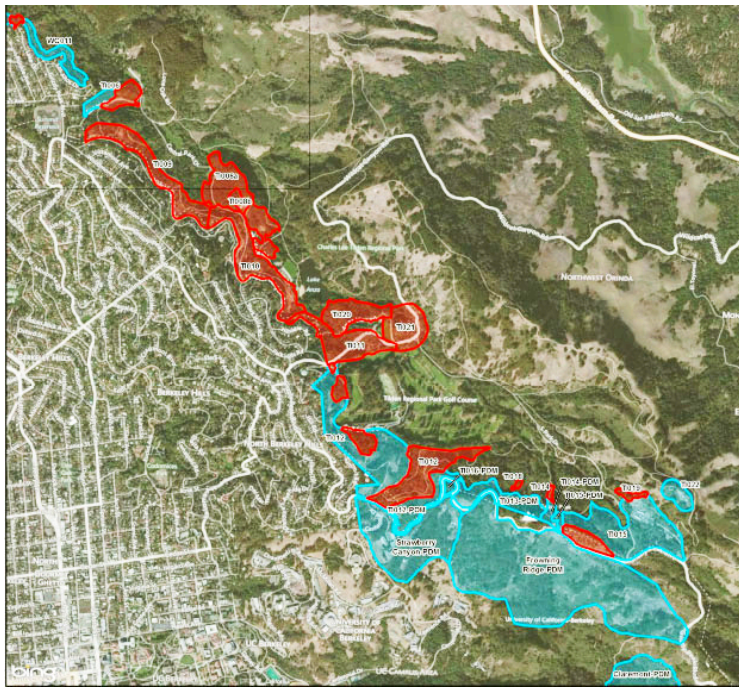
Several groups participated in the planning process, and appeared at Park District board meetings to oppose the draft and final Plan. The Hills Conservation Network (HCN) eventually filed a lawsuit and spent two years trying to defeat the District Plan only to agree, days before trial, for the District to thin 75 acres of ridgetop eucalyptus and pine instead of conversion to native oak/bay woodland or managed native shrubs along with a settlement of \$57,000 for HCN's legal costs. The Park District otherwise made just a few changes to its Plan/EIR, but was stalled while the FEMA EIS and the USFWS Biological Opinion were being completed.

D. Work on the 6,000-page draft FEMA East Bay Hills Hazardous Fire Risk Reduction EIS began in 2007 and was completed in 2016

In 2005 the University of California (UC) submitted and won nationally competitive grants for Strawberry and Claremont Canyon. In 2006 UC, Oakland, and the Park District submitted and won a collaborative nationally competitive grant application and EBRPD won a Hazard Mitigation Grant Program (HMGP) that all together totaled \$5,606,750. The funding sought in the four grant applications would be provided under FEMA's Pre-Disaster and Hazard Mitigation Grant Programs. FEMA's involvement in the hazardous fire risk reduction projects triggered the requirements of the National Environmental Policy Act which include an evaluation by FEMA and other federal agencies of the potential environmental impacts of the grant projects. Consultants were retained to draft Environmental Assessments (EA's) for Strawberry and Claremont Canyon with Oakland and Park District project EA's to follow. After four years of consultant work, FEMA faced opposition to the University's Strawberry and Claremont Canyon EA process with opponents demanding a full EIS.

FEMA then determined that all vegetation management work, including the Park District's 60 self-funded projects and the four grant applications should be assessed in a single East Bay Hills Hazardous Fire Risk Reduction Plan and Environmental Impact Statement (EIS). This determination was based on the proximity of all project areas to each other and the potential for cumulative impacts. The grant funded projects were called the proposed action, and the 60 EBRPD funded projects were called connected projects in the FEMA EIS. See FEMA and USFWS project descriptions [13].

The selection of topics that were addressed in the EIS were based on concerns raised during public scoping, and by regulatory and FEMA policy requirements. Impact topics included: Biological Resources, Fire and Fuels, Geology, Seismicity, and Soils, Water Resources, Air Quality, Climate and Microclimate, Historic Properties, Aesthetics and Visual Quality, Socioeconomics, Human Health and Safety (herbicides), Public Services, Infrastructure, and Recreation, Land Use and Planning, Transportation, and Noise. The final FEMA Plan/EIS contained reliable fire and resource scientific and natural resource material, and will be an excellent resource for UC and Oakland Plans.

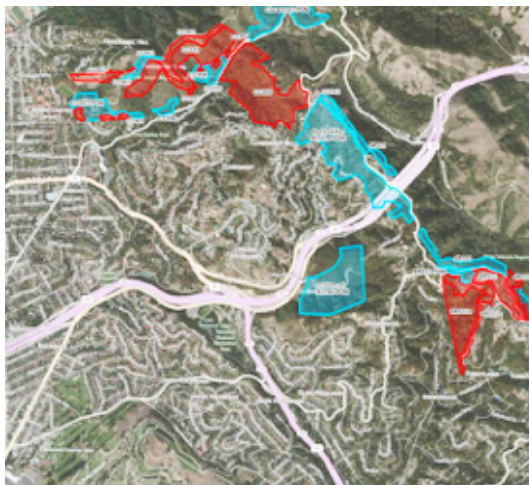


The stated purpose for projects analyzed in the EIS was “to substantially reduce hazardous fire risks to people (100,000 residents) and structures (34,000 homes) in project areas, and consequently reduce the need for future disaster relief and the risk of repetitive suffering and damage.” And, “the needed fire risk reduction projects arise from the severity and repetitive nature of wildfires in the East Bay Hills area and the proximity of residential areas to open spaces that are susceptible to fires.”

The red polygon areas along this section of the Tilden to Sibley residential interface were to be funded by the Park District and blue areas funded by FEMA. During legal proceedings, FEMA

eventually withdrew funding for the blue UC and Oakland polygons. However, the project descriptions and requirements for completing work on UC and Oakland land remained in the adopted FEMA Plan/EIS and will possibly need to be followed in the future when CEQA documents are approved and funding is obtained for fuel management projects on UC and Oakland land. Photo map above showing FEMA polygons for Tilden and UC Hill property

The following projects were for areas involved in the 1991 fire. The red and blue polygon projects in the FEMA EIS are critical to reduce the chance for another major Tunnel Canyon Fire. Since FEMA pulled funding for Oakland projects, the blue areas are now topic areas for the Oakland Park Plan and Environmental document process.



Oakland removed its dead pines on Grizzly Peak Open Space by helicopter at a cost of \$1 million dollars, but did not follow up with pine seedling and eucalyptus tree removal on the east side of the Canyon. Hiller Highlands crews later removed more than 600 pine seedlings from under tall pines that torched in the 1991 fire, and were removed as dead trees.

Homeowners in Tunnel Canyon have provided increased defensible space around significantly improved fire-resistant homes, but the entire Canyon needs a coordinated plan with ongoing maintenance by an experienced and qualified unit of city government.

The Caldecott Corridor Wildlife Plan and the USFWS Biological Opinion contain detailed information on listed species and required mitigation that will need to be considered in Oakland’s Grizzly Peak Open Space vegetation management plan.

Photo map above showing FEMA polygons for Park District and Oakland property near the 1991 Tunnel fire.

The USF&WS Biological Opinion and Required Mitigation

The FEMA EIS process resulted in the issuance of a significant biological opinion by the United States Fish and Wildlife Service (USF&WS) [14]. The biological opinion was issued under the authority of the Endangered Species Act, and described and analyzed the impact of FEMA and Park District funded projects on 3,153 acres concerning three federally listed species including the Alameda whipsnake and its critical habitat.

The biological opinion described the specific details and impacts of UC, EBRPD, and Oakland's proposed vegetation management projects on eucalyptus, pine, and other vegetation that would be consistent with fire hazard reduction objectives, and at the same time benefited protected wildlife and listed species. The biological opinion mapped the location and habitat for three federally listed species (Alameda whipsnake (*Masticophis lateralis euryxanthus*), California red-legged frog (*Rana draytonii*), and pallid manzanita (*Arctostaphylos pallida*) that could be impacted by project work. The biological opinion included a list of mandatory agency mitigations for work necessary to create and manage shrub and grasslands for fuelbreaks or for the management of agency lands for environmental purposes.

Hazardous Fire Risk Reduction- East Bay Hills, California **ERRATA** Biological Assessment January 2013

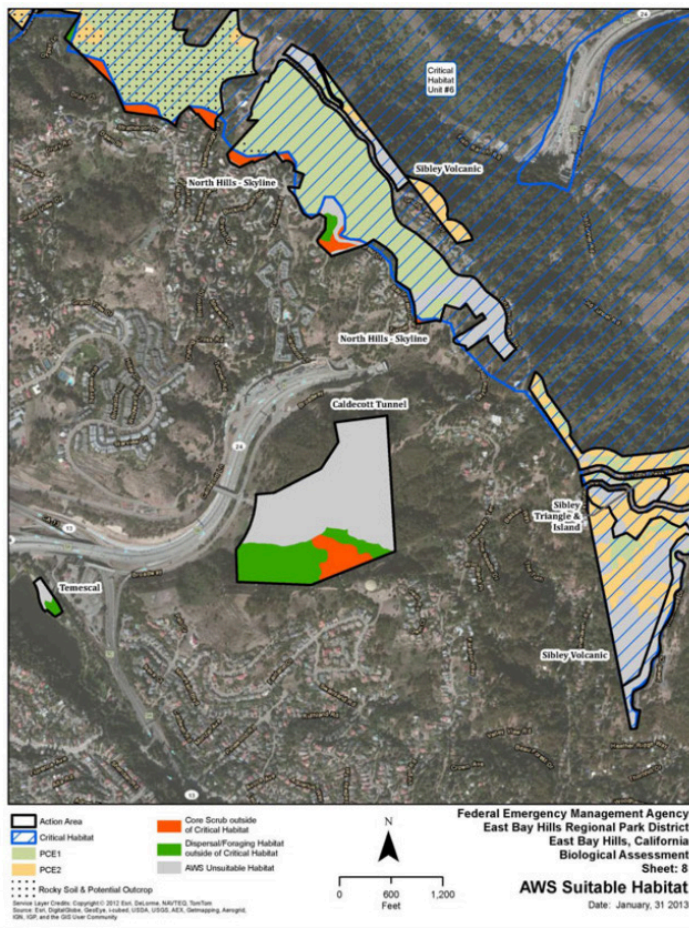


Figure 4-3H. AWS Suitable Habitat and PCEs (Sheet 8)

Castro Valley and El Sobrante have recently been mapped as suitable habitat for the Alameda whipsnake, with blue hatched lines as shown on Figure 4-3H. Projects in these areas that could impact listed species would be subject to a USFWS Biological Opinion with federal nexus under Section 7 of the Endangered Species Act, or without federal nexus through section 10 with a Habitat Conservation Plan (HCP).

UC and Oakland proposed self-mitigating projects in the FEMA/EIS for Alameda whipsnake. However, the Park District 2010 Plan/EIR did not address whipsnake mitigation in its polygon projects that were later carried forward into the 2016 FEMA EIS. As a result, the Park District must now satisfy mitigation conditions in the final USFWS biological opinion by the purchase of 386 acres of off-site land (not associated with fire hazard reduction purposes) with an endowment to manage the new land in perpetuity for whipsnake habitat. In order for the District to actually begin work on projects (now in 2017), it must obtain permits from the California Department of Fish and Wildlife to receive incidental take coverage, and comply with the terms and conditions of the USFWS Biological Opinion for project areas.

Most of the undeveloped East Bay Hills along the ridge and North/east slopes between

Several groups organized to oppose the Draft 2015 FEMA EIS

Moveon.org and the social media were effectively used to generate 13,000 letters of comment by individuals and groups from San Diego to New York using postcards, letters, and emails. Most comments were responding to inaccurate project descriptions in the social media, and it is doubtful many commenters actually read the 6,000 page FEMA EIS. Anti-herbicide, pro-eucalyptus and other tree advocates, anti-native restoration, and carbon/global warming concerns were among the issues expressed. Opposition required leadership provided by people representing organizations with official sounding names like the Hills Conservation Network, the Forest Action Brigade, Save the East Bay Hills, The TreeSpirit Project, and others.

Those who locally opposed FEMA's fire hazard mitigation projects in the media and on their web pages often claimed: "Clear-cutting will kill 500,000 trees. Eucalyptus stop fires, just clean up the debris. Eucalyptus and pine will be replaced by grasslands and shrubs, and fire risks will be increased. It's a pro eradication and pro herbicide plan. The EIS is unacceptable as it will inflict enormous environmental damage, expose the public to thousands of gallons of toxic herbicide, destroy raptor habitats, destabilize steep slopes, and actually increase the risk of hazardous wildfires. The EIS should instead support a far less destructive methodology that would use a "species-neutral" approach, focusing on eliminating ground fuels and fire ladders, thinning where appropriate, and limbing-up as needed to ensure minimal risk of crown fires. The fire hazard claim is a nativist myth. Killing more than 50,000 trees on UC land and poisoning them for up to 10 years will have disastrous effects on this beautiful and healthy ecosystem, and cannot be allowed to happen. They are targeting eucalyptus, pines, and acacia for complete eradication, not because of a fire risk, but because these species are despised by the native plant restoration community. I want to live in the urban/wildland interface, and want everyone to respect my right to put myself in harm's way. We like living in our forested hills and accept the fire risk."

Litigation ended with pressure on FEMA to settle, with minor rulings at the end by the judge
One month after FEMA approval of its draft Plan/EIS, HCN filed a lawsuit to defeat the FEMA Plan/EIS. The Sierra Club also sued three months later to remove the 28 acres of "Unified Method" experimental eucalyptus thinning that FEMA added to its draft EIR at the last minute, and to encourage Park District use of a program of 3R's for eucalyptus and pine removal, restoration of natives, and re-establishment of habitat for listed species. There was another year of legal briefs followed by court ordered mediation. FEMA dropped the 28 acres of unified thinning, and the judge dismissed the Sierra Club suit as being "moot" [15]. FEMA eventually settled with HCN at the last minute to eliminate the costs and risks of a trial, and to preserve their costly Fire Mitigation Plan and Environmental Impact Statement. FEMA was willing to avoid a trial by agreeing to withdraw \$5.6 million in UC and Oakland grant funds (awarded in 2006) leaving both agencies without funding, and the legal, environmental, and political cover required for dealing with high fire risk vegetation and federally protected species on their property. Also, if federal nexus is lost, there will be complications in obtaining incidental permits for Oakland and UC projects, likely requiring the development of Title 10 Habitat Conservation Plans. Otherwise, the multi-million dollar FEMA Plan/EIS was not changed with the exception that all grant funds were awarded to the Park District along with a FEMA refund of \$90,000 to HCN for legal costs.

Southside of Claremont Canyon above at signpost #29 with eucalyptus removed.



Surprisingly, FEMA and the Park District did not embrace the Sierra Club 3R's concept, (see sierraclub.org/san-francisco-bay/hillsfacts) [16], in favor of retaining eucalyptus acreage at the expense of restored native acreage where the 3R's should be used when restoration to natives either is or should be the goal. However, the Park District Plan is a 25-year program with an adaptive management commitment to make changes when new

information is discovered, i.e. new fire or resource management science, new information about state or federal listed species, factual information about the costs and taxpayer funding needed to grow and manage high risk eucalyptus and pine or new information about freeze, insect, or pathogen damage.

The involved major environmental organizations like the Sierra Club, East Bay Chapter of the California Native Plant Society, and the Claremont Canyon Conservancy supported UC and Oakland projects, like milepost #29 in Claremont Canyon, and will continue to advocate for projects that meet the twin goals of reducing the threat of catastrophic fire while restoring less flammable native plants that also provide significantly improved habitat for native wildlife.

VI. Conflicting News and arguments about a few key topics have made East Bay fire safety progress difficult

It would be impossible to summarize the 13,000 letters of complaint that FEMA received concerning its draft EIS, to itemize the local complaints noted above, or even to describe in clear terms all of the confusion and controversy that the media attempted to report in articles and news casts on radio or TV. However, there are a few worth describing that made discussions about hill fire safety contentious and difficult.

A. The clearcutting claims about 500,000 eucalyptus and pine trees were false, and they were "toxic"

Clearcutting does not describe what will be done under the FEMA grants. Commercial loggers refer to clearcutting when they log all trees in a given area to harvest a crop of trees for commercial sale. Under the FEMA grant program, eucalyptus and pine trees would be selectively removed leaving the native oak/bay or native shrub understory as the permanent less fire-prone vegetation. This will mean the land will quickly become a native woodland, scrub or grassland, depending on the specific topography and soil conditions.

The FEMA opponents most repeated claim was that 500,000 eucalyptus and pines trees would be clear-cut leaving the hills bare and even more hazardous. FEMA funded projects were based on acres and not the number of guessed trees, i.e. 200,000 small stems and small trees removed and 100,000 large trees saved. Projects of this scale do not attempt to count the number of normally small stems and trees (<12") and overly dense trees involved while thinning to save larger (>12") well-spaced trees or to remove flammable eucalyptus and pine trees to release less flammable understory native oak and bay trees.

The Park District Plan and The FEMA EIS documents were not clear about numbers of trees, the impact of the 1972 freeze, or the number of mature 120-year-old trees to be thinned and 40-year-old freeze damaged coppice stems on stumps to be managed or removed. Inaccurate claims about clear cutting of eucalyptus and pine became toxic and hijacked a more reasoned debate about tree fire safety and overall vegetation management that was documented in the otherwise very detailed fire science and environmentally based FEMA EIS.

Actual agency projects involved thinning some and retaining 85% of the eucalyptus and pine forest acres with selective conversion of 15% of eucalyptus and pine acres (usually acres logged after the 1972 freeze with coppice stems and native understory) to oak, bay, and other natives on ridges or in stands above homes to reduce the potential for fire and embers being spread into residential areas. The estimated total project related acreage in the Hills owned by the Park District, UC, and Oakland involved 13,636 acres which include a total of 2,731 eucalyptus and pine acres, and 10,905 acres of natural wildlands. Combined project and grant funded acres described in the adopted Park District EIR and the FEMA EIS involved the following [17]:

- 1,300 acres (48%) of eucalyptus and pine acres that were to be thinned and retained,
- 1,000 acres (37%) of eucalyptus and pine acres that were to be retained and not managed for fire safety,
- 400 acres (15%) of eucalyptus and pine acres that were to be restored to oak, bay, or native shrub land. (200 acres by EBRPD and a combined 200 acres by UC and Oakland)
- 1,700 acres of native and wildland vegetation would be managed as either residential edge fuel break or for fire trail edge and evacuation roadside edge fire safety,
- 655 acres of mitigation for Alameda whip snake, including off-site mitigation to be provided by the Park District.

B. Arguing about eucalyptus, pine, oaks, and bay trees made good media copy but missed the point

Arguing about the beauty or assumed fire-risk characteristics of eucalyptus or pines vs. oaks or bays is tangential to the fire science and analysis included in the adopted Plans. As are arguments about non-natives being as important as natives. Or, arguments about grassland's and shrub's being more flammable and dangerous than a eucalyptus or pine forest. Or, arguments that oak woodlands will not remain fire-safe for long because oaks will all die from SOD, and eucalyptus forests will live for 300 years.

Vegetation management proposals for the East Bay Hills were limited to a few specific concepts, and were not based on the above arguments so often highlighted in the media.

Recommendations are focused on:

1. Reducing vegetation fuel and fire-risks to structures by having homeowners create and maintain defensible space for their ember resistant homes.
2. Having agencies owning large natural areas create and maintain fuelbreaks along their residential edge containing vegetation with flame lengths of less than 8 feet within 200 feet of homes or other values at risk.
3. Having agencies owning large natural areas manage or remove vegetation that is predicted to torch or experience active crown fire from shrub fuel types within 1,000 feet, and forest fuel types within 2,000 feet of residential areas.
4. Managing vegetation to become habitat for listed species in compliance with USFWS mitigation requirements.
5. Managing vegetation and excessive fuel along strategic fire trails and roads for safe access and evacuation.
6. Using forest science based flame and fire concepts that have not been accepted as real by many urban residents such as:

Flame length Flame length values are generally classified in four categories based on standard ranges: 0.1 to 4.0 feet, 4.1 to 8.0 feet, 8.1 to 11.0 feet and greater than 11.0 feet. These ranges use flame lengths that are meaningful to firefighters.

Structures within 200 feet of above 8-foot flame lengths are assumed to be at risk during an approaching wildfire. The 8-foot, flame length is a nationally recognized standard over which erratic fire behavior would be difficult in control.

Crown fire advances from top to top of trees or shrubs. Crown fire activity is classified into three categories: active, torching and surface. In the surface fire category, little or no tree torching or active crowning is expected. During passive crown fire activity, isolated torching of trees or groups of trees is observed and the fire only moves through the canopy for short distances. During active crown fire activity, sustained runs through the canopy occur that may be independent of surface fire activity. Both torching and crown fire can lead to spotting.

Spotting is the production of sparks or embers that are carried by heat currents or wind and start new fires beyond the main fire. Structures can be lost in fires started by embers landing on or wedging into flammable building components, or penetrating to the interior through vents or other access points.

7. Similarly, the 1991 East Bay Hills Fire, Oakland-Berkeley California. Investigated by: J. Gordon Routley on page 68 describes a more complex environment for fire that was also not accepted as relevant by some.

“The East Bay Hills could be described as an extreme example of a wildland-urban interface zone, where the fuel supply and an intimate mixture of natural trees, brush, and grass surrounding man-made structures and vehicles. The complete intermingling of the natural and man-made fuels, combined with the steep terrain, created a combination that was more hazardous than either urban or wildland fuels alone. Hundreds of homes were completely enveloped in an extremely flammable environment. The natural fuels provided a continuous fuel blanket to carry the fire across the hillsides.”

The above concepts and related vegetation management goals are described and analyzed in detail in the 2010 Park District Plan/EIR and the 2015 FEMA Plan/EIS [18]. Vegetation behavior during fire is covered in both plans, but too often information from other sources or ideas based on personal opinions, for or against a specific tree or idea, got more attention than the actual fire science and vegetation management recommendations in the Plan’s. The FEMA Introduction section 4.3.2.1- Fire and Fuels Parameters- pages 113 to 124 contained the definitions of vegetative fuels, fire behavior, risk to human life and property, and the parameters that were used in the wildfire hazard and risk analysis. FEMA Plan Section 4.3- pages 55 to 65 included information on the way in which fire and fuels are described by fire science professionals, how the fire and fuels environment in the proposed and connected project areas was studied and characterized, the historic vegetation conditions and fire regimes, and the existing fuel hazard characteristics for each of the major vegetation communities found in project areas. FEMA Plan Section 5.2- pages 431 to 452 assessed the effectiveness of the proposed and connected actions and the no action alternative in reducing risks from fire hazards. FEMA Plan Appendix M, Fire and Fuels Modeling provided 100 pages of information regarding the specific metrics used to identify and evaluate, on a polygon-by-polygon basis, the performance and effectiveness of fire hazard reduction treatments [19].

These and other mitigation measures contained in the final FEMA EIS and Record of Decision are extensive. The fire mitigation projects, and the conservation measures and terms and conditions described in the FEMA Plan/EIS and the USFWS Biological Opinion (BO) were established to protect 11,000 homes near project areas, thousands of homes downwind in a Diablo wind fire, and to protect sensitive habitat and listed species. For these and other projects to be implemented by EBRPD, Oakland, and UC in mapped areas of listed federal species along the ridge, it will be necessary to obtain incidental take permits. If FEMA funding and nexus

are lost, a Habitat Conservation Plan (HCP) will be required when disturbing or clearing vegetation on project area lands.

C. Management of eucalyptus, pine, and natives by thinning, removal, and restoration

The thinning vs. removal and restore conflict originated with Park District and FEMA settlements with HCN, and not because of the fire and natural resource science proposed for projects in multi-million-dollar Plan/EIR and EIS documents. Fire and natural resource science support both alternatives.

However, the conflict appeared when the Park District agreed, in its lawsuit settlement in 2012 with HCN, to thin 30% of several ridgetop eucalyptus areas, leaving 70% of the polygons containing dense eucalyptus and senescent pine acres to be removed and restored to native understory vegetation. In 2015, FEMA added the 28-acre Unified Method of experimental thinning as a last-minute response to comments in its draft EIS as a test for seeing how restored areas would burn next to thinned areas. FEMA's settlement with HCN in 2016, then withdrew funding for 200 acres of UC and Oakland projects but did not modify its 2015 Plan/EIS, or address the 200-acres of eucalyptus to be removed, restored, and funded by the Park District. This issue was not solved by science but by litigation that could eventually have serious consequences for down-wind residential areas. FEMA's 28 acres of test areas are now gone, but the Park District's settlement and experimental 30% thinned eucalyptus and 70% restored native ridgetop areas remain.

Eucalyptus and pine groves can exceed 120' in height and are prone to dramatic fire behavior. When wind driven wildfire reaches their crown, 60-foot flames above tree-top can be expected with burning embers blowing downwind up to one mile. The capacity to spot new fires that overwhelm firefighting forces during Diablo wind conditions means these species must receive high priority for treatment. Un-maintained eucalyptus groves can have 250 to 1,000 stems per acre with fuel ladders into the canopy and 15 to 50 tons of flammable fuel on the ground. Wind driven wildfire in these groves can be expected to produce flame lengths and ember throws that will quickly overcome firefighters and significantly reduce evacuation time for residents.

Eucalyptus tree density varies wildly in Hill forests. Trees with diameters greater than 12" may include 100, 200 or 300 trees per acre with an equivalent number of stems less than 10" creating overly dense forests that are flammable and impenetrable. Thinning is often required at several stages in a forest as trees age and need to occupy larger spaces. As an example, the Vegetation Management Plan for the Presidio included the following statement on tree density. "In the experience of managers of Golden Gate Park, tree vigor is highest where mature tree density is between 30 and 50 trees per acre. When density is above 100 trees per acre, stand vigor decreases (State of California 1980)."

For the East Bay Hills the recommended strategy for mature eucalyptus and pine groves is thinning to eventually keep 30 to 50 mature trees per acre, with shrubs removed and ground fuel maintained at less than three tons per acre. The recommended strategy for freeze damaged eucalyptus areas that were logged between 1972 and 1975 is to remove all 40-year old stump sprouts and seedlings that will not form sound, sustainable woodlands, and to allow these areas to be converted to native oaks, bays, or shrubs typically found under taller coppice and seedling eucalyptus.

Native woodlands are generally below 50' in height, and are less prone to unmanageable fire behavior. Each native plant community behaves differently in wind-driven fire. Grassland fires are flashy and move quickly, but are relatively controllable. Shrub fires can also move quickly and some shrubs can produce flame lengths above 30' and, once ignited, are more difficult to control. Oak/bay woodlands are a relatively fire-safe plant community, with periodic clearing of ladder fuels being the only required maintenance needed near homes. The recommended strategy for protecting residential areas from wildfire coming from native vegetation is to

establish a fuel management zone “fuel breaks” with vegetation that will not exceed 8’ flames at the residential edge. And then manage these edges to provide safe access for firefighters defending structures that are ember resistant with defensible space to hopefully stop fire before it enters residential areas.

D. Herbicide use will be a “toxic” issue for some, but is a key tool for completing fire hazard reduction efforts

As this paper was being prepared, the Park District is the primary agency that would be using herbicides for its grant funded projects. The Park District has a Board approved IPM program that uses an adaptive management approach for preventing and suppressing pests before they reach unacceptable levels. “The goal of the IPM program is to manage pests in the most effective and safest manner for the public, staff and the environment in order to optimize recreational experiences and ecosystem functioning [20]. Our IPM approach includes: monitoring and research, cultural, mechanical, chemical, and biological strategies that, when integrated together, create sustainable land management practices. Site characteristics, biological timing, pest species, environmental considerations, level of desired control and efficacy factors dictate the strategies selected. Before implementing management actions, possible strategies are evaluated to develop an adaptable management strategy that maximizes pest control, ecological functioning, and public and staff safety.”

Some have argued that herbicide use and analysis was not adequately addressed in the FEMA Plan/EIS. Yet, detailed project descriptions for the use of herbicides in fuel management projects are covered in the FEMA documents. Best management practices for herbicide use, monitoring, and mitigation requirements for stump treatments and invasive weed control can be found in the published FEMA documents [21]. Specific directions and requirements are found in FEMA EIS Section 4.5 (8 pages), FEMA EIS Appendix F (336 pages providing a human health and ecological risk assessment), FEMA EIS Appendix L (25 pages), USFWS Biological Opinion (50 pages), and in the FEMA EIS Record of Decision (13 pages).

Licensed contractors or licensed staff or other employees under their direct supervision will use Garlon and Roundup to eliminate eucalyptus stump sprouting and to treat flammable invasive weeds within fire hazard reduction project areas. If left untreated, new stems will emerge from the logged tree stumps and within a short time as many as six or eight new trees will emerge from what was once just one. Eucalyptus are known to grow six-to-ten feet a year.

E. City Fire Department policies and inspections have yet to cause neighborhoods to become fire adapted

Cities have yet to enforce effective vegetation and residential fire safety policy or provide leadership in reducing the obvious fire potential along the urban side in the East Bay Hills. It doesn’t take a rocket scientist driving through dense residential neighborhoods covered with tall trees and surrounded by lush landscapes to know there would be little that firefighters could do if a fall Diablo wind driven fire were to occur again. Oakland is now facing criticism for the Ghost Ship fire of December 2, 2016 where 36 people died, and the alleged inadequacy or even irrelevancy of city fire department inspections for both buildings and residential property fire safety recently reported in the media. However, the media attention, and improved inspections by Oakland Fire are beginning to result in more obvious weed clearing by residents and public agencies. Weedy grass areas in the hills are now being mowed or weed-whacked by an increasing number of residents. Cal Trans is mowing weeds along the highway 24 and 13 corridors, and Oakland’s expanded goat grazing on public land is resulting in short grassland areas in city parks. Yet, based on both Oakland and Berkeley Fire Department filings of completed Local Hazard Mitigation Plans posted on agency web pages, cities seem to have a limited understanding of their role in reducing fire hazards [22]. Cities state in their Local Hazard Mitigation Plans that they don’t have an interface fire problem because fires will come from somewhere outside of the city. And, they don’t describe or deal with the intermix fire problem similar to the Tunnel fire that came from city land and spread into 1,500 acres in four adjacent canyons.



Cities (Berkeley and Oakland) must plan and prepare for fires that will start or do their damage within the urban intermix, urban forest areas, or urban residential areas similar to the 1923, 1970, 1980, and 1991 fires. Lead agencies (Cities and Cal Fire) must enforce codes that require all landowners to mitigate fire hazards in both residential and wildland/urban areas. Nine public landowners, and 100,000 residents in 34,000 homes in the Hills can't figure it out by themselves.

In the case of Berkeley, densely spaced homes on a steep hillside near the route of the 1923 fire are not ready for the next fire if it were to occur today. The Berkeley Local Hazard Mitigation Plan states that if the "imagined" fire in the above photo happened during a fall Diablo wind, 3,000 homes would be in the footprint of the 1923 burn at a cost of \$6 to \$9 billion dollars. These assumptions would not matter if the fire started in parkland East of Tilden's fuelbreak or West of the fuelbreak in a Berkeley residential area.

F. Growing large blue gum eucalyptus and Monterey Pine can be risky, costly, and controversial

It does not seem possible for the general public to view eucalyptus and pine as either a wildfire or liability problem because of the beauty of trees in their favorite park or neighborhood forest. Yet, anyone growing blue gum eucalyptus trees will eventually discover that the miracle tree of the 20th century can become the Jekyll and Hyde tree of the 21st century when very large eucalyptus trees become safety hazards. Blue gum eucalypts, because of their size create a special dilemma for public agencies because they have no economic value to help in covering removal costs, and very large trees are beloved by vocal members of the public who will lobby to save every tree possible. [23]

Many pioneer blue gums planted in the Bay Area have already been removed, presumably for cause, but a few 120 to 140-year old blue gum trees remain on campuses and parks to be monitored for performance during their final years. There will obviously be a few giants, but California blue gum descriptions should be for trees that are 150 to 200 feet tall, and 120 to 150 years of safe/viable age. Maximum tree diameters should be for 2 to 4 feet for trees in groves, and 5 to 12 feet for solitary trees. Of course, individual tree, forest age, and tree size will vary based on overall health, site conditions, and resistance to increasing pests and pathogens.

Retaining large high-risk trees that exhibit failure tendencies forces a landowner to hope that no one will ever be injured or killed by the retained tree or large limb if they fail. It's commonly called "betting not to lose". The "bet" can be safeguarded to some extent by following the advice of science-based arborists or other tree experts, but the agency, landowner, or individual involved in the "bet" will remain responsible and should expect a lawsuit if they are accused of being negligent. Given the number of existing and adopted plans that describe and document the potential risks of owning un-managed eucalyptus and pine, both the fire and liability claim will likely be made by injured parties.

Costs related to the management of fuelbreaks and dense tree groves are now becoming more apparent. The Park District uses an \$8,000 average cost estimate per acre for the initial entry for fuelbreak projects or dense grove thinning, and \$1,500 average per acre cost for ongoing annual maintenance. Overall costs for mature stands would include the first entry thinning, and 25 years of regular management and understory fuel removal. A follow-up second thinning would be required to get 30' spacing for large trees with the eventual removal of 50 large blue gums (\$3,000 per tree) when trees are a hazard or reach the end of their normal life cycle. The total cost for each mature eucalyptus/pine acre with large trees could easily reach \$200,000 per acre when all costs are included.

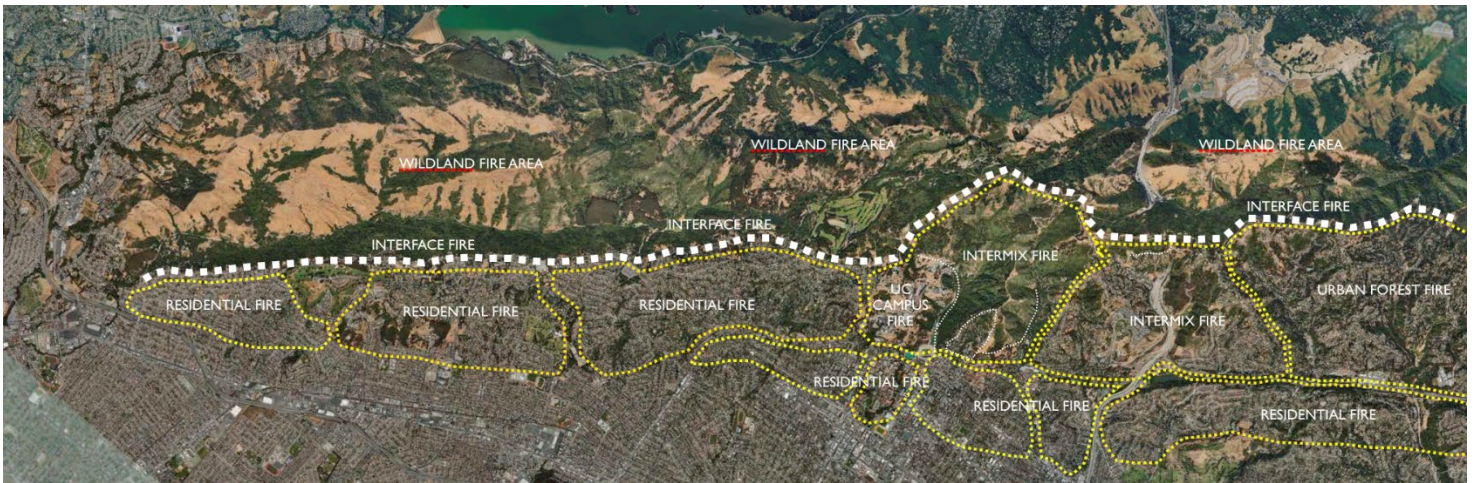
Options for dealing with dense eucalyptus sucker dominated areas that were logged after the 1972 freeze are also becoming more apparent. Costs are significantly lower by removing the suckers and coppiced stumps to save the native understory vegetation that would survive the next freeze and exhibit less risky fire behavior. The Park District and the University have completed several 1972 freeze blue gum sucker-to-native oak, bay, and shrub/grassland projects with recent project costs ranging from \$4,000 to \$16,000 per acre. Maintenance of established native trees and shrubs will then be minimal after one to ten years of controlling weeds, eucalyptus sprouts, and seedlings. The alternative cost choices may be as simple as \$15,000 to 20,000 per acre for freeze damaged groves, and \$200,000 per acre to remove large trees when the grove is classified as a hazard, plus any vegetation restoration costs after the eucalyptus are removed. The math is relatively simple with 1,300 acres times \$200,000 to equal \$260 million dollars, and 400 acres times \$20,000 to equal \$8 million dollars.

VII. Complex Fire Behavior in the Hills will Require Site-specific Fire Hazard Mitigation

The Hill's geographic footprint, and the focus area for fire hazard reduction projects has been relatively small at 20 miles long by 3 miles wide. Yet, the Hills are complex enough to support a challenging variety of fire behaviors across lands managed by nine different public agencies serving approximately 100,000 people in 34,000 densely clustered homes in the hills. Each fire hazard condition and potential fire behavior requires mitigation that is site specific and complex with detailed fire mitigation efforts that should be focused on the following five categories.

- **Wildland Fire Areas**- Mostly EBRPD and EBMUD park and watershed land East of the high ridge including parks between Lake Chabot and Wildcat Canyon and watershed for Lake Chabot, San Leandro, San Pablo, and Briones reservoirs. Agencies should use conservation grazing of grasslands with invasive weed control, prescribed fire in selected areas, manage high ridge eucalyptus and pine for ember reduction, and managed road shoulders for access and evacuation. Cal Fire is the primary agency for firefighting with-local multi-agency support.
- **Interface Fire Areas**- Usually Park District, UC, or EBMUD land at the residential interface. Create ridgetop, residential or urban edge fuelbreak's (200' minimum) with mowed or grazed grass, managed shrubs, and low growing oak/bay/native trees. Eucalyptus and pine should be removed in managed fuelbreaks, and along the high ridges above homes to prevent torch or crown fire that would spread embers into residential areas. Cal Fire is the primary agency for firefighting with-local multi-agency support.

- **Intermix Fire Areas**- Usually Oakland, UC, or Park District land. Maintain all grass, shrubs, and structures to resist uncontrollable fire. Eucalyptus and pine should be maintained for ember control or converted to lower growing oak/bay/shrubs. In intermix areas with large acreage of natural wildland vegetation, provide managed interior residential scale fuelbreaks (100' private and public agency defensible space) at the residential edge. Intermix areas are the highest fire risk areas in the East Bay Hills because they do not have a defined edge like a ridge where wildland and residential fuels meet. Vegetation must be managed to remove excessive fuel with a more developed and maintained landscape appropriate for an urban residential area with million dollar homes. Each City is the primary agency for firefighting with-local multi-agency support.
- **Urban Forest Fire Areas**- City forested residential areas with tall eucalyptus and pine tree canopies- Use code enforcement based on Cohen's ember resistant structures, with defensible space and thinned trees near homes [26]. A mountain setting but still an urban residential area. Each City is the primary agency for firefighting with-local multi-agency support.
- **Residential Fire Areas**- City residential areas with modest tree cover and urban landscapes. Use code enforcement base on Cal Fire ember resistant structures, and defensible space [29]. Each City is the primary agency for firefighting with-local multi-agency support.



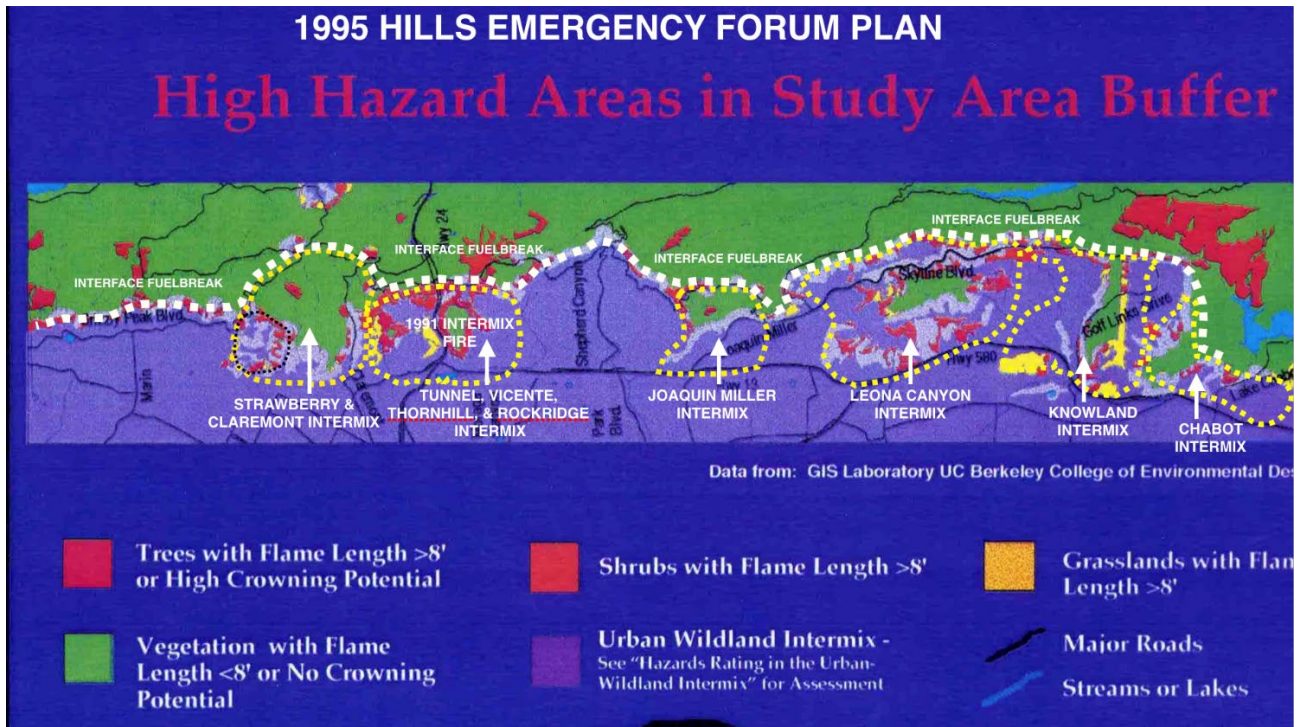
Map #1, North end of the East Bay Hills from Richmond to the Central Oakland Hills



Map #2, Central Oakland Hills from Tunnel Canyon to San Leandro and Castro Valley.

The above mapped intermix interface and intermix areas are outlined below over the 1995 HEF Plan High Hazard Study Area Buffer. The Ridgetop wildland interface fuelbreaks (along the white

dot lines) are primarily the responsibility of EBRPD, UC, and EBMUD. The intermix areas (within the yellow dot lines) are primarily the responsibility of Berkeley, UC, Oakland, and homeowners. Shepard and Thornhill Canyons, and the Berkeley Hills are urban forest fire areas or residential fire areas requiring active code enforcement with compliance by homeowners.



Page 27, 1995 HEF Fire Hazard Mitigation Plan with city intermix zones (yellow dot lines) added.

VIII. Other Principles for Fire Hazard Planning, and Vegetation Management in the Hills

We have included several articles based on the latest publications for addition background about living in high fire risk areas. Most of the research in the articles is for mountain conifer forests where large acreage fires will occur with increasing costs for federal and state agencies. Little published research is available for areas like the East Bay Hills where relatively small acreage fires occur, but at the highest cost to residents and insurers. The "mountain" research is useful, but difficult to apply directly to the East Bay Hills. The most recent example occurred during the ten-year FEMA process with the confusion about thinning forests vs. removing planted blue gum eucalyptus and Monterey pine to convert to safer and sustainable native woodlands. Local agencies have some of the most experience in the state with eucalyptus conversion projects, but the research on thinning conifers has been channeled to address state-wide and federal issues. The following eight summaries are provided for information in published articles worthy of being obtained and read.

A. Published article by Jack D. Cohen on What is the Wildfire Threat to Homes?

This is the article is to read if you live in the mountains, understand that forests will burn, and that it's natural and "okay". According to Cohen, "homeowners should take the principle responsibility for assuring homes have adequately low ignitability." And, "instead of relying on the fire service for all pre-suppression and fire services, the strategy of assisted and managed community self-sufficiency must be shared and implemented equally by homeowners and the fire services." Cohen makes the often-quoted argument offered by agencies owning forested areas with intrusions of homes into wildland's, and provides the research, details, and logic for home survival in forested areas. [24]

B. Published article by Moritz and Knowles about Coexisting with Wildfire

This is the article to read about fire realism in fire-prone urban ecosystems. The authors provide a wide-ranging discussion of topics about fire and risk management, but their section on realism

about fire hazards offered only two examples. 1. The use of fire-safe codes to create new subdivisions like Rancho Santa Fe with homes that are protected from fire contrasted with the fierce individualism of fire adapted communities in Painted Cave above Santa Barbara with residents who understand that they must be prepared to live with and respond accordingly to future fires. And, 2 for a FEMA grant for homeowners near Big Bear to replace wood roofs with class A roofs. In many ways, this is the modern urban version of the “Cohen principle”, but with more homes and people. The authors first example is the extreme concept that would not be feasible for the already developed and dense East Bay Hills with 34,000 homes and 100,000 residents, but the second should be explored when FEMA has new funding to distribute. However, the authors were suspicious about the role of seeking federal and state help as an example of “disaster federalism”. The article provides excellent material on hazards versus vulnerability, and the struggle that homeowners need to understand about fuel reduction not being a panacea. Homeowners must understand their risks and take action accordingly. [25]

C. Published article about How Risk Management can prevent Future Wildfire Disasters in the WUI

This is the article to read about a concept model for reducing home loss with tiered efforts and programs for home ignition prevention, fuel and vegetation management, preparedness and suppression response, land use and zoning, and home ignition zone management.

The information in this article was co-written by four experienced fire and forestry professionals and researchers associated with the US Forest Service. They describe the current problem in the context of mountain experiences with quotes like: “recent wildfire events throughout the world have highlighted the consequences of residential development in the wildland urban interface (WUI) including hundreds to thousands of homes burned during a single wildfire to, more tragically, firefighter and homeowner fatalities. Despite substantial investments in modifying wildland fuels near populated areas, losses appear to be increasing.”

In this article, they examined the conditions under which wildland urban interface wildfire disasters occur and introduced a wildfire risk assessment framework for reducing residential losses because of wildfire. They describe the current Wildfire Paradox of the inevitable occurrence of wildfires as a home ignition problem, and that mitigating wildfire risk to human communities is best done by using a strategic risk assessment framework for reducing home ignition potential and reducing fuel loads by applying a framework that requires an understanding of the relationship between extreme wildfires, home ignitions, and mitigation opportunities.

Their conclusion for forested mountain areas, is that an integrated risk-sharing approach is necessary to have fire-adapted communities, successful and efficient wildfire response, and resilient landscapes. By addressing the home ignition zone problem, public land managers can “focus on expanded burning (prescribed and beneficial natural fire) to begin to reduce wildfire-related losses, and thereby untangle the wildfire paradox of home loss within the wildland urban interface”. [26]

D. Published article by Agee and Skinner about Basic Principles of Forest Fuel Reduction Treatments

This is the article to read about research for reliable fuel reduction methods in forest areas (and possibly in interface, intermix, and urban forest areas). The authors basic principles are: 1. Reduce surface fuels. 2. Increase height to live crown. 3. Decrease crown density. 4. Keep big trees of fire-resistant species. [27]

Agee and Skinner’s research suggest that agencies and residents in the East Bay Hills in high fire risk forest areas should be ready to: 1. Accept thinning of overly dense, unmaintained eucalyptus and pine trees to achieve an eventual 30 to 50 trees per acre that

would be safe and manageable into the future. 2. Remove most of the native and invasive shrubs under eucalyptus and pine, and control poison oak to be able to get at and remove seedlings that will otherwise become established. 3. Remove ribbon bark and the lower branches on trees for possibly up to 10' of fire ladder clearance on steep slopes. 4. Thin trees to open closed canopies for possibly up to 50% of clearance in eucalyptus or pine canopies in steep and windy areas. 5. Comply with tree spacing diagrams between trees (and not trunks) in Cal Fire and local defensible space brochures for residential intermix area trees. The above comments have been limited to eucalyptus and pine, but will also apply to oaks, bays, and other trees in designated defensible space areas near homes.

E. Published article by Wolf and DiTomaso on The Management of blue gum eucalyptus

This is the article to read if you believe that “while blue gum is a nonnative plant that in some cases can be particularly invasive or hazardous, eradication of blue gum populations is not always appropriate.” The authors provide a wide-ranging discussion of blue gum eucalyptus benefits and impacts, and explore a variety of management questions for a tree that is both loved and despised in the East Bay Hills. Their information will not be new to individuals who have paid attention to local eucalyptus debates. But, the article is worthy because it provides a beautiful description of a tree that is now part of the California landscape. [28]

It also documents many of the issues faced by land managers responsible for eucalyptus trees, but with not much detail for large groves or urban forests. The discussion about flame length and litter (fuel) accumulation does not provide clarity about overall flammability with 60' flames possible from the top of very large and sometimes dangerous trees on steep windy ridges above homes. Their notion that nonnative, invasiveness, or hazardousness might lead to eradication is a paper tiger because there are legitimate reasons why both private and public landowners remove trees, even when they value trees and the forest. Even Jared Farmer, author of *Trees in Paradise*, felt that it made perfect sense to remove or thin their numbers in nature preserves or in high fire-risk areas like the East Bay Hills.

IX. The high-density, residential fuel issue must be addressed to protect homes and facilitate firefighting

It is an allusion to believe that wildfire safety can ever be achieved in the Hills by dealing only with wildland vegetation fuels, leaving structure vulnerability and flammability issues unresolved. The following quote is from *Home survival in Wildfire-Prone Areas: Building Materials and Design Considerations*-UC Publication 8393, May 2010. [29]

“A wildfire-safe home must be an ember-ignition-resistant home, so that even if the flames do not reach the home, it will be able to with-stand the exposure to embers that may have been blown a mile or more in front of a wildfire. To provide maximum wildfire protection for a home, a combination of near-home vegetation management, appropriate building materials, and related design features must be used. Preparing and maintaining adequate defensible space will guard against flame contact and radiant exposures from nearby vegetation, but because of the likely ember exposure to a home during a wildfire, homeowners cannot ignore building material and design considerations. Similarly, if a homeowner ignores defensible space (i.e., does not have it or does not maintain it), the wildfire will produce maximum ember, flame, and radiant exposures to a home. It is very unlikely that even hardened buildings can survive such exposure, as a weak link will likely exist somewhere in the building enclosure”

An estimate of the energy release rate during a house fire in the 1991 Oakland and Berkeley Hills fire was made by Trelles (1995) and by Trelles and Pagni (1997) [30]. “According to these estimates, a house burns at a peak rate of 45 MW for 1 hour yielding about 160 GJ (equivalent to 151 million Btu or 1,100 gallons of gasoline), and then dies down over a 6-hour period. If as assumed, there is also brush around each house, which releases another 5 MW for one hour, then an additional 18 GJ of energy (equivalent to 17

million Btu or 125 gallons of gasoline) will be released”. Unprepared homes will therefore represent more than 80 to 90% of the burning material in a large intermix fire.

The high-density, residential fuel issue is the crucial unaddressed fire mitigation step that would have lasting benefit for homeowners and agency firefighters. Allowing homeowners to feel their homes might survive or be protected without making the appropriate investments for retrofitting homes to eliminate ember, flame, and radiant exposure is both misleading and would be indefensible if another 3,000 unprepared \$600,000 to \$3,000,000 homes are lost in the next major wildfire. Adopting standards only for new construction will not solve the home fire loss problem in high-risk areas dominated by 50 to 70-year old homes.

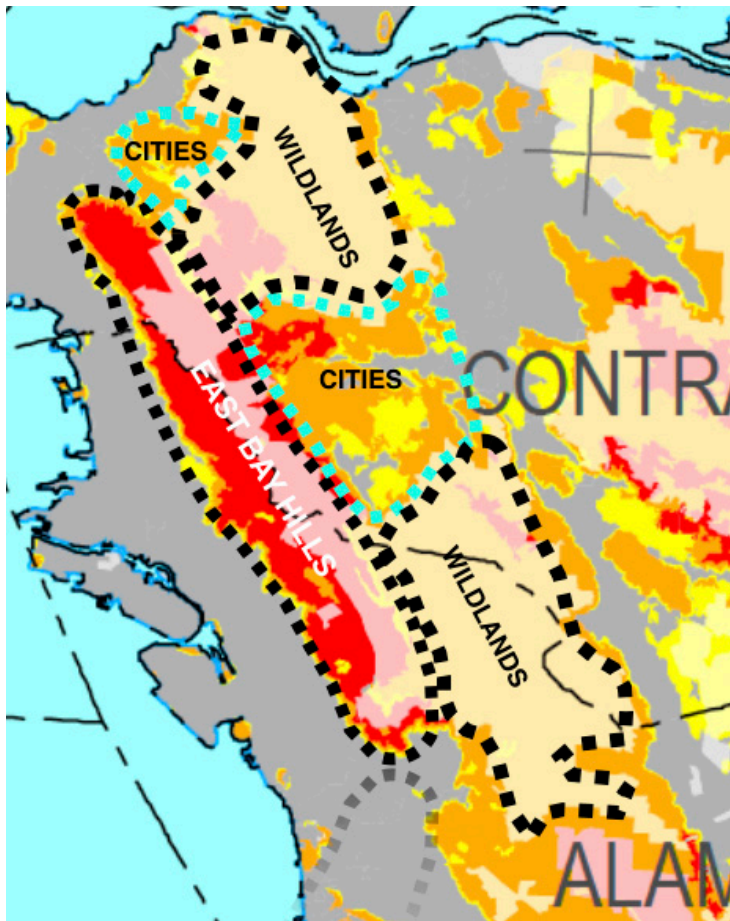
Wind driven wildfire in the hills will automatically result in the evacuation of residents leaving most homes unguarded. There are no guarantees offered by making a home fire resistant; However, a home that is vulnerable to radiant heat, flames, and burning firebrands without survivable space and a crew of firefighters will be totally defenseless in a wildfire with little chance of survival. Cities must find a way to require that both defensible space and home retrofitting standards are met to give homes a reasonable chance to survive, and to give firefighting a reasonable chance in the East Bay Hills during Diablo winds.

X. State Cal Fire Zoning of East Bay Hill Fire Hazards, and current State and Federal Fire Planning Law

Following the 1991 fire, the State required the Department of Forestry and Fire Protection (Cal Fire) to Map fire hazards throughout the State of California. Cal Fire has posted Fire Resource and Assessment Program (FRAP) recommended maps for Very High Fire Hazard Severity Zones for both Local and State responsibility areas that cover all of the East Bay Hills.

The California Government Code (GC) Section 51177 [31] defines “Very High Fire Hazard Severity Zones” to mean areas designated by the Director of Forestry and Fire Protection based on consistent statewide criteria and based on the severity of fire hazard that is expected to prevail in those areas. Very High Fire Hazard Severity Zones shall be based on fuel loading, slope, fire weather, and other relevant factors including areas where Santa Ana, Mono, or Diablo winds have been identified by the Department of Forestry and Fire Protection as a major cause of wildfire spread. (<http://myplan.calema.ca.gov/>)

The FEMA Plan/EIS was limited to grant projects on public land, and did not otherwise address fire hazards in developed and private urban areas. The EIS noted on page 2-1 in the Introduction that “Fire hazard severity mapping prepared by the California Department of Forestry and Fire Protection (Cal Fire) indicates that most of the undeveloped areas in the East Bay Hills are in the very high fire hazard severity zone – the zone where wildfire hazard is most severe (Cal Fire 2007a, 2007b, 2008, 2009b). Several factors contribute to this very high fire hazard. The East Bay Hills are subject to hot, dry winds from the northeast that can drive a wildfire from the regional parks and other open space areas into residential areas.” And, “The East Bay Hills contain many areas with dense flammable vegetation. The primary vegetation types of concern are trees and shrubs that are more fire prone; have fine, dry, or dead material such as needles or loose papery bark; and tend to accumulate dead, dry material around them. The East Bay Hills also contain other vegetation types that are composed of less fire prone species that have higher moisture contents and lower fuel loads, including grassland and shrub islands. The combination of litter build-up (limbs, leaves, stringy bark) and extensive ladder fuels with the heavy forest fuels contributes to high-intensity fires and increased potential for fires laddering up into the crowns, which allows fires to spread much farther. Heavy accumulations of forest litter under mature pine canopies lead to similar fire behavior. Longer flame lengths and greater heat output are associated with increased fire intensity. Oak-bay woodlands or grasslands with shrub islands produce less accumulated dead fuels and ladder fuels over time as compared to eucalyptus and pine communities. The goals of the project are to reduce fuel loading and fire intensity with shorter flame lengths and reduce the potential for crown fires.”



The Eastern 50% of the Hills (pink) are undeveloped SRA zoned lands, and are mostly regional parkland between Lake Chabot and Wildcat Canyon or EBMUD watershed land between San Leandro and San Pablo Reservoirs. Orange, yellow, and red zones are City LRA areas. Undeveloped land and watershed lands (pink areas) are in the mapped Cal Fire Very High Fire Hazard Severity Zone. The tan area is also mapped as SRA zoned lands in the Cal Fire High Fire Hazard Zone. Both pink and tan zones are classified as State Responsibility Areas (SRA) for primary firefighting purposes. Red, orange, and yellow zones East of the Hills are Lamorinda LRA areas for primary firefighting by municipal fire departments.

The Western 50% of the Hills (red) are developed residential city or county land in Alameda County or Contra Costa County between Castro Valley

and Richmond. Developed city or county lands in the Hills are mapped in the Cal Fire Very High Fire Hazard Severity Zone, but are classified as Local Responsibility Areas (LRA) for primary firefighting by municipal or county fire departments.

Graphic from: Cal Fire Resource and Assessment Program (FRAP) Map of Fire Hazard Severity Zones for LRA and SRA areas of the East Bay Hills and immediate areas to the East in Contra Costa and Alameda Counties. Gray areas are developed urban areas.

The State of California has determined that fires pose a serious threat to the preservation of the public peace, health, or safety. Since fires ignore civil boundaries, it is necessary that cities, counties, special districts, state agencies, and federal agencies work together to bring raging fires under control. Preventive measures are essential for successful fire suppression, and are therefore also needed to ensure the preservation of the public peace, health, or safety.

Summary of Fire Hazard Planning Requirements for Local Governments

- In order to be eligible for FEMA mitigation project funding, local governments must adopt a Local Hazard Mitigation Plan, and then review and revise that plan every five years.
- In order to influence where and how federal agencies implement fuel reduction projects on federal land, as well as how additional federal funds may be distributed for projects on non-federal lands, local governments may develop Community Wildfire Protection Plans together with local, state and federal fire officials.
- Safety Elements of local general plans must be revised, upon the next update to the Housing Element, to address state responsibility areas and very high fire hazard severity zones. The revision must include information about wildfire hazards, as well as goals, policies, and objectives and feasible implementation measures for the protection of the

community from the unreasonable risk of wildfire. (SB 1241; Government Code Sections 65302; and 65302.5.)

- Before approving a tentative subdivision map or parcel map within a state responsibility area or a very high fire hazard severity zone, a city or county must make certain findings. Those findings include that the subdivision is consistent with Cal FIRE regulations and that fire protection and suppression services are available for the subdivision.

XI. The need for Enforcement, and for Someone to-be-In-charge

It would be appropriate for officials and residents to breathe a sigh of relief while also taking credit for the fact that no major Hills wildland/urban fires have occurred during the past 26-years. And, to appreciate the many improvements made thus far. However, The East Bay experiment with multi-agency politics and the application of fire and natural resource science for fire hazard reduction in an area that values individualism has not resulted in a unified fire plan or countered aggressive opponents. No one can currently speak with authority about what needs to be done and how.

The East Bay has been involved in several long and contentious fire hazard reduction planning efforts, but it's time to bring the experiment to a close and to begin the significant fire hazard mitigation work that will make the hills safer while retaining their natural beauty. Hopefully, the public will be able to accept the fact that identified fire hazards are real, and that agency projects based on sound fire and natural resource science must be allowed to proceed. We also do not support the idea that agency fire fighters should be given an impossible task for making the hills safe, and then being criticized after a fire when residents did not give them the support, tools and funding to do what was necessary. The 1991 fire was a \$2 billion-dollar loss with today's costs upgraded by several billion dollars. Fire safety improvements for agencies and residents cannot be done on the cheap.

Realistic fire hazard mitigation plans must be developed within the context of overall agency goals, staff capabilities, and financial capacity. Most public agency land was purchased for other purposes, and fire safety hazard mitigation is a recent "area wide overlay". At this point, the Berkeley lab has finished its initial work, and all HEF members have worked on fire hazard mitigation projects. But, only the Park District has the political and administrative leadership with qualified, assigned staff necessary to comply with the complex and detailed requirements of a federally funded fire mitigation project that impacts listed species. UC and Oakland will soon need to decide who will be in charge, and which unit of their agency will be responsible for hiring a qualified fire hazard mitigation manager, resource consultants, and experienced field staff to handle at least ten years of project work and future ongoing years of maintenance. Agencies together, will need to decide how to obtain a reliable source of funding for coordinated fire hazard mitigation projects. Pre-and post-disaster federalism will provide periodic funding, but reliable local funding will be required.

This paper does not downplay the concerns raised by the general public and the opponents during both the Park District and FEMA ten-year long Plan and Environmental review processes. Fire hazard mitigation and management decisions now require an understanding of the science of wildland and urban fire behavior, and the science of natural resource management in an age of litigation and political exposure. Day to day decisions should be made by licensed professionals in agencies who have the legal and political responsibility for protecting residents living in the Hills.

Individuals who are concerned about fuelbreaks, eucalyptus and pine trees, and other resource issues can visit the following locations to see before and after examples of fire hazard mitigation projects discussed in this paper.

Examples of fire-safe areas with eucalyptus and pine removed, paired with areas where landowners have retained flammable eucalyptus and pine fire hazards

1. Hiller Highlands oak fire-safe hillside with 600 pines removed - Cal Trans thinned, closed canopy flammable eucalyptus grove with understory weeds.
2. Fire-safe Southside of Claremont Avenue at signpost #29 with flammable eucalyptus removed - Northside of Claremont Ave. with flammable eucalyptus along the road.
3. Sibley Island Ridgetop fire-safe native fuelbreak without eucalyptus and pine - Sibley Park Staging Area with retained flammable dense eucalyptus and pine.
4. Tilden and UC fire-safe Frowning Ridge conversion of eucalyptus to oak/bay woodland - EBMUD retained flammable eucalyptus above Grizzly Peak Road.
5. West side of Temescal Park with eucalyptus and pine removed - Home above Caldecott Tunnel surrounded by retained flammable eucalyptus.
6. Tilden Blue Gum Gate fire-safe thinned eucalyptus grove with 38 trees/acre - Interior TNA eucalyptus grove with retained flammable 1,000 stems/acre.
7. UC's Founders fire-safe Grove with 30 eucalyptus trees/acre - UC's Claremont Canyon coppice eucalyptus with retained flammable 1,000 stems/acre.
8. Northside of Thornhill Canyon with fire-safe new homes and trees - Shepard Canyon homes with retained flammable tall eucalyptus and pine.
9. East fire-safe "Skyline Garden" side of EBMUD Grizzly Ridge managed jointly by EBMUD and CNPS – West side of the Ridge above Claremont Canyon with retained flammable eucalyptus seedlings above power line and Grizzly Peak Boulevard evacuation road.

The public and elected officials have quietly accepted the consequences of the conflicts noted in this paper. Since the 1982 Blue Ribbon Report findings and recommendations in its Executive Summary [32], agencies and homeowners have lost at least 37 years of opportunities for making coordinated improvements. Since the 1991 fire and the first HEF plan of 1995, agencies and homeowners have lost at least 24 years of opportunities to complete work that should have begun well before 2019. And, as a result of the FEMA 10-year diversion, the Park District alone can begin work on their projects in 2018, but UC and Oakland's projects where the 1991 fire actually occurred are not likely to begin before 2022 if not later.

I applaud the fact that the Park District can proceed with wildland and interface projects included in its 2010 adopted Plan/EIR, while also using grant funds for projects authorized by the 2016 FEMA EIS. But, I also believe that new leadership is required to deal with the politics and funding needed for overall Hill wildfire safety that can only be achieved when all agencies and residents are doing their part in a well-funded and coordinated effort.

In his article about the Big Ones, Dr. Stephen J. Pyne, noted that historians have come to think of the 20th century as a "short century," defined by the onset of the Great War in 1914 and the end of the Cold War in 1991. For fire history, the corresponding events are the San Francisco conflagration of 1906 and the Oakland holocaust of 1991. The two cities pair off across the Bay; so, too, they bookend a century. "They are the Big Ones that haunt the imagination of California fire. That is why the frontier between city and park exists and why quarreling is interminable about tradeoffs regarding trees and houses. The story demonstrates, however, why California has the fire management system it does. Whatever the starting point, if the site is south of the San Andreas, or its East Bay offset, the Hayward, the pressures will drive the outcome to the same responses. If those measures fail, the fires will follow." [33]

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Jerry Kent retired in 2004 as Assistant General Manager of Park Operations with the East Bay Regional Park District. He was involved for 42 years in all aspects of District management and policy, including overseeing the Park District's fire related vegetation management programs. He staffed the 1982 East Bay Hills Blue Ribbon Fire Hazard Reduction Planning Study, assisted in fighting the 1991 fire, and in restoration efforts after the fire, and he was the Park District's representative while developing the 1995 East Bay Hills Vegetation Management Consortium Fire Hazard Mitigation Program and Plan. After retirement, Jerry has also been engaged in 15 years of wildfire prevention advocacy serving on the Sierra Club Public Lands Committee, the Claremont Canyon Conservancy Board of Directors, and the Regional Parks Association Board of Directors.